Appendix E.

Other Supporting Information

Table of Contents

PR&G Analysis Report....E-2
Preliminary Design Report....E-34
Water Model Report....E-336
Aquatic Resources Delineation Report....E-390
Zion National Park Water Rights Settlement Agreement....E-560
Colorado River Compact....E-573
Final Biological Assessment....E-577
First Cultural Resources Inventory Report (redacted)....E-674
Second Cultural Resources Inventory Report (redacted)....E-715
Third Cultural Resources Inventory Report (redacted)....E-730
Indirect APE Memorandum (redacted)....E-742
Visual Resources Memorandum....E-804
Paleontological Survey Report (redacted)....E-813
Plan of Development....E-846
Alternatives Site Evaluation Memorandum....E-875
Alternatives Matrix....E-886
Alternatives 2 and 3 Comparison Memorandum....E-887
BMP/SOP List....E-889
Site Erosion Analysis....E-896
Sediment Report....E-933
Dam Feasibility Study....E-937
Importance of Alfalfa Hay Memorandum....E-1018
BLM IDT Checklist....E-1025
NRCS Programmatic Agreement for Inadvertent Discoveries....E-1029

Cove East Fork of the Virgin River Watershed Plan

Proposed NEE Alternative

Kane and Washington Counties, Utah

Prepared for:

September 2026

Prepared by:

Scott Hoag, Jr, Economist

Table of Contents

1.0 Introduction 1

2.0 Principles, Requirements, and Guidelines Evaluation Process Overview 1

3.0 Principles, Requirements, and Guidelines Eight-Step Evaluation Process 2

3.1 Identify Problems and Opportunities 2

3.2 Inventory Existing Resource Conditions 3

3.3 Forecast Future Conditions 3

3.4 Develop Array of Alternatives 4

3.4.1 6,055-Acre Foot Alternative (Preferred Alternative) 4

3.4.2 3,000-Acre Foot Alternative 6

3.5 Evaluate Effects of Individual Alternatives 7

3.5.1 Economic Evaluation and Comparison 8

3.5.2 Agricultural Water Management Benefits 9

3.5.3 Recreation Benefits 10

3.5.4 Municipal and Industrial Water Benefits 12

3.5.5 Cost Allocation 13

3.5.6 Environmental Evaluation 14

3.6 Compare Alternatives 14

3.7 Identify Recommended Alternative 16

3.8 Implement and Evaluate 16

3.9 Environmental and Social Benefits 17

4.0 References 19

List of Tables

Table 1: 6,055-Acre-Foot Reservoir Construction Elements 5

Table 2: Reservoir Outlet Pipeline Construction Elements 5

Table 3: Mt. Carmel Irrigation Pipeline Construction Elements 5

Table 4: Cultural Resource Mitigation 6

Table 5: Recreation Facilities Construction Elements 6

Table 6: Access Road Construction Elements 6

Table 7: 3,000 Acre-Foot Reservoir Construction Elements 7

Table 8: Recreation Facilities Construction Elements 7

Table 9: Potential Agricultural Water Management, Recreation, and M&I Opportunities 9

Table 10: Benefit-Cost Summary 9

Table 11: USCOE EGM point values 11

Table 12: Dollar Values and Corresponding Point Values ..... **Error! Bookmark not defined.**

Table 13: Calculations based on Dollar and Point Values 12

Table 14: Municipal and Industrial Water Benefits Calculations 12

Table 15: Use of Facilities Cost Allocations 13

1.0 Introduction

A Natural Resources Conservation Service (NRCS) Watershed Plan and Environmental Impact Statement (Plan-EIS) is being prepared for the East Fork of the Virgin River (EVFR) Watershed Project (Project) in Kane County, Utah. The Project is authorized under the NRCS Watershed and Flood Prevention Operations Program and funded through the Watershed Protection and Flood Prevention Act of 1954 (PL 83-566). Kane County Water Conservancy District (KCWCD) is the Sponsoring Local Organization. Washington County Water Conservancy District (WCWCD) is a co-sponsor. Cooperating agencies include the Bureau of Land Management (BLM), National Park Service, Environmental Protection Agency, United States Army Corps of Engineers, Utah School and Institutional Trust Lands Administration, and Public Lands Policy Coordination Office.

The Project proposes the installation of a 6,000-acre-foot reservoir for the purposes of Agricultural Water Management (AWM), Recreation, and Municipal and Industrial (M&I) Water Supply.

The purpose of this report is to document Project compliance with Principles, Requirements, and Guidelines (PR&G) for Federal Investments in Water Resources per the *Principles and Requirements for Federal Investments in Water Resources* (Council on Environmental Quality [CEQ] 2013), the *Final Interagency Guidelines* (CEQ 2014), and *NRCS Decision Memorandum* (NRCS 2018).

2.0 Principles, Requirements, and Guidelines Evaluation Process Overview

The PR&G evaluation process is based on an eight-step watershed planning process and was completed for the EFVR Project, as described in section 3.0. The NRCS nine-step planning process was also followed in conjunction with the PR&G evaluation process. The PR&G eight-step evaluation process includes consideration of the federal objective, PL 83-566 general purposes, guiding principles, and ecosystem services. Guiding principles were used to assist in decision making and weighing tradeoffs of Project alternatives. The use of an ecosystem services framework to describe the comprehensive set of benefits that people receive from nature is characterized as ecological goods and services provided by a healthy, functioning environment. The guiding principles outlined in the PR&G documents include:

1) Healthy and Resilient Ecosystems

2) Sustainable Economic Development

3) Floodplains (avoiding unwise use of floodplains)

4) Public Safety (reducing public health and safety risks)

5) Environmental Justice

6) Watershed Approach

Ecosystem services benefits have been organized into four service categories that are reflected in the Department of Agriculture Departmental Manual (DM9500-13) and include:

1) **Provisioning services** are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass.

2) **Regulating services** maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe. Examples include flood and disease control, water filtrations, climate stabilization, or crop pollination.

3) **Supporting services** refer to the underlying processes maintaining conditions for life on earth, including nutrient cycling, soil formation, and primary production.

4) **Culture services** make the world a place in which people want to live, including recreational use, spiritual, aesthetic viewsheds, or Tribal values.

The guiding principles and service categories were evaluated for those that were critical to the decision maker, the analysis, and the stakeholders. A measurement of change in services was determined, where applicable, between the Future without Federal Investment (FWOFI) Alternative, also referred to as the No Action Alternative, and the Future with Federal Investment (FWFI) Alternatives, also referred to as Action Alternatives. An evaluation framework was developed to compare the FWOFI and FWFI Alternatives and is attached in Appendix A. This framework was used to select the alternative that maximizes public benefits (environmental, economic, and social goals) with appropriate consideration of costs and included consideration of the guiding principles and ecosystem services.

3.0 Principles, Requirements, and Guidelines Eight-Step Evaluation Process

The PR&G eight-step evaluation process used in decision making is outlined in Sections 3.1 through 3.8 below.

3.1 Identify Problems and Opportunities

Problems and opportunities were identified during the Project scoping process. Input from the sponsors, agencies, public, organizations, and Tribes were solicited as described in Chapter 1.8.4 and Chapter 7.0 of the Plan-EIS. A copy of the Scoping Report is provided in Appendix A of the Plan-EIS. Engineering analysis was completed to further identify and evaluate problems as documented in the engineering technical memorandums attached in Appendix E of the Plan-EIS. The Purpose and Need of the Project was formulated with the problems and opportunities in consideration. Where the “Purpose” identifies the fundamental reason why the action is being proposed and the “Need” describes the problem(s) that the proposed action is intended to address and explains the underlying causes of the problem(s). The Purpose and Need of the Project is included in Chapter 2.0 of the Plan-EIS with information supporting the Purpose and Need and a description of the watershed problems identified in Chapter 2.2.1 of the Plan-EIS. The Purpose

and Need of the Project, as stated in the Plan-EIS (Chapters 2.1 and 2.2) and for reference, is included below.

> The primary purpose of the proposed Project is to enhance the efficiency and reliability of the current agricultural water management in Long Valley, part of the EFVR sub-watershed, while complying with the Zion National Park Water Rights Settlement of 1996. Effective irrigation systems and water management strategies would support farm profitability amid constraints posed by scarce and costly water resources.
>
> The secondary purposes of the project are public recreation and to increase irrigation and M&I water supply to communities in Washington County. The water demand in the WCWCD service area is projected to increase as summer irrigation water shortages continue and more municipal water providers join and receive from the WCWCD system.
>
> The need for this project arises from annual water shortages experienced by local agricultural users served by the Glendale, Orderville, and Mt. Carmel irrigation companies. Due to a difference in timing between the melting of snowpack within the watershed and the peak demand for agricultural water use, these users experience water shortages during the summer months. Contributing factors include variable precipitation patters, EFVR flow trends, absence of sufficient water storage facilities, and inefficiencies in current irrigation water during summer, causing inconsistent agricultural production and limiting the potential for cultivation of water-dependent crops.
>
> Additionally, water users in Washington County, served by the Hurricane Canal Company, experience water shortages during the summer months when Virgin River flows decrease, and a projected county population increase will result in a greater M&I water demand.

3.2 Inventory Existing Resource Conditions

Resources relevant to the proposed action were determined during the scoping process, as described in Chapter 3.1 of the Plan-EIS. The existing conditions of resources determined to be relevant are documented in Chapter 3.2 of the Plan-EIS, which provides the environmental baseline conditions for resources to be evaluated against alternative actions. The best available data and science was used to inventory the existing resource conditions at a level and scale of analysis determined reasonable for evaluating alternatives and impacts.

3.3 Forecast Future Conditions

A forecast of future conditions was made for resources, where reasonable to address, in the Chapter 3.3 of the Plan-EIS. Additional future conditions forecasting was made for each alternative and associated implementation and Operations and Maintenance (O&M) costs. Future forecasting of alternative impacts is described in Chapter 5.0 of the Plan-EIS. The installation and O&M costs for future conditions of each alternative are provided in Chapter 4.0 of the Plan-EIS.

3.4 Develop Array of Alternatives

Project alternatives were formulated following procedures outlined in the National Watershed Program Manual, National Watershed Program Handbook, and PR&G. Alternatives required in the initial consideration per PR&G includes the FWOFI Alternative and the FWFI Alternatives, locally preferred alternative, environmentally preferable alternative, and any additional alternatives. A nonstructural alternative did not meet the Project purpose and need and was determined not feasible. Therefore, the FWOFI Alternative, which would not include any structural measures but maintain the existing situation, is the nonstructural alternative.

Two action alternatives, a 6,000-Acre-Foot Reservoir, and a 3,000-Acre-Foot Reservoir, were developed for the EFVR Watershed for the PL 83-566 water management authorized purpose. Descriptions of alternative measures are provided in 4.2 of the Plan-EIS.

Alternatives were removed from further consideration and analysis during the PR&G evaluation if they were determined infeasible, did not meet the purpose and need, conflicted with the federal objective or guiding principles, had exorbitant costs, or were determined to be inferior due to other critical factors. A detailed description of these alternatives is included in Chapter 4.2 of the Plan-EIS. In those cases, a brief discussion is included in the evaluation framework table (Appendix A) to identify the reasons for elimination of an alternative. A discussion of the alternatives eliminated and the reasons for elimination are also documented in Section 5.3 of the Plan-EIS.

The FWOFI Alternative (No Action Alternative) was also evaluated to provide a benchmark for comparison. The FWOFI Alternative would consist of continued diversion of water from the East Fork of the Virgin River to irrigate 1,109 acres in the Glendale, Orderville and Mt. Carmel irrigation districts.

3.4.1 6,000-Acre Foot Alternative (Preferred Alternative)

The FWFI Alternative consists of construction of a 6,000-acre-foot reservoir and dam, principal and auxiliary spillways, recreation area, pipelines, booster pump station, and access road improvements. Construction elements for the preferred alternative are described in tables 1 through 6 below.

Table 1: 6,000-Acre-Foot Reservoir Construction Elements

ITEM	DESCRIPTION	QUANTITY	UNITS
1	Mobilization (5 percent)	1	Lump Sum (L.S.)
2	Excavation	644,000	Cubic Yards (C.Y.)
3	Foundation Preparation	12,000	Square Yards (S.Y.)
4	Earthfill, Zone I - Dam Embankment	1,575,000	C.Y.
5	Earthfill, Zone II - Filter / Drain	82,000	C.Y.
6	Roadbase - Riprap Bedding	19,000	C.Y.
7	Rock Riprap	28,000	C.Y.
8	Grout Curtain	31,500	Linear Feet (L.F.)
9	Outlet Works	550	L.F.
10	Spillway	1	L.S.
11	Instrumentation	1	L.S.

Table 2: Reservoir Outlet Pipeline Construction Elements

ITEM	DESCRIPTION	QUANTITY	UNITS
1	Mobilization (5 percent)	1	L.S.
2	Replace Line from Existing Glendale Hydro to Orderville Diversion Dam with 10-inch Pipeline	9,200	L.F.
3	Replace Existing 18-inch and 14-inch BV Valves with Gate Valves	2	Each
4	Clean Pipeline	1	L.S.
5	Furnish and Install 10-inch Plunger Valve and Vault	1	L.S.
6	Power Interconnection	1	Each

Table 3: Mt. Carmel Irrigation Pipeline Construction Elements

ITEM	DESCRIPTION	QUANTITY	UNITS
1	Mobilization at 5 percent	1	L.S.
2	8-inch Pipeline	4,960	L.F.
3	10-inch Pipeline	8,300	L.F.
4	12-inch Pipeline	6,400	L.F.
5	16-inch Pipeline	4,100	L.F.
6	Misc. Fittings	1	L.S.
7	Highway Crossings	3	Each
8	Pump Station	1	Each
9	Cultural Resource Mitigation	1	Each

Table 4: Cultural Resource Mitigation

Tasks	Description
Task 1	Project Management and Coordination
Task 2	Drone Flyovers
Task 3	Aerial Photographs
Task 4	Measured Drawings
Task 5	GIS Story Map
Task 6	Informational Brochure
Task 7	Updated Site Records
Task 8	Historic Context

Table 5: Recreation Facilities Construction Elements

ITEM	DESCRIPTION	QUANTITY
1	Mobilization at 5 percent	1
2	Excavation and Subgrade Prep	88,000
3	6-inch Reinforced Concrete (Boat Ramp)	6,500
4	6-inch Untreated Base Course (Boat Ramp)	6,500
5	6-inch Untreated Base Course (Parking)	28,500
6	6-inch Untreated Base Course (Roads)	53,000
7	Camp/RV Site Facilities (Barbeque Grill, Table, Fire Pit)	20
8	Pavilion	1
9	Signage	5
10	Restroom Facility (Assume Pit Toilet System)	2

Table 6: Access Road Construction Elements

ITEM	DESCRIPTION	QUANTITY
1	Mobilization at 5 percent	1
2	Excavation and Subgrade Prep	110,440
3	6-inch Untreated Base Course (24-foot width)	291,408
4	Misc. Culverts	1
5	Signage	4

3.4.2 3,000-Acre Foot Alternative

Alternative 2 consists of construction of a 3,000-acre-foot reservoir and dam, principal and auxiliary spillways, recreation area, pipelines, booster pump station, and access road improvements. Construction elements for the reservoir and recreation area are described in tables 7 and 8 below. Construction for the remainder of the project would be the same as described in section 3.4.1.

Table 7: 3,000 Acre-Foot Reservoir Construction Elements

ITEM	DESCRIPTION	QUANTITY	UNITS
1	Mobilization (5 percent)	1	L.S.
2	Excavation	523,000	C.Y.
3	Foundation Preparation	11,000	S.Y.
4	Earthfill, Zone I - Dam Embankment	1,050,000	C.Y.
5	Earthfill, Zone II - Filter / Drain	64,000	C.Y.
6	Roadbase - Riprap Bedding	15,000	C.Y.
7	Rock Riprap	20,000	C.Y.
8	Grout Curtain	29,000	L.F.
9	Outlet Works	300	L.F.
10	Spillway	1	L.S.
11	Instrumentation	1	L.S.

Table 8: Recreation Facilities Construction Elements

ITEM	DESCRIPTION	QUANTITY
1	Mobilization at 5 percent	1
2	Excavation and Subgrade Prep	88,000
3	6-inch Reinforced Concrete (Boat Ramp)	6,500
4	6-inch Untreated Base Course (Boat Ramp)	6,500
5	6-inch Untreated Base Course (Parking)	28,500
6	6-inch Untreated Base Course (Roads)	53,000
7	Camp/RV Site Facilities (Barbeque Grill, Table, Fire Pit)	12
8	Pavilion	1
9	Signage	5
10	Restroom Facility (Assume Pit Toilet System)	1

3.5 Evaluate Effects of Individual Alternatives

The PR&G evaluation framework assessed two Action Alternatives that included water storage for Cove EFVR. Refer to the framework table provided in Appendix A. The framework table includes the guiding principles listed in Section 2.0 above and ecosystem services for provisioning, regulating, cultural, and supporting, as applicable. The ecosystem services determined to be applicable to Project measures for evaluation are listed below. Because short-term construction impacts would be avoided, minimized, and/or mitigated, only measurable long-term effects to ecosystem services are considered for the framework table and determination of applicability.

Provisioning Services

- Ecosystem Productivity
- Food (agricultural yield)

Regulating Services

- Climate
- Water Regulation (quality and quantity)
- Biological Regulation (plants and animals)

Cultural Services

- Peace and Sustainability
- Community Well-being
- Cultural/Historical Identity and Heritage

Supporting Services

- Water Cycling
- Nutrient Cycling
- Habitat and Biomass

An economic analysis was also completed for the FWOFI (No Action) and FWFI (Action) alternatives evaluated in the framework tables for each site as described in the following section.

3.5.1 Economic Evaluation and Comparison

During June, July, August, and September, the water flow in the EFVR is insufficient to meet the Glendale, Orderville, and Mt. Carmel Irrigation Company agriculture irrigation needs as well as the irrigation water supply needs of the HCC and the M&I water needs in Washington County.

The existing conditions of the Project area are identified in Chapter 3.0 of the Plan-EIS. The economic analysis for the FWFI alternative identified those resources determined necessary for evaluation as part of the alternative development process. The economic evaluation considered the benefits and costs of the FWFI alternative for each of the two reservoir sizes and are described below. The FWOFI alternative was also evaluated. The FWOFI is the likely future condition in the absence of federal action or federal funding and provides the baseline for comparison of the FWFI. The sponsors have obtained funding at local and state level for their share of the Project cost.

3.5.1.1 Calculations

Three primary economic benefits were identified that would result from implementation of the FWFI alternative. Table 1 identifies the beneficial effects that ensue by implementing the Action Alternative. These individual resources are discussed in detail below.

Table 9: Potential Agricultural Water Management, Recreation, and M&I Opportunities

Site Name	Rural Community and Agricultural Benefits	Recreation Benefits	M&I Benefits
AWM	X	-	-
Recreation	-	X	-
Washington County M&I	-	-	X

(Hoag 2023)

The Proposed Project benefit-cost summary of implementing the FWFI alternative is shown below.

Table 10: Benefit-Cost Summary

Purpose	Average Annual Cost	Average Annual Benefit	Benefit-Cost Ratio	Net Benefit
AWM	$503,402	$389,000	0.77	-$114,402
Recreation	$424,749	$414,000	0.97	-$10,749
M&I Water	$431,257	$594,000	1.38	$162,743
Total	$1,359,000	$1,397,000	1.03	$38,000

3.5.2 Agricultural Water Management Benefits

The principal ecosystem services considered in the evaluation of this Project are:

1) Provisioning services are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass

2) Healthy and resilient ecosystems

3) Sustainable economic development

Benefits to AWM were assessed by comparing the FWOFI alternative and the FWFI alternative. Crop budgets for alfalfa and alfalfa establishment produced by the Utah State University Cooperative Extension Service were used to assess benefits to increased and reliable water supplies for 1,109 acres in Kane County and 67 acres in Washington County.

The 2016 crop budget operating costs for Kane and Washington Counties were brought to current value using the Producer Prices Paid Index for FY 2026 (152) divided by the Index for 2006 (148), giving a multiplier of 1.03 Fixed costs were not considered in the analysis since each operator has a full complement of machinery and sprinkler systems.

Kane County alfalfa production in the FWOFI alternative is 3 tons per acre while the FWFI alternative is 5 tons per acre. Washington County, alfalfa production is 4 tons and 6 tons per acre, respective to the FWOFI and FWFI alternatives. Residue grazing values were also assessed in both Kane and Washington Counties.

Per acre benefits were calculated by subtracting the FWOFI alternative net return from the FWFI alternative net return. This was done for both Kane and Washington Counties. The 1,109 acres in Kane County are comprised of three Irrigation companies: Orderville, 286.05 acres; Glendale, 427.26 acres; and, Mt Carmel, 395.75 acres. There are 198 acres in Mt. Carmel sprinkler irrigated and 198 acres flood irrigated. A per-acre, sprinkler system purchase-cost was calculated and included in the 198 flood irrigated acres in the Mt. Carmel district. The FWFI alternative and a benefit was calculated as above. The same analysis was employed for oat hay/alfalfa establishment.

AWM benefits were calculated assuming a 10-year crop rotation: 8 years in alfalfa and 2 years in oat hay/alfalfa establishment. A weighted average (80 percent alfalfa, 20 percent oat hay/alfalfa establishment) per-acre net return was calculated for the 713.31 acres in Glendale and Orderville. A weighted average (80 percent alfalfa, 20 percent oat hay/alfalfa establishment and 50 percent sprinkler irrigated and 50 percent flood to sprinkler irrigated) per-acre net return was calculated for the Mt. Carmel area. Total AWM benefits are shown in Table 2. Evaluation files for AWM are found in the EXCEL workbook titled Irrigation Benefit Analysis (Appendix B). Each sheet in the workbook details the AWM analysis.

3.5.3 Recreation Benefits

Benefits to recreation were assessed based on the Army Corps of Engineers Unit Day Values for recreation activities. Point values for General Recreation and Specialized Recreation for each category (Recreation Experience, Availability of Opportunity, Carrying Capacity, Accessibility, Environmental Quality) were assigned based on the Tables 1 and 2 in the above EGM. Point values were converted to dollar values based on the table of Conversion of Points to Dollar Values (page 2 of the EGM).

Recreation benefits were calculated based on recreation use at Jackson Flat Reservoir (14,090 annual visits). Total points were determined for General Recreation (64) and Specialized Recreation (53). A dollar value was calculated for both General Recreation and Specialized Recreation for each of the categories listed above and a weighted average (assuming 50 percent General and 50 percent Specialized) computed for the Project equal to $28.53 per annual visit for a benefit of $414,000. The USCOE EGM point values and their conversion are in the following tables.

Table 2: USCOE EGM point values

-	Unit Day Value Point Values (General Recreation)	Unit Day Value Point Values (Specialized Recreation)
Recreation experience	23	13
Availability of Opportunity	4	3
Carrying Capacity	11	11
Accessibility	11	11
Environmental quality	15	15
TOTAL PTS	64	53
Value	$12.23	$44.82

Table 11: Dollar Values and Corresponding Point Values

Point Values	General Recreation Values (1)	General Fishing and Hunting Values (1)	Specialized Fishing and Hunting Values (2)	Specialized Recreation Values other than Fishing and Hunting (2)
0	$5.17	$7.44	$36.22	$21.02
10	$6.14	$8.41	$37.19	$22.31
20	$6.79	$9.05	$37.84	$23.93
30	$7.76	$10.02	$38.81	$25.87
40	$9.70	$11.00	$39.78	$27.49
50	$11.00	$11.97	$43.66	$31.05
60	$11.97	$13.26	$47.54	$34.28
70	$12.61	$13.91	$50.45	$41.39
80	$13.91	$14.88	$54.33	$48.18
90	$14.88	$15.20	$58.21	$54.98
100	$15.52	$15.52	$61.44	$61.44

Table 4: Calculations based on Dollar and Point Values

General Recreation $ value at 60 pts	$11.97
General Recreation $ value at 70 pts	$12.61
General Recreation $ value at 64 pts equals (12.61-11.97) times .4 plus 11.97 equals	$12.23
Specialized Recreation $ value at 50 pts	$43.66
Specialized Recreation $ value at 60 pts	$47.54
Specialized Recreation $ value at 53 pts equals ($47.54-$43.66) times .3 plus $43.66 equals	$44.82
Combined Value equals .5 times 12.23+.5 times 47.54	$28.53

3.5.4 Municipal and Industrial Water Benefits

Benefits to M&I in Washington County were assessed based on cost information in the following study prepared for the WCWCD: Washington County Small Surface Water Storage Project Feasibility Study. The average annual cost of the Ash Creek Project per acre-foot was computed from information in Table 5-1: Cost Comparison of Water Supply Alternatives of the Feasibility Study. The 2022 cost per acre-foot was updated to the current value based on a multiplier computed from the Engineering News Record Construction Cost indices for FY 2022 and FY 2025. The average annual cost per acre-foot was then multiplied by the 300-acre-foot unit provided by the Cove EFVR Reservoir. This value is then a cost savings attributed to WCWCD and is the computed M&I benefit. The following table shows the calculations.

Table 5: Municipal and Industrial Water Benefits Calculations

-	Construction Cost	Amortized Const Cost	Acre-Foot	Ave Ann Const Cost per Acre-Foot	Benefit per 300 Acre-Foot
	$101,622,816	$3,443,338	1,739	$1,932 $1,980	$594,020

3.5.5 Cost Allocation

Cost allocation is described in Part 611 Water Resources Handbook for Economics National Resource Economics Handbook at 611.0601 Cost allocation. Separable Cost/Remaining Benefit–Use of Facilities was used to allocate the Costs of the Multipurpose Reservoir. Calculations are shown in the table below.

Table 12: Use of Facilities Cost Allocations

		Purpose			
		Irrigation	Recreation	M&I	Total
1 Benefits		$14,284,234	$13,133,232	$17,117,471	$44,534,937
2 Alternative cost		$35,098,689	$21,799,133	$16,738,530	$73,636,352
3 Lesser of step 1 or 2		$14,284,234	$13,133,232	$16,738,530	$44,155,996
4 Separable cost		$1,803,015	$2,008,713	$1,285,234	$5,096,962
5 Use of facility (ac ft)		1,700	1,500	2,800	6,000
5a Percentage use of facility		28%	25%	47%	100%
6 Allocated joint cost		$1,444,139	$1,274,240	$2,378,582	$5,096,962
7 Total allocated cost		$3,247,154	$3,282,953	$3,663,816	$10,193,923
8 Net benefits		$11,037,080	$9,850,279	$13,074,714	$33,962,073
Total Allocated Cost		31.9%	32.2%	35.9%	100.0%

Step 1: Report the benefits for each purpose for which the plan was formulated. Benefits are shown in present value terms.

Step 2: The alternative cost is the financial cost of achieving the same or equivalent benefits by a single purpose project.

Step 3: Record the lesser of the benefits or the alternative cost, by purpose.

Step 4: Separable cost is the cost of adding each purpose to the multiple purpose project. This figure indicates the minimum cost that will be allocated to the purpose. If the separable cost for a purpose exceeds the amount shown in step 3, the project contains an infeasible purpose.

Step 5: is the use each purpose makes of the multiple purpose facility in acre-feet. When two purposes make joint use of the same reservoir capacity, that capacity is equally divided among the purposes.

Step 6: The allocated joint cost in the total column is the difference between project financial cost and the sum of the separable costs for all of the purposes. The total allocated joint cost is distributed to each purpose by the percentage shown for that purpose in step 5a.

Step 7: Total allocated cost for each purpose is the sum of the separable cost and allocated joint cost for the purpose.

Step 8: Net benefits are the difference between the amounts in Step 3 and Step 7. Because purpose feasibility is not automatic in this method, Step 8 is added.

Cost allocation is defined below (see Part 611, Water Resources Handbook for Economics, National Resource Economics Handbook, 611.0601 Cost Allocation):

Public Law 83-566, as amended, authorizes the U.S. Secretary of Agriculture "to make allocations of costs to the various purposes, and to show the basis of such allocations and to determine whether benefits exceed costs" (PL 83-566). NRCS national policy directs that, in allocating total project financial costs among the purposes served by the project or plan, "separable costs will be assigned to their respective purposes, and all joint costs will be allocated to purposes for which the project was formulated." The distinction between cost allocation and cost sharing must be recognized. Cost allocation pertains to works of improvement serving more than one purpose. It is the process of dividing costs of the structure equitably among the purposes served, with each purpose receiving its fair share of the advantage resulting from multiple purpose installation. Cost sharing is the division of the cost allocated to each purpose by the financing agencies or groups involved. In NRCS water resource projects, costs of the works of improvement are shared between federal and local funds. The need for allocation stems from cost-share rates that vary among purposes. Although either annual equivalents or capital costs can be used in allocations, NRCS policy is to use capital costs.

3.5.6 Environmental Evaluation

A detailed analysis was completed for each alternative evaluated in the Plan-EIS. These are the FWOFI Alternative (No Action Alternative) and the FWFI Alternative (Action Alternative). The potential effects of implementing each alternative were analyzed and documented in Chapter 5.0 of the Plan-EIS.

3.6 Compare Alternatives

A measurement of change in services was determined, where applicable, between the FWOFI alternative and the FWFI alternative. The alternatives for each site meeting the guiding principles were noted in the framework table for side-by-side alternative comparison. The ecosystem services were also compared in the framework table. The PR&G evaluation comparison tables for decision making are included in Attachment A of this document.

The two alternatives were evaluated to determine the locally, environmentally, and socially preferred alternative plans. The preferred alternative was coordinated with the those having local interests and oversight for implementation authorities and responsibilities. The local entities include the KCWCD, WCWCD, BLM. The environmentally preferred alternative was selected based on evaluations conducted during the NEPA process and from the determination of

environmental consequences as documented in Chapter 6.0 of the Plan-EIS. Determination of the socially preferred alternative compared impacts or benefits for each alternative related to the social well-being of the community. Specifically for this Project, these comparison items included socioeconomic effects on the community.

3.7 Identify Recommended Alternative

NRCS must identify the federally assisted alternative that best maximize public benefits (environmental, economic, and social goals) with appropriate consideration of costs, guiding principles, and ecosystem services. This alternative is known as the NRCS National Economic Efficiency (NEE) Alternative. The NEE Alternative also reflects national priorities, economic development, and environmental protection through:

1) Seeking to maximize sustainable economic development

2) Seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used

3) Protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

The FWFI alternative is in line with the federal objectives outlined above. This alternative was formulated to maximize sustainable economic development and economic benefits for the agricultural community, recreationists, and M&I water users in Washington County. Implementation of the FWFI alternative would improve agriculture water management and avoid short water supplies in late summer and early fall. Producers would be assured of a full water supply for the entire growing season. Recreationists can take advantage of a flat-water reservoir with RV sites. Users will enjoy boating, fishing, hiking and camping.

The NEE alternative was selected based on the best option determined from the comparison of alternatives included in the framework table in Appendix A. In comparing the FWOFI and FWFI alternatives, the FWFI option was the preferred option, based on the purpose and need and objectives of the Project. The FWFI alternative resulted in the least cost (installation and operation, maintenance, and replacement costs versus Project benefits) over the evaluated life of the Project and was selected as the NEE alternative. This alternative would meet the guiding principles, provide the greatest benefits for ecosystem services, and is in line with the federal objective and PL 83-566 general purposes. This alternative was also determined to be the locally preferred, environmentally preferred, and socially preferred alternative. The Plan-EIS incorporates a description of the decision-making process for selection of the NEE alternative in Chapter 6.0. See Benefit-Cost Summary Tables in Chapter 6.12 of the Plan-EIS.

3.8 Implement and Evaluate

The NEE alternative (FWFI or Action Alternative) was evaluated, and the subsequent environmental consequences are analyzed in Section 6.0 of the Plan-EIS. The No Action alternative (FWOFI Alternative) was also evaluated to provide a baseline comparison as well as evaluate the effects of not implementing the FWI alternative. The effects of these alternatives were determined for each potentially affected resource relevant to the proposed action. The evaluation assessed the alternatives against the baseline data presented in Section 4.0 of the Plan-EIS. An

additional evaluation of the NEE alternative was completed that included information on implementing the proposed measures. This included recommended measures to be installed, avoidance/minimization measures, required permits and compliance, installation/financing, O&M, costs, cost share, and economic benefits. This is included in Section 8.0 of the Plan-EIS.

3.9 Environmental and Social Benefits

Environmental and social benefits were not monetized but are further explained for each alternative studied in detail in the Chapter 5.0 of the Plan-EIS. The proposed project would have long-term, beneficial effect son agricultural production, recreation, M&I, and hydroelectric power production. Short-term, adverse effects could result from construction activities and are summarized below:

- Additional water would be provided to local water users during summer months on approximately 1,100 acres in Kane County and 770 acres in Washington County, increasing agricultural production. A new water-based recreation opportunity would also be available. The existing Orderville hydroelectric power plant would be able to produce energy during the summer months.
- Approximately 259 acres of permanent surface disturbance would occur during a 15-month construction period. Approximately 64 acres of additional temporary surface disturbance would result from installation of pipelines and access roads.
- Changes in stream flows would result in negligible changes to river depth and channel width. No WSR values in EFVR in Zion National Park would be affected.
- Emissions from construction equipment and fugitive dust would be anticipated during the 15-month construction period.
- Negligible changes in river flows below the Quail Creek Dam Diversion would not adversely affect the listed Woundfin or Virgin River Chub habitat.
- Construction activities may disturb migratory birds and eagles in the short term. Increased human presence in the project area could disturb these species in the long-term. Additional habitat is located adjacent to the project area.
- Construction-related effects would expose disturbed areas to invasive plant species growth.
- An increase in human presence in the project area may drive some wildlife away from the area long-term. Construction of the reservoir would result in additional riparian and aquatic habitat.
- Two historic ditches eligible for listing under the NRHP would be converted from open ditches to buried pipe. The NRCS, with SHPO concurrence, has determined an Adverse Effect to historic properties. Indirect effects could arise from visitor activity at the proposed reservoir site. Tribal groups have been notified about the project, and no concerns have been raised.
- Dam failure is a risk with all dams and would affect homes and other infrastructure located below the dam site.
- Roads could be damaged from use by large construction vehicles. Increased traffic could result in an increase of traffic-related accidents.

- There is potential for short-term effects resulting from the accidental release of hazardous materials.
- Construction activities would have a short-term, temporary noise impact. The effects would be minimal due to the short duration of construction and implementation of BMPs.
- Short-term, temporary effects would be visible during construction activities. The presence of the reservoir and associated facilities would alter the appearance of the local landscape.

4.0 References

Alpha Engineering. 2024. Cove Water Model.

CEQ. 2014. Updated Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies

CEQ 2013. Principles and Requirements for Federal Investments in Water Resources, March 2013 https://obamawhitehouse.archives.gov/sites/default/files/final_principles_and_requirements_march_2013.pdf

NRCS. 2018. Decision Memorandum for the Acting Chief. Implementation of the Principles, Requirements, and Guidelines (PR&G) for NRCS Watershed Programs. Signed April 2018.

USACOE, 2025, Economic Guidance Memorandum (EGM), 24-02, Unit Day Values for Recreation for Fiscal Year 2025. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiRxYnF0N2EAxXBATQIHYnsAWMQFnoECBcQAQ&url=https%3A%2F%2Fplanning.erdc.dren.mil%2Ftoolbox%2Flibrary.cfm%3FOption%3DListing%26Type%3DEGM%26Search%3DPolicy%26Sort%3DDefault&usg=AOvVaw38JqX54SYVco0iZ1R4UMQ6&opi=89978449

Utah State University, 2024, Applied Economics Extension. https://extension.usu.edu/apec/agribusiness-food/crops

United States Department of Agriculture, Natural Resources Conservation Service, 1998. Part 611 Water Resources Handbook for Economics, National Resource Economics Handbook

United States Department of Agriculture, Natural Resources Conservation Service. 1995. Part 610 National Economics Handbook.

Washington County Water Conservancy District, 2013. WASHINGTON COUNTY SMALL SURFACE WATER STORAGE PROJECT FEASIBILITY STUDY. Stantec/Bowen Collins & Associates

Appendix A: Tables

TABLE A-1.

TEMPLATE FOR TABLE SUMMARIZING PROJECT ALTERNATIVES AND ASSOCIATED ECOSYSTEM SERVICES

	Alternatives		
	(FWOFI)	3,000 AcFt Reservoir	6,055 AcFt Reservoir
Alternatives			
Locally Preferred			X
Environmentally Preferable			X
Brief Description of Major		3,000 ACFT reservoir	6,055 ACFT Reservoir
Project Features		to provide water for	to provide water for
		798 acres	1,191 acres
		Recreation Facilities	Recreation Facilities
		with 12 RV Sites	with 20 RV Sites
		200 ACFT of M&I water	300 ACFT of M&I water
Total Project Investment	$0	$32,345,000	$39,511,000
Average Annual including OM&R		$1,104,000	$1,347,000
Monetized Net Benefits		-$123,000	$162,000
Provisioning Services			
Municipal and Industrial Water		Provides 200 ACFT to	Provides 300 ACFT to
		Washington Co residents	Washington Co residents
		Benefit = $387,000	Benefit = $580,000
		Cost = $343,000	Cost = $429,000
Irrigation Water		Provides water for	Provides water for
		798 acres	1,191 acres
		Benefit = $327,000	Benefit = $484,000
		Cost = $417,000	Cost = $494,000
Cultural Services		12 RV sites	20 RV sites
Recreation		Benefit = $267,000	Benefit = $580,000
		Cost = $344,000	Cost = $429,000

TABLE A-2.
TEMPLATE FOR TABLE DISPLAYING CONSIDERATION OF PR&G GUIDING PRINCIPLES

PR&G GUIDING PRINCIPLES	Alt A FWOFI	Alt B 3,000 acft reservoir	Alt C 6,055 acft reservoir
Healthy and Resilient Ecosystems	The system is well balanced and diverse, maintaining its structure and function over time	The system will be improved with an increased water supply for 798 acres, recreational facilities for 12 RV sites, and 200 acft of water to augment domestic water supplies in Washington County.	The system will be improved with an increased water supply for 1,191 acres, recreational facilities for 20 RV sites, and 300 acft of water to augment domestic water supplies in Washington County.
Sustainable Economic Development	Limited water supplies lead to highly variable alfalfa production	A consistent water supply will allow alfalfa production of 5 tons per acre on 798 acres.	A consistent water supply will allow alfalfa production of 5 tons per acre on 1,191 acres.
Floodplains	No issues with floodplains	No issues with floodplains	No issues with floodplains
Public Safety	No issues with public safety	No issues with public safety	No issues with public safety
Environmental Justice	No ongoing activities to address Envionment Justice	All landowners and operators in the watershed will have access to increased irrigation water for 798 acres. Recreation facilities will provide fishing, boating, and camping (12 developed RV sites). Residents in Washington will have access to increased domestic water supplies.	All landowners and operators in the watershed will have access to increased irrigation water for 1,191 acres. Recreation facilities will provide fishing, boating, and camping (20 developed RV sites). Residents in Washington will have access to increased domestic water supplies.
Watershed Approach	Landowners and operators are engaged in planning for sustainable development	Land owners and operators, along with the residents of Glendale, Oderville, and Mt. Carmel, as well as residents in Washington County, are engaged in planning and sustaining economic development.	Land owners and operators, along with the residents of Glendale, Oderville, and Mt. Carmel, as well as residents in Washington County, are engaged in planning and sustaining economic development.

Appendix B: AWM Evaluation Files

Explanatory Notes for Irrigation Analysis

1	Kane County Crop Budgets tab - 2006 budget data by USU Extension	https://extension.usu.edu/apec/agribusiness-food/	scroll to *Kane* , click *Alfalfa* or *Oat Hay*
1a	Washington County Crop Budgets tab - 2006 budget data by USU Extension	https://extension.usu.edu/apec/agribusiness-food/	scroll to *Washington* , click *Alfalfa* or *Oat Hay*
2	Alfalfa Hay NR Tab - Without and With analysis of the base budget from Utah State University Extension Service. Net return for alfalfa hay calculated based on Costs and Returns for Growing Alfafa Hay, Kane County, 2006, USU. Cost data was brought to current value using Producers Prices Paid 2016 to 2023 for FY 2024. Value of hay is based on The Hoyt Report data for Southern Utah and then normalized.		
3	Oat Hay NR Tab - Without and With analysis of the base budget from Utah State University Extension Service Net return for oat hay calculated based on Costs and Returns for Growing Oat Hay, Kane County, 2006, USU. Cost data was brought to current value using Producers Prices Paid 2006 to 2023. Value of hay is based on The Hoyt Report data for Southern Utah and then normalized.		
3b	The Mt Carmel Irrigation District is 395.75 Acres. Half (200 ac) are sprinkled and half (200 ac) are flood irrigated. The composit net return for alfalfa and oat hay are calculated at the Mt Carmel Alfalfa and Mt Carmel Oat tabs. Half the acres (200) include a cost to purchase sprinkler systems. The composite net return accounts for this in the four budgets (2 in Alfafa and 2 in Oat hay).		
*	Same ananlysis for Washington County as in 2 and 3 above except increased water supply will serve 67 idle acres in Hurricane Canal Company Net return and cost WO/ Project are zero. The W/ Project net return is gross return minus production costs.		
4	Price and Indices Tab - Producer Prices Paid and Received and current normalized price for hay - FY 2026 values		
5	AWM-Weighted Net Return. Calculations on a per acre basis for each irrigation district; 8 years in alfalfa and 2 years in oathay/alfalfa establishment		
6	AWM Weighted Benefits calculates benefits generated by each irrigation district; 8 years in alfalfa and 2 years in oathay/alfalfa establishment		
7	AWM-Benefit Evaluation. This sheet evaluates the trade-off between M&I Water and AWM in the Bench Lake area		
8	AWM Benefit Ck. Provides a check benefit calculations using per acre values and irrigated acres to calculate AWM benefits for each irrigation disrict		

Utah State University
Extension Economics

Modify Colored Columns

Costs and Returns per acre from growing alfalfa hay, 2006
Kane County

Receipts	Quantity per acre	Unit	Price/cost per unit	Value/cost per acre	Base Value
Alfalfa hay	3.3	tons	$88.57	$292.27	$292.27
Residue	0.25	AUM	$11.53	$2.88	$2.88
Subtotal				$295.15	$295.15
Operating costs					
Fertilization					
Phosphate	125	pounds	$0.18	$22.31	$22.31
Custom ap	1	acre	$7.82	$7.82	$7.82
Pesticides/herbicides					
Furadan	1.00	pints	$10.50	$10.50	$10.50
Custom ap	1	acre	$7.82	$7.82	$7.82
Irrigation (wheel line)	7	irrigations			
Labor	2.33	hours	$10.00	$23.33	$23.33
Water asse	1	share	$20.00	$20.00	$20.00
Repairs/ma	1	acre	$2.30	$2.30	$2.30
Pumping	43	acre inch	$0.00	$0.00	$0.00
Harvesting					
Swathing	3	acre	$15.56	$46.68	$46.68
Turning	3	acre	$4.69	$14.07	$14.07
Baling	3.30	tons	$4.79	$15.81	$15.81
Hauling/sta	3.30	tons	$3.63	$11.98	$11.98
Interest on operating capital			7.61%	$4.40	$5.24
Subtotal				$187.02	$232.11
Ownership costs (excludes cost of land)				$117.83	$117.83
Farm insurance	1	acre	$2.00	$2.00	$2.00
Machinery ownership c	1	acre	$107.58	$107.58	$107.58
Irrigation equipment co	1	acre	$8.25	$8.25	$8.25
Total costs				$304.84	$349.94
Net returns to owner for unpaid labor, management, equity and risk					
Above operating costs				$108.14	$63.04
Above total listed costs				-$9.69	-$54.78

Assumptions
1. Alfalfa already established. Harvested in June, August, September.
2. Interest computed on fertilization/herbicide costs for 6 months and operating costs for 3 months.
3. Custom rates for all field operations.
4. Only owned machinery are a loader and truck.

Budget prepared by: E. Bruce Godfrey, Cody Bingham and Kevin Heaton
go to: https://extension.usu.edu/apec/agribusiness-food/crops
scroll to *Kane* , click *Alfalfa*

Utah State University
Extension Economics

Modify Colored Columns

Costs and Returns per acre from establishing alfalfa in oat hay, 2006
Kane County

Receipts	Quantity per acre	Unit	Price/cost per unit	Value/cost per acre	Base Value
Oat hay	2.3	tons	$67.67	$155.63	$155.63
Residue	-	AUM	$0.00	$0.00	$0.00
Subtotal				$155.63	$155.63
Operating costs					
Land preparation					
Plowing	1	acre	$22.78	$22.78	$22.78
Roller harrc	2	acre	$14.33	$28.66	$28.66
Planting	1	acre	$12.21	$12.21	$12.21
Seed					
Oat seed	20	pounds	$0.17	$3.40	$3.40
Alfalfa seec	16	pounds	$2.52	$40.32	$40.32
Fertilization					
Nitrogen (3	294	pounds	$0.18	$52.48	$52.48
Phosphate	96	pounds	$0.18	$17.14	$17.14
Custom ap	1	acre	$7.82	$7.82	$7.82
Irrigation (wheel line)	6	irrigations			
Labor	2.00	hours	$10.00	$20.00	$20.00
Water asse	1	share	$20.00	$20.00	$20.00
Repairs/ma	1	acre	$2.30	$2.30	$2.30
Pumping	43	acre inch	$0.00	$0.00	$0.00
Harvesting					
Swathing	1	acre	$15.56	$15.56	$15.56
Turning/rak	1	acre	$4.69	$4.69	$4.69
Baling	2.30	tons	$4.79	$11.02	$11.02
Hauling/sta	2.30	tons	$3.63	$8.35	$8.35
Interest on operating capital			7.61%	$11.36	$11.36
Subtotal				$278.09	$308.93
Ownership costs (excludes cost of land)				$117.83	$117.83
Farm insurance	1	acre	$2.00	$2.00	$2.00
Machinery ownership c	1	acre	$107.58	$107.58	$107.58
Irrigation equipment co	1	acre	$8.25	$8.25	$8.25
Total costs				$395.91	$426.75
Net returns to owner for unpaid labor, management, equity and risk					
Above operating costs				-$122.45	-$182.00
Above total listed costs				-$240.28	-$271.12

Assumptions
1. Grain and alfalfa planted in May and harvested in July.
2. Interest computed on land preparation and planting costs for 10 months and fertilization/herbicide/irrigation costs for 6 months.
3. Custom rates for all field operations.
4. Only owned machinery are a loader and truck.

Budget prepared by: E. Bruce Godfrey, Cody Bingham and Kevin Heaton
go to: https://extension.usu.edu/apec/agribusiness-food/crops
scroll to *Kane* , click *Established Alfalfa Oat Hay*

Costs and Returns per acre from growing alfalfa hay, 2006
Kane County

					WO/Project			W/Project		
Receipts	**Quantity per acre**	**Unit**	**Price/cost per unit**	**Value/cost per acre**	**Quantity per acre**	**Price/cost per unit**	**Value/cost per acre**	**Quantity per acre**	**Price/cost per unit**	**Value/cost per acre**
Alfalfa hay	3.3	tons	$88.57	$292.27	3	$220.57	$661.71	5	$220.57	$1,102.85
Residue	0.25	AUM	$11.53	$2.88	0.25	$13.13	$3.28	0.4	$13.13	$5.25
Subtotal				$295.15			$664.99			$1,108.10
Operating costs										
Fertilization										
Phosphate (11-52-0)	125	pounds	$0.18	$22.31	125	$0.18	$22.92	125	$0.18	$22.92
Custom application	1	acre	$7.82	$7.82	1	$8.03	$8.03	1	$8.03	$8.03
Pesticides/herbicides										
Furadan	1.00	pints	$10.50	$10.50	1.00	$10.78	$10.78	1.00	$10.78	$10.78
Custom application	1	acre	$7.82	$7.82	1	$8.03	$8.03	1	$8.03	$8.03
Irrigation (wheel line)	7	irrigations			7			7	$0.00	$0.00
Labor	2.33	hours	$10.00	$23.33	2.33	$10.27	$23.96	2.33	$10.27	$23.96
Water assessment	1	share	$20.00	$20.00	1	$20.54	$20.54	1	$20.54	$20.54
Repairs/maintenance	1	acre	$2.30	$2.30	1	$2.36	$2.36	1	$2.36	$2.36
Pumping	43	acre inch	$0.00	$0.00	43	$0.00	$0.00	43	$0.00	$0.00
Harvesting										
Swathing	3	acre	$15.56	$46.68	3.0	$15.98	$47.94	5.0	$15.98	$79.90
Turning	3	acre	$4.69	$14.07	3.0	$4.82	$14.45	5.0	$4.82	$24.08
Baling	3.30	tons	$4.79	$15.81	3.0	$4.92	$14.76	5.0	$4.92	$24.60
Hauling/stacking	3.30	tons	$3.63	$11.98	3.0	$3.73	$11.18	5.0	$3.73	$18.64
Interest on operating capital			7.61%	$4.40		4.88%	$2.86		4.88%	$3.58
Subtotal				$187.02			$187.82			$247.43
Ownership costs (excludes cost of land)				$117.83						
Farm insurance	1	acre	$2.00	$2.00						
Machinery ownership costs	1	acre	$107.58	$107.58						
Irrigation equipment costs	1	acre	$8.25	$8.25						
Total costs				$304.84						
Net returns to owner for unpaid labor, management, equity and risk										
Above operating costs				$108.14			$477.17			$860.67
Above total listed costs				-$9.69						

Budget prepared by: E. Bruce Godfrey, Cody Bingham and Kevin Heaton

go to: https://extension.usu.edu/apec/agribusiness-food/crops
scroll to *Kane* , click *Alfalfa*

Change in NR - Hay	
per acre	$383.50

911 acres curently under sprinkler irrigation Glendale - 427, Orderville - 286 and 198 Mt Carmel acres

1. Alfalfa already established. Harvested in June, August, September.
2. Interest computed on fertilization/herbicide costs for 6 months and operating costs for 3 months.
3. Custom rates for all field operations.
4. Only owned machinery are a loader and truck.

Costs and Returns per acre from establishing alfalfa in oat hay, 2006
Kane County

Receipts	Quantity per acre	Price/cost per unit	Price/cost per unit	Value/cost per acre	Base Value	WO/Project Quantity per acre	WO/Project Price/cost per unit	WO/Project Value/cost per acre	W/Project Quantity per acre	W/Project Price/cost per unit	W/Project Value/cost per acre
Oat hay	2.3	tons	$ 67.67	$ 155.63	$ 155.63	2.3	$220.57	$507.31	3.8	$220.57	$838.17
Residue	0.2	AUM	$ 11.53	$ 2.31	$ -	0.2	$0.00	$0.00	0.3	$0.00	$0.00
Subtotal				$ 157.94	$ 155.63			$507.31			$838.17
Operating costs											
Land preparation											
Plowing	1	acre	$ 22.78	$ 22.78	$ 22.78	1	$23.40	$23.40	1	$23.40	$23.40
Roller harrow	2	acre	$ 14.33	$ 28.66	$ 28.66	2	$14.72	$29.43	2	$14.72	$29.43
Planting	1	acre	$ 12.21	$ 12.21	$ 12.21	1	$12.54	$12.54	1	$12.54	$12.54
Seed											
Oat seed	20	pounds	$ 0.17	$ 3.40	$ 3.40	20	$0.17	$3.49	20	$0.17	$3.49
Alfalfa seed	16	pounds	$ 2.52	$ 40.32	$ 40.32	16	$2.59	$41.41	16	$2.59	$41.41
Fertilization											
Nitrogen (34-0-0)	294	pounds	$ 0.18	$ 52.48	$ 52.48	294	$0.18	$53.90	294	$0.18	$53.90
Phosphate (11-52-0)	96	pounds	$ 0.18	$ 17.14	$ 17.14	96	$0.18	$17.60	96	$0.18	$17.60
Custom application	1	acre	$ 7.82	$ 7.82	$ 7.82	1	$8.03	$8.03	1	$8.03	$8.03
Irrigation (wheel line)	6	irrigations				6			6		
Labor	2	hours	$ 10.00	$ 20.00	$ 20.00	2	$10.27	$20.54	2	$10.27	$20.54
Water assessment	1	share	$ 20.00	$ 20.00	$ 20.00	1	$20.54	$20.54	1	$20.54	$20.54
Repairs/maintenance	1	acre	$ 2.30	$ 2.30	$ 2.30	1	$2.36	$2.36	1	$2.36	$2.36
Pumping	43.2	acre inch	$ -	$ -	$ -	43.2			43.2		
Harvesting											
Swathing	2.3	acre	$ 15.56	$ 35.79	$ 15.56	2.3	$15.98	$36.76	3.8	$15.98	$60.73
Turning/raking	2.3	acre	$ 4.69	$ 10.79	$ 4.69	2.3	$4.82	$11.08	3.8	$4.82	$18.30
Baling	2.3	tons	$ 4.79	$ 11.02	$ 11.02	2.3	$4.92	$11.31	3.8	$4.92	$18.69
Hauling/stacking	2.3	tons	$ 3.63	$ 8.35	$ 8.35	2.3	$3.73	$8.57	3.8	$3.73	$14.17
Interest on operating capital			$ 0.08	$ 11.36	$ 11.36		$0.05	$9.13		$0.05	$10.20
Subtotal				$ 304.41	$ 308.93			$310.09			$355.34
Ownership costs (excludes cost of land)				$ 117.83	$ 117.83						
Farm insurance	1	acre	$ 2.00	$ 2.00	$ 2.00						
Machinery ownership costs	1	acre	$ 107.58	$ 107.58	$ 107.58						
Irrigation equipment costs	1	acre	$ 8.25	$ 8.25	$ 8.25						
Total costs				$ 422.24	$ 426.75						
Net returns to owner for unpaid labor, management, equity and risk											
Above operating costs				$ (146.47)	$ (182.00)			$197.22			$482.83
Above total listed costs				$ (264.30)	$ (271.12)						
								Change in NR - Oat Hay/1			
							per acre				$285.61

Assumptions

1. Grain and alfalfa planted in May and harvested in July.

2. Interest computed on land preparation and planting costs for 10 months and fertilization/herbicide/irrigation costs for 6 months.

3. Custom rates for all field operations.

4. Only owned machinery are a loader and truck.

Budget prepared by: E. Bruce Godfrey, Cody Bingham and Kevin Heaton

go to: https://extension.usu.edu/apec/agribusiness-food/crops

scroll to *Kane* , click *Established Alfalfa Oat Hay*

https://extension.usu.edu/apec/agribusiness-food/crops

911 acres curently under sprinkler irrigation Glendale - 427, Orderville - 286 and 198 Mt Carmel acres

Costs and Returns per acre from growing alfalfa hay, 2006
Kane County

Receipts	Quantity per acre	Unit	Price/cost per unit	Value/cost per acre	Costs and Returns per acre from growing alfalfa hay Mt Carmel Sprinkler Irrigated — WO/Project Quantity per acre	WO/Project Price/cost per unit	WO/Project Value/cost per acre	W/Project Quantity per acre	W/Project Price/cost per unit	W/Project Value/cost per acre	Costs and Returns per acre from growing alfalfa hay Mt Carmel Flood Irrigated to Sprinkler Irrigated — WO/Project Flood Irrigated Quantity per acre	WO/Project Flood Irrigated Price/cost per unit	WO/Project Flood Irrigated Value/cost per acre	W/Project Sprinkler Irrigated Quantity per acre	W/Project Sprinkler Irrigated Price/cost per unit	W/Project Sprinkler Irrigated Value/cost per acre
Alfalfa hay	3.3	tons	$88.57	$292.27	3	$220.57	$661.71	5	$220.57	$1,102.85	3	$220.57	$661.71	5	$220.57	$1,102.85
Residue	0.25	AUM	$11.53	$2.88	0.25	$13.13	$3.28	0.4	$13.13	$5.25	0.25	$20.49	$5.12	0.4	$20.49	$8.20
Subtotal				$295.15			$664.99			$1,108.10			$666.83			$1,111.05
Operating costs																
Fertilization																
Phosphate (11-52-0)	125	pounds	$0.18	$22.31	125	$0.18	$22.92	125	$0.18	$22.92	125	$0.34	$35.13	125	$0.34	$42.06
Custom application	1	acre	$7.82	$7.82	1	$8.03	$8.03	1	$8.03	$8.03	1	$14.74	$12.31	1	$14.74	$14.74
Pesticides/herbicides																
Furadan	1.00	pints	$10.50	$10.50	1.00	$10.78	$10.78	1.00	$10.78	$10.78	1.00	$19.79	$16.53	1.00	$19.79	$19.79
Custom application	1	acre	$7.82	$7.82	1	$8.03	$8.03	1	$8.03	$8.03	1	$14.74	$12.31	1	$14.74	$14.74
Irrigation (wheel line)	7	irrigations			7			7	$0.00	$0.00	7			7	$0.00	$0.00
Labor	2.33	hours	$10.00	$23.33	2.33	$10.27	$23.96	2.33	$10.27	$23.96	6.00	$18.85	$113.11	2.33	$18.85	$43.99
Water assessment	1	share	$20.00	$20.00	1	$20.54	$20.54	1	$20.54	$20.54	1	$37.70	$31.49	1	$37.70	$37.70
Repairs/maintenance	1	acre	$2.30	$2.30	1	$2.36	$2.36	1	$2.36	$2.36	-	$4.34	$3.62	1	$4.34	$4.34
Pumping	43	acre inch	$0.00	$0.00	43	$0.00	$0.00	43	$0.00	$0.00	43	$0.00	$0.00	43	$0.00	$0.00
Harvesting																
Swathing	3	acre	$15.56	$46.68	3.0	$15.98	$47.94	5.0	$15.98	$79.90	3.0	$29.33	$73.49	5.0	$29.33	$146.66
Turning	3	acre	$4.69	$14.07	3.0	$4.82	$14.45	5.0	$4.82	$24.08	3.0	$8.84	$22.15	5.0	$8.84	$44.21
Baling	3.30	tons	$4.79	$15.81	3.0	$4.92	$14.76	5.0	$4.92	$24.60	3.0	$9.03	$24.89	5.0	$9.03	$45.15
Hauling/stacking	3.30	tons	$3.63	$11.98	3.0	$3.73	$11.18	5.0	$3.73	$18.64	3.0	$6.84	$18.86	5.0	$6.84	$34.22
Interest on operating capital			7.61%	$4.40		4.88%	$2.86		4.88%	$3.58		4.88%	$5.36		4.88%	$6.57
Subtotal				$187.02			$187.82			$247.43			$369.24			$454.17
Ownership costs (excludes cost of land)				$117.83												
Farm insurance	1	acre	$2.00	$2.00							Cost per Acre of Sprinkler System /1					
Machinery ownership costs	1	acre	$107.58	$107.58										1	$46.61	$46.61
Irrigation equipment costs	1	acre	$8.25	$8.25							/1 See 2011 Budget tab for calculastions, cells A82 to G83					
Total costs				$304.84												
Sprinkler irrigation implementation																
Net returns to owner for unpaid labor, management, equity and risk																
Above operating costs				$108.14			$477.17			$860.67			$297.59			$610.27
Above total listed costs				-$9.69												

Change in NR - Hay Sprinkler Irrigated	
per acre	$383.50
198 acres	

Change in NR - Flood to Hay Sprinkler Irrigated	
per acre	$312.68
198 acres	

Budget prepared by: E. Bruce Godfrey, Cody Bingham and Kevin Heaton
go to: https://extension.usu.edu/apec/agribusiness-food/crops
scroll to *Kane* , click *Alfalfa*

1. Alfalfa already established. Harvested in June, August, September.

2. Interest computed on fertilization/herbicide costs for 6 months and operating costs for 3 months.
3. Custom rates for all field operations.
4. Only owned machinery are a loader and truck.

Weighted Net Return MT Carmel Alfalfa	Net Return
Sprinkler Irrigated Alfalfa	$383.50
Flood to Sprinkler Irr Alfafa	$312.68
Weighted Net Return	$350.00

Preliminary Design Report

Cove Reservoir

Kane County

Water Conservancy District

PRELIMINARY

June 2026

ALPHA ENGINEERING

RB&G ENGINEERING, INC.

Table of Contents

Table of Contents i
Part I. Introduction 1
Part II. Hydrology Analysis 3
A. Site Location and Existing Conditions 3
B. Design Criteria 3
C. Precipitation Values 5
D. Drainage Basin Parameters 6
i. Land Use 6
ii. Lag Times 7
iii. Initial Abstraction 7
iv. Reach Parameters 8
E. Storm Hydrographs 8
F. Results 8
Part III. Hydraulic Analysis 9
A. Spillway Analysis 9
B. Spillway Parameters 10
C. Emergency Drain and Outlet Works 11
Part IV. Freeboard Analysis 13
A. Storm and Wind Events 13
B. Maximum Wave Runup 13
C. Results 13
Part V. Breach Analysis 15
A. Criteria 15
B. Methodology 16
C. Results 16
Appendix A. Exhibits
Appendix B. Calculations
Appendix C. Model Output

Part I. Introduction

The Kane County Water Conservancy District (KCWCD) is proposing to install a new reservoir known as Cove Reservoir with associated facilities to be located near Orderville, Utah. The reservoir is a joint venture between KCWCD and the Washington County Water Conservancy District (WCWCD). The system will store water rights from local irrigation companies for use throughout the year.

The engineering design is being performed by Alpha Engineering Company (Alpha) out of St. George, Utah, and RB&G Engineering, Inc., (RB&G) out of Provo, Utah. Alpha is responsible for providing hydraulic analyses and spillway and water conveyance facility design, and RB&G is responsible for providing geologic investigations and dam structure design.

The project includes the construction of an off-stream reservoir less than one mile off the main drainage course, East Fork Virgin River (see **Figure 1** below). The reservoir is designed to hold approximately 6,055 acre-feet of water. The dam will be an earthen structure with principal and emergency spillways adjacent to the left abutment. To convey flows to and from the reservoir, new piping will be installed to tie into existing water transmission facilities. Due to immediately downstream homes, this dam is classified as High Hazard.

This report is being prepared as a comprehensive analysis of the design elements associated with the construction and operation of Cove Reservoir. The project location is shown below and overall exhibits of the project components—which include the dam structure, principal and auxiliary spillways, outlet works, an access road around the reservoir and a water conveyance system that ties the reservoir into the existing water system—are shown in **Appendix A, Exhibits 1 and 2**.

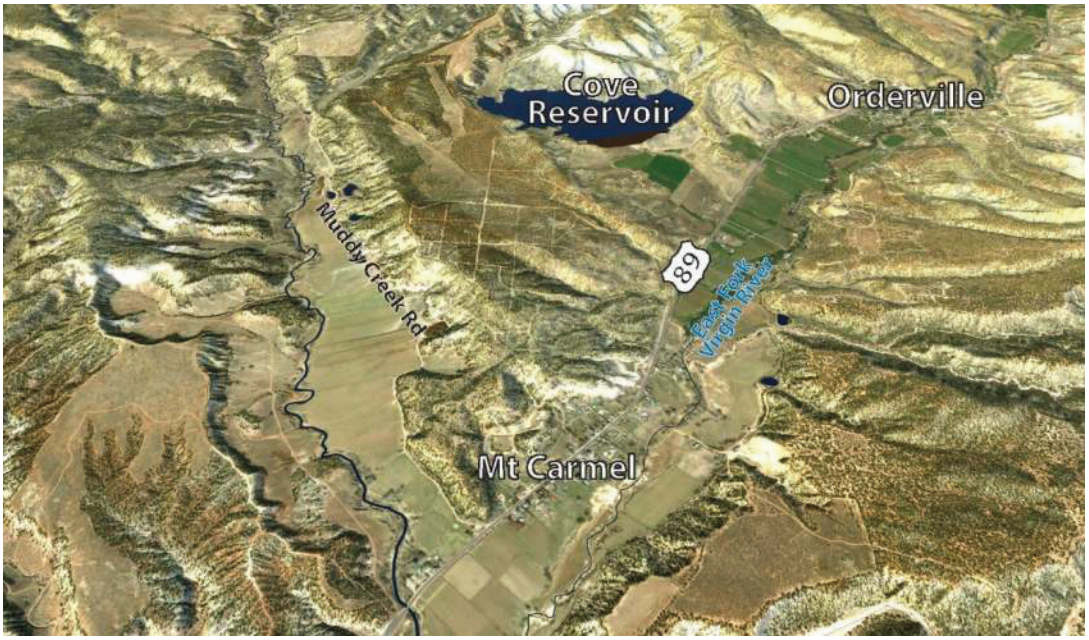


Figure 1 Cove Reservoir Location

This study references the following sources in the analysis of the hydrologic conditions at the Cove Reservoir:

- Technical Release 210-60 (TR-60), USDA 2019
- Technical Release 55 (TR-55), USDA 1986
- Technical Release 56 (TR-56), USDA 2014
- Utah Administrative Code Rule R655-11 (UAC), utah.gov 2020
- Hydrometeorological Report 49 (HMR-49), USACE 1984
- PMP Studies by Donald T. Jensen (Jensen), USU 1995 and 2003
- National Engineering Handbook, Section 4 (NEH-4), Mockus 1965 and 1972
- NOAA Atlas 14 (NWS), NWS 2018
- National Land Cover Database (NLCD), MRLC 2011
- Web Soil Survey (WSS), NRCS 2018
- National Engineering Handbook Part 630 (NEH), USDA 2019
- Flood Hydrology Manual (USBR), USBR 1989

The following software programs were used in modeling the hydrologic/hydraulic conditions and breach analysis:

- HEC-1 version 4.1 (HEC-1), USACE 1998
- USDA Water Resource Site Analysis version 2005.1.8 (SITES), USDA 2005
- HEC-RAS version 7.0.1 (HEC-RAS), USACE 2026
- Bentley FlowMaster version V8i (FlowMaster), Bentley 2009

Part II. Hydrology Analysis

A. Site Location and Existing Conditions

The Cove Reservoir dam is located 0.6 miles west of Highway 89 along Cove Road due southwest of the town of Orderville, Utah, or 37.269° North Latitude and 112.661° West Longitude. The reservoir surface area generated with the construction of the dam is approximately 188 acres and is comprised of undisturbed shrub ground cover, natural drainage channels, dirt roads and a section of ranch land used for grazing.

An aerial drone survey was performed across the anticipated footprint of the reservoir and was used to generate a 3D model of the existing surface with an approximate one-foot vertical accuracy and six inch horizontal accuracy. This surface model was used in designing the different components of the project and are shown at 10-foot contour intervals on **Appendix A, Exhibit 2**.

Using available USGS DEM data, the area upstream of the proposed reservoir was delineated to determine the drainage area tributary to the reservoir. The drainage basin tributary to the Cove Reservoir site is 3,034 acres, or 4.7 square miles, and is generally comprised of undeveloped shrub and evergreen forest ground cover. The centroidal location of the tributary drainage basin is 37.305° North Latitude and 112.662° West Longitude. The mean basin elevation is 6271'. The average annual temperature for the area is 51.2°F (NWS, Climate Monitoring) with an average annual precipitation of 15.6 inches (USGS, StreamStats). The Climatic Index calculates to 0.6 (NEH 630, Equation 21-1). An exhibit of the Cove Reservoir and its tributary drainage basin is shown in **Appendix A, Exhibit 3**. This exhibit also shows delineated subbasins of the overall tributary drainage basin as will be discussed later in this report.

B. Design Criteria

The hydrographs analyzed in this study, as required by NRCS and Utah Dam Safety, are summarized in **Table 1**. The NRCS requires hydrograph analyses for the Principal Spillway, Auxiliary Spillway and Freeboard (TR-60, Part 2). The Utah State Engineers Office requires hydrograph analyses for probable maximum flood events (general and local storms) and for 100-year events with saturated soil conditions (UAC, Section 11-4A). As directed by the NRCS, additional hydrographs with varying return frequencies are being analyzed for informational purposes.

Hydrograph	Frequency	Duration	Precipitation
NRCS Required Hydrographs			
Principal Spillway Hydrograph	100-year	10-day	TR-60, Fig 2-1 (NWS)
Auxiliary Spillway Hydrographs	Maximum	6- & 24-hour	TR-60, Fig 2-2
Freeboard Hydrographs	Maximum	6- & 24-hour	TR-60, Fig 2-2
Varying Frequency Hydrographs	2-, 5-, 10-, 25-, 50-, 100- & 500-year	24-hour	NWS
Utah State Required Hydrographs			
SEP Hydrographs	Maximum	6- & 72-hour	Jensen
100-year (AMC III) Hydrographs	100-year	6- & 72-hour	NWS

Table 1 Summary of Design Hydrographs

Each of the above hydrographs is included in this analysis as separate Storm Events. For purposes of this analysis, **Table 2** assigns numbers to each Storm Event.

	Storm Event	Duration	Frequency	AMC
01	2-year 24-hour	24-hour	2-year	II
02	5-year 24-hour	24-hour	5-year	II
03	10-year 24-hour	24-hour	10-year	II
04	25-year 24-hour	24-hour	25-year	II
05	50-year 24-hour	24-hour	50-year	II
06	100-year 24-hour	24-hour	100-year	II
07	500-year, 24-hour	24-hour	500-year	II
08	100-year 6-hour AMC III	6-hour	100-year	III
09	100-year 24-hour AMC III	24-hour	100-year	III
10	Local SEP Hydrograph (SEP-L)	6-hour	Maximum	II
11	General SEP Hydrograph (SEP-G)	72-hour	Maximum	II
12	Principal Spillway Hydrograph (PSH)	10-day	100-year	-[1]
13	Local Auxiliary Spillway Hydrograph (ASH-L)	6-hour	Maximum	II
14	General Auxiliary Spillway Hydrograph (ASH-G)	24-hour	Maximum	II
15	Local Freeboard Hydrograph (FBH-L)	6-hour	Maximum	II
16	General Freeboard Hydrograph (FBH-G)	24-hour	Maximum	II

Table 2 Summary of Storm Events

The Principal Spillway Hydrograph (Storm Event 12) will be used in designing the Principal spillway. The most critical of the Auxiliary Spillway, Freeboard and SEP Hydrographs (Storm Events 10, 11, 13, 14, 15 and 16) will be used in designing the auxiliary spillway and establishing the top-of-dam elevation. The Local Auxiliary Spillway Hydrograph (Storm Event 13) is used to check the stability of auxiliary spillway.

[1] As directed in NEH 630.2102(a)(1), Curve Numbers reflected in NEH 630.2102, Table 21-2, are used for the PSH because the precipitation value exceeds 6 inches.

C. Precipitation Values

The precipitation values for the 2- to 500-year, 24-hour and the 100-year, 10-day storm events (Storm Events 01 through 09 and 12) are taken from NWS. For the PSH (Storm Event 12), see also TR-60, Figure 2-1. Fourteen evenly spaced points throughout the drainage basin were taken and averaged out to calculate a single overall precipitation value for each storm frequency. An exhibit reflecting these points is included in **Appendix A, Exhibit 4**, and calculations are included in **Appendix B**.

The precipitation values for the SEP storms (Storm Events 10 and 11) are taken from HMR-49 and Jensen. It is noted that HMR-49 outlines the method used in calculating the Probable Maximum Precipitation (PMP) values for this drainage basin. Jensen has been accepted by the Utah State Engineer's Office and further updates the PMP values. PMP values that have been updated by Jensen are referred to as Spillway Evaluation Precipitation (SEP) values and are used in lieu of the PMP values. Calculations for the SEP values are included in **Appendix B**.

The precipitation value for the ASH and FBH storm events (Storm Events 13 through 16) are taken from TR-60, Figure 2-2. The precipitation values are calculated using the NWS 100-year and Jensen SEP precipitation values. Calculations for the ASH and FBH values are included in **Appendix B**.

The precipitation values for each storm event are summarized in **Table 3**.

	Storm Event	Precipitation Value
01	2-year 24-hour	1.61 in
02	5-year 24-hour	2.01 in
03	10-year 24-hour	2.34 in
04	25-year 24-hour	2.79 in
05	50-year 24-hour	3.14 in
06	100-year 24-hour	3.51 in
07	500-year, 24-hour	4.69 in
08	100-year 6-hour AMC III	2.75 in
09	100-year 24-hour AMC III	3.51 in
10	Local SEP Hydrograph (SEP-L)[2]	7.67 in
11	General SEP Hydrograph (SEP-G)	12.50 in
12	Principal Spillway Hydrograph (PSH)	6.83 in
13	Local Auxiliary Spillway Hydrograph (ASH-L)	4.03 in
14	General Auxiliary Spillway Hydrograph (ASH-G)	5.85 in
15	Local Freeboard Hydrograph (FBH-L)	7.67 in
16	General Freeboard Hydrograph (FBH-G)	10.20 in

Table 3 Storm Event and Precipitation Values

[2] As allowed by UAC, SEP values are used in this analysis and are updated values (Jensen) to PMP values calculated in HMR-49. For comparison purposes, the Local PMP Precipitation Value is 9.46 inches and the General PMP Precipitation Value is 12.50 inches.

D. Drainage Basin Parameters

The 4.7-square mile tributary drainage basin for the Cove Reservoir was divided into 12 smaller subbasins, ranging in size from 0.13 square miles to 1.01 square miles, to facilitate calculations of the overall basin and account for the varying land cover conditions across each subbasin. The subbasin characteristics are summarized in **Table 4** and discussed in following sections.

Sub-basin	Area (sq mi)	CN, AMC II/III	Flow Length (ft)	Ave Slope (%)	Lag Time, AMC II/III (hr)	Time of Conc, AMC II/III (hr)	Initial Abst, AMC II/III (in)
1	0.503	72.8/86.0	7,814	44.5	0.30/0.20	0.51/0.34	0.75/0.32
2	0.436	72.5/85.8	7,709	42.1	0.31/0.21	0.52/0.34	0.76/0.33
3	0.279	71.0/84.9	5,069	42.6	0.23/0.15	0.39/0.25	0.82/0.36
4	0.453	73.3/86.3	7,181	42.1	0.29/0.19	0.48/0.32	0.73/0.32
5	0.805	74.1/86.8	10,349	42.7	0.38/0.25	0.63/0.42	0.70/0.30
6	0.150	84.3/92.5	3,221	36.9	0.12/0.08	0.19/0.14	0.37/0.16
7	0.327	75.7/87.8	7,022	39.6	0.27/0.18	0.46/0.31	0.64/0.28
8	1.012	84.0/92.4	11,194	23.1	0.40/0.29	0.67/0.48	0.38/0.17
9	0.242	85.5/93.1	4,699	34.4	0.16/0.11	0.26/0.19	0.34/0.15
10	0.129	86.7/93.7	3,010	33.3	0.11/0.08	0.18/0.14	0.31/0.13
11	0.279	84.8/92.8	6,019	24.0	0.23/0.17	0.39/0.28	0.36/0.16
12	0.127	81.2/90.9	3,485	12.0	0.24/0.17	0.40/0.28	0.46/0.20
Total[3]	**4.742**	**77.8/88.9**	**33,591**	**35.4**	**0.95/0.65**	**1.58/1.09**	**0.57/0.25**

Table 4 Drainage Subbasin Parameters

i. Land Use

Land use and soil data were obtained from NLCD and WSS. The majority of the basin is comprised of *42-Evergreen Forest*, with portions of *52-Shrub/Scrub* and smaller portions of *41-Deciduous Forest*, *21/22-Developed Open Space/Low Intensity* and *31-Barren Land*. An exhibit of the land use is included in **Appendix A, Exhibit 5**. The soil data for the site classifies the basin to have a relatively even mixture of all four hydrologic soil groups. An exhibit of the hydrologic soil groups is included in **Appendix A, Exhibit 6**.

Each subbasin is assigned a Soil Conservation Service Curve Number (CN) that associates the land use with the soil data. As different types of soil cover exist throughout a subbasin, CNs have been prorated on an area-weighted basis. CNs for each subbasin are taken from NEH, Tables 9-2 and 9-5. Because NLCD land use designations do not directly correspond to NEH land cover descriptions, **Table 5** demonstrates how each correspond for this analysis.

NLCD Land Use Designation	NEH Land Cover Designation
21/22-Developed Open Space/Low Intensity	Open Space, Poor (Table 9-5)
31-Barren Land	Desert Shrub, Fair (Table 9-2)

[3] While the Area for the Overall basin is a sum of each of the subbasins, the flow length is derived from portions of Subbasins B1, B2, B4, B6 and B8, which comprise the longest path through the Overall basin and is used to calculate the lag time and time of concentration. The average slope, curve number and initial abstraction were calculated based on the Overall basin.

41-Deciduous Forest	Pinyon-Juniper, Fair (Table 9-2)
42-Evergreen Forest	Pinyon-Juniper, Poor (Table 9-2)
52-Shrub/Scrub	Desert Shrub, Good (Table 9-2)

Table 5 NLCD Land Use to NEH Land Cover Designations

CNs for the individual subbasins are summarized in **Table 4** and range between 71.0 and 86.7 for AMC II and between 84.9 and 93.7 for AMC III. CNs used for the PSH (Storm Event 12) are modified per NEH 630.2102, Table 21-2, and range between 53.0 and 75.4. The overall basin CN is 77.8 for AMC II and 88.9 for AMC III. NLCD Land Use descriptions and curve number calculations are included in **Appendix B**.

ii. Lag Times

Lag times and times of concentration for the subbasins were calculated using methodology outlined in NEH Chapter 15, which estimates the lag time, TLAG, and time of concentration, T_c, for large drainage basins as:

$$TLAG = \frac{l^{0.8}\left(\left(\frac{1000}{CN} - 10\right) + 1\right)^{0.7}}{1{,}900Y^{0.5}}$$

$$T_c = \frac{TLAG}{0.6}$$

Paths for the basin lengths (l) are shown in **Appendix A, Exhibit 3**. Criteria and calculated lag times and times of concentration for the individual subbasins are summarized in **Table 4**. The overall time of concentration for the entire tributary basin—having a basin length of 33,591 feet, an average CN of 77.8/88.9 (AMC II/III), and an average watershed land slope of 35.4%–are 1.58 hours for AMC II and 1.09 hours for AMC III. For the PSH (Storm Event 12), which uses a CN based on NEH 630.2102, Table 21-2, the average CN is 71.8 and the overall time of concentration is 1.88 hours.

iii. Initial Abstraction

Initial abstraction depths for the subbasins were calculated using methodology outlined in TR-55, which estimates the initial abstraction depth, I_a, as:

$$I_a = 0.2 \times \left(\frac{1000}{CN} - 10\right)$$

Initial abstraction depth for the individual subbasins are summarized in **Table 4**. The overall basin initial abstraction depth equates to 0.57 inches for AMC II and 0.25 inches for AMC III. For the PSH (Storm Event 12), which uses a CN based on NEH 630.2102, Table 21-2, the initial abstraction for the overall basin is 0.79 inches.

iv. Reach Parameters

In developing the hydrologic models of the drainage basin, accumulating flows were routed along reach paths as shown in **Appendix A, Exhibit 3**. The geometry and characteristics of these reaches were based on field observations and engineering judgment. A trapezoidal channel was assumed along the reaches in conformance with field measurements having an increasing flow width, ranging from 20 to 40 feet wide, and a roughness coefficient of 0.30.

E. Storm Hydrographs

For the PSH, ASH and FBH (Storm Events 12-16), the hydrographs were developed using NEH 630.2102 and 2103. For all other storm events (Storm Events 01-11), a dimensionless design storm distribution (NEH 630.2103, Figure 21-9) was applied and modeled using HEC-1 software. The dimensionless storm distribution and calculated storm hydrographs are shown in tabular form with calculations in **Appendix B**.

F. Results

As mentioned, Storm Events 01 through 10 were modeled using HEC-1 software to determine the hydrographs. Each of the storm events were setup as separate models, and model output for the models is included in **Appendix C**. Storm Events 12-16 were developed using NEH 630.2103 and 2103 but were also modeled using HEC-1 software for comparison purposes, the calculations for which can also be found in **Appendix C**. The most conservative value between the NEH 630 results and HEC-1 model was used for these storm events. The peak inflows into the reservoir and total inflow volumes for each storm event are summarized in **Table 6**.

	Storm Event	Peak Inflow	Volume
01	2-year 24-hour	89 cfs	77 af
02	5-year 24-hour	175 cfs	130 af
03	10-year 24-hour	261 cfs	178 af
04	25-year 24-hour	396 cfs	254 af
05	50-year 24-hour	506 cfs	317 af
06	100-year 24-hour	632 cfs	387 af
07	500-year, 24-hour	1,064 cfs	624 af
08	100-year 6-hour AMC III	2,280 cfs	425 af
09	100-year 24-hour AMC III	1,031 cfs	601 af
10	Local SEP Hydrograph (SEP-L)	6,395 cfs	1,286 af
11	General SEP Hydrograph (SEP-G)	1,587 cfs	2,439 af
12	Principal Spillway Hydrograph (PSH)	850 cfs	749 af
13	Local Auxiliary Spillway Hydrograph (ASH-L)	2,180 cfs	498 af
14	General Auxiliary Spillway Hydrograph (ASH-G)	1,766 cfs	868 af
15	Local Freeboard Hydrograph (FBH-L)	6,395 cfs	1,286 af
16	General Freeboard Hydrograph (FBH-G)	3,524 cfs	1,880 af

Table 6 Peak Flows by Storm Event

Part III. Hydraulic Analysis

A. Spillway Analysis

The principal spillway (PS)—which will be an inlet and pipe carrying the flows away from the dam structure—is sized based on TR-60, Section 2-1 and Part 6. The auxiliary spillway (AS)—which will be a broad-crested weir discharging into a trapezoidal open channel—is sized based on TR-60, Section 2-2 and Part 7. The hydrographs analyzed in designing the spillway configuration are the Principal Spillway Hydrograph (PSH), Auxiliary Spillway Hydrographs (ASH) and the Freeboard Hydrographs (FBH) (Storm Events 12-16). The remaining storm events are being analyzed for comparison purposes and to ensure they are routed adequately through the principal and auxiliary spillways configuration.

SITES was used to model the PSH, ASH and FBH (Storm Events 12-16). Iteratively designed principal and auxiliary spillways were used in the model to accurately reflect conditions. A conservative auxiliary spillway crest elevation was used and each of the storm events were attenuated accordingly through the reservoir using HEC-1 modeling. A summary of the maximum water surface elevations produced in the HEC-1 models is shown in **Table 7**.

	Storm Event	Maximum Water Elevation
01	2-year 24-hour	5546.0’
02	5-year 24-hour	5546.4’
03	10-year 24-hour	5546.7’
04	25-year 24-hour	5547.3’
05	50-year 24-hour	5547.7’
06	100-year 24-hour	5548.1’
07	500-year, 24-hour	5548.9’
08	100-year 6-hour AMC III	5548.3
09	100-year 24-hour AMC III	5548.8’
10	Local SEP Hydrograph (SEP-L)	5551.0’
11	General SEP Hydrograph (SEP-G)	5551.6’
12	Principal Spillway Hydrograph (PSH)	5548.2’
13	Local Auxiliary Spillway Hydrograph (ASH-L)	5548.6’
14	General Auxiliary Spillway Hydrograph (ASH-G)	5549.6’
15	Local Freeboard Hydrograph (FBH-L)	5551.0’
16	General Freeboard Hydrograph (FBH-G)	5551.8’

Table 7 Maximum Water Surface Elevation by Storm Event

The worst-case scenario storm event is the General Freeboard Hydrograph (Storm Event 16). This storm event is also referred to as the Inflow Design Flood (IDF).

A comparative analysis was performed to see the changes in hydrologic flows during the higher frequency storm events with construction of the proposed reservoir, a summary of which is included in **Table 8**.

	Storm Event	Peak Flow *before* Proposed Reservoir	Peak Flow *after* Proposed Reservoir
01	2-year 24-hour	89 cfs	16 cfs
02	5-year 24-hour	175 cfs	22 cfs
03	10-year 24-hour	261 cfs	26 cfs
04	25-year 24-hour	396 cfs	31 cfs
05	50-year 24-hour	506 cfs	35 cfs
06	100-year 24-hour	632 cfs	38 cfs
07	500-year, 24-hour	1,064 cfs	43 cfs

Table 8 Peak Flows Before and After the Proposed Reservoir

B. Spillway Parameters

Models were setup in SITES based on the governing storm events for the PSH, ASH and FBH (Storm Events 12-16). The inflow hydrographs produced in the Hydrology Analysis section was input into the model. Output for the model is included in **Appendix C**. The results from the SITES model, which incorporate the principal and auxiliary spillway parameters at an AS width of 30 feet, include the following:

- Peak Inflow (ASH-L): 2,180 cfs
- Peak Inflow (FBH-G): 6,395 cfs
- Principal Spillway Crest Elevation: 5545.5’
- Auxiliary Spillway Crest Elevation: 5548.5’
- Maximum Water Surface (ASH-L): 5548.7’
- Maximum Water Surface (FBH-G): 5552.3’
- Peak reservoir outflow (FBH-G): 648 cfs (PS: 127 cfs, AS: 521 cfs)
- Maximum depth above AS crest: 3.8 feet

Additional constraints are considered in the design of the principal and auxiliary spillways. A riser is proposed to be installed at the inlet to the principal spillway. The riser shall have a larger cross-sectional area to reduce excessive surging, noise, vibration and vortex action. Per TR-60, Section 6-2, this cross-sectional area shall be a minimum of 2.5’ x 7.5’ (L x W). A trash rack shall be incorporated into the riser structure to avoid clogging, and an anti-vortex device (i.e. anti-vortex baffle plate) shall also be incorporated to prevent a vortex condition as water spills into the riser. An air vent is also added to the inlet to remove air and improve hydraulic performance.

It is noted that the SITES model maximum water surface elevation of 5552.3’. A more conservative auxiliary spillway crest elevation was chosen at elevation 5549.2’. All storm event hydrographs

were modeled in HEC-1 using this elevation. Based on the HEC-1 model results and the site and code constraints, the following spillway parameters were selected:

- Principal Spillway (Pipe)
  - Crest Elevation: 5545.5'
  - Pipe Material: Ductile Iron Encased in Concrete
  - Pipe Diameter: 30 inches
- Auxiliary Spillway (Trapezoidal Channel)
  - Crest Elevation: 5549. 2'
  - Material: Earthen
  - Base Width: 30 feet
  - Bank Slopes: 2:1 (H:V)

The HEC-1 results are summarized as follows:

- Peak Inflow: 3,524 cfs
- Peak Outflow: 404 cfs
- Maximum Water Surface: 5551.8'
- Maximum depth above AS crest: 2.6 feet
- Time to Maximum Water Surface: 19.2 hours (0.8 days)
- Time to first flow in auxiliary spillway: 10.2 hours (0.4 days)
- Time to zero flow in auxiliary spillway: 105.8 hours (5.4 days)

C. *Emergency Drain and Outlet Works*

The emergency drain pipeline is required in order to drain the water supply storage in case of emergency. According to Utah State Code R655-11-7A, the pipeline is required to drain 90% of the storage volume within 30 days neglecting reservoir inflows.

Due to geographical constraints, the proposed drain is approximately 675 feet in length. The water discharges approximately 300 feet from the base of the dam into an existing ephemeral drainage channel. The maximum water surface elevation is 5545.5 feet (principal spillway crest elevation providing for 6,055 acre-feet of storage), and the outlet works discharge elevation is 5497.5 feet, which provides for 600 acre-feet of storage. A minimum 24-inch pipeline is required to drain the Cove Reservoir within the required amount of time.

A 24-inch ductile iron (DI) pipeline encased in concrete has been selected to be installed through the dam section in order to withstand bearing pressures and minimize thermal expansion. A riser is proposed to be installed at the inlet to the emergency drain pipeline with a control valve to allow use as needed. The riser shall have a larger cross-sectional area to reduce excessive surging, noise, vibration and vortex action. A trash rack shall be incorporated into the riser structure to avoid clogging, and an anti-vortex device (i.e. anti-vortex baffle plate) shall also be incorporated

to prevent a vortex condition as water spills into the riser. An air vent is also added to the inlet to remove air and improve hydraulic performance. Once the emergency drain pipeline exits through the dam section, a pipeline will be upsized to 30 inches to allow the reservoir to drain in the appropriate amount of time. An energy dissipation structure and trash rack will be installed at the outlet of the pipe as it discharges into the existing channel.

Different configurations of the riser, valve and pipe inlet were evaluated, including:

1. A sloping structure constructed on the upstream face of the dam that extends to the dam crest with a stem-operated gate.

2. A shorter vertical structure with one slide gate. This structure would be partially submerged under normal reservoir operation and would not extend to the dam crest.

Of the two configurations considered, it was decided that the first configuration consisting of a sloping structure and stem operated gate would best meet the needs of the project. The second configuration was not used due to cost considerations and functionality of the valve. A stem for the gate will extend up along the face of the dam and will be supported on concrete blocks spaced every 10 feet. The blocks will have adjustable stem guides to allow for re-alignment, as required.

Reservoir discharge data has been determined by combining the amount of head in the reservoir combined with losses from the entrance, pipe friction, and other minor losses. Calculations are included in **Appendix A**. **Table 9** summarizes the discharge data:

Water Surface Elevation (ft)	Water Storage (ac-ft)	Discharge Time (days)
5545.5	6055	0.0
5530	3542	10.1
5514	1737	18.1
5797	587	23.9

Table 9 Emergency Drain Discharge Rating

The emergency drain pipeline will be also used as the feed into the reservoir. The pipeline will tie into the existing irrigation system. A new pump station will be installed on the existing irrigation system that will pump flows from the East Fork Virgin River into the reservoir. Valving will be installed to allow pressurized flows to fill the reservoir while stopping flows from discharging into the existing channel. During emergencies, pumping will stop and the valving will be opened to allow flows to discharge into the existing channel and drain the reservoir.

Part IV. Freeboard Analysis

A. Storm and Wind Events

The Administrative Rules for Dam Safety and TR-60, Part 5, state that the freeboard above the principal spillway crest elevation must exceed the values produced by the scenarios given below. In analyzing a permeable and an impermeable dam, a range of freeboard is given for the first and second condition. The dam is considered to be semi-permeable, and therefore, the actual freeboard requirement is adjusted within this range.

1. 100-year, 24-hour storm (AMC III) in conjunction with a 50-mph wind.
2. 100-mph wind without any significant rainstorm.
3. IDF (or FBH-G) without any significant windstorm.
4. ASH with Wave Action (TR-60)

B. Maximum Wave Runup

Historic data for the design wind for the Cove Reservoir area is not available. As required, wind speeds of 50 mph and 100 mph were analyzed. For these two wind speeds, the wind setup, wave height, and total wave runup was calculated as summarized in **Table 10**. Calculations are included in **Appendix B**.

Wind Velocity	Wave Runup	Wind Setup	Wave Freeboard
50 mph	2.8 ft	0.1 ft	2.9 ft
100 mph	5.8 ft	0.1 ft	5.9 ft

Table 10 Wave Runup by Wind Speed

Wave Action was further calculated using procedures outlined in TR-56. The maximum overwater wind velocity calculated to 87 mph and produced a significant wave height 1.8 ft. Calculations are included in **Appendix B**.

C. Results

The total required freeboard for each storm and wind event is summarized in **Table 11**. The Storm Freeboard is taken from the difference between the principal spillway crest elevation and the maximum water surface elevation produced by the respective storm events. The Total Freeboard is the sum of the Storm Freeboard plus the Wave Freeboard.

Scenario	Wave Freeboard	Storm Freeboard	Total Freeboard
1	2.9 ft	3.3 ft	6.2 ft
2	5.9 ft	0.0 ft	5.9 ft
3	0.0 ft	6.3 ft	6.3 ft
4	1.8 ft	4.1 ft	5.9 ft

Table 11 Total Freeboard Requirements

The governing total freeboard requirement is 6.3 feet as taken from Scenario 3. With a principal spillway crest elevation of 5545.5', the minimum top of dam elevation allowing for adequate freeboard is 5551.8'. The proposed top of dam elevation is 5552.0'.

Part V. Breach Analysis

A. Criteria

Breach simulations were completed for "Sunny Day" and "Rainy Day" scenarios. Both scenarios assume the water level is at the auxiliary spillway crest elevation (5549.2') at the start of the model. The "Sunny Day" scenario breaches immediately with no storm event attenuating through the reservoir. The "Rainy Day" scenario attenuates the worst-case storm event and breaches as the water surface elevation approaches the top of the dam.

A sensitivity analysis was performed to determine the most extreme breach within NRCS parameters. Per TR-60, the minimum peak discharge of the breach hydrograph is:

$$Q_{max} = 1{,}100\left(\frac{V_s H_w}{A}\right)^{1.35} = 1{,}100\left(\frac{(8{,}058)(94)}{25{,}615}\right)^{1.35} = 106{,}428\ cfs$$

But not less than:

$$Q_{max} = 3.2H_w^{2.5} = 3.2(94^{2.5}) = 274{,}138\ cfs$$

Nor more than:

$$Q_{max} = 65H_w^{1.85} = 65(94^{1.85}) = 290{,}536\ cfs$$

As a result of the analysis, the most extreme breach occurred under the following breach parameter

- Storm Event: Local Freeboard Hydrograph (Storm Event 15)
- Depth of water at breach: 94'
- Water surface elevation: 5560'
- Bottom width: 520'
- Side slope: 3:1 upstream, 2.5:1 downstream (H:V)
- Time to develop: 0.95 hours
- Storm event for "Rainy Day" scenario
    - Peak inflow: 6,395 cfs
    - Inflow volume: 1,286 af
- Manning's 'n': 0.05
- Width of the downstream valley: approx. 1,100'
- Breach location at maximum section of dam
- Cross-sectional area of dam embankment at breach location: approx. 25,615 sf
- Reservoir storage at breach: 8,058 af

B. Methodology

Separate HEC-RAS models were setup for the “Sunny Day” and “Rainy Day” scenarios. Constraints were input based on the Hydrology, Hydraulic and Freeboard Analyses of this report. The terrain downstream of the dam structure was imported into the HEC-RAS geometry editor using USGS DEM files to simulate a 2D breach for each scenario.

C. Results

Inundation maps have been prepared based on the results of the HEC-RAS models, as shown in **Appendix A, Exhibits 7 and 8**. Model output from the HEC-RAS models are included in **Appendix D**. The results of the models are summarized below.

- Sunny Day
  - Maximum outflow: 266,454 cfs
  - Total volume: 12,287 ac-ft
- Rainy Day
  - Maximum outflow: 329,203 cfs
  - Total volume: 15,529 ac-ft

Appendix A. Exhibits

Exhibit 1. Overall Project Components

Exhibit 2. Reservoir Project Components

Exhibit 3. Reservoir Drainage Basin

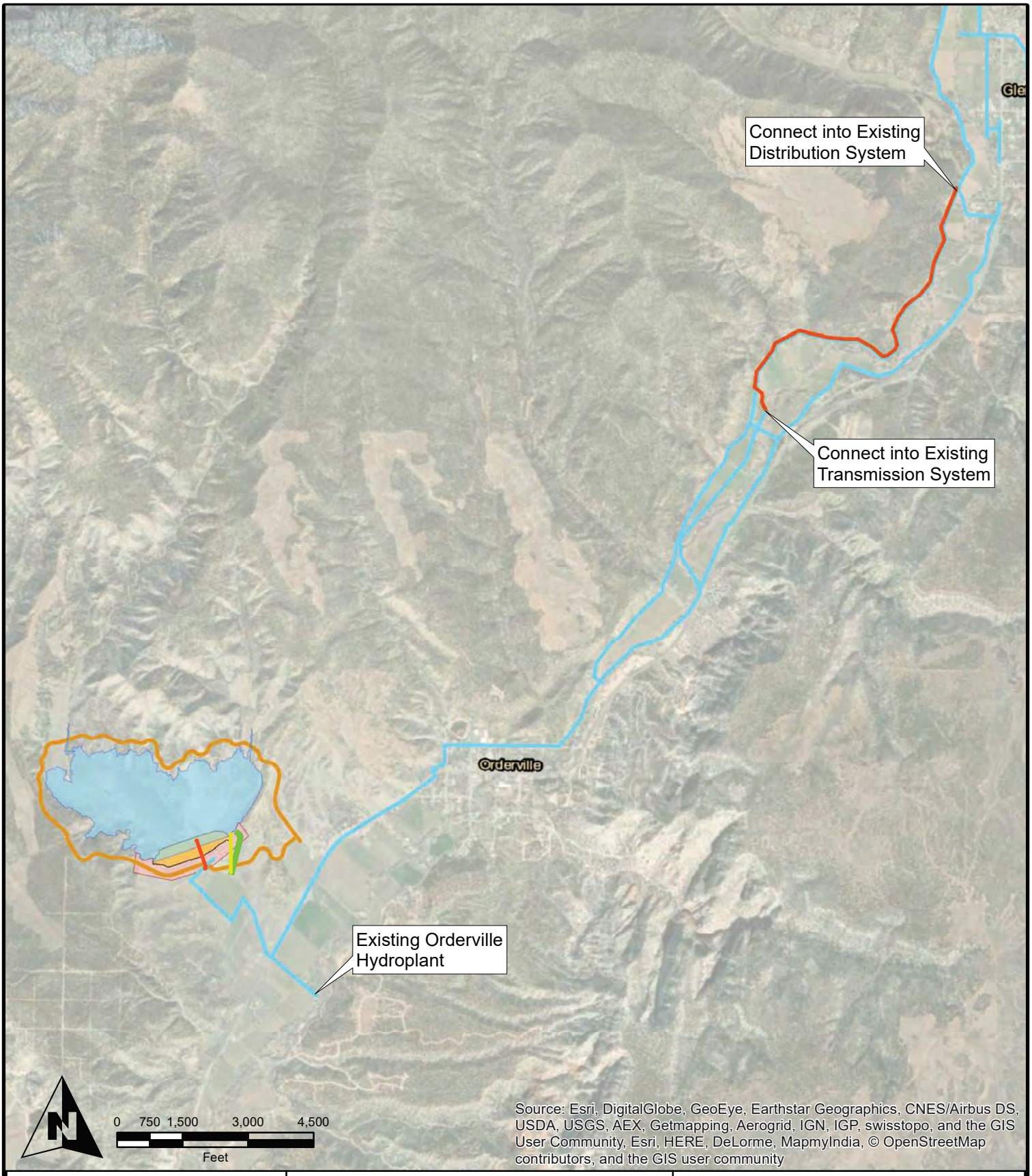
Exhibit 4. NWS Precipitation Points

Exhibit 5. NLCD Soil Data

Exhibit 6. Hydrologic Soil Groups

Exhibit 7. Sunny Day Breach Inundation Map

Exhibit 8. Rainy Day Breach Inundation Map



ALPHA ENGINEERING

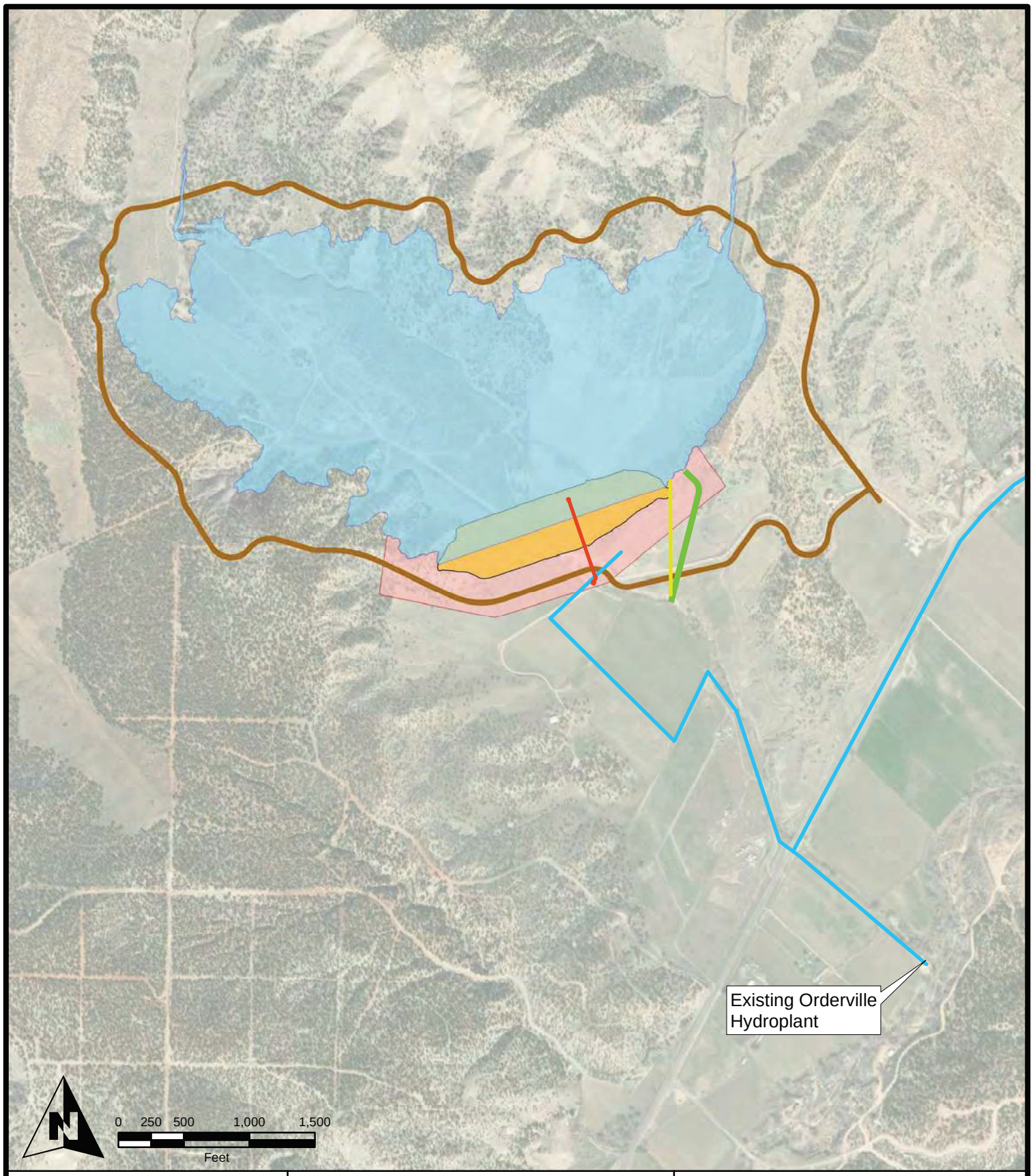
RB&G ENGINEERING, INC.

- Cove Reservoir
- Cove Dam Structure
- Construction/Instrumentation Buffer Area
- Existing Transmission Pipeline
- New Transmission Pipeline

Overall Project Components
Exhibit 1 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 3,000 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 1 Overall Project Components.mxd, 9/17/2019 11:20:04 AM jmadsen



ALPHA ENGINEERING

RB&G ENGINEERING, INC.

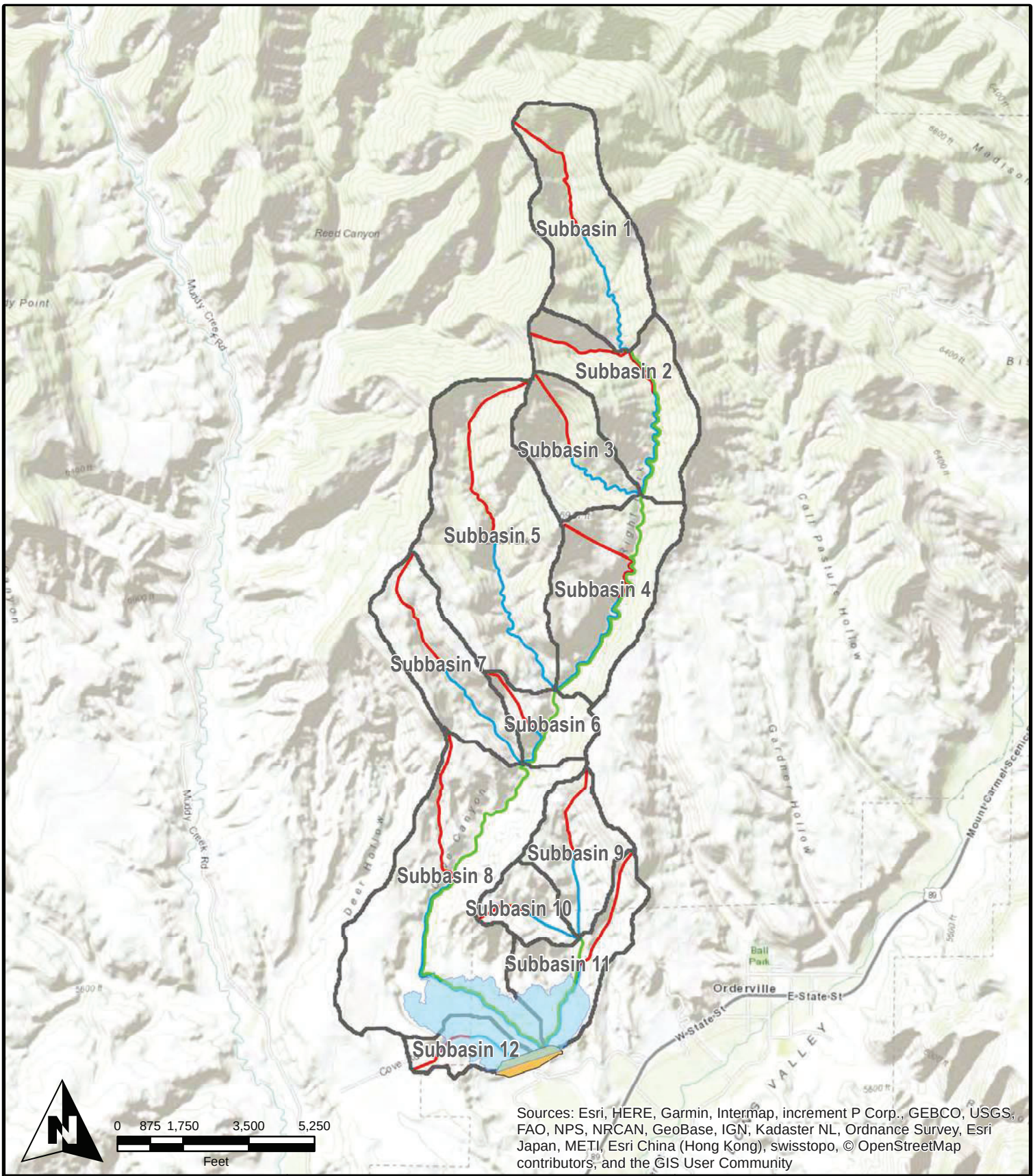
- Cove Reservoir
- Cove Dam Structure
- Construction/Instrumentation Buffer Area
- Existing Transmission Pipeline
- OutletWorks
- Principal Spillway
- Auxiliary Spillway
- Access Road

Reservoir Project Components

Exhibit 2 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 1,000 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 2 Reservoir Project Components.mxd, 9/17/2019 11:13:46 AM jmadsen



ALPHA ENGINEERING

RB&G ENGINEERING, INC.

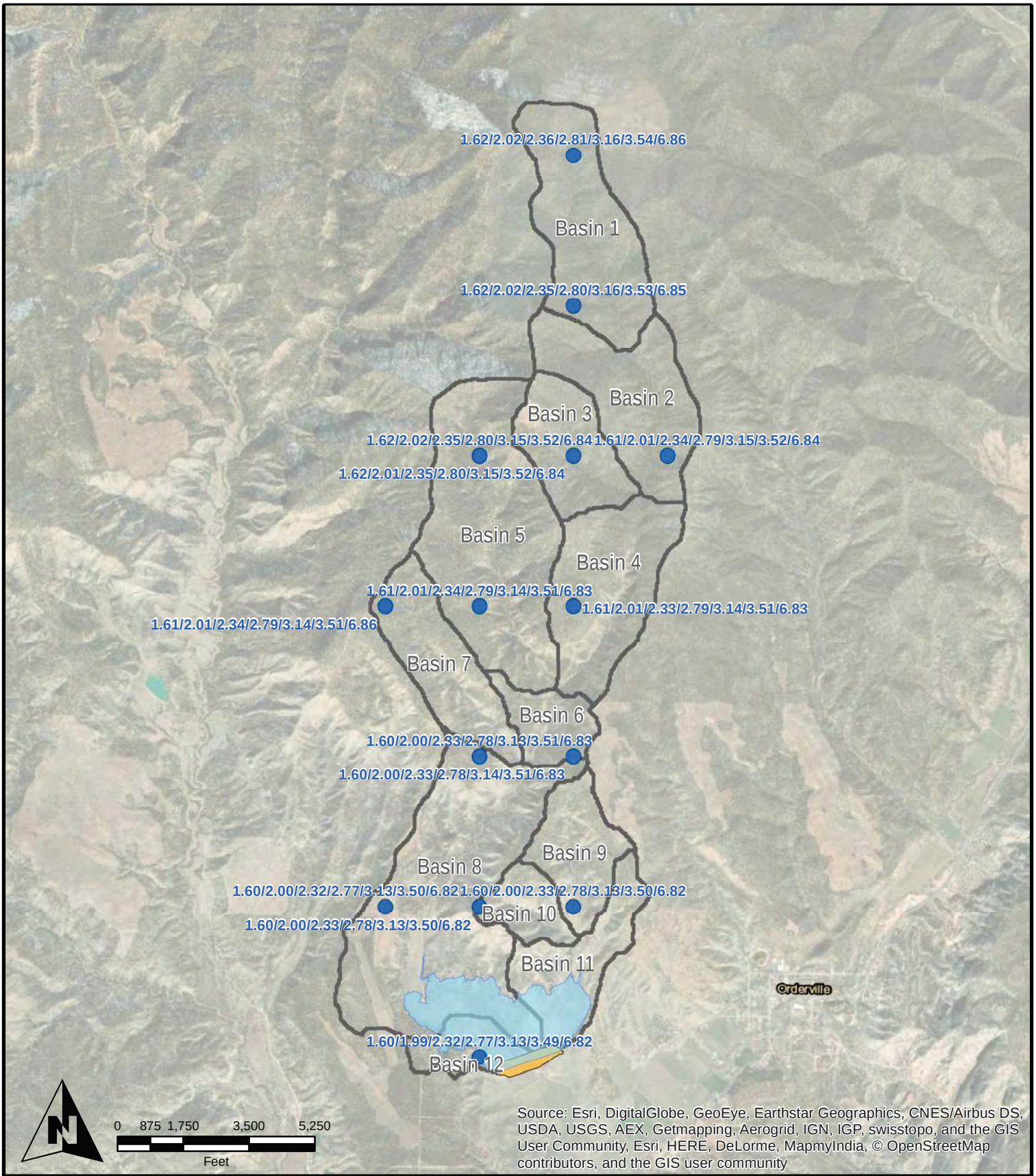
- Cove Reservoir
- Drainage Subbasins
- Centroidal Water Course
- Maximum Water Course
- Routed Flow (Modeling)

Reservoir Drainage Basin

Exhibit 3 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 3,500 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 3 Reservoir Drainage Basin.mxd, 9/17/2019 11:22:44 AM jmadsen



ALPHA ENGINEERING

RB&G ENGINEERING, INC.

Cove Reservoir

Drainage Subbasins

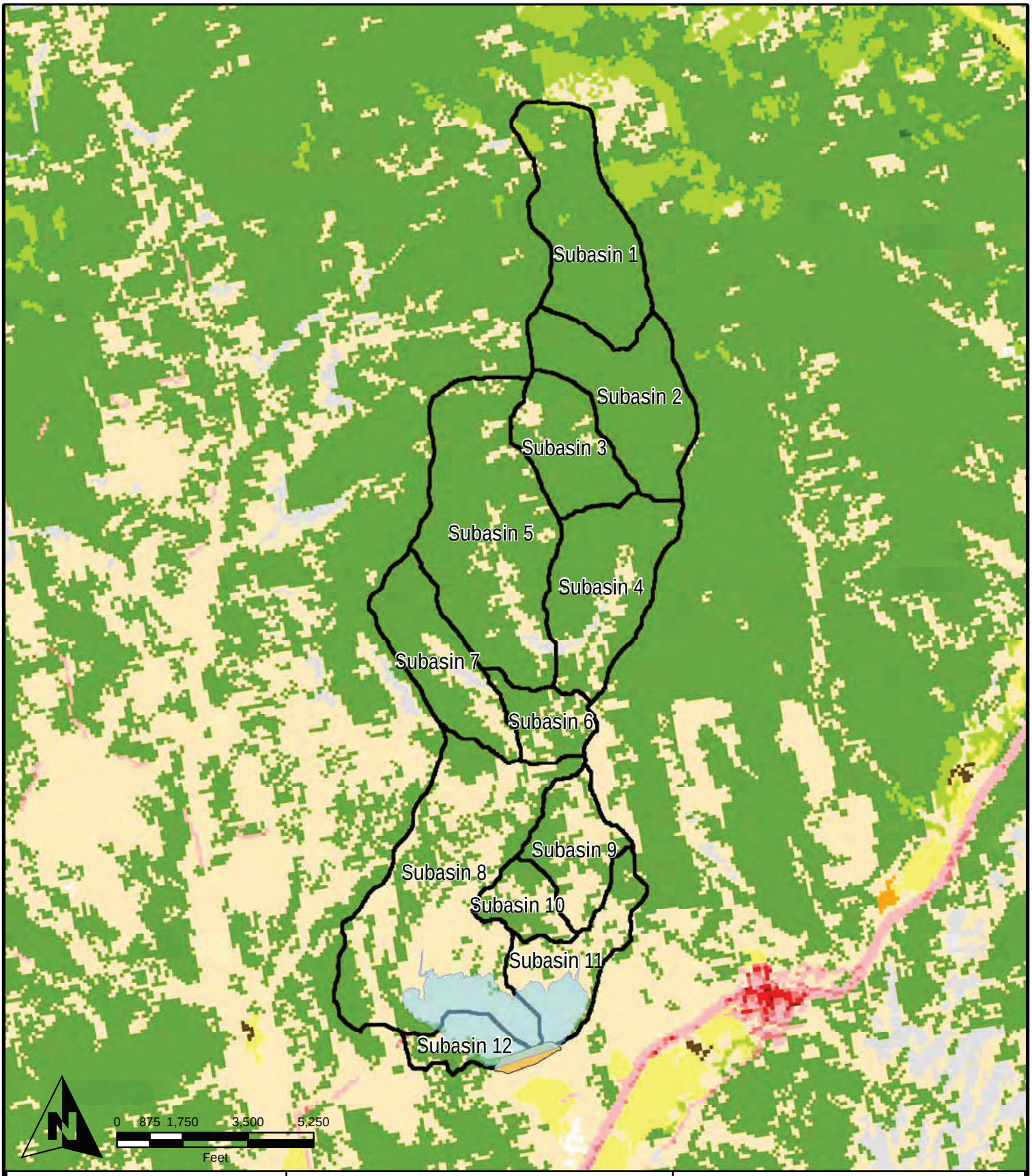
NOAA Precipitation Values
2-yr / 5-yr / 10-yr / 25-yr / 50-yr / 100-yr / 100-yr (10-day)

NOAA Precipitation Points

Exhibit 4 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 3,500 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 4 NOAA Precipitation.mxd, 9/17/2019 11:42:42 AM jmadsen



ALPHA ENGINEERING

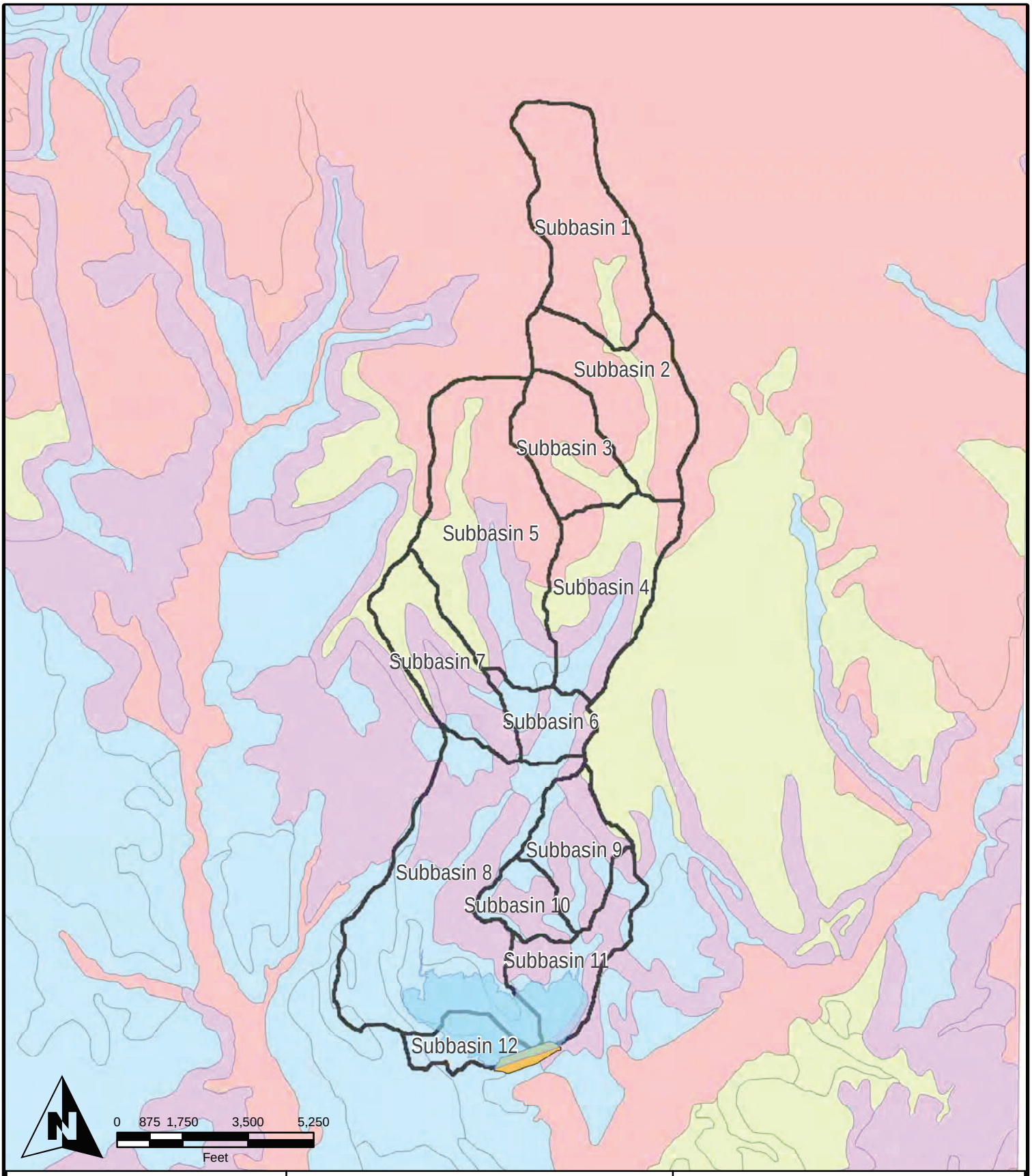
RB&G ENGINEERING, INC.

Cove Reservoir
Drainage Subbasins
NLCD Land Cover
21 - Developed, Open Space
22 - Developed, Low Intensity
23 - Developed, Medium Intensity
24 - Developed, High Intensity
31 - Barren Land (Rock/Sand/Clay)
41 - Deciduous Forest
42 - Evergreen Forest
43 - Mixed Forest
52 - Shrub/Scrub
81 - Pasture/Hay
82 - Cultivated Crops
90 - Woodly Wetlands

NLCD Soil Data
Exhibit 5 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 3,500 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 5 NLCD Soil Data.mxd, 9/17/2019 11:44:54 AM jmadsen



ALPHA ENGINEERING

RB&G ENGINEERING, INC.

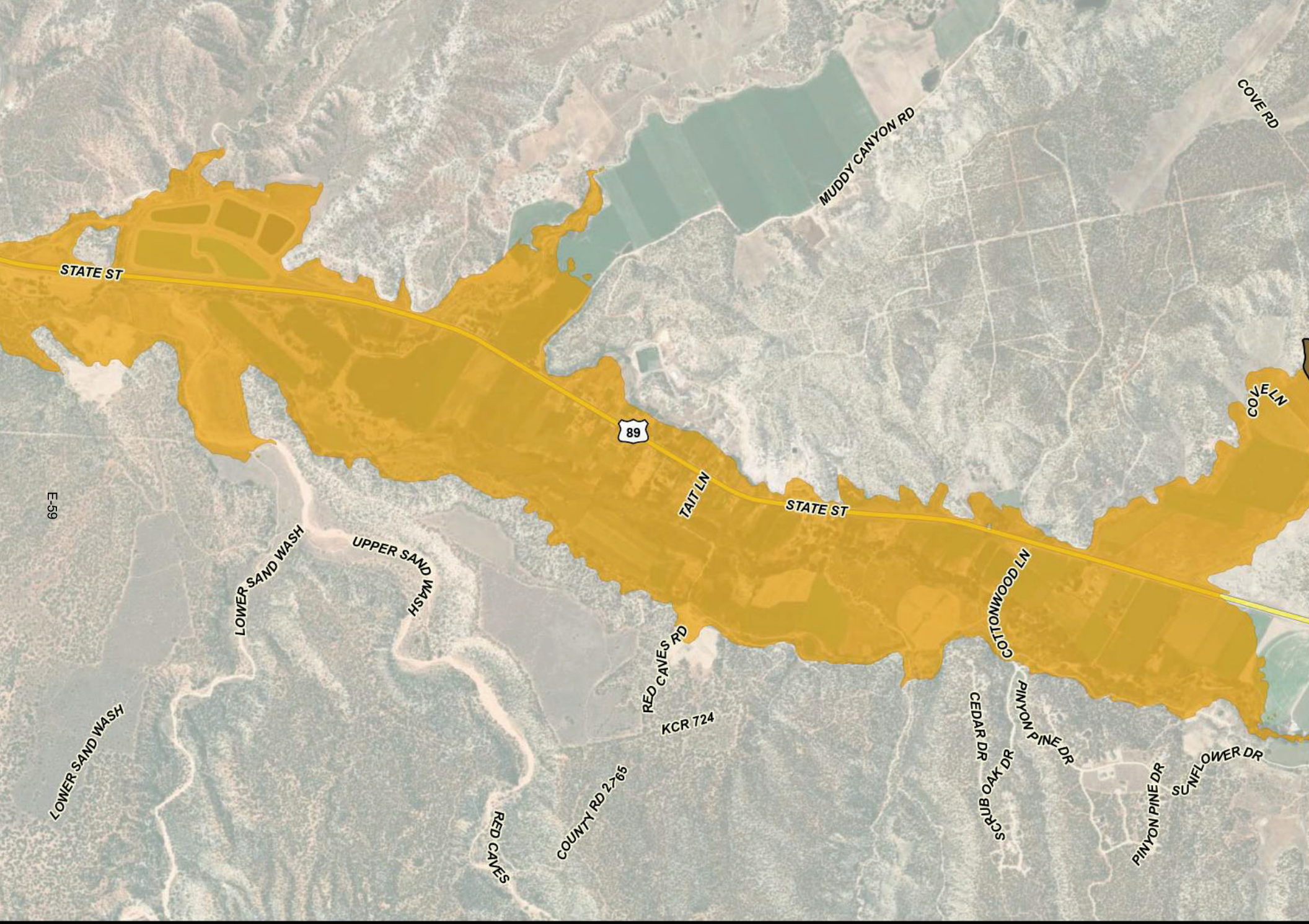
Cove Reservoir
Drainage Subbasins
Hydrologic Soil Group
A
B
C
D

Hydrologic Soil Groups

Exhibit 6 - Cove Reservoir

Spatial Reference:	UT83-SF
Drawn By:	JTM
Scale:	1 inch = 3,500 feet
Date:	September 17, 2019

P:\357-21 KCWCD Cove Reservoir Environmental and Design\Drawings\GIS\357-21 Design Report Exhibit 6 Hydro Soil Groups.mxd, 9/17/2019 11:48:45 AM jmadsen



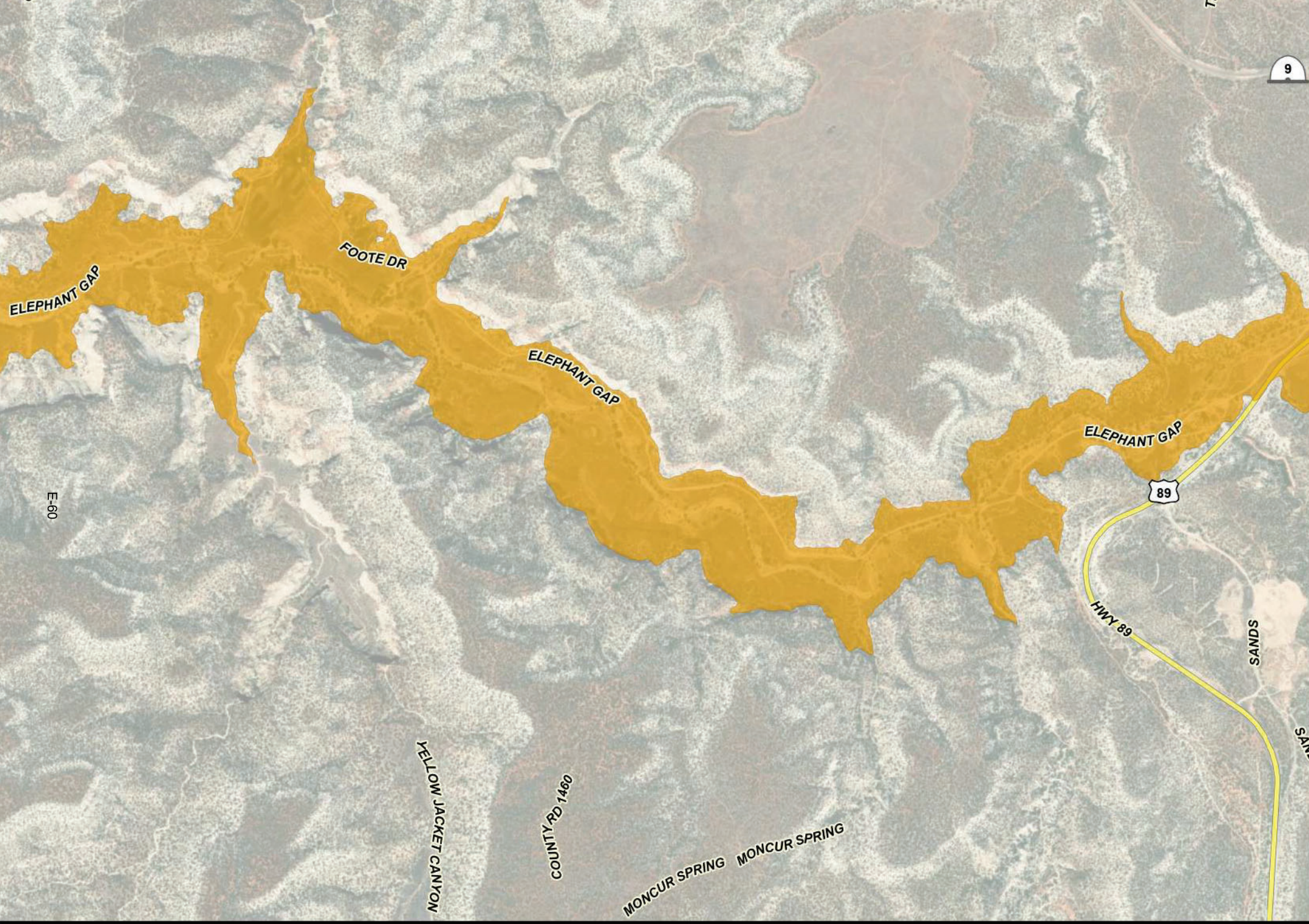
Legend

- Cove Dam Structure
- Inundation Boundary (Sunny Day)

N

Dam Breach Sunny

Cove Reserv



Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

Dam Breach Sunny

Cove Reserv

Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

- Cove Dam Structure
- Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

- Cove Dam Structure
- Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

N

E

Dam Breach Sunny

Cove Reserv

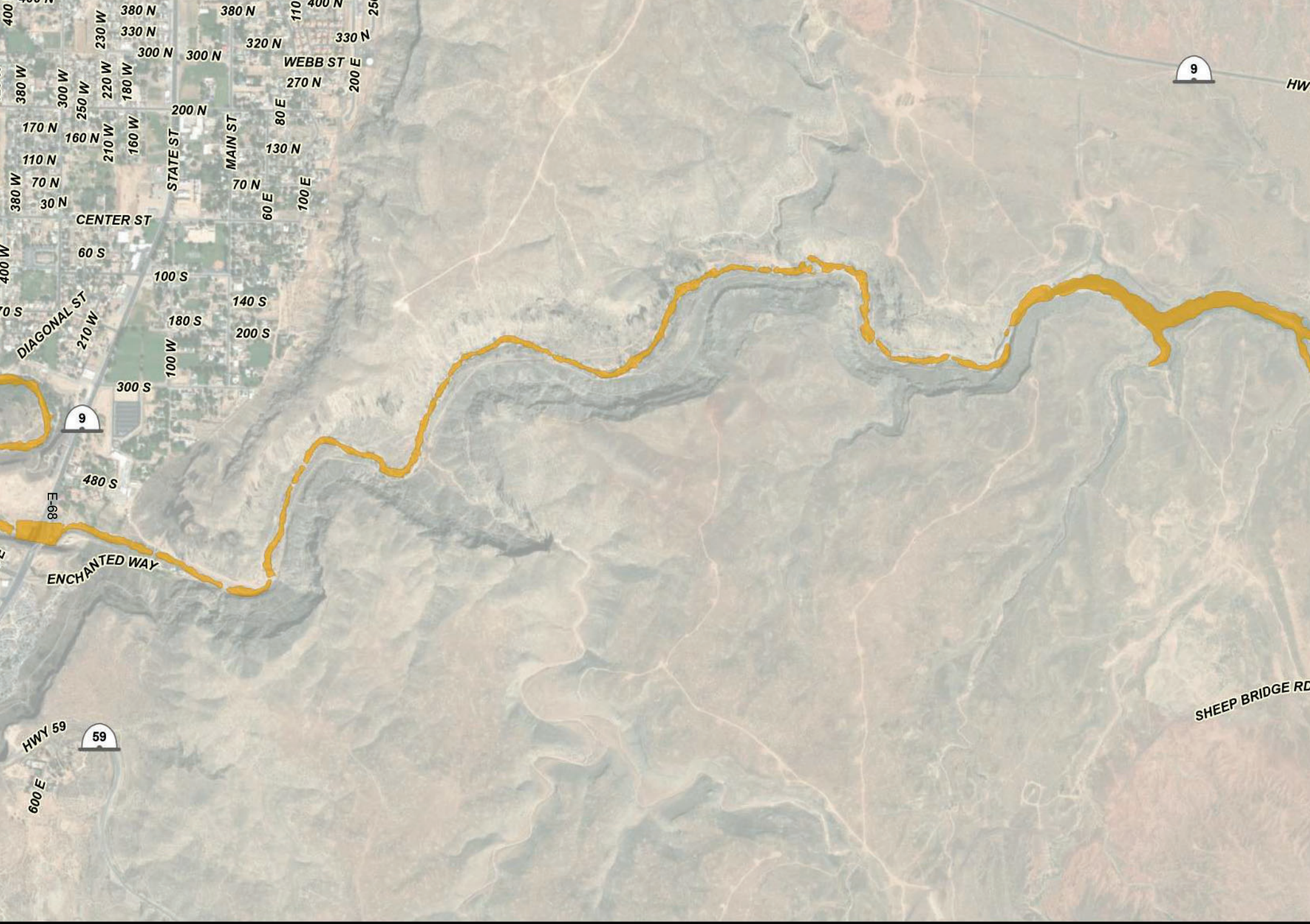
Legend

- Cove Dam Structure
- Inundation Boundary (Sunny Day)

N
W E

Dam Breach Sunny

Cove Reserv



Legend

Cove Dam Structure

Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

Legend

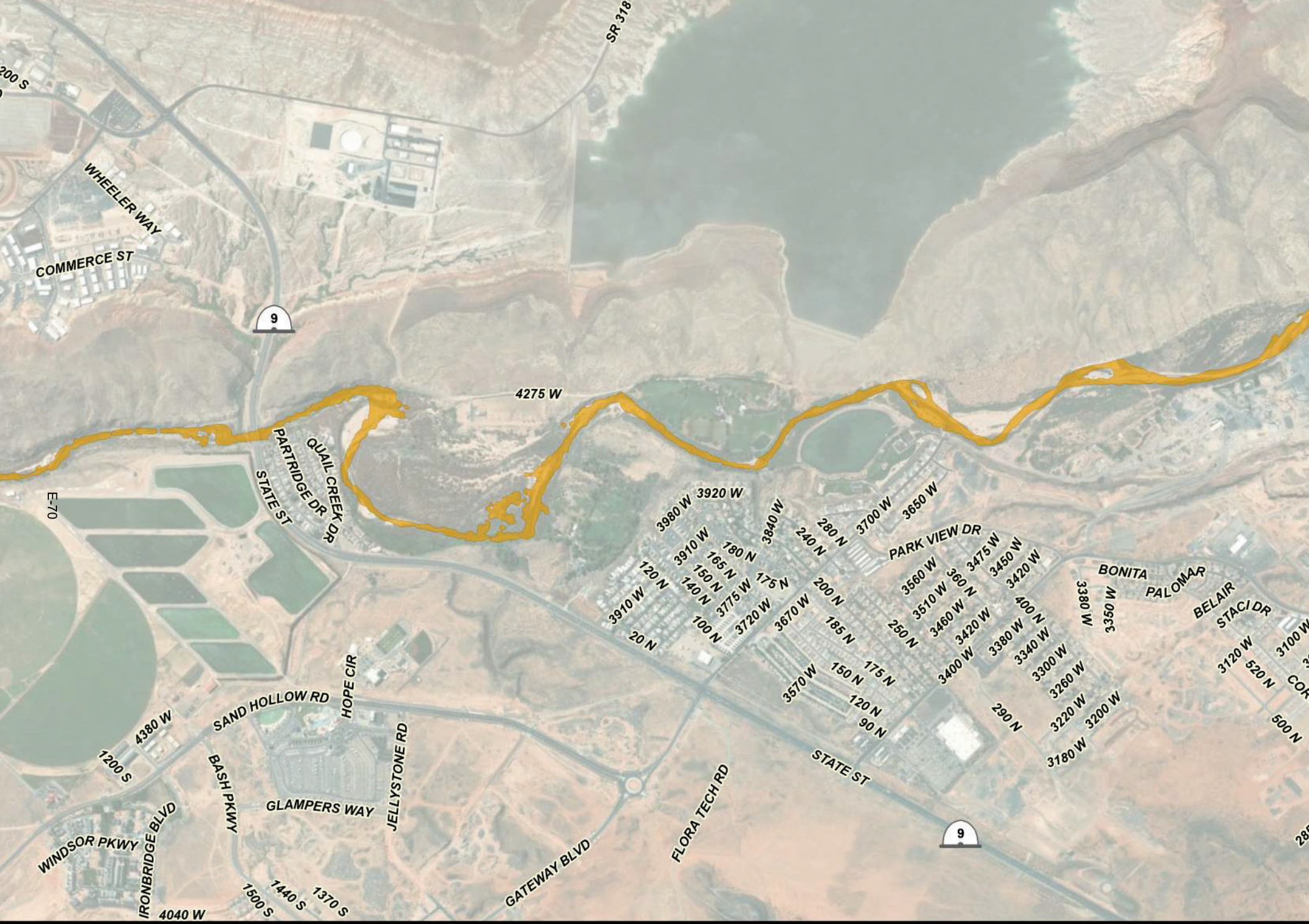
- Cove Dam Structure
- Inundation Boundary (Sunny Day)

N

W E

Dam Breach Sunny

Cove Reserv

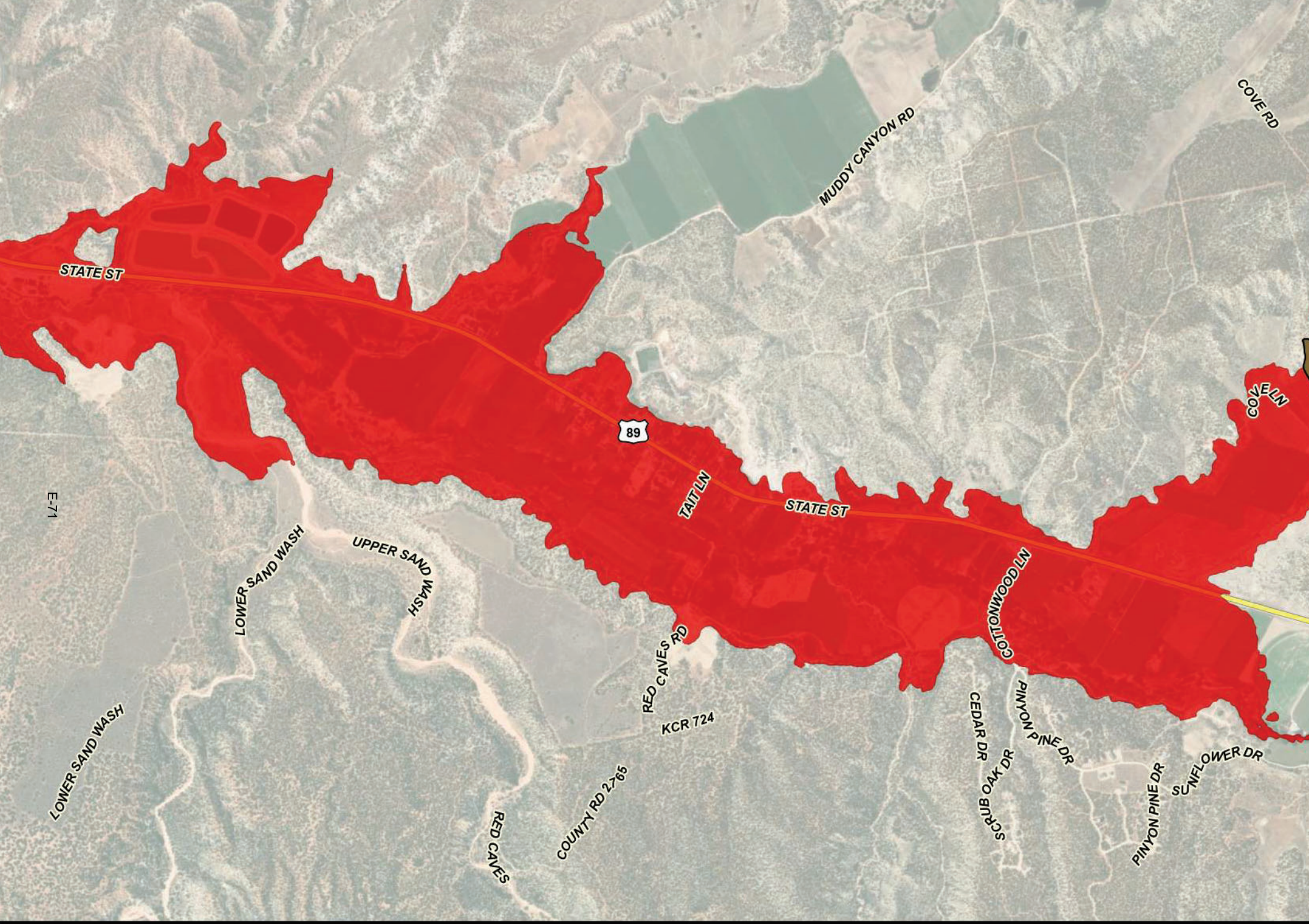


Legend

- Cove Dam Structure
- Inundation Boundary (Sunny Day)

Dam Breach Sunny

Cove Reserv



Legend

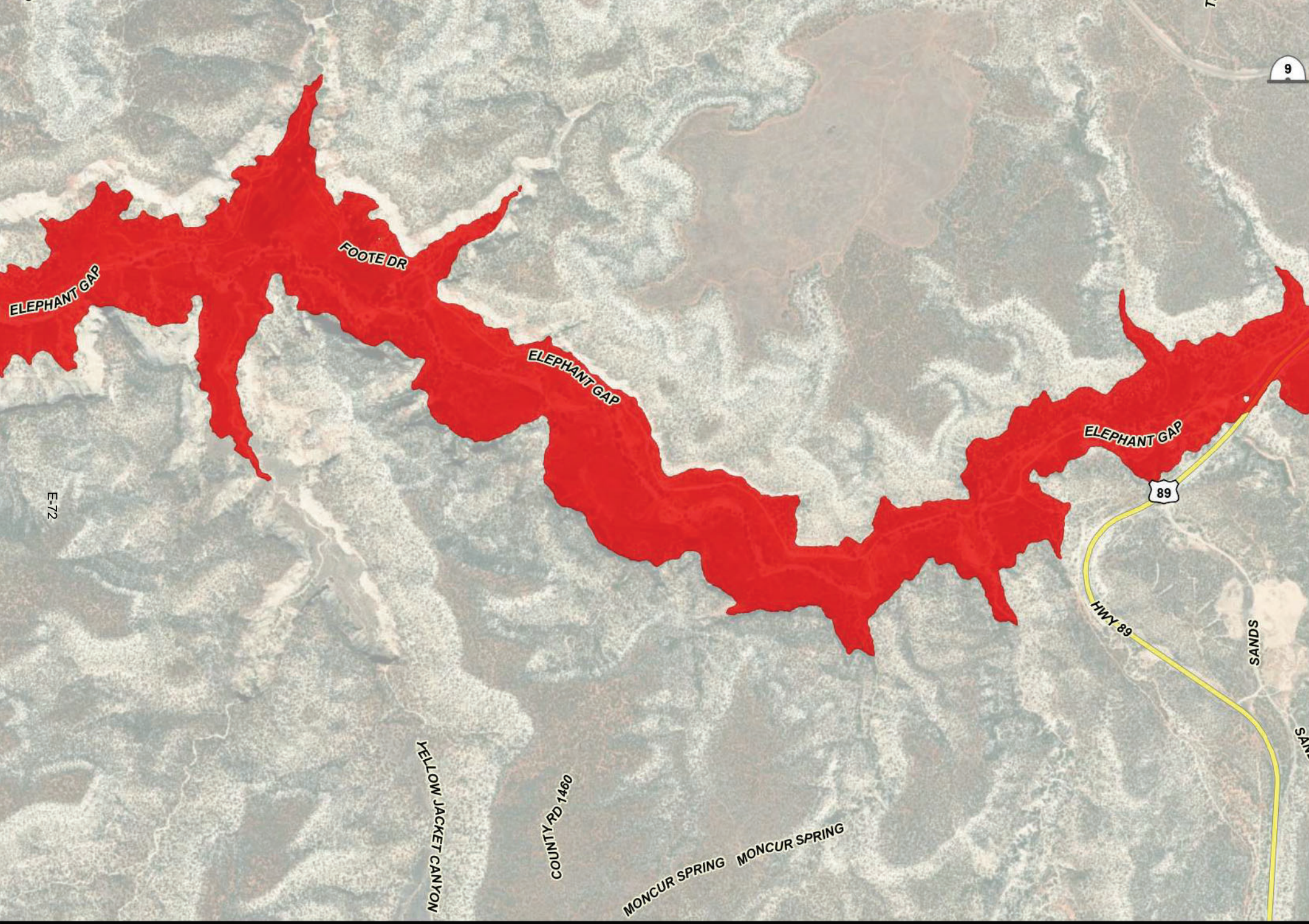
Inundation Boundary (Rainy Day)

Cove Dam Structure

W N

Dam Breach Rainy I

Cove Reserv



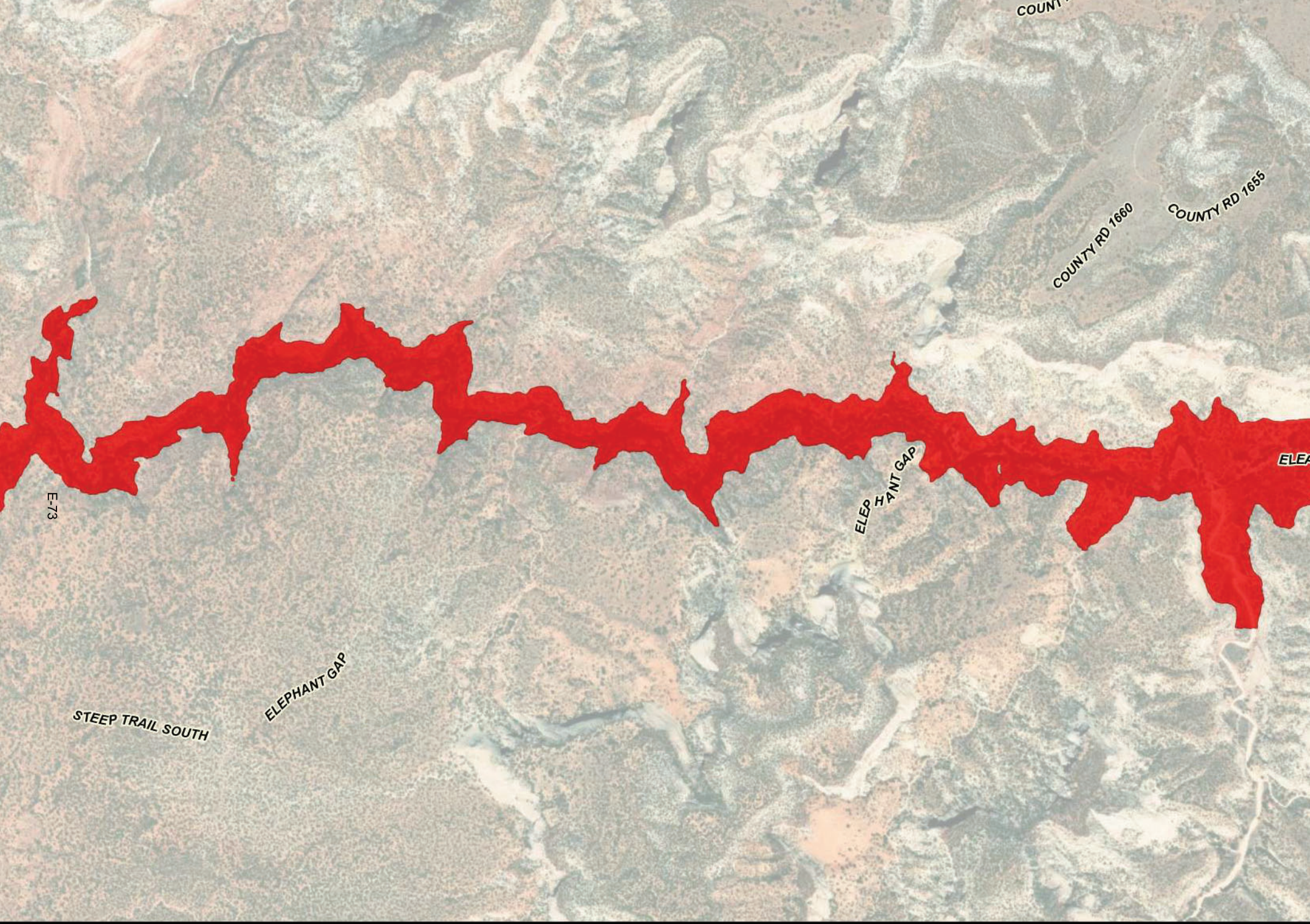
Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

Dam Breach Rainy I

Cove Reserv



Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W E

Dam Breach Rainy D

Cove Reserv

Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W E

Dam Breach Rainy I

Cove Reserv

Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W

E

Dam Breach Rainy D

Cove Reserv

Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W E

Dam Breach Rainy I

Cove Reserv

Legend

Inundation Boundary (Rainy Day)

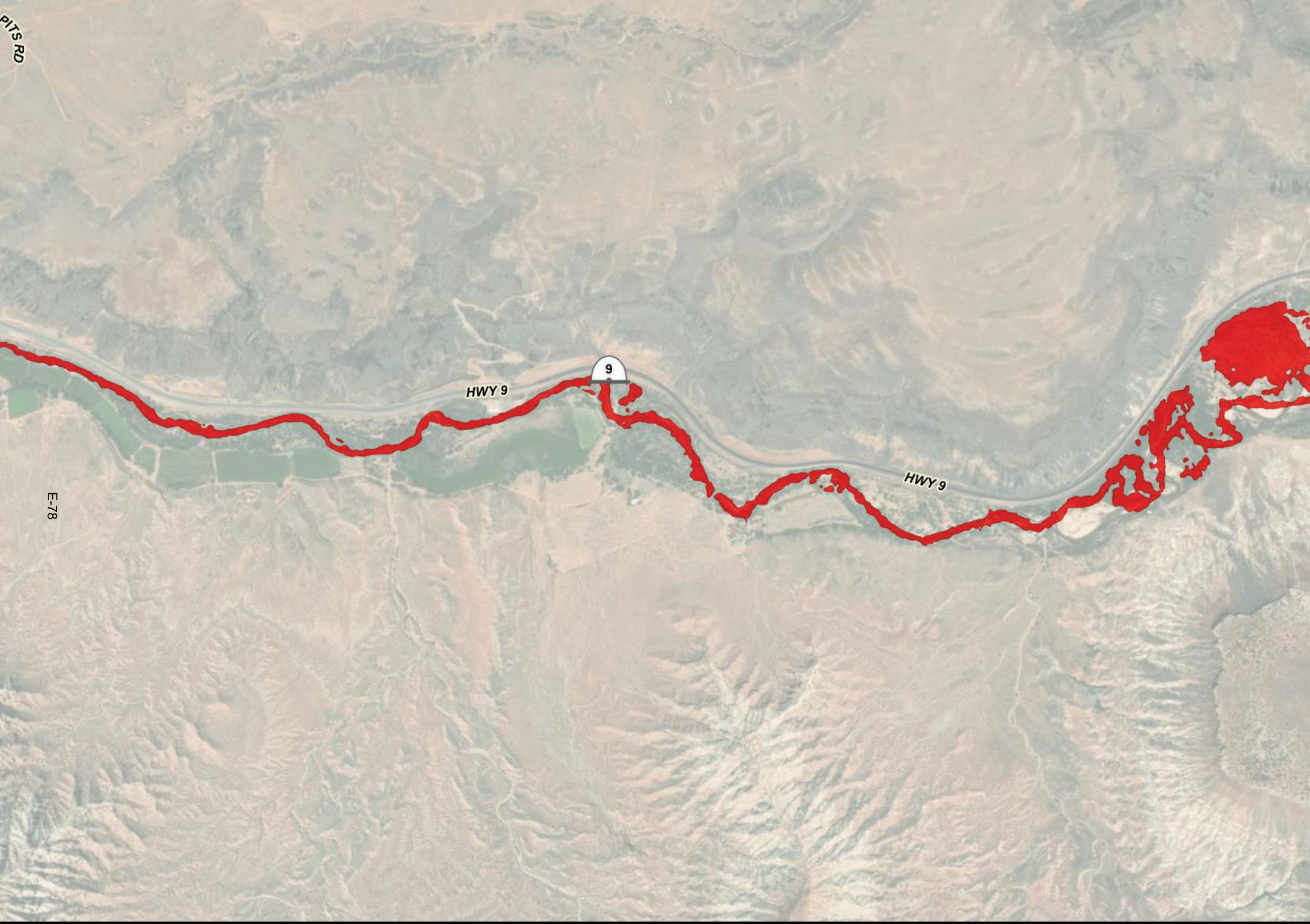
Cove Dam Structure

N

W E

Dam Breach Rainy I

Cove Reserv



Legend

Inundation Boundary (Rainy Day)

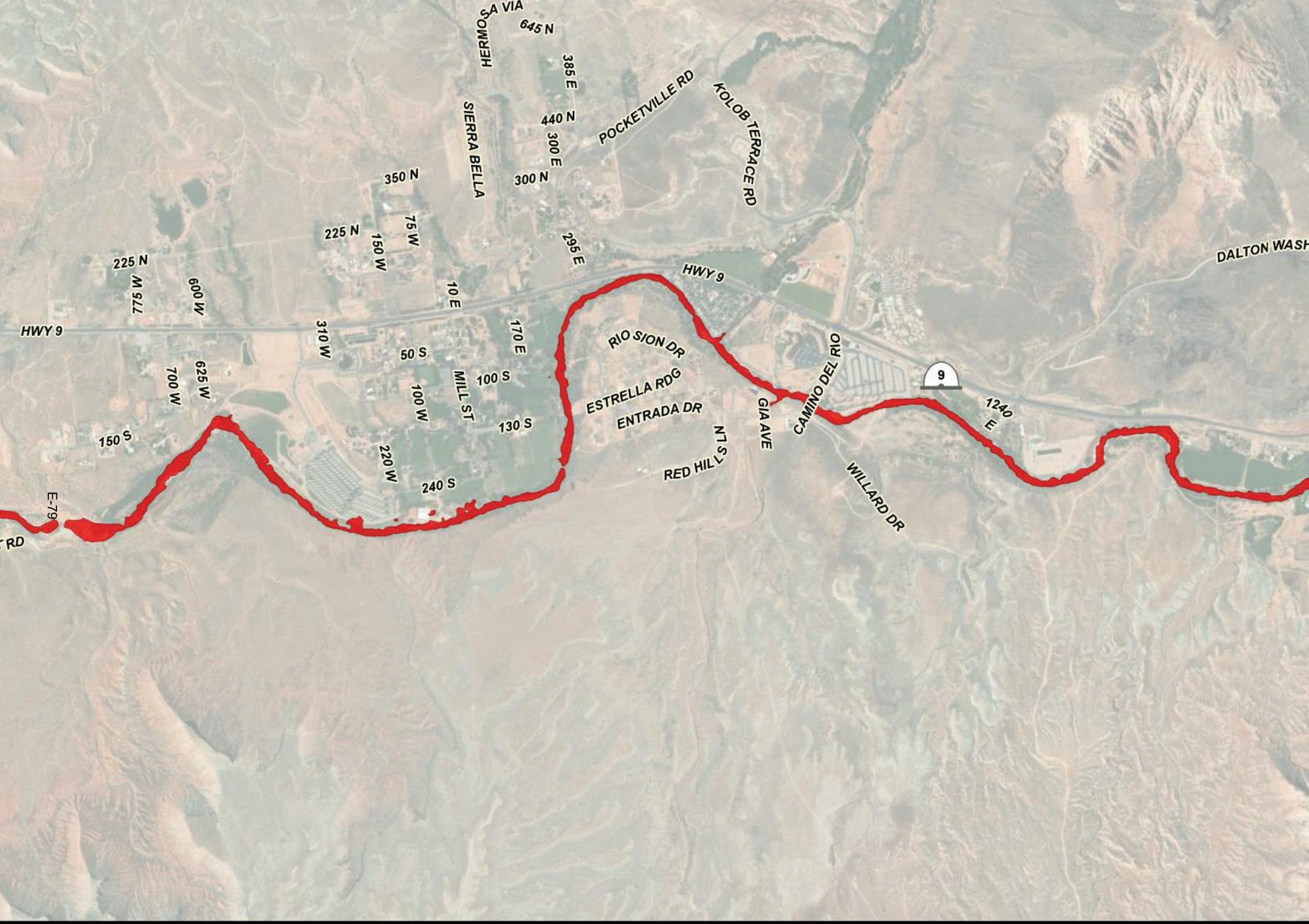
Cove Dam Structure

N

E

Dam Breach Rainy I

Cove Reserv



Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W E

Dam Breach Rainy

Cove Reserv

Legend

- Inundation Boundary (Rainy Day)
- Cove Dam Structure

N
W E

Dam Breach Rainy

Cove Reserv

Legend

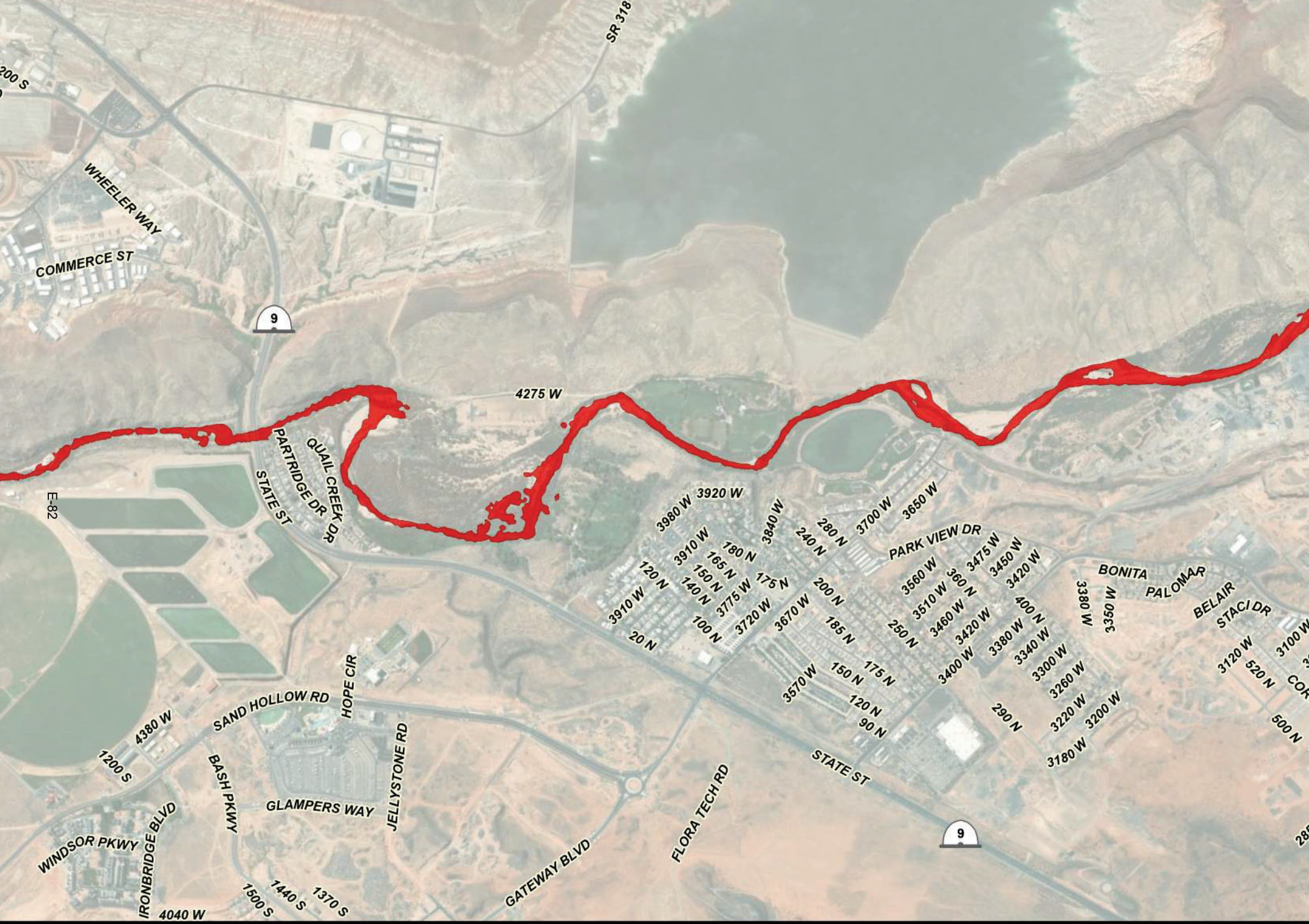
- Inundation Boundary (Rainy Day)
- Cove Dam Structure

N

W E

Dam Breach Rainy I

Cove Reserv



Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

W N

Dam Breach Rainy I

Cove Reserv

Legend

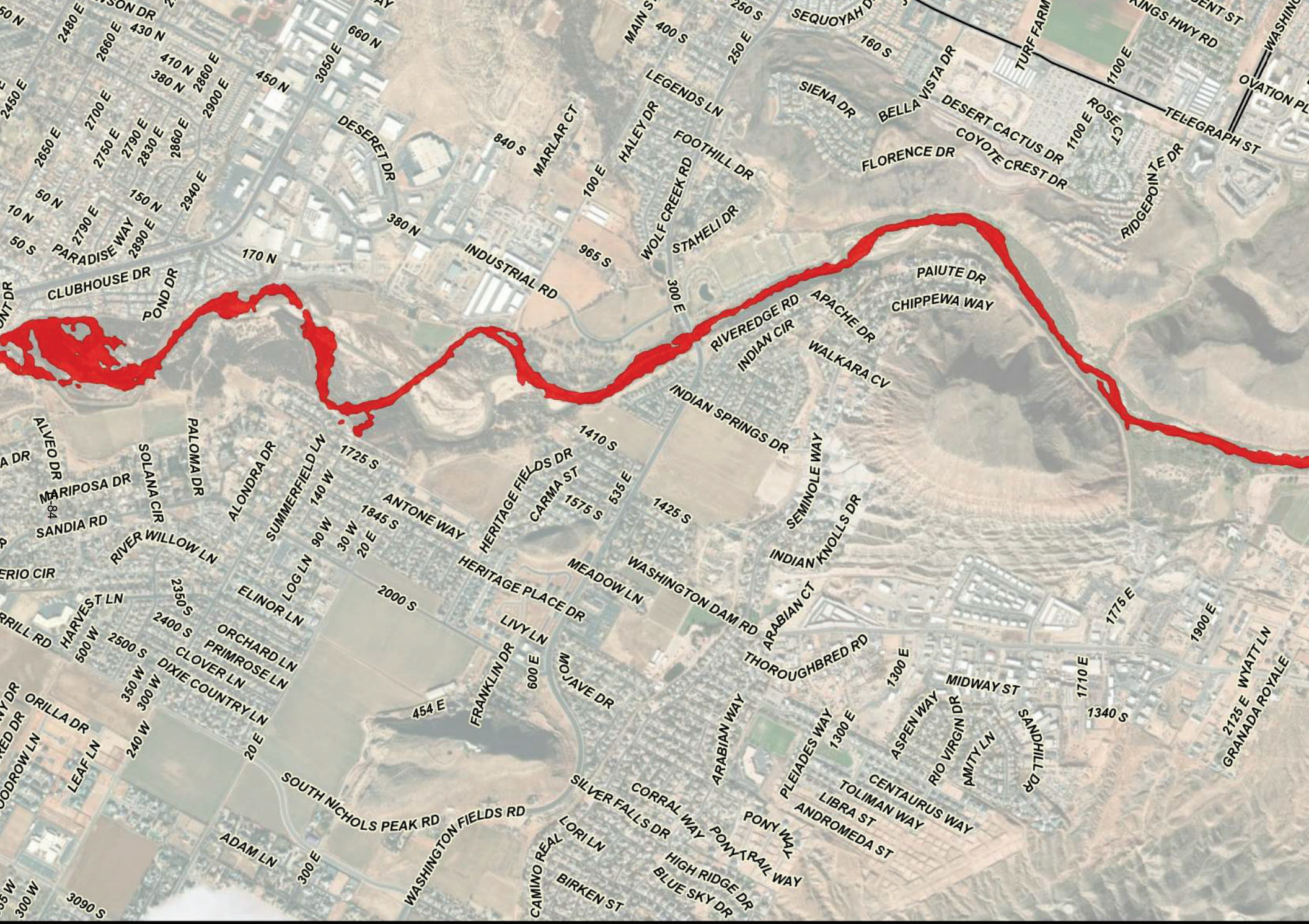
- Inundation Boundary (Rainy Day)
- Cove Dam Structure

N

W

Dam Breach Rainy I

Cove Reserv


Legend
Inundation Boundary (Rainy Day)
Cove Dam Structure
N
W
Dam Breach Rainy
Cove Reserv
CLUBHOUSE DR
POND DR
PARADISE WAY
INDUSTRIAL RD
DESERET DR
MARLAR CT
HALEY DR
LEGENDS LN
FOOTHILL DR
WOLF CREEK RD
STAHELI DR
SIENA DR
BELLA VISTA DR
DESERT CACTUS DR
COYOTE CREST DR
FLORENCE DR
ROSE CT
RIDGEPOINTE DR
TELEGRAPH ST
TURF FARM
OVATION PL
RIVEREDGE RD
INDIAN CIR
APACHE DR
CHIPPEWA WAY
PAIUTE DR
WALKARA CV
INDIAN SPRINGS DR
SEMINOLE WAY
INDIAN KNOLLS DR
ALVEO DR
MARIPOSA DR
SANDIA RD
SOLANA CIR
PALOMA DR
ALONDRA DR
SUMMERFIELD LN
ANTONE WAY
HERITAGE FIELDS DR
CARMA ST
RIVER WILLOW LN
ELINOR LOG LN
HERITAGE PLACE DR
MEADOW LN
WASHINGTON DAM RD
ARABIAN CT
THOROUGHBRED RD
HARVEST LN
ORCHARD LN
PRIMROSE LN
CLOVER LN
DIXIE COUNTRY LN
LIVY LN
FRANKLIN DR
MOJAVE DR
ARABIAN WAY
PLEIADES WAY
ASPEN WAY
RIO VIRGIN DR
AMITY LN
SANDHILL DR
MIDWAY ST
CENTAURUS WAY
TOLIMAN WAY
LIBRA ST
ANDROMEDA ST
PONY WAY
PONY TRAIL WAY
CORRAL WAY
SILVER FALLS DR
HIGH RIDGE DR
BLUE SKY DR
BIRKEN ST
CAMINO REAL
LORI LN
ADAM LN
WASHINGTON FIELDS RD
SOUTH NICHOLS PEAK RD
ORILLA DR
LEAF LN
GRANADA ROYALE
WYATT LN
WASHINGTON
KINGS HWY RD
400 S
250 S
250 E
160 S
1100 E
840 S
100 E
380 N
170 N
965 S
300 E
1410 S
1725 S
1575 S
535 E
1425 S
1845 S
140 W
90 W
30 W
20 E
2000 S
2350 S
2400 S
2500 S
500 W
350 W
300 W
240 W
20 E
454 E
600 E
1300 E
1710 E
1775 E
1900 E
1340 S
2125 E
3090 S
300 W
300 E
2480 E
2660 E
2860 E
2900 E
3050 E
660 N
450 N
410 N
380 N
430 N
2450 E
2650 E
2700 E
2750 E
2790 E
2830 E
2860 E
2940 E
150 N
50 N
10 N
50 S
2790 E
2890 E
84

Legend

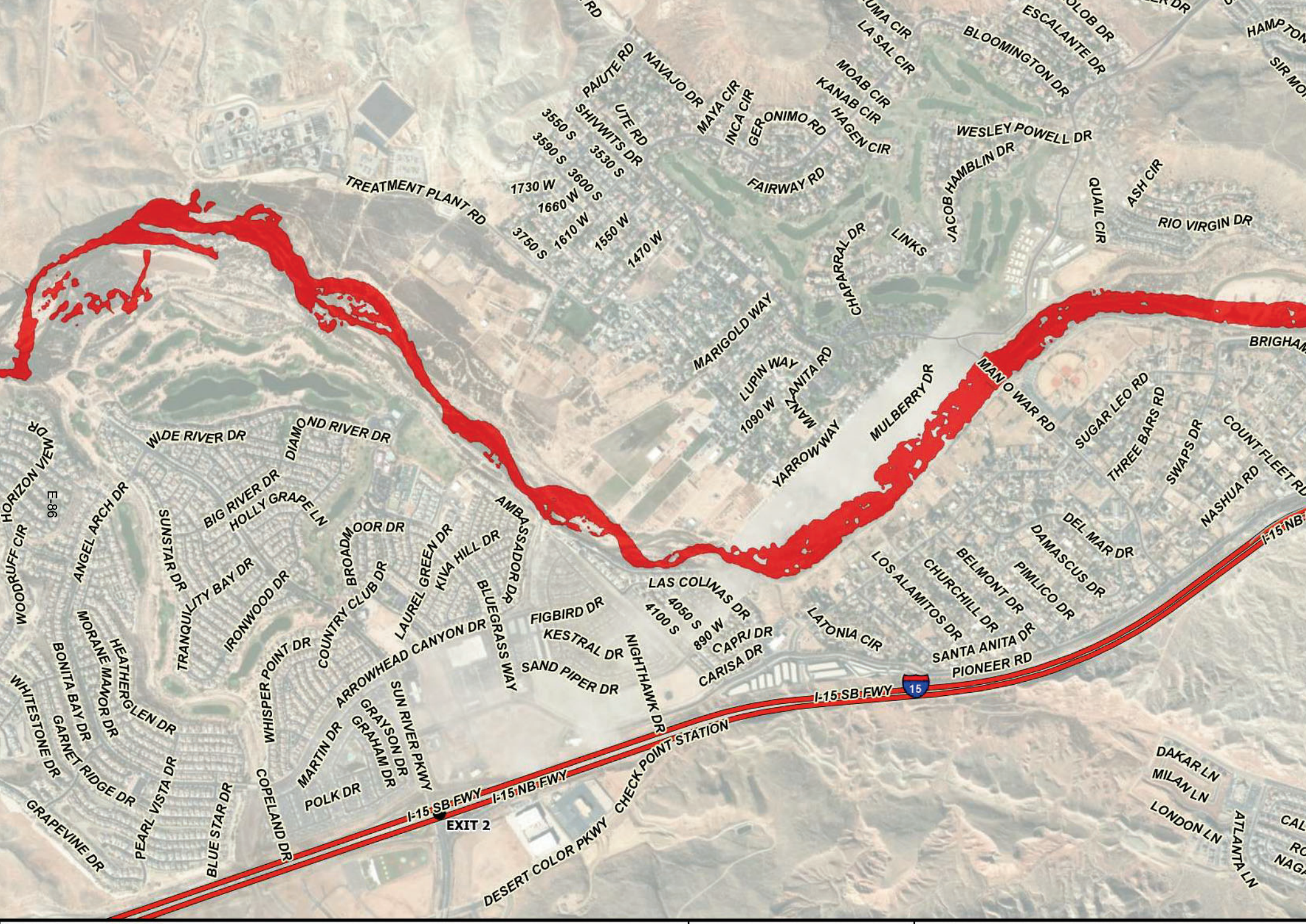
- Inundation Boundary (Rainy Day)
- Cove Dam Structure

N

W

Dam Breach Rainy I

Cove Reserv



Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

Dam Breach Rainy I

Cove Reserv

Legend

Inundation Boundary (Rainy Day)

Cove Dam Structure

N

W

E

Dam Breach Rainy I

Cove Reserv

Appendix B. Calculations

Section 1. Soil Data and Curve Numbers

Section 2. Storm Distributions

Section 3. Precipitation Values

Section 4. Wave Runup

Section 5. Emergency Drain

Section 1. Soil Data and Curve Numbers

```
**********************************************************************
* Program written in ANSI-C by J. Heward                             *
* June 21 2018                                                       *
* Alpha Engineering                                                  *
* 43 S. 100 E.                                                       *
* St. George, Utah 84770                                             *
* 435-628-6500                                                       *
*                                                                    *
* Calculates curve number within basin                               *
* based on NLCD Data & Soil Data                                     *
*                                                                    *
* The following curve numbers are assumed for each                   *
* NLCD Landcover Class and Hydrologic Soil Group:                    *
*  NLCD  Group_A   Group_B   Group_C  Group_D                        *
*    11     98.0     98.0     98.0     98.0                         *
*    12     98.0     98.0     98.0     98.0                         *
*    21     68.0     79.0     86.0     89.0                         *
*    22     68.0     79.0     86.0     89.0                         *
*    23     61.0     75.0     83.0     87.0                         *
*    24     89.0     92.0     94.0     95.0                         *
*    31     55.0     72.0     81.0     86.0                         *
*    41     36.0     58.0     73.0     80.0                         *
*    42     58.0     75.0     85.0     89.0                         *
*    43     36.0     60.0     73.0     79.0                         *
*    51     35.0     56.0     70.0     77.0                         *
*    52     49.0     68.0     79.0     89.0                         *
*    71     39.0     61.0     74.0     80.0                         *
*    72     39.0     61.0     74.0     80.0                         *
*    73     39.0     61.0     74.0     80.0                         *
*    74     39.0     61.0     74.0     80.0                         *
*    81     49.0     69.0     79.0     84.0                         *
*    82     61.0     70.0     77.0     80.0                         *
*    90     30.0     55.0     70.0     77.0                         *
*    95     30.0     55.0     70.0     77.0                         *
**********************************************************************

<<Basin 1>>
       NLCD,  Soil_Group,  %_Watershed,    CN,  Weighted_CN
         41,           B,          4.5,  58.0,          2.6
         42,           A,          8.0,  58.0,          4.7
         42,           B,         85.9,  75.0,         64.4
         52,           B,          1.6,  68.0,          1.1
                                   Composite CN = **72.8**

<<Basin 2>>
       NLCD,  Soil_Group,  %_Watershed,    CN,  Weighted_CN
         42,           A,         14.5,  58.0,          8.4
         42,           B,         85.1,  75.0,         63.8
         52,           B,          0.4,  68.0,          0.3
                                   Composite CN = **72.5**

<<Basin 3>>
       NLCD,  Soil_Group,  %_Watershed,    CN,  Weighted_CN
         42,           A,         19.6,  58.0,         11.4
         42,           B,         71.4,  75.0,         53.6
         52,           B,          9.0,  68.0,          6.1
                                   Composite CN = **71.0**

<<Basin 4>>
```

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
31	C	0.0	81.0	0.0
31	D	1.8	86.0	1.6
42	A	38.7	58.0	22.5
42	B	19.0	75.0	14.2
42	C	7.9	85.0	6.7
42	D	18.2	89.0	16.2
52	A	0.3	49.0	0.2
52	B	0.4	68.0	0.3
52	C	4.5	79.0	3.6
52	D	9.2	89.0	8.2

Composite CN = **73.3**

<<Basin 5>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
31	C	0.0	81.0	0.0
31	D	0.9	86.0	0.8
42	A	25.5	58.0	14.8
42	B	38.5	75.0	28.8
42	C	10.3	85.0	8.8
42	D	12.9	89.0	11.5
52	A	0.0	49.0	0.0
52	B	4.1	68.0	2.8
52	C	3.1	79.0	2.4
52	D	4.7	89.0	4.2

Composite CN = **74.1**

<<Basin 6>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
42	A	0.5	58.0	0.3
42	C	49.2	85.0	41.8
42	D	23.0	89.0	20.4
52	A	3.0	49.0	1.5
52	C	13.9	79.0	11.0
52	D	10.3	89.0	9.2

Composite CN = **84.3**

<<Basin 7>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
31	C	0.0	81.0	0.0
31	D	2.6	86.0	2.3
42	A	41.1	58.0	23.8
42	C	7.4	85.0	6.3
42	D	29.4	89.0	26.2
52	A	0.0	49.0	0.0
52	C	1.7	79.0	1.4
52	D	17.7	89.0	15.7

Composite CN = **75.7**

<<Basin 8>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
21	C	0.0	86.0	0.0
42	A	0.0	58.0	0.0
42	C	26.9	85.0	22.9
42	D	10.5	89.0	9.3
52	A	0.0	49.0	0.0
52	C	39.4	79.0	31.1
52	D	23.2	89.0	20.6

Composite CN = **84.0**

<<Basin 9>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
42	A	0.6	58.0	0.3
42	C	20.7	85.0	17.6
42	D	27.7	89.0	24.7
52	A	3.7	49.0	1.8
52	C	10.4	79.0	8.2
52	D	36.9	89.0	32.8

Composite CN = **85.5**

<<Basin 10>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
42	C	27.5	85.0	23.4
42	D	32.1	89.0	28.5
52	C	12.4	79.0	9.8
52	D	28.1	89.0	25.0

Composite CN = **86.7**

<<Basin 11>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
42	A	0.2	58.0	0.1
42	C	9.1	85.0	7.7
42	D	18.0	89.0	16.0
52	A	0.0	49.0	0.0
52	C	37.4	79.0	29.5
52	D	35.3	89.0	31.4

Composite CN = **84.8**

<<Basin 12>>

NLCD	Soil_Group	%_Watershed	CN	Weighted_CN
21	C	0.1	86.0	0.0
22	C	0.4	86.0	0.4
42	C	35.0	85.0	29.7
52	C	64.0	79.0	50.6
52	D	0.5	89.0	0.5

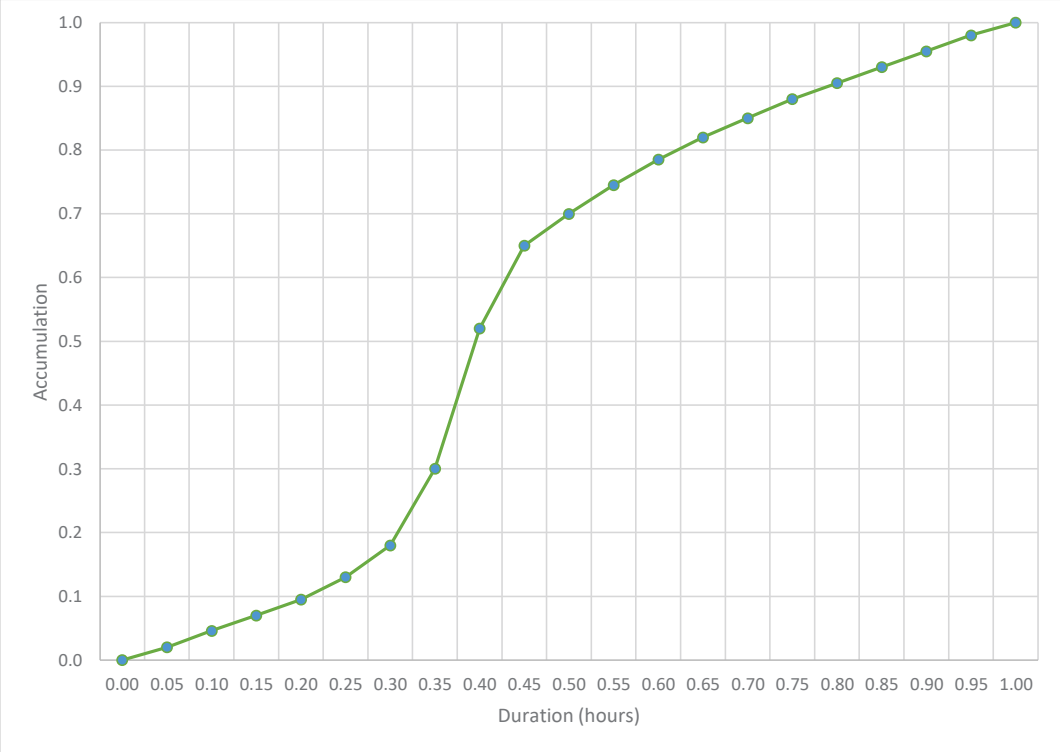
Composite CN = **81.2**

Section 2. Storm Distributions

Dimensionless Hydrograph

Hours	Accumulation
0.00	0.000
0.05	0.020
0.10	0.046
0.15	0.070
0.20	0.095
0.25	0.130
0.30	0.180
0.35	0.300
0.40	0.520
0.45	0.650
0.50	0.700
0.55	0.745
0.60	0.785
0.65	0.820
0.70	0.850
0.75	0.880
0.80	0.905
0.85	0.930
0.90	0.955
0.95	0.980
1.00	1.000

(NEH 630, Chapter 21, Figure 21-9)



PSH Hydrograph

Characteristics

Drainage Area	4.742	sq mi
Time of Concentration	1.88	hr
Ave. Annual Precipitation	15.6	in
Ave. Annual Temperature	51.2	°F
Curve Number	71.8	
100-yr, 24-hr Precipitation	3.51	in
100-yr, 10-day Precipitation	6.83	in
Structure Hazard Classification	High	
Climatic Index	0.6	

Principal Spillway Mass Curve

Adjusted Areal Rainfall

Not Applicable (<10 sq mi)

Adjusted 10-day Curve Numbers (Table 21-2)

$CN_{1\text{-day}}$	77.8	
$CN_{10\text{-day}}$	71.8	

Direct Runoff (NEH, Appendix 10A)

$Q_{1\text{-day}}$	1.49	in
$Q_{10\text{-day}}$	3.66	in

Net Runoff (Table 21-4)

Channel Loss Reduction Factor	0.84	
$Q_{1\text{-day net}}$	1.25	in
$Q_{10\text{-day net}}$	3.08	in

Mass Curve (Equation 21-2)

a	0.3903
Qd (1-hour)	0.3625

Time (days)	Qd (inches)	Inc. Volumes (inches)	Rank	Inc. Volume Ranked	Inc. Arrangement	Time (hrs)	Inc. Volumes Rearrange	PSMC	Dimensionless PSMC
0.0000	0.0000	-	-	-	-	0	-	0.0000	0.0000
0.0417	0.3624	0.3624	1	0.3624	239	1	0.0050	0.0050	0.0016
0.0833	0.4749	0.1126	2	0.1126	237	2	0.0051	0.0101	0.0033
0.1250	0.5564	0.0814	3	0.0814	235	3	0.0051	0.0152	0.0049
0.1667	0.6225	0.0661	4	0.0661	233	4	0.0051	0.0203	0.0066
0.2083	0.6792	0.0567	5	0.0567	231	5	0.0051	0.0254	0.0082
0.2500	0.7293	0.0501	6	0.0501	229	6	0.0052	0.0305	0.0099
0.2917	0.7745	0.0452	7	0.0452	227	7	0.0052	0.0357	0.0116
0.3333	0.8159	0.0414	8	0.0414	225	8	0.0052	0.0409	0.0133
0.3750	0.8543	0.0384	9	0.0384	223	9	0.0052	0.0462	0.0150
0.4167	0.8902	0.0359	10	0.0359	221	10	0.0053	0.0515	0.0167
0.4583	0.9239	0.0337	11	0.0337	219	11	0.0053	0.0568	0.0184
0.5000	0.9558	0.0319	12	0.0319	217	12	0.0053	0.0621	0.0202
0.5417	0.9862	0.0303	13	0.0303	215	13	0.0054	0.0674	0.0219
0.5833	1.0151	0.0289	14	0.0289	213	14	0.0054	0.0728	0.0237
0.6250	1.0428	0.0277	15	0.0277	211	15	0.0054	0.0783	0.0254

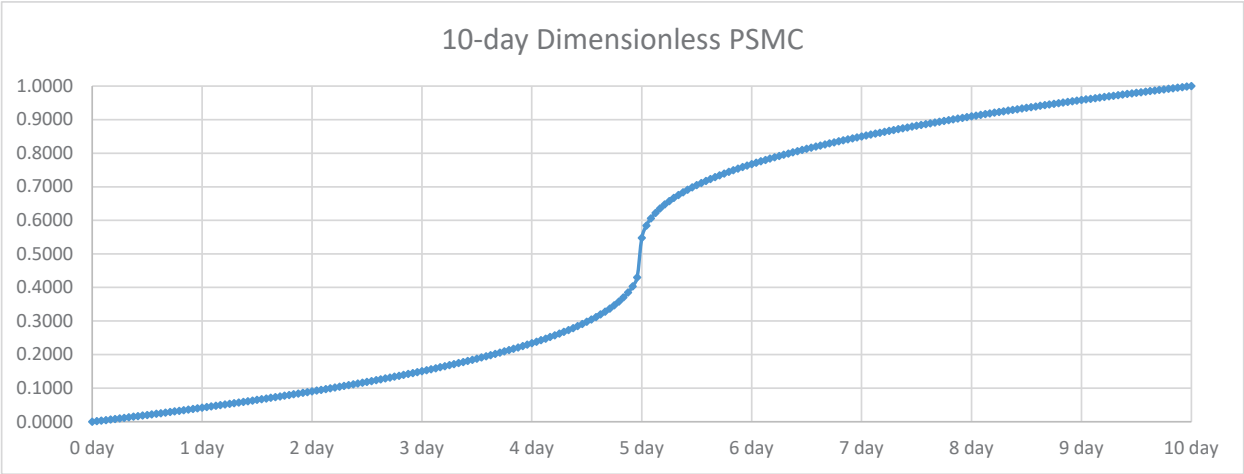
0.6667	1.0694	0.0266	16	0.0266	209	16	0.0055	0.0837	0.0272
0.7083	1.0950	0.0256	17	0.0256	207	17	0.0055	0.0892	0.0290
0.7500	1.1197	0.0247	18	0.0247	205	18	0.0055	0.0947	0.0308
0.7917	1.1436	0.0239	19	0.0239	203	19	0.0056	0.1003	0.0326
0.8333	1.1667	0.0231	20	0.0231	201	20	0.0056	0.1059	0.0344
0.8750	1.1892	0.0224	21	0.0224	199	21	0.0056	0.1115	0.0362
0.9167	1.2110	0.0218	22	0.0218	197	22	0.0057	0.1171	0.0381
0.9583	1.2322	0.0212	23	0.0212	195	23	0.0057	0.1228	0.0399
1.0000	1.2528	0.0206	24	0.0206	193	24	0.0057	0.1285	0.0418
1.0417	1.2729	0.0201	25	0.0201	191	25	0.0058	0.1343	0.0436
1.0833	1.2926	0.0196	26	0.0196	189	26	0.0058	0.1401	0.0455
1.1250	1.3117	0.0192	27	0.0192	187	27	0.0058	0.1459	0.0474
1.1667	1.3305	0.0188	28	0.0188	185	28	0.0059	0.1518	0.0493
1.2083	1.3488	0.0183	29	0.0183	183	29	0.0059	0.1577	0.0513
1.2500	1.3668	0.0180	30	0.0180	181	30	0.0060	0.1637	0.0532
1.2917	1.3844	0.0176	31	0.0176	179	31	0.0060	0.1697	0.0551
1.3333	1.4017	0.0173	32	0.0173	177	32	0.0060	0.1757	0.0571
1.3750	1.4186	0.0169	33	0.0169	175	33	0.0061	0.1818	0.0591
1.4167	1.4352	0.0166	34	0.0166	173	34	0.0061	0.1879	0.0611
1.4583	1.4516	0.0163	35	0.0163	171	35	0.0062	0.1941	0.0631
1.5000	1.4676	0.0160	36	0.0160	169	36	0.0062	0.2003	0.0651
1.5417	1.4834	0.0158	37	0.0158	167	37	0.0063	0.2065	0.0671
1.5833	1.4989	0.0155	38	0.0155	165	38	0.0063	0.2129	0.0692
1.6250	1.5142	0.0153	39	0.0153	163	39	0.0063	0.2192	0.0712
1.6667	1.5292	0.0150	40	0.0150	161	40	0.0064	0.2256	0.0733
1.7083	1.5441	0.0148	41	0.0148	159	41	0.0064	0.2320	0.0754
1.7500	1.5586	0.0146	42	0.0146	157	42	0.0065	0.2385	0.0775
1.7917	1.5730	0.0144	43	0.0144	155	43	0.0065	0.2451	0.0796
1.8333	1.5872	0.0142	44	0.0142	153	44	0.0066	0.2517	0.0818
1.8750	1.6012	0.0140	45	0.0140	151	45	0.0067	0.2583	0.0839
1.9167	1.6150	0.0138	46	0.0138	149	46	0.0067	0.2650	0.0861
1.9583	1.6286	0.0136	47	0.0136	147	47	0.0068	0.2718	0.0883
2.0000	1.6420	0.0134	48	0.0134	145	48	0.0068	0.2786	0.0905
2.0417	1.6553	0.0133	49	0.0133	143	49	0.0069	0.2855	0.0928
2.0833	1.6684	0.0131	50	0.0131	141	50	0.0069	0.2924	0.0950
2.1250	1.6814	0.0129	51	0.0129	139	51	0.0070	0.2994	0.0973
2.1667	1.6942	0.0128	52	0.0128	137	52	0.0071	0.3065	0.0996
2.2083	1.7068	0.0126	53	0.0126	135	53	0.0071	0.3136	0.1019
2.2500	1.7193	0.0125	54	0.0125	133	54	0.0072	0.3208	0.1042
2.2917	1.7317	0.0124	55	0.0124	131	55	0.0073	0.3281	0.1066
2.3333	1.7439	0.0122	56	0.0122	129	56	0.0073	0.3354	0.1090
2.3750	1.7560	0.0121	57	0.0121	127	57	0.0074	0.3428	0.1114
2.4167	1.7679	0.0120	58	0.0120	125	58	0.0075	0.3503	0.1138
2.4583	1.7798	0.0118	59	0.0118	123	59	0.0075	0.3578	0.1163
2.5000	1.7915	0.0117	60	0.0117	121	60	0.0076	0.3654	0.1187
2.5417	1.8031	0.0116	61	0.0116	119	61	0.0077	0.3731	0.1212
2.5833	1.8145	0.0115	62	0.0115	117	62	0.0078	0.3809	0.1238
2.6250	1.8259	0.0114	63	0.0114	115	63	0.0079	0.3888	0.1263
2.6667	1.8372	0.0113	64	0.0113	113	64	0.0079	0.3967	0.1289
2.7083	1.8483	0.0112	65	0.0112	111	65	0.0080	0.4047	0.1315
2.7500	1.8594	0.0110	66	0.0110	109	66	0.0081	0.4129	0.1341
2.7917	1.8703	0.0109	67	0.0109	107	67	0.0082	0.4211	0.1368
2.8333	1.8812	0.0108	68	0.0108	105	68	0.0083	0.4294	0.1395
2.8750	1.8919	0.0108	69	0.0108	103	69	0.0084	0.4378	0.1422
2.9167	1.9026	0.0107	70	0.0107	101	70	0.0085	0.4463	0.1450

2.9583	1.9131	0.0106	71	0.0106	99	71	0.0086	0.4549	0.1478
3.0000	1.9236	0.0105	72	0.0105	97	72	0.0087	0.4636	0.1506
3.0417	1.9340	0.0104	73	0.0104	95	73	0.0088	0.4725	0.1535
3.0833	1.9443	0.0103	74	0.0103	93	74	0.0090	0.4814	0.1564
3.1250	1.9545	0.0102	75	0.0102	91	75	0.0091	0.4905	0.1594
3.1667	1.9646	0.0101	76	0.0101	89	76	0.0092	0.4997	0.1624
3.2083	1.9747	0.0101	77	0.0101	87	77	0.0093	0.5090	0.1654
3.2500	1.9847	0.0100	78	0.0100	85	78	0.0095	0.5185	0.1685
3.2917	1.9946	0.0099	79	0.0099	83	79	0.0096	0.5281	0.1716
3.3333	2.0044	0.0098	80	0.0098	81	80	0.0097	0.5378	0.1747
3.3750	2.0141	0.0097	81	0.0097	79	81	0.0099	0.5477	0.1780
3.4167	2.0238	0.0097	82	0.0097	77	82	0.0101	0.5578	0.1812
3.4583	2.0334	0.0096	83	0.0096	75	83	0.0102	0.5680	0.1845
3.5000	2.0429	0.0095	84	0.0095	73	84	0.0104	0.5784	0.1879
3.5417	2.0524	0.0095	85	0.0095	71	85	0.0106	0.5889	0.1914
3.5833	2.0618	0.0094	86	0.0094	69	86	0.0108	0.5997	0.1948
3.6250	2.0711	0.0093	87	0.0093	67	87	0.0109	0.6106	0.1984
3.6667	2.0803	0.0093	88	0.0093	65	88	0.0112	0.6218	0.2020
3.7083	2.0895	0.0092	89	0.0092	63	89	0.0114	0.6331	0.2057
3.7500	2.0987	0.0091	90	0.0091	61	90	0.0116	0.6447	0.2095
3.7917	2.1077	0.0091	91	0.0091	59	91	0.0118	0.6566	0.2133
3.8333	2.1168	0.0090	92	0.0090	57	92	0.0121	0.6687	0.2173
3.8750	2.1257	0.0090	93	0.0090	55	93	0.0124	0.6810	0.2213
3.9167	2.1346	0.0089	94	0.0089	53	94	0.0126	0.6937	0.2254
3.9583	2.1434	0.0088	95	0.0088	51	95	0.0129	0.7066	0.2296
4.0000	2.1522	0.0088	96	0.0088	49	96	0.0133	0.7199	0.2339
4.0417	2.1609	0.0087	97	0.0087	47	97	0.0136	0.7335	0.2383
4.0833	2.1696	0.0087	98	0.0087	45	98	0.0140	0.7475	0.2429
4.1250	2.1782	0.0086	99	0.0086	43	99	0.0144	0.7618	0.2475
4.1667	2.1868	0.0086	100	0.0086	41	100	0.0148	0.7767	0.2524
4.2083	2.1953	0.0085	101	0.0085	39	101	0.0153	0.7919	0.2573
4.2500	2.2037	0.0085	102	0.0085	37	102	0.0158	0.8077	0.2624
4.2917	2.2122	0.0084	103	0.0084	35	103	0.0163	0.8240	0.2678
4.3333	2.2205	0.0084	104	0.0084	33	104	0.0169	0.8410	0.2733
4.3750	2.2288	0.0083	105	0.0083	31	105	0.0176	0.8586	0.2790
4.4167	2.2371	0.0083	106	0.0083	29	106	0.0183	0.8769	0.2849
4.4583	2.2453	0.0082	107	0.0082	27	107	0.0192	0.8961	0.2912
4.5000	2.2535	0.0082	108	0.0082	25	108	0.0201	0.9162	0.2977
4.5417	2.2616	0.0081	109	0.0081	23	109	0.0212	0.9374	0.3046
4.5833	2.2697	0.0081	110	0.0081	21	110	0.0224	0.9599	0.3119
4.6250	2.2777	0.0080	111	0.0080	19	111	0.0239	0.9838	0.3196
4.6667	2.2857	0.0080	112	0.0080	17	112	0.0256	1.0094	0.3280
4.7083	2.2936	0.0079	113	0.0079	15	113	0.0277	1.0371	0.3370
4.7500	2.3015	0.0079	114	0.0079	13	114	0.0303	1.0674	0.3468
4.7917	2.3094	0.0079	115	0.0079	11	115	0.0337	1.1011	0.3578
4.8333	2.3172	0.0078	116	0.0078	9	116	0.0384	1.1395	0.3703
4.8750	2.3250	0.0078	117	0.0078	7	117	0.0452	1.1848	0.3850
4.9167	2.3327	0.0077	118	0.0077	5	118	0.0567	1.2414	0.4034
4.9583	2.3404	0.0077	119	0.0077	3	119	0.0814	1.3229	0.4298
5.0000	2.3481	0.0077	120	0.0077	1	120	**0.3624**	1.6852	0.5476
5.0417	2.3557	0.0076	121	0.0076	2	121	0.1126	1.7978	0.5842
5.0833	2.3633	0.0076	122	0.0076	4	122	0.0661	1.8639	0.6056
5.1250	2.3708	0.0075	123	0.0075	6	123	0.0501	1.9140	0.6219
5.1667	2.3783	0.0075	124	0.0075	8	124	0.0414	1.9555	0.6354
5.2083	2.3858	0.0075	125	0.0075	10	125	0.0359	1.9913	0.6470

5.2500	2.3932	0.0074	126	0.0074	12	126	0.0319	2.0232	0.6574
5.2917	2.4006	0.0074	127	0.0074	14	127	0.0289	2.0522	0.6668
5.3333	2.4080	0.0074	128	0.0074	16	128	0.0266	2.0788	0.6755
5.3750	2.4153	0.0073	129	0.0073	18	129	0.0247	2.1035	0.6835
5.4167	2.4226	0.0073	130	0.0073	20	130	0.0231	2.1266	0.6910
5.4583	2.4298	0.0073	131	0.0073	22	131	0.0218	2.1484	0.6981
5.5000	2.4371	0.0072	132	0.0072	24	132	0.0206	2.1690	0.7048
5.5417	2.4443	0.0072	133	0.0072	26	133	0.0196	2.1887	0.7112
5.5833	2.4514	0.0072	134	0.0072	28	134	0.0188	2.2074	0.7173
5.6250	2.4585	0.0071	135	0.0071	30	135	0.0180	2.2254	0.7231
5.6667	2.4656	0.0071	136	0.0071	32	136	0.0173	2.2427	0.7287
5.7083	2.4727	0.0071	137	0.0071	34	137	0.0166	2.2593	0.7341
5.7500	2.4797	0.0070	138	0.0070	36	138	0.0160	2.2753	0.7393
5.7917	2.4867	0.0070	139	0.0070	38	139	0.0155	2.2909	0.7444
5.8333	2.4937	0.0070	140	0.0070	40	140	0.0150	2.3059	0.7493
5.8750	2.5006	0.0069	141	0.0069	42	141	0.0146	2.3205	0.7540
5.9167	2.5075	0.0069	142	0.0069	44	142	0.0142	2.3347	0.7586
5.9583	2.5144	0.0069	143	0.0069	46	143	0.0138	2.3485	0.7631
6.0000	2.5213	0.0068	144	0.0068	48	144	0.0134	2.3619	0.7675
6.0417	2.5281	0.0068	145	0.0068	50	145	0.0131	2.3750	0.7717
6.0833	2.5349	0.0068	146	0.0068	52	146	0.0128	2.3878	0.7759
6.1250	2.5416	0.0068	147	0.0068	54	147	0.0125	2.4003	0.7799
6.1667	2.5484	0.0067	148	0.0067	56	148	0.0122	2.4125	0.7839
6.2083	2.5551	0.0067	149	0.0067	58	149	0.0120	2.4245	0.7878
6.2500	2.5618	0.0067	150	0.0067	60	150	0.0117	2.4362	0.7916
6.2917	2.5684	0.0067	151	0.0067	62	151	0.0115	2.4477	0.7953
6.3333	2.5750	0.0066	152	0.0066	64	152	0.0113	2.4589	0.7990
6.3750	2.5816	0.0066	153	0.0066	66	153	0.0110	2.4700	0.8026
6.4167	2.5882	0.0066	154	0.0066	68	154	0.0108	2.4808	0.8061
6.4583	2.5948	0.0065	155	0.0065	70	155	0.0107	2.4915	0.8096
6.5000	2.6013	0.0065	156	0.0065	72	156	0.0105	2.5020	0.8130
6.5417	2.6078	0.0065	157	0.0065	74	157	0.0103	2.5123	0.8163
6.5833	2.6142	0.0065	158	0.0065	76	158	0.0101	2.5224	0.8196
6.6250	2.6207	0.0064	159	0.0064	78	159	0.0100	2.5324	0.8228
6.6667	2.6271	0.0064	160	0.0064	80	160	0.0098	2.5422	0.8260
6.7083	2.6335	0.0064	161	0.0064	82	161	0.0097	2.5519	0.8292
6.7500	2.6399	0.0064	162	0.0064	84	162	0.0095	2.5614	0.8323
6.7917	2.6462	0.0063	163	0.0063	86	163	0.0094	2.5708	0.8353
6.8333	2.6526	0.0063	164	0.0063	88	164	0.0093	2.5800	0.8383
6.8750	2.6589	0.0063	165	0.0063	90	165	0.0091	2.5892	0.8413
6.9167	2.6651	0.0063	166	0.0063	92	166	0.0090	2.5982	0.8442
6.9583	2.6714	0.0063	167	0.0063	94	167	0.0089	2.6071	0.8471
7.0000	2.6776	0.0062	168	0.0062	96	168	0.0088	2.6158	0.8500
7.0417	2.6838	0.0062	169	0.0062	98	169	0.0087	2.6245	0.8528
7.0833	2.6900	0.0062	170	0.0062	100	170	0.0086	2.6331	0.8556
7.1250	2.6962	0.0062	171	0.0062	102	171	0.0085	2.6415	0.8583
7.1667	2.7023	0.0061	172	0.0061	104	172	0.0084	2.6499	0.8610
7.2083	2.7085	0.0061	173	0.0061	106	173	0.0083	2.6582	0.8637
7.2500	2.7146	0.0061	174	0.0061	108	174	0.0082	2.6663	0.8664
7.2917	2.7206	0.0061	175	0.0061	110	175	0.0081	2.6744	0.8690
7.3333	2.7267	0.0061	176	0.0061	112	176	0.0080	2.6824	0.8716
7.3750	2.7327	0.0060	177	0.0060	114	177	0.0079	2.6903	0.8741
7.4167	2.7387	0.0060	178	0.0060	116	178	0.0078	2.6981	0.8767
7.4583	2.7447	0.0060	179	0.0060	118	179	0.0077	2.7058	0.8792
7.5000	2.7507	0.0060	180	0.0060	120	180	0.0077	2.7135	0.8817

7.5417	2.7567	0.0060	181	0.0060	122	181	0.0076	2.7211	0.8842
7.5833	2.7626	0.0059	182	0.0059	124	182	0.0075	2.7286	0.8866
7.6250	2.7685	0.0059	183	0.0059	126	183	0.0074	2.7360	0.8890
7.6667	2.7744	0.0059	184	0.0059	128	184	0.0074	2.7434	0.8914
7.7083	2.7803	0.0059	185	0.0059	130	185	0.0073	2.7507	0.8938
7.7500	2.7861	0.0059	186	0.0059	132	186	0.0072	2.7579	0.8961
7.7917	2.7920	0.0058	187	0.0058	134	187	0.0072	2.7650	0.8984
7.8333	2.7978	0.0058	188	0.0058	136	188	0.0071	2.7721	0.9007
7.8750	2.8036	0.0058	189	0.0058	138	189	0.0070	2.7792	0.9030
7.9167	2.8094	0.0058	190	0.0058	140	190	0.0070	2.7861	0.9053
7.9583	2.8151	0.0058	191	0.0058	142	191	0.0069	2.7930	0.9075
8.0000	2.8209	0.0057	192	0.0057	144	192	0.0068	2.7999	0.9098
8.0417	2.8266	0.0057	193	0.0057	146	193	0.0068	2.8067	0.9120
8.0833	2.8323	0.0057	194	0.0057	148	194	0.0067	2.8134	0.9142
8.1250	2.8380	0.0057	195	0.0057	150	195	0.0067	2.8201	0.9163
8.1667	2.8437	0.0057	196	0.0057	152	196	0.0066	2.8267	0.9185
8.2083	2.8493	0.0057	197	0.0057	154	197	0.0066	2.8333	0.9206
8.2500	2.8550	0.0056	198	0.0056	156	198	0.0065	2.8398	0.9227
8.2917	2.8606	0.0056	199	0.0056	158	199	0.0065	2.8463	0.9248
8.3333	2.8662	0.0056	200	0.0056	160	200	0.0064	2.8527	0.9269
8.3750	2.8718	0.0056	201	0.0056	162	201	0.0064	2.8591	0.9290
8.4167	2.8774	0.0056	202	0.0056	164	202	0.0063	2.8654	0.9311
8.4583	2.8829	0.0056	203	0.0056	166	203	0.0063	2.8717	0.9331
8.5000	2.8884	0.0055	204	0.0055	168	204	0.0062	2.8779	0.9351
8.5417	2.8940	0.0055	205	0.0055	170	205	0.0062	2.8841	0.9371
8.5833	2.8995	0.0055	206	0.0055	172	206	0.0061	2.8903	0.9391
8.6250	2.9049	0.0055	207	0.0055	174	207	0.0061	2.8964	0.9411
8.6667	2.9104	0.0055	208	0.0055	176	208	0.0061	2.9024	0.9431
8.7083	2.9159	0.0055	209	0.0055	178	209	0.0060	2.9084	0.9450
8.7500	2.9213	0.0054	210	0.0054	180	210	0.0060	2.9144	0.9470
8.7917	2.9267	0.0054	211	0.0054	182	211	0.0059	2.9203	0.9489
8.8333	2.9321	0.0054	212	0.0054	184	212	0.0059	2.9262	0.9508
8.8750	2.9375	0.0054	213	0.0054	186	213	0.0059	2.9321	0.9527
8.9167	2.9429	0.0054	214	0.0054	188	214	0.0058	2.9379	0.9546
8.9583	2.9483	0.0054	215	0.0054	190	215	0.0058	2.9437	0.9565
9.0000	2.9536	0.0053	216	0.0053	192	216	0.0057	2.9494	0.9584
9.0417	2.9589	0.0053	217	0.0053	194	217	0.0057	2.9551	0.9602
9.0833	2.9642	0.0053	218	0.0053	196	218	0.0057	2.9608	0.9620
9.1250	2.9695	0.0053	219	0.0053	198	219	0.0056	2.9664	0.9639
9.1667	2.9748	0.0053	220	0.0053	200	220	0.0056	2.9720	0.9657
9.2083	2.9801	0.0053	221	0.0053	202	221	0.0056	2.9776	0.9675
9.2500	2.9854	0.0053	222	0.0053	204	222	0.0055	2.9832	0.9693
9.2917	2.9906	0.0052	223	0.0052	206	223	0.0055	2.9887	0.9711
9.3333	2.9958	0.0052	224	0.0052	208	224	0.0055	2.9941	0.9729
9.3750	3.0010	0.0052	225	0.0052	210	225	0.0054	2.9996	0.9746
9.4167	3.0062	0.0052	226	0.0052	212	226	0.0054	3.0050	0.9764
9.4583	3.0114	0.0052	227	0.0052	214	227	0.0054	3.0103	0.9781
9.5000	3.0166	0.0052	228	0.0052	216	228	0.0053	3.0157	0.9799
9.5417	3.0218	0.0052	229	0.0052	218	229	0.0053	3.0210	0.9816
9.5833	3.0269	0.0051	230	0.0051	220	230	0.0053	3.0263	0.9833
9.6250	3.0320	0.0051	231	0.0051	222	231	0.0053	3.0315	0.9850
9.6667	3.0371	0.0051	232	0.0051	224	232	0.0052	3.0368	0.9867
9.7083	3.0423	0.0051	233	0.0051	226	233	0.0052	3.0420	0.9884
9.7500	3.0473	0.0051	234	0.0051	228	234	0.0052	3.0471	0.9901
9.7917	3.0524	0.0051	235	0.0051	230	235	0.0051	3.0523	0.9918

9.8333	3.0575	0.0051	236	0.0051	232	236	0.0051	3.0574	0.9934
9.8750	3.0625	0.0051	237	0.0051	234	237	0.0051	3.0625	0.9951
9.9167	3.0676	0.0050	238	0.0050	236	238	0.0051	3.0676	0.9967
9.9583	3.0726	0.0050	239	0.0050	238	239	0.0050	3.0726	0.9984
10.0000	3.0776	0.0050	240	0.0050	240	240	0.0050	3.0776	1.0000



Unit Hydrograph

Unit Storm Duration

ΔD 0.25 hr << 0.2-hr time increments are used

Time to Peak

Tp 1.25 hr << rounded to 1.0 hr

Unit Hydrograph Peak Discharge

qp 2295 cfs

Time Ratio	Discharge Ratio	Time (hr)	q (cfs)
0.0	0.000	0.000	0
0.1	0.030	0.100	69
0.2	0.100	0.200	230
0.3	0.190	0.300	436
0.4	0.310	0.400	711
0.5	0.470	0.500	1079
0.6	0.660	0.600	1515
0.7	0.820	0.700	1882
0.8	0.930	0.800	2134
0.9	0.990	0.900	2272
1.0	1.000	1.000	2295
1.1	0.990	1.100	2272
1.2	0.930	1.200	2134
1.3	0.860	1.300	1974
1.4	0.780	1.400	1790
1.5	0.680	1.500	1561
1.6	0.560	1.600	1285
1.7	0.460	1.700	1056
1.8	0.390	1.800	895

Time (hr)	q (cfs)
0	**0**
0.30	230
0.60	711
0.90	1515
1.20	2134
1.50	**2295**
1.80	2134
2.10	1790
2.40	1285
2.70	895
3.00	**643**
3.30	475
3.60	337
3.90	246
4.20	177
4.50	**126**
4.80	92
5.10	67
5.40	48

1.9	0.330	1.900	757
2.0	0.280	2.000	643
2.2	0.207	2.200	475
2.4	0.147	2.400	337
2.6	0.107	2.600	246
2.8	0.077	2.800	177
3.0	0.055	3.000	126
3.2	0.040	3.200	92
3.4	0.029	3.400	67
3.6	0.021	3.600	48
3.8	0.015	3.800	34
4.0	0.011	4.000	25
4.5	0.005	4.500	11
5.0	0.000	5.000	0

5.70	34
6.00	**25**
6.30	19
6.60	14
6.90	9
7.20	5
7.50	**0**
7.80	0
8.10	0
8.40	0
8.70	0
9.00	**0**
9.30	0
9.60	0

Sum	4592 cfs-h

Check

Unit Hydrograph (per 1 in. Unit Runoff) 3060.2 cfs-h

Variance -50.05%

Principal Spillway Hydrograph

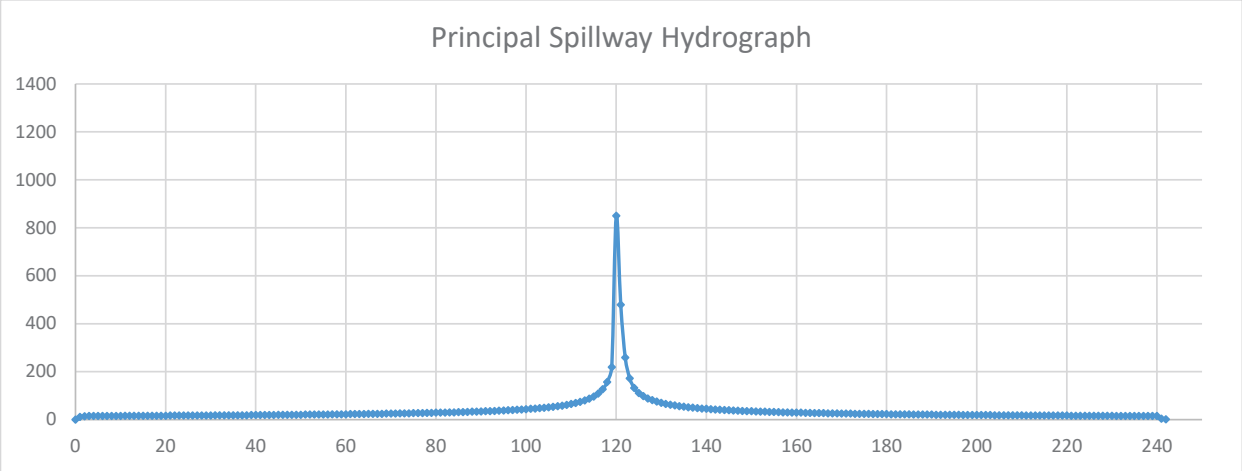
Time (hrs)	Inc. Volumes Rearranged	q (cfs)	Composite PSH (cfs)
0.0	0.0000	0	0
1.0	0.0050	2186	11
2.0	0.0051	612	14
3.0	0.0051	120	15
4.0	0.0051	24	15
5.0	0.0051	0	15
6.0	0.0052		15
7.0	0.0052		15
8.0	0.0052		15
9.0	0.0052		15
10.0	0.0053		15
11.0	0.0053		16
12.0	0.0053		16
13.0	0.0054		16
14.0	0.0054		16
15.0	0.0054		16
16.0	0.0055		16
17.0	0.0055		16
18.0	0.0055		16
19.0	0.0056		16
20.0	0.0056		16
21.0	0.0056		17
22.0	0.0057		17
23.0	0.0057		17
24.0	0.0057		17
25.0	0.0058		17
26.0	0.0058		17
27.0	0.0058		17
28.0	0.0059		17
29.0	0.0059		17

30.0	0.0060		17
31.0	0.0060		18
32.0	0.0060		18
33.0	0.0061		18
34.0	0.0061		18
35.0	0.0062		18
36.0	0.0062		18
37.0	0.0063		18
38.0	0.0063		18
39.0	0.0063		19
40.0	0.0064		19
41.0	0.0064		19
42.0	0.0065		19
43.0	0.0065		19
44.0	0.0066		19
45.0	0.0067		20
46.0	0.0067		20
47.0	0.0068		20
48.0	0.0068		20
49.0	0.0069		20
50.0	0.0069		20
51.0	0.0070		21
52.0	0.0071		21
53.0	0.0071		21
54.0	0.0072		21
55.0	0.0073		21
56.0	0.0073		21
57.0	0.0074		22
58.0	0.0075		22
59.0	0.0075		22
60.0	0.0076		22
61.0	0.0077		23
62.0	0.0078		23
63.0	0.0079		23
64.0	0.0079		23
65.0	0.0080		24
66.0	0.0081		24
67.0	0.0082		24
68.0	0.0083		24
69.0	0.0084		25
70.0	0.0085		25
71.0	0.0086		25
72.0	0.0087		26
73.0	0.0088		26
74.0	0.0090		26
75.0	0.0091		27
76.0	0.0092		27
77.0	0.0093		27
78.0	0.0095		28
79.0	0.0096		28
80.0	0.0097		29
81.0	0.0099		29
82.0	0.0101		29
83.0	0.0102		30
84.0	0.0104		30

85.0	0.0106		31
86.0	0.0108		31
87.0	0.0109		32
88.0	0.0112		33
89.0	0.0114		33
90.0	0.0116		34
91.0	0.0118		35
92.0	0.0121		35
93.0	0.0124		36
94.0	0.0126		37
95.0	0.0129		38
96.0	0.0133		39
97.0	0.0136		40
98.0	0.0140		41
99.0	0.0144		42
100.0	0.0148		43
101.0	0.0153		45
102.0	0.0158		46
103.0	0.0163		48
104.0	0.0169		49
105.0	0.0176		51
106.0	0.0183		53
107.0	0.0192		56
108.0	0.0201		58
109.0	0.0212		61
110.0	0.0224		65
111.0	0.0239		69
112.0	0.0256		74
113.0	0.0277		80
114.0	0.0303		87
115.0	0.0337		96
116.0	0.0384		109
117.0	0.0452		127
118.0	0.0567		157
119.0	0.0814		219
120.0	0.3624		850
121.0	0.1126		479
122.0	0.0661		259
123.0	0.0501		172
124.0	0.0414		132
125.0	0.0359		111
126.0	0.0319		98
127.0	0.0289		88
128.0	0.0266		81
129.0	0.0247		75
130.0	0.0231		70
131.0	0.0218		65
132.0	0.0206		62
133.0	0.0196		59
134.0	0.0188		56
135.0	0.0180		54
136.0	0.0173		51
137.0	0.0166		50
138.0	0.0160		48
139.0	0.0155		46

140.0	0.0150		45
141.0	0.0146		43
142.0	0.0142		42
143.0	0.0138		41
144.0	0.0134		40
145.0	0.0131		39
146.0	0.0128		38
147.0	0.0125		37
148.0	0.0122		36
149.0	0.0120		35
150.0	0.0117		35
151.0	0.0115		34
152.0	0.0113		33
153.0	0.0110		33
154.0	0.0108		32
155.0	0.0107		32
156.0	0.0105		31
157.0	0.0103		30
158.0	0.0101		30
159.0	0.0100		29
160.0	0.0098		29
161.0	0.0097		29
162.0	0.0095		28
163.0	0.0094		28
164.0	0.0093		27
165.0	0.0091		27
166.0	0.0090		27
167.0	0.0089		26
168.0	0.0088		26
169.0	0.0087		26
170.0	0.0086		25
171.0	0.0085		25
172.0	0.0084		25
173.0	0.0083		24
174.0	0.0082		24
175.0	0.0081		24
176.0	0.0080		24
177.0	0.0079		23
178.0	0.0078		23
179.0	0.0077		23
180.0	0.0077		23
181.0	0.0076		22
182.0	0.0075		22
183.0	0.0074		22
184.0	0.0074		22
185.0	0.0073		22
186.0	0.0072		21
187.0	0.0072		21
188.0	0.0071		21
189.0	0.0070		21
190.0	0.0070		21
191.0	0.0069		20
192.0	0.0068		20
193.0	0.0068		20
194.0	0.0067		20

195.0	0.0067		20
196.0	0.0066		20
197.0	0.0066		19
198.0	0.0065		19
199.0	0.0065		19
200.0	0.0064		19
201.0	0.0064		19
202.0	0.0063		19
203.0	0.0063		19
204.0	0.0062		18
205.0	0.0062		18
206.0	0.0061		18
207.0	0.0061		18
208.0	0.0061		18
209.0	0.0060		18
210.0	0.0060		18
211.0	0.0059		17
212.0	0.0059		17
213.0	0.0059		17
214.0	0.0058		17
215.0	0.0058		17
216.0	0.0057		17
217.0	0.0057		17
218.0	0.0057		17
219.0	0.0056		17
220.0	0.0056		17
221.0	0.0056		16
222.0	0.0055		16
223.0	0.0055		16
224.0	0.0055		16
225.0	0.0054		16
226.0	0.0054		16
227.0	0.0054		16
228.0	0.0053		16
229.0	0.0053		16
230.0	0.0053		16
231.0	0.0053		15
232.0	0.0052		15
233.0	0.0052		15
234.0	0.0052		15
235.0	0.0051		15
236.0	0.0051		15
237.0	0.0051		15
238.0	0.0051		15
239.0	0.0050		15
240.0	0.0050		15
241.0	0.0000		4
242.0	0.0000		1



Results

Peak Hydrograph Flow	850	cfs
Total Volume	749	ac-ft

ASH-L Hydrograph

Characteristics

Drainage Area	4.742	sq mi
Time of Concentration	1.58	hr
Curve Number	77.8	
Structure Hazard Classification	High	
Initial Abstraction	0.57	in
Maximum Potential Retention	2.85	in
Precipitation	4.03	in
ΔD	0.05	hr

5-Point Rainfall Distribution

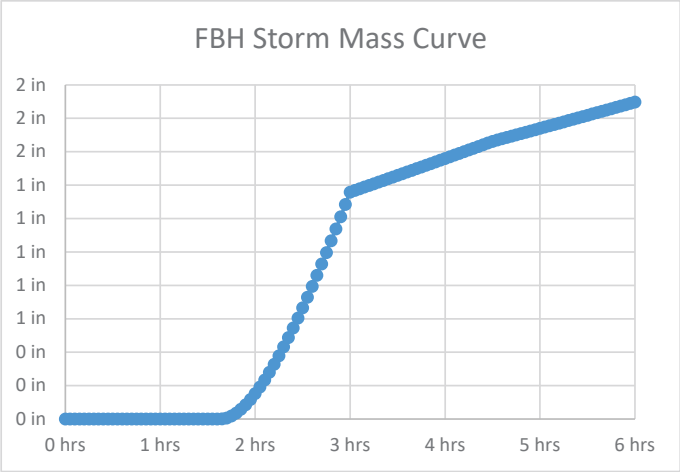
Time Increment	Incremental Rainfall	Rainfall Fractions for Each Time Increment		5 Point Rainfall Distribution	
0 to 1.5	0.299 in	0.074		0.074	
1.5 to 3	3.032 in	0.752		0.827	
2 to 4.5	0.400 in	0.099		0.926	
4.5 to 6	0.299 in	0.074		1.000	

Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution
0.00	0.000	1.50	0.074	3.00	0.827	4.50	0.926
0.05	0.002	1.55	0.099	3.05	0.830	4.55	0.928
0.10	0.005	1.60	0.124	3.10	0.833	4.60	0.931
0.15	0.007	1.65	0.149	3.15	0.836	4.65	0.933
0.20	0.010	1.70	0.175	3.20	0.840	4.70	0.936
0.25	0.012	1.75	0.200	3.25	0.843	4.75	0.938
0.30	0.015	1.80	0.225	3.30	0.846	4.80	0.941
0.35	0.017	1.85	0.250	3.35	0.850	4.85	0.943
0.40	0.020	1.90	0.275	3.40	0.853	4.90	0.946
0.45	0.022	1.95	0.300	3.45	0.856	4.95	0.948
0.50	0.025	2.00	0.325	3.50	0.860	5.00	0.951
0.55	0.027	2.05	0.350	3.55	0.863	5.05	0.953
0.60	0.030	2.10	0.375	3.60	0.866	5.10	0.955
0.65	0.032	2.15	0.400	3.65	0.870	5.15	0.958
0.70	0.035	2.20	0.425	3.70	0.873	5.20	0.960
0.75	0.037	2.25	0.450	3.75	0.876	5.25	0.963
0.80	0.040	2.30	0.475	3.80	0.879	5.30	0.965
0.85	0.042	2.35	0.501	3.85	0.883	5.35	0.968
0.90	0.045	2.40	0.526	3.90	0.886	5.40	0.970
0.95	0.047	2.45	0.551	3.95	0.889	5.45	0.973
1.00	0.049	2.50	0.576	4.00	0.893	5.50	0.975
1.05	0.052	2.55	0.601	4.05	0.896	5.55	0.978
1.10	0.054	2.60	0.626	4.10	0.899	5.60	0.980
1.15	0.057	2.65	0.651	4.15	0.903	5.65	0.983
1.20	0.059	2.70	0.676	4.20	0.906	5.70	0.985
1.25	0.062	2.75	0.701	4.25	0.909	5.75	0.988
1.30	0.064	2.80	0.726	4.30	0.913	5.80	0.990
1.35	0.067	2.85	0.751	4.35	0.916	5.85	0.993
1.40	0.069	2.90	0.776	4.40	0.919	5.90	0.995
1.45	0.072	2.95	0.801	4.45	0.922	5.95	0.998
						6.00	1.000

Time (hr)	Rainfall Distribution	Total Rainfall (in)	Acc. Mass Curve of Runoff (in)	Inc. Mass Curve of Runoff (in)
0.00	0.000	0.000	0.000	0.000
0.05	0.002	0.010	0.000	0.000
0.10	0.005	0.020	0.000	0.000
0.15	0.007	0.030	0.000	0.000
0.20	0.010	0.040	0.000	0.000
0.25	0.012	0.050	0.000	0.000
0.30	0.015	0.060	0.000	0.000
0.35	0.017	0.070	0.000	0.000
0.40	0.020	0.080	0.000	0.000
0.45	0.022	0.090	0.000	0.000
0.50	0.025	0.100	0.000	0.000
0.55	0.027	0.110	0.000	0.000
0.60	0.030	0.120	0.000	0.000
0.65	0.032	0.130	0.000	0.000
0.70	0.035	0.140	0.000	0.000
0.75	0.037	0.150	0.000	0.000
0.80	0.040	0.159	0.000	0.000
0.85	0.042	0.169	0.000	0.000
0.90	0.045	0.179	0.000	0.000
0.95	0.047	0.189	0.000	0.000
1.00	0.049	0.199	0.000	0.000
1.05	0.052	0.209	0.000	0.000
1.10	0.054	0.219	0.000	0.000
1.15	0.057	0.229	0.000	0.000
1.20	0.059	0.239	0.000	0.000
1.25	0.062	0.249	0.000	0.000
1.30	0.064	0.259	0.000	0.000
1.35	0.067	0.269	0.000	0.000
1.40	0.069	0.279	0.000	0.000
1.45	0.072	0.289	0.000	0.000
1.50	0.074	0.299	0.000	0.000
1.55	0.099	0.400	0.000	0.000
1.60	0.124	0.501	0.000	0.000
1.65	0.149	0.602	0.000	0.000
1.70	0.175	0.703	0.006	0.006
1.75	0.200	0.804	0.018	0.012
1.80	0.225	0.905	0.035	0.018
1.85	0.250	1.006	0.058	0.023
1.90	0.275	1.108	0.085	0.027
1.95	0.300	1.209	0.117	0.032
2.00	0.325	1.310	0.152	0.036
2.05	0.350	1.411	0.192	0.039
2.10	0.375	1.512	0.234	0.042
2.15	0.400	1.613	0.279	0.045
2.20	0.425	1.714	0.328	0.048
2.25	0.450	1.815	0.379	0.051
2.30	0.475	1.916	0.432	0.053
2.35	0.501	2.017	0.487	0.056

2.40	0.526	2.118	0.545	0.058
2.45	0.551	2.219	0.605	0.060
2.50	0.576	2.320	0.666	0.061
2.55	0.601	2.421	0.729	0.063
2.60	0.626	2.522	0.794	0.065
2.65	0.651	2.624	0.860	0.066
2.70	0.676	2.725	0.928	0.068
2.75	0.701	2.826	0.997	0.069
2.80	0.726	2.927	1.067	0.070
2.85	0.751	3.028	1.138	0.071
2.90	0.776	3.129	1.211	0.072
2.95	0.801	3.230	1.284	0.074
3.00	0.827	3.331	1.359	0.075
3.05	0.830	3.344	1.369	0.010
3.10	0.833	3.358	1.378	0.010
3.15	0.836	3.371	1.388	0.010
3.20	0.840	3.384	1.398	0.010
3.25	0.843	3.398	1.408	0.010
3.30	0.846	3.411	1.418	0.010
3.35	0.850	3.424	1.428	0.010
3.40	0.853	3.438	1.438	0.010
3.45	0.856	3.451	1.448	0.010
3.50	0.860	3.464	1.458	0.010
3.55	0.863	3.478	1.468	0.010
3.60	0.866	3.491	1.478	0.010
3.65	0.870	3.504	1.489	0.010
3.70	0.873	3.518	1.499	0.010
3.75	0.876	3.531	1.509	0.010
3.80	0.879	3.544	1.519	0.010
3.85	0.883	3.558	1.529	0.010
3.90	0.886	3.571	1.539	0.010
3.95	0.889	3.584	1.549	0.010
4.00	0.893	3.598	1.560	0.010
4.05	0.896	3.611	1.570	0.010
4.10	0.899	3.624	1.580	0.010
4.15	0.903	3.638	1.590	0.010
4.20	0.906	3.651	1.600	0.010
4.25	0.909	3.664	1.611	0.010
4.30	0.913	3.678	1.621	0.010
4.35	0.916	3.691	1.631	0.010
4.40	0.919	3.704	1.642	0.010
4.45	0.922	3.718	1.652	0.010
4.50	0.926	3.731	1.662	0.010
4.55	0.928	3.741	1.670	0.008
4.60	0.931	3.751	1.678	0.008
4.65	0.933	3.761	1.685	0.008
4.70	0.936	3.771	1.693	0.008
4.75	0.938	3.781	1.701	0.008
4.80	0.941	3.791	1.709	0.008
4.85	0.943	3.801	1.717	0.008
4.90	0.946	3.811	1.724	0.008
4.95	0.948	3.821	1.732	0.008
5.00	0.951	3.831	1.740	0.008
5.05	0.953	3.841	1.748	0.008
5.10	0.955	3.851	1.756	0.008

5.15	0.958	3.861	1.763	0.008
5.20	0.960	3.871	1.771	0.008
5.25	0.963	3.881	1.779	0.008
5.30	0.965	3.890	1.787	0.008
5.35	0.968	3.900	1.795	0.008
5.40	0.970	3.910	1.803	0.008
5.45	0.973	3.920	1.810	0.008
5.50	0.975	3.930	1.818	0.008
5.55	0.978	3.940	1.826	0.008
5.60	0.980	3.950	1.834	0.008
5.65	0.983	3.960	1.842	0.008
5.70	0.985	3.970	1.850	0.008
5.75	0.988	3.980	1.858	0.008
5.80	0.990	3.990	1.866	0.008
5.85	0.993	4.000	1.873	0.008
5.90	0.995	4.010	1.881	0.008
5.95	0.998	4.020	1.889	0.008
6.00	1.000	4.030	1.897	0.008



Unit Hydrograph

Unit Storm Duration

ΔD 0.05

Time to Peak

Tp 0.99 << rounded to 1.0 hr

Unit Hydrograph Peak Discharge

qp 2295

Time Ratio	Discharge Ratio	Time (hr)	q (cfs)
0.0	0.000	0.000	0
0.1	0.030	0.100	69
0.2	0.100	0.200	230
0.3	0.190	0.300	436
0.4	0.310	0.400	711
0.5	0.470	0.500	1079
0.6	0.660	0.600	1515

Time (hr)	q (cfs)
0	**0**
0.05	230
0.10	711
0.15	1515
0.20	2134
0.25	**2295**
0.30	2134

0.7	0.820	0.700	1882
0.8	0.930	0.800	2134
0.9	0.990	0.900	2272
1.0	1.000	1.000	2295
1.1	0.990	1.100	2272
1.2	0.930	1.200	2134
1.3	0.860	1.300	1974
1.4	0.780	1.400	1790
1.5	0.680	1.500	1561
1.6	0.560	1.600	1285
1.7	0.460	1.700	1056
1.8	0.390	1.800	895
1.9	0.330	1.900	757
2.0	0.280	2.000	643
2.2	0.207	2.200	475
2.4	0.147	2.400	337
2.6	0.107	2.600	246
2.8	0.077	2.800	177
3.0	0.055	3.000	126
3.2	0.040	3.200	92
3.4	0.029	3.400	67
3.6	0.021	3.600	48
3.8	0.015	3.800	34
4.0	0.011	4.000	25
4.5	0.005	4.500	11
5.0	0.000	5.000	0

0.35	1790
0.40	1285
0.45	895
0.50	**643**
0.55	475
0.60	337
0.65	246
0.70	177
0.75	**126**
0.80	92
0.85	67
0.90	48
0.95	34
1.00	**25**
1.05	19
1.10	14
1.15	9
1.20	5
1.25	**0**
1.30	0
1.35	0
1.40	0
1.45	0
1.50	**0**
1.55	0
1.60	0

Sum	1531 cfs-h

Check

Unit Hydrograph (per 1 in. Unit Runoff)	3060.2
Variance	49.98%

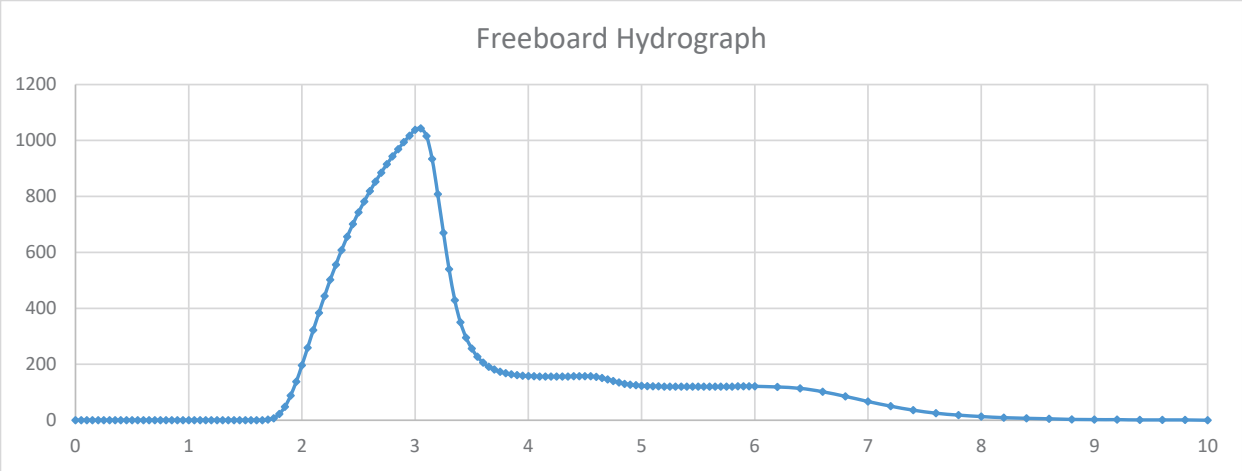
Freeboard Hydrograph

Time (hrs)	Inc. Runoff	q (cfs)	Composite FBH (cfs)
0.0	0.0000	0	0
0.1	0.0000	230	0
0.1	0.0000	711	0
0.2	0.0000	1515	0
0.2	0.0000	2134	0
0.3	0.0000	2295	0
0.3	0.0000	2134	0
0.4	0.0000	1790	0
0.4	0.0000	1285	0
0.5	0.0000	895	0
0.5	0.0000	643	0
0.6	0.0000	475	0
0.6	0.0000	337	0

0.7	0.0000	246	0
0.7	0.0000	177	0
0.8	0.0000	126	0
0.8	0.0000	92	0
0.9	0.0000	67	0
0.9	0.0000	48	0
1.0	0.0000	34	0
1.0	0.0000	25	0
1.1	0.0000	19	0
1.1	0.0000	14	0
1.2	0.0000	9	0
1.2	0.0000	5	0
1.3	0.0000	0	0
1.3	0.0000		0
1.4	0.0000		0
1.4	0.0000		0
1.5	0.0000		0
1.5	0.0000		0
1.6	0.0000		0
1.6	0.0000		0
1.7	0.0004		0
1.7	0.0056		2
1.8	0.0119		7
1.8	0.0175		22
1.9	0.0227		48
1.9	0.0273		88
2.0	0.0316		138
2.0	0.0355		196
2.1	0.0391		259
2.1	0.0424		322
2.2	0.0455		384
2.2	0.0483		444
2.3	0.0509		502
2.3	0.0533		556
2.4	0.0555		608
2.4	0.0576		656
2.5	0.0596		701
2.5	0.0614		743
2.6	0.0631		782
2.6	0.0647		819
2.7	0.0662		853
2.7	0.0676		885
2.8	0.0689		915
2.8	0.0702		943
2.9	0.0714		969
2.9	0.0725		994
3.0	0.0735		1017
3.0	0.0745		1038
3.1	0.0099		1043
3.1	0.0099		1016
3.2	0.0099		934
3.2	0.0099		808
3.3	0.0100		670
3.3	0.0100		540
3.4	0.0100		429

3.4	0.0100		350
3.5	0.0100		295
3.5	0.0100		256
3.6	0.0101		227
3.6	0.0101		206
3.7	0.0101		191
3.7	0.0101		181
3.7	0.0101		173
3.8	0.0101		168
3.8	0.0101		164
3.9	0.0102		161
3.9	0.0102		159
4.0	0.0102		158
4.0	0.0102		157
4.1	0.0102		156
4.1	0.0102		156
4.2	0.0102		156
4.2	0.0103		156
4.3	0.0103		156
4.3	0.0103		156
4.4	0.0103		157
4.4	0.0103		157
4.5	0.0103		157
4.5	0.0077		157
4.6	0.0077		155
4.6	0.0077		151
4.7	0.0078		146
4.7	0.0078		140
4.8	0.0078		135
4.8	0.0078		130
4.9	0.0078		127
4.9	0.0078		125
5.0	0.0078		123
5.0	0.0078		122
5.1	0.0078		121
5.1	0.0078		121
5.2	0.0078		120
5.2	0.0078		120
5.3	0.0078		120
5.3	0.0078		120
5.4	0.0079		120
5.4	0.0079		120
5.5	0.0079		120
5.5	0.0079		120
5.6	0.0079		120
5.6	0.0079		120
5.7	0.0079		120
5.7	0.0079		120
5.8	0.0079		120
5.8	0.0079		121
5.9	0.0079		121
5.9	0.0079		121
6.0	0.0079		121
6.2			119
6.4			114

6.6			102
6.8			85
7.0			67
7.2			50
7.4			36
7.6			25
7.8			18
8.0			13
8.2			9
8.4			7
8.6			5
8.8			3
9.0			2
9.2			2
9.4			1
9.6			1
9.8			1
10.0			0
10.2			0
10.4			0



Results

Peak Hydrograph Flow	1043	cfs
Total Volume	480	ac-ft

ASH-G Hydrograph

Characteristics

Drainage Area	4.742	sq mi	
Time of Concentration	1.58	hr	
Curve Number	77.8		
Structure Hazard Classification	High		
Initial Abstraction	0.57	in	
Maximum Potential Retention	2.85	in	
Precipitation	5.85	in	
ΔD	0.21	hr	<< 0.2-hr time increments are used

5-Point Rainfall Distribution

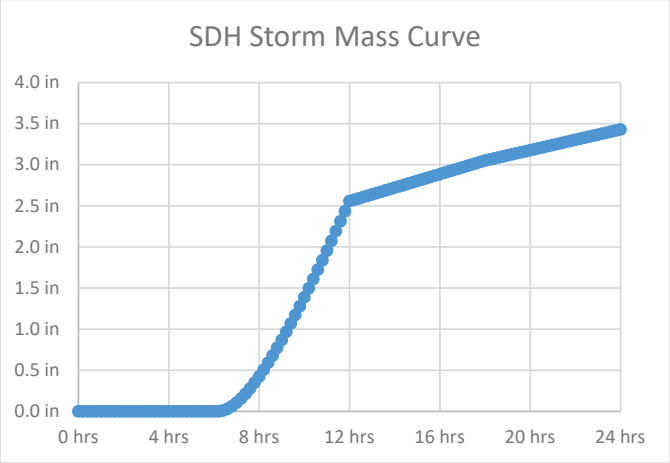
Time Increment	Incremental Rainfall		Rainfall Fractions for Each Time Increment		5 Point Rainfall Distribution	
0 to 6	0.436	in	0.075		0.075	
6 to 12	4.399	in	0.752		0.826	
12 to 18	0.580	in	0.099		0.926	
18 to 24	0.435	in	0.074		1.000	

Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution
0.00	0.000	6.00	0.075	12.00	0.826	18.00	0.926
0.20	0.002	6.20	0.100	12.20	0.830	18.20	0.928
0.40	0.005	6.40	0.125	12.40	0.833	18.40	0.931
0.60	0.007	6.60	0.150	12.60	0.836	18.60	0.933
0.80	0.010	6.80	0.175	12.80	0.840	18.80	0.936
1.00	0.012	7.00	0.200	13.00	0.843	19.00	0.938
1.20	0.015	7.20	0.225	13.20	0.846	19.20	0.941
1.40	0.017	7.40	0.250	13.40	0.850	19.40	0.943
1.60	0.020	7.60	0.275	13.60	0.853	19.60	0.945
1.80	0.022	7.80	0.300	13.80	0.856	19.80	0.948
2.00	0.025	8.00	0.325	14.00	0.860	20.00	0.950
2.20	0.027	8.20	0.350	14.20	0.863	20.20	0.953
2.40	0.030	8.40	0.375	14.40	0.866	20.40	0.955
2.60	0.032	8.60	0.400	14.60	0.869	20.60	0.958
2.80	0.035	8.80	0.425	14.80	0.873	20.80	0.960
3.00	0.037	9.00	0.451	15.00	0.876	21.00	0.963
3.20	0.040	9.20	0.476	15.20	0.879	21.20	0.965
3.40	0.042	9.40	0.501	15.40	0.883	21.40	0.968
3.60	0.045	9.60	0.526	15.60	0.886	21.60	0.970
3.80	0.047	9.80	0.551	15.80	0.889	21.80	0.973
4.00	0.050	10.00	0.576	16.00	0.893	22.00	0.975
4.20	0.052	10.20	0.601	16.20	0.896	22.20	0.978
4.40	0.055	10.40	0.626	16.40	0.899	22.40	0.980
4.60	0.057	10.60	0.651	16.60	0.903	22.60	0.983
4.80	0.060	10.80	0.676	16.80	0.906	22.80	0.985
5.00	0.062	11.00	0.701	17.00	0.909	23.00	0.988
5.20	0.065	11.20	0.726	17.20	0.912	23.20	0.990
5.40	0.067	11.40	0.751	17.40	0.916	23.40	0.993
5.60	0.070	11.60	0.776	17.60	0.919	23.60	0.995
5.80	0.072	11.80	0.801	17.80	0.922	23.80	0.998
						24.00	1.000

Time (hr)	Rainfall Distribution	Total Rainfall (in)	Acc. Mass Curve of Runoff (in)	Inc. Mass Curve of Runoff (in)
0.00	0.000	0.000	0.000	0.000
0.20	0.002	0.015	0.000	0.000
0.40	0.005	0.029	0.000	0.000
0.60	0.007	0.044	0.000	0.000
0.80	0.010	0.058	0.000	0.000
1.00	0.012	0.073	0.000	0.000
1.20	0.015	0.087	0.000	0.000
1.40	0.017	0.102	0.000	0.000
1.60	0.020	0.116	0.000	0.000
1.80	0.022	0.131	0.000	0.000
2.00	0.025	0.145	0.000	0.000
2.20	0.027	0.160	0.000	0.000
2.40	0.030	0.174	0.000	0.000
2.60	0.032	0.189	0.000	0.000
2.80	0.035	0.203	0.000	0.000
3.00	0.037	0.218	0.000	0.000
3.20	0.040	0.233	0.000	0.000
3.40	0.042	0.247	0.000	0.000
3.60	0.045	0.262	0.000	0.000
3.80	0.047	0.276	0.000	0.000
4.00	0.050	0.291	0.000	0.000
4.20	0.052	0.305	0.000	0.000
4.40	0.055	0.320	0.000	0.000
4.60	0.057	0.334	0.000	0.000
4.80	0.060	0.349	0.000	0.000
5.00	0.062	0.363	0.000	0.000
5.20	0.065	0.378	0.000	0.000
5.40	0.067	0.392	0.000	0.000
5.60	0.070	0.407	0.000	0.000
5.80	0.072	0.421	0.000	0.000
6.00	0.075	0.436	0.000	0.000
6.20	0.100	0.583	0.000	0.000
6.40	0.125	0.729	0.008	0.008
6.60	0.150	0.876	0.030	0.021
6.80	0.175	1.023	0.062	0.032
7.00	0.200	1.169	0.104	0.042
7.20	0.225	1.316	0.155	0.051
7.40	0.250	1.462	0.213	0.058
7.60	0.275	1.609	0.278	0.065
7.80	0.300	1.756	0.348	0.071
8.00	0.325	1.902	0.424	0.076
8.20	0.350	2.049	0.505	0.081
8.40	0.375	2.196	0.590	0.085
8.60	0.400	2.342	0.680	0.089
8.80	0.425	2.489	0.772	0.093
9.00	0.451	2.636	0.868	0.096
9.20	0.476	2.782	0.967	0.099
9.40	0.501	2.929	1.068	0.101
9.60	0.526	3.075	1.172	0.104
9.80	0.551	3.222	1.278	0.106
10.00	0.576	3.369	1.387	0.108

10.20	0.601	3.515	1.497	0.110
10.40	0.626	3.662	1.609	0.112
10.60	0.651	3.809	1.723	0.114
10.80	0.676	3.955	1.838	0.115
11.00	0.701	4.102	1.955	0.117
11.20	0.726	4.248	2.073	0.118
11.40	0.751	4.395	2.192	0.119
11.60	0.776	4.542	2.312	0.120
11.80	0.801	4.688	2.434	0.122
12.00	0.826	4.835	2.557	0.123
12.20	0.830	4.854	2.573	0.016
12.40	0.833	4.874	2.589	0.016
12.60	0.836	4.893	2.605	0.016
12.80	0.840	4.912	2.622	0.016
13.00	0.843	4.932	2.638	0.016
13.20	0.846	4.951	2.654	0.016
13.40	0.850	4.970	2.671	0.016
13.60	0.853	4.990	2.687	0.016
13.80	0.856	5.009	2.703	0.016
14.00	0.860	5.028	2.720	0.016
14.20	0.863	5.048	2.736	0.016
14.40	0.866	5.067	2.753	0.016
14.60	0.869	5.086	2.769	0.016
14.80	0.873	5.106	2.785	0.016
15.00	0.876	5.125	2.802	0.016
15.20	0.879	5.144	2.818	0.016
15.40	0.883	5.164	2.835	0.016
15.60	0.886	5.183	2.851	0.017
15.80	0.889	5.202	2.868	0.017
16.00	0.893	5.222	2.884	0.017
16.20	0.896	5.241	2.901	0.017
16.40	0.899	5.260	2.918	0.017
16.60	0.903	5.280	2.934	0.017
16.80	0.906	5.299	2.951	0.017
17.00	0.909	5.318	2.967	0.017
17.20	0.912	5.338	2.984	0.017
17.40	0.916	5.357	3.001	0.017
17.60	0.919	5.376	3.017	0.017
17.80	0.922	5.396	3.034	0.017
18.00	0.926	5.415	3.051	0.017
18.20	0.928	5.430	3.063	0.013
18.40	0.931	5.444	3.076	0.013
18.60	0.933	5.459	3.088	0.013
18.80	0.936	5.473	3.101	0.013
19.00	0.938	5.488	3.113	0.013
19.20	0.941	5.502	3.126	0.013
19.40	0.943	5.517	3.138	0.013
19.60	0.945	5.531	3.151	0.013
19.80	0.948	5.546	3.163	0.013
20.00	0.950	5.560	3.176	0.013
20.20	0.953	5.575	3.189	0.013
20.40	0.955	5.589	3.201	0.013
20.60	0.958	5.604	3.214	0.013
20.80	0.960	5.618	3.226	0.013
21.00	0.963	5.633	3.239	0.013
21.20	0.965	5.647	3.252	0.013

21.40	0.968	5.662	3.264	0.013
21.60	0.970	5.676	3.277	0.013
21.80	0.973	5.691	3.290	0.013
22.00	0.975	5.705	3.302	0.013
22.20	0.978	5.720	3.315	0.013
22.40	0.980	5.734	3.328	0.013
22.60	0.983	5.749	3.340	0.013
22.80	0.985	5.763	3.353	0.013
23.00	0.988	5.778	3.366	0.013
23.20	0.990	5.792	3.378	0.013
23.40	0.993	5.807	3.391	0.013
23.60	0.995	5.821	3.404	0.013
23.80	0.998	5.836	3.416	0.013
24.00	1.000	5.850	3.429	0.013



Unit Hydrograph

Unit Storm Duration

ΔD 0.21 << 0.2-hr time increments are used

Time to Peak

Tp 1.05 << rounded to 1.0 hr

Unit Hydrograph Peak Discharge

qp 2295

Time Ratio	Discharge Ratio	Time (hr)	q (cfs)
0.0	0.000	0.000	0
0.1	0.030	0.100	69
0.2	0.100	0.200	230
0.3	0.190	0.300	436
0.4	0.310	0.400	711
0.5	0.470	0.500	1079
0.6	0.660	0.600	1515
0.7	0.820	0.700	1882
0.8	0.930	0.800	2134
0.9	0.990	0.900	2272
1.0	1.000	1.000	2295
1.1	0.990	1.100	2272

Time (hr)	q (cfs)
0	**0**
0.20	230
0.40	711
0.60	1515
0.80	2134
1.00	**2295**
1.20	2134
1.40	1790
1.60	1285
1.80	895
2.00	**643**
2.20	475

1.2	0.930	1.200	2134
1.3	0.860	1.300	1974
1.4	0.780	1.400	1790
1.5	0.680	1.500	1561
1.6	0.560	1.600	1285
1.7	0.460	1.700	1056
1.8	0.390	1.800	895
1.9	0.330	1.900	757
2.0	0.280	2.000	643
2.2	0.207	2.200	475
2.4	0.147	2.400	337
2.6	0.107	2.600	246
2.8	0.077	2.800	177
3.0	0.055	3.000	126
3.2	0.040	3.200	92
3.4	0.029	3.400	67
3.6	0.021	3.600	48
3.8	0.015	3.800	34
4.0	0.011	4.000	25
4.5	0.005	4.500	11
5.0	0.000	5.000	0

2.40	337
2.60	246
2.80	177
3.00	**126**
3.20	92
3.40	67
3.60	48
3.80	34
4.00	**25**
4.20	19
4.40	14
4.60	9
4.80	5
5.00	**0**
5.20	0
5.40	0
5.60	0
5.80	0
6.00	**0**
6.20	0
6.40	0

Sum	3061 cfs-h

Check

Unit Hydrograph (per 1 in. Unit Runoff)	3060.2
Variance	-0.04%

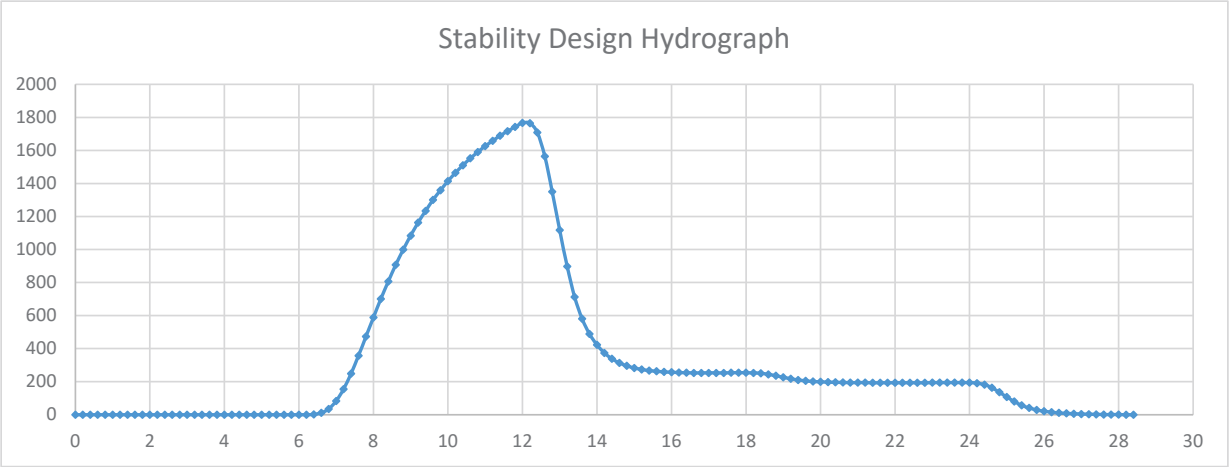
Stability Design Hydrograph

Time (hrs)	Inc. Runoff	q (cfs)	Composite SDH (cfs)
0.0	0.0000	0	0
0.2	0.0000	230	0
0.4	0.0000	711	0
0.6	0.0000	1515	0
0.8	0.0000	2134	0
1.0	0.0000	2295	0
1.2	0.0000	2134	0
1.4	0.0000	1790	0
1.6	0.0000	1285	0
1.8	0.0000	895	0
2.0	0.0000	643	0
2.2	0.0000	475	0
2.4	0.0000	337	0
2.6	0.0000	246	0
2.8	0.0000	177	0
3.0	0.0000	126	0
3.2	0.0000	92	0
3.4	0.0000	67	0
3.6	0.0000	48	0
3.8	0.0000	34	0
4.0	0.0000	25	0
4.2	0.0000	19	0
4.4	0.0000	14	0
4.6	0.0000	9	0

4.8	0.0000	5	0
5.0	0.0000	0	0
5.2	0.0000		0
5.4	0.0000		0
5.6	0.0000		0
5.8	0.0000		0
6.0	0.0000		0
6.2	0.0001		0
6.4	0.0084		2
6.6	0.0212		11
6.8	0.0324		35
7.0	0.0421		83
7.2	0.0506		155
7.4	0.0581		249
7.6	0.0648		357
7.8	0.0707		473
8.0	0.0761		589
8.2	0.0808		701
8.4	0.0852		807
8.6	0.0891		907
8.8	0.0926		999
9.0	0.0958		1084
9.2	0.0988		1163
9.4	0.1015		1234
9.6	0.1039		1300
9.8	0.1062		1359
10.0	0.1083		1414
10.2	0.1103		1464
10.4	0.1120		1510
10.6	0.1137		1552
10.8	0.1153		1590
11.0	0.1167		1626
11.2	0.1180		1658
11.4	0.1193		1689
11.6	0.1205		1716
11.8	0.1216		1742
12.0	0.1226		1766
12.2	0.0162		1764
12.4	0.0163		1708
12.6	0.0163		1564
12.8	0.0163		1350
13.0	0.0163		1117
13.2	0.0163		898
13.4	0.0163		713
13.6	0.0164		581
13.8	0.0164		489
14.0	0.0164		423
14.2	0.0164		374
14.4	0.0164		339
14.6	0.0164		314
14.8	0.0164		296
15.0	0.0165		283
15.2	0.0165		274
15.4	0.0165		267
15.6	0.0165		263
15.8	0.0165		259

16.0	0.0165		257
16.2	0.0166		255
16.4	0.0166		254
16.6	0.0166		253
16.8	0.0166		253
17.0	0.0166		253
17.2	0.0166		253
17.4	0.0166		253
17.6	0.0166		254
17.8	0.0167		254
18.0	0.0167		254
18.2	0.0125		253
18.4	0.0125		251
18.6	0.0125		244
18.8	0.0125		236
19.0	0.0125		226
19.2	0.0126		218
19.4	0.0126		210
19.6	0.0126		205
19.8	0.0126		201
20.0	0.0126		199
20.2	0.0126		197
20.4	0.0126		196
20.6	0.0126		195
20.8	0.0126		194
21.0	0.0126		194
21.2	0.0126		194
21.4	0.0126		193
21.6	0.0126		193
21.8	0.0126		193
22.0	0.0126		193
22.2	0.0127		193
22.4	0.0127		193
22.6	0.0127		193
22.8	0.0127		193
23.0	0.0127		194
23.2	0.0127		194
23.4	0.0127		194
23.6	0.0127		194
23.8	0.0127		194
24.0	0.0127		194
24.2			191
24.4			182
24.6			163
24.8			136
25.0			107
25.2			80
25.4			57
25.6			41
25.8			29
26.0			21
26.2			15
26.4			11
26.6			8
26.8			6
27.0			4

27.2			3
27.4			2
27.6			1
27.8			1
28.0			1
28.2			0
28.4			0



Results

Peak Hydrograph Flow	1766 cfs
Total Volume	868 ac-ft

FBH-L Hydrograph

Characteristics

Drainage Area	4.742	sq mi
Time of Concentration	1.58	hr
Curve Number	77.8	
Structure Hazard Classification	High	
Initial Abstraction	0.57	in
Maximum Potential Retention	2.85	in
$PMP_{6\text{-}hr}$	7.67	in
$PMP_{12\text{-}hr}$	8.68	in
$PMP_{24\text{-}hr}$	10.2	in
$PMP_{72\text{-}hr}$	12.5	in
ΔD	0.05	hr

5-Point Rainfall Distribution

Time Increment	Incremental Rainfall	Rainfall Fractions for Each Time Increment		5 Point Rainfall Distribution	
0 to 1.5	0.57 in	0.074		0.074	
1.5 to 3	5.77 in	0.752		0.827	
2 to 4.5	0.76 in	0.099		0.926	
4.5 to 6	0.57 in	0.074		1.000	

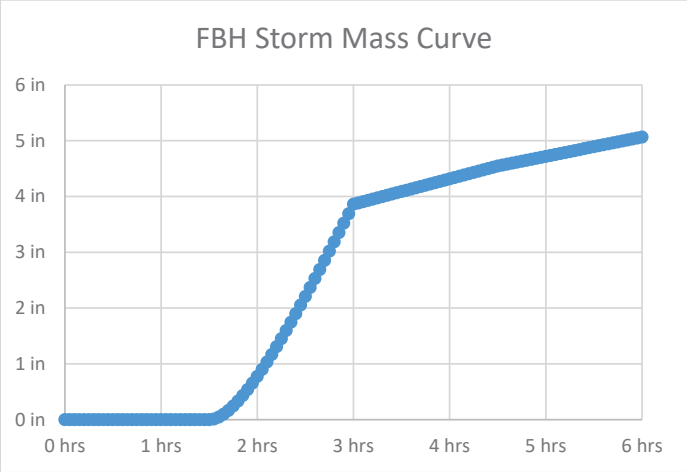
Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution
0.00	0.000	1.50	0.074	3.00	0.827	4.50	0.926
0.05	0.002	1.55	0.099	3.05	0.830	4.55	0.928
0.10	0.005	1.60	0.124	3.10	0.833	4.60	0.931
0.15	0.007	1.65	0.150	3.15	0.837	4.65	0.933
0.20	0.010	1.70	0.175	3.20	0.840	4.70	0.936
0.25	0.012	1.75	0.200	3.25	0.843	4.75	0.938
0.30	0.015	1.80	0.225	3.30	0.846	4.80	0.941
0.35	0.017	1.85	0.250	3.35	0.850	4.85	0.943
0.40	0.020	1.90	0.275	3.40	0.853	4.90	0.946
0.45	0.022	1.95	0.300	3.45	0.856	4.95	0.948
0.50	0.025	2.00	0.325	3.50	0.860	5.00	0.950
0.55	0.027	2.05	0.350	3.55	0.863	5.05	0.953
0.60	0.030	2.10	0.375	3.60	0.866	5.10	0.955
0.65	0.032	2.15	0.400	3.65	0.870	5.15	0.958
0.70	0.035	2.20	0.425	3.70	0.873	5.20	0.960
0.75	0.037	2.25	0.450	3.75	0.876	5.25	0.963
0.80	0.040	2.30	0.476	3.80	0.879	5.30	0.965
0.85	0.042	2.35	0.501	3.85	0.883	5.35	0.968
0.90	0.045	2.40	0.526	3.90	0.886	5.40	0.970
0.95	0.047	2.45	0.551	3.95	0.889	5.45	0.973
1.00	0.050	2.50	0.576	4.00	0.893	5.50	0.975
1.05	0.052	2.55	0.601	4.05	0.896	5.55	0.978
1.10	0.054	2.60	0.626	4.10	0.899	5.60	0.980
1.15	0.057	2.65	0.651	4.15	0.903	5.65	0.983
1.20	0.059	2.70	0.676	4.20	0.906	5.70	0.985
1.25	0.062	2.75	0.701	4.25	0.909	5.75	0.988
1.30	0.064	2.80	0.726	4.30	0.912	5.80	0.990

1.35	0.067	2.85	0.751	4.35	0.916	5.85	0.993
1.40	0.069	2.90	0.776	4.40	0.919	5.90	0.995
1.45	0.072	2.95	0.802	4.45	0.922	5.95	0.998
						6.00	1.000

Time (hr)	Rainfall Distribution	Total Rainfall (in)	Acc. Mass Curve of Runoff (in)	Inc. Mass Curve of Runoff (in)
0.00	0.000	0.000	0.000	0.000
0.05	0.002	0.019	0.000	0.000
0.10	0.005	0.038	0.000	0.000
0.15	0.007	0.057	0.000	0.000
0.20	0.010	0.076	0.000	0.000
0.25	0.012	0.095	0.000	0.000
0.30	0.015	0.114	0.000	0.000
0.35	0.017	0.133	0.000	0.000
0.40	0.020	0.152	0.000	0.000
0.45	0.022	0.171	0.000	0.000
0.50	0.025	0.190	0.000	0.000
0.55	0.027	0.209	0.000	0.000
0.60	0.030	0.228	0.000	0.000
0.65	0.032	0.247	0.000	0.000
0.70	0.035	0.266	0.000	0.000
0.75	0.037	0.285	0.000	0.000
0.80	0.040	0.304	0.000	0.000
0.85	0.042	0.323	0.000	0.000
0.90	0.045	0.342	0.000	0.000
0.95	0.047	0.361	0.000	0.000
1.00	0.050	0.380	0.000	0.000
1.05	0.052	0.399	0.000	0.000
1.10	0.054	0.418	0.000	0.000
1.15	0.057	0.437	0.000	0.000
1.20	0.059	0.456	0.000	0.000
1.25	0.062	0.475	0.000	0.000
1.30	0.064	0.494	0.000	0.000
1.35	0.067	0.513	0.000	0.000
1.40	0.069	0.532	0.000	0.000
1.45	0.072	0.551	0.000	0.000
1.50	0.074	0.570	0.000	0.000
1.55	0.099	0.762	0.012	0.012
1.60	0.124	0.955	0.046	0.034
1.65	0.150	1.147	0.097	0.051
1.70	0.175	1.339	0.164	0.066
1.75	0.200	1.532	0.243	0.079
1.80	0.225	1.724	0.333	0.090
1.85	0.250	1.916	0.432	0.099
1.90	0.275	2.109	0.539	0.108
1.95	0.300	2.301	0.654	0.115
2.00	0.325	2.493	0.775	0.121
2.05	0.350	2.686	0.901	0.126
2.10	0.375	2.878	1.033	0.131
2.15	0.400	3.070	1.168	0.136
2.20	0.425	3.263	1.308	0.140
2.25	0.450	3.455	1.451	0.143
2.30	0.476	3.647	1.598	0.146
2.35	0.501	3.840	1.747	0.149

2.40	0.526	4.032	1.899	0.152
2.45	0.551	4.224	2.053	0.154
2.50	0.576	4.417	2.210	0.156
2.55	0.601	4.609	2.368	0.158
2.60	0.626	4.801	2.528	0.160
2.65	0.651	4.994	2.690	0.162
2.70	0.676	5.186	2.854	0.164
2.75	0.701	5.378	3.019	0.165
2.80	0.726	5.571	3.185	0.166
2.85	0.751	5.763	3.353	0.168
2.90	0.776	5.955	3.522	0.169
2.95	0.802	6.148	3.691	0.170
3.00	0.827	6.340	3.862	0.171
3.05	0.830	6.365	3.885	0.023
3.10	0.833	6.391	3.907	0.023
3.15	0.837	6.416	3.930	0.023
3.20	0.840	6.441	3.953	0.023
3.25	0.843	6.467	3.975	0.023
3.30	0.846	6.492	3.998	0.023
3.35	0.850	6.517	4.021	0.023
3.40	0.853	6.543	4.043	0.023
3.45	0.856	6.568	4.066	0.023
3.50	0.860	6.593	4.089	0.023
3.55	0.863	6.619	4.111	0.023
3.60	0.866	6.644	4.134	0.023
3.65	0.870	6.669	4.157	0.023
3.70	0.873	6.695	4.180	0.023
3.75	0.876	6.720	4.203	0.023
3.80	0.879	6.745	4.225	0.023
3.85	0.883	6.771	4.248	0.023
3.90	0.886	6.796	4.271	0.023
3.95	0.889	6.821	4.294	0.023
4.00	0.893	6.847	4.317	0.023
4.05	0.896	6.872	4.340	0.023
4.10	0.899	6.897	4.362	0.023
4.15	0.903	6.923	4.385	0.023
4.20	0.906	6.948	4.408	0.023
4.25	0.909	6.973	4.431	0.023
4.30	0.912	6.999	4.454	0.023
4.35	0.916	7.024	4.477	0.023
4.40	0.919	7.049	4.500	0.023
4.45	0.922	7.075	4.523	0.023
4.50	0.926	7.100	4.546	0.023
4.55	0.928	7.119	4.563	0.017
4.60	0.931	7.138	4.580	0.017
4.65	0.933	7.157	4.598	0.017
4.70	0.936	7.176	4.615	0.017
4.75	0.938	7.195	4.632	0.017
4.80	0.941	7.214	4.650	0.017
4.85	0.943	7.233	4.667	0.017
4.90	0.946	7.252	4.684	0.017
4.95	0.948	7.271	4.701	0.017
5.00	0.950	7.290	4.719	0.017
5.05	0.953	7.309	4.736	0.017
5.10	0.955	7.328	4.753	0.017

5.15	0.958	7.347	4.771	0.017
5.20	0.960	7.366	4.788	0.017
5.25	0.963	7.385	4.805	0.017
5.30	0.965	7.404	4.823	0.017
5.35	0.968	7.423	4.840	0.017
5.40	0.970	7.442	4.857	0.017
5.45	0.973	7.461	4.875	0.017
5.50	0.975	7.480	4.892	0.017
5.55	0.978	7.499	4.910	0.017
5.60	0.980	7.518	4.927	0.017
5.65	0.983	7.537	4.944	0.017
5.70	0.985	7.556	4.962	0.017
5.75	0.988	7.575	4.979	0.017
5.80	0.990	7.594	4.997	0.017
5.85	0.993	7.613	5.014	0.017
5.90	0.995	7.632	5.031	0.017
5.95	0.998	7.651	5.049	0.017
6.00	1.000	7.670	5.066	0.017



Unit Hydrograph

Unit Storm Duration

ΔD 0.05

Time to Peak

Tp 0.99 << rounded to 1.0 hr

Unit Hydrograph Peak Discharge

qp 2295

Time Ratio	Discharge Ratio	Time (hr)	q (cfs)
0.0	0.000	0.000	0
0.1	0.030	0.100	69
0.2	0.100	0.200	230
0.3	0.190	0.300	436
0.4	0.310	0.400	711
0.5	0.470	0.500	1079
0.6	0.660	0.600	1515
0.7	0.820	0.700	1882
0.8	0.930	0.800	2134
0.9	0.990	0.900	2272
1.0	1.000	1.000	2295
1.1	0.990	1.100	2272
1.2	0.930	1.200	2134
1.3	0.860	1.300	1974
1.4	0.780	1.400	1790
1.5	0.680	1.500	1561
1.6	0.560	1.600	1285
1.7	0.460	1.700	1056
1.8	0.390	1.800	895
1.9	0.330	1.900	757
2.0	0.280	2.000	643
2.2	0.207	2.200	475
2.4	0.147	2.400	337
2.6	0.107	2.600	246
2.8	0.077	2.800	177
3.0	0.055	3.000	126
3.2	0.040	3.200	92
3.4	0.029	3.400	67
3.6	0.021	3.600	48
3.8	0.015	3.800	34
4.0	0.011	4.000	25
4.5	0.005	4.500	11
5.0	0.000	5.000	0

Time (hr)	q (cfs)
0	**0**
0.05	230
0.10	711
0.15	1515
0.20	2134
0.25	**2295**
0.30	2134
0.35	1790
0.40	1285
0.45	895
0.50	**643**
0.55	475
0.60	337
0.65	246
0.70	177
0.75	**126**
0.80	92
0.85	67
0.90	48
0.95	34
1.00	**25**
1.05	19
1.10	14
1.15	9
1.20	5
1.25	**0**
1.30	0
1.35	0
1.40	0
1.45	0
1.50	**0**
1.55	0
1.60	0

Sum	1531 cfs-h

Check

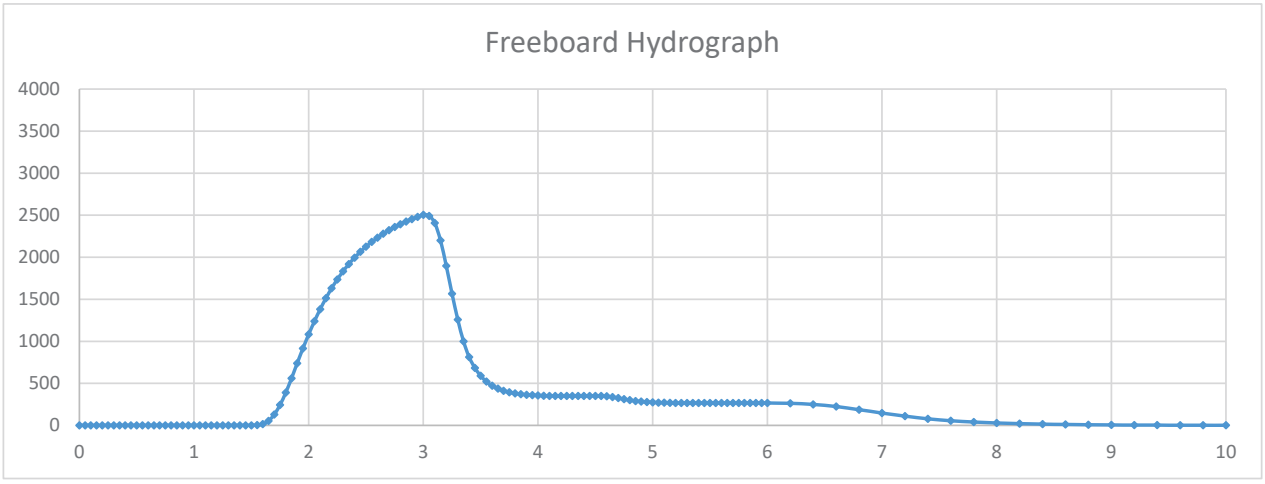
Unit Hydrograph (per 1 in. Unit Runoff)	3060.2
Variance	49.98%

Freeboard Hydrograph

Time (hrs)	Inc. Runoff	q (cfs)	Composite FBH (cfs)
0.0	0.0000	0	0
0.1	0.0000	230	0
0.1	0.0000	711	0
0.2	0.0000	1515	0
0.2	0.0000	2134	0
0.3	0.0000	2295	0
0.3	0.0000	2134	0
0.4	0.0000	1790	0
0.4	0.0000	1285	0
0.5	0.0000	895	0
0.5	0.0000	643	0
0.6	0.0000	475	0
0.6	0.0000	337	0
0.7	0.0000	246	0
0.7	0.0000	177	0
0.8	0.0000	126	0
0.8	0.0000	92	0
0.9	0.0000	67	0
0.9	0.0000	48	0
1.0	0.0000	34	0
1.0	0.0000	25	0
1.1	0.0000	19	0
1.1	0.0000	14	0
1.2	0.0000	9	0
1.2	0.0000	5	0
1.3	0.0000	0	0
1.3	0.0000		0
1.4	0.0000		0
1.4	0.0000		0
1.5	0.0000		0
1.5	0.0000		0
1.6	0.0122		3
1.6	0.0336		16
1.7	0.0514		54
1.7	0.0664		129
1.8	0.0791		243
1.8	0.0900		390
1.9	0.0994		560
1.9	0.1075		738
2.0	0.1146		915
2.0	0.1209		1082
2.1	0.1264		1238
2.1	0.1313		1382
2.2	0.1357		1512
2.2	0.1397		1630
2.3	0.1432		1736
2.3	0.1464		1832

2.4	0.1493		1918
2.4	0.1519		1995
2.5	0.1543		2064
2.5	0.1565		2126
2.6	0.1585		2182
2.6	0.1603		2233
2.7	0.1620		2279
2.7	0.1636		2321
2.8	0.1650		2359
2.8	0.1663		2393
2.9	0.1676		2425
2.9	0.1687		2453
3.0	0.1698		2480
3.0	0.1708		2504
3.1	0.0226		2492
3.1	0.0226		2407
3.2	0.0226		2199
3.2	0.0226		1897
3.3	0.0226		1567
3.3	0.0227		1258
3.4	0.0227		999
3.4	0.0227		812
3.5	0.0227		683
3.5	0.0227		590
3.6	0.0227		521
3.6	0.0227		472
3.7	0.0228		437
3.7	0.0228		411
3.7	0.0228		393
3.8	0.0228		380
3.8	0.0228		371
3.9	0.0228		364
3.9	0.0228		359
4.0	0.0229		356
4.0	0.0229		353
4.1	0.0229		351
4.1	0.0229		350
4.2	0.0229		350
4.2	0.0229		350
4.3	0.0229		350
4.3	0.0229		350

4.4	0.0230		350
4.4	0.0230		351
4.5	0.0230		351
4.5	0.0172		350
4.6	0.0173		346
4.6	0.0173		337
4.7	0.0173		325
4.7	0.0173		312
4.8	0.0173		300
4.8	0.0173		290
4.9	0.0173		283
4.9	0.0173		278
5.0	0.0173		274
5.0	0.0173		271
5.1	0.0173		270
5.1	0.0173		268
5.2	0.0173		267
5.2	0.0173		267
5.3	0.0174		266
5.3	0.0174		266
5.4	0.0174		266
5.4	0.0174		266
5.5	0.0174		266
5.5	0.0174		266
5.6	0.0174		266
5.6	0.0174		266
5.7	0.0174		266
5.7	0.0174		266
5.8	0.0174		266
5.8	0.0174		266
5.9	0.0174		266
5.9	0.0174		266
6.0	0.0174		266
6.2			262
6.4			250
6.6			224
6.8			187
7.0			147
7.2			110
7.4			78
7.6			56
7.8			40
8.0			29
8.2			21
8.4			15
8.6			11
8.8			8
9.0			5
9.2			4
9.4			3
9.6			2
9.8			1
10.0			1
10.2			0
10.4			0



Results

Peak Hydrograph Flow	2504 cfs
Total Volume	1282 ac-ft

FBH-G Hydrograph

Characteristics

Drainage Area	4.742	sq mi	
Time of Concentration	1.58	hr	
Curve Number	77.8		
Structure Hazard Classification	High		
Initial Abstraction	0.57	in	
Maximum Potential Retention	2.85	in	
$PMP_{6\text{-hr}}$	7.67	in	
$PMP_{12\text{-hr}}$	8.68	in	
$PMP_{24\text{-hr}}$	10.2	in	
$PMP_{72\text{-hr}}$	12.5	in	
ΔD	0.21	hr	<< 0.2-hr time increments are used

5-Point Rainfall Distribution

Time Increment	Incremental Rainfall	Rainfall Fractions for Each Time Increment		5 Point Rainfall Distribution	
0 to 6	0.76 in	0.075		0.075	
6 to 12	7.67 in	0.752		0.826	
12 to 18	1.01 in	0.099		0.925	
18 to 24	0.76 in	0.075		1.000	

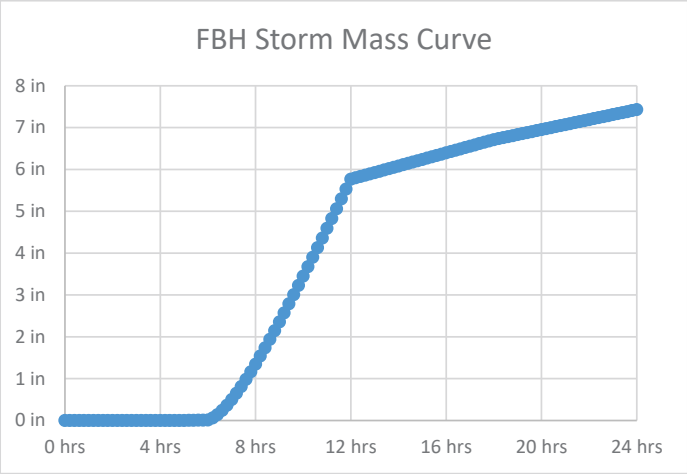
Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution	Time (hr)	Rainfall Distribution
0.00	0.000	6.00	0.075	12.00	0.826	18.00	0.925
0.20	0.002	6.20	0.100	12.20	0.830	18.20	0.928
0.40	0.005	6.40	0.125	12.40	0.833	18.40	0.930
0.60	0.007	6.60	0.150	12.60	0.836	18.60	0.933
0.80	0.010	6.80	0.175	12.80	0.840	18.80	0.935
1.00	0.012	7.00	0.200	13.00	0.843	19.00	0.938
1.20	0.015	7.20	0.225	13.20	0.846	19.20	0.940
1.40	0.017	7.40	0.250	13.40	0.850	19.40	0.943
1.60	0.020	7.60	0.275	13.60	0.853	19.60	0.945
1.80	0.022	7.80	0.300	13.80	0.856	19.80	0.948
2.00	0.025	8.00	0.325	14.00	0.859	20.00	0.950
2.20	0.027	8.20	0.350	14.20	0.863	20.20	0.953
2.40	0.030	8.40	0.375	14.40	0.866	20.40	0.955
2.60	0.032	8.60	0.400	14.60	0.869	20.60	0.958
2.80	0.035	8.80	0.425	14.80	0.873	20.80	0.960
3.00	0.037	9.00	0.450	15.00	0.876	21.00	0.963
3.20	0.040	9.20	0.476	15.20	0.879	21.20	0.965
3.40	0.042	9.40	0.501	15.40	0.883	21.40	0.968
3.60	0.045	9.60	0.526	15.60	0.886	21.60	0.970
3.80	0.047	9.80	0.551	15.80	0.889	21.80	0.973
4.00	0.050	10.00	0.576	16.00	0.892	22.00	0.975
4.20	0.052	10.20	0.601	16.20	0.896	22.20	0.978
4.40	0.055	10.40	0.626	16.40	0.899	22.40	0.980
4.60	0.057	10.60	0.651	16.60	0.902	22.60	0.983
4.80	0.060	10.80	0.676	16.80	0.906	22.80	0.985
5.00	0.062	11.00	0.701	17.00	0.909	23.00	0.988
5.20	0.065	11.20	0.726	17.20	0.912	23.20	0.990

5.40	0.067	11.40	0.751	17.40	0.916	23.40	0.993
5.60	0.070	11.60	0.776	17.60	0.919	23.60	0.995
5.80	0.072	11.80	0.801	17.80	0.922	23.80	0.998
						24.00	1.000

Time (hr)	Rainfall Distribution	Total Rainfall (in)	Acc. Mass Curve of Runoff (in)	Inc. Mass Curve of Runoff (in)
0.00	0.000	0.000	0.000	0.000
0.20	0.002	0.025	0.000	0.000
0.40	0.005	0.051	0.000	0.000
0.60	0.007	0.076	0.000	0.000
0.80	0.010	0.101	0.000	0.000
1.00	0.012	0.127	0.000	0.000
1.20	0.015	0.152	0.000	0.000
1.40	0.017	0.177	0.000	0.000
1.60	0.020	0.203	0.000	0.000
1.80	0.022	0.228	0.000	0.000
2.00	0.025	0.253	0.000	0.000
2.20	0.027	0.279	0.000	0.000
2.40	0.030	0.304	0.000	0.000
2.60	0.032	0.329	0.000	0.000
2.80	0.035	0.355	0.000	0.000
3.00	0.037	0.380	0.000	0.000
3.20	0.040	0.405	0.000	0.000
3.40	0.042	0.431	0.000	0.000
3.60	0.045	0.456	0.000	0.000
3.80	0.047	0.481	0.000	0.000
4.00	0.050	0.507	0.000	0.000
4.20	0.052	0.532	0.000	0.000
4.40	0.055	0.557	0.000	0.000
4.60	0.057	0.583	0.000	0.000
4.80	0.060	0.608	0.001	0.000
5.00	0.062	0.633	0.001	0.001
5.20	0.065	0.659	0.003	0.001
5.40	0.067	0.684	0.004	0.002
5.60	0.070	0.709	0.006	0.002
5.80	0.072	0.735	0.009	0.003
6.00	0.075	0.760	0.012	0.003
6.20	0.100	1.016	0.060	0.048
6.40	0.125	1.271	0.139	0.078
6.60	0.150	1.527	0.241	0.102
6.80	0.175	1.783	0.362	0.121
7.00	0.200	2.038	0.499	0.137
7.20	0.225	2.294	0.650	0.151
7.40	0.250	2.550	0.811	0.162
7.60	0.275	2.805	0.983	0.171
7.80	0.300	3.061	1.162	0.179
8.00	0.325	3.317	1.348	0.186
8.20	0.350	3.572	1.540	0.192
8.40	0.375	3.828	1.738	0.198
8.60	0.400	4.084	1.940	0.202

8.80	0.425	4.339	2.146	0.206
9.00	0.450	4.595	2.356	0.210
9.20	0.476	4.851	2.570	0.213
9.40	0.501	5.106	2.786	0.216
9.60	0.526	5.362	3.005	0.219
9.80	0.551	5.618	3.226	0.221
10.00	0.576	5.873	3.450	0.223
10.20	0.601	6.129	3.675	0.225
10.40	0.626	6.385	3.902	0.227
10.60	0.651	6.640	4.131	0.229
10.80	0.676	6.896	4.361	0.230
11.00	0.701	7.152	4.593	0.232
11.20	0.726	7.407	4.826	0.233
11.40	0.751	7.663	5.060	0.234
11.60	0.776	7.919	5.295	0.235
11.80	0.801	8.174	5.531	0.236
12.00	0.826	8.430	5.768	0.237
12.20	0.830	8.464	5.800	0.031
12.40	0.833	8.497	5.831	0.031
12.60	0.836	8.531	5.862	0.031
12.80	0.840	8.565	5.894	0.031
13.00	0.843	8.598	5.925	0.031
13.20	0.846	8.632	5.956	0.031
13.40	0.850	8.666	5.988	0.031
13.60	0.853	8.699	6.019	0.031
13.80	0.856	8.733	6.051	0.031
14.00	0.859	8.767	6.082	0.031
14.20	0.863	8.800	6.113	0.031
14.40	0.866	8.834	6.145	0.031
14.60	0.869	8.868	6.176	0.031
14.80	0.873	8.901	6.208	0.031
15.00	0.876	8.935	6.239	0.031
15.20	0.879	8.969	6.271	0.031
15.40	0.883	9.002	6.302	0.032
15.60	0.886	9.036	6.334	0.032
15.80	0.889	9.070	6.365	0.032
16.00	0.892	9.103	6.397	0.032
16.20	0.896	9.137	6.428	0.032
16.40	0.899	9.171	6.460	0.032
16.60	0.902	9.204	6.492	0.032
16.80	0.906	9.238	6.523	0.032
17.00	0.909	9.272	6.555	0.032
17.20	0.912	9.305	6.586	0.032
17.40	0.916	9.339	6.618	0.032
17.60	0.919	9.373	6.650	0.032
17.80	0.922	9.406	6.681	0.032
18.00	0.925	9.440	6.713	0.032
18.20	0.928	9.465	6.737	0.024
18.40	0.930	9.491	6.761	0.024
18.60	0.933	9.516	6.785	0.024
18.80	0.935	9.541	6.808	0.024
19.00	0.938	9.567	6.832	0.024
19.20	0.940	9.592	6.856	0.024
19.40	0.943	9.617	6.880	0.024
19.60	0.945	9.643	6.904	0.024

19.80	0.948	9.668	6.928	0.024
20.00	0.950	9.693	6.952	0.024
20.20	0.953	9.719	6.976	0.024
20.40	0.955	9.744	7.000	0.024
20.60	0.958	9.769	7.023	0.024
20.80	0.960	9.795	7.047	0.024
21.00	0.963	9.820	7.071	0.024
21.20	0.965	9.845	7.095	0.024
21.40	0.968	9.871	7.119	0.024
21.60	0.970	9.896	7.143	0.024
21.80	0.973	9.921	7.167	0.024
22.00	0.975	9.947	7.191	0.024
22.20	0.978	9.972	7.215	0.024
22.40	0.980	9.997	7.239	0.024
22.60	0.983	10.023	7.263	0.024
22.80	0.985	10.048	7.287	0.024
23.00	0.988	10.073	7.311	0.024
23.20	0.990	10.099	7.335	0.024
23.40	0.993	10.124	7.359	0.024
23.60	0.995	10.149	7.383	0.024
23.80	0.998	10.175	7.407	0.024
24.00	1.000	10.200	7.431	0.024



Unit Hydrograph

Unit Storm Duration

ΔD — 0.21 << 0.2-hr time increments are used

Time to Peak

Tp — 1.05 << rounded to 1.0 hr

Unit Hydrograph Peak Discharge

qp — 2295

Time Ratio	Discharge Ratio	Time (hr)	q (cfs)
0.0	0.000	0.000	0
0.1	0.030	0.100	69
0.2	0.100	0.200	230

Time (hr)	q (cfs)
0	**0**
0.20	230
0.40	711

0.3	0.190	0.300	436
0.4	0.310	0.400	711
0.5	0.470	0.500	1079
0.6	0.660	0.600	1515
0.7	0.820	0.700	1882
0.8	0.930	0.800	2134
0.9	0.990	0.900	2272
1.0	1.000	1.000	2295
1.1	0.990	1.100	2272
1.2	0.930	1.200	2134
1.3	0.860	1.300	1974
1.4	0.780	1.400	1790
1.5	0.680	1.500	1561
1.6	0.560	1.600	1285
1.7	0.460	1.700	1056
1.8	0.390	1.800	895
1.9	0.330	1.900	757
2.0	0.280	2.000	643
2.2	0.207	2.200	475
2.4	0.147	2.400	337
2.6	0.107	2.600	246
2.8	0.077	2.800	177
3.0	0.055	3.000	126
3.2	0.040	3.200	92
3.4	0.029	3.400	67
3.6	0.021	3.600	48
3.8	0.015	3.800	34
4.0	0.011	4.000	25
4.5	0.005	4.500	11
5.0	0.000	5.000	0

0.60	1515
0.80	2134
1.00	**2295**
1.20	2134
1.40	1790
1.60	1285
1.80	895
2.00	**643**
2.20	475
2.40	337
2.60	246
2.80	177
3.00	**126**
3.20	92
3.40	67
3.60	48
3.80	34
4.00	**25**
4.20	19
4.40	14
4.60	9
4.80	5
5.00	**0**
5.20	0
5.40	0
5.60	0
5.80	0
6.00	**0**
6.20	0
6.40	0

Sum	3061 cfs-h

Check

Unit Hydrograph (per 1 in. Unit Runoff)	3060.2
Variance	-0.04%

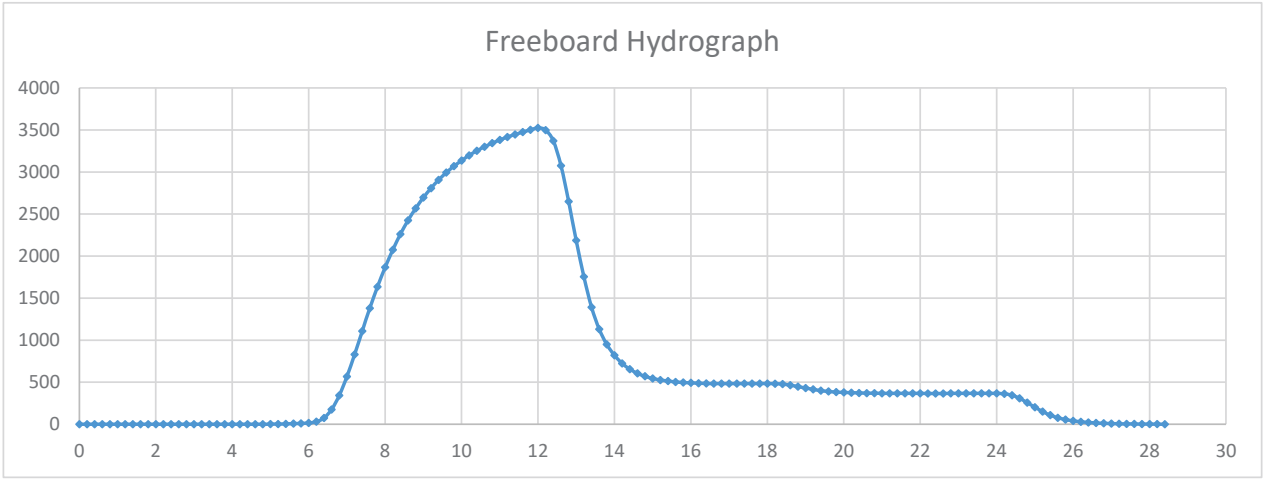
Freeboard Hydrograph

Time (hrs)	Inc. Runoff	q (cfs)	Composite FBH (cfs)
0.0	0.0000	0	0
0.2	0.0000	230	0
0.4	0.0000	711	0
0.6	0.0000	1515	0
0.8	0.0000	2134	0
1.0	0.0000	2295	0
1.2	0.0000	2134	0
1.4	0.0000	1790	0
1.6	0.0000	1285	0
1.8	0.0000	895	0
2.0	0.0000	643	0
2.2	0.0000	475	0
2.4	0.0000	337	0
2.6	0.0000	246	0

2.8	0.0000	177	0
3.0	0.0000	126	0
3.2	0.0000	92	0
3.4	0.0000	67	0
3.6	0.0000	48	0
3.8	0.0000	34	0
4.0	0.0000	25	0
4.2	0.0000	19	0
4.4	0.0000	14	0
4.6	0.0001	9	0
4.8	0.0004	5	0
5.0	0.0009	0	1
5.2	0.0013		2
5.4	0.0017		4
5.6	0.0021		7
5.8	0.0025		10
6.0	0.0029		15
6.2	0.0484		30
6.4	0.0782		74
6.6	0.1021		175
6.8	0.1214		342
7.0	0.1373		567
7.2	0.1505		829
7.4	0.1617		1108
7.6	0.1711		1380
7.8	0.1792		1634
8.0	0.1862		1866
8.2	0.1923		2074
8.4	0.1976		2260
8.6	0.2022		2424
8.8	0.2064		2568
9.0	0.2100		2696
9.2	0.2133		2807
9.4	0.2162		2906
9.6	0.2189		2993
9.8	0.2213		3069
10.0	0.2234		3137
10.2	0.2254		3198
10.4	0.2272		3252
10.6	0.2288		3300
10.8	0.2303		3343
11.0	0.2317		3381
11.2	0.2329		3416
11.4	0.2341		3447
11.6	0.2352		3475
11.8	0.2362		3501
12.0	0.2371		3524
12.2	0.0313		3498
12.4	0.0313		3371
12.6	0.0313		3075
12.8	0.0313		2649
13.0	0.0313		2187
13.2	0.0314		1755
13.4	0.0314		1392
13.6	0.0314		1131

13.8	0.0314		950
14.0	0.0314		820
14.2	0.0314		724
14.4	0.0314		655
14.6	0.0315		606
14.8	0.0315		570
15.0	0.0315		545
15.2	0.0315		526
15.4	0.0315		513
15.6	0.0315		503
15.8	0.0315		496
16.0	0.0316		492
16.2	0.0316		488
16.4	0.0316		485
16.6	0.0316		483
16.8	0.0316		483
17.0	0.0316		483
17.2	0.0316		483
17.4	0.0316		483
17.6	0.0316		483
17.8	0.0317		484
18.0	0.0317		484
18.2	0.0238		482
18.4	0.0238		477
18.6	0.0239		465
18.8	0.0239		448
19.0	0.0239		431
19.2	0.0239		414
19.4	0.0239		400
19.6	0.0239		390
19.8	0.0239		383
20.0	0.0239		378
20.2	0.0239		375
20.4	0.0239		372
20.6	0.0239		370
20.8	0.0239		369
21.0	0.0239		368
21.2	0.0239		368
21.4	0.0239		367
21.6	0.0239		367
21.8	0.0239		367
22.0	0.0240		367
22.2	0.0240		366
22.4	0.0240		366
22.6	0.0240		366
22.8	0.0240		367
23.0	0.0240		367
23.2	0.0240		367
23.4	0.0240		367
23.6	0.0240		367
23.8	0.0240		367
24.0	0.0240		367
24.2			362
24.4			345
24.6			308

24.8			257
25.0			202
25.2			151
25.4			108
25.6			77
25.8			56
26.0			40
26.2			29
26.4			21
26.6			15
26.8			11
27.0			8
27.2			5
27.4			4
27.6			3
27.8			2
28.0			1
28.2			1
28.4			0



Results

Peak Hydrograph Flow	3524 cfs
Total Volume	1880 ac-ft

Section 3. Precipitation Values

Precipitation Value - Limited Frequency Hydrographs (Storm Events 01-09 and 12)

Description: The NOAA Precipitation Value is taken from the NOAA Precipitation Frequency Data Server (PFDS). As outlined in NOAA Atlas 2 and Atlas 14, an average precipitation value for entire the basin area is calculated by deriving the values on a grid throughout the drainage basin and taking the average of these values. The exhibit on the following page, *NOAA Atlas 14 Precipitation Grid Exhibit* , shows the grid points where the point precipitation values were taken and averaged out.

NOAA Point Precipitation Value:

	6-hour	24-hour							10-day
	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	100-yr
	3.71	1.62	2.02	2.36	2.81	3.16	3.54	4.73	6.86
	3.69	1.62	2.02	2.35	2.80	3.16	3.53	4.72	6.85
	3.68	1.61	2.01	2.34	2.79	3.15	3.52	4.70	6.84
	3.67	1.61	2.01	2.33	2.79	3.14	3.51	4.69	6.83
	3.67	1.60	2.00	2.33	2.78	3.14	3.51	4.69	6.83
	3.66	1.60	2.00	2.33	2.78	3.13	3.50	4.68	6.82
	3.66	1.60	2.00	2.33	2.78	3.13	3.50	4.68	6.82
	3.65	1.60	1.99	2.32	2.77	3.13	3.49	4.66	6.82
	3.66	1.60	2.00	2.32	2.77	3.13	3.50	4.68	6.82
	3.67	1.60	2.00	2.33	2.78	3.13	3.51	4.69	6.83
	3.67	1.61	2.01	2.34	2.79	3.14	3.51	4.69	6.83
	3.67	1.61	2.01	2.34	2.79	3.14	3.51	4.69	6.83
	3.69	1.62	2.02	2.35	2.80	3.15	3.53	4.72	6.85
	3.69	1.62	2.01	2.35	2.80	3.15	3.53	4.72	6.85
Average >>	**3.68**	**1.61**	**2.01**	**2.34**	**2.79**	**3.14**	**3.51**	**4.69**	**6.83**

(*NOAA Atlas 14*)

Precipitation Value - Local SEP Hydrograph (Storm Event 10)

Description: The Local SEP Value is the Probable Maximum Precipitation to occur ever for a period of 6 hours. It involves evaluation of the average PMP and the areal distribution of the PMP within the drainage area using methods outlined in HMR 49. Donald T. Jensen with Utah State University was commissioned to provide an update to HMR 49 resulting in the *Probable Maximum Precipitation Estimates for Short-Duration, Small-Area Storms in Utah* . The study uses the 1-hour Point PMP Value for 1 mi^2, taken from HMR 49, and applies updated reduction factors for elevation, duration, and area to adjust the value to match the characteristics of the drainage basin.

Local SEP

Initial Precipitation Value (1-hr, 1-mi^2):

9.5 in (Fig. 4.5. *HMR 49* , 1984)

Elevation Variation:

Mean Elevation: 6271'

93.6% (Section 4.3.2, *HMR 49* , 1984)

Adjusted Value 8.90 in

Duration and Areal Variation:

Duration: 6 hrs

Area: 5 sq mi

86.15% (Table 15. *Probable Maximum Precipitation for Short-Duration, Short-Area Storms in Utah* , Jensen. 1995, 2002)

Adjusted Value 7.67 in

Total Local SEP	**7.67 in**

Precipitation Value - General SEP Hydrograph (Storm Event 11)

Description

The General SEP Value is the Probable Maximum Precipitation to occur ever for a period of 72 hours. It involves evaluation of the Convergance PMP (precipitation resulting from atmospheric processes not affected by terrain) and the Orographic PMP (precipitation resulting from atmospheric processes affected by terrain) using methods outlined in HMR 49. Convergance and orographic precipitation can occur simultaneously. Donald T. Jensen with Utah State University was commissioned to provide an update to HMR 49 resulting in the *2002 Update for Probable Maximum Precipitation, Utah, 72-Hour Estimates, Areas to 5,000 mi*^{2}. The study updates the 72-hour Point PMP Value for 10 mi^2, as shown in Figure 1 of the said study, from which the SEP value is calculated. This point value includes adjustments from barrier and elevation variations and the orographic component. An area reduction factor is applied to adjust the value to match the size of the drainage basin.

General SEP

Point PMP 72-hr Precipitation Value:

12.5 in (Fig. 1. *2002 Update for Probably Maximum Precipitation, Utah, 72-Hour Estimates, Areas to 5,000 mi*^{2}, Jensen. 2003)

Total General PMP	12.50 in

Areal Variation:

Area: 5 sq mi

100.00% (Table 1. *2002 Update for Probably Maximum Precipitation, Utah, 72-Hour Estimates, Areas to 5,000 mi*^{2}, Jensen. 2003)

Total General SEP	**12.50 in**
Total General SEP Used	**12.50 in**

Precipitation Value - Auxiliary Spillway Hydrographs (Storm Events 13 and 14)

Description The ASH Storm Events are the maximum precipitation events used to design the auxiliary spillway and top of dam elevation as determined by the equations set forth in TR-60, Table Figure 2-2, using the PMP precipitation value and the 100-year precipitation value.

Local ASH

P100:	2.75 in	< 100-yr, 6-hr NWS	(TR-60, Figure 2-2)
PMP:	7.67 in	< Local SEP	

ASH-L Precipitation Value	**4.03 in**

General ASH

P100:	3.51 in	< 100-yr, 24-hr NWS	(TR-60, Figure 2-2)
PMP:	12.50 in	< General SEP	

ASH-G Precipitation Value	**5.85 in**

Precipitation Value - Freeboard Hydrographs (Storm Events 15 and 16)

Description The FBH Storm Events are the maximum precipitation events used to design the spillway and top of dam elevation as determined by the equations set forth in TR-60, Table Figure 2-2, using the PMP precipitation value (and applying a duration reduction factor for the 24-hour General FBH).

Local FBH PMP: 7.67 in < Local (6-hr) SEP (TR-60, Figure 2-2)

FBH-L Precipitation Value	**7.67 in**

General FBH PMP: 12.50 in < Local (72-hr) SEP (TR-60, Figure 2-2)

24-hour Duration Reduction Factor:
81.6%

FBH-G Precipitation Value	**10.20 in**

Section 4. Wave Runup

Wave Runup - 50 mph Wind

Design Wind

Fastest Mile Wind:
50 mph

Maximum 1-hr wind
45 mph (Fig. 6, McCartney)

Fetch (F) Length:
0.42 miles (see attached *Fetch Length Exhibit*)

Water-Land Velocity Ratio:
1.07 (Page 11, McCartney)

Note: 120-minute velocity is calculated by multiplying the 60-minute velocity by 0.95.

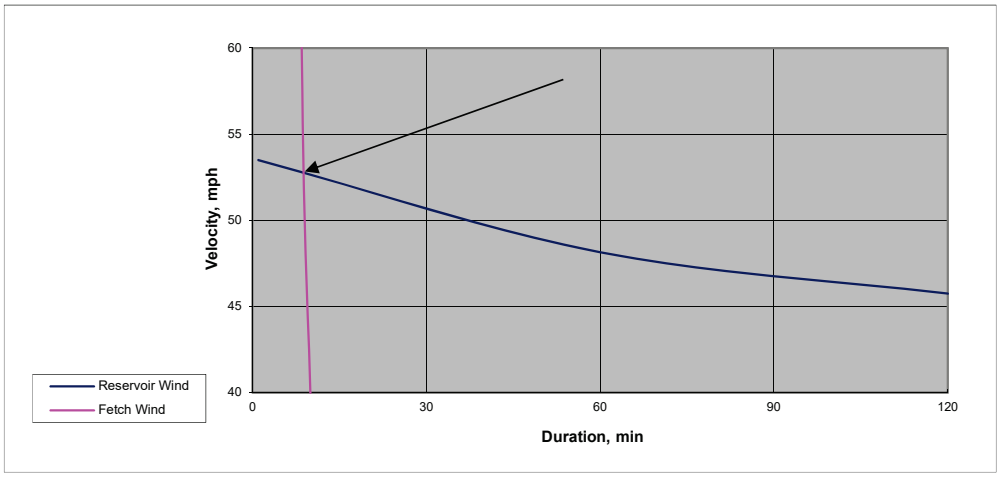
Reservoir Wind:

Duration	Velocity (Land)	Velocity (Water)
min	mph	mph
1	50	53.5
60	45	48.2
120	43	45.7

0.42-mi. Fetch Wind:

Duration	Velocity (Land)	Velocity (Water)
min	mph	mph
10	-	40
9	-	50
8.5	-	60

Note: Duration taken from Fig. 11, McCartney.



The Design Wind is taken from the intersection of the curves in the above chart:

U = 52.8 mph for 8.8 min.

Design Wave

Using a Design Wind of 52.8 mph for 8.8 minutes, the Design Wave is:

H_s = 1.40 ft (Fig. 11, McCartney)

Design Wave Significant Time Period

Using a Design Wind of 52.8 mph over a 0.42-mi. fetch, the Design Wave Significant Period is:

T_s = 2.2 sec (Fig. 12, McCartney)

Wave Runup - 50 mph Wind (cont.)

Wave Runup

Wave Runup, $\mathbf{R_s}$, is calculated using the following equation:

$$\frac{R_s}{H_s} \quad \frac{1}{0.4 + \left(\frac{H_s}{L_o}\right)^{1/2} \cot\theta}$$

where:

H_s =		1.40 ft
L_o =	$5.12(T_s)^2$ =	24.8 ft
cotθ =		1.5

Therefore:

R_s = 1.85 ft

Maximum Wave Runup, $\mathbf{R_{max}}$, is calculated using the following equation:

$$R_{\max} \quad R_s \times 1.5$$

Therefore:

R_{max} = 2.78 ft

Wind Setup

Wind Setup, **S**, is calculated using the following equation:

$$S \quad \frac{2U^2F}{1400D}$$

where:

U =	52.8 mph
F =	0.42 mi
D (ave. water depth) =	50 ft

Therefore:

S = 0.03 ft

Required Freeboard

The required amount of freeboard is the sum of the maximum wave runup and the wind setup.

Required Freeboard = 2.81 ft

Wave Runup - 100 mph Wind

Design Wind

Fastest Mile Wind:
100 mph

Maximum 1-hr wind
45 mph (Fig. 6, McCartney)

Fetch (F) Length:
0.42 miles (see attached *Fetch Length Exhibit*)

Water-Land Velocity Ratio:
1.07 (Page 11, McCartney)

Note: 120-minute velocity is calculated by multiplying the 60-minute velocity by 0.95.

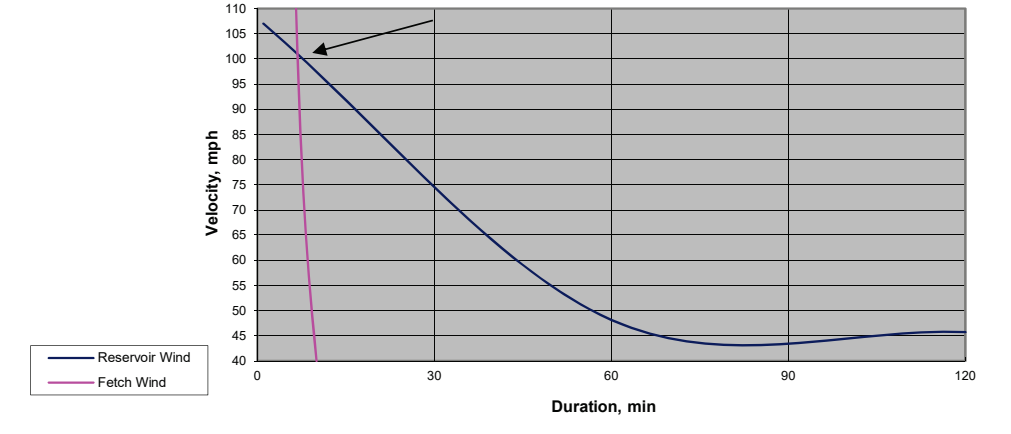
Reservoir Wind:

Duration	Velocity (Land)	Velocity (Water)
min	mph	mph
1	100	107.0
60	45	48.2
120	43	45.7

0.42-mi. Fetch Wind:

Duration	Velocity (Land)	Velocity (Water)
min	mph	mph
10	-	40
8.5	-	60
7.5	-	80
6.8	-	100
6.3	-	120

Note: Duration taken from Fig. 11, McCartney.



The Design Wind is taken from the intersection of the curves in the above chart:

U = 101 mph for 7.0 min.

Design Wave

Using a Design Wind of 101 mph for 7.0 minutes, the Design Wave is:

H_s = 3.10 ft (Fig. 11, McCartney)

Design Wave Significant Time Period

Using a Design Wind of 101 mph over a 0.42-mi. fetch, the Design Wave Significant Period is:

T_s = 2.9 sec (Fig. 12, McCartney)

Wave Runup - 100 mph Wind (cont.)

Wave Runup

Wave Runup, $\mathbf{R_s}$, is calculated using the following equation:

$$\frac{R_s}{H_s} \quad \frac{1}{0.4 + \left(\frac{H_s}{L_o}\right)^{1/2} \cot\theta}$$

where:

H_s =		3.10 ft
L_o =	$5.12(T_s)^2$ =	43.1 ft
cotθ =		1.5

Therefore:

R_s = 3.86 ft

Maximum Wave Runup, $\mathbf{R_{max}}$, is calculated using the following equation:

$$R_{max} \quad R_s \times 1.5$$

Therefore:

R_{max} = 5.79 ft

Wind Setup

Wind Setup, **S**, is calculated using the following equation:

$$S \quad \frac{2U^2F}{1400D}$$

where:

U =		101 mph
F =		0.42 mi
D (ave. water depth) =		50 ft

Therefore:

S = 0.12 ft

Required Freeboard

The required amount of freeboard is the sum of the maximum wave runup and the wind setup.

Required Freeboard = 5.92 ft

Wave Action

Wave Action

Fetch (F) Length:		
	0.42 miles	see attached *Fetch Length Exhibit*
Maximum Land Wind Velocity:		
	81 mph	TR-56, Figure 4)
Water-Land Velocity Ratio:		
	1.07	TR-56, Figure 5)
Overwater Wind Velocity		
	87 mph	TR-56, Equation 2)
Significant Wave Height		
	1.75 ft	TR-56, Equation 3)

Section 5. Emergency Drain

Emergency Drain Pipeline Design

OUTLET WORKS	
24" DI Pipe Inner Diameter (in)	24
Pipe Cross-Section Area (sf)	3.1
Pipe Circumference (ft)	6.3.
Pipe Length (ft)	375
Trash Loss Coefficient, K_t	1.23
Trash Rack Gross-Net Area Ratio	0.3
Trash Rack Area (sf)	100
Entrance Loss Coefficient, K_e	0.5
Friction Loss Coefficient, K_f	4.05
Manning's Coefficient	0.012

EMERGENCY DRAIN	
30" DI Pipe Inner Diameter (in)	30
Pipe Cross-Section Area (sf)	5.7
Pipe Circumference (ft)	8.5
Pipe Length (ft)	300
Bend Loss Coefficient, K_b	0.7
45° Bend Loss Coefficient	0.7
Friction Loss Coefficient, Kf	2.38
Manning's Coefficient	0.012
Discharge Loss Coefficient, Kd	1
Pipe Discharge Elevation (ft)	5450

Water Surface Elev (ft)	Water Storage (ac-ft)	Discharge Volume (ac-ft)	Cum. Discharge Vol. (ac-ft)	Height (ft)	Velocity (fps)	Discharge (cfs)	Discharge (ac-ft/day)	Discharge Time (days)	Cum. Discharge Time (days)
5546									
5545.5	6055		0	95.8	26.7	131.0	259.9		
5545	5916	139	139	95.3	26.7	130.7	259.2	0.536	0.5
5544	5777	139	278	94.5	26.6	130.2	258.2	0.538	1.1
5542	5419	179	636	92.5	26.3	128.8	255.5	0.701	2.5
5540	5074	173	981	90.5	26.0	127.4	252.7	0.685	3.8
5538	4742	166	1313	88.5	25.7	126.0	249.9	0.664	5.2
5536	4423	160	1632	86.5	25.4	124.5	247.0	0.648	6.4
5534	4116	154	1939	84.5	25.1	123.1	244.2	0.631	7.7
5532	3823	147	2232	82.5	24.8	121.6	241.3	0.609	8.9
5530	3542	141	2513	80.5	24.5	120.1	238.3	0.592	10.1
5528	3274	134	2781	78.5	24.2	118.6	235.3	0.569	11.2
5526	3018	128	3037	76.5	23.9	117.1	232.3	0.551	12.3
5524	2773	123	3282	74.5	23.6	115.6	229.3	0.537	13.4
5522	2542	116	3513	72.5	23.3	114.0	226.2	0.513	14.4
5520	2323	110	3732	70.5	22.9	112.4	223.0	0.493	15.4
5518	2117	103	3938	68.5	22.6	110.8	219.8	0.469	16.3
5516	1922	98	4133	66.5	22.3	109.2	216.6	0.452	17.2
5514	1737	93	4318	64.5	21.9	107.5	213.3	0.436	18.1
5512	1563	87	4492	62.5	21.6	105.9	210.0	0.414	18.9
5508	1248	76	4807	58.5	20.9	102.4	203.2	0.374	20.4
5506	1106	71	4949	56.5	20.5	100.7	199.7	0.356	21.1
5504	973	67	5082	54.5	20.2	98.9	196.1	0.342	21.8
5502	851	61	5204	52.5	19.8	97.0	192.5	0.317	22.4
5500	738	57	5317	50.5	19.4	95.2	188.8	0.302	23.0
5498	634	52	5421	48.5	19.0	93.3	185.0	0.281	23.6
5497	587	47	5468	47.5	18.8	92.3	183.1	0.257	23.9
5496	539	48	5516	46.5	18.6	91.3	181.1	0.265	24.1

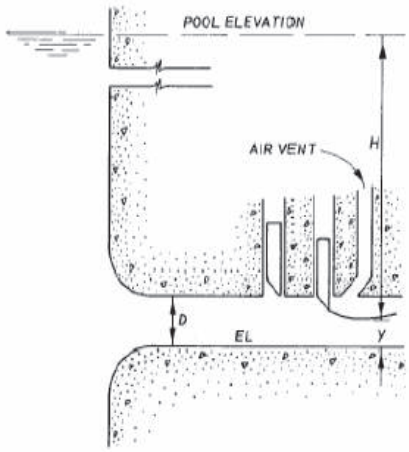
RESULTS	
Water Surface Elevation @ 24 Days	5497
Vol. Drained @ 24 Days (ac-ft)	5468
% Drained @ 24 Days	90%
Vol. Remaining @ 24 Days (ac-ft)	587
Average Flow Rate (cfs)	117

Air Vent Design

This program is to aid in the design of air vents for low level outlet works of medium size dams. The design assumption is that 80 percent gate opening the maximum air requirement will occur. Also, the maximum air velocity is not to exceed 150 fps. Although both parameters can be defined by the user. The method used below was developed by the U.S. Army Corps of Engineers in 1946.

User Defined Parameters

Gravity (ft/s)	32.2
Elev. Sluice Invert at Gate (ft)	5493.00
Design Pool Elevation (ft)	5517.00
Diameter (ft)	2.50
Discharge Coefficient	0.60
Gate Opening (%)	80%
Maximum Air Velocity (ft/s)	150.00



Slope of Outlet	0.007
Pipe Length (ft)	675
Cu	1.486
Manning's n	0.012

Calculated Parameters

Depth of Water at Vena Contracta (y) in (ft) = 1.200

y = Discharge Coefficient x Gate Opening x Diameter (D)

a (radians) =1.531 $\quad a = a\cos\left(1 - \frac{Y}{R}\right)$

Area at Vena Contracta (ft^2) = 2.329 $\quad A_{vc} = R^2 \cdot (\alpha - \cos\alpha \cdot \sin\alpha)$

Effective Head (H) in (ft) = 22.800

H = Design Pool Elev.- Elev. Sluice Invert at Gate – Depth of Water at Vena Contracta (y)

Water Discharge (Q_W) in (ft^3/s) = 89.260 $\quad Q = A_{vc}\sqrt{2 \cdot g \cdot H}$

Water Velocity (V_W) in (ft/s) = 38.319 $\quad V_w = \frac{Q_w}{A_{vc}}$

Froude Number at Vena Contracta = 6.164 $\quad F_r = \frac{V_w}{\sqrt{g \cdot y}}$

$\beta = 0.171$ $\quad \beta = 0.03(F_r - 1)^{1.06}$

Air Discharge (Q_a) in (ft^3/s) = 15.261 $\quad Q_a = \beta \cdot Q_w$

Area of Air Vent Required (ft^2) = 0.102 $A_v = \frac{Q_a}{Maximum\_Air\_Velocity}$

Diameter for Circular Vent (ft) = 0.360 $D_v = \sqrt{\frac{A_v \cdot 4}{\pi}}$

Normal Depth (Y_n) in (ft) = Full Pipe

Vent Ring Design

Air Vent Diameter (in) = 6.0

Air Vent Area (in^2) = 28.27

Combined Req'd Area of Vent Ring Holes (in^2) = 56.55

Vent Ring Hole Diameter (in) = 1

Vent Ring Hole Area (in^2) = 0.79

Req'd Number of Vent Rings Holes = 36.0

Appendix C. Model Output

Storm Event 1. 2-year, 24-hour [HEC-1]

Storm Event 2. 5-year, 24-hour [HEC-1]

Storm Event 3. 10-year, 24-hour [HEC-1]

Storm Event 4. 25-year, 24-hour [HEC-1]

Storm Event 5. 50-year, 24-hour [HEC-1]

Storm Event 6. 100-year, 24-hour [HEC-1]

Storm Event 7. 500-year, 24-hour [HEC-1]

Storm Event 8. 100-year, 6-hour AMC III [HEC-1]

Storm Event 9. 100-year, 24-hour AMC III [HEC-1]

Storm Event 10. Local SEP Hydrograph [HEC-1]

Storm Event 11. General SEP Hydrograph [HEC-1]

Storm Event 12. Principal Spillway Hydrograph [HEC-1]

Storm Event 13. Local Auxiliary Spillway Hydrograph [HEC-1]

Storm Event 14. General Auxiliary Spillway Hydrograph [HEC-1]

Storm Event 15. Local Freeboard Hydrograph [HEC-1]

Storm Event 16. General Freeboard Hydrograph [HEC-1]

Spillway Analysis [SITES]

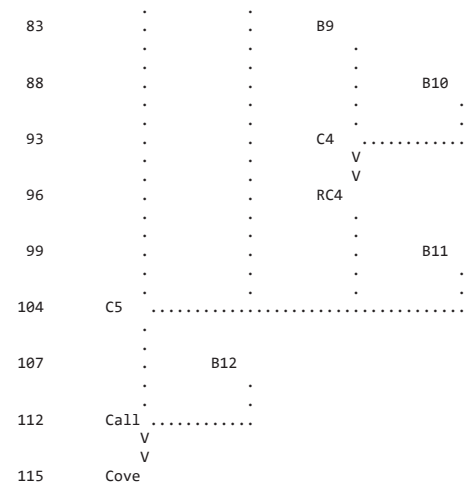
Breach Analysis [HEC-RAS]

Storm Event 1. 2-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:50:18  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   2-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    1.61
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:50:18   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

2-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL    1.20 HOURS
                       TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 112 KK    *     Call   *
           *            *
           **************
                        Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
     1     0000    1        0.   *    1     1536   14       56.   *    2     0712   27        0.   *    2     2248   40        0.
     1     0112    2        0.   *    1     1648   15       52.   *    2     0824   28        0.   *    3     0000   41        0.
     1     0224    3        0.   *    1     1800   16       50.   *    2     0936   29        0.   *    3     0112   42        0.
     1     0336    4        0.   *    1     1912   17       47.   *    2     1048   30        0.   *    3     0224   43        0.
     1     0448    5        0.   *    1     2024   18       45.   *    2     1200   31        0.   *    3     0336   44        0.
     1     0600    6        0.   *    1     2136   19       45.   *    2     1312   32        0.   *    3     0448   45        0.
     1     0712    7        0.   *    1     2248   20       46.   *    2     1424   33        0.   *    3     0600   46        0.
     1     0824    8        4.   *    2     0000   21       43.   *    2     1536   34        0.   *    3     0712   47        0.
     1     0936    9       59.   *    2     0112   22       25.   *    2     1648   35        0.   *    3     0824   48        0.
     1     1048   10       89.   *    2     0224   23       10.   *    2     1800   36        0.   *    3     0936   49        0.
     1     1200   11       78.   *    2     0336   24        5.   *    2     1912   37        0.   *    3     1048   50        0.
     1     1312   12       65.   *    2     0448   25        2.   *    2     2024   38        0.   *
     1     1424   13       60.   *    2     0600   26        1.   *    2     2136   39        0.   *
                                *                                *                                *
*****************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR       72-HR     58.80-HR
+   (CFS)       (HR)
                        (CFS)
+      89.     10.80                    70.         39.         16.          16.
                       (INCHES)       .137        .306        .306         .306
                        (AC-FT)        35.         77.         77.          77.

                        CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 115 KK    *     Cove   *     Reservoir
           *            *
           **************
                        Routing through Res'v

              HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1		2024	18	15.	5892.4	5545.9	2		1648	35	14.	5886.3	5545.8
1	0112		2	0.	5844.8	5545.5	1		2136	19	15.	5895.4	5545.9	2		1800	36	14.	5884.9	5545.8
1	0224		3	0.	5844.8	5545.5	1		2248	20	16.	5898.4	5545.9	2		1912	37	13.	5883.6	5545.8
1	0336		4	0.	5844.8	5545.5	2		0000	21	16.	5901.2	5546.0	2		2024	38	13.	5882.3	5545.8
1	0448		5	0.	5844.8	5545.5	2		0112	22	16.	5902.9	5546.0	2		2136	39	13.	5881.0	5545.8
1	0600		6	0.	5844.8	5545.5	2		0224	23	16.	5903.0	5546.0	2		2248	40	13.	5879.8	5545.8
1	0712		7	0.	5844.8	5545.5	2		0336	24	16.	5902.1	5546.0	3		0000	41	12.	5878.5	5545.8
1	0824		8	1.	5845.0	5545.5	2		0448	25	16.	5900.9	5546.0	3		0112	42	12.	5877.3	5545.8
1	0936		9	4.	5847.9	5545.5	2		0600	26	16.	5899.4	5545.9	3		0224	43	12.	5876.1	5545.8
1	1048		10	7.	5854.8	5545.6	2		0712	27	16.	5897.9	5545.9	3		0336	44	12.	5874.9	5545.7
1	1200		11	9.	5862.2	5545.6	2		0824	28	15.	5896.4	5545.9	3		0448	45	12.	5873.8	5545.7
1	1312		12	10.	5868.4	5545.7	2		0936	29	15.	5894.9	5545.9	3		0600	46	11.	5872.6	5545.7
1	1424		13	11.	5873.5	5545.7	2		1048	30	15.	5893.4	5545.9	3		0712	47	11.	5871.5	5545.7
1	1536		14	12.	5878.0	5545.8	2		1200	31	15.	5891.9	5545.9	3		0824	48	11.	5870.4	5545.7
1	1648		15	13.	5882.1	5545.8	2		1312	32	14.	5890.5	5545.9	3		0936	49	11.	5869.4	5545.7
1	1800		16	14.	5885.9	5545.8	2		1424	33	14.	5889.1	5545.9	3		1048	50	10.	5868.3	5545.7
1	1912		17	14.	5889.3	5545.9	2		1536	34	14.	5887.7	5545.9							

PEAK OUTFLOW IS 16. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 16.	26.40	16.	15.	11.	11.
		(INCHES) .032	.119	.214	.214
		(AC-FT) 8.	30.	54.	54.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
5903.	26.40	5902.	5895.	5878.	5878.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5545.98	26.40	5545.97	5545.91	5545.77	5545.77

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	4.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	4.
				TIME	12.00
HYDROGRAPH AT					
+	B2	.44	1	FLOW	3.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	2.
				TIME	22.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	9.
				TIME	14.40
ROUTED TO					
+	RC1	1.22	1	FLOW	9.
				TIME	14.40
HYDROGRAPH AT					
+	B4	.45	1	FLOW	4.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	9.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	19.
				TIME	14.40
ROUTED TO					
+	RC2	2.48	1	FLOW	19.
				TIME	14.40
HYDROGRAPH AT					
+	B6	.15	1	FLOW	7.
				TIME	10.80
HYDROGRAPH AT					
+	B7	.33	1	FLOW	5.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	27.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	27.
				TIME	12.00
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	43.
				TIME	10.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	12.
				TIME	10.80
HYDROGRAPH AT					
+	B10	.13	1	FLOW	7.
				TIME	10.80
2 COMBINED AT					
+	C4	.37	1	FLOW	19.
				TIME	10.80
ROUTED TO					
+	RC4	.37	1	FLOW	19.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	13.
				TIME	10.80
4 COMBINED AT					
+	C5	4.61	1	FLOW	85.
				TIME	10.80

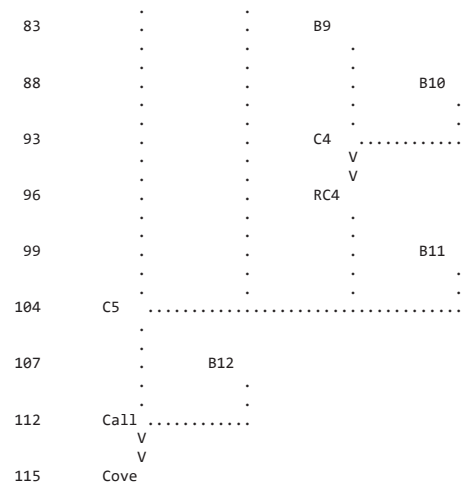
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW           4.
                                            TIME        10.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW          89.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          16.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5545.98
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE         7.20      4.28    691.20       .16     72.00      3.95    720.00         .16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4342E+01 EXCESS= .0000E+00 OUTFLOW= .4342E+01 BASIN STORAGE= .3500E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE        14.40      8.59    763.20       .15     72.00      8.52    864.00         .15


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9892E+01 EXCESS= .0000E+00 OUTFLOW= .9895E+01 BASIN STORAGE= .3327E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE        10.57     19.01    856.25       .17     72.00     19.01    864.00         .17


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2218E+02 EXCESS= .0000E+00 OUTFLOW= .2218E+02 BASIN STORAGE= .2800E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE        10.80     27.32    702.00       .19     72.00     26.74    720.00         .19


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3011E+02 EXCESS= .0000E+00 OUTFLOW= .3013E+02 BASIN STORAGE= .8425E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE        10.80     18.94    658.80       .56     72.00     18.68    648.00         .57


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1115E+02 EXCESS= .0000E+00 OUTFLOW= .1115E+02 BASIN STORAGE= .2705E-02 PERCENT ERROR=    .0


1                                SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                               (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50           5549.20          5552.00
                                  STORAGE             5845.             6508.            7347.
                                  OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5545.98         .00       5903.        16.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 2. 5-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:51:41  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   5-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    2.01
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
 99          KK   B11
100          KM   Runoff from Basin 11
101          BA   0.279
102          LS       0    84.8
103          UD    0.39
             *

104          KK   C5
105          KM   Combine RC3, B8, RC4, B11
106          HC       4
             *

107          KK   B12
108          KM   Runoff from Basin 12
109          BA   0.127
110          LS       0    81.2
111          UD    0.40
             *
1                                          HEC-1 INPUT                                          PAGE  4

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


112          KK   Call
113          KM   Combine C5, B12
114          HC       2
             *

115          KK   Cove Reservoir
116          KM   Routing through Res'v
117          RS       1    ELEV  5545.5
118          SV       0      19      95     240     453     738    1105    1563    2217    2773
119          SV    3542    4423    5419    6149    7347    8000
120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
121          SE    5530    5536    5542    5548    5552    5558
122          SL  5545.5   4.909     0.6     0.5
123          SS  5549.2      30    2.67     1.5
124          ST  5552.0    1892     2.9     1.5
             *
125          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                 V
                 V
    27       RB1
                 .
                 .
    30           .       B2
                 .           .
                 .           .
    35           .           .       B3
                 .           .           .
                 .           .           .
    40       C1   ........................
                 V
                 V
    43       RC1
                 .
                 .
    46           .       B4
                 .           .
                 .           .
    51           .           .       B5
                 .           .           .
                 .           .           .
    56       C2   ........................
                 V
                 V
    59       RC2
                 .
                 .
    62           .       B6
                 .           .
                 .           .
    67           .           .       B7
                 .           .           .
                 .           .           .
    72       C3   ........................
                 V
                 V
    75       RC3
                 .
                 .
    78           .       B8
                 .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   06AUG20  TIME  02:51:41   *
 *                                       *
 *****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                   *
*************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

5-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.20 HOURS
                        TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00
```

*** ***

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 112 KK    *     Call   *
           *            *
           **************
                        Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
     1     0000    1        0.   *    1     1536   14        90.   *    2     0712   27        0.   *    2     2248   40        0.
     1     0112    2        0.   *    1     1648   15        81.   *    2     0824   28        0.   *    3     0000   41        0.
     1     0224    3        0.   *    1     1800   16        78.   *    2     0936   29        0.   *    3     0112   42        0.
     1     0336    4        0.   *    1     1912   17        72.   *    2     1048   30        0.   *    3     0224   43        0.
     1     0448    5        0.   *    1     2024   18        69.   *    2     1200   31        0.   *    3     0336   44        0.
     1     0600    6        0.   *    1     2136   19        68.   *    2     1312   32        0.   *    3     0448   45        0.
     1     0712    7        0.   *    1     2248   20        69.   *    2     1424   33        0.   *    3     0600   46        0.
     1     0824    8       17.   *    2     0000   21        64.   *    2     1536   34        0.   *    3     0712   47        0.
     1     0936    9      110.   *    2     0112   22        36.   *    2     1648   35        0.   *    3     0824   48        0.
     1     1048   10      175.   *    2     0224   23        15.   *    2     1800   36        0.   *    3     0936   49        0.
     1     1200   11      141.   *    2     0336   24         6.   *    2     1912   37        0.   *    3     1048   50        0.
     1     1312   12      113.   *    2     0448   25         3.   *    2     2024   38        0.   *
     1     1424   13       99.   *    2     0600   26         1.   *    2     2136   39        0.   *
                                *                                *                                *
*****************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR        72-HR     58.80-HR
+   (CFS)       (HR)
                        (CFS)
+     175.     10.80                  125.          65.          27.          27.
                          (INCHES)     .246         .512         .512         .512
                           (AC-FT)      62.         130.         130.         130.

                         CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 115 KK    *     Cove   *     Reservoir
           *            *
           **************
                        Routing through Res'v

              HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                  3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000	1	0.	5844.8	5545.5	1	2024	18	20.	5931.0	5546.2	2	1648	35	19.	5925.4	5546.2			
1	0112	2	0.	5844.8	5545.5	1	2136	19	20.	5935.8	5546.2	2	1800	36	19.	5923.5	5546.1			
1	0224	3	0.	5844.8	5545.5	1	2248	20	21.	5940.6	5546.3	2	1912	37	19.	5921.6	5546.1			
1	0336	4	0.	5844.8	5545.5	2	0000	21	21.	5945.1	5546.3	2	2024	38	19.	5919.8	5546.1			
1	0448	5	0.	5844.8	5545.5	2	0112	22	22.	5947.9	5546.3	2	2136	39	18.	5918.0	5546.1			
1	0600	6	0.	5844.8	5545.5	2	0224	23	22.	5948.3	5546.4	2	2248	40	18.	5916.2	5546.1			
1	0712	7	0.	5844.8	5545.5	2	0336	24	22.	5947.1	5546.3	3	0000	41	18.	5914.4	5546.1			
1	0824	8	2.	5845.6	5545.5	2	0448	25	21.	5945.4	5546.3	3	0112	42	18.	5912.6	5546.1			
1	0936	9	6.	5851.5	5545.6	2	0600	26	21.	5943.4	5546.3	3	0224	43	17.	5910.9	5546.0			
1	1048	10	10.	5864.9	5545.7	2	0712	27	21.	5941.4	5546.3	3	0336	44	17.	5909.2	5546.0			
1	1200	11	13.	5879.5	5545.8	2	0824	28	21.	5939.4	5546.3	3	0448	45	17.	5907.4	5546.0			
1	1312	12	15.	5890.8	5545.9	2	0936	29	21.	5937.3	5546.3	3	0600	46	17.	5905.8	5546.0			
1	1424	13	16.	5899.8	5546.0	2	1048	30	20.	5935.3	5546.2	3	0712	47	16.	5904.1	5546.0			
1	1536	14	17.	5907.5	5546.0	2	1200	31	20.	5933.2	5546.2	3	0824	48	16.	5902.5	5546.0			
1	1648	15	18.	5914.3	5546.1	2	1312	32	20.	5931.3	5546.2	3	0936	49	16.	5900.9	5546.0			
1	1800	16	19.	5920.4	5546.1	2	1424	33	20.	5929.3	5546.2	3	1048	50	16.	5899.3	5545.9			
1	1912	17	19.	5926.0	5546.2	2	1536	34	19.	5927.4	5546.2									

PEAK OUTFLOW IS 22. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 22.	26.40	22.	20.	15.	15.
		(INCHES) .042	.161	.297	.297
		(AC-FT) 11.	41.	75.	75.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
5948.	26.40	5947.	5937.	5908.	5908.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5546.35	26.40	5546.33	5546.25	5546.02	5546.02

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	11.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	10.
				TIME	12.00
HYDROGRAPH AT					
+	B2	.44	1	FLOW	10.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	5.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	23.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	21.
				TIME	12.00
HYDROGRAPH AT					
+	B4	.45	1	FLOW	11.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	21.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	50.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	48.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	11.
				TIME	10.80
HYDROGRAPH AT					
+	B7	.33	1	FLOW	11.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	69.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	63.
				TIME	12.00
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	70.
				TIME	10.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	19.
				TIME	10.80
HYDROGRAPH AT					
+	B10	.13	1	FLOW	11.
				TIME	10.80
2 COMBINED AT					
+	C4	.37	1	FLOW	30.
				TIME	10.80
ROUTED TO					
+	RC4	.37	1	FLOW	29.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	21.
				TIME	10.80
4 COMBINED AT					
+	C5	4.61	1	FLOW	168.
				TIME	10.80

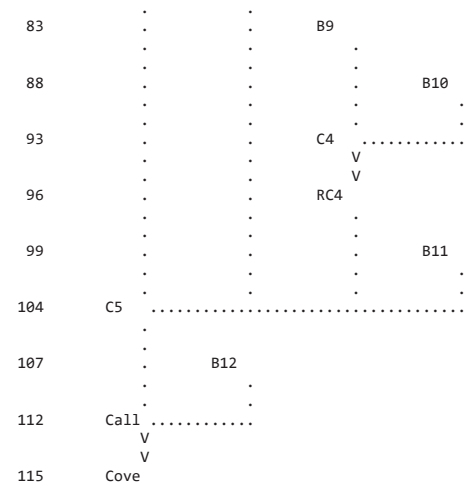
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW           7.
                                            TIME        10.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW         175.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          22.
                                            TIME        26.40

                                        ** PEAK STAGES IN FEET **
                                        1   STAGE     5546.35
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE         7.20     11.31    676.80       .32     72.00      9.54    720.00         .32


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8557E+01 EXCESS= .0000E+00 OUTFLOW= .8560E+01 BASIN STORAGE= .3508E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE         7.20     23.21    676.80       .30     72.00     21.22    720.00         .31


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1977E+02 EXCESS= .0000E+00 OUTFLOW= .1977E+02 BASIN STORAGE= .3640E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE         7.20     50.33    655.20       .33     72.00     47.70    648.00         .33


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4326E+02 EXCESS= .0000E+00 OUTFLOW= .4326E+02 BASIN STORAGE= .2914E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE        10.80     69.04    691.20       .36     72.00     63.27    720.00         .36


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5668E+02 EXCESS= .0000E+00 OUTFLOW= .5670E+02 BASIN STORAGE= .9084E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE        14.08     29.35    633.76       .85     72.00     29.23    648.00         .86


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1687E+02 EXCESS= .0000E+00 OUTFLOW= .1688E+02 BASIN STORAGE= .2335E-02 PERCENT ERROR=    .0


1                               SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                              (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50           5549.20          5552.00
                                  STORAGE             5845.             6508.            7347.
                                  OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5546.35         .00       5948.        22.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 3. 10-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:52:08  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   10-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    2.34
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
          40          KK   C1
          41          KM   Combine RB1, B2, B3
          42          HC       3
                      *

          43          KK   RC1
          44          KM   Route RC1
          45          RD    7255    .060    .030           TRAP      20      20
                      *

          46          KK   B4
          47          KM   Runoff from Basin 4
          48          BA   0.453
          49          LS       0    73.3
          50          UD    0.48
                      *

          51          KK   B5
          52          KM   Runoff from Basin 5
          53          BA   0.805
          54          LS       0    74.1
          55          UD    0.63
                      *

          56          KK   C2
          57          KM   Combine RC1, B4, B5
          58          HC       3
                      *

          59          KK   RC2
          60          KM   Route C2
          61          RD    2380    .039    .030           TRAP      40       2
                      *

          62          KK   B6
          63          KM   Runoff from Basin 6
          64          BA   0.150
          65          LS       0    84.3
          66          UD    0.19
                      *

          67          KK   B7
          68          KM   Runoff from Basin 7
          69          BA   0.327
          70          LS       0    75.7
          71          UD    0.46
                      *

          72          KK   C3
          73          KM   Combine RC2, B6, B7
          74          HC       3
                      *
1                                        HEC-1 INPUT                                          PAGE  3

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          75          KK   RC3
          76          KM   Route C3
          77          RD   11323    .023    .030           TRAP      40      20
                      *

          78          KK   B8
          79          KM   Runoff from Basin 8
          80          BA   1.012
          81          LS       0    84.0
          82          UD    0.67
                      *

          83          KK   B9
          84          KM   Runoff from Basin 9
          85          BA   0.242
          86          LS       0    85.5
          87          UD    0.26
                      *

          88          KK   B10
          89          KM   Runoff from Basin 10
          90          BA   0.129
          91          LS       0    86.7
          92          UD    0.18
                      *

          93          KK   C4
          94          KM   Combine B9, B10
          95          HC       2
                      *

          96          KK   RC4
          97          KM   Route C4
          98          RD    3380    .037    .030           TRAP      40      20
                      *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:52:08   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

10-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.20 HOURS
                        TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                  *                                  *                                  *
   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW
                                  *                                  *                                  *
    1     0000    1        0.     *    1     1536   14      120.     *    2     0712   27        0.     *    2     2248   40        0.
    1     0112    2        0.     *    1     1648   15      107.     *    2     0824   28        0.     *    3     0000   41        0.
    1     0224    3        0.     *    1     1800   16      102.     *    2     0936   29        0.     *    3     0112   42        0.
    1     0336    4        0.     *    1     1912   17       94.     *    2     1048   30        0.     *    3     0224   43        0.
    1     0448    5        0.     *    1     2024   18       89.     *    2     1200   31        0.     *    3     0336   44        0.
    1     0600    6        0.     *    1     2136   19       89.     *    2     1312   32        0.     *    3     0448   45        0.
    1     0712    7        1.     *    1     2248   20       89.     *    2     1424   33        0.     *    3     0600   46        0.
    1     0824    8       32.     *    2     0000   21       82.     *    2     1536   34        0.     *    3     0712   47        0.
    1     0936    9      165.     *    2     0112   22       46.     *    2     1648   35        0.     *    3     0824   48        0.
    1     1048   10      261.     *    2     0224   23       18.     *    2     1800   36        0.     *    3     0936   49        0.
    1     1200   11      201.     *    2     0336   24        7.     *    2     1912   37        0.     *    3     1048   50        0.
    1     1312   12      155.     *    2     0448   25        2.     *    2     2024   38        0.     *
    1     1424   13      133.     *    2     0600   26        1.     *    2     2136   39        0.     *
                                  *                                  *                                  *
*****************************************************************************************************************************

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     58.80-HR
+   (CFS)       (HR)
                         (CFS)
+     261.     10.80                179.         90.         37.          37.
                       (INCHES)     .350        .704        .705         .705
                        (AC-FT)      89.        178.        178.         178.

                        CUMULATIVE AREA =    4.74 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1		2024	18	24.	5968.3	5546.5	2		1648	35	23.	5964.1	5546.5
1	0112		2	0.	5844.8	5545.5	1		2136	19	24.	5974.8	5546.6	2		1800	36	23.	5961.7	5546.5
1	0224		3	0.	5844.8	5545.5	1		2248	20	25.	5981.1	5546.6	2		1912	37	23.	5959.5	5546.4
1	0336		4	0.	5844.8	5545.5	2		0000	21	26.	5987.1	5546.7	2		2024	38	23.	5957.2	5546.4
1	0448		5	0.	5844.8	5545.5	2		0112	22	26.	5990.9	5546.7	2		2136	39	22.	5955.0	5546.4
1	0600		6	0.	5844.8	5545.5	2		0224	23	26.	5991.5	5546.7	2		2248	40	22.	5952.8	5546.4
1	0712		7	1.	5844.9	5545.5	2		0336	24	26.	5990.2	5546.7	3		0000	41	22.	5950.6	5546.4
1	0824		8	3.	5846.4	5545.5	2		0448	25	26.	5988.1	5546.7	3		0112	42	22.	5948.4	5546.4
1	0936		9	7.	5855.7	5545.6	2		0600	26	25.	5985.7	5546.7	3		0224	43	22.	5946.2	5546.3
1	1048		10	12.	5876.0	5545.8	2		0712	27	25.	5983.3	5546.6	3		0336	44	21.	5944.1	5546.3
1	1200		11	16.	5897.5	5545.9	2		0824	28	25.	5980.8	5546.6	3		0448	45	21.	5942.0	5546.3
1	1312		12	18.	5913.6	5546.1	2		0936	29	25.	5978.4	5546.6	3		0600	46	21.	5939.9	5546.3
1	1424		13	19.	5926.0	5546.2	2		1048	30	25.	5975.9	5546.6	3		0712	47	21.	5937.9	5546.3
1	1536		14	21.	5936.6	5546.3	2		1200	31	24.	5973.5	5546.6	3		0824	48	20.	5935.8	5546.2
1	1648		15	22.	5945.8	5546.3	2		1312	32	24.	5971.1	5546.5	3		0936	49	20.	5933.8	5546.2
1	1800		16	22.	5954.1	5546.4	2		1424	33	24.	5968.8	5546.5	3		1048	50	20.	5931.8	5546.2
1	1912		17	23.	5961.6	5546.5	2		1536	34	24.	5966.4	5546.5							

PEAK OUTFLOW IS 26. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 26.	26.40	26.	25.	19.	19.
		(INCHES) .050	.193	.362	.362
		(AC-FT) 13.	49.	91.	91.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
5992.	26.40	5989.	5977.	5938.	5938.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5546.71	26.40	5546.69	5546.59	5546.27	5546.27

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	19.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	16.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	16.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	9.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	41.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	35.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	18.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	34.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	88.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	84.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	14.
				TIME	10.80
HYDROGRAPH AT					
+	B7	.33	1	FLOW	16.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	115.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	99.
				TIME	12.00
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	94.
				TIME	10.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	25.
				TIME	10.80
HYDROGRAPH AT					
+	B10	.13	1	FLOW	14.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	39.
				TIME	10.80
ROUTED TO					
+	RC4	.37	1	FLOW	39.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	27.
				TIME	10.80
4 COMBINED AT					
+	C5	4.61	1	FLOW	251.
				TIME	10.80

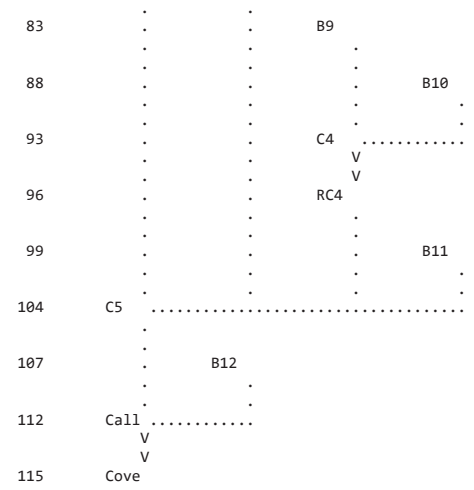
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          10.
                                            TIME        10.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW         261.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          26.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5546.71
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE         7.20     18.90    676.80       .48     72.00     16.14    648.00         .48


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1277E+02 EXCESS= .0000E+00 OUTFLOW= .1278E+02 BASIN STORAGE= .3345E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE         7.20     40.76    669.60       .46     72.00     35.00    648.00         .46


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2976E+02 EXCESS= .0000E+00 OUTFLOW= .2977E+02 BASIN STORAGE= .3635E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         6.10     86.70    652.57       .49     72.00     84.43    648.00         .49


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6439E+02 EXCESS= .0000E+00 OUTFLOW= .6439E+02 BASIN STORAGE= .3086E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE        14.40    113.78    691.20       .53     72.00     99.11    720.00         .52


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8293E+02 EXCESS= .0000E+00 OUTFLOW= .8298E+02 BASIN STORAGE= .8804E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC4    MANE        13.06     39.45    600.61      1.11     72.00     38.67    648.00        1.11


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2195E+02 EXCESS= .0000E+00 OUTFLOW= .2195E+02 BASIN STORAGE= .2242E-02 PERCENT ERROR=    .0


1                              SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                             (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                 ELEVATION         5545.50           5549.20          5552.00
                                 STORAGE             5845.             6508.            7347.
                                 OUTFLOW                0.               45.              435.


                       RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                         OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                        PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                       1.00      5546.71         .00       5992.        26.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 4. 25-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:52:36  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   25-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    2.79
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030           TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030           TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                        HEC-1 INPUT                                          PAGE  3

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030           TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030           TRAP      40      20
              *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   06AUG20  TIME  02:52:36   *
 *                                       *
 *****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                   *
*************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

25-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.20 HOURS
                        TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00
```

*** ***

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                         Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                    *                                    *                                    *
   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW
                                    *                                    *                                    *
    1     0000    1        0.       *    1     1536   14      162.       *    2     0712   27        0.       *    2     2248   40        0.
    1     0112    2        0.       *    1     1648   15      144.       *    2     0824   28        0.       *    3     0000   41        0.
    1     0224    3        0.       *    1     1800   16      137.       *    2     0936   29        0.       *    3     0112   42        0.
    1     0336    4        0.       *    1     1912   17      125.       *    2     1048   30        0.       *    3     0224   43        0.
    1     0448    5        0.       *    1     2024   18      119.       *    2     1200   31        0.       *    3     0336   44        0.
    1     0600    6        0.       *    1     2136   19      117.       *    2     1312   32        0.       *    3     0448   45        0.
    1     0712    7        6.       *    1     2248   20      118.       *    2     1424   33        0.       *    3     0600   46        0.
    1     0824    8       59.       *    2     0000   21      108.       *    2     1536   34        0.       *    3     0712   47        0.
    1     0936    9      288.       *    2     0112   22       59.       *    2     1648   35        0.       *    3     0824   48        0.
    1     1048   10      396.       *    2     0224   23       23.       *    2     1800   36        0.       *    3     0936   49        0.
    1     1200   11      290.       *    2     0336   24        9.       *    2     1912   37        0.       *    3     1048   50        0.
    1     1312   12      216.       *    2     0448   25        3.       *    2     2024   38        0.       *
    1     1424   13      183.       *    2     0600   26        1.       *    2     2136   39        0.       *
                                    *                                    *                                    *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     58.80-HR
+   (CFS)       (HR)
                         (CFS)
+     396.     10.80                 262.        128.         52.          52.
                       (INCHES)      .514       1.005       1.005        1.005
                        (AC-FT)      130.        254.        254.         254.

                        CUMULATIVE AREA =    4.74 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                         Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1	2024		18	29.	6028.3	5547.0	2	1648		35	29.	6026.4	5547.0
1	0112		2	0.	5844.8	5545.5	1	2136		19	30.	6037.1	5547.1	2	1800		36	29.	6023.5	5547.0
1	0224		3	0.	5844.8	5545.5	1	2248		20	30.	6045.7	5547.2	2	1912		37	28.	6020.7	5546.9
1	0336		4	0.	5844.8	5545.5	2	0000		21	31.	6053.9	5547.2	2	2024		38	28.	6017.9	5546.9
1	0448		5	0.	5844.8	5545.5	2	0112		22	31.	6059.1	5547.3	2	2136		39	28.	6015.1	5546.9
1	0600		6	0.	5844.8	5545.5	2	0224		23	31.	6060.1	5547.3	2	2248		40	28.	6012.4	5546.9
1	0712		7	1.	5845.1	5545.5	2	0336		24	31.	6058.5	5547.3	3	0000		41	27.	6009.6	5546.9
1	0824		8	4.	5848.0	5545.5	2	0448		25	31.	6056.0	5547.2	3	0112		42	27.	6006.9	5546.8
1	0936		9	10.	5864.6	5545.7	2	0600		26	31.	6053.1	5547.2	3	0224		43	27.	6004.2	5546.8
1	1048		10	16.	5897.3	5545.9	2	0712		27	31.	6050.0	5547.2	3	0336		44	27.	6001.6	5546.8
1	1200		11	20.	5929.6	5546.2	2	0824		28	30.	6047.0	5547.2	3	0448		45	27.	5998.9	5546.8
1	1312		12	22.	5952.7	5546.4	2	0936		29	30.	6044.0	5547.1	3	0600		46	26.	5996.3	5546.7
1	1424		13	24.	5970.2	5546.5	2	1048		30	30.	6041.0	5547.1	3	0712		47	26.	5993.6	5546.7
1	1536		14	25.	5984.9	5546.7	2	1200		31	30.	6038.0	5547.1	3	0824		48	26.	5991.1	5546.7
1	1648		15	26.	5997.5	5546.8	2	1312		32	30.	6035.1	5547.1	3	0936		49	26.	5988.5	5546.7
1	1800		16	27.	6008.8	5546.8	2	1424		33	29.	6032.1	5547.0	3	1048		50	25.	5986.0	5546.7
1	1912		17	28.	6019.0	5546.9	2	1536		34	29.	6029.2	5547.0							

PEAK OUTFLOW IS 31. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 31.	26.40	31.	30.	23.	23.
		(INCHES) .061	.236	.447	.447
		(AC-FT) 15.	60.	113.	113.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
6060.	26.40	6057.	6042.	5986.	5986.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5547.27	26.40	5547.25	5547.12	5546.66	5546.66

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	31.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	29.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	27.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	15.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	70.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	64.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	29.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	55.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	148.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	145.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	20.
				TIME	9.60
HYDROGRAPH AT					
+	B7	.33	1	FLOW	25.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	190.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	166.
				TIME	10.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	128.
				TIME	10.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	34.
				TIME	9.60
HYDROGRAPH AT					
+	B10	.13	1	FLOW	20.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	54.
				TIME	9.60
ROUTED TO					
+	RC4	.37	1	FLOW	52.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	38.
				TIME	9.60
4 COMBINED AT					
+	C5	4.61	1	FLOW	383.
				TIME	10.80

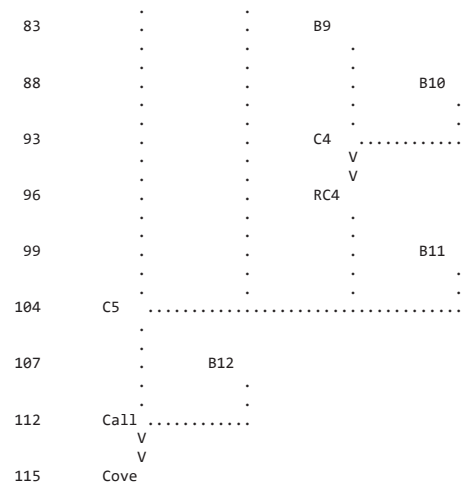
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          14.
                                            TIME        10.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW         396.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          31.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5547.27
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE        10.80     30.91    669.60       .72     72.00     28.63    648.00         .73


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1937E+02 EXCESS= .0000E+00 OUTFLOW= .1938E+02 BASIN STORAGE= .4507E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE        10.80     69.48    669.60       .70     72.00     64.10    648.00         .71


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4557E+02 EXCESS= .0000E+00 OUTFLOW= .4558E+02 BASIN STORAGE= .4033E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         5.04    146.95    655.56       .74     72.00    145.12    648.00         .74


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9743E+02 EXCESS= .0000E+00 OUTFLOW= .9744E+02 BASIN STORAGE= .3141E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE        14.40    187.14    676.80       .79     72.00    165.61    648.00         .78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1237E+03 EXCESS= .0000E+00 OUTFLOW= .1237E+03 BASIN STORAGE= .1170E-01 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC4    MANE        11.89     54.51    594.33      1.48     72.00     52.02    648.00        1.48


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2925E+02 EXCESS= .0000E+00 OUTFLOW= .2926E+02 BASIN STORAGE= .2520E-02 PERCENT ERROR=    .0


1                                SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                               (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50           5549.20          5552.00
                                  STORAGE             5845.             6508.            7347.
                                  OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5547.27         .00       6060.        31.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 5. 50-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:53:04  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   50-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    3.14
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
            40          KK   C1
            41          KM   Combine RB1, B2, B3
            42          HC       3
                        *

            43          KK   RC1
            44          KM   Route RC1
            45          RD    7255    .060    .030           TRAP      20      20
                        *

            46          KK   B4
            47          KM   Runoff from Basin 4
            48          BA   0.453
            49          LS       0    73.3
            50          UD    0.48
                        *

            51          KK   B5
            52          KM   Runoff from Basin 5
            53          BA   0.805
            54          LS       0    74.1
            55          UD    0.63
                        *

            56          KK   C2
            57          KM   Combine RC1, B4, B5
            58          HC       3
                        *

            59          KK   RC2
            60          KM   Route C2
            61          RD    2380    .039    .030           TRAP      40       2
                        *

            62          KK   B6
            63          KM   Runoff from Basin 6
            64          BA   0.150
            65          LS       0    84.3
            66          UD    0.19
                        *

            67          KK   B7
            68          KM   Runoff from Basin 7
            69          BA   0.327
            70          LS       0    75.7
            71          UD    0.46
                        *

            72          KK   C3
            73          KM   Combine RC2, B6, B7
            74          HC       3
                        *
1                                          HEC-1 INPUT                                          PAGE  3

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            75          KK   RC3
            76          KM   Route C3
            77          RD   11323    .023    .030           TRAP      40      20
                        *

            78          KK   B8
            79          KM   Runoff from Basin 8
            80          BA   1.012
            81          LS       0    84.0
            82          UD    0.67
                        *

            83          KK   B9
            84          KM   Runoff from Basin 9
            85          BA   0.242
            86          LS       0    85.5
            87          UD    0.26
                        *

            88          KK   B10
            89          KM   Runoff from Basin 10
            90          BA   0.129
            91          LS       0    86.7
            92          UD    0.18
                        *

            93          KK   C4
            94          KM   Combine B9, B10
            95          HC       2
                        *

            96          KK   RC4
            97          KM   Route C4
            98          RD    3380    .037    .030           TRAP      40      20
                        *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:53:04   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

50-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL    1.20 HOURS
                       TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 112 KK    *     Call   *
           *            *
           **************
                        Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
                                *                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
    1     0000    1        0.   *    1     1536   14       196.   *    2     0712   27        0.   *    2     2248   40        0.
    1     0112    2        0.   *    1     1648   15       174.   *    2     0824   28        0.   *    3     0000   41        0.
    1     0224    3        0.   *    1     1800   16       165.   *    2     0936   29        0.   *    3     0112   42        0.
    1     0336    4        0.   *    1     1912   17       150.   *    2     1048   30        0.   *    3     0224   43        0.
    1     0448    5        0.   *    1     2024   18       142.   *    2     1200   31        0.   *    3     0336   44        0.
    1     0600    6        1.   *    1     2136   19       140.   *    2     1312   32        0.   *    3     0448   45        0.
    1     0712    7       12.   *    1     2248   20       141.   *    2     1424   33        0.   *    3     0600   46        0.
    1     0824    8       85.   *    2     0000   21       129.   *    2     1536   34        0.   *    3     0712   47        0.
    1     0936    9      398.   *    2     0112   22        69.   *    2     1648   35        0.   *    3     0824   48        0.
    1     1048   10      506.   *    2     0224   23        28.   *    2     1800   36        0.   *    3     0936   49        0.
    1     1200   11      362.   *    2     0336   24         9.   *    2     1912   37        0.   *    3     1048   50        0.
    1     1312   12      268.   *    2     0448   25         3.   *    2     2024   38        0.   *
    1     1424   13      223.   *    2     0600   26         1.   *    2     2136   39        0.   *
                                *                                *                                *
*****************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR        72-HR     58.80-HR
+   (CFS)       (HR)
                      (CFS)
+     506.     10.80                338.         160.          65.          65.
                    (INCHES)      .662        1.254        1.255        1.255
                     (AC-FT)      167.         317.         317.         317.

                     CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 115 KK    *     Cove   *     Reservoir
           *            *
           **************
                        Routing through Res'v

              HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                  3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1	2024		18	33.	6079.1	5547.4	2	1648		35	33.	6079.8	5547.4
1	0112		2	0.	5844.8	5545.5	1	2136		19	34.	6089.8	5547.5	2	1800		36	33.	6076.5	5547.4
1	0224		3	0.	5844.8	5545.5	1	2248		20	34.	6100.3	5547.6	2	1912		37	32.	6073.3	5547.4
1	0336		4	0.	5844.8	5545.5	2	0000		21	35.	6110.3	5547.7	2	2024		38	32.	6070.1	5547.4
1	0448		5	0.	5844.8	5545.5	2	0112		22	35.	6116.6	5547.7	2	2136		39	32.	6067.0	5547.3
1	0600		6	0.	5844.8	5545.5	2	0224		23	35.	6117.8	5547.7	2	2248		40	32.	6063.8	5547.3
1	0712		7	2.	5845.4	5545.5	2	0336		24	35.	6116.1	5547.7	3	0000		41	31.	6060.7	5547.3
1	0824		8	5.	5849.9	5545.5	2	0448		25	35.	6113.2	5547.7	3	0112		42	31.	6057.6	5547.2
1	0936		9	11.	5873.1	5545.7	2	0600		26	35.	6109.9	5547.7	3	0224		43	31.	6054.5	5547.2
1	1048		10	18.	5916.5	5546.1	2	0712		27	35.	6106.5	5547.7	3	0336		44	31.	6051.4	5547.2
1	1200		11	23.	5957.5	5546.4	2	0824		28	34.	6103.1	5547.6	3	0448		45	31.	6048.4	5547.2
1	1312		12	25.	5986.4	5546.7	2	0936		29	34.	6099.8	5547.6	3	0600		46	30.	6045.3	5547.1
1	1424		13	27.	6008.1	5546.8	2	1048		30	34.	6096.4	5547.6	3	0712		47	30.	6042.4	5547.1
1	1536		14	29.	6026.1	5547.0	2	1200		31	34.	6093.0	5547.5	3	0824		48	30.	6039.4	5547.1
1	1648		15	30.	6041.5	5547.1	2	1312		32	34.	6089.7	5547.5	3	0936		49	30.	6036.4	5547.1
1	1800		16	31.	6055.3	5547.2	2	1424		33	33.	6086.3	5547.5	3	1048		50	29.	6033.5	5547.1
1	1912		17	32.	6067.8	5547.3	2	1536		34	33.	6083.1	5547.5							

PEAK OUTFLOW IS 35. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 35.	26.40	35.	34.	27.	27.
		(INCHES) .069	.267	.509	.509
		(AC-FT) 17.	67.	129.	129.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
6118.	26.40	6115.	6097.	6028.	6028.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5547.74	26.40	5547.72	5547.57	5547.00	5547.00

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	42.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	39.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	36.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	20.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	95.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	89.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	39.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	73.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	201.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	198.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	24.
				TIME	9.60
HYDROGRAPH AT					
+	B7	.33	1	FLOW	33.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	254.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	226.
				TIME	10.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	156.
				TIME	10.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	43.
				TIME	9.60
HYDROGRAPH AT					
+	B10	.13	1	FLOW	24.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	67.
				TIME	9.60
ROUTED TO					
+	RC4	.37	1	FLOW	63.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	47.
				TIME	9.60
4 COMBINED AT					
+	C5	4.61	1	FLOW	489.
				TIME	10.80

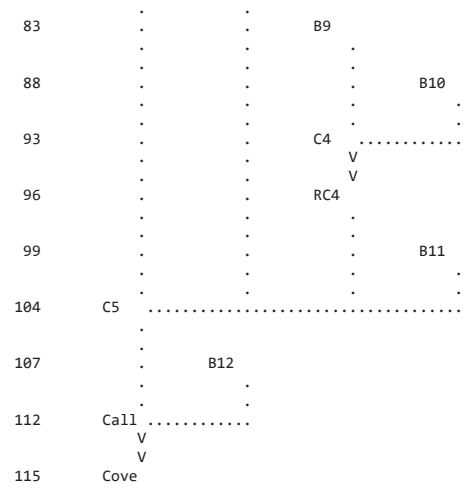
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          17.
                                            TIME        10.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW         506.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          35.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5547.74
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE        10.80     41.28    669.60       .93     72.00     39.32    648.00         .94


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2506E+02 EXCESS= .0000E+00 OUTFLOW= .2507E+02 BASIN STORAGE= .3252E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE        10.80     93.85    669.60       .91     72.00     89.39    648.00         .92


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5909E+02 EXCESS= .0000E+00 OUTFLOW= .5910E+02 BASIN STORAGE= .3497E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE         4.52    199.61    651.21       .95     72.00    197.63    648.00         .95


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1257E+03 EXCESS= .0000E+00 OUTFLOW= .1257E+03 BASIN STORAGE= .3088E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE        18.00    247.22    666.00      1.01     72.00    225.83    648.00        1.01


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1584E+03 EXCESS= .0000E+00 OUTFLOW= .1585E+03 BASIN STORAGE= .1185E-01 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE        11.21     66.99    594.15      1.78     72.00     62.77    648.00        1.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3515E+02 EXCESS= .0000E+00 OUTFLOW= .3516E+02 BASIN STORAGE= .2436E-02 PERCENT ERROR=    .0


1                               SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                              (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


       PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                 ELEVATION         5545.50           5549.20          5552.00
                                 STORAGE             5845.             6508.            7347.
                                 OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5547.74         .00       6118.        35.        .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 6. 100-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:53:31  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX          X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   100-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    3.51
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:53:31   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

100-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL    1.20 HOURS
                       TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 112 KK    *     Call   *
           *            *
           **************
                        Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
                                *                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
    1     0000    1        0.   *    1     1536   14       233.   *    2     0712   27        0.   *    2     2248   40        0.
    1     0112    2        0.   *    1     1648   15       206.   *    2     0824   28        0.   *    3     0000   41        0.
    1     0224    3        0.   *    1     1800   16       194.   *    2     0936   29        0.   *    3     0112   42        0.
    1     0336    4        0.   *    1     1912   17       177.   *    2     1048   30        0.   *    3     0224   43        0.
    1     0448    5        0.   *    1     2024   18       167.   *    2     1200   31        0.   *    3     0336   44        0.
    1     0600    6        3.   *    1     2136   19       165.   *    2     1312   32        0.   *    3     0448   45        0.
    1     0712    7       20.   *    1     2248   20       165.   *    2     1424   33        0.   *    3     0600   46        0.
    1     0824    8      116.   *    2     0000   21       150.   *    2     1536   34        0.   *    3     0712   47        0.
    1     0936    9      519.   *    2     0112   22        79.   *    2     1648   35        0.   *    3     0824   48        0.
    1     1048   10      632.   *    2     0224   23        32.   *    2     1800   36        0.   *    3     0936   49        0.
    1     1200   11      442.   *    2     0336   24        11.   *    2     1912   37        0.   *    3     1048   50        0.
    1     1312   12      321.   *    2     0448   25         3.   *    2     2024   38        0.   *
    1     1424   13      265.   *    2     0600   26         1.   *    2     2136   39        0.   *
                                *                                *                                *
*****************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR        72-HR     58.80-HR
+   (CFS)       (HR)
                        (CFS)
+     632.     10.80                  421.         195.          80.          80.
                       (INCHES)      .826        1.529        1.530        1.530
                        (AC-FT)      209.         387.         387.         387.

                        CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 115 KK    *     Cove   *     Reservoir
           *            *
           **************
                        Routing through Res'v

              HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                  3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		2024	18	36.	6135.3	5547.9	2		1648	35	37.	6140.0	5547.9
1		0112	2	0.	5844.8	5545.5	1		2136	19	37.	6148.0	5548.0	2		1800	36	37.	6136.3	5547.9
1		0224	3	0.	5844.8	5545.5	1		2248	20	38.	6160.7	5548.0	2		1912	37	36.	6132.7	5547.9
1		0336	4	0.	5844.8	5545.5	2		0000	21	38.	6172.5	5548.1	2		2024	38	36.	6129.2	5547.8
1		0448	5	0.	5844.8	5545.5	2		0112	22	38.	6180.1	5548.1	2		2136	39	36.	6125.6	5547.8
1		0600	6	1.	5845.0	5545.5	2		0224	23	38.	6181.9	5548.1	2		2248	40	36.	6122.0	5547.8
1		0712	7	2.	5846.0	5545.5	2		0336	24	38.	6180.1	5548.1	3		0000	41	35.	6118.5	5547.7
1		0824	8	6.	5852.3	5545.6	2		0448	25	38.	6177.1	5548.1	3		0112	42	35.	6115.0	5547.7
1		0936	9	13.	5882.9	5545.8	2		0600	26	38.	6173.4	5548.1	3		0224	43	35.	6111.5	5547.7
1		1048	10	21.	5938.3	5546.3	2		0712	27	38.	6169.8	5548.1	3		0336	44	35.	6108.1	5547.7
1		1200	11	26.	5989.3	5546.7	2		0824	28	38.	6166.0	5548.1	3		0448	45	35.	6104.6	5547.6
1		1312	12	29.	6024.4	5547.0	2		0936	29	38.	6162.2	5548.0	3		0600	46	34.	6101.2	5547.6
1		1424	13	31.	6050.6	5547.2	2		1048	30	38.	6158.4	5548.0	3		0712	47	34.	6097.9	5547.6
1		1536	14	32.	6072.1	5547.4	2		1200	31	37.	6154.7	5548.0	3		0824	48	34.	6094.5	5547.6
1		1648	15	34.	6090.6	5547.5	2		1312	32	37.	6151.0	5548.0	3		0936	49	34.	6091.1	5547.5
1		1800	16	35.	6107.0	5547.7	2		1424	33	37.	6147.3	5548.0	3		1048	50	33.	6087.8	5547.5
1		1912	17	36.	6121.9	5547.8	2		1536	34	37.	6143.7	5548.0							

PEAK OUTFLOW IS 38. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 38.	26.40	38.	37.	30.	30.
		(INCHES) .075	.294	.568	.568
		(AC-FT) 19.	74.	144.	144.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
6182.	26.40	6178.	6158.	6075.	6075.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5548.11	26.40	5548.10	5548.02	5547.36	5547.36

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	54.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	51.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	46.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	27.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	124.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	118.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	50.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	92.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	260.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	257.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	30.
				TIME	9.60
HYDROGRAPH AT					
+	B7	.33	1	FLOW	41.
				TIME	10.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	326.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	298.
				TIME	10.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	190.
				TIME	9.60
HYDROGRAPH AT					
+	B9	.24	1	FLOW	51.
				TIME	9.60
HYDROGRAPH AT					
+	B10	.13	1	FLOW	29.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	81.
				TIME	9.60
ROUTED TO					
+	RC4	.37	1	FLOW	74.
				TIME	10.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	57.
				TIME	9.60
4 COMBINED AT					
+	C5	4.61	1	FLOW	611.
				TIME	10.80

```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          21.
                                            TIME         9.60

  2 COMBINED AT
+                  Call        4.74     1   FLOW         632.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          38.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5548.11
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE        10.80     52.87    669.60      1.17     72.00     51.47    648.00        1.18


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3151E+02 EXCESS= .0000E+00 OUTFLOW= .3152E+02 BASIN STORAGE= .3618E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE        10.80    122.15    658.80      1.15     72.00    118.32    648.00        1.15


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7446E+02 EXCESS= .0000E+00 OUTFLOW= .7448E+02 BASIN STORAGE= .3965E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         4.12    258.94    650.80      1.19     72.00    257.20    648.00        1.20


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1578E+03 EXCESS= .0000E+00 OUTFLOW= .1578E+03 BASIN STORAGE= .3030E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE        18.00    321.28    666.00      1.25     72.00    298.28    648.00        1.26


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1975E+03 EXCESS= .0000E+00 OUTFLOW= .1976E+03 BASIN STORAGE= .8525E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC4    MANE        10.64     80.58    595.79      2.10     72.00     74.24    648.00        2.11


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4157E+02 EXCESS= .0000E+00 OUTFLOW= .4158E+02 BASIN STORAGE= .3047E-02 PERCENT ERROR=    .0


1                              SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                             (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                ELEVATION         5545.50           5549.20          5552.00
                                STORAGE             5845.             6508.            7347.
                                OUTFLOW                0.               45.              435.


                       RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                         OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                        PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                       1.00      5548.11         .00       6182.        38.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 7. 500-year, 24-hour

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:53:56  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   500-YR, 24-HR, AMC II
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    4.69
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
 99          KK   B11
100          KM   Runoff from Basin 11
101          BA   0.279
102          LS       0    84.8
103          UD    0.39
             *

104          KK   C5
105          KM   Combine RC3, B8, RC4, B11
106          HC       4
             *

107          KK   B12
108          KM   Runoff from Basin 12
109          BA   0.127
110          LS       0    81.2
111          UD    0.40
             *
```

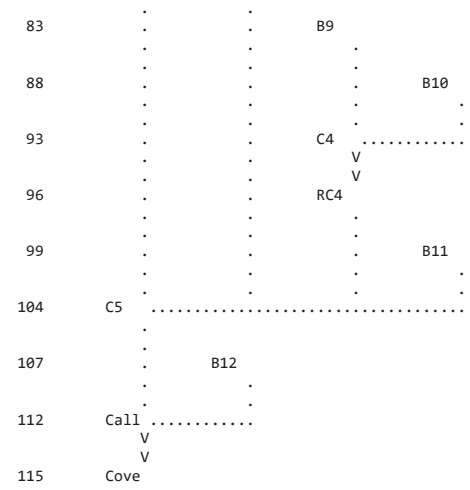


```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


112          KK   Call
113          KM   Combine C5, B12
114          HC       2
             *

115          KK   Cove Reservoir
116          KM   Routing through Res'v
117          RS       1    ELEV  5545.5
118          SV       0      19      95     240     453     738    1105    1563    2217    2773
119          SV    3542    4423    5419    6149    7347    8000
120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
121          SE    5530    5536    5542    5548    5552    5558
122          SL  5545.5   4.909     0.6     0.5
123          SS  5549.2      30    2.67     1.5
124          ST  5552.0    1892     2.9     1.5
             *
125          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     18      B1
                 V
                 V
     27      RB1
                 .
                 .
     30          .       B2
                 .           .
                 .           .
     35          .           .       B3
                 .           .           .
                 .           .           .
     40      C1   ........................
                 V
                 V
     43      RC1
                 .
                 .
     46          .       B4
                 .           .
                 .           .
     51          .           .       B5
                 .           .           .
                 .           .           .
     56      C2   ........................
                 V
                 V
     59      RC2
                 .
                 .
     62          .       B6
                 .           .
                 .           .
     67          .           .       B7
                 .           .           .
                 .           .           .
     72      C3   ........................
                 V
                 V
     75      RC3
                 .
                 .
     78          .       B8
                 .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:53:56   *                    *          (916) 756-1104               *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

500-YR, 24-HR, AMC II

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.20 HOURS
                        TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                        *                                        *                                        *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                        *                                        *                                        *
    1     0000    1        0.   *    1     1536   14      352.   *    2     0712   27        0.   *    2     2248   40        0.
    1     0112    2        0.   *    1     1648   15      309.   *    2     0824   28        0.   *    3     0000   41        0.
    1     0224    3        0.   *    1     1800   16      291.   *    2     0936   29        0.   *    3     0112   42        0.
    1     0336    4        0.   *    1     1912   17      263.   *    2     1048   30        0.   *    3     0224   43        0.
    1     0448    5        2.   *    1     2024   18      247.   *    2     1200   31        0.   *    3     0336   44        0.
    1     0600    6       17.   *    1     2136   19      244.   *    2     1312   32        0.   *    3     0448   45        0.
    1     0712    7       55.   *    1     2248   20      244.   *    2     1424   33        0.   *    3     0600   46        0.
    1     0824    8      257.   *    2     0000   21      221.   *    2     1536   34        0.   *    3     0712   47        0.
    1     0936    9      937.   *    2     0112   22      114.   *    2     1648   35        0.   *    3     0824   48        0.
    1     1048   10     1064.   *    2     0224   23       43.   *    2     1800   36        0.   *    3     0936   49        0.
    1     1200   11      711.   *    2     0336   24       13.   *    2     1912   37        0.   *    3     1048   50        0.
    1     1312   12      497.   *    2     0448   25        3.   *    2     2024   38        0.   *
    1     1424   13      404.   *    2     0600   26        1.   *    2     2136   39        0.   *
                                        *                                        *                                        *
*****************************************************************************************************************************

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     58.80-HR
+   (CFS)       (HR)
                          (CFS)
+    1064.     10.80                708.        314.        128.         128.
                        (INCHES)     1.388       2.465       2.466        2.466
                         (AC-FT)      351.        623.        624.         624.

                         CUMULATIVE AREA =    4.74 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1	2024		18	42.	6333.4	5548.6	2	1648		35	42.	6361.0	5548.7
1	0112		2	0.	5844.8	5545.5	1	2136		19	42.	6353.6	5548.7	2	1800		36	42.	6356.8	5548.7
1	0224		3	0.	5844.8	5545.5	1	2248		20	43.	6373.6	5548.8	2	1912		37	42.	6352.6	5548.7
1	0336		4	0.	5844.8	5545.5	2	0000		21	43.	6392.5	5548.8	2	2024		38	42.	6348.3	5548.7
1	0448		5	1.	5845.0	5545.5	2	0112		22	43.	6404.8	5548.9	2	2136		39	42.	6344.2	5548.7
1	0600		6	2.	5845.8	5545.5	2	0224		23	43.	6408.3	5548.9	2	2248		40	42.	6340.1	5548.6
1	0712		7	4.	5849.1	5545.5	2	0336		24	43.	6406.8	5548.9	3	0000		41	42.	6336.0	5548.6
1	0824		8	9.	5863.8	5545.7	2	0448		25	43.	6403.3	5548.8	3	0112		42	42.	6331.9	5548.6
1	0936		9	19.	5921.6	5546.1	2	0600		26	43.	6399.2	5548.8	3	0224		43	42.	6327.9	5548.6
1	1048		10	28.	6018.5	5546.9	2	0712		27	43.	6395.0	5548.8	3	0336		44	41.	6323.8	5548.6
1	1200		11	34.	6103.4	5547.6	2	0824		28	43.	6390.7	5548.8	3	0448		45	41.	6319.7	5548.6
1	1312		12	38.	6159.7	5548.0	2	0936		29	43.	6386.5	5548.8	3	0600		46	41.	6315.6	5548.6
1	1424		13	39.	6200.6	5548.2	2	1048		30	43.	6382.3	5548.8	3	0712		47	41.	6311.5	5548.5
1	1536		14	39.	6234.3	5548.3	2	1200		31	43.	6378.0	5548.8	3	0824		48	41.	6307.4	5548.5
1	1648		15	40.	6263.1	5548.4	2	1312		32	43.	6373.8	5548.8	3	0936		49	41.	6303.3	5548.5
1	1800		16	41.	6288.8	5548.5	2	1424		33	42.	6369.5	5548.7	3	1048		50	41.	6299.2	5548.5
1	1912		17	41.	6312.2	5548.5	2	1536		34	42.	6365.3	5548.7							

PEAK OUTFLOW IS 43. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 43.	26.40	43.	43.	35.	35.
		(INCHES) .085	.335	.670	.670
		(AC-FT) 21.	85.	169.	169.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
6408.	26.40	6404.	6380.	6245.	6245.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5548.87	26.40	5548.85	5548.77	5548.06	5548.06

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	95.
				TIME	10.80
ROUTED TO					
+	RB1	.50	1	FLOW	96.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	82.
				TIME	10.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	49.
				TIME	10.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	227.
				TIME	10.80
ROUTED TO					
+	RC1	1.22	1	FLOW	221.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	88.
				TIME	10.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	161.
				TIME	10.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	469.
				TIME	10.80
ROUTED TO					
+	RC2	2.48	1	FLOW	467.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	48.
				TIME	9.60
HYDROGRAPH AT					
+	B7	.33	1	FLOW	70.
				TIME	9.60
3 COMBINED AT					
+	C3	2.95	1	FLOW	579.
				TIME	10.80
ROUTED TO					
+	RC3	2.95	1	FLOW	555.
				TIME	10.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	307.
				TIME	9.60
HYDROGRAPH AT					
+	B9	.24	1	FLOW	81.
				TIME	9.60
HYDROGRAPH AT					
+	B10	.13	1	FLOW	45.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	126.
				TIME	9.60
ROUTED TO					
+	RC4	.37	1	FLOW	117.
				TIME	9.60
HYDROGRAPH AT					
+	B11	.28	1	FLOW	91.
				TIME	9.60
4 COMBINED AT					
+	C5	4.61	1	FLOW	1031.
				TIME	10.80

```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          36.
                                            TIME         9.60

  2 COMBINED AT
+                  Call        4.74     1   FLOW        1064.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          43.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5548.87
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE        14.40     95.90    648.00      2.02     72.00     95.90    648.00        2.04


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5431E+02 EXCESS= .0000E+00 OUTFLOW= .5432E+02 BASIN STORAGE= .4285E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE        13.43    223.85    658.04      1.99     72.00    220.85    648.00        2.00


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1292E+03 EXCESS= .0000E+00 OUTFLOW= .1293E+03 BASIN STORAGE= .3778E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         3.33    467.63    649.64      2.05     72.00    466.77    648.00        2.06


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2710E+03 EXCESS= .0000E+00 OUTFLOW= .2710E+03 BASIN STORAGE= .3014E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE        21.60    572.39    669.60      2.13     72.00    554.87    648.00        2.13


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3352E+03 EXCESS= .0000E+00 OUTFLOW= .3354E+03 BASIN STORAGE= .1060E-01 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC4    MANE         9.39    125.40    591.38      3.17     72.00    117.08    576.00        3.18


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6274E+02 EXCESS= .0000E+00 OUTFLOW= .6274E+02 BASIN STORAGE= .2980E-02 PERCENT ERROR=    .0


1                               SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                              (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


       PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                 ELEVATION         5545.50           5549.20          5552.00
                                 STORAGE             5845.             6508.            7347.
                                 OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5548.87         .00       6408.        43.        .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 8. 100-year, 6-hour AMC III

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:54:27  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   100-YR, 6-HR, AMC III
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      18       0       0      50
           16          IO       0
           17          IN      18
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    2.75
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    86.0
           26          UD    0.34
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    85.8
           34          UD    0.34
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    84.9
           39          UD    0.25
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
 40          KK   C1
 41          KM   Combine RB1, B2, B3
 42          HC       3
             *

 43          KK   RC1
 44          KM   Route RC1
 45          RD    7255    .060    .030           TRAP      20      20
             *

 46          KK   B4
 47          KM   Runoff from Basin 4
 48          BA   0.453
 49          LS       0    86.3
 50          UD    0.32
             *

 51          KK   B5
 52          KM   Runoff from Basin 5
 53          BA   0.805
 54          LS       0    86.8
 55          UD    0.42
             *

 56          KK   C2
 57          KM   Combine RC1, B4, B5
 58          HC       3
             *

 59          KK   RC2
 60          KM   Route C2
 61          RD    2380    .039    .030           TRAP      40       2
             *

 62          KK   B6
 63          KM   Runoff from Basin 6
 64          BA   0.150
 65          LS       0    92.5
 66          UD    0.14
             *

 67          KK   B7
 68          KM   Runoff from Basin 7
 69          BA   0.327
 70          LS       0    87.8
 71          UD    0.31
             *

 72          KK   C3
 73          KM   Combine RC2, B6, B7
 74          HC       3
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 75          KK   RC3
 76          KM   Route C3
 77          RD   11323    .023    .030           TRAP      40      20
             *

 78          KK   B8
 79          KM   Runoff from Basin 8
 80          BA   1.012
 81          LS       0    92.4
 82          UD    0.48
             *

 83          KK   B9
 84          KM   Runoff from Basin 9
 85          BA   0.242
 86          LS       0    93.1
 87          UD    0.19
             *

 88          KK   B10
 89          KM   Runoff from Basin 10
 90          BA   0.129
 91          LS       0    93.7
 92          UD    0.14
             *

 93          KK   C4
 94          KM   Combine B9, B10
 95          HC       2
             *

 96          KK   RC4
 97          KM   Route C4
 98          RD    3380    .037    .030           TRAP      40      20
             *
```

```
 99          KK   B11
100          KM   Runoff from Basin 11
101          BA   0.279
102          LS       0    92.8
103          UD    0.28
             *

104          KK   C5
105          KM   Combine RC3, B8, RC4, B11
106          HC       4
             *

107          KK   B12
108          KM   Runoff from Basin 12
109          BA   0.127
110          LS       0    90.9
111          UD    0.28
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


112          KK   Call
113          KM   Combine C5, B12
114          HC       2
             *

115          KK   Cove Reservoir
116          KM   Routing through Res'v
117          RS       1    ELEV  5545.5
118          SV       0      19      95     240     453     738    1105    1563    2217    2773
119          SV    3542    4423    5419    6149    7347    8000
120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
121          SE    5530    5536    5542    5548    5552    5558
122          SL  5545.5   4.909     0.6     0.5
123          SS  5549.2      30    2.67     1.5
124          ST  5552.0    1892     2.9     1.5
             *
125          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     18      B1
                 V
                 V
     27      RB1
                 .
                 .
     30          .       B2
                 .           .
                 .           .
     35          .           .       B3
                 .           .           .
                 .           .           .
     40      C1   ........................
                 V
                 V
     43      RC1
                 .
                 .
     46          .       B4
                 .           .
                 .           .
     51          .           .       B5
                 .           .           .
                 .           .           .
     56      C2   ........................
                 V
                 V
     59      RC2
                 .
                 .
     62          .       B6
                 .           .
                 .           .
     67          .           .       B7
                 .           .           .
                 .           .           .
     72      C3   ........................
                 V
                 V
     75      RC3
                 .
                 .
     78          .       B8
                 .           .
```

```
               .           .
   83          .           .       B9
               .           .           .
               .           .           .
   88          .           .           .       B10
               .           .           .           .
               .           .           .           .
   93          .           .       C4   ...........
               .           .           V
               .           .           V
   96          .           .       RC4
               .           .           .
               .           .           .
   99          .           .           .       B11
               .           .           .           .
               .           .           .           .
  104      C5   ..................................
               .
               .
  107          .       B12
               .           .
               .           .
  112      Call ...........
               V
               V
  115      Cove

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   06AUG20  TIME  02:54:27   *
 *                                       *
 *****************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

```
                          HYDROLOGY STUDY for COVE RESERVOIR
                          Located in KANE COUNTY, UTAH

                          AUG 2020

                          PREPARED BY ALPHA ENGINEERING
                          43 SOUTH 100 EAST, SUITE 100
                          ST. GEORGE, UTAH  84770
                          TEL: (435) 628-6500
                          FAX: (435) 628-6553

                          100-YR, 6-HR, AMC III


  16 IO         OUTPUT CONTROL VARIABLES
                      IPRNT          0  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN         18  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ         50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME       1442  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .30 HOURS
                      TOTAL TIME BASE   14.70 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                   1.00


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                    *                                    *                                    *
   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW
                                    *                                    *                                    *
    1     0000    1        0.       *    1     0354   14     1248.       *    1     0748   27       53.       *    1     1142   40        0.
    1     0018    2        0.       *    1     0412   15     1032.       *    1     0806   28       30.       *    1     1200   41        0.
    1     0036    3        0.       *    1     0430   16      892.       *    1     0824   29       15.       *    1     1218   42        0.
    1     0054    4        1.       *    1     0448   17      796.       *    1     0842   30        8.       *    1     1236   43        0.
    1     0112    5       10.       *    1     0506   18      719.       *    1     0900   31        4.       *    1     1254   44        0.
    1     0130    6       39.       *    1     0524   19      668.       *    1     0918   32        2.       *    1     1312   45        0.
    1     0148    7      106.       *    1     0542   20      638.       *    1     0936   33        1.       *    1     1330   46        0.
    1     0206    8      321.       *    1     0600   21      611.       *    1     0954   34        0.       *    1     1348   47        0.
    1     0224    9      883.       *    1     0618   22      529.       *    1     1012   35        0.       *    1     1406   48        0.
    1     0242   10     1826.       *    1     0636   23      386.       *    1     1030   36        0.       *    1     1424   49        0.
    1     0300   11     2280.       *    1     0654   24      254.       *    1     1048   37        0.       *    1     1442   50        0.
    1     0318   12     1978.       *    1     0712   25      156.       *    1     1106   38        0.       *
    1     0336   13     1550.       *    1     0730   26       95.       *    1     1124   39        0.       *
                                    *                                    *                                    *
*****************************************************************************************************************************

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     14.70-HR
+   (CFS)       (HR)
                         (CFS)
+    2280.      3.00                 847.        350.        350.         350.
                        (INCHES)     1.661       1.679       1.679        1.679
                         (AC-FT)      420.        425.        425.         425.

                         CUMULATIVE AREA =    4.74 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		0506	18	38.	6168.2	5548.1	1		1012	35	40.	6245.8	5548.3
1		0018	2	0.	5844.8	5545.5	1		0524	19	38.	6184.4	5548.1	1		1030	36	40.	6244.8	5548.3
1		0036	3	0.	5844.8	5545.5	1		0542	20	39.	6199.6	5548.2	1		1048	37	40.	6243.8	5548.3
1		0054	4	0.	5844.8	5545.5	1		0600	21	39.	6214.1	5548.2	1		1106	38	40.	6242.7	5548.3
1		0112	5	1.	5845.0	5545.5	1		0618	22	39.	6227.2	5548.3	1		1124	39	40.	6241.7	5548.3
1		0130	6	2.	5845.5	5545.5	1		0636	23	39.	6237.6	5548.3	1		1142	40	40.	6240.7	5548.3
1		0148	7	3.	5847.3	5545.5	1		0654	24	40.	6244.6	5548.3	1		1200	41	40.	6239.7	5548.3
1		0206	8	6.	5852.4	5545.6	1		0712	25	40.	6248.7	5548.3	1		1218	42	40.	6238.6	5548.3
1		0224	9	10.	5867.2	5545.7	1		0730	26	40.	6250.9	5548.3	1		1236	43	39.	6237.6	5548.3
1		0242	10	16.	5900.4	5546.0	1		0748	27	40.	6251.8	5548.3	1		1254	44	39.	6236.6	5548.3
1		0300	11	22.	5950.9	5546.4	1		0806	28	40.	6251.8	5548.3	1		1312	45	39.	6235.6	5548.3
1		0318	12	27.	6003.0	5546.8	1		0824	29	40.	6251.4	5548.3	1		1330	46	39.	6234.6	5548.3
1		0336	13	30.	6046.0	5547.2	1		0842	30	40.	6250.6	5548.3	1		1348	47	39.	6233.5	5548.3
1		0354	14	33.	6080.0	5547.4	1		0900	31	40.	6249.8	5548.3	1		1406	48	39.	6232.5	5548.3
1		0412	15	35.	6107.4	5547.7	1		0918	32	40.	6248.9	5548.3	1		1424	49	39.	6231.5	5548.3
1		0430	16	36.	6130.3	5547.8	1		0936	33	40.	6247.9	5548.3	1		1442	50	39.	6230.5	5548.3
1		0448	17	37.	6150.3	5548.0	1		0954	34	40.	6246.8	5548.3							

PEAK OUTFLOW IS 40. AT TIME 7.80 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	14.70-HR
+ (CFS)	(HR)				
		(CFS)			
+ 40.	7.80	40.	31.	31.	31.
		(INCHES) .078	.151	.151	.151
		(AC-FT) 20.	38.	38.	38.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	14.70-HR
+ (AC-FT)	(HR)				
6252.	7.80	6246.	6138.	6138.	6138.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	14.70-HR
+ (FEET)	(HR)				
5548.34	7.80	5548.32	5547.63	5547.63	5547.63

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	252.
				TIME	2.70
ROUTED TO					
+	RB1	.50	1	FLOW	245.
				TIME	3.00
HYDROGRAPH AT					
+	B2	.44	1	FLOW	216.
				TIME	2.70
HYDROGRAPH AT					
+	B3	.28	1	FLOW	142.
				TIME	2.70
3 COMBINED AT					
+	C1	1.22	1	FLOW	542.
				TIME	2.70
ROUTED TO					
+	RC1	1.22	1	FLOW	538.
				TIME	3.00
HYDROGRAPH AT					
+	B4	.45	1	FLOW	237.
				TIME	2.70
HYDROGRAPH AT					
+	B5	.81	1	FLOW	376.
				TIME	2.70
3 COMBINED AT					
+	C2	2.48	1	FLOW	1100.
				TIME	3.00
ROUTED TO					
+	RC2	2.48	1	FLOW	1090.
				TIME	3.00
HYDROGRAPH AT					
+	B6	.15	1	FLOW	128.
				TIME	2.40
HYDROGRAPH AT					
+	B7	.33	1	FLOW	188.
				TIME	2.70
3 COMBINED AT					
+	C3	2.95	1	FLOW	1294.
				TIME	3.00
ROUTED TO					
+	RC3	2.95	1	FLOW	1250.
				TIME	3.30
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	620.
				TIME	3.00
HYDROGRAPH AT					
+	B9	.24	1	FLOW	196.
				TIME	2.40
HYDROGRAPH AT					
+	B10	.13	1	FLOW	118.
				TIME	2.40
2 COMBINED AT					
+	C4	.37	1	FLOW	314.
				TIME	2.40
ROUTED TO					
+	RC4	.37	1	FLOW	290.
				TIME	2.70
HYDROGRAPH AT					
+	B11	.28	1	FLOW	212.
				TIME	2.70
4 COMBINED AT					
+	C5	4.61	1	FLOW	2218.
				TIME	3.00

```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          88.
                                            TIME         2.70

  2 COMBINED AT
+                  Call        4.74     1   FLOW        2280.
                                            TIME         3.00

 ROUTED TO
+                  Cove        4.74     1   FLOW          40.
                                            TIME         7.80

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5548.34
                                            TIME         7.80
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                  COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE         4.50    251.41    175.50      1.45     18.00    245.28    180.00        1.45


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3891E+02 EXCESS= .0000E+00 OUTFLOW= .3894E+02 BASIN STORAGE= .4659E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE         4.50    551.33    175.50      1.43     18.00    538.17    180.00        1.42


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9271E+02 EXCESS= .0000E+00 OUTFLOW= .9275E+02 BASIN STORAGE= .3503E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE         2.45   1093.25    181.44      1.46     18.00   1089.58    180.00        1.46


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+03 EXCESS= .0000E+00 OUTFLOW= .1925E+03 BASIN STORAGE= .2883E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE         7.20   1313.52    187.20      1.50     18.00   1250.30    198.00        1.50


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2363E+03 EXCESS= .0000E+00 OUTFLOW= .2366E+03 BASIN STORAGE= .1038E-01 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE         5.40    310.06    156.60      2.04     18.00    289.52    162.00        2.04


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4045E+02 EXCESS= .0000E+00 OUTFLOW= .4046E+02 BASIN STORAGE= .2901E-02 PERCENT ERROR=    .0


1                               SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                              (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                 ELEVATION        5545.50           5549.20          5552.00
                                 STORAGE             5845.             6508.            7347.
                                 OUTFLOW                0.               45.              435.


                       RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                         OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                        PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                       1.00      5548.34         .00       6252.        40.        .00         7.80         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 9. 100-year, 24-hour AMC III

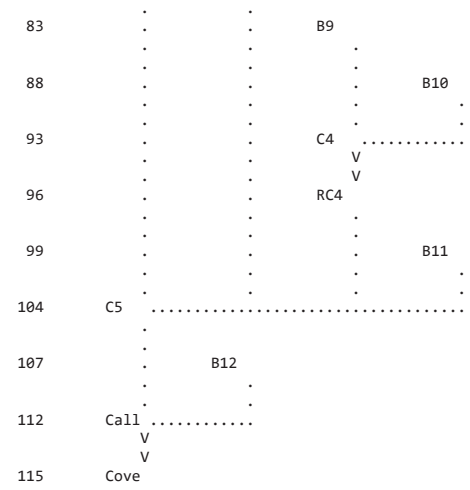
```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:55:10  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   100-YR, 24-HR, AMC III
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      72       0       0      50
           16          IO       0
           17          IN      72
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    3.51
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    86.0
           26          UD    0.34
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    85.8
           34          UD    0.34
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    84.9
           39          UD    0.25
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
 40          KK   C1
 41          KM   Combine RB1, B2, B3
 42          HC       3
             *

 43          KK   RC1
 44          KM   Route RC1
 45          RD    7255    .060    .030           TRAP      20      20
             *

 46          KK   B4
 47          KM   Runoff from Basin 4
 48          BA   0.453
 49          LS       0    86.3
 50          UD    0.32
             *

 51          KK   B5
 52          KM   Runoff from Basin 5
 53          BA   0.805
 54          LS       0    86.8
 55          UD    0.42
             *

 56          KK   C2
 57          KM   Combine RC1, B4, B5
 58          HC       3
             *

 59          KK   RC2
 60          KM   Route C2
 61          RD    2380    .039    .030           TRAP      40       2
             *

 62          KK   B6
 63          KM   Runoff from Basin 6
 64          BA   0.150
 65          LS       0    92.5
 66          UD    0.14
             *

 67          KK   B7
 68          KM   Runoff from Basin 7
 69          BA   0.327
 70          LS       0    87.8
 71          UD    0.31
             *

 72          KK   C3
 73          KM   Combine RC2, B6, B7
 74          HC       3
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 75          KK   RC3
 76          KM   Route C3
 77          RD   11323    .023    .030           TRAP      40      20
             *

 78          KK   B8
 79          KM   Runoff from Basin 8
 80          BA   1.012
 81          LS       0    92.4
 82          UD    0.48
             *

 83          KK   B9
 84          KM   Runoff from Basin 9
 85          BA   0.242
 86          LS       0    93.1
 87          UD    0.19
             *

 88          KK   B10
 89          KM   Runoff from Basin 10
 90          BA   0.129
 91          LS       0    93.7
 92          UD    0.14
             *

 93          KK   C4
 94          KM   Combine B9, B10
 95          HC       2
             *

 96          KK   RC4
 97          KM   Route C4
 98          RD    3380    .037    .030           TRAP      40      20
             *
```

```
             99           KK   B11
            100           KM   Runoff from Basin 11
            101           BA   0.279
            102           LS       0    92.8
            103           UD    0.28
                          *

            104           KK   C5
            105           KM   Combine RC3, B8, RC4, B11
            106           HC       4
                          *

            107           KK   B12
            108           KM   Runoff from Basin 12
            109           BA   0.127
            110           LS       0    90.9
            111           UD    0.28
                          *
1                                              HEC-1 INPUT                                                PAGE  4

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            112           KK   Call
            113           KM   Combine C5, B12
            114           HC       2
                          *

            115           KK   Cove Reservoir
            116           KM   Routing through Res'v
            117           RS       1    ELEV  5545.5
            118           SV       0      19      95     240     453     738    1105    1563    2217    2773
            119           SV    3542    4423    5419    6149    7347    8000
            120           SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
            121           SE    5530    5536    5542    5548    5552    5558
            122           SL  5545.5   4.909     0.6     0.5
            123           SS  5549.2      30    2.67     1.5
            124           ST  5552.0    1892     2.9     1.5
                          *
            125           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     18       B1
                  V
                  V
     27       RB1
                  .
                  .
     30           .       B2
                  .           .
                  .           .
     35           .           .       B3
                  .           .           .
                  .           .           .
     40       C1   .......................
                  V
                  V
     43       RC1
                  .
                  .
     46           .       B4
                  .           .
                  .           .
     51           .           .       B5
                  .           .           .
                  .           .           .
     56       C2   .......................
                  V
                  V
     59       RC2
                  .
                  .
     62           .       B6
                  .           .
                  .           .
     67           .           .       B7
                  .           .           .
                  .           .           .
     72       C3   .......................
                  V
                  V
     75       RC3
                  .
                  .
     78           .       B8
                  .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   06AUG20  TIME  02:55:10   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                   *
*************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

100-YR, 24-HR, AMC III

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          72  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3    0  ENDING DATE
                     NDTIME        1048  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.20 HOURS
                        TOTAL TIME BASE   58.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00
```

*** ***

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                  HYDROGRAPH AT STATION    Call
                                                      SUM OF  2 HYDROGRAPHS
                                                     PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                    *                                    *                                    *
   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW
                                    *                                    *                                    *
    1     0000    1        0.       *    1     1536   14      305.       *    2     0712   27        0.       *    2     2248   40        0.
    1     0112    2        0.       *    1     1648   15      266.       *    2     0824   28        0.       *    3     0000   41        0.
    1     0224    3        0.       *    1     1800   16      248.       *    2     0936   29        0.       *    3     0112   42        0.
    1     0336    4        6.       *    1     1912   17      223.       *    2     1048   30        0.       *    3     0224   43        0.
    1     0448    5       18.       *    1     2024   18      209.       *    2     1200   31        0.       *    3     0336   44        0.
    1     0600    6       44.       *    1     2136   19      205.       *    2     1312   32        0.       *    3     0448   45        0.
    1     0712    7      101.       *    1     2248   20      204.       *    2     1424   33        0.       *    3     0600   46        0.
    1     0824    8      371.       *    2     0000   21      185.       *    2     1536   34        0.       *    3     0712   47        0.
    1     0936    9     1026.       *    2     0112   22       96.       *    2     1648   35        0.       *    3     0824   48        0.
    1     1048   10     1031.       *    2     0224   23       37.       *    2     1800   36        0.       *    3     0936   49        0.
    1     1200   11      662.       *    2     0336   24       12.       *    2     1912   37        0.       *    3     1048   50        0.
    1     1312   12      453.       *    2     0448   25        3.       *    2     2024   38        0.       *
    1     1424   13      356.       *    2     0600   26        1.       *    2     2136   39        0.       *
                                    *                                    *                                    *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     58.80-HR
+   (CFS)       (HR)
                          (CFS)
+    1031.     10.80                 707.        302.        124.         124.
                        (INCHES)     1.386       2.372       2.377        2.377
                         (AC-FT)      351.        600.        601.         601.

                         CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	5844.8	5545.5	1		2024	18	42.	6325.1	5548.6	2		1648	35	42.	6337.5	5548.6
1	0112		2	0.	5844.8	5545.5	1		2136	19	42.	6341.5	5548.6	2		1800	36	42.	6333.4	5548.6
1	0224		3	0.	5844.8	5545.5	1		2248	20	42.	6357.5	5548.7	2		1912	37	42.	6329.3	5548.6
1	0336		4	1.	5845.1	5545.5	2		0000	21	43.	6372.6	5548.7	2		2024	38	42.	6325.2	5548.6
1	0448		5	2.	5846.1	5545.5	2		0112	22	43.	6382.3	5548.8	2		2136	39	41.	6321.1	5548.6
1	0600		6	4.	5848.8	5545.5	2		0224	23	43.	6384.6	5548.8	2		2248	40	41.	6317.0	5548.6
1	0712		7	7.	5855.4	5545.6	2		0336	24	43.	6382.8	5548.8	3		0000	41	41.	6312.9	5548.5
1	0824		8	12.	5877.9	5545.8	2		0448	25	43.	6379.3	5548.8	3		0112	42	41.	6308.8	5548.5
1	0936		9	21.	5945.5	5546.3	2		0600	26	43.	6375.2	5548.8	3		0224	43	41.	6304.7	5548.5
1	1048		10	30.	6044.9	5547.1	2		0712	27	43.	6371.0	5548.7	3		0336	44	41.	6300.7	5548.5
1	1200		11	36.	6125.6	5547.8	2		0824	28	42.	6366.8	5548.7	3		0448	45	41.	6296.6	5548.5
1	1312		12	38.	6177.2	5548.1	2		0936	29	42.	6362.5	5548.7	3		0600	46	41.	6292.5	5548.5
1	1424		13	39.	6213.5	5548.2	2		1048	30	42.	6358.3	5548.7	3		0712	47	41.	6288.4	5548.5
1	1536		14	40.	6242.4	5548.3	2		1200	31	42.	6354.0	5548.7	3		0824	48	41.	6284.3	5548.5
1	1648		15	40.	6266.9	5548.4	2		1312	32	42.	6349.8	5548.7	3		0936	49	40.	6280.3	5548.4
1	1800		16	41.	6288.4	5548.5	2		1424	33	42.	6345.7	5548.7	3		1048	50	40.	6276.4	5548.4
1	1912		17	41.	6307.7	5548.5	2		1536	34	42.	6341.6	5548.6							

PEAK OUTFLOW IS 43. AT TIME 26.40 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	58.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 43.	26.40	43.	42.	35.	35.
		(INCHES) .084	.331	.671	.671
		(AC-FT) 21.	84.	170.	170.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (AC-FT)	(HR)				
6385.	26.40	6381.	6358.	6233.	6233.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	58.80-HR
+ (FEET)	(HR)				
5548.79	26.40	5548.77	5548.70	5548.03	5548.03

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	110.
				TIME	9.60
ROUTED TO					
+	RB1	.50	1	FLOW	102.
				TIME	10.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	94.
				TIME	9.60
HYDROGRAPH AT					
+	B3	.28	1	FLOW	57.
				TIME	9.60
3 COMBINED AT					
+	C1	1.22	1	FLOW	245.
				TIME	9.60
ROUTED TO					
+	RC1	1.22	1	FLOW	241.
				TIME	10.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	100.
				TIME	9.60
HYDROGRAPH AT					
+	B5	.81	1	FLOW	183.
				TIME	9.60
3 COMBINED AT					
+	C2	2.48	1	FLOW	502.
				TIME	9.60
ROUTED TO					
+	RC2	2.48	1	FLOW	496.
				TIME	10.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	44.
				TIME	9.60
HYDROGRAPH AT					
+	B7	.33	1	FLOW	78.
				TIME	9.60
3 COMBINED AT					
+	C3	2.95	1	FLOW	612.
				TIME	9.60
ROUTED TO					
+	RC3	2.95	1	FLOW	589.
				TIME	10.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	298.
				TIME	9.60
HYDROGRAPH AT					
+	B9	.24	1	FLOW	73.
				TIME	9.60
HYDROGRAPH AT					
+	B10	.13	1	FLOW	40.
				TIME	9.60
2 COMBINED AT					
+	C4	.37	1	FLOW	113.
				TIME	9.60
ROUTED TO					
+	RC4	.37	1	FLOW	106.
				TIME	9.60
HYDROGRAPH AT					
+	B11	.28	1	FLOW	83.
				TIME	9.60
4 COMBINED AT					
+	C5	4.61	1	FLOW	1001.
				TIME	10.80

```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          35.
                                            TIME         9.60

  2 COMBINED AT
+                  Call        4.74     1   FLOW        1031.
                                            TIME        10.80

 ROUTED TO
+                  Cove        4.74     1   FLOW          43.
                                            TIME        26.40

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5548.79
                                            TIME        26.40
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE        17.89    109.66    608.15      2.11     72.00    102.14    648.00        2.12


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5653E+02 EXCESS= .0000E+00 OUTFLOW= .5654E+02 BASIN STORAGE= .5474E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE        13.16    246.58    605.26      2.08     72.00    240.71    648.00        2.09


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1354E+03 EXCESS= .0000E+00 OUTFLOW= .1354E+03 BASIN STORAGE= .3020E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         3.25    503.11    582.29      2.13     72.00    496.18    648.00        2.13


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2808E+03 EXCESS= .0000E+00 OUTFLOW= .2808E+03 BASIN STORAGE= .2726E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE        23.97    630.14    623.12      2.17     72.00    588.94    648.00        2.18


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3423E+03 EXCESS= .0000E+00 OUTFLOW= .3424E+03 BASIN STORAGE= .1070E-01 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC4    MANE         9.67    112.23    590.06      2.78     72.00    105.70    576.00        2.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5492E+02 EXCESS= .0000E+00 OUTFLOW= .5492E+02 BASIN STORAGE= .2119E-02 PERCENT ERROR=    .0


1                                SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                               (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 ..............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50           5549.20          5552.00
                                  STORAGE             5845.             6508.            7347.
                                  OUTFLOW                0.               45.              435.


                        RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                          OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                         PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                        1.00      5548.79         .00       6385.        43.       .00        26.40         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 10. Local SEP Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:56:10  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   Local SEP
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT      18       0       0      50
           16          IO       0
           17          IN      18
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    7.67
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```

```
              .           .
  83          .           .       B9
              .           .           .
              .           .           .
  88          .           .           .       B10
              .           .           .           .
              .           .           .           .
  93          .           .       C4   ............
              .           .           V
              .           .           V
  96          .           .       RC4
              .           .           .
              .           .           .
  99          .           .           .       B11
              .           .           .           .
              .           .           .           .
 104      C5   ...................................
              .
              .
 107          .       B12
              .           .
              .           .
 112      Call ............
              V
              V
 115      Cove

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                 ***************************************
 *                                       *                                                 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                 *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                                                 *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                                                 *         609 SECOND STREET           *
 *                                       *                                                 *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:56:10   *                                                 *           (916) 756-1104            *
 *                                       *                                                 *                                     *
 *****************************************                                                 ***************************************



                         HYDROLOGY STUDY for COVE RESERVOIR
                         Located in KANE COUNTY, UTAH

                         AUG 2020

                         PREPARED BY ALPHA ENGINEERING
                         43 SOUTH 100 EAST, SUITE 100
                         ST. GEORGE, UTAH  84770
                         TEL: (435) 628-6500
                         FAX: (435) 628-6553

                         Local SEP


 16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          18  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1442  ENDING TIME
                     ICENT           19  CENTURY MARK

                COMPUTATION INTERVAL     .30 HOURS
                     TOTAL TIME BASE   14.70 HOURS

       ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

    JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                      1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *    Call    *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                    *                                    *                                    *
   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW       *   DA MON HRMN  ORD      FLOW
                                    *                                    *                                    *
    1     0000    1        0.       *    1     0354   14     4063.       *    1     0748   27      201.       *    1     1142   40        0.
    1     0018    2        0.       *    1     0412   15     3364.       *    1     0806   28      113.       *    1     1200   41        0.
    1     0036    3        0.       *    1     0430   16     2855.       *    1     0824   29       62.       *    1     1218   42        0.
    1     0054    4        8.       *    1     0448   17     2500.       *    1     0842   30       34.       *    1     1236   43        0.
    1     0112    5       43.       *    1     0506   18     2228.       *    1     0900   31       18.       *    1     1254   44        0.
    1     0130    6      129.       *    1     0524   19     2039.       *    1     0918   32        9.       *    1     1312   45        0.
    1     0148    7      306.       *    1     0542   20     1913.       *    1     0936   33        5.       *    1     1330   46        0.
    1     0206    8      824.       *    1     0600   21     1819.       *    1     0954   34        2.       *    1     1348   47        0.
    1     0224    9     2325.       *    1     0618   22     1614.       *    1     1012   35        1.       *    1     1406   48        0.
    1     0242   10     4867.       *    1     0636   23     1240.       *    1     1030   36        0.       *    1     1424   49        0.
    1     0300   11     6395.       *    1     0654   24      851.       *    1     1048   37        0.       *    1     1442   50        0.
    1     0318   12     6123.       *    1     0712   25      540.       *    1     1106   38        0.       *
    1     0336   13     5053.       *    1     0730   26      332.       *    1     1124   39        0.       *
                                    *                                    *                                    *
*****************************************************************************************************************************

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     14.70-HR
+   (CFS)       (HR)
                          (CFS)
+    6395.      3.00                 2560.       1059.       1059.        1059.
                         (INCHES)    5.019       5.085       5.085        5.085
                          (AC-FT)    1269.       1286.       1286.        1286.

                          CUMULATIVE AREA =    4.74 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *    Cove    *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		0506	18	137.	6821.4	5550.2	1		1012	35	233.	7019.3	5550.9
1		0018	2	0.	5844.8	5545.5	1		0524	19	159.	6870.7	5550.4	1		1030	36	230.	7013.6	5550.9
1		0036	3	0.	5844.8	5545.5	1		0542	20	180.	6915.4	5550.6	1		1048	37	227.	7007.9	5550.9
1		0054	4	1.	5845.0	5545.5	1		0600	21	201.	6957.0	5550.7	1		1106	38	224.	7002.3	5550.8
1		0112	5	2.	5845.5	5545.5	1		0618	22	220.	6994.3	5550.8	1		1124	39	221.	6996.8	5550.8
1		0130	6	4.	5847.6	5545.5	1		0636	23	236.	7024.0	5550.9	1		1142	40	218.	6991.3	5550.8
1		0148	7	6.	5852.9	5545.6	1		0654	24	247.	7043.8	5551.0	1		1200	41	216.	6985.9	5550.8
1		0206	8	10.	5866.8	5545.7	1		0712	25	253.	7054.8	5551.0	1		1218	42	213.	6980.7	5550.8
1		0224	9	17.	5905.5	5546.0	1		0730	26	255.	7059.3	5551.0	1		1236	43	210.	6975.4	5550.8
1		0242	10	26.	5994.1	5546.7	1		0748	27	256.	7059.6	5551.0	1		1254	44	207.	6970.3	5550.7
1		0300	11	36.	6133.0	5547.9	1		0806	28	254.	7057.2	5551.0	1		1312	45	205.	6965.2	5550.7
1		0318	12	41.	6287.2	5548.5	1		0824	29	252.	7053.1	5551.0	1		1330	46	202.	6960.0	5550.7
1		0336	13	44.	6424.7	5548.9	1		0842	30	249.	7048.1	5551.0	1		1348	47	200.	6955.1	5550.7
1		0354	14	48.	6536.5	5549.3	1		0900	31	246.	7042.5	5551.0	1		1406	48	197.	6950.1	5550.7
1		0412	15	68.	6627.1	5549.6	1		0918	32	243.	7036.8	5551.0	1		1424	49	195.	6945.3	5550.7
1		0430	16	91.	6702.2	5549.8	1		0936	33	240.	7031.0	5550.9	1		1442	50	192.	6940.5	5550.6
1		0448	17	114.	6766.0	5550.1	1		0954	34	237.	7025.1	5550.9							

PEAK OUTFLOW IS 256. AT TIME 7.80 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	14.70-HR
+ (CFS)	(HR)				
	(CFS)				
+ 256.	7.80	238.	156.	156.	156.
	(INCHES)	.466	.752	.752	.752
	(AC-FT)	118.	190.	190.	190.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	14.70-HR
+ (AC-FT)	(HR)				
7060.	7.80	7027.	6705.	6705.	6705.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	14.70-HR
+ (FEET)	(HR)				
5551.04	7.80	5550.93	5549.59	5549.59	5549.59

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	689.
				TIME	3.00
ROUTED TO					
+	RB1	.50	1	FLOW	657.
				TIME	3.00
HYDROGRAPH AT					
+	B2	.44	1	FLOW	589.
				TIME	3.00
HYDROGRAPH AT					
+	B3	.28	1	FLOW	393.
				TIME	2.70
3 COMBINED AT					
+	C1	1.22	1	FLOW	1608.
				TIME	3.00
ROUTED TO					
+	RC1	1.22	1	FLOW	1507.
				TIME	3.00
HYDROGRAPH AT					
+	B4	.45	1	FLOW	636.
				TIME	3.00
HYDROGRAPH AT					
+	B5	.81	1	FLOW	1050.
				TIME	3.00
3 COMBINED AT					
+	C2	2.48	1	FLOW	3194.
				TIME	3.00
ROUTED TO					
+	RC2	2.48	1	FLOW	3137.
				TIME	3.00
HYDROGRAPH AT					
+	B6	.15	1	FLOW	351.
				TIME	2.40
HYDROGRAPH AT					
+	B7	.33	1	FLOW	490.
				TIME	3.00
3 COMBINED AT					
+	C3	2.95	1	FLOW	3813.
				TIME	3.00
ROUTED TO					
+	RC3	2.95	1	FLOW	3723.
				TIME	3.30
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	1656.
				TIME	3.00
HYDROGRAPH AT					
+	B9	.24	1	FLOW	547.
				TIME	2.70
HYDROGRAPH AT					
+	B10	.13	1	FLOW	326.
				TIME	2.40
2 COMBINED AT					
+	C4	.37	1	FLOW	835.
				TIME	2.70
ROUTED TO					
+	RC4	.37	1	FLOW	819.
				TIME	2.70
HYDROGRAPH AT					
+	B11	.28	1	FLOW	575.
				TIME	2.70
4 COMBINED AT					
+	C5	4.61	1	FLOW	6184.
				TIME	3.00

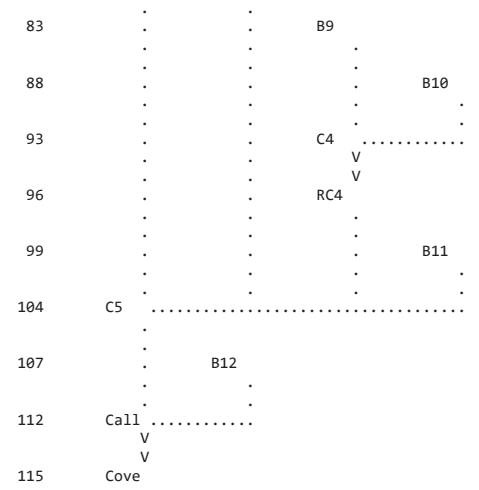
```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW         238.
                                            TIME         2.70

  2 COMBINED AT
+                  Call        4.74     1   FLOW        6395.
                                            TIME         3.00

 ROUTED TO
+                  Cove        4.74     1   FLOW         256.
                                            TIME         7.80

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5551.04
                                            TIME         7.80
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE         5.40    673.41    189.00      4.50     18.00    657.41    180.00        4.48


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1206E+03 EXCESS= .0000E+00 OUTFLOW= .1207E+03 BASIN STORAGE= .3686E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE         5.40   1594.30    189.00      4.43     18.00   1507.33    180.00        4.43


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2880E+03 EXCESS= .0000E+00 OUTFLOW= .2881E+03 BASIN STORAGE= .3547E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE         1.67   3186.21    182.05      4.52     18.00   3137.38    180.00        4.53


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5970E+03 EXCESS= .0000E+00 OUTFLOW= .5970E+03 BASIN STORAGE= .3099E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE         7.20   3778.09    194.40      4.63     18.00   3723.23    198.00        4.64


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7287E+03 EXCESS= .0000E+00 OUTFLOW= .7291E+03 BASIN STORAGE= .1048E-01 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE         5.53    841.55    154.72      6.01     18.00    818.78    162.00        6.02


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1188E+03 EXCESS= .0000E+00 OUTFLOW= .1189E+03 BASIN STORAGE= .2808E-02 PERCENT ERROR=    .0


1                                SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                                (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                    INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                 ELEVATION        5545.50           5549.20          5552.00
                                 STORAGE             5845.             6508.            7347.
                                 OUTFLOW                0.               45.              435.


                       RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                         OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                        PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                       1.00      5551.04         .00       7060.       256.       .00         7.80         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 11. General SEP Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:56:37  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   SEP General
           13          ID
                       *Diagram
           14          JR    PREC     1.0
           15          IT     216       0       0      50
           16          IO       0
           17          IN     216
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB   12.50
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
          99          KK   B11
         100          KM   Runoff from Basin 11
         101          BA   0.279
         102          LS       0    84.8
         103          UD    0.39
                      *

         104          KK   C5
         105          KM   Combine RC3, B8, RC4, B11
         106          HC       4
                      *

         107          KK   B12
         108          KM   Runoff from Basin 12
         109          BA   0.127
         110          LS       0    81.2
         111          UD    0.40
                      *
1                                                  HEC-1 INPUT                                                  PAGE  4

        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         112          KK   Call
         113          KM   Combine C5, B12
         114          HC       2
                      *

         115          KK   Cove Reservoir
         116          KM   Routing through Res'v
         117          RS       1    ELEV  5545.5
         118          SV       0      19      95     240     453     738    1105    1563    2217    2773
         119          SV    3542    4423    5419    6149    7347    8000
         120          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
         121          SE    5530    5536    5542    5548    5552    5558
         122          SL  5545.5   4.909     0.6     0.5
         123          SS  5549.2      30    2.67     1.5
         124          ST  5552.0    1892     2.9     1.5
                      *
         125          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18       B1
                V
                V
    27       RB1
                .
                .
    30          .       B2
                .           .
                .           .
    35          .           .       B3
                .           .           .
                .           .           .
    40       C1   ........................
                V
                V
    43       RC1
                .
                .
    46          .       B4
                .           .
                .           .
    51          .           .       B5
                .           .           .
                .           .           .
    56       C2   ........................
                V
                V
    59       RC2
                .
                .
    62          .       B6
                .           .
                .           .
    67          .           .       B7
                .           .           .
                .           .           .
    72       C3   ........................
                V
                V
    75       RC3
                .
                .
    78          .       B8
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   06AUG20  TIME  02:56:37   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

SEP General

```
  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN         216  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      8    0  ENDING DATE
                     NDTIME        0824  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    3.60 HOURS
                        TOTAL TIME BASE  176.40 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 112 KK    *     Call   *
           *            *
           **************
                        Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    Call
                                                     SUM OF  2 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
     1     0000    1        0.   *    2     2248   14       372.   *    4     2136   27        0.   *    6     2024   40        0.
     1     0336    2        0.   *    3     0224   15       323.   *    5     0112   28        0.   *    7     0000   41        0.
     1     0712    3        5.   *    3     0600   16       307.   *    5     0448   29        0.   *    7     0336   42        0.
     1     1048    4       25.   *    3     0936   17       271.   *    5     0824   30        0.   *    7     0712   43        0.
     1     1424    5       56.   *    3     1312   18       257.   *    5     1200   31        0.   *    7     1048   44        0.
     1     1800    6      120.   *    3     1648   19       254.   *    5     1536   32        0.   *    7     1424   45        0.
     1     2136    7      235.   *    3     2024   20       254.   *    5     1912   33        0.   *    7     1800   46        0.
     2     0112    8      688.   *    4     0000   21       221.   *    5     2248   34        0.   *    7     2136   47        0.
     2     0448    9     1587.   *    4     0336   22        81.   *    6     0224   35        0.   *    8     0112   48        0.
     2     0824   10     1393.   *    4     0712   23        21.   *    6     0600   36        0.   *    8     0448   49        0.
     2     1200   11      771.   *    4     1048   24         4.   *    6     0936   37        0.   *    8     0824   50        0.
     2     1536   12      523.   *    4     1424   25         1.   *    6     1312   38        0.   *
     2     1912   13      428.   *    4     1800   26         0.   *    6     1648   39        0.   *
                                *                                *                                *
*****************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR        24-HR        72-HR     176.40-HR
+   (CFS)       (HR)
                        (CFS)
+    1587.     28.80                 1490.         882.         409.          167.
                          (INCHES)    1.753        6.228        9.622         9.643
                           (AC-FT)     443.        1575.        2433.         2439.

                         CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 115 KK    *     Cove   *     Reservoir
           *            *
           **************
                        Routing through Res'v

              HYDROGRAPH ROUTING DATA

 117 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     5545.50  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

 118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

 120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                               5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

 122 SL          LOW-LEVEL OUTLET
                      ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                      CAREA        4.91  CROSS-SECTIONAL AREA
                       COQL         .60  COEFFICIENT
                       EXPL         .50  EXPONENT OF HEAD

 123 SS          SPILLWAY
                       CREL     5549.20  SPILLWAY CREST ELEVATION
                      SPWID       30.00  SPILLWAY WIDTH
                       COQW        2.67  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

 124 ST          TOP OF DAM
```

TOPEL	5552.00	ELEVATION AT TOP OF DAM
DAMWID	1892.00	DAM WIDTH
COQD	2.90	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	3		1312	18	326.	7179.3	5551.4	6		0224	35	61.	6601.8	5549.5
1		0336	2	0.	5844.8	5545.5	3		1648	19	314.	7160.1	5551.4	6		0600	36	57.	6584.2	5549.5
1		0712	3	2.	5845.4	5545.5	3		2024	20	304.	7143.7	5551.3	6		0936	37	54.	6567.7	5549.4
1		1048	4	4.	5849.0	5545.5	4		0000	21	294.	7125.6	5551.3	6		1312	38	51.	6552.2	5549.3
1		1424	5	8.	5859.3	5545.6	4		0336	22	271.	7086.7	5551.1	6		1648	39	48.	6537.4	5549.3
1		1800	6	13.	5882.4	5545.8	4		0712	23	237.	7026.1	5550.9	6		2024	40	47.	6523.2	5549.2
1		2136	7	20.	5930.4	5546.2	4		1048	24	204.	6964.1	5550.7	7		0000	41	45.	6509.5	5549.2
2		0112	8	31.	6060.0	5547.3	4		1424	25	177.	6908.3	5550.5	7		0336	42	45.	6496.0	5549.2
2		0448	9	43.	6386.9	5548.8	4		1800	26	154.	6859.3	5550.4	7		0712	43	45.	6482.6	5549.1
2		0824	10	130.	6804.4	5550.2	4		2136	27	135.	6816.4	5550.2	7		1048	44	45.	6469.3	5549.1
2		1200	11	261.	7069.4	5551.1	5		0112	28	119.	6778.6	5550.1	7		1424	45	44.	6456.0	5549.0
2		1536	12	323.	7174.9	5551.4	5		0448	29	106.	6745.1	5550.0	7		1800	46	44.	6442.9	5549.0
2		1912	13	349.	7216.3	5551.6	5		0824	30	95.	6715.1	5549.9	7		2136	47	44.	6429.9	5548.9
2		2248	14	358.	7230.0	5551.6	5		1200	31	86.	6688.0	5549.8	8		0112	48	44.	6417.1	5548.9
3		0224	15	356.	7227.2	5551.6	5		1536	32	78.	6663.6	5549.7	8		0448	49	43.	6404.2	5548.9
3		0600	16	349.	7216.0	5551.6	5		1912	33	72.	6641.2	5549.6	8		0824	50	43.	6391.5	5548.8
3		0936	17	339.	7199.7	5551.5	5		2248	34	66.	6620.8	5549.6							

PEAK OUTFLOW IS 358. AT TIME 46.80 HOURS

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	176.40-HR
+ (CFS)	(HR)				
		(CFS)			
+ 358.	46.80	357.	346.	254.	130.
		(INCHES)	.420	2.442	5.987	7.487
		(AC-FT)	106.	618.	1514.	1894.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	176.40-HR
+ (AC-FT)	(HR)				
7230.	46.80	7229.	7211.	7044.	6643.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	176.40-HR
+ (FEET)	(HR)				
5551.61	46.80	5551.60	5551.55	5550.99	5549.46

CUMULATIVE AREA = 4.74 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	B1	.50	1	FLOW	162.
				TIME	28.80
ROUTED TO					
+	RB1	.50	1	FLOW	156.
				TIME	28.80
HYDROGRAPH AT					
+	B2	.44	1	FLOW	140.
				TIME	28.80
HYDROGRAPH AT					
+	B3	.28	1	FLOW	87.
				TIME	28.80
3 COMBINED AT					
+	C1	1.22	1	FLOW	382.
				TIME	28.80
ROUTED TO					
+	RC1	1.22	1	FLOW	371.
				TIME	28.80
HYDROGRAPH AT					
+	B4	.45	1	FLOW	147.
				TIME	28.80
HYDROGRAPH AT					
+	B5	.81	1	FLOW	266.
				TIME	28.80
3 COMBINED AT					
+	C2	2.48	1	FLOW	785.
				TIME	28.80
ROUTED TO					
+	RC2	2.48	1	FLOW	780.
				TIME	28.80
HYDROGRAPH AT					
+	B6	.15	1	FLOW	58.
				TIME	28.80
HYDROGRAPH AT					
+	B7	.33	1	FLOW	111.
				TIME	28.80
3 COMBINED AT					
+	C3	2.95	1	FLOW	949.
				TIME	28.80
ROUTED TO					
+	RC3	2.95	1	FLOW	900.
				TIME	28.80
HYDROGRAPH AT					
+	B8	1.01	1	FLOW	389.
				TIME	28.80
HYDROGRAPH AT					
+	B9	.24	1	FLOW	95.
				TIME	28.80
HYDROGRAPH AT					
+	B10	.13	1	FLOW	51.
				TIME	28.80
2 COMBINED AT					
+	C4	.37	1	FLOW	146.
				TIME	28.80
ROUTED TO					
+	RC4	.37	1	FLOW	143.
				TIME	28.80
HYDROGRAPH AT					
+	B11	.28	1	FLOW	108.
				TIME	28.80
4 COMBINED AT					
+	C5	4.61	1	FLOW	1540.
				TIME	28.80

```
 HYDROGRAPH AT
+                  B12          .13     1   FLOW          47.
                                            TIME        28.80

  2 COMBINED AT
+                  Call        4.74     1   FLOW        1587.
                                            TIME        28.80

 ROUTED TO
+                  Cove        4.74     1   FLOW         358.
                                            TIME        46.80

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5551.61
                                            TIME        46.80
1
                                            SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                  COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO=  .00
              RB1    MANE        16.14    161.33   1758.92      8.92    216.00    155.93   1728.00        8.94


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2392E+03 EXCESS= .0000E+00 OUTFLOW= .2392E+03 BASIN STORAGE= .3928E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC1    MANE        11.70    381.73   1743.12      8.85    216.00    371.42   1728.00        8.87


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5750E+03 EXCESS= .0000E+00 OUTFLOW= .5750E+03 BASIN STORAGE= .2955E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC2    MANE         2.77    784.17   1730.55      8.97    216.00    779.86   1728.00        8.97


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1184E+04 EXCESS= .0000E+00 OUTFLOW= .1184E+04 BASIN STORAGE= .2978E-02 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC3    MANE        21.20    945.64   1759.24      9.09    216.00    900.19   1728.00        9.11


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1431E+04 EXCESS= .0000E+00 OUTFLOW= .1431E+04 BASIN STORAGE= .1049E-01 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
              RC4    MANE         9.01    145.33   1739.46     10.73    216.00    142.95   1728.00       10.74


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2123E+03 EXCESS= .0000E+00 OUTFLOW= .2123E+03 BASIN STORAGE= .2832E-02 PERCENT ERROR=    .0


1                              SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                             (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 .............                  INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                               ELEVATION        5545.50           5549.20          5552.00
                               STORAGE            5845.             6508.            7347.
                               OUTFLOW               0.               45.              435.


                     RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                       OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                      PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                     1.00      5551.61         .00       7230.       358.       .00        46.80         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 12. Principal Spillway Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  03:15:56  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                  HEC-1 INPUT                                                  PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HYDROLOGY STUDY for COVE RESERVOIR
             2          ID   Located in KANE COUNTY, UTAH
             3          ID
             4          ID   AUG 2020
             5          ID
             6          ID   PREPARED BY ALPHA ENGINEERING
             7          ID   43 SOUTH 100 EAST, SUITE 100
             8          ID   ST. GEORGE, UTAH  84770
             9          ID   TEL: (435) 628-6500
            10          ID   FAX: (435) 628-6553
            11          ID
            12          ID   PSH (NEH)
            13          ID
                        *Diagram
            14          JR    PREC     1.0
            15          IT      60       0       0     350
            16          IO       0
            17          IN      60
                        *
            18          QI       0      11      14      15      15      15      15      15      15      15
            19          QI      15      16      16      16      16      16      16      16      16      16
            20          QI      16      17      17      17      17      17      17      17      17      17
            21          QI      17      18      18      18      18      18      18      18      18      19
            22          QI      19      19      19      19      19      20      20      20      20      20
            23          QI      20      21      21      21      21      21      21      22      22      22
            24          QI      22      23      23      23      23      24      24      24      24      25
            25          QI      25      25      26      26      26      27      27      27      28      28
            26          QI      29      29      29      30      30      31      31      32      33      33
            27          QI      34      35      35      36      37      38      39      40      41      42
            28          QI      43      45      46      48      49      51      53      56      58      61
            29          QI      65      69      74      80      87      96     109     127     157     219
            30          QI     850     479     259     172     132     111      98      88      81      75
            31          QI      70      65      62      59      56      54      51      50      48      46
            32          QI      45      43      42      41      40      39      38      37      36      35
            33          QI      35      34      33      33      32      32      31      30      30      29
            34          QI      29      29      28      28      27      27      27      26      26      26
            35          QI      25      25      25      24      24      24      24      23      23      23
            36          QI      23      22      22      22      22      22      21      21      21      21
            37          QI      21      20      20      20      20      20      20      19      19      19
            38          QI      19      19      19      19      18      18      18      18      18      18
            39          QI      18      17      17      17      17      17      17      17      17      17
            40          QI      17      16      16      16      16      16      16      16      16      16
            41          QI      16      15      15      15      15      15      15      15      15      15
            42          QI      15       4       1
                        *

            43          KK   Cove Reservoir
            44          KM   Routing through Res'v
            45          RS       1    ELEV  5545.5
            46          SV       0      19      95     240     453     738    1105    1563    2217    2773
            47          SV    3542    4423    5419    6149    7347    8000
            48          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
            49          SE    5530    5536    5542    5548    5552    5558
            50          SL  5545.5   4.909     0.6     0.5
```

```
            51          SS  5549.2      30    2.67     1.5
1                                                  HEC-1 INPUT                                                  PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            52          ST  5552.0    1892     2.9     1.5
                        *
            53          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 *** HEC1 ERROR 4 *** NO HYDROGRAPHS AVAILABLE TO ROUTE
                V
                V
    43       Cove

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION

         1 ERRORS IN STREAM SYSTEM
1*****************************************                                                  ***************************************
 *                                       *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                                                  *          609 SECOND STREET          *
 *                                       *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  03:15:56   *                                                  *           (916) 756-1104            *
 *                                       *                                                  *                                     *
 *****************************************                                                  ***************************************



                           HYDROLOGY STUDY for COVE RESERVOIR
                           Located in KANE COUNTY, UTAH

                           AUG 2020

                           PREPARED BY ALPHA ENGINEERING
                           43 SOUTH 100 EAST, SUITE 100
                           ST. GEORGE, UTAH  84770
                           TEL: (435) 628-6500
                           FAX: (435) 628-6553

                           PSH (NEH)


   16 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           0  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN          60  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         350  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     15    0  ENDING DATE
                      NDTIME        1300  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL    1.00 HOURS
                        TOTAL TIME BASE  349.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00

   17 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN          60  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
                      JXTIME           0  STARTING TIME

               SUBBASIN RUNOFF DATA

    0 BA          SUBBASIN CHARACTERISTICS
```

TAREA .00 SUBBASIN AREA

***

HYDROGRAPH AT STATION Cove

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	4		1600	89	33.	8		0800	177	24.	12		0000	265	1.
1		0100	2	11.	4		1700	90	33.	8		0900	178	23.	12		0100	266	1.
1		0200	3	14.	4		1800	91	34.	8		1000	179	23.	12		0200	267	1.
1		0300	4	15.	4		1900	92	35.	8		1100	180	23.	12		0300	268	1.
1		0400	5	15.	4		2000	93	35.	8		1200	181	23.	12		0400	269	1.
1		0500	6	15.	4		2100	94	36.	8		1300	182	22.	12		0500	270	1.
1		0600	7	15.	4		2200	95	37.	8		1400	183	22.	12		0600	271	1.
1		0700	8	15.	4		2300	96	38.	8		1500	184	22.	12		0700	272	1.
1		0800	9	15.	5		0000	97	39.	8		1600	185	22.	12		0800	273	1.
1		0900	10	15.	5		0100	98	40.	8		1700	186	22.	12		0900	274	1.
1		1000	11	15.	5		0200	99	41.	8		1800	187	21.	12		1000	275	1.
1		1100	12	16.	5		0300	100	42.	8		1900	188	21.	12		1100	276	1.
1		1200	13	16.	5		0400	101	43.	8		2000	189	21.	12		1200	277	1.
1		1300	14	16.	5		0500	102	45.	8		2100	190	21.	12		1300	278	1.
1		1400	15	16.	5		0600	103	46.	8		2200	191	21.	12		1400	279	1.
1		1500	16	16.	5		0700	104	48.	8		2300	192	20.	12		1500	280	1.
1		1600	17	16.	5		0800	105	49.	9		0000	193	20.	12		1600	281	1.
1		1700	18	16.	5		0900	106	51.	9		0100	194	20.	12		1700	282	1.
1		1800	19	16.	5		1000	107	53.	9		0200	195	20.	12		1800	283	1.
1		1900	20	16.	5		1100	108	56.	9		0300	196	20.	12		1900	284	1.
1		2000	21	16.	5		1200	109	58.	9		0400	197	20.	12		2000	285	1.
1		2100	22	17.	5		1300	110	61.	9		0500	198	19.	12		2100	286	1.
1		2200	23	17.	5		1400	111	65.	9		0600	199	19.	12		2200	287	1.
1		2300	24	17.	5		1500	112	69.	9		0700	200	19.	12		2300	288	1.
2		0000	25	17.	5		1600	113	74.	9		0800	201	19.	13		0000	289	1.
2		0100	26	17.	5		1700	114	80.	9		0900	202	19.	13		0100	290	1.
2		0200	27	17.	5		1800	115	87.	9		1000	203	19.	13		0200	291	1.
2		0300	28	17.	5		1900	116	96.	9		1100	204	19.	13		0300	292	1.
2		0400	29	17.	5		2000	117	109.	9		1200	205	18.	13		0400	293	1.
2		0500	30	17.	5		2100	118	127.	9		1300	206	18.	13		0500	294	1.
2		0600	31	17.	5		2200	119	157.	9		1400	207	18.	13		0600	295	1.
2		0700	32	18.	5		2300	120	219.	9		1500	208	18.	13		0700	296	1.
2		0800	33	18.	6		0000	121	850.	9		1600	209	18.	13		0800	297	1.
2		0900	34	18.	6		0100	122	479.	9		1700	210	18.	13		0900	298	1.
2		1000	35	18.	6		0200	123	259.	9		1800	211	18.	13		1000	299	1.
2		1100	36	18.	6		0300	124	172.	9		1900	212	17.	13		1100	300	1.
2		1200	37	18.	6		0400	125	132.	9		2000	213	17.	13		1200	301	1.
2		1300	38	18.	6		0500	126	111.	9		2100	214	17.	13		1300	302	1.
2		1400	39	18.	6		0600	127	98.	9		2200	215	17.	13		1400	303	1.
2		1500	40	19.	6		0700	128	88.	9		2300	216	17.	13		1500	304	1.
2		1600	41	19.	6		0800	129	81.	10		0000	217	17.	13		1600	305	1.
2		1700	42	19.	6		0900	130	75.	10		0100	218	17.	13		1700	306	1.
2		1800	43	19.	6		1000	131	70.	10		0200	219	17.	13		1800	307	1.
2		1900	44	19.	6		1100	132	65.	10		0300	220	17.	13		1900	308	1.
2		2000	45	19.	6		1200	133	62.	10		0400	221	17.	13		2000	309	1.
2		2100	46	20.	6		1300	134	59.	10		0500	222	16.	13		2100	310	1.
2		2200	47	20.	6		1400	135	56.	10		0600	223	16.	13		2200	311	1.
2		2300	48	20.	6		1500	136	54.	10		0700	224	16.	13		2300	312	1.
3		0000	49	20.	6		1600	137	51.	10		0800	225	16.	14		0000	313	1.
3		0100	50	20.	6		1700	138	50.	10		0900	226	16.	14		0100	314	1.
3		0200	51	20.	6		1800	139	48.	10		1000	227	16.	14		0200	315	1.
3		0300	52	21.	6		1900	140	46.	10		1100	228	16.	14		0300	316	1.
3		0400	53	21.	6		2000	141	45.	10		1200	229	16.	14		0400	317	1.
3		0500	54	21.	6		2100	142	43.	10		1300	230	16.	14		0500	318	1.
3		0600	55	21.	6		2200	143	42.	10		1400	231	16.	14		0600	319	1.
3		0700	56	21.	6		2300	144	41.	10		1500	232	15.	14		0700	320	1.
3		0800	57	21.	7		0000	145	40.	10		1600	233	15.	14		0800	321	1.
3		0900	58	22.	7		0100	146	39.	10		1700	234	15.	14		0900	322	1.
3		1000	59	22.	7		0200	147	38.	10		1800	235	15.	14		1000	323	1.
3		1100	60	22.	7		0300	148	37.	10		1900	236	15.	14		1100	324	1.
3		1200	61	22.	7		0400	149	36.	10		2000	237	15.	14		1200	325	1.
3		1300	62	23.	7		0500	150	35.	10		2100	238	15.	14		1300	326	1.
3		1400	63	23.	7		0600	151	35.	10		2200	239	15.	14		1400	327	1.
3		1500	64	23.	7		0700	152	34.	10		2300	240	15.	14		1500	328	1.
3		1600	65	23.	7		0800	153	33.	11		0000	241	15.	14		1600	329	1.
3		1700	66	24.	7		0900	154	33.	11		0100	242	4.	14		1700	330	1.
3		1800	67	24.	7		1000	155	32.	11		0200	243	1.	14		1800	331	1.
3		1900	68	24.	7		1100	156	32.	11		0300	244	1.	14		1900	332	1.
3		2000	69	24.	7		1200	157	31.	11		0400	245	1.	14		2000	333	1.
3		2100	70	25.	7		1300	158	30.	11		0500	246	1.	14		2100	334	1.
3		2200	71	25.	7		1400	159	30.	11		0600	247	1.	14		2200	335	1.
3		2300	72	25.	7		1500	160	29.	11		0700	248	1.	14		2300	336	1.
4		0000	73	26.	7		1600	161	29.	11		0800	249	1.	15		0000	337	1.
4		0100	74	26.	7		1700	162	29.	11		0900	250	1.	15		0100	338	1.
4		0200	75	26.	7		1800	163	28.	11		1000	251	1.	15		0200	339	1.
4		0300	76	27.	7		1900	164	28.	11		1100	252	1.	15		0300	340	1.
4		0400	77	27.	7		2000	165	27.	11		1200	253	1.	15		0400	341	1.
4		0500	78	27.	7		2100	166	27.	11		1300	254	1.	15		0500	342	1.
4		0600	79	28.	7		2200	167	27.	11		1400	255	1.	15		0600	343	1.
4		0700	80	28.	7		2300	168	26.	11		1500	256	1.	15		0700	344	1.

4	0800	81	29.	*	8	0000	169	26.	*	11	1600	257	1.	*	15	0800	345	1.	
4	0900	82	29.	*	8	0100	170	26.	*	11	1700	258	1.	*	15	0900	346	1.	
4	1000	83	29.	*	8	0200	171	25.	*	11	1800	259	1.	*	15	1000	347	1.	
4	1100	84	30.	*	8	0300	172	25.	*	11	1900	260	1.	*	15	1100	348	1.	
4	1200	85	30.	*	8	0400	173	25.	*	11	2000	261	1.	*	15	1200	349	1.	
4	1300	86	31.	*	8	0500	174	24.	*	11	2100	262	1.	*	15	1300	350	1.	
4	1400	87	31.	*	8	0600	175	24.	*	11	2200	263	1.	*					
4	1500	88	32.	*	8	0700	176	24.	*	11	2300	264	1.	*					
				*					*					*					

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	349.00-HR
+ (CFS)	(HR)					
		(CFS)				
+ 850.	120.00		354.	154.	79.	26.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	175.	305.	468.	757.

CUMULATIVE AREA = .00 SQ MI

****

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
					*						*						*					
1		0000	1	0.	*	4		1600	89	33.	*	8		0800	177	24.	*	12		0000	265	1.
1		0100	2	11.	*	4		1700	90	33.	*	8		0900	178	23.	*	12		0100	266	1.
1		0200	3	14.	*	4		1800	91	34.	*	8		1000	179	23.	*	12		0200	267	1.
1		0300	4	15.	*	4		1900	92	35.	*	8		1100	180	23.	*	12		0300	268	1.
1		0400	5	15.	*	4		2000	93	35.	*	8		1200	181	23.	*	12		0400	269	1.
1		0500	6	15.	*	4		2100	94	36.	*	8		1300	182	22.	*	12		0500	270	1.
1		0600	7	15.	*	4		2200	95	37.	*	8		1400	183	22.	*	12		0600	271	1.
1		0700	8	15.	*	4		2300	96	38.	*	8		1500	184	22.	*	12		0700	272	1.
1		0800	9	15.	*	5		0000	97	39.	*	8		1600	185	22.	*	12		0800	273	1.
1		0900	10	15.	*	5		0100	98	40.	*	8		1700	186	22.	*	12		0900	274	1.
1		1000	11	15.	*	5		0200	99	41.	*	8		1800	187	21.	*	12		1000	275	1.
1		1100	12	16.	*	5		0300	100	42.	*	8		1900	188	21.	*	12		1100	276	1.
1		1200	13	16.	*	5		0400	101	43.	*	8		2000	189	21.	*	12		1200	277	1.
1		1300	14	16.	*	5		0500	102	45.	*	8		2100	190	21.	*	12		1300	278	1.
1		1400	15	16.	*	5		0600	103	46.	*	8		2200	191	21.	*	12		1400	279	1.
1		1500	16	16.	*	5		0700	104	48.	*	8		2300	192	20.	*	12		1500	280	1.
1		1600	17	16.	*	5		0800	105	49.	*	9		0000	193	20.	*	12		1600	281	1.
1		1700	18	16.	*	5		0900	106	51.	*	9		0100	194	20.	*	12		1700	282	1.
1		1800	19	16.	*	5		1000	107	53.	*	9		0200	195	20.	*	12		1800	283	1.
1		1900	20	16.	*	5		1100	108	56.	*	9		0300	196	20.	*	12		1900	284	1.
1		2000	21	16.	*	5		1200	109	58.	*	9		0400	197	20.	*	12		2000	285	1.
1		2100	22	17.	*	5		1300	110	61.	*	9		0500	198	19.	*	12		2100	286	1.
1		2200	23	17.	*	5		1400	111	65.	*	9		0600	199	19.	*	12		2200	287	1.
1		2300	24	17.	*	5		1500	112	69.	*	9		0700	200	19.	*	12		2300	288	1.
2		0000	25	17.	*	5		1600	113	74.	*	9		0800	201	19.	*	13		0000	289	1.
2		0100	26	17.	*	5		1700	114	80.	*	9		0900	202	19.	*	13		0100	290	1.
2		0200	27	17.	*	5		1800	115	87.	*	9		1000	203	19.	*	13		0200	291	1.
2		0300	28	17.	*	5		1900	116	96.	*	9		1100	204	19.	*	13		0300	292	1.
2		0400	29	17.	*	5		2000	117	109.	*	9		1200	205	18.	*	13		0400	293	1.
2		0500	30	17.	*	5		2100	118	127.	*	9		1300	206	18.	*	13		0500	294	1.
2		0600	31	17.	*	5		2200	119	157.	*	9		1400	207	18.	*	13		0600	295	1.
2		0700	32	18.	*	5		2300	120	219.	*	9		1500	208	18.	*	13		0700	296	1.
2		0800	33	18.	*	6		0000	121	850.	*	9		1600	209	18.	*	13		0800	297	1.
2		0900	34	18.	*	6		0100	122	479.	*	9		1700	210	18.	*	13		0900	298	1.
2		1000	35	18.	*	6		0200	123	259.	*	9		1800	211	18.	*	13		1000	299	1.
2		1100	36	18.	*	6		0300	124	172.	*	9		1900	212	17.	*	13		1100	300	1.
2		1200	37	18.	*	6		0400	125	132.	*	9		2000	213	17.	*	13		1200	301	1.
2		1300	38	18.	*	6		0500	126	111.	*	9		2100	214	17.	*	13		1300	302	1.
2		1400	39	18.	*	6		0600	127	98.	*	9		2200	215	17.	*	13		1400	303	1.
2		1500	40	19.	*	6		0700	128	88.	*	9		2300	216	17.	*	13		1500	304	1.
2		1600	41	19.	*	6		0800	129	81.	*	10		0000	217	17.	*	13		1600	305	1.
2		1700	42	19.	*	6		0900	130	75.	*	10		0100	218	17.	*	13		1700	306	1.
2		1800	43	19.	*	6		1000	131	70.	*	10		0200	219	17.	*	13		1800	307	1.
2		1900	44	19.	*	6		1100	132	65.	*	10		0300	220	17.	*	13		1900	308	1.
2		2000	45	19.	*	6		1200	133	62.	*	10		0400	221	17.	*	13		2000	309	1.
2		2100	46	20.	*	6		1300	134	59.	*	10		0500	222	16.	*	13		2100	310	1.
2		2200	47	20.	*	6		1400	135	56.	*	10		0600	223	16.	*	13		2200	311	1.
2		2300	48	20.	*	6		1500	136	54.	*	10		0700	224	16.	*	13		2300	312	1.
3		0000	49	20.	*	6		1600	137	51.	*	10		0800	225	16.	*	14		0000	313	1.
3		0100	50	20.	*	6		1700	138	50.	*	10		0900	226	16.	*	14		0100	314	1.
3		0200	51	20.	*	6		1800	139	48.	*	10		1000	227	16.	*	14		0200	315	1.
3		0300	52	21.	*	6		1900	140	46.	*	10		1100	228	16.	*	14		0300	316	1.
3		0400	53	21.	*	6		2000	141	45.	*	10		1200	229	16.	*	14		0400	317	1.
3		0500	54	21.	*	6		2100	142	43.	*	10		1300	230	16.	*	14		0500	318	1.
3		0600	55	21.	*	6		2200	143	42.	*	10		1400	231	16.	*	14		0600	319	1.
3		0700	56	21.	*	6		2300	144	41.	*	10		1500	232	15.	*	14		0700	320	1.
3		0800	57	21.	*	7		0000	145	40.	*	10		1600	233	15.	*	14		0800	321	1.
3		0900	58	22.	*	7		0100	146	39.	*	10		1700	234	15.	*	14		0900	322	1.
3		1000	59	22.	*	7		0200	147	38.	*	10		1800	235	15.	*	14		1000	323	1.
3		1100	60	22.	*	7		0300	148	37.	*	10		1900	236	15.	*	14		1100	324	1.
3		1200	61	22.	*	7		0400	149	36.	*	10		2000	237	15.	*	14		1200	325	1.

```
    3     1300   62       23.   *    7     0500  150       35.   *   10     2100  238       15.   *   14     1300  326        1.
    3     1400   63       23.   *    7     0600  151       35.   *   10     2200  239       15.   *   14     1400  327        1.
    3     1500   64       23.   *    7     0700  152       34.   *   10     2300  240       15.   *   14     1500  328        1.
    3     1600   65       23.   *    7     0800  153       33.   *   11     0000  241       15.   *   14     1600  329        1.
    3     1700   66       24.   *    7     0900  154       33.   *   11     0100  242        4.   *   14     1700  330        1.
    3     1800   67       24.   *    7     1000  155       32.   *   11     0200  243        1.   *   14     1800  331        1.
    3     1900   68       24.   *    7     1100  156       32.   *   11     0300  244        1.   *   14     1900  332        1.
    3     2000   69       24.   *    7     1200  157       31.   *   11     0400  245        1.   *   14     2000  333        1.
    3     2100   70       25.   *    7     1300  158       30.   *   11     0500  246        1.   *   14     2100  334        1.
    3     2200   71       25.   *    7     1400  159       30.   *   11     0600  247        1.   *   14     2200  335        1.
    3     2300   72       25.   *    7     1500  160       29.   *   11     0700  248        1.   *   14     2300  336        1.
    4     0000   73       26.   *    7     1600  161       29.   *   11     0800  249        1.   *   15     0000  337        1.
    4     0100   74       26.   *    7     1700  162       29.   *   11     0900  250        1.   *   15     0100  338        1.
    4     0200   75       26.   *    7     1800  163       28.   *   11     1000  251        1.   *   15     0200  339        1.
    4     0300   76       27.   *    7     1900  164       28.   *   11     1100  252        1.   *   15     0300  340        1.
    4     0400   77       27.   *    7     2000  165       27.   *   11     1200  253        1.   *   15     0400  341        1.
    4     0500   78       27.   *    7     2100  166       27.   *   11     1300  254        1.   *   15     0500  342        1.
    4     0600   79       28.   *    7     2200  167       27.   *   11     1400  255        1.   *   15     0600  343        1.
    4     0700   80       28.   *    7     2300  168       26.   *   11     1500  256        1.   *   15     0700  344        1.
    4     0800   81       29.   *    8     0000  169       26.   *   11     1600  257        1.   *   15     0800  345        1.
    4     0900   82       29.   *    8     0100  170       26.   *   11     1700  258        1.   *   15     0900  346        1.
    4     1000   83       29.   *    8     0200  171       25.   *   11     1800  259        1.   *   15     1000  347        1.
    4     1100   84       30.   *    8     0300  172       25.   *   11     1900  260        1.   *   15     1100  348        1.
    4     1200   85       30.   *    8     0400  173       25.   *   11     2000  261        1.   *   15     1200  349        1.
    4     1300   86       31.   *    8     0500  174       24.   *   11     2100  262        1.   *   15     1300  350        1.
    4     1400   87       31.   *    8     0600  175       24.   *   11     2200  263        1.   *
    4     1500   88       32.   *    8     0700  176       24.   *   11     2300  264        1.   *
                                *                                *                                *
*****************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR    349.00-HR
+   (CFS)       (HR)
                          (CFS)
+     850.    120.00                 354.        154.         79.          26.
                       (INCHES)     .000        .000        .000         .000
                        (AC-FT)     175.        305.        468.         757.

                        CUMULATIVE AREA =     .00 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   43 KK    *     Cove   *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

   45 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

   46 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

   48 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                                5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

   50 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

   51 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

   52 ST          TOP OF DAM
                       TOPEL     5552.00  ELEVATION AT TOP OF DAM
                      DAMWID     1892.00  DAM WIDTH
                        COQD        2.90  WEIR COEFFICIENT
                        EXPD        1.50  EXPONENT OF HEAD

                                                                  ***

                                                  COMPUTED OUTFLOW-ELEVATION DATA

                                                    (EXCLUDING FLOW OVER DAM)

            OUTFLOW        .00       .00     25.78     27.48     29.42     31.65     34.25     37.31     40.98     45.44
```

ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	5		2100	118	26.	5992.5	5546.7	10		1800	235	34.	6094.7	5547.6
1		0100	2	1.	5845.2	5545.5	5		2200	119	27.	6002.1	5546.8	10		1900	236	34.	6093.2	5547.5
1		0200	3	2.	5846.1	5545.5	5		2300	120	28.	6015.3	5546.9	10		2000	237	34.	6091.6	5547.5
1		0300	4	3.	5847.1	5545.5	6		0000	121	31.	6057.0	5547.2	10		2100	238	34.	6090.1	5547.5
1		0400	5	4.	5848.0	5545.5	6		0100	122	35.	6109.3	5547.7	10		2200	239	33.	6088.5	5547.5
1		0500	6	4.	5848.9	5545.5	6		0200	123	37.	6136.7	5547.9	10		2300	240	33.	6087.0	5547.5
1		0600	7	5.	5849.8	5545.5	6		0300	124	37.	6151.5	5548.0	11		0000	241	33.	6085.6	5547.5
1		0700	8	5.	5850.7	5545.5	6		0400	125	38.	6161.0	5548.0	11		0100	242	33.	6083.6	5547.5
1		0800	9	6.	5851.5	5545.6	6		0500	126	38.	6167.9	5548.1	11		0200	243	33.	6081.1	5547.4
1		0900	10	6.	5852.3	5545.6	6		0600	127	38.	6173.4	5548.1	11		0300	244	33.	6078.5	5547.4
1		1000	11	6.	5853.0	5545.6	6		0700	128	38.	6178.0	5548.1	11		0400	245	33.	6075.9	5547.4
1		1100	12	6.	5853.8	5545.6	6		0800	129	38.	6181.8	5548.1	11		0500	246	32.	6073.3	5547.4
1		1200	13	7.	5854.6	5545.6	6		0900	130	38.	6185.0	5548.1	11		0600	247	32.	6070.6	5547.4
1		1300	14	7.	5855.3	5545.6	6		1000	131	38.	6187.8	5548.1	11		0700	248	32.	6068.1	5547.3
1		1400	15	7.	5856.1	5545.6	6		1100	132	38.	6190.1	5548.1	11		0800	249	32.	6065.5	5547.3
1		1500	16	7.	5856.8	5545.6	6		1200	133	38.	6192.1	5548.1	11		0900	250	32.	6063.0	5547.3
1		1600	17	8.	5857.5	5545.6	6		1300	134	38.	6193.9	5548.1	11		1000	251	31.	6060.5	5547.3
1		1700	18	8.	5858.3	5545.6	6		1400	135	38.	6195.5	5548.2	11		1100	252	31.	6058.0	5547.3
1		1800	19	8.	5858.9	5545.6	6		1500	136	39.	6196.8	5548.2	11		1200	253	31.	6055.5	5547.2
1		1900	20	8.	5859.6	5545.6	6		1600	137	39.	6198.0	5548.2	11		1300	254	31.	6053.0	5547.2
1		2000	21	8.	5860.2	5545.6	6		1700	138	39.	6199.0	5548.2	11		1400	255	31.	6050.6	5547.2
1		2100	22	9.	5860.9	5545.6	6		1800	139	39.	6199.9	5548.2	11		1500	256	31.	6048.1	5547.2
1		2200	23	9.	5861.6	5545.6	6		1900	140	39.	6200.6	5548.2	11		1600	257	30.	6045.7	5547.2
1		2300	24	9.	5862.2	5545.6	6		2000	141	39.	6201.2	5548.2	11		1700	258	30.	6043.3	5547.1
2		0000	25	9.	5862.9	5545.6	6		2100	142	39.	6201.6	5548.2	11		1800	259	30.	6040.9	5547.1
2		0100	26	9.	5863.5	5545.7	6		2200	143	39.	6201.9	5548.2	11		1900	260	30.	6038.5	5547.1
2		0200	27	9.	5864.2	5545.7	6		2300	144	39.	6202.2	5548.2	11		2000	261	30.	6036.1	5547.1
2		0300	28	10.	5864.8	5545.7	7		0000	145	39.	6202.4	5548.2	11		2100	262	29.	6033.7	5547.1
2		0400	29	10.	5865.4	5545.7	7		0100	146	39.	6202.4	5548.2	11		2200	263	29.	6031.4	5547.0
2		0500	30	10.	5866.0	5545.7	7		0200	147	39.	6202.4	5548.2	11		2300	264	29.	6029.1	5547.0
2		0600	31	10.	5866.6	5545.7	7		0300	148	39.	6202.2	5548.2	12		0000	265	29.	6026.8	5547.0
2		0700	32	10.	5867.2	5545.7	7		0400	149	39.	6202.1	5548.2	12		0100	266	29.	6024.5	5547.0
2		0800	33	10.	5867.8	5545.7	7		0500	150	39.	6201.8	5548.2	12		0200	267	29.	6022.2	5547.0
2		0900	34	10.	5868.5	5545.7	7		0600	151	39.	6201.5	5548.2	12		0300	268	28.	6020.0	5546.9
2		1000	35	11.	5869.1	5545.7	7		0700	152	39.	6201.2	5548.2	12		0400	269	28.	6017.7	5546.9
2		1100	36	11.	5869.7	5545.7	7		0800	153	39.	6200.8	5548.2	12		0500	270	28.	6015.5	5546.9
2		1200	37	11.	5870.3	5545.7	7		0900	154	39.	6200.3	5548.2	12		0600	271	28.	6013.3	5546.9
2		1300	38	11.	5870.9	5545.7	7		1000	155	39.	6199.9	5548.2	12		0700	272	28.	6011.1	5546.9
2		1400	39	11.	5871.4	5545.7	7		1100	156	39.	6199.3	5548.2	12		0800	273	27.	6008.9	5546.8
2		1500	40	11.	5872.0	5545.7	7		1200	157	39.	6198.7	5548.2	12		0900	274	27.	6006.7	5546.8
2		1600	41	11.	5872.7	5545.7	7		1300	158	39.	6198.0	5548.2	12		1000	275	27.	6004.5	5546.8
2		1700	42	11.	5873.3	5545.7	7		1400	159	39.	6197.3	5548.2	12		1100	276	27.	6002.4	5546.8
2		1800	43	12.	5873.9	5545.7	7		1500	160	39.	6196.5	5548.2	12		1200	277	27.	6000.2	5546.8
2		1900	44	12.	5874.5	5545.7	7		1600	161	38.	6195.8	5548.2	12		1300	278	27.	5998.1	5546.8
2		2000	45	12.	5875.1	5545.7	7		1700	162	38.	6195.1	5548.2	12		1400	279	26.	5996.0	5546.7
2		2100	46	12.	5875.8	5545.8	7		1800	163	38.	6194.2	5548.2	12		1500	280	26.	5993.9	5546.7
2		2200	47	12.	5876.4	5545.8	7		1900	164	38.	6193.3	5548.1	12		1600	281	26.	5991.9	5546.7
2		2300	48	12.	5877.1	5545.8	7		2000	165	38.	6192.4	5548.1	12		1700	282	26.	5989.8	5546.7
3		0000	49	12.	5877.7	5545.8	7		2100	166	38.	6191.6	5548.1	12		1800	283	26.	5987.8	5546.7
3		0100	50	12.	5878.4	5545.8	7		2200	167	38.	6190.7	5548.1	12		1900	284	25.	5985.7	5546.7
3		0200	51	13.	5879.1	5545.8	7		2300	168	38.	6189.7	5548.1	12		2000	285	25.	5983.7	5546.6
3		0300	52	13.	5879.7	5545.8	8		0000	169	38.	6188.6	5548.1	12		2100	286	25.	5981.7	5546.6
3		0400	53	13.	5880.4	5545.8	8		0100	170	38.	6187.6	5548.1	12		2200	287	25.	5979.7	5546.6
3		0500	54	13.	5881.1	5545.8	8		0200	171	38.	6186.6	5548.1	12		2300	288	25.	5977.8	5546.6
3		0600	55	13.	5881.7	5545.8	8		0300	172	38.	6185.6	5548.1	13		0000	289	25.	5975.8	5546.6
3		0700	56	13.	5882.4	5545.8	8		0400	173	38.	6184.5	5548.1	13		0100	290	24.	5973.9	5546.6
3		0800	57	13.	5883.0	5545.8	8		0500	174	38.	6183.4	5548.1	13		0200	291	24.	5972.0	5546.5

```
   3     0900  58      13.   5883.7  5545.8 *  8     0600 175      38.   6182.2  5548.1 * 13     0300 292      24.   5970.1  5546.5
   3     1000  59      13.   5884.4  5545.8 *  8     0700 176      38.   6181.0  5548.1 * 13     0400 293      24.   5968.2  5546.5
   3     1100  60      14.   5885.1  5545.8 *  8     0800 177      38.   6179.9  5548.1 * 13     0500 294      24.   5966.3  5546.5
   3     1200  61      14.   5885.8  5545.8 *  8     0900 178      38.   6178.7  5548.1 * 13     0600 295      23.   5964.4  5546.5
   3     1300  62      14.   5886.5  5545.8 *  8     1000 179      38.   6177.4  5548.1 * 13     0700 296      23.   5962.6  5546.5
   3     1400  63      14.   5887.3  5545.8 *  8     1100 180      38.   6176.2  5548.1 * 13     0800 297      23.   5960.7  5546.5
   3     1500  64      14.   5888.1  5545.9 *  8     1200 181      38.   6175.0  5548.1 * 13     0900 298      23.   5958.9  5546.4
   3     1600  65      14.   5888.8  5545.9 *  8     1300 182      38.   6173.7  5548.1 * 13     1000 299      23.   5957.1  5546.4
   3     1700  66      14.   5889.6  5545.9 *  8     1400 183      38.   6172.4  5548.1 * 13     1100 300      23.   5955.3  5546.4
   3     1800  67      14.   5890.3  5545.9 *  8     1500 184      38.   6171.1  5548.1 * 13     1200 301      22.   5953.5  5546.4
   3     1900  68      15.   5891.1  5545.9 *  8     1600 185      38.   6169.8  5548.1 * 13     1300 302      22.   5951.8  5546.4
   3     2000  69      15.   5891.9  5545.9 *  8     1700 186      38.   6168.5  5548.1 * 13     1400 303      22.   5950.0  5546.4
   3     2100  70      15.   5892.7  5545.9 *  8     1800 187      38.   6167.1  5548.1 * 13     1500 304      22.   5948.3  5546.4
   3     2200  71      15.   5893.5  5545.9 *  8     1900 188      38.   6165.8  5548.1 * 13     1600 305      22.   5946.6  5546.3
   3     2300  72      15.   5894.4  5545.9 *  8     2000 189      38.   6164.5  5548.1 * 13     1700 306      21.   5944.9  5546.3
   4     0000  73      15.   5895.2  5545.9 *  8     2100 190      38.   6163.2  5548.0 * 13     1800 307      21.   5943.2  5546.3
   4     0100  74      15.   5896.1  5545.9 *  8     2200 191      38.   6161.9  5548.0 * 13     1900 308      21.   5941.5  5546.3
   4     0200  75      15.   5897.0  5545.9 *  8     2300 192      38.   6160.4  5548.0 * 13     2000 309      21.   5939.9  5546.3
   4     0300  76      16.   5897.9  5545.9 *  9     0000 193      38.   6158.9  5548.0 * 13     2100 310      21.   5938.2  5546.3
   4     0400  77      16.   5898.8  5545.9 *  9     0100 194      38.   6157.5  5548.0 * 13     2200 311      21.   5936.6  5546.3
   4     0500  78      16.   5899.8  5546.0 *  9     0200 195      38.   6156.0  5548.0 * 13     2300 312      20.   5935.0  5546.2
   4     0600  79      16.   5900.7  5546.0 *  9     0300 196      37.   6154.6  5548.0 * 14     0000 313      20.   5933.4  5546.2
   4     0700  80      16.   5901.7  5546.0 *  9     0400 197      37.   6153.1  5548.0 * 14     0100 314      20.   5931.8  5546.2
   4     0800  81      16.   5902.8  5546.0 *  9     0500 198      37.   6151.6  5548.0 * 14     0200 315      20.   5930.3  5546.2
   4     0900  82      16.   5903.8  5546.0 *  9     0600 199      37.   6150.2  5548.0 * 14     0300 316      20.   5928.7  5546.2
   4     1000  83      17.   5904.8  5546.0 *  9     0700 200      37.   6148.6  5548.0 * 14     0400 317      19.   5927.2  5546.2
   4     1100  84      17.   5905.9  5546.0 *  9     0800 201      37.   6147.2  5548.0 * 14     0500 318      19.   5925.6  5546.2
   4     1200  85      17.   5907.0  5546.0 *  9     0900 202      37.   6145.7  5548.0 * 14     0600 319      19.   5924.1  5546.2
   4     1300  86      17.   5908.1  5546.0 *  9     1000 203      37.   6144.2  5548.0 * 14     0700 320      19.   5922.7  5546.1
   4     1400  87      17.   5909.2  5546.0 *  9     1100 204      37.   6142.7  5547.9 * 14     0800 321      19.   5921.2  5546.1
   4     1500  88      17.   5910.4  5546.0 *  9     1200 205      37.   6141.2  5547.9 * 14     0900 322      19.   5919.7  5546.1
   4     1600  89      18.   5911.7  5546.0 *  9     1300 206      37.   6139.6  5547.9 * 14     1000 323      18.   5918.3  5546.1
   4     1700  90      18.   5912.9  5546.1 *  9     1400 207      37.   6138.1  5547.9 * 14     1100 324      18.   5916.8  5546.1
   4     1800  91      18.   5914.2  5546.1 *  9     1500 208      37.   6136.5  5547.9 * 14     1200 325      18.   5915.4  5546.1
   4     1900  92      18.   5915.6  5546.1 *  9     1600 209      36.   6135.0  5547.9 * 14     1300 326      18.   5914.0  5546.1
   4     2000  93      18.   5917.0  5546.1 *  9     1700 210      36.   6133.4  5547.9 * 14     1400 327      18.   5912.6  5546.1
   4     2100  94      18.   5918.4  5546.1 *  9     1800 211      36.   6131.9  5547.9 * 14     1500 328      17.   5911.3  5546.0
   4     2200  95      19.   5919.9  5546.1 *  9     1900 212      36.   6130.3  5547.8 * 14     1600 329      17.   5909.9  5546.0
   4     2300  96      19.   5921.5  5546.1 *  9     2000 213      36.   6128.7  5547.8 * 14     1700 330      17.   5908.5  5546.0
   5     0000  97      19.   5923.1  5546.1 *  9     2100 214      36.   6127.2  5547.8 * 14     1800 331      17.   5907.2  5546.0
   5     0100  98      19.   5924.7  5546.2 *  9     2200 215      36.   6125.7  5547.8 * 14     1900 332      17.   5905.9  5546.0
   5     0200  99      19.   5926.5  5546.2 *  9     2300 216      36.   6124.1  5547.8 * 14     2000 333      17.   5904.6  5546.0
   5     0300 100      20.   5928.4  5546.2 * 10     0000 217      36.   6122.6  5547.8 * 14     2100 334      16.   5903.3  5546.0
   5     0400 101      20.   5930.3  5546.2 * 10     0100 218      36.   6121.0  5547.8 * 14     2200 335      16.   5902.0  5546.0
   5     0500 102      20.   5932.3  5546.2 * 10     0200 219      35.   6119.5  5547.8 * 14     2300 336      16.   5900.8  5546.0
   5     0600 103      20.   5934.4  5546.2 * 10     0300 220      35.   6117.9  5547.7 * 15     0000 337      16.   5899.5  5545.9
   5     0700 104      21.   5936.6  5546.3 * 10     0400 221      35.   6116.4  5547.7 * 15     0100 338      16.   5898.3  5545.9
   5     0800 105      21.   5938.9  5546.3 * 10     0500 222      35.   6114.8  5547.7 * 15     0200 339      15.   5897.1  5545.9
   5     0900 106      21.   5941.3  5546.3 * 10     0600 223      35.   6113.2  5547.7 * 15     0300 340      15.   5895.9  5545.9
   5     1000 107      21.   5943.9  5546.3 * 10     0700 224      35.   6111.7  5547.7 * 15     0400 341      15.   5894.7  5545.9
   5     1100 108      22.   5946.6  5546.3 * 10     0800 225      35.   6110.1  5547.7 * 15     0500 342      15.   5893.5  5545.9
   5     1200 109      22.   5949.5  5546.4 * 10     0900 226      35.   6108.6  5547.7 * 15     0600 343      15.   5892.4  5545.9
   5     1300 110      22.   5952.6  5546.4 * 10     1000 227      35.   6107.1  5547.7 * 15     0700 344      15.   5891.3  5545.9
   5     1400 111      23.   5956.0  5546.4 * 10     1100 228      35.   6105.5  5547.6 * 15     0800 345      14.   5890.2  5545.9
   5     1500 112      23.   5959.7  5546.4 * 10     1200 229      34.   6104.0  5547.6 * 15     0900 346      14.   5889.0  5545.9
   5     1600 113      23.   5963.6  5546.5 * 10     1300 230      34.   6102.4  5547.6 * 15     1000 347      14.   5888.0  5545.9
   5     1700 114      24.   5968.0  5546.5 * 10     1400 231      34.   6100.9  5547.6 * 15     1100 348      14.   5886.9  5545.8
   5     1800 115      24.   5973.0  5546.6 * 10     1500 232      34.   6099.4  5547.6 * 15     1200 349      14.   5885.8  5545.8
   5     1900 116      25.   5978.5  5546.6 * 10     1600 233      34.   6097.8  5547.6 * 15     1300 350      14.   5884.8  5545.8
   5     2000 117      25.   5984.9  5546.7 * 10     1700 234      34.   6096.2  5547.6 *
                                       *                                       *
 ********************************************************************************************************************************************************

 PEAK OUTFLOW IS       39. AT TIME 144.00 HOURS


  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR     349.00-HR
+   (CFS)       (HR)
                        (CFS)
+      39.    144.00                39.          39.          38.          25.
                      (INCHES)      .000         .000         .000         .000
                       (AC-FT)       19.          77.         228.         718.

 PEAK STORAGE   TIME                      MAXIMUM AVERAGE STORAGE
                                  6-HR        24-HR        72-HR     349.00-HR
+  (AC-FT)      (HR)
     6202.    144.00               6202.        6200.        6186.        6010.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR     349.00-HR
+   (FEET)      (HR)
   5548.18    144.00             5548.18      5548.17      5548.13      5546.82

                       CUMULATIVE AREA =     .00 SQ MI

1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                           FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                        TIME TO PEAK IN HOURS
```

```
                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                       1.00

 HYDROGRAPH AT
+                 Cove        .00     1   FLOW          850.
                                           TIME       120.00

 ROUTED TO
+                 Cove        .00     1   FLOW           39.
                                           TIME       144.00

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5548.18
                                           TIME       144.00
1                                   SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                                  (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 ..............                  INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50            5549.20          5552.00
                                  STORAGE             5845.              6508.            7347.
                                  OUTFLOW                0.                45.             435.

                      RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                        OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                       PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                      1.00      5548.18         .00       6202.        39.       .00       144.00         .00


 *** NORMAL END OF HEC-1 ***
```

Storm Event 13. Local Auxiliary Spillway Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:58:03  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX          X
                                                X     X  X        X     X        XX
                                                X     X  X        X               X
                                                XXXXXXX  XXXX     X        XXXXX  X
                                                X     X  X        X               X
                                                X     X  X        X     X         X
                                                X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   Local ASH
           13          ID
                       *
           14          JR    PREC     1.0
           15          IT      18       0       0     100
           16          IO       0
           17          IN      18
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    4.09
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                  PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
  40          KK   C1
  41          KM   Combine RB1, B2, B3
  42          HC       3
              *

  43          KK   RC1
  44          KM   Route RC1
  45          RD    7255    .060    .030            TRAP      20      20
              *

  46          KK   B4
  47          KM   Runoff from Basin 4
  48          BA   0.453
  49          LS       0    73.3
  50          UD    0.48
              *

  51          KK   B5
  52          KM   Runoff from Basin 5
  53          BA   0.805
  54          LS       0    74.1
  55          UD    0.63
              *

  56          KK   C2
  57          KM   Combine RC1, B4, B5
  58          HC       3
              *

  59          KK   RC2
  60          KM   Route C2
  61          RD    2380    .039    .030            TRAP      40       2
              *

  62          KK   B6
  63          KM   Runoff from Basin 6
  64          BA   0.150
  65          LS       0    84.3
  66          UD    0.19
              *

  67          KK   B7
  68          KM   Runoff from Basin 7
  69          BA   0.327
  70          LS       0    75.7
  71          UD    0.46
              *

  72          KK   C3
  73          KM   Combine RC2, B6, B7
  74          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  75          KK   RC3
  76          KM   Route C3
  77          RD   11323    .023    .030            TRAP      40      20
              *

  78          KK   B8
  79          KM   Runoff from Basin 8
  80          BA   1.012
  81          LS       0    84.0
  82          UD    0.67
              *

  83          KK   B9
  84          KM   Runoff from Basin 9
  85          BA   0.242
  86          LS       0    85.5
  87          UD    0.26
              *

  88          KK   B10
  89          KM   Runoff from Basin 10
  90          BA   0.129
  91          LS       0    86.7
  92          UD    0.18
              *

  93          KK   C4
  94          KM   Combine B9, B10
  95          HC       2
              *

  96          KK   RC4
  97          KM   Route C4
  98          RD    3380    .037    .030            TRAP      40      20
              *
```

```
             99           KK   B11
            100           KM   Runoff from Basin 11
            101           BA   0.279
            102           LS       0    84.8
            103           UD    0.39
                          *

            104           KK   C5
            105           KM   Combine RC3, B8, RC4, B11
            106           HC       4
                          *

            107           KK   B12
            108           KM   Runoff from Basin 12
            109           BA   0.127
            110           LS       0    81.2
            111           UD    0.40
                          *
1                                              HEC-1 INPUT                                              PAGE  4

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            112           KK   Call
            113           KM   Combine C5, B12
            114           HC       2
                          *

            115           KK   Cove Reservoir
            116           KM   Routing through Res'v
            117           RS       1    ELEV  5545.5
            118           SV       0      19      95     240     453     738    1105    1563    2217    2773
            119           SV    3542    4423    5419    6149    7347    8000
            120           SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
            121           SE    5530    5536    5542    5548    5552    5558
            122           SL  5545.5   4.909     0.6     0.5
            123           SS  5549.2      30    2.67     1.5
            124           ST  5552.0    1892     2.9     1.5
                          *
            125           ZZ
1*************************************                                          *************************************
 *                                   *                                          *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                      *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998            *                                      *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1              *                                      *          609 SECOND STREET          *
 *                                     *                                      *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:58:03   *                                    *           (916) 756-1104            *
 *                                     *                                      *                                     *
 *************************************                                          *************************************


                          HYDROLOGY STUDY for COVE RESERVOIR
                          Located in KANE COUNTY, UTAH

                          AUG 2020

                          PREPARED BY ALPHA ENGINEERING
                          43 SOUTH 100 EAST, SUITE 100
                          ST. GEORGE, UTAH  84770
                          TEL: (435) 628-6500
                          FAX: (435) 628-6553

                          Local ASH


   16 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           0  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN          18  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         100  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0542  ENDING TIME
                      ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .30 HOURS
                         TOTAL TIME BASE   29.70 HOURS

            ENGLISH UNITS
                 DRAINAGE AREA         SQUARE MILES
                 PRECIPITATION DEPTH   INCHES
                 LENGTH, ELEVATION     FEET
                 FLOW                  CUBIC FEET PER SECOND
                 STORAGE VOLUME        ACRE-FEET
```

```
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *     Call   *
            *            *
            **************
                          Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                  HYDROGRAPH AT STATION    Call
                                                       SUM OF  2 HYDROGRAPHS
                                                      PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                *                                *                                *
   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                                *                                *
    1     0000    1        0.   *    1     0730   26      180.   *    1     1500   51        0.   *    1     2230   76        0.
    1     0018    2        0.   *    1     0748   27      112.   *    1     1518   52        0.   *    1     2248   77        0.
    1     0036    3        0.   *    1     0806   28       73.   *    1     1536   53        0.   *    1     2306   78        0.
    1     0054    4        0.   *    1     0824   29       47.   *    1     1554   54        0.   *    1     2324   79        0.
    1     0112    5        0.   *    1     0842   30       28.   *    1     1612   55        0.   *    1     2342   80        0.
    1     0130    6        6.   *    1     0900   31       16.   *    1     1630   56        0.   *    2     0000   81        0.
    1     0148    7       39.   *    1     0918   32        9.   *    1     1648   57        0.   *    2     0018   82        0.
    1     0206    8      194.   *    1     0936   33        5.   *    1     1706   58        0.   *    2     0036   83        0.
    1     0224    9      687.   *    1     0954   34        3.   *    1     1724   59        0.   *    2     0054   84        0.
    1     0242   10     1365.   *    1     1012   35        1.   *    1     1742   60        0.   *    2     0112   85        0.
    1     0300   11     2027.   *    1     1030   36        1.   *    1     1800   61        0.   *    2     0130   86        0.
    1     0318   12     2180.   *    1     1048   37        0.   *    1     1818   62        0.   *    2     0148   87        0.
    1     0336   13     1955.   *    1     1106   38        0.   *    1     1836   63        0.   *    2     0206   88        0.
    1     0354   14     1683.   *    1     1124   39        0.   *    1     1854   64        0.   *    2     0224   89        0.
    1     0412   15     1441.   *    1     1142   40        0.   *    1     1912   65        0.   *    2     0242   90        0.
    1     0430   16     1248.   *    1     1200   41        0.   *    1     1930   66        0.   *    2     0300   91        0.
    1     0448   17     1107.   *    1     1218   42        0.   *    1     1948   67        0.   *    2     0318   92        0.
    1     0506   18     1001.   *    1     1236   43        0.   *    1     2006   68        0.   *    2     0336   93        0.
    1     0524   19      924.   *    1     1254   44        0.   *    1     2024   69        0.   *    2     0354   94        0.
    1     0542   20      874.   *    1     1312   45        0.   *    1     2042   70        0.   *    2     0412   95        0.
    1     0600   21      833.   *    1     1330   46        0.   *    1     2100   71        0.   *    2     0430   96        0.
    1     0618   22      748.   *    1     1348   47        0.   *    1     2118   72        0.   *    2     0448   97        0.
    1     0636   23      589.   *    1     1406   48        0.   *    1     2136   73        0.   *    2     0506   98        0.
    1     0654   24      423.   *    1     1424   49        0.   *    1     2154   74        0.   *    2     0524   99        0.
    1     0712   25      283.   *    1     1442   50        0.   *    1     2212   75        0.   *    2     0542  100        0.
                                *                                *                                *
*****************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     29.70-HR
+   (CFS)       (HR)
                          (CFS)
+    2180.      3.30                  991.        251.        203.         203.
                       (INCHES)     1.943       1.969       1.969        1.969
                        (AC-FT)      491.        498.        498.         498.

                        CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *     Cove   *     Reservoir
            *            *
            **************
                          Routing through Res'v

              HYDROGRAPH ROUTING DATA
```

```
117 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     5545.50  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                             3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                              5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

122 SL          LOW-LEVEL OUTLET
                     ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                     CAREA        4.91  CROSS-SECTIONAL AREA
                      COQL         .60  COEFFICIENT
                      EXPL         .50  EXPONENT OF HEAD

123 SS          SPILLWAY
                     CREL     5549.20  SPILLWAY CREST ELEVATION
                    SPWID       30.00  SPILLWAY WIDTH
                     COQW        2.67  WEIR COEFFICIENT
                     EXPW        1.50  EXPONENT OF HEAD

124 ST          TOP OF DAM
                     TOPEL     5552.00  ELEVATION AT TOP OF DAM
                    DAMWID     1892.00  DAM WIDTH
                      COQD        2.90  WEIR COEFFICIENT
                      EXPD        1.50  EXPONENT OF HEAD
```

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

****

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		1012	35	41.	6318.9	5548.6	1		2024	69	41.	6284.1	5548.5
1		0018	2	0.	5844.8	5545.5	1		1030	36	41.	6317.9	5548.6	1		2042	70	41.	6283.1	5548.4
1		0036	3	0.	5844.8	5545.5	1		1048	37	41.	6316.9	5548.6	1		2100	71	41.	6282.1	5548.4
1		0054	4	0.	5844.8	5545.5	1		1106	38	41.	6315.9	5548.6	1		2118	72	41.	6281.1	5548.4
1		0112	5	0.	5844.8	5545.5	1		1124	39	41.	6314.8	5548.6	1		2136	73	40.	6280.0	5548.4
1		0130	6	1.	5844.9	5545.5	1		1142	40	41.	6313.8	5548.6	1		2154	74	40.	6279.0	5548.4
1		0148	7	2.	5845.4	5545.5	1		1200	41	41.	6312.8	5548.5	1		2212	75	40.	6278.0	5548.4
1		0206	8	4.	5848.3	5545.5	1		1218	42	41.	6311.8	5548.5	1		2230	76	40.	6277.0	5548.4
1		0224	9	8.	5859.1	5545.6	1		1236	43	41.	6310.7	5548.5	1		2248	77	40.	6275.9	5548.4
1		0242	10	13.	5884.3	5545.8	1		1254	44	41.	6309.7	5548.5	1		2306	78	40.	6274.9	5548.4
1		0300	11	19.	5925.9	5546.2	1		1312	45	41.	6308.7	5548.5	1		2324	79	40.	6273.9	5548.4
1		0318	12	25.	5977.5	5546.6	1		1330	46	41.	6307.7	5548.5	1		2342	80	40.	6272.9	5548.4
1		0336	13	29.	6028.2	5547.0	1		1348	47	41.	6306.6	5548.5	2		0000	81	40.	6271.8	5548.4
1		0354	14	32.	6072.5	5547.4	1		1406	48	41.	6305.6	5548.5	2		0018	82	40.	6270.8	5548.4
1		0412	15	35.	6110.4	5547.7	1		1424	49	41.	6304.6	5548.5	2		0036	83	40.	6269.8	5548.4
1		0430	16	37.	6142.7	5547.9	1		1442	50	41.	6303.6	5548.5	2		0054	84	40.	6268.8	5548.4
1		0448	17	38.	6170.9	5548.1	1		1500	51	41.	6302.6	5548.5	2		0112	85	40.	6267.7	5548.4
1		0506	18	39.	6196.1	5548.2	1		1518	52	41.	6301.5	5548.5	2		0130	86	40.	6266.7	5548.4
1		0524	19	39.	6219.0	5548.2	1		1536	53	41.	6300.5	5548.5	2		0148	87	40.	6265.7	5548.4
1		0542	20	40.	6240.4	5548.3	1		1554	54	41.	6299.5	5548.5	2		0206	88	40.	6264.7	5548.4

```
   1     0600  21      40.   6260.6  5548.4 *  1     1612  55      41.   6298.5  5548.5 *  2     0224  89      40.   6263.7  5548.4
   1     0618  22      40.   6279.2  5548.4 *  1     1630  56      41.   6297.4  5548.5 *  2     0242  90      40.   6262.6  5548.4
   1     0636  23      41.   6294.7  5548.5 *  1     1648  57      41.   6296.4  5548.5 *  2     0300  91      40.   6261.6  5548.4
   1     0654  24      41.   6306.2  5548.5 *  1     1706  58      41.   6295.4  5548.5 *  2     0318  92      40.   6260.6  5548.4
   1     0712  25      41.   6314.0  5548.6 *  1     1724  59      41.   6294.4  5548.5 *  2     0336  93      40.   6259.6  5548.4
   1     0730  26      41.   6318.6  5548.6 *  1     1742  60      41.   6293.3  5548.5 *  2     0354  94      40.   6258.5  5548.4
   1     0748  27      41.   6321.3  5548.6 *  1     1800  61      41.   6292.3  5548.5 *  2     0412  95      40.   6257.5  5548.4
   1     0806  28      41.   6322.6  5548.6 *  1     1818  62      41.   6291.3  5548.5 *  2     0430  96      40.   6256.5  5548.4
   1     0824  29      41.   6323.0  5548.6 *  1     1836  63      41.   6290.3  5548.5 *  2     0448  97      40.   6255.5  5548.4
   1     0842  30      41.   6322.9  5548.6 *  1     1854  64      41.   6289.2  5548.5 *  2     0506  98      40.   6254.4  5548.4
   1     0900  31      41.   6322.4  5548.6 *  1     1912  65      41.   6288.2  5548.5 *  2     0524  99      40.   6253.4  5548.3
   1     0918  32      41.   6321.7  5548.6 *  1     1930  66      41.   6287.2  5548.5 *  2     0542 100      40.   6252.4  5548.3
   1     0936  33      41.   6320.8  5548.6 *  1     1948  67      41.   6286.2  5548.5 *
   1     0954  34      41.   6320.0  5548.6 *  1     2006  68      41.   6285.1  5548.5 *
                                            *                                            *
 ****************************************************************************************************************************

 PEAK OUTFLOW IS       41. AT TIME   8.40 HOURS


  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     29.70-HR
+   (CFS)       (HR)
                          (CFS)
+      41.      8.40                  41.         41.         36.          36.
                       (INCHES)      .081        .319        .353         .353
                        (AC-FT)       20.         81.         89.          89.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     29.70-HR
+  (AC-FT)      (HR)
     6323.      8.40                 6317.       6290.       6230.        6230.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     29.70-HR
+   (FEET)      (HR)
   5548.58      8.40               5548.56     5548.47     5548.10      5548.10

                        CUMULATIVE AREA =    4.74 SQ MI

1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                       1.00

 HYDROGRAPH AT
+                 B1          .50     1   FLOW         221.
                                          TIME         3.00

 ROUTED TO
+                 RB1         .50     1   FLOW         215.
                                          TIME         3.30

 HYDROGRAPH AT
+                 B2          .44     1   FLOW         187.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B3          .28     1   FLOW         116.
                                          TIME         3.00

  3 COMBINED AT
+                 C1         1.22     1   FLOW         493.
                                          TIME         3.00

 ROUTED TO
+                 RC1        1.22     1   FLOW         478.
                                          TIME         3.30

 HYDROGRAPH AT
+                 B4          .45     1   FLOW         209.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B5          .81     1   FLOW         334.
                                          TIME         3.00

  3 COMBINED AT
+                 C2         2.48     1   FLOW         983.
                                          TIME         3.30

 ROUTED TO
+                 RC2        2.48     1   FLOW         977.
                                          TIME         3.30

 HYDROGRAPH AT
```

```
+                 B6          .15     1   FLOW         141.
                                          TIME         2.70

 HYDROGRAPH AT
+                 B7          .33     1   FLOW         172.
                                          TIME         3.00

  3 COMBINED AT
+                 C3         2.95     1   FLOW        1173.
                                          TIME         3.30

 ROUTED TO
+                 RC3        2.95     1   FLOW        1135.
                                          TIME         3.30

 HYDROGRAPH AT
+                 B8         1.01     1   FLOW         669.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B9          .24     1   FLOW         237.
                                          TIME         2.70

 HYDROGRAPH AT
+                 B10         .13     1   FLOW         138.
                                          TIME         2.40

  2 COMBINED AT
+                 C4          .37     1   FLOW         368.
                                          TIME         2.70

 ROUTED TO
+                 RC4         .37     1   FLOW         354.
                                          TIME         2.70

 HYDROGRAPH AT
+                 B11         .28     1   FLOW         237.
                                          TIME         2.70

  4 COMBINED AT
+                 C5         4.61     1   FLOW        2118.
                                          TIME         3.30

 HYDROGRAPH AT
+                 B12         .13     1   FLOW          90.
                                          TIME         2.70

  2 COMBINED AT
+                 Call       4.74     1   FLOW        2180.
                                          TIME         3.30

 ROUTED TO
+                 Cove       4.74     1   FLOW          41.
                                          TIME         8.40

                                    ** PEAK STAGES IN FEET **
                                    1   STAGE     5548.58
                                        TIME         8.40
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE         3.60    218.47    194.40      1.58     18.00    214.54    198.00        1.58


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4234E+02 EXCESS= .0000E+00 OUTFLOW= .4236E+02 BASIN STORAGE= .4004E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE         3.60    494.09    190.80      1.54     18.00    478.26    198.00        1.53


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1002E+03 EXCESS= .0000E+00 OUTFLOW= .1002E+03 BASIN STORAGE= .2965E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         2.55    978.48    199.17      1.59     18.00    977.20    198.00        1.60


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2103E+03 EXCESS= .0000E+00 OUTFLOW= .2103E+03 BASIN STORAGE= .2799E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE         7.20   1186.64    208.80      1.66     18.00   1135.13    198.00        1.66
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2617E+03 EXCESS= .0000E+00 OUTFLOW= .2619E+03 BASIN STORAGE= .9925E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

RC4	MANE	5.40	361.92	167.40	2.62	18.00	354.00	162.00	2.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5187E+02 EXCESS= .0000E+00 OUTFLOW= .5189E+02 BASIN STORAGE= .2315E-02 PERCENT ERROR= .0

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION Cove
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	5545.50	5549.20	5552.00
STORAGE	5845.	6508.	7347.
OUTFLOW	0.	45.	435.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	5548.58	.00	6323.	41.	.00	8.40	.00

*** NORMAL END OF HEC-1 ***

Storm Event 14. General Auxiliary Spillway Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  03:33:46  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX          X
                                                X     X  X        X     X        XX
                                                X     X  X        X               X
                                                XXXXXXX  XXXX     X        XXXXX  X
                                                X     X  X        X               X
                                                X     X  X        X     X         X
                                                X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                  PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   General ASH (NEH)
           13          ID
                       *
           14          JR    PREC     1.0
           15          IT      12       0       0     200
           16          IO       0
           17          IN      12
                       *
           18          QI       0       0       0       0       0       0       0       0       0       0
           19          QI       0       0       0       0       0       0       0       0       0       0
           20          QI       0       0       0       0       0       0       0       0       0       0
           21          QI       0       0       2      11      35      83     155     249     357     473
           22          QI     589     701     807     907     999    1084    1163    1234    1300    1359
           23          QI    1414    1464    1510    1552    1590    1626    1658    1689    1716    1742
           24          QI    1766    1764    1708    1564    1350    1117     898     713     581     489
           25          QI     423     374     339     314     296     283     274     267     263     259
           26          QI     257     255     254     253     253     253     253     253     254     254
           27          QI     254     253     251     244     236     226     218     210     205     201
           28          QI     199     197     196     195     194     194     194     193     193     193
           29          QI     193     193     193     193     193     194     194     194     194     194
           30          QI     194     191     182     163     136     107      80      57      41      29
           31          QI      21      15      11       8       6       4       3       2       1       1
           32          QI       1
                       *

           33          KK   Cove Reservoir
           34          KM   Routing through Res'v
           35          RS       1    ELEV  5545.5
           36          SV       0      19      95     240     453     738    1105    1563    2217    2773
           37          SV    3542    4423    5419    6149    7347    8000
           38          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
           39          SE    5530    5536    5542    5548    5552    5558
           40          SL  5545.5   4.909     0.6     0.5
           41          SS  5549.2      30    2.67     1.5
           42          ST  5552.0    1892     2.9     1.5
                       *
           43          ZZ
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
```

```
*  RUN DATE   06AUG20  TIME  03:33:46   *                                                  *          (916) 756-1104           *
*                                       *                                                  *                                   *
*****************************************                                                  *************************************
```

```
                         HYDROLOGY STUDY for COVE RESERVOIR
                         Located in KANE COUNTY, UTAH

                         AUG 2020

                         PREPARED BY ALPHA ENGINEERING
                         43 SOUTH 100 EAST, SUITE 100
                         ST. GEORGE, UTAH  84770
                         TEL: (435) 628-6500
                         FAX: (435) 628-6553

                         General ASH (NEH)


  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          12  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        1548  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .20 HOURS
                       TOTAL TIME BASE   39.80 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00

  17 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          12  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

               SUBBASIN RUNOFF DATA

   0 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                                                                  ***

*****************************************************************************************************************************

                                                  HYDROGRAPH AT STATION    Cove

*****************************************************************************************************************************
                                 *                                 *                                 *
   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                 *                                 *                                 *
    1     0000    1        0.    *    1     1000   51     1414.   *    1     2000  101      199.   *    2     0600  151        1.
    1     0012    2        0.    *    1     1012   52     1464.   *    1     2012  102      197.   *    2     0612  152        1.
    1     0024    3        0.    *    1     1024   53     1510.   *    1     2024  103      196.   *    2     0624  153        1.
    1     0036    4        0.    *    1     1036   54     1552.   *    1     2036  104      195.   *    2     0636  154        1.
    1     0048    5        0.    *    1     1048   55     1590.   *    1     2048  105      194.   *    2     0648  155        1.
    1     0100    6        0.    *    1     1100   56     1626.   *    1     2100  106      194.   *    2     0700  156        1.
    1     0112    7        0.    *    1     1112   57     1658.   *    1     2112  107      194.   *    2     0712  157        1.
    1     0124    8        0.    *    1     1124   58     1689.   *    1     2124  108      193.   *    2     0724  158        1.
    1     0136    9        0.    *    1     1136   59     1716.   *    1     2136  109      193.   *    2     0736  159        1.
    1     0148   10        0.    *    1     1148   60     1742.   *    1     2148  110      193.   *    2     0748  160        1.
    1     0200   11        0.    *    1     1200   61     1766.   *    1     2200  111      193.   *    2     0800  161        1.
    1     0212   12        0.    *    1     1212   62     1764.   *    1     2212  112      193.   *    2     0812  162        1.
    1     0224   13        0.    *    1     1224   63     1708.   *    1     2224  113      193.   *    2     0824  163        1.
    1     0236   14        0.    *    1     1236   64     1564.   *    1     2236  114      193.   *    2     0836  164        1.
    1     0248   15        0.    *    1     1248   65     1350.   *    1     2248  115      193.   *    2     0848  165        1.
    1     0300   16        0.    *    1     1300   66     1117.   *    1     2300  116      194.   *    2     0900  166        1.
    1     0312   17        0.    *    1     1312   67      898.   *    1     2312  117      194.   *    2     0912  167        1.
```

1	0324	18	0.	*	1	1324	68	713.	*	1	2324	118	194.	*	2	0924	168	1.
1	0336	19	0.	*	1	1336	69	581.	*	1	2336	119	194.	*	2	0936	169	1.
1	0348	20	0.	*	1	1348	70	489.	*	1	2348	120	194.	*	2	0948	170	1.
1	0400	21	0.	*	1	1400	71	423.	*	2	0000	121	194.	*	2	1000	171	1.
1	0412	22	0.	*	1	1412	72	374.	*	2	0012	122	191.	*	2	1012	172	1.
1	0424	23	0.	*	1	1424	73	339.	*	2	0024	123	182.	*	2	1024	173	1.
1	0436	24	0.	*	1	1436	74	314.	*	2	0036	124	163.	*	2	1036	174	1.
1	0448	25	0.	*	1	1448	75	296.	*	2	0048	125	136.	*	2	1048	175	1.
1	0500	26	0.	*	1	1500	76	283.	*	2	0100	126	107.	*	2	1100	176	1.
1	0512	27	0.	*	1	1512	77	274.	*	2	0112	127	80.	*	2	1112	177	1.
1	0524	28	0.	*	1	1524	78	267.	*	2	0124	128	57.	*	2	1124	178	1.
1	0536	29	0.	*	1	1536	79	263.	*	2	0136	129	41.	*	2	1136	179	1.
1	0548	30	0.	*	1	1548	80	259.	*	2	0148	130	29.	*	2	1148	180	1.
1	0600	31	0.	*	1	1600	81	257.	*	2	0200	131	21.	*	2	1200	181	1.
1	0612	32	0.	*	1	1612	82	255.	*	2	0212	132	15.	*	2	1212	182	1.
1	0624	33	2.	*	1	1624	83	254.	*	2	0224	133	11.	*	2	1224	183	1.
1	0636	34	11.	*	1	1636	84	253.	*	2	0236	134	8.	*	2	1236	184	1.
1	0648	35	35.	*	1	1648	85	253.	*	2	0248	135	6.	*	2	1248	185	1.
1	0700	36	83.	*	1	1700	86	253.	*	2	0300	136	4.	*	2	1300	186	1.
1	0712	37	155.	*	1	1712	87	253.	*	2	0312	137	3.	*	2	1312	187	1.
1	0724	38	249.	*	1	1724	88	253.	*	2	0324	138	2.	*	2	1324	188	1.
1	0736	39	357.	*	1	1736	89	254.	*	2	0336	139	1.	*	2	1336	189	1.
1	0748	40	473.	*	1	1748	90	254.	*	2	0348	140	1.	*	2	1348	190	1.
1	0800	41	589.	*	1	1800	91	254.	*	2	0400	141	1.	*	2	1400	191	1.
1	0812	42	701.	*	1	1812	92	253.	*	2	0412	142	1.	*	2	1412	192	1.
1	0824	43	807.	*	1	1824	93	251.	*	2	0424	143	1.	*	2	1424	193	1.
1	0836	44	907.	*	1	1836	94	244.	*	2	0436	144	1.	*	2	1436	194	1.
1	0848	45	999.	*	1	1848	95	236.	*	2	0448	145	1.	*	2	1448	195	1.
1	0900	46	1084.	*	1	1900	96	226.	*	2	0500	146	1.	*	2	1500	196	1.
1	0912	47	1163.	*	1	1912	97	218.	*	2	0512	147	1.	*	2	1512	197	1.
1	0924	48	1234.	*	1	1924	98	210.	*	2	0524	148	1.	*	2	1524	198	1.
1	0936	49	1300.	*	1	1936	99	205.	*	2	0536	149	1.	*	2	1536	199	1.
1	0948	50	1359.	*	1	1948	100	201.	*	2	0548	150	1.	*	2	1548	200	1.

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	39.80-HR
+ (CFS)	(HR)				
		(CFS)			
+ 1766.	12.00	1268.	437.	264.	264.
		(INCHES) .000	.000	.000	.000
		(AC-FT) 629.	868.	868.	868.

CUMULATIVE AREA = .00 SQ MI

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		1000	51	1414.	*	1		2000	101	199.	*	2		0600	151	1.
1		0012	2	0.	*	1		1012	52	1464.	*	1		2012	102	197.	*	2		0612	152	1.
1		0024	3	0.	*	1		1024	53	1510.	*	1		2024	103	196.	*	2		0624	153	1.
1		0036	4	0.	*	1		1036	54	1552.	*	1		2036	104	195.	*	2		0636	154	1.
1		0048	5	0.	*	1		1048	55	1590.	*	1		2048	105	194.	*	2		0648	155	1.
1		0100	6	0.	*	1		1100	56	1626.	*	1		2100	106	194.	*	2		0700	156	1.
1		0112	7	0.	*	1		1112	57	1658.	*	1		2112	107	194.	*	2		0712	157	1.
1		0124	8	0.	*	1		1124	58	1689.	*	1		2124	108	193.	*	2		0724	158	1.
1		0136	9	0.	*	1		1136	59	1716.	*	1		2136	109	193.	*	2		0736	159	1.
1		0148	10	0.	*	1		1148	60	1742.	*	1		2148	110	193.	*	2		0748	160	1.
1		0200	11	0.	*	1		1200	61	1766.	*	1		2200	111	193.	*	2		0800	161	1.
1		0212	12	0.	*	1		1212	62	1764.	*	1		2212	112	193.	*	2		0812	162	1.
1		0224	13	0.	*	1		1224	63	1708.	*	1		2224	113	193.	*	2		0824	163	1.
1		0236	14	0.	*	1		1236	64	1564.	*	1		2236	114	193.	*	2		0836	164	1.
1		0248	15	0.	*	1		1248	65	1350.	*	1		2248	115	193.	*	2		0848	165	1.
1		0300	16	0.	*	1		1300	66	1117.	*	1		2300	116	194.	*	2		0900	166	1.
1		0312	17	0.	*	1		1312	67	898.	*	1		2312	117	194.	*	2		0912	167	1.
1		0324	18	0.	*	1		1324	68	713.	*	1		2324	118	194.	*	2		0924	168	1.
1		0336	19	0.	*	1		1336	69	581.	*	1		2336	119	194.	*	2		0936	169	1.
1		0348	20	0.	*	1		1348	70	489.	*	1		2348	120	194.	*	2		0948	170	1.
1		0400	21	0.	*	1		1400	71	423.	*	2		0000	121	194.	*	2		1000	171	1.
1		0412	22	0.	*	1		1412	72	374.	*	2		0012	122	191.	*	2		1012	172	1.
1		0424	23	0.	*	1		1424	73	339.	*	2		0024	123	182.	*	2		1024	173	1.
1		0436	24	0.	*	1		1436	74	314.	*	2		0036	124	163.	*	2		1036	174	1.
1		0448	25	0.	*	1		1448	75	296.	*	2		0048	125	136.	*	2		1048	175	1.
1		0500	26	0.	*	1		1500	76	283.	*	2		0100	126	107.	*	2		1100	176	1.
1		0512	27	0.	*	1		1512	77	274.	*	2		0112	127	80.	*	2		1112	177	1.
1		0524	28	0.	*	1		1524	78	267.	*	2		0124	128	57.	*	2		1124	178	1.
1		0536	29	0.	*	1		1536	79	263.	*	2		0136	129	41.	*	2		1136	179	1.
1		0548	30	0.	*	1		1548	80	259.	*	2		0148	130	29.	*	2		1148	180	1.
1		0600	31	0.	*	1		1600	81	257.	*	2		0200	131	21.	*	2		1200	181	1.
1		0612	32	0.	*	1		1612	82	255.	*	2		0212	132	15.	*	2		1212	182	1.
1		0624	33	2.	*	1		1624	83	254.	*	2		0224	133	11.	*	2		1224	183	1.
1		0636	34	11.	*	1		1636	84	253.	*	2		0236	134	8.	*	2		1236	184	1.
1		0648	35	35.	*	1		1648	85	253.	*	2		0248	135	6.	*	2		1248	185	1.
1		0700	36	83.	*	1		1700	86	253.	*	2		0300	136	4.	*	2		1300	186	1.

```
     1     0712   37      155.   *    1     1712   87      253.   *    2     0312  137        3.   *    2     1312  187        1.
     1     0724   38      249.   *    1     1724   88      253.   *    2     0324  138        2.   *    2     1324  188        1.
     1     0736   39      357.   *    1     1736   89      254.   *    2     0336  139        1.   *    2     1336  189        1.
     1     0748   40      473.   *    1     1748   90      254.   *    2     0348  140        1.   *    2     1348  190        1.
     1     0800   41      589.   *    1     1800   91      254.   *    2     0400  141        1.   *    2     1400  191        1.
     1     0812   42      701.   *    1     1812   92      253.   *    2     0412  142        1.   *    2     1412  192        1.
     1     0824   43      807.   *    1     1824   93      251.   *    2     0424  143        1.   *    2     1424  193        1.
     1     0836   44      907.   *    1     1836   94      244.   *    2     0436  144        1.   *    2     1436  194        1.
     1     0848   45      999.   *    1     1848   95      236.   *    2     0448  145        1.   *    2     1448  195        1.
     1     0900   46     1084.   *    1     1900   96      226.   *    2     0500  146        1.   *    2     1500  196        1.
     1     0912   47     1163.   *    1     1912   97      218.   *    2     0512  147        1.   *    2     1512  197        1.
     1     0924   48     1234.   *    1     1924   98      210.   *    2     0524  148        1.   *    2     1524  198        1.
     1     0936   49     1300.   *    1     1936   99      205.   *    2     0536  149        1.   *    2     1536  199        1.
     1     0948   50     1359.   *    1     1948  100      201.   *    2     0548  150        1.   *    2     1548  200        1.
                                *                                *                                *
*****************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     39.80-HR
+   (CFS)       (HR)
                          (CFS)
+    1766.     12.00                 1268.        437.        264.         264.
                       (INCHES)      .000        .000        .000         .000
                        (AC-FT)      629.        868.        868.         868.

                        CUMULATIVE AREA =     .00 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   33 KK    *     Cove   *     Reservoir
            *            *
            **************
                          Routing through Res'v

               HYDROGRAPH ROUTING DATA

   35 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

   36 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

   38 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                                5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

   40 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

   41 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

   42 ST          TOP OF DAM
                       TOPEL     5552.00  ELEVATION AT TOP OF DAM
                      DAMWID     1892.00  DAM WIDTH
                        COQD        2.90  WEIR COEFFICIENT
                        EXPD        1.50  EXPONENT OF HEAD

                                                                  ***

                                                COMPUTED OUTFLOW-ELEVATION DATA

                                                  (EXCLUDING FLOW OVER DAM)

            OUTFLOW        .00       .00     25.78     27.48     29.42     31.65     34.25     37.31     40.98     45.44
          ELEVATION    5470.00   5545.50   5546.69   5546.85   5547.05   5547.30   5547.60   5548.00   5548.51   5549.20

            OUTFLOW      49.37     68.29    113.97    198.20    332.85    529.64    800.37   1156.85   1610.93   2174.46
          ELEVATION    5549.32   5549.60   5550.06   5550.68   5551.48   5552.44   5553.58   5554.88   5556.36   5558.00


                                              COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

                                                  (INCLUDING FLOW OVER DAM)

            STORAGE        .00     19.00     95.00    240.00    453.00    738.00   1105.00   1563.00   2217.00   2773.00
            OUTFLOW        .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
          ELEVATION    5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
```

STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		1324	68	44.	6457.6	5549.0	2		0248	135	69.	6632.9	5549.6
1		0012	2	0.	5844.8	5545.5	1		1336	69	45.	6467.5	5549.1	2		0300	136	69.	6631.9	5549.6
1		0024	3	0.	5844.8	5545.5	1		1348	70	45.	6475.6	5549.1	2		0312	137	69.	6630.9	5549.6
1		0036	4	0.	5844.8	5545.5	1		1400	71	45.	6482.3	5549.1	2		0324	138	69.	6629.8	5549.6
1		0048	5	0.	5844.8	5545.5	1		1412	72	45.	6488.1	5549.1	2		0336	139	68.	6628.7	5549.6
1		0100	6	0.	5844.8	5545.5	1		1424	73	45.	6493.2	5549.1	2		0348	140	68.	6627.5	5549.6
1		0112	7	0.	5844.8	5545.5	1		1436	74	45.	6497.9	5549.2	2		0400	141	68.	6626.3	5549.6
1		0124	8	0.	5844.8	5545.5	1		1448	75	45.	6502.2	5549.2	2		0412	142	67.	6625.2	5549.6
1		0136	9	0.	5844.8	5545.5	1		1500	76	45.	6506.3	5549.2	2		0424	143	67.	6624.1	5549.6
1		0148	10	0.	5844.8	5545.5	1		1512	77	46.	6510.1	5549.2	2		0436	144	67.	6623.1	5549.6
1		0200	11	0.	5844.8	5545.5	1		1524	78	46.	6513.7	5549.2	2		0448	145	66.	6622.1	5549.6
1		0212	12	0.	5844.8	5545.5	1		1536	79	46.	6517.4	5549.2	2		0500	146	66.	6621.1	5549.6
1		0224	13	0.	5844.8	5545.5	1		1548	80	46.	6520.9	5549.2	2		0512	147	66.	6620.0	5549.6
1		0236	14	0.	5844.8	5545.5	1		1600	81	47.	6524.4	5549.3	2		0524	148	66.	6619.0	5549.6
1		0248	15	0.	5844.8	5545.5	1		1612	82	47.	6527.9	5549.3	2		0536	149	65.	6618.0	5549.6
1		0300	16	0.	5844.8	5545.5	1		1624	83	48.	6531.3	5549.3	2		0548	150	65.	6617.0	5549.6
1		0312	17	0.	5844.8	5545.5	1		1636	84	48.	6534.6	5549.3	2		0600	151	65.	6615.9	5549.6
1		0324	18	0.	5844.8	5545.5	1		1648	85	49.	6538.0	5549.3	2		0612	152	65.	6614.9	5549.6
1		0336	19	0.	5844.8	5545.5	1		1700	86	49.	6541.4	5549.3	2		0624	153	64.	6613.9	5549.6
1		0348	20	0.	5844.8	5545.5	1		1712	87	50.	6544.7	5549.3	2		0636	154	64.	6612.9	5549.5
1		0400	21	0.	5844.8	5545.5	1		1724	88	50.	6548.1	5549.3	2		0648	155	64.	6611.9	5549.5
1		0412	22	0.	5844.8	5545.5	1		1736	89	51.	6551.5	5549.3	2		0700	156	63.	6610.8	5549.5
1		0424	23	0.	5844.8	5545.5	1		1748	90	51.	6554.8	5549.4	2		0712	157	63.	6609.8	5549.5
1		0436	24	0.	5844.8	5545.5	1		1800	91	52.	6558.2	5549.4	2		0724	158	63.	6608.8	5549.5
1		0448	25	0.	5844.8	5545.5	1		1812	92	52.	6561.5	5549.4	2		0736	159	63.	6607.8	5549.5
1		0500	26	0.	5844.8	5545.5	1		1824	93	53.	6564.9	5549.4	2		0748	160	62.	6606.7	5549.5
1		0512	27	0.	5844.8	5545.5	1		1836	94	54.	6568.1	5549.4	2		0800	161	62.	6605.7	5549.5
1		0524	28	0.	5844.8	5545.5	1		1848	95	54.	6571.2	5549.4	2		0812	162	62.	6604.7	5549.5
1		0536	29	0.	5844.8	5545.5	1		1900	96	55.	6574.1	5549.4	2		0824	163	62.	6603.7	5549.5
1		0548	30	0.	5844.8	5545.5	1		1912	97	56.	6576.9	5549.4	2		0836	164	61.	6602.6	5549.5
1		0600	31	0.	5844.8	5545.5	1		1924	98	56.	6579.5	5549.4	2		0848	165	61.	6601.6	5549.5
1		0612	32	0.	5844.8	5545.5	1		1936	99	57.	6582.0	5549.4	2		0900	166	61.	6600.6	5549.5
1		0624	33	0.	5844.8	5545.5	1		1948	100	57.	6584.5	5549.5	2		0912	167	61.	6599.6	5549.5
1		0636	34	1.	5845.0	5545.5	1		2000	101	58.	6586.8	5549.5	2		0924	168	60.	6598.5	5549.5
1		0648	35	1.	5845.3	5545.5	1		2012	102	58.	6589.2	5549.5	2		0936	169	60.	6597.5	5549.5
1		0700	36	3.	5846.3	5545.5	1		2024	103	59.	6591.5	5549.5	2		0948	170	60.	6596.5	5549.5
1		0712	37	4.	5848.2	5545.5	1		2036	104	59.	6593.7	5549.5	2		1000	171	60.	6595.5	5549.5
1		0724	38	5.	5851.4	5545.6	1		2048	105	60.	6595.9	5549.5	2		1012	172	59.	6594.4	5549.5
1		0736	39	7.	5856.4	5545.6	1		2100	106	60.	6598.1	5549.5	2		1024	173	59.	6593.4	5549.5
1		0748	40	9.	5863.1	5545.6	1		2112	107	61.	6600.3	5549.5	2		1036	174	59.	6592.4	5549.5
1		0800	41	11.	5871.7	5545.7	1		2124	108	61.	6602.5	5549.5	2		1048	175	59.	6591.4	5549.5
1		0812	42	13.	5882.1	5545.8	1		2136	109	62.	6604.7	5549.5	2		1100	176	59.	6590.4	5549.5
1		0824	43	15.	5894.4	5545.9	1		2148	110	63.	6606.9	5549.5	2		1112	177	58.	6589.5	5549.5
1		0836	44	17.	5908.3	5546.0	1		2200	111	63.	6609.1	5549.5	2		1124	178	58.	6588.6	5549.5
1		0848	45	19.	5923.7	5546.1	1		2212	112	64.	6611.3	5549.5	2		1136	179	58.	6587.7	5549.5
1		0900	46	21.	5940.6	5546.3	1		2224	113	64.	6613.5	5549.6	2		1148	180	58.	6586.8	5549.5
1		0912	47	23.	5958.8	5546.4	1		2236	114	65.	6615.7	5549.6	2		1200	181	58.	6586.0	5549.5
1		0924	48	25.	5978.3	5546.6	1		2248	115	65.	6617.7	5549.6	2		1212	182	57.	6585.1	5549.5
1		0936	49	27.	5998.8	5546.8	1		2300	116	66.	6619.7	5549.6	2		1224	183	57.	6584.2	5549.5
1		0948	50	28.	6020.3	5546.9	1		2312	117	66.	6621.8	5549.6	2		1236	184	57.	6583.3	5549.5
1		1000	51	30.	6042.7	5547.1	1		2324	118	67.	6623.8	5549.6	2		1248	185	57.	6582.5	5549.4
1		1012	52	32.	6066.0	5547.3	1		2336	119	67.	6625.9	5549.6	2		1300	186	57.	6581.6	5549.4
1		1024	53	34.	6090.1	5547.5	1		2348	120	68.	6627.9	5549.6	2		1312	187	56.	6580.7	5549.4
1		1036	54	35.	6114.7	5547.7	2		0000	121	69.	6630.0	5549.6	2		1324	188	56.	6579.8	5549.4
1		1048	55	37.	6140.0	5547.9	2		0012	122	69.	6632.0	5549.6	2		1336	189	56.	6578.9	5549.4
1		1100	56	38.	6166.0	5548.1	2		0024	123	70.	6633.9	5549.6	2		1348	190	56.	6578.1	5549.4
1		1112	57	38.	6192.4	5548.1	2		0036	124	70.	6635.7	5549.6	2		1400	191	56.	6577.2	5549.4
1		1124	58	39.	6219.5	5548.2	2		0048	125	71.	6637.0	5549.6	2		1412	192	55.	6576.3	5549.4
1		1136	59	40.	6247.0	5548.3	2		0100	126	71.	6637.9	5549.6	2		1424	193	55.	6575.4	5549.4
1		1148	60	40.	6274.9	5548.4	2		0112	127	71.	6638.3	5549.6	2		1436	194	55.	6574.6	5549.4
1		1200	61	41.	6303.3	5548.5	2		0124	128	71.	6638.3	5549.6	2		1448	195	55.	6573.7	5549.4
1		1212	62	42.	6331.8	5548.6	2		0136	129	71.	6638.0	5549.6	2		1500	196	55.	6572.8	5549.4
1		1224	63	42.	6359.7	5548.7	2		0148	130	71.	6637.4	5549.6	2		1512	197	55.	6571.9	5549.4
1		1236	64	43.	6386.1	5548.8	2		0200	131	70.	6636.7	5549.6	2		1524	198	54.	6571.0	5549.4
1		1248	65	43.	6409.5	5548.9	2		0212	132	70.	6635.8	5549.6	2		1536	199	54.	6570.2	5549.4
1		1300	66	44.	6429.0	5548.9	2		0224	133	70.	6635.0	5549.6	2		1548	200	54.	6569.3	5549.4
1		1312	67	44.	6445.0	5549.0	2		0236	134	70.	6633.9	5549.6							

PEAK OUTFLOW IS 71. AT TIME 25.20 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	39.80-HR
+ (CFS)	(HR)					
		(CFS)				
+ 71.	25.20		69.	61.	44.	44.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	34.	121.	145.	145.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	39.80-HR
+ (AC-FT)	(HR)				
6638.	25.20	6631.	6598.	6379.	6379.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	39.80-HR
+ (FEET)	(HR)				
5549.63	25.20	5549.61	5549.50	5548.41	5548.41

CUMULATIVE AREA = .00 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	Cove	.00	1	FLOW	1766.
				TIME	12.00
ROUTED TO					
+	Cove	.00	1	FLOW	71.
				TIME	25.20

** PEAK STAGES IN FEET **

1	STAGE	5549.63
	TIME	25.20

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION Cove
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	5545.50	5549.20	5552.00
STORAGE	5845.	6508.	7347.
OUTFLOW	0.	45.	435.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	5549.63	.00	6638.	71.	.00	25.20	.00

*** NORMAL END OF HEC-1 ***

Storm Event 15. Local Freeboard Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:59:11  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                  HEC-1 INPUT                                                PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1          ID   HYDROLOGY STUDY for COVE RESERVOIR
            2          ID   Located in KANE COUNTY, UTAH
            3          ID
            4          ID   AUG 2020
            5          ID
            6          ID   PREPARED BY ALPHA ENGINEERING
            7          ID   43 SOUTH 100 EAST, SUITE 100
            8          ID   ST. GEORGE, UTAH  84770
            9          ID   TEL: (435) 628-6500
           10          ID   FAX: (435) 628-6553
           11          ID
           12          ID   Local FBH
           13          ID
                       *
           14          JR    PREC     1.0
           15          IT      18       0       0     100
           16          IO       0
           17          IN      18
                       *

           18          KK   B1
           19          KM   Runoff from Basin 1
           20          BA   0.503
           21          PB    7.67
           22          PC       0   0.020   0.046   0.070   0.095   0.130   0.180   0.300   0.520   0.650
           23          PC   0.700   0.745   0.785   0.820   0.850   0.880   0.905   0.930   0.955   0.980
           24          PC   1.000
           25          LS       0    72.8
           26          UD    0.51
                       *

           27          KK   RB1
           28          KM   Route B1
           29          RD    4928    .045    .050            TRAP      20      20
                       *

           30          KK   B2
           31          KM   Runoff from Basin 2
           32          BA   0.436
           33          LS       0    72.5
           34          UD    0.52
                       *

           35          KK   B3
           36          KM   Runoff from Basin 3
           37          BA   0.279
           38          LS       0    71.0
           39          UD    0.39
                       *
1                                                  HEC-1 INPUT                                                PAGE  2

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
 40          KK   C1
 41          KM   Combine RB1, B2, B3
 42          HC       3
             *

 43          KK   RC1
 44          KM   Route RC1
 45          RD    7255    .060    .030           TRAP      20      20
             *

 46          KK   B4
 47          KM   Runoff from Basin 4
 48          BA   0.453
 49          LS       0    73.3
 50          UD    0.48
             *

 51          KK   B5
 52          KM   Runoff from Basin 5
 53          BA   0.805
 54          LS       0    74.1
 55          UD    0.63
             *

 56          KK   C2
 57          KM   Combine RC1, B4, B5
 58          HC       3
             *

 59          KK   RC2
 60          KM   Route C2
 61          RD    2380    .039    .030           TRAP      40       2
             *

 62          KK   B6
 63          KM   Runoff from Basin 6
 64          BA   0.150
 65          LS       0    84.3
 66          UD    0.19
             *

 67          KK   B7
 68          KM   Runoff from Basin 7
 69          BA   0.327
 70          LS       0    75.7
 71          UD    0.46
             *

 72          KK   C3
 73          KM   Combine RC2, B6, B7
 74          HC       3
             *
1                                        HEC-1 INPUT                                          PAGE  3

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 75          KK   RC3
 76          KM   Route C3
 77          RD   11323    .023    .030           TRAP      40      20
             *

 78          KK   B8
 79          KM   Runoff from Basin 8
 80          BA   1.012
 81          LS       0    84.0
 82          UD    0.67
             *

 83          KK   B9
 84          KM   Runoff from Basin 9
 85          BA   0.242
 86          LS       0    85.5
 87          UD    0.26
             *

 88          KK   B10
 89          KM   Runoff from Basin 10
 90          BA   0.129
 91          LS       0    86.7
 92          UD    0.18
             *

 93          KK   C4
 94          KM   Combine B9, B10
 95          HC       2
             *

 96          KK   RC4
 97          KM   Route C4
 98          RD    3380    .037    .030           TRAP      40      20
             *
```

```
             99           KK   B11
            100           KM   Runoff from Basin 11
            101           BA   0.279
            102           LS       0    84.8
            103           UD    0.39
                          *

            104           KK   C5
            105           KM   Combine RC3, B8, RC4, B11
            106           HC       4
                          *

            107           KK   B12
            108           KM   Runoff from Basin 12
            109           BA   0.127
            110           LS       0    81.2
            111           UD    0.40
                          *
1                                              HEC-1 INPUT                                              PAGE  4

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            112           KK   Call
            113           KM   Combine C5, B12
            114           HC       2
                          *

            115           KK   Cove Reservoir
            116           KM   Routing through Res'v
            117           RS       1    ELEV  5545.5
            118           SV       0      19      95     240     453     738    1105    1563    2217    2773
            119           SV    3542    4423    5419    6149    7347    8000
            120           SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
            121           SE    5530    5536    5542    5548    5552    5558
            122           SL  5545.5   4.909     0.6     0.5
            123           SS  5549.2      30    2.67     1.5
            124           ST  5552.0    1892     2.9     1.5
                          *
            125           ZZ
1*************************************                                          *************************************
 *                                   *                                          *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                      *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998           *                                          *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1             *                                          *         609 SECOND STREET           *
 *                                   *                                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  02:59:11   *                                      *          (916) 756-1104           *
 *                                   *                                          *                                   *
 *************************************                                          *************************************



                        HYDROLOGY STUDY for COVE RESERVOIR
                        Located in KANE COUNTY, UTAH

                        AUG 2020

                        PREPARED BY ALPHA ENGINEERING
                        43 SOUTH 100 EAST, SUITE 100
                        ST. GEORGE, UTAH  84770
                        TEL: (435) 628-6500
                        FAX: (435) 628-6553

                        Local FBH


  16 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          0  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                      NMIN         18  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         100  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME        0542  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .30 HOURS
                       TOTAL TIME BASE   29.70 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
```

```
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *     Call   *
            *            *
            **************
                           Combine C5, B12

 114 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************

                                                  HYDROGRAPH AT STATION    Call
                                                       SUM OF  2 HYDROGRAPHS
                                                      PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************
                                 *                                 *                                 *
   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                 *                                 *                                 *
    1     0000    1        0.    *    1     0730   26      332.   *    1     1500   51        0.   *    1     2230   76        0.
    1     0018    2        0.    *    1     0748   27      201.   *    1     1518   52        0.   *    1     2248   77        0.
    1     0036    3        0.    *    1     0806   28      113.   *    1     1536   53        0.   *    1     2306   78        0.
    1     0054    4        8.    *    1     0824   29       62.   *    1     1554   54        0.   *    1     2324   79        0.
    1     0112    5       43.    *    1     0842   30       34.   *    1     1612   55        0.   *    1     2342   80        0.
    1     0130    6      129.    *    1     0900   31       18.   *    1     1630   56        0.   *    2     0000   81        0.
    1     0148    7      306.    *    1     0918   32        9.   *    1     1648   57        0.   *    2     0018   82        0.
    1     0206    8      824.    *    1     0936   33        5.   *    1     1706   58        0.   *    2     0036   83        0.
    1     0224    9     2325.    *    1     0954   34        2.   *    1     1724   59        0.   *    2     0054   84        0.
    1     0242   10     4867.    *    1     1012   35        1.   *    1     1742   60        0.   *    2     0112   85        0.
    1     0300   11     6395.    *    1     1030   36        0.   *    1     1800   61        0.   *    2     0130   86        0.
    1     0318   12     6123.    *    1     1048   37        0.   *    1     1818   62        0.   *    2     0148   87        0.
    1     0336   13     5053.    *    1     1106   38        0.   *    1     1836   63        0.   *    2     0206   88        0.
    1     0354   14     4063.    *    1     1124   39        0.   *    1     1854   64        0.   *    2     0224   89        0.
    1     0412   15     3364.    *    1     1142   40        0.   *    1     1912   65        0.   *    2     0242   90        0.
    1     0430   16     2855.    *    1     1200   41        0.   *    1     1930   66        0.   *    2     0300   91        0.
    1     0448   17     2500.    *    1     1218   42        0.   *    1     1948   67        0.   *    2     0318   92        0.
    1     0506   18     2228.    *    1     1236   43        0.   *    1     2006   68        0.   *    2     0336   93        0.
    1     0524   19     2039.    *    1     1254   44        0.   *    1     2024   69        0.   *    2     0354   94        0.
    1     0542   20     1913.    *    1     1312   45        0.   *    1     2042   70        0.   *    2     0412   95        0.
    1     0600   21     1819.    *    1     1330   46        0.   *    1     2100   71        0.   *    2     0430   96        0.
    1     0618   22     1614.    *    1     1348   47        0.   *    1     2118   72        0.   *    2     0448   97        0.
    1     0636   23     1240.    *    1     1406   48        0.   *    1     2136   73        0.   *    2     0506   98        0.
    1     0654   24      851.    *    1     1424   49        0.   *    1     2154   74        0.   *    2     0524   99        0.
    1     0712   25      540.    *    1     1442   50        0.   *    1     2212   75        0.   *    2     0542  100        0.
                                 *                                 *                                 *
*****************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                       6-HR       24-HR       72-HR     29.70-HR
+   (CFS)       (HR)
                          (CFS)
+    6395.      3.00                 2560.        648.        524.         524.
                       (INCHES)     5.019       5.085       5.085        5.085
                        (AC-FT)     1269.       1286.       1286.        1286.

                        CUMULATIVE AREA =    4.74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 115 KK     *     Cove   *     Reservoir
            *            *
            **************
                           Routing through Res'v

              HYDROGRAPH ROUTING DATA
```

```
117 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     5545.50  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

118 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                               3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

120 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                              5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

122 SL          LOW-LEVEL OUTLET
                     ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                     CAREA        4.91  CROSS-SECTIONAL AREA
                      COQL         .60  COEFFICIENT
                      EXPL         .50  EXPONENT OF HEAD

123 SS          SPILLWAY
                     CREL     5549.20  SPILLWAY CREST ELEVATION
                     SPWID       30.00  SPILLWAY WIDTH
                      COQW        2.67  WEIR COEFFICIENT
                      EXPW        1.50  EXPONENT OF HEAD

124 ST          TOP OF DAM
                     TOPEL     5552.00  ELEVATION AT TOP OF DAM
                     DAMWID    1892.00  DAM WIDTH
                      COQD        2.90  WEIR COEFFICIENT
                      EXPD        1.50  EXPONENT OF HEAD
```

***

COMPUTED OUTFLOW-ELEVATION DATA

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

****

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	1		1012	35	233.	7019.3	5550.9	1		2024	69	154.	6859.6	5550.4
1		0018	2	0.	5844.8	5545.5	1		1030	36	230.	7013.6	5550.9	1		2042	70	152.	6855.8	5550.4
1		0036	3	0.	5844.8	5545.5	1		1048	37	227.	7007.9	5550.9	1		2100	71	150.	6852.0	5550.3
1		0054	4	1.	5845.0	5545.5	1		1106	38	224.	7002.3	5550.8	1		2118	72	149.	6848.3	5550.3
1		0112	5	2.	5845.5	5545.5	1		1124	39	221.	6996.8	5550.8	1		2136	73	147.	6844.7	5550.3
1		0130	6	4.	5847.6	5545.5	1		1142	40	218.	6991.3	5550.8	1		2154	74	146.	6841.0	5550.3
1		0148	7	6.	5852.9	5545.6	1		1200	41	216.	6985.9	5550.8	1		2212	75	144.	6837.4	5550.3
1		0206	8	10.	5866.8	5545.7	1		1218	42	213.	6980.7	5550.8	1		2230	76	142.	6833.8	5550.3
1		0224	9	17.	5905.5	5546.0	1		1236	43	210.	6975.4	5550.8	1		2248	77	141.	6830.3	5550.3
1		0242	10	26.	5994.1	5546.7	1		1254	44	207.	6970.3	5550.7	1		2306	78	139.	6826.8	5550.3
1		0300	11	36.	6133.0	5547.9	1		1312	45	205.	6965.2	5550.7	1		2324	79	138.	6823.5	5550.3
1		0318	12	41.	6287.2	5548.5	1		1330	46	202.	6960.0	5550.7	1		2342	80	136.	6820.1	5550.2
1		0336	13	44.	6424.7	5548.9	1		1348	47	200.	6955.1	5550.7	2		0000	81	135.	6816.7	5550.2
1		0354	14	48.	6536.5	5549.3	1		1406	48	197.	6950.1	5550.7	2		0018	82	134.	6813.4	5550.2
1		0412	15	68.	6627.1	5549.6	1		1424	49	195.	6945.3	5550.7	2		0036	83	132.	6810.0	5550.2
1		0430	16	91.	6702.2	5549.8	1		1442	50	192.	6940.5	5550.6	2		0054	84	131.	6806.8	5550.2
1		0448	17	114.	6766.0	5550.1	1		1500	51	190.	6935.8	5550.6	2		0112	85	129.	6803.6	5550.2
1		0506	18	137.	6821.4	5550.2	1		1518	52	188.	6931.1	5550.6	2		0130	86	128.	6800.4	5550.2
1		0524	19	159.	6870.7	5550.4	1		1536	53	185.	6926.4	5550.6	2		0148	87	127.	6797.1	5550.2
1		0542	20	180.	6915.4	5550.6	1		1554	54	183.	6921.9	5550.6	2		0206	88	126.	6794.1	5550.2

```
  1     0600  21     201.   6957.0  5550.7 *  1     1612  55     181.   6917.3  5550.6 *  2     0224  89     124.   6791.0  5550.1
  1     0618  22     220.   6994.3  5550.8 *  1     1630  56     179.   6913.0  5550.6 *  2     0242  90     123.   6787.9  5550.1
  1     0636  23     236.   7024.0  5550.9 *  1     1648  57     177.   6908.6  5550.5 *  2     0300  91     122.   6784.9  5550.1
  1     0654  24     247.   7043.8  5551.0 *  1     1706  58     175.   6904.2  5550.5 *  2     0318  92     121.   6781.8  5550.1
  1     0712  25     253.   7054.8  5551.0 *  1     1724  59     173.   6899.9  5550.5 *  2     0336  93     119.   6778.9  5550.1
  1     0730  26     255.   7059.3  5551.0 *  1     1742  60     171.   6895.7  5550.5 *  2     0354  94     118.   6775.9  5550.1
  1     0748  27     256.   7059.6  5551.0 *  1     1800  61     169.   6891.5  5550.5 *  2     0412  95     117.   6773.0  5550.1
  1     0806  28     254.   7057.2  5551.0 *  1     1818  62     167.   6887.4  5550.5 *  2     0430  96     116.   6770.1  5550.1
  1     0824  29     252.   7053.1  5551.0 *  1     1836  63     165.   6883.3  5550.5 *  2     0448  97     115.   6767.2  5550.1
  1     0842  30     249.   7048.1  5551.0 *  1     1854  64     163.   6879.2  5550.4 *  2     0506  98     114.   6764.4  5550.1
  1     0900  31     246.   7042.5  5551.0 *  1     1912  65     161.   6875.2  5550.4 *  2     0524  99     113.   6761.6  5550.0
  1     0918  32     243.   7036.8  5551.0 *  1     1930  66     159.   6871.3  5550.4 *  2     0542 100     112.   6758.8  5550.0
  1     0936  33     240.   7031.0  5550.9 *  1     1948  67     157.   6867.3  5550.4 *
  1     0954  34     237.   7025.1  5550.9 *  1     2006  68     156.   6863.4  5550.4 *
                                            *                                            *
 ******************************************************************************************************************************

 PEAK OUTFLOW IS      256. AT TIME   7.80 HOURS


  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     29.70-HR
+   (CFS)       (HR)
                          (CFS)
+     256.      7.80                 238.        178.        151.         151.
                       (INCHES)      .466       1.393       1.470        1.470
                        (AC-FT)      118.        352.        372.         372.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     29.70-HR
+  (AC-FT)      (HR)
     7060.      7.80                7027.       6906.       6774.        6774.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     29.70-HR
+   (FEET)      (HR)
   5551.04      7.80              5550.93     5550.53     5549.96      5549.96

                        CUMULATIVE AREA =    4.74 SQ MI

1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                       1.00

 HYDROGRAPH AT
+                 B1          .50     1   FLOW         689.
                                          TIME         3.00

 ROUTED TO
+                 RB1         .50     1   FLOW         657.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B2          .44     1   FLOW         589.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B3          .28     1   FLOW         393.
                                          TIME         2.70

  3 COMBINED AT
+                 C1         1.22     1   FLOW        1608.
                                          TIME         3.00

 ROUTED TO
+                 RC1        1.22     1   FLOW        1507.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B4          .45     1   FLOW         636.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B5          .81     1   FLOW        1050.
                                          TIME         3.00

  3 COMBINED AT
+                 C2         2.48     1   FLOW        3194.
                                          TIME         3.00

 ROUTED TO
+                 RC2        2.48     1   FLOW        3137.
                                          TIME         3.00

 HYDROGRAPH AT
```

```
+                 B6          .15     1   FLOW         351.
                                          TIME         2.40

 HYDROGRAPH AT
+                 B7          .33     1   FLOW         490.
                                          TIME         3.00

  3 COMBINED AT
+                 C3         2.95     1   FLOW        3813.
                                          TIME         3.00

 ROUTED TO
+                 RC3        2.95     1   FLOW        3723.
                                          TIME         3.30

 HYDROGRAPH AT
+                 B8         1.01     1   FLOW        1656.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B9          .24     1   FLOW         547.
                                          TIME         2.70

 HYDROGRAPH AT
+                 B10         .13     1   FLOW         326.
                                          TIME         2.40

  2 COMBINED AT
+                 C4          .37     1   FLOW         835.
                                          TIME         2.70

 ROUTED TO
+                 RC4         .37     1   FLOW         819.
                                          TIME         2.70

 HYDROGRAPH AT
+                 B11         .28     1   FLOW         575.
                                          TIME         2.70

  4 COMBINED AT
+                 C5         4.61     1   FLOW        6184.
                                          TIME         3.00

 HYDROGRAPH AT
+                 B12         .13     1   FLOW         238.
                                          TIME         2.70

  2 COMBINED AT
+                 Call       4.74     1   FLOW        6395.
                                          TIME         3.00

 ROUTED TO
+                 Cove       4.74     1   FLOW         256.
                                          TIME         7.80

                                     ** PEAK STAGES IN FEET **
                                     1   STAGE     5551.04
                                          TIME         7.80
1
                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             RB1    MANE         5.40    673.41    189.00      4.50     18.00    657.41    180.00        4.48


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1206E+03 EXCESS= .0000E+00 OUTFLOW= .1207E+03 BASIN STORAGE= .3686E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC1    MANE         5.40   1594.30    189.00      4.43     18.00   1507.33    180.00        4.43


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2880E+03 EXCESS= .0000E+00 OUTFLOW= .2881E+03 BASIN STORAGE= .3547E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC2    MANE         1.67   3186.21    182.05      4.52     18.00   3137.38    180.00        4.53


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5970E+03 EXCESS= .0000E+00 OUTFLOW= .5970E+03 BASIN STORAGE= .3099E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RC3    MANE         7.20   3778.09    194.40      4.63     18.00   3723.23    198.00        4.64
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7287E+03 EXCESS= .0000E+00 OUTFLOW= .7291E+03 BASIN STORAGE= .1048E-01 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

RC4	MANE	5.53	841.55	154.72	6.01	18.00	818.78	162.00	6.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1188E+03 EXCESS= .0000E+00 OUTFLOW= .1189E+03 BASIN STORAGE= .2808E-02 PERCENT ERROR= .0

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION Cove
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	5545.50	5549.20	5552.00
STORAGE	5845.	6508.	7347.
OUTFLOW	0.	45.	435.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	5551.04	.00	7060.	256.	.00	7.80	.00

*** NORMAL END OF HEC-1 ***

Storm Event 16. General Freeboard Hydrograph

```
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06AUG20  TIME  03:41:08  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                  HEC-1 INPUT                                                  PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HYDROLOGY STUDY for COVE RESERVOIR
             2          ID   Located in KANE COUNTY, UTAH
             3          ID
             4          ID   AUG 2020
             5          ID
             6          ID   PREPARED BY ALPHA ENGINEERING
             7          ID   43 SOUTH 100 EAST, SUITE 100
             8          ID   ST. GEORGE, UTAH  84770
             9          ID   TEL: (435) 628-6500
            10          ID   FAX: (435) 628-6553
            11          ID
            12          ID   General FBH (NEH)
            13          ID
                        *
            14          JR    PREC     1.0
            15          IT      12       0       0     600
            16          IO       0
            17          IN      12
                        *
            18          QI       0       0       0       0       0       0       0       0       0       0
            19          QI       0       0       0       0       0       0       0       0       0       0
            20          QI       0       0       0       0       0       1       2       4       7      10
            21          QI      15      30      74     175     342     567     829    1108    1380    1634
            22          QI    1866    2071    2260    2424    2568    2696    2807    2906    2993    3069
            23          QI    3137    3198    3252    3300    3343    3381    3416    3447    3475    3501
            24          QI    3524    3498    3371    3075    2649    2187    1755    1392    1131     950
            25          QI     820     724     655     606     570     545     526     513     503     496
            26          QI     492     488     485     483     483     483     483     483     483     484
            27          QI     484     482     477     465     448     431     414     400     390     383
            28          QI     378     375     372     370     369     368     368     367     367     367
            29          QI     367     366     366     366     367     367     367     367     367     367
            30          QI     367     362     345     308     257     202     151     108      77      56
            31          QI      40      29      21      15      11       8       5       4       3       2
            32          QI       1       1       0
                        *

            33          KK   Cove Reservoir
            34          KM   Routing through Res'v
            35          RS       1    ELEV  5545.5
            36          SV       0      19      95     240     453     738    1105    1563    2217    2773
            37          SV    3542    4423    5419    6149    7347    8000
            38          SE    5470    5476    5482    5488    5494    5500    5506    5512    5518    5524
            39          SE    5530    5536    5542    5548    5552    5558
            40          SL  5545.5   4.909     0.6     0.5
            41          SS  5549.2      30    2.67     1.5
            42          ST  5552.0    1892     2.9     1.5
                        *
            43          ZZ
1****************************************                                                  ***************************************
 *                                      *                                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                                                  *          609 SECOND STREET          *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616       *
```

```
*  RUN DATE   06AUG20  TIME  03:41:08   *                                          *          (916) 756-1104           *
*                                       *                                          *                                   *
*****************************************                                          *************************************
```

HYDROLOGY STUDY for COVE RESERVOIR
Located in KANE COUNTY, UTAH

AUG 2020

PREPARED BY ALPHA ENGINEERING
43 SOUTH 100 EAST, SUITE 100
ST. GEORGE, UTAH 84770
TEL: (435) 628-6500
FAX: (435) 628-6553

General FBH (NEH)

```
 16 IO          OUTPUT CONTROL VARIABLES
                     IPRNT           0  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                      NMIN          12  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         600  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      5    0  ENDING DATE
                    NDTIME        2348  ENDING TIME
                    ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .20 HOURS
                       TOTAL TIME BASE  119.80 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

    JP          MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00

 17 IN          TIME DATA FOR INPUT TIME SERIES
                     JXMIN          12  TIME INTERVAL IN MINUTES
                    JXDATE      1    0  STARTING DATE
                    JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

  0 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .00  SUBBASIN AREA
```

***

HYDROGRAPH AT STATION Cove

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	2		0600	151	1.	3		1200	301	1.	4		1800	451	1.
1		0012	2	0.	2		0612	152	1.	3		1212	302	1.	4		1812	452	1.
1		0024	3	0.	2		0624	153	1.	3		1224	303	1.	4		1824	453	1.
1		0036	4	0.	2		0636	154	1.	3		1236	304	1.	4		1836	454	1.
1		0048	5	0.	2		0648	155	1.	3		1248	305	1.	4		1848	455	1.
1		0100	6	0.	2		0700	156	1.	3		1300	306	1.	4		1900	456	1.
1		0112	7	0.	2		0712	157	1.	3		1312	307	1.	4		1912	457	1.
1		0124	8	0.	2		0724	158	1.	3		1324	308	1.	4		1924	458	1.
1		0136	9	0.	2		0736	159	1.	3		1336	309	1.	4		1936	459	1.
1		0148	10	0.	2		0748	160	1.	3		1348	310	1.	4		1948	460	1.
1		0200	11	0.	2		0800	161	1.	3		1400	311	1.	4		2000	461	1.
1		0212	12	0.	2		0812	162	1.	3		1412	312	1.	4		2012	462	1.
1		0224	13	0.	2		0824	163	1.	3		1424	313	1.	4		2024	463	1.
1		0236	14	0.	2		0836	164	1.	3		1436	314	1.	4		2036	464	1.
1		0248	15	0.	2		0848	165	1.	3		1448	315	1.	4		2048	465	1.
1		0300	16	0.	2		0900	166	1.	3		1500	316	1.	4		2100	466	1.
1		0312	17	0.	2		0912	167	1.	3		1512	317	1.	4		2112	467	1.

1	0324	18	0.	*	2	0924	168	1.	*	3	1524	318	1.	*	4	2124	468	1.
1	0336	19	0.	*	2	0936	169	1.	*	3	1536	319	1.	*	4	2136	469	1.
1	0348	20	0.	*	2	0948	170	1.	*	3	1548	320	1.	*	4	2148	470	1.
1	0400	21	0.	*	2	1000	171	1.	*	3	1600	321	1.	*	4	2200	471	1.
1	0412	22	0.	*	2	1012	172	1.	*	3	1612	322	1.	*	4	2212	472	1.
1	0424	23	0.	*	2	1024	173	1.	*	3	1624	323	1.	*	4	2224	473	1.
1	0436	24	0.	*	2	1036	174	1.	*	3	1636	324	1.	*	4	2236	474	1.
1	0448	25	0.	*	2	1048	175	1.	*	3	1648	325	1.	*	4	2248	475	1.
1	0500	26	1.	*	2	1100	176	1.	*	3	1700	326	1.	*	4	2300	476	1.
1	0512	27	2.	*	2	1112	177	1.	*	3	1712	327	1.	*	4	2312	477	1.
1	0524	28	4.	*	2	1124	178	1.	*	3	1724	328	1.	*	4	2324	478	1.
1	0536	29	7.	*	2	1136	179	1.	*	3	1736	329	1.	*	4	2336	479	1.
1	0548	30	10.	*	2	1148	180	1.	*	3	1748	330	1.	*	4	2348	480	1.
1	0600	31	15.	*	2	1200	181	1.	*	3	1800	331	1.	*	5	0000	481	1.
1	0612	32	30.	*	2	1212	182	1.	*	3	1812	332	1.	*	5	0012	482	1.
1	0624	33	74.	*	2	1224	183	1.	*	3	1824	333	1.	*	5	0024	483	1.
1	0636	34	175.	*	2	1236	184	1.	*	3	1836	334	1.	*	5	0036	484	1.
1	0648	35	342.	*	2	1248	185	1.	*	3	1848	335	1.	*	5	0048	485	1.
1	0700	36	567.	*	2	1300	186	1.	*	3	1900	336	1.	*	5	0100	486	1.
1	0712	37	829.	*	2	1312	187	1.	*	3	1912	337	1.	*	5	0112	487	1.
1	0724	38	1108.	*	2	1324	188	1.	*	3	1924	338	1.	*	5	0124	488	1.
1	0736	39	1380.	*	2	1336	189	1.	*	3	1936	339	1.	*	5	0136	489	1.
1	0748	40	1634.	*	2	1348	190	1.	*	3	1948	340	1.	*	5	0148	490	1.
1	0800	41	1866.	*	2	1400	191	1.	*	3	2000	341	1.	*	5	0200	491	1.
1	0812	42	2071.	*	2	1412	192	1.	*	3	2012	342	1.	*	5	0212	492	1.
1	0824	43	2260.	*	2	1424	193	1.	*	3	2024	343	1.	*	5	0224	493	1.
1	0836	44	2424.	*	2	1436	194	1.	*	3	2036	344	1.	*	5	0236	494	1.
1	0848	45	2568.	*	2	1448	195	1.	*	3	2048	345	1.	*	5	0248	495	1.
1	0900	46	2696.	*	2	1500	196	1.	*	3	2100	346	1.	*	5	0300	496	1.
1	0912	47	2807.	*	2	1512	197	1.	*	3	2112	347	1.	*	5	0312	497	1.
1	0924	48	2906.	*	2	1524	198	1.	*	3	2124	348	1.	*	5	0324	498	1.
1	0936	49	2993.	*	2	1536	199	1.	*	3	2136	349	1.	*	5	0336	499	1.
1	0948	50	3069.	*	2	1548	200	1.	*	3	2148	350	1.	*	5	0348	500	1.
1	1000	51	3137.	*	2	1600	201	1.	*	3	2200	351	1.	*	5	0400	501	1.
1	1012	52	3198.	*	2	1612	202	1.	*	3	2212	352	1.	*	5	0412	502	1.
1	1024	53	3252.	*	2	1624	203	1.	*	3	2224	353	1.	*	5	0424	503	1.
1	1036	54	3300.	*	2	1636	204	1.	*	3	2236	354	1.	*	5	0436	504	1.
1	1048	55	3343.	*	2	1648	205	1.	*	3	2248	355	1.	*	5	0448	505	1.
1	1100	56	3381.	*	2	1700	206	1.	*	3	2300	356	1.	*	5	0500	506	1.
1	1112	57	3416.	*	2	1712	207	1.	*	3	2312	357	1.	*	5	0512	507	1.
1	1124	58	3447.	*	2	1724	208	1.	*	3	2324	358	1.	*	5	0524	508	1.
1	1136	59	3475.	*	2	1736	209	1.	*	3	2336	359	1.	*	5	0536	509	1.
1	1148	60	3501.	*	2	1748	210	1.	*	3	2348	360	1.	*	5	0548	510	1.
1	1200	61	3524.	*	2	1800	211	1.	*	4	0000	361	1.	*	5	0600	511	1.
1	1212	62	3498.	*	2	1812	212	1.	*	4	0012	362	1.	*	5	0612	512	1.
1	1224	63	3371.	*	2	1824	213	1.	*	4	0024	363	1.	*	5	0624	513	1.
1	1236	64	3075.	*	2	1836	214	1.	*	4	0036	364	1.	*	5	0636	514	1.
1	1248	65	2649.	*	2	1848	215	1.	*	4	0048	365	1.	*	5	0648	515	1.
1	1300	66	2187.	*	2	1900	216	1.	*	4	0100	366	1.	*	5	0700	516	1.
1	1312	67	1755.	*	2	1912	217	1.	*	4	0112	367	1.	*	5	0712	517	1.
1	1324	68	1392.	*	2	1924	218	1.	*	4	0124	368	1.	*	5	0724	518	1.
1	1336	69	1131.	*	2	1936	219	1.	*	4	0136	369	1.	*	5	0736	519	1.
1	1348	70	950.	*	2	1948	220	1.	*	4	0148	370	1.	*	5	0748	520	1.
1	1400	71	820.	*	2	2000	221	1.	*	4	0200	371	1.	*	5	0800	521	1.
1	1412	72	724.	*	2	2012	222	1.	*	4	0212	372	1.	*	5	0812	522	1.
1	1424	73	655.	*	2	2024	223	1.	*	4	0224	373	1.	*	5	0824	523	1.
1	1436	74	606.	*	2	2036	224	1.	*	4	0236	374	1.	*	5	0836	524	1.
1	1448	75	570.	*	2	2048	225	1.	*	4	0248	375	1.	*	5	0848	525	1.
1	1500	76	545.	*	2	2100	226	1.	*	4	0300	376	1.	*	5	0900	526	1.
1	1512	77	526.	*	2	2112	227	1.	*	4	0312	377	1.	*	5	0912	527	1.
1	1524	78	513.	*	2	2124	228	1.	*	4	0324	378	1.	*	5	0924	528	1.
1	1536	79	503.	*	2	2136	229	1.	*	4	0336	379	1.	*	5	0936	529	1.
1	1548	80	496.	*	2	2148	230	1.	*	4	0348	380	1.	*	5	0948	530	1.
1	1600	81	492.	*	2	2200	231	1.	*	4	0400	381	1.	*	5	1000	531	1.
1	1612	82	488.	*	2	2212	232	1.	*	4	0412	382	1.	*	5	1012	532	1.
1	1624	83	485.	*	2	2224	233	1.	*	4	0424	383	1.	*	5	1024	533	1.
1	1636	84	483.	*	2	2236	234	1.	*	4	0436	384	1.	*	5	1036	534	1.
1	1648	85	483.	*	2	2248	235	1.	*	4	0448	385	1.	*	5	1048	535	1.
1	1700	86	483.	*	2	2300	236	1.	*	4	0500	386	1.	*	5	1100	536	1.
1	1712	87	483.	*	2	2312	237	1.	*	4	0512	387	1.	*	5	1112	537	1.
1	1724	88	483.	*	2	2324	238	1.	*	4	0524	388	1.	*	5	1124	538	1.
1	1736	89	483.	*	2	2336	239	1.	*	4	0536	389	1.	*	5	1136	539	1.
1	1748	90	484.	*	2	2348	240	1.	*	4	0548	390	1.	*	5	1148	540	1.
1	1800	91	484.	*	3	0000	241	1.	*	4	0600	391	1.	*	5	1200	541	1.
1	1812	92	482.	*	3	0012	242	1.	*	4	0612	392	1.	*	5	1212	542	1.
1	1824	93	477.	*	3	0024	243	1.	*	4	0624	393	1.	*	5	1224	543	1.
1	1836	94	465.	*	3	0036	244	1.	*	4	0636	394	1.	*	5	1236	544	1.
1	1848	95	448.	*	3	0048	245	1.	*	4	0648	395	1.	*	5	1248	545	1.
1	1900	96	431.	*	3	0100	246	1.	*	4	0700	396	1.	*	5	1300	546	1.
1	1912	97	414.	*	3	0112	247	1.	*	4	0712	397	1.	*	5	1312	547	1.
1	1924	98	400.	*	3	0124	248	1.	*	4	0724	398	1.	*	5	1324	548	1.
1	1936	99	390.	*	3	0136	249	1.	*	4	0736	399	1.	*	5	1336	549	1.
1	1948	100	383.	*	3	0148	250	1.	*	4	0748	400	1.	*	5	1348	550	1.
1	2000	101	378.	*	3	0200	251	1.	*	4	0800	401	1.	*	5	1400	551	1.
1	2012	102	375.	*	3	0212	252	1.	*	4	0812	402	1.	*	5	1412	552	1.
1	2024	103	372.	*	3	0224	253	1.	*	4	0824	403	1.	*	5	1424	553	1.
1	2036	104	370.	*	3	0236	254	1.	*	4	0836	404	1.	*	5	1436	554	1.
1	2048	105	369.	*	3	0248	255	1.	*	4	0848	405	1.	*	5	1448	555	1.
1	2100	106	368.	*	3	0300	256	1.	*	4	0900	406	1.	*	5	1500	556	1.
1	2112	107	368.	*	3	0312	257	1.	*	4	0912	407	1.	*	5	1512	557	1.
1	2124	108	367.	*	3	0324	258	1.	*	4	0924	408	1.	*	5	1524	558	1.
1	2136	109	367.	*	3	0336	259	1.	*	4	0936	409	1.	*	5	1536	559	1.

1	2148	110	367.	*	3	0348	260	1.	*	4	0948	410	1.	*	5	1548	560	1.
1	2200	111	367.	*	3	0400	261	1.	*	4	1000	411	1.	*	5	1600	561	1.
1	2212	112	366.	*	3	0412	262	1.	*	4	1012	412	1.	*	5	1612	562	1.
1	2224	113	366.	*	3	0424	263	1.	*	4	1024	413	1.	*	5	1624	563	1.
1	2236	114	366.	*	3	0436	264	1.	*	4	1036	414	1.	*	5	1636	564	1.
1	2248	115	367.	*	3	0448	265	1.	*	4	1048	415	1.	*	5	1648	565	1.
1	2300	116	367.	*	3	0500	266	1.	*	4	1100	416	1.	*	5	1700	566	1.
1	2312	117	367.	*	3	0512	267	1.	*	4	1112	417	1.	*	5	1712	567	1.
1	2324	118	367.	*	3	0524	268	1.	*	4	1124	418	1.	*	5	1724	568	1.
1	2336	119	367.	*	3	0536	269	1.	*	4	1136	419	1.	*	5	1736	569	1.
1	2348	120	367.	*	3	0548	270	1.	*	4	1148	420	1.	*	5	1748	570	1.
2	0000	121	367.	*	3	0600	271	1.	*	4	1200	421	1.	*	5	1800	571	1.
2	0012	122	362.	*	3	0612	272	1.	*	4	1212	422	1.	*	5	1812	572	1.
2	0024	123	345.	*	3	0624	273	1.	*	4	1224	423	1.	*	5	1824	573	1.
2	0036	124	308.	*	3	0636	274	1.	*	4	1236	424	1.	*	5	1836	574	1.
2	0048	125	257.	*	3	0648	275	1.	*	4	1248	425	1.	*	5	1848	575	1.
2	0100	126	202.	*	3	0700	276	1.	*	4	1300	426	1.	*	5	1900	576	1.
2	0112	127	151.	*	3	0712	277	1.	*	4	1312	427	1.	*	5	1912	577	1.
2	0124	128	108.	*	3	0724	278	1.	*	4	1324	428	1.	*	5	1924	578	1.
2	0136	129	77.	*	3	0736	279	1.	*	4	1336	429	1.	*	5	1936	579	1.
2	0148	130	56.	*	3	0748	280	1.	*	4	1348	430	1.	*	5	1948	580	1.
2	0200	131	40.	*	3	0800	281	1.	*	4	1400	431	1.	*	5	2000	581	1.
2	0212	132	29.	*	3	0812	282	1.	*	4	1412	432	1.	*	5	2012	582	1.
2	0224	133	21.	*	3	0824	283	1.	*	4	1424	433	1.	*	5	2024	583	1.
2	0236	134	15.	*	3	0836	284	1.	*	4	1436	434	1.	*	5	2036	584	1.
2	0248	135	11.	*	3	0848	285	1.	*	4	1448	435	1.	*	5	2048	585	1.
2	0300	136	8.	*	3	0900	286	1.	*	4	1500	436	1.	*	5	2100	586	1.
2	0312	137	5.	*	3	0912	287	1.	*	4	1512	437	1.	*	5	2112	587	1.
2	0324	138	4.	*	3	0924	288	1.	*	4	1524	438	1.	*	5	2124	588	1.
2	0336	139	3.	*	3	0936	289	1.	*	4	1536	439	1.	*	5	2136	589	1.
2	0348	140	2.	*	3	0948	290	1.	*	4	1548	440	1.	*	5	2148	590	1.
2	0400	141	1.	*	3	1000	291	1.	*	4	1600	441	1.	*	5	2200	591	1.
2	0412	142	1.	*	3	1012	292	1.	*	4	1612	442	1.	*	5	2212	592	1.
2	0424	143	1.	*	3	1024	293	1.	*	4	1624	443	1.	*	5	2224	593	1.
2	0436	144	1.	*	3	1036	294	1.	*	4	1636	444	1.	*	5	2236	594	1.
2	0448	145	1.	*	3	1048	295	1.	*	4	1648	445	1.	*	5	2248	595	1.
2	0500	146	1.	*	3	1100	296	1.	*	4	1700	446	1.	*	5	2300	596	1.
2	0512	147	1.	*	3	1112	297	1.	*	4	1712	447	1.	*	5	2312	597	1.
2	0524	148	1.	*	3	1124	298	1.	*	4	1724	448	1.	*	5	2324	598	1.
2	0536	149	1.	*	3	1136	299	1.	*	4	1736	449	1.	*	5	2336	599	1.
2	0548	150	1.	*	3	1148	300	1.	*	4	1748	450	1.	*	5	2348	600	1.

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	119.80-HR	
+ (CFS)	(HR)					
		(CFS)				
+ 3524.	12.00	2782.	948.	317.	191.	
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	1379.	1880.	1884.	1888.

CUMULATIVE AREA = .00 SQ MI

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	2		0600	151	1.	3		1200	301	1.	4		1800	451	1.
1		0012	2	0.	2		0612	152	1.	3		1212	302	1.	4		1812	452	1.
1		0024	3	0.	2		0624	153	1.	3		1224	303	1.	4		1824	453	1.
1		0036	4	0.	2		0636	154	1.	3		1236	304	1.	4		1836	454	1.
1		0048	5	0.	2		0648	155	1.	3		1248	305	1.	4		1848	455	1.
1		0100	6	0.	2		0700	156	1.	3		1300	306	1.	4		1900	456	1.
1		0112	7	0.	2		0712	157	1.	3		1312	307	1.	4		1912	457	1.
1		0124	8	0.	2		0724	158	1.	3		1324	308	1.	4		1924	458	1.
1		0136	9	0.	2		0736	159	1.	3		1336	309	1.	4		1936	459	1.
1		0148	10	0.	2		0748	160	1.	3		1348	310	1.	4		1948	460	1.
1		0200	11	0.	2		0800	161	1.	3		1400	311	1.	4		2000	461	1.
1		0212	12	0.	2		0812	162	1.	3		1412	312	1.	4		2012	462	1.
1		0224	13	0.	2		0824	163	1.	3		1424	313	1.	4		2024	463	1.
1		0236	14	0.	2		0836	164	1.	3		1436	314	1.	4		2036	464	1.
1		0248	15	0.	2		0848	165	1.	3		1448	315	1.	4		2048	465	1.
1		0300	16	0.	2		0900	166	1.	3		1500	316	1.	4		2100	466	1.
1		0312	17	0.	2		0912	167	1.	3		1512	317	1.	4		2112	467	1.
1		0324	18	0.	2		0924	168	1.	3		1524	318	1.	4		2124	468	1.
1		0336	19	0.	2		0936	169	1.	3		1536	319	1.	4		2136	469	1.
1		0348	20	0.	2		0948	170	1.	3		1548	320	1.	4		2148	470	1.
1		0400	21	0.	2		1000	171	1.	3		1600	321	1.	4		2200	471	1.
1		0412	22	0.	2		1012	172	1.	3		1612	322	1.	4		2212	472	1.
1		0424	23	0.	2		1024	173	1.	3		1624	323	1.	4		2224	473	1.
1		0436	24	0.	2		1036	174	1.	3		1636	324	1.	4		2236	474	1.
1		0448	25	0.	2		1048	175	1.	3		1648	325	1.	4		2248	475	1.
1		0500	26	1.	2		1100	176	1.	3		1700	326	1.	4		2300	476	1.
1		0512	27	2.	2		1112	177	1.	3		1712	327	1.	4		2312	477	1.
1		0524	28	4.	2		1124	178	1.	3		1724	328	1.	4		2324	478	1.

1	0536	29	7.	*	2	1136	179	1.	*	3	1736	329	1.	*	4	2336	479	1.
1	0548	30	10.	*	2	1148	180	1.	*	3	1748	330	1.	*	4	2348	480	1.
1	0600	31	15.	*	2	1200	181	1.	*	3	1800	331	1.	*	5	0000	481	1.
1	0612	32	30.	*	2	1212	182	1.	*	3	1812	332	1.	*	5	0012	482	1.
1	0624	33	74.	*	2	1224	183	1.	*	3	1824	333	1.	*	5	0024	483	1.
1	0636	34	175.	*	2	1236	184	1.	*	3	1836	334	1.	*	5	0036	484	1.
1	0648	35	342.	*	2	1248	185	1.	*	3	1848	335	1.	*	5	0048	485	1.
1	0700	36	567.	*	2	1300	186	1.	*	3	1900	336	1.	*	5	0100	486	1.
1	0712	37	829.	*	2	1312	187	1.	*	3	1912	337	1.	*	5	0112	487	1.
1	0724	38	1108.	*	2	1324	188	1.	*	3	1924	338	1.	*	5	0124	488	1.
1	0736	39	1380.	*	2	1336	189	1.	*	3	1936	339	1.	*	5	0136	489	1.
1	0748	40	1634.	*	2	1348	190	1.	*	3	1948	340	1.	*	5	0148	490	1.
1	0800	41	1866.	*	2	1400	191	1.	*	3	2000	341	1.	*	5	0200	491	1.
1	0812	42	2071.	*	2	1412	192	1.	*	3	2012	342	1.	*	5	0212	492	1.
1	0824	43	2260.	*	2	1424	193	1.	*	3	2024	343	1.	*	5	0224	493	1.
1	0836	44	2424.	*	2	1436	194	1.	*	3	2036	344	1.	*	5	0236	494	1.
1	0848	45	2568.	*	2	1448	195	1.	*	3	2048	345	1.	*	5	0248	495	1.
1	0900	46	2696.	*	2	1500	196	1.	*	3	2100	346	1.	*	5	0300	496	1.
1	0912	47	2807.	*	2	1512	197	1.	*	3	2112	347	1.	*	5	0312	497	1.
1	0924	48	2906.	*	2	1524	198	1.	*	3	2124	348	1.	*	5	0324	498	1.
1	0936	49	2993.	*	2	1536	199	1.	*	3	2136	349	1.	*	5	0336	499	1.
1	0948	50	3069.	*	2	1548	200	1.	*	3	2148	350	1.	*	5	0348	500	1.
1	1000	51	3137.	*	2	1600	201	1.	*	3	2200	351	1.	*	5	0400	501	1.
1	1012	52	3198.	*	2	1612	202	1.	*	3	2212	352	1.	*	5	0412	502	1.
1	1024	53	3252.	*	2	1624	203	1.	*	3	2224	353	1.	*	5	0424	503	1.
1	1036	54	3300.	*	2	1636	204	1.	*	3	2236	354	1.	*	5	0436	504	1.
1	1048	55	3343.	*	2	1648	205	1.	*	3	2248	355	1.	*	5	0448	505	1.
1	1100	56	3381.	*	2	1700	206	1.	*	3	2300	356	1.	*	5	0500	506	1.
1	1112	57	3416.	*	2	1712	207	1.	*	3	2312	357	1.	*	5	0512	507	1.
1	1124	58	3447.	*	2	1724	208	1.	*	3	2324	358	1.	*	5	0524	508	1.
1	1136	59	3475.	*	2	1736	209	1.	*	3	2336	359	1.	*	5	0536	509	1.
1	1148	60	3501.	*	2	1748	210	1.	*	3	2348	360	1.	*	5	0548	510	1.
1	1200	61	3524.	*	2	1800	211	1.	*	4	0000	361	1.	*	5	0600	511	1.
1	1212	62	3498.	*	2	1812	212	1.	*	4	0012	362	1.	*	5	0612	512	1.
1	1224	63	3371.	*	2	1824	213	1.	*	4	0024	363	1.	*	5	0624	513	1.
1	1236	64	3075.	*	2	1836	214	1.	*	4	0036	364	1.	*	5	0636	514	1.
1	1248	65	2649.	*	2	1848	215	1.	*	4	0048	365	1.	*	5	0648	515	1.
1	1300	66	2187.	*	2	1900	216	1.	*	4	0100	366	1.	*	5	0700	516	1.
1	1312	67	1755.	*	2	1912	217	1.	*	4	0112	367	1.	*	5	0712	517	1.
1	1324	68	1392.	*	2	1924	218	1.	*	4	0124	368	1.	*	5	0724	518	1.
1	1336	69	1131.	*	2	1936	219	1.	*	4	0136	369	1.	*	5	0736	519	1.
1	1348	70	950.	*	2	1948	220	1.	*	4	0148	370	1.	*	5	0748	520	1.
1	1400	71	820.	*	2	2000	221	1.	*	4	0200	371	1.	*	5	0800	521	1.
1	1412	72	724.	*	2	2012	222	1.	*	4	0212	372	1.	*	5	0812	522	1.
1	1424	73	655.	*	2	2024	223	1.	*	4	0224	373	1.	*	5	0824	523	1.
1	1436	74	606.	*	2	2036	224	1.	*	4	0236	374	1.	*	5	0836	524	1.
1	1448	75	570.	*	2	2048	225	1.	*	4	0248	375	1.	*	5	0848	525	1.
1	1500	76	545.	*	2	2100	226	1.	*	4	0300	376	1.	*	5	0900	526	1.
1	1512	77	526.	*	2	2112	227	1.	*	4	0312	377	1.	*	5	0912	527	1.
1	1524	78	513.	*	2	2124	228	1.	*	4	0324	378	1.	*	5	0924	528	1.
1	1536	79	503.	*	2	2136	229	1.	*	4	0336	379	1.	*	5	0936	529	1.
1	1548	80	496.	*	2	2148	230	1.	*	4	0348	380	1.	*	5	0948	530	1.
1	1600	81	492.	*	2	2200	231	1.	*	4	0400	381	1.	*	5	1000	531	1.
1	1612	82	488.	*	2	2212	232	1.	*	4	0412	382	1.	*	5	1012	532	1.
1	1624	83	485.	*	2	2224	233	1.	*	4	0424	383	1.	*	5	1024	533	1.
1	1636	84	483.	*	2	2236	234	1.	*	4	0436	384	1.	*	5	1036	534	1.
1	1648	85	483.	*	2	2248	235	1.	*	4	0448	385	1.	*	5	1048	535	1.
1	1700	86	483.	*	2	2300	236	1.	*	4	0500	386	1.	*	5	1100	536	1.
1	1712	87	483.	*	2	2312	237	1.	*	4	0512	387	1.	*	5	1112	537	1.
1	1724	88	483.	*	2	2324	238	1.	*	4	0524	388	1.	*	5	1124	538	1.
1	1736	89	483.	*	2	2336	239	1.	*	4	0536	389	1.	*	5	1136	539	1.
1	1748	90	484.	*	2	2348	240	1.	*	4	0548	390	1.	*	5	1148	540	1.
1	1800	91	484.	*	3	0000	241	1.	*	4	0600	391	1.	*	5	1200	541	1.
1	1812	92	482.	*	3	0012	242	1.	*	4	0612	392	1.	*	5	1212	542	1.
1	1824	93	477.	*	3	0024	243	1.	*	4	0624	393	1.	*	5	1224	543	1.
1	1836	94	465.	*	3	0036	244	1.	*	4	0636	394	1.	*	5	1236	544	1.
1	1848	95	448.	*	3	0048	245	1.	*	4	0648	395	1.	*	5	1248	545	1.
1	1900	96	431.	*	3	0100	246	1.	*	4	0700	396	1.	*	5	1300	546	1.
1	1912	97	414.	*	3	0112	247	1.	*	4	0712	397	1.	*	5	1312	547	1.
1	1924	98	400.	*	3	0124	248	1.	*	4	0724	398	1.	*	5	1324	548	1.
1	1936	99	390.	*	3	0136	249	1.	*	4	0736	399	1.	*	5	1336	549	1.
1	1948	100	383.	*	3	0148	250	1.	*	4	0748	400	1.	*	5	1348	550	1.
1	2000	101	378.	*	3	0200	251	1.	*	4	0800	401	1.	*	5	1400	551	1.
1	2012	102	375.	*	3	0212	252	1.	*	4	0812	402	1.	*	5	1412	552	1.
1	2024	103	372.	*	3	0224	253	1.	*	4	0824	403	1.	*	5	1424	553	1.
1	2036	104	370.	*	3	0236	254	1.	*	4	0836	404	1.	*	5	1436	554	1.
1	2048	105	369.	*	3	0248	255	1.	*	4	0848	405	1.	*	5	1448	555	1.
1	2100	106	368.	*	3	0300	256	1.	*	4	0900	406	1.	*	5	1500	556	1.
1	2112	107	368.	*	3	0312	257	1.	*	4	0912	407	1.	*	5	1512	557	1.
1	2124	108	367.	*	3	0324	258	1.	*	4	0924	408	1.	*	5	1524	558	1.
1	2136	109	367.	*	3	0336	259	1.	*	4	0936	409	1.	*	5	1536	559	1.
1	2148	110	367.	*	3	0348	260	1.	*	4	0948	410	1.	*	5	1548	560	1.
1	2200	111	367.	*	3	0400	261	1.	*	4	1000	411	1.	*	5	1600	561	1.
1	2212	112	366.	*	3	0412	262	1.	*	4	1012	412	1.	*	5	1612	562	1.
1	2224	113	366.	*	3	0424	263	1.	*	4	1024	413	1.	*	5	1624	563	1.
1	2236	114	366.	*	3	0436	264	1.	*	4	1036	414	1.	*	5	1636	564	1.
1	2248	115	367.	*	3	0448	265	1.	*	4	1048	415	1.	*	5	1648	565	1.
1	2300	116	367.	*	3	0500	266	1.	*	4	1100	416	1.	*	5	1700	566	1.
1	2312	117	367.	*	3	0512	267	1.	*	4	1112	417	1.	*	5	1712	567	1.
1	2324	118	367.	*	3	0524	268	1.	*	4	1124	418	1.	*	5	1724	568	1.
1	2336	119	367.	*	3	0536	269	1.	*	4	1136	419	1.	*	5	1736	569	1.
1	2348	120	367.	*	3	0548	270	1.	*	4	1148	420	1.	*	5	1748	570	1.

```
     2     0000  121      367.   *    3     0600  271        1.   *    4     1200  421        1.   *    5     1800  571        1.
     2     0012  122      362.   *    3     0612  272        1.   *    4     1212  422        1.   *    5     1812  572        1.
     2     0024  123      345.   *    3     0624  273        1.   *    4     1224  423        1.   *    5     1824  573        1.
     2     0036  124      308.   *    3     0636  274        1.   *    4     1236  424        1.   *    5     1836  574        1.
     2     0048  125      257.   *    3     0648  275        1.   *    4     1248  425        1.   *    5     1848  575        1.
     2     0100  126      202.   *    3     0700  276        1.   *    4     1300  426        1.   *    5     1900  576        1.
     2     0112  127      151.   *    3     0712  277        1.   *    4     1312  427        1.   *    5     1912  577        1.
     2     0124  128      108.   *    3     0724  278        1.   *    4     1324  428        1.   *    5     1924  578        1.
     2     0136  129       77.   *    3     0736  279        1.   *    4     1336  429        1.   *    5     1936  579        1.
     2     0148  130       56.   *    3     0748  280        1.   *    4     1348  430        1.   *    5     1948  580        1.
     2     0200  131       40.   *    3     0800  281        1.   *    4     1400  431        1.   *    5     2000  581        1.
     2     0212  132       29.   *    3     0812  282        1.   *    4     1412  432        1.   *    5     2012  582        1.
     2     0224  133       21.   *    3     0824  283        1.   *    4     1424  433        1.   *    5     2024  583        1.
     2     0236  134       15.   *    3     0836  284        1.   *    4     1436  434        1.   *    5     2036  584        1.
     2     0248  135       11.   *    3     0848  285        1.   *    4     1448  435        1.   *    5     2048  585        1.
     2     0300  136        8.   *    3     0900  286        1.   *    4     1500  436        1.   *    5     2100  586        1.
     2     0312  137        5.   *    3     0912  287        1.   *    4     1512  437        1.   *    5     2112  587        1.
     2     0324  138        4.   *    3     0924  288        1.   *    4     1524  438        1.   *    5     2124  588        1.
     2     0336  139        3.   *    3     0936  289        1.   *    4     1536  439        1.   *    5     2136  589        1.
     2     0348  140        2.   *    3     0948  290        1.   *    4     1548  440        1.   *    5     2148  590        1.
     2     0400  141        1.   *    3     1000  291        1.   *    4     1600  441        1.   *    5     2200  591        1.
     2     0412  142        1.   *    3     1012  292        1.   *    4     1612  442        1.   *    5     2212  592        1.
     2     0424  143        1.   *    3     1024  293        1.   *    4     1624  443        1.   *    5     2224  593        1.
     2     0436  144        1.   *    3     1036  294        1.   *    4     1636  444        1.   *    5     2236  594        1.
     2     0448  145        1.   *    3     1048  295        1.   *    4     1648  445        1.   *    5     2248  595        1.
     2     0500  146        1.   *    3     1100  296        1.   *    4     1700  446        1.   *    5     2300  596        1.
     2     0512  147        1.   *    3     1112  297        1.   *    4     1712  447        1.   *    5     2312  597        1.
     2     0524  148        1.   *    3     1124  298        1.   *    4     1724  448        1.   *    5     2324  598        1.
     2     0536  149        1.   *    3     1136  299        1.   *    4     1736  449        1.   *    5     2336  599        1.
     2     0548  150        1.   *    3     1148  300        1.   *    4     1748  450        1.   *    5     2348  600        1.
                                *                                *                                *
*****************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR    119.80-HR
+   (CFS)       (HR)
                          (CFS)
+    3524.     12.00                2782.        948.        317.         191.
                       (INCHES)      .000        .000        .000         .000
                        (AC-FT)     1379.       1880.       1884.        1888.

                        CUMULATIVE AREA =     .00 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   33 KK    *     Cove   *     Reservoir
            *            *
            **************
                          Routing through Res'v

              HYDROGRAPH ROUTING DATA

   35 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC     5545.50  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

   36 SV            STORAGE          .0      19.0      95.0     240.0     453.0     738.0    1105.0    1563.0    2217.0    2773.0
                                 3542.0    4423.0    5419.0    6149.0    7347.0    8000.0

   38 SE          ELEVATION     5470.00   5476.00   5482.00   5488.00   5494.00   5500.00   5506.00   5512.00   5518.00   5524.00
                                5530.00   5536.00   5542.00   5548.00   5552.00   5558.00

   40 SL          LOW-LEVEL OUTLET
                       ELEVL     5545.50  ELEVATION AT CENTER OF OUTLET
                       CAREA        4.91  CROSS-SECTIONAL AREA
                        COQL         .60  COEFFICIENT
                        EXPL         .50  EXPONENT OF HEAD

   41 SS          SPILLWAY
                        CREL     5549.20  SPILLWAY CREST ELEVATION
                       SPWID       30.00  SPILLWAY WIDTH
                        COQW        2.67  WEIR COEFFICIENT
                        EXPW        1.50  EXPONENT OF HEAD

   42 ST          TOP OF DAM
                       TOPEL     5552.00  ELEVATION AT TOP OF DAM
                      DAMWID     1892.00  DAM WIDTH
                        COQD        2.90  WEIR COEFFICIENT
                        EXPD        1.50  EXPONENT OF HEAD

                                                                  ***

                                                  COMPUTED OUTFLOW-ELEVATION DATA
```

(EXCLUDING FLOW OVER DAM)

OUTFLOW	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31	40.98	45.44
ELEVATION	5470.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00	5548.51	5549.20
OUTFLOW	49.37	68.29	113.97	198.20	332.85	529.64	800.37	1156.85	1610.93	2174.46
ELEVATION	5549.32	5549.60	5550.06	5550.68	5551.48	5552.44	5553.58	5554.88	5556.36	5558.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	19.00	95.00	240.00	453.00	738.00	1105.00	1563.00	2217.00	2773.00
OUTFLOW	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ELEVATION	5470.00	5476.00	5482.00	5488.00	5494.00	5500.00	5506.00	5512.00	5518.00	5524.00
STORAGE	3542.00	4423.00	5419.00	5844.83	5989.79	6009.51	6033.57	6063.27	6100.64	6148.41
OUTFLOW	.00	.00	.00	.00	25.78	27.48	29.42	31.65	34.25	37.31
ELEVATION	5530.00	5536.00	5542.00	5545.50	5546.69	5546.85	5547.05	5547.30	5547.60	5548.00
STORAGE	6301.53	6508.46	6543.56	6628.96	6765.11	6952.15	7190.23	7347.00	7395.04	7518.54
OUTFLOW	40.98	45.44	49.37	68.29	113.97	198.20	332.85	435.48	2138.72	11657.74
ELEVATION	5548.51	5549.20	5549.32	5549.60	5550.06	5550.68	5551.48	5552.00	5552.44	5553.58
STORAGE	7660.53	7821.02	8000.00							
OUTFLOW	27985.71	51484.63	82813.63							
ELEVATION	5554.88	5556.36	5558.00							

HYDROGRAPH AT STATION Cove
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	5844.8	5545.5	2		1600	201	195.	6946.4	5550.7	4		0800	401	60.	6596.5	5549.5
1		0012	2	0.	5844.8	5545.5	2		1612	202	194.	6943.2	5550.7	4		0812	402	60.	6595.5	5549.5
1		0024	3	0.	5844.8	5545.5	2		1624	203	192.	6940.0	5550.6	4		0824	403	59.	6594.4	5549.5
1		0036	4	0.	5844.8	5545.5	2		1636	204	191.	6936.8	5550.6	4		0836	404	59.	6593.4	5549.5
1		0048	5	0.	5844.8	5545.5	2		1648	205	189.	6933.7	5550.6	4		0848	405	59.	6592.4	5549.5
1		0100	6	0.	5844.8	5545.5	2		1700	206	187.	6930.7	5550.6	4		0900	406	59.	6591.4	5549.5
1		0112	7	0.	5844.8	5545.5	2		1712	207	186.	6927.6	5550.6	4		0912	407	59.	6590.4	5549.5
1		0124	8	0.	5844.8	5545.5	2		1724	208	184.	6924.5	5550.6	4		0924	408	58.	6589.5	5549.5
1		0136	9	0.	5844.8	5545.5	2		1736	209	183.	6921.4	5550.6	4		0936	409	58.	6588.6	5549.5
1		0148	10	0.	5844.8	5545.5	2		1748	210	182.	6918.5	5550.6	4		0948	410	58.	6587.7	5549.5
1		0200	11	0.	5844.8	5545.5	2		1800	211	180.	6915.6	5550.6	4		1000	411	58.	6586.8	5549.5
1		0212	12	0.	5844.8	5545.5	2		1812	212	179.	6912.7	5550.5	4		1012	412	58.	6586.0	5549.5
1		0224	13	0.	5844.8	5545.5	2		1824	213	177.	6909.7	5550.5	4		1024	413	57.	6585.1	5549.5
1		0236	14	0.	5844.8	5545.5	2		1836	214	176.	6906.8	5550.5	4		1036	414	57.	6584.2	5549.5
1		0248	15	0.	5844.8	5545.5	2		1848	215	174.	6903.9	5550.5	4		1048	415	57.	6583.3	5549.5
1		0300	16	0.	5844.8	5545.5	2		1900	216	173.	6901.0	5550.5	4		1100	416	57.	6582.5	5549.4
1		0312	17	0.	5844.8	5545.5	2		1912	217	172.	6898.2	5550.5	4		1112	417	57.	6581.6	5549.4
1		0324	18	0.	5844.8	5545.5	2		1924	218	170.	6895.4	5550.5	4		1124	418	56.	6580.7	5549.4
1		0336	19	0.	5844.8	5545.5	2		1936	219	169.	6892.6	5550.5	4		1136	419	56.	6579.8	5549.4
1		0348	20	0.	5844.8	5545.5	2		1948	220	168.	6889.9	5550.5	4		1148	420	56.	6578.9	5549.4
1		0400	21	0.	5844.8	5545.5	2		2000	221	166.	6887.1	5550.5	4		1200	421	56.	6578.1	5549.4
1		0412	22	0.	5844.8	5545.5	2		2012	222	165.	6884.3	5550.5	4		1212	422	56.	6577.2	5549.4
1		0424	23	0.	5844.8	5545.5	2		2024	223	164.	6881.7	5550.4	4		1224	423	55.	6576.3	5549.4
1		0436	24	0.	5844.8	5545.5	2		2036	224	163.	6879.0	5550.4	4		1236	424	55.	6575.4	5549.4
1		0448	25	0.	5844.8	5545.5	2		2048	225	162.	6876.4	5550.4	4		1248	425	55.	6574.6	5549.4
1		0500	26	0.	5844.8	5545.5	2		2100	226	160.	6873.8	5550.4	4		1300	426	55.	6573.7	5549.4
1		0512	27	0.	5844.8	5545.5	2		2112	227	159.	6871.1	5550.4	4		1312	427	55.	6572.8	5549.4
1		0524	28	1.	5844.9	5545.5	2		2124	228	158.	6868.5	5550.4	4		1324	428	55.	6571.9	5549.4
1		0536	29	1.	5845.0	5545.5	2		2136	229	157.	6865.9	5550.4	4		1336	429	54.	6571.0	5549.4
1		0548	30	1.	5845.1	5545.5	2		2148	230	155.	6863.2	5550.4	4		1348	430	54.	6570.2	5549.4
1		0600	31	1.	5845.2	5545.5	2		2200	231	154.	6860.8	5550.4	4		1400	431	54.	6569.3	5549.4
1		0612	32	2.	5845.6	5545.5	2		2212	232	153.	6858.3	5550.4	4		1412	432	54.	6568.4	5549.4
1		0624	33	3.	5846.4	5545.5	2		2224	233	152.	6855.8	5550.4	4		1424	433	54.	6567.5	5549.4
1		0636	34	4.	5848.5	5545.5	2		2236	234	151.	6853.3	5550.4	4		1436	434	53.	6566.7	5549.4
1		0648	35	6.	5852.7	5545.6	2		2248	235	150.	6850.8	5550.3	4		1448	435	53.	6565.8	5549.4
1		0700	36	8.	5860.1	5545.6	2		2300	236	149.	6848.3	5550.3	4		1500	436	53.	6564.9	5549.4
1		0712	37	11.	5871.5	5545.7	2		2312	237	148.	6845.8	5550.3	4		1512	437	53.	6564.0	5549.4
1		0724	38	14.	5887.3	5545.8	2		2324	238	147.	6843.3	5550.3	4		1524	438	53.	6563.2	5549.4
1		0736	39	17.	5907.6	5546.0	2		2336	239	146.	6841.0	5550.3	4		1536	439	53.	6562.3	5549.4
1		0748	40	20.	5932.2	5546.2	2		2348	240	144.	6838.7	5550.3	4		1548	440	52.	6561.4	5549.4
1		0800	41	23.	5960.8	5546.5	3		0000	241	143.	6836.3	5550.3	4		1600	441	52.	6560.5	5549.4
1		0812	42	26.	5992.9	5546.7	3		0012	242	142.	6834.0	5550.3	4		1612	442	52.	6559.6	5549.4
1		0824	43	29.	6028.3	5547.0	3		0024	243	141.	6831.6	5550.3	4		1624	443	52.	6558.8	5549.4
1		0836	44	32.	6066.5	5547.3	3		0036	244	140.	6829.3	5550.3	4		1636	444	52.	6557.9	5549.4
1		0848	45	35.	6107.2	5547.7	3		0048	245	139.	6827.0	5550.3	4		1648	445	52.	6557.0	5549.4
1		0900	46	37.	6150.0	5548.0	3		0100	246	138.	6824.6	5550.3	4		1700	446	51.	6556.1	5549.4
1		0912	47	38.	6194.9	5548.2	3		0112	247	137.	6822.4	5550.2	4		1712	447	51.	6555.3	5549.4
1		0924	48	40.	6241.4	5548.3	3		0124	248	137.	6820.2	5550.2	4		1724	448	51.	6554.4	5549.4
1		0936	49	41.	6289.5	5548.5	3		0136	249	136.	6818.0	5550.2	4		1736	449	51.	6553.5	5549.4
1		0948	50	42.	6339.0	5548.6	3		0148	250	135.	6815.9	5550.2	4		1748	450	51.	6552.6	5549.3
1		1000	51	43.	6389.6	5548.8	3		0200	251	134.	6813.7	5550.2	4		1800	451	51.	6551.7	5549.3
1		1012	52	44.	6441.2	5549.0	3		0212	252	133.	6811.5	5550.2	4		1812	452	51.	6550.9	5549.3
1		1024	53	45.	6493.7	5549.2	3		0224	253	132.	6809.3	5550.2	4		1824	453	50.	6550.0	5549.3
1		1036	54	50.	6547.1	5549.3	3		0236	254	131.	6807.1	5550.2	4		1836	454	50.	6549.1	5549.3

1	1048	55	61.	6601.0	5549.5	*	3	0248	255	130.	6804.9	5550.2	*	4	1848	455	50.	6548.2	5549.3
1	1100	56	76.	6655.4	5549.7	*	3	0300	256	129.	6802.7	5550.2	*	4	1900	456	50.	6547.4	5549.3
1	1112	57	94.	6710.1	5549.9	*	3	0312	257	128.	6800.6	5550.2	*	4	1912	457	50.	6546.5	5549.3
1	1124	58	114.	6765.1	5550.1	*	3	0324	258	127.	6798.6	5550.2	*	4	1924	458	50.	6545.6	5549.3
1	1136	59	137.	6820.2	5550.2	*	3	0336	259	127.	6796.6	5550.2	*	4	1936	459	50.	6544.9	5549.3
1	1148	60	161.	6875.4	5550.4	*	3	0348	260	126.	6794.5	5550.2	*	4	1948	460	49.	6544.1	5549.3
1	1200	61	187.	6930.5	5550.6	*	3	0400	261	125.	6792.5	5550.1	*	4	2000	461	49.	6543.4	5549.3
1	1212	62	215.	6985.2	5550.8	*	3	0412	262	124.	6790.4	5550.1	*	4	2012	462	49.	6542.7	5549.3
1	1224	63	244.	7038.1	5551.0	*	3	0424	263	123.	6788.4	5550.1	*	4	2024	463	49.	6541.9	5549.3
1	1236	64	271.	7087.1	5551.1	*	3	0436	264	122.	6786.3	5550.1	*	4	2036	464	49.	6541.2	5549.3
1	1248	65	296.	7129.7	5551.3	*	3	0448	265	122.	6784.3	5550.1	*	4	2048	465	49.	6540.5	5549.3
1	1300	66	317.	7164.6	5551.4	*	3	0500	266	121.	6782.2	5550.1	*	4	2100	466	49.	6539.8	5549.3
1	1312	67	334.	7191.8	5551.5	*	3	0512	267	120.	6780.3	5550.1	*	4	2112	467	49.	6539.0	5549.3
1	1324	68	347.	7212.2	5551.5	*	3	0524	268	119.	6778.4	5550.1	*	4	2124	468	49.	6538.3	5549.3
1	1336	69	356.	7227.2	5551.6	*	3	0536	269	118.	6776.5	5550.1	*	4	2136	469	48.	6537.6	5549.3
1	1348	70	363.	7238.5	5551.6	*	3	0548	270	118.	6774.6	5550.1	*	4	2148	470	48.	6536.8	5549.3
1	1400	71	369.	7247.1	5551.7	*	3	0600	271	117.	6772.7	5550.1	*	4	2200	471	48.	6536.1	5549.3
1	1412	72	373.	7253.7	5551.7	*	3	0612	272	116.	6770.8	5550.1	*	4	2212	472	48.	6535.4	5549.3
1	1424	73	377.	7259.0	5551.7	*	3	0624	273	115.	6768.9	5550.1	*	4	2224	473	48.	6534.6	5549.3
1	1436	74	379.	7263.2	5551.7	*	3	0636	274	115.	6767.0	5550.1	*	4	2236	474	48.	6533.9	5549.3
1	1448	75	382.	7266.6	5551.7	*	3	0648	275	114.	6765.1	5550.1	*	4	2248	475	48.	6533.2	5549.3
1	1500	76	383.	7269.5	5551.7	*	3	0700	276	113.	6763.2	5550.1	*	4	2300	476	48.	6532.4	5549.3
1	1512	77	385.	7272.0	5551.7	*	3	0712	277	112.	6761.3	5550.0	*	4	2312	477	48.	6531.7	5549.3
1	1524	78	387.	7274.2	5551.8	*	3	0724	278	112.	6759.4	5550.0	*	4	2324	478	48.	6531.0	5549.3
1	1536	79	388.	7276.2	5551.8	*	3	0736	279	111.	6757.7	5550.0	*	4	2336	479	47.	6530.2	5549.3
1	1548	80	389.	7278.1	5551.8	*	3	0748	280	110.	6755.9	5550.0	*	4	2348	480	47.	6529.5	5549.3
1	1600	81	390.	7279.9	5551.8	*	3	0800	281	110.	6754.1	5550.0	*	5	0000	481	47.	6528.8	5549.3
1	1612	82	391.	7281.5	5551.8	*	3	0812	282	109.	6752.4	5550.0	*	5	0012	482	47.	6528.1	5549.3
1	1624	83	392.	7283.1	5551.8	*	3	0824	283	108.	6750.6	5550.0	*	5	0024	483	47.	6527.3	5549.3
1	1636	84	393.	7284.6	5551.8	*	3	0836	284	108.	6748.9	5550.0	*	5	0036	484	47.	6526.6	5549.3
1	1648	85	394.	7286.0	5551.8	*	3	0848	285	107.	6747.1	5550.0	*	5	0048	485	47.	6525.9	5549.3
1	1700	86	395.	7287.5	5551.8	*	3	0900	286	106.	6745.4	5550.0	*	5	0100	486	47.	6525.1	5549.3
1	1712	87	396.	7288.9	5551.8	*	3	0912	287	106.	6743.6	5550.0	*	5	0112	487	47.	6524.4	5549.3
1	1724	88	397.	7290.4	5551.8	*	3	0924	288	105.	6741.9	5550.0	*	5	0124	488	47.	6523.7	5549.3
1	1736	89	398.	7291.9	5551.8	*	3	0936	289	104.	6740.1	5550.0	*	5	0136	489	47.	6522.9	5549.2
1	1748	90	399.	7293.3	5551.8	*	3	0948	290	104.	6738.3	5550.0	*	5	0148	490	47.	6522.2	5549.2
1	1800	91	400.	7294.8	5551.8	*	3	1000	291	103.	6736.6	5550.0	*	5	0200	491	46.	6521.5	5549.2
1	1812	92	401.	7296.1	5551.8	*	3	1012	292	103.	6734.8	5550.0	*	5	0212	492	46.	6520.7	5549.2
1	1824	93	402.	7297.4	5551.8	*	3	1024	293	102.	6733.2	5550.0	*	5	0224	493	46.	6520.0	5549.2
1	1836	94	403.	7298.6	5551.8	*	3	1036	294	101.	6731.6	5549.9	*	5	0236	494	46.	6519.3	5549.2
1	1848	95	403.	7299.5	5551.8	*	3	1048	295	101.	6730.0	5549.9	*	5	0248	495	46.	6518.5	5549.2
1	1900	96	404.	7300.1	5551.8	*	3	1100	296	100.	6728.4	5549.9	*	5	0300	496	46.	6517.8	5549.2
1	1912	97	404.	7300.3	5551.8	*	3	1112	297	100.	6726.8	5549.9	*	5	0312	497	46.	6517.1	5549.2
1	1924	98	404.	7300.3	5551.8	*	3	1124	298	99.	6725.2	5549.9	*	5	0324	498	46.	6516.4	5549.2
1	1936	99	404.	7300.2	5551.8	*	3	1136	299	98.	6723.6	5549.9	*	5	0336	499	46.	6515.6	5549.2
1	1948	100	404.	7299.9	5551.8	*	3	1148	300	98.	6722.0	5549.9	*	5	0348	500	46.	6514.9	5549.2
1	2000	101	403.	7299.5	5551.8	*	3	1200	301	97.	6720.4	5549.9	*	5	0400	501	46.	6514.2	5549.2
1	2012	102	403.	7299.0	5551.8	*	3	1212	302	97.	6718.8	5549.9	*	5	0412	502	46.	6513.4	5549.2
1	2024	103	403.	7298.6	5551.8	*	3	1224	303	96.	6717.1	5549.9	*	5	0424	503	46.	6512.7	5549.2
1	2036	104	402.	7298.0	5551.8	*	3	1236	304	96.	6715.5	5549.9	*	5	0436	504	46.	6512.0	5549.2
1	2048	105	402.	7297.4	5551.8	*	3	1248	305	95.	6713.9	5549.9	*	5	0448	505	46.	6511.2	5549.2
1	2100	106	402.	7296.8	5551.8	*	3	1300	306	94.	6712.3	5549.9	*	5	0500	506	46.	6510.5	5549.2
1	2112	107	401.	7296.3	5551.8	*	3	1312	307	94.	6710.7	5549.9	*	5	0512	507	45.	6509.8	5549.2
1	2124	108	401.	7295.7	5551.8	*	3	1324	308	93.	6709.2	5549.9	*	5	0524	508	45.	6509.0	5549.2
1	2136	109	400.	7295.1	5551.8	*	3	1336	309	93.	6707.8	5549.9	*	5	0536	509	45.	6508.3	5549.2
1	2148	110	400.	7294.5	5551.8	*	3	1348	310	92.	6706.3	5549.9	*	5	0548	510	45.	6507.6	5549.2
1	2200	111	400.	7293.9	5551.8	*	3	1400	311	92.	6704.9	5549.9	*	5	0600	511	45.	6506.8	5549.2
1	2212	112	399.	7293.3	5551.8	*	3	1412	312	91.	6703.4	5549.9	*	5	0612	512	45.	6506.1	5549.2
1	2224	113	399.	7292.7	5551.8	*	3	1424	313	91.	6701.9	5549.8	*	5	0624	513	45.	6505.4	5549.2
1	2236	114	398.	7292.2	5551.8	*	3	1436	314	90.	6700.5	5549.8	*	5	0636	514	45.	6504.7	5549.2
1	2248	115	398.	7291.6	5551.8	*	3	1448	315	90.	6699.0	5549.8	*	5	0648	515	45.	6503.9	5549.2
1	2300	116	398.	7291.1	5551.8	*	3	1500	316	89.	6697.5	5549.8	*	5	0700	516	45.	6503.2	5549.2
1	2312	117	397.	7290.7	5551.8	*	3	1512	317	89.	6696.1	5549.8	*	5	0712	517	45.	6502.5	5549.2
1	2324	118	397.	7290.3	5551.8	*	3	1524	318	88.	6694.6	5549.8	*	5	0724	518	45.	6501.7	5549.2
1	2336	119	397.	7289.8	5551.8	*	3	1536	319	88.	6693.2	5549.8	*	5	0736	519	45.	6501.0	5549.2
1	2348	120	397.	7289.4	5551.8	*	3	1548	320	87.	6691.7	5549.8	*	5	0748	520	45.	6500.3	5549.2
2	0000	121	396.	7288.9	5551.8	*	3	1600	321	87.	6690.2	5549.8	*	5	0800	521	45.	6499.5	5549.2
2	0012	122	396.	7288.4	5551.8	*	3	1612	322	86.	6688.8	5549.8	*	5	0812	522	45.	6498.8	5549.2
2	0024	123	395.	7287.6	5551.8	*	3	1624	323	86.	6687.3	5549.8	*	5	0824	523	45.	6498.1	5549.2
2	0036	124	395.	7286.5	5551.8	*	3	1636	324	85.	6685.8	5549.8	*	5	0836	524	45.	6497.3	5549.2
2	0048	125	393.	7284.6	5551.8	*	3	1648	325	85.	6684.4	5549.8	*	5	0848	525	45.	6496.6	5549.2
2	0100	126	392.	7281.9	5551.8	*	3	1700	326	85.	6683.1	5549.8	*	5	0900	526	45.	6495.9	5549.2
2	0112	127	389.	7278.4	5551.8	*	3	1712	327	84.	6681.8	5549.8	*	5	0912	527	45.	6495.2	5549.2
2	0124	128	387.	7274.2	5551.8	*	3	1724	328	84.	6680.4	5549.8	*	5	0924	528	45.	6494.4	5549.2
2	0136	129	383.	7269.3	5551.7	*	3	1736	329	83.	6679.1	5549.8	*	5	0936	529	45.	6493.7	5549.2
2	0148	130	380.	7264.1	5551.7	*	3	1748	330	83.	6677.8	5549.8	*	5	0948	530	45.	6493.0	5549.1
2	0200	131	376.	7258.7	5551.7	*	3	1800	331	82.	6676.5	5549.8	*	5	1000	531	45.	6492.2	5549.1
2	0212	132	373.	7253.1	5551.7	*	3	1812	332	82.	6675.2	5549.8	*	5	1012	532	45.	6491.5	5549.1
2	0224	133	369.	7247.4	5551.7	*	3	1824	333	82.	6673.9	5549.8	*	5	1024	533	45.	6490.8	5549.1
2	0236	134	365.	7241.7	5551.6	*	3	1836	334	81.	6672.5	5549.7	*	5	1036	534	45.	6490.0	5549.1
2	0248	135	362.	7235.9	5551.6	*	3	1848	335	81.	6671.2	5549.7	*	5	1048	535	45.	6489.3	5549.1
2	0300	136	358.	7230.0	5551.6	*	3	1900	336	80.	6669.9	5549.7	*	5	1100	536	45.	6488.6	5549.1
2	0312	137	354.	7224.2	5551.6	*	3	1912	337	80.	6668.6	5549.7	*	5	1112	537	45.	6487.8	5549.1
2	0324	138	351.	7218.5	5551.6	*	3	1924	338	80.	6667.3	5549.7	*	5	1124	538	45.	6487.1	5549.1
2	0336	139	347.	7212.8	5551.6	*	3	1936	339	79.	6666.0	5549.7	*	5	1136	539	45.	6486.4	5549.1
2	0348	140	343.	7207.0	5551.5	*	3	1948	340	79.	6664.6	5549.7	*	5	1148	540	45.	6485.6	5549.1
2	0400	141	340.	7201.5	5551.5	*	3	2000	341	78.	6663.3	5549.7	*	5	1200	541	45.	6484.9	5549.1
2	0412	142	336.	7195.9	5551.5	*	3	2012	342	78.	6662.0	5549.7	*	5	1212	542	45.	6484.2	5549.1
2	0424	143	333.	7190.4	5551.5	*	3	2024	343	77.	6660.7	5549.7	*	5	1224	543	45.	6483.5	5549.1
2	0436	144	330.	7185.0	5551.5	*	3	2036	344	77.	6659.4	5549.7	*	5	1236	544	45.	6482.7	5549.1
2	0448	145	326.	7179.6	5551.4	*	3	2048	345	77.	6658.1	5549.7	*	5	1248	545	45.	6482.0	5549.1
2	0500	146	323.	7174.1	5551.4	*	3	2100	346	76.	6656.7	5549.7	*	5	1300	546	45.	6481.3	5549.1

```
   2     0512 147     320.   7168.9  5551.4 *  3     2112 347      76.   6655.6  5549.7 *  5     1312 547      45.   6480.5  5549.1
   2     0524 148     316.   7163.6  5551.4 *  3     2124 348      76.   6654.4  5549.7 *  5     1324 548      45.   6479.8  5549.1
   2     0536 149     313.   7158.5  5551.4 *  3     2136 349      75.   6653.2  5549.7 *  5     1336 549      45.   6479.1  5549.1
   2     0548 150     310.   7153.4  5551.4 *  3     2148 350      75.   6652.1  5549.7 *  5     1348 550      45.   6478.3  5549.1
   2     0600 151     307.   7148.3  5551.3 *  3     2200 351      75.   6650.9  5549.7 *  5     1400 551      45.   6477.6  5549.1
   2     0612 152     304.   7143.3  5551.3 *  3     2212 352      74.   6649.7  5549.7 *  5     1412 552      45.   6476.9  5549.1
   2     0624 153     301.   7138.3  5551.3 *  3     2224 353      74.   6648.6  5549.7 *  5     1424 553      45.   6476.1  5549.1
   2     0636 154     298.   7133.3  5551.3 *  3     2236 354      74.   6647.4  5549.7 *  5     1436 554      45.   6475.4  5549.1
   2     0648 155     295.   7128.5  5551.3 *  3     2248 355      73.   6646.2  5549.7 *  5     1448 555      45.   6474.7  5549.1
   2     0700 156     292.   7123.7  5551.3 *  3     2300 356      73.   6645.0  5549.7 *  5     1500 556      45.   6473.9  5549.1
   2     0712 157     290.   7118.9  5551.2 *  3     2312 357      72.   6643.9  5549.7 *  5     1512 557      45.   6473.2  5549.1
   2     0724 158     287.   7114.2  5551.2 *  3     2324 358      72.   6642.7  5549.6 *  5     1524 558      45.   6472.5  5549.1
   2     0736 159     284.   7109.5  5551.2 *  3     2336 359      72.   6641.5  5549.6 *  5     1536 559      45.   6471.8  5549.1
   2     0748 160     281.   7104.8  5551.2 *  3     2348 360      71.   6640.4  5549.6 *  5     1548 560      45.   6471.0  5549.1
   2     0800 161     279.   7100.1  5551.2 *  4     0000 361      71.   6639.2  5549.6 *  5     1600 561      45.   6470.3  5549.1
   2     0812 162     276.   7095.6  5551.2 *  4     0012 362      71.   6638.0  5549.6 *  5     1612 562      45.   6469.6  5549.1
   2     0824 163     273.   7091.1  5551.1 *  4     0024 363      70.   6636.9  5549.6 *  5     1624 563      45.   6468.8  5549.1
   2     0836 164     271.   7086.5  5551.1 *  4     0036 364      70.   6635.7  5549.6 *  5     1636 564      45.   6468.1  5549.1
   2     0848 165     268.   7082.2  5551.1 *  4     0048 365      70.   6634.5  5549.6 *  5     1648 565      45.   6467.4  5549.1
   2     0900 166     266.   7077.8  5551.1 *  4     0100 366      70.   6633.3  5549.6 *  5     1700 566      45.   6466.6  5549.1
   2     0912 167     263.   7073.4  5551.1 *  4     0112 367      69.   6632.2  5549.6 *  5     1712 567      45.   6465.9  5549.1
   2     0924 168     261.   7069.0  5551.1 *  4     0124 368      69.   6631.0  5549.6 *  5     1724 568      45.   6465.2  5549.1
   2     0936 169     258.   7064.8  5551.1 *  4     0136 369      69.   6629.8  5549.6 *  5     1736 569      45.   6464.4  5549.1
   2     0948 170     256.   7060.5  5551.0 *  4     0148 370      68.   6628.7  5549.6 *  5     1748 570      45.   6463.7  5549.1
   2     1000 171     254.   7056.3  5551.0 *  4     0200 371      68.   6627.5  5549.6 *  5     1800 571      44.   6463.0  5549.0
   2     1012 172     251.   7052.2  5551.0 *  4     0212 372      68.   6626.3  5549.6 *  5     1812 572      44.   6462.2  5549.0
   2     1024 173     249.   7048.1  5551.0 *  4     0224 373      67.   6625.2  5549.6 *  5     1824 573      44.   6461.5  5549.0
   2     1036 174     247.   7044.0  5551.0 *  4     0236 374      67.   6624.1  5549.6 *  5     1836 574      44.   6460.8  5549.0
   2     1048 175     245.   7039.9  5551.0 *  4     0248 375      67.   6623.1  5549.6 *  5     1848 575      44.   6460.1  5549.0
   2     1100 176     242.   7035.9  5551.0 *  4     0300 376      66.   6622.1  5549.6 *  5     1900 576      44.   6459.3  5549.0
   2     1112 177     240.   7032.0  5550.9 *  4     0312 377      66.   6621.1  5549.6 *  5     1912 577      44.   6458.6  5549.0
   2     1124 178     238.   7028.0  5550.9 *  4     0324 378      66.   6620.0  5549.6 *  5     1924 578      44.   6457.9  5549.0
   2     1136 179     236.   7024.1  5550.9 *  4     0336 379      66.   6619.0  5549.6 *  5     1936 579      44.   6457.1  5549.0
   2     1148 180     234.   7020.3  5550.9 *  4     0348 380      65.   6618.0  5549.6 *  5     1948 580      44.   6456.4  5549.0
   2     1200 181     232.   7016.5  5550.9 *  4     0400 381      65.   6617.0  5549.6 *  5     2000 581      44.   6455.7  5549.0
   2     1212 182     230.   7012.7  5550.9 *  4     0412 382      65.   6615.9  5549.6 *  5     2012 582      44.   6454.9  5549.0
   2     1224 183     228.   7008.9  5550.9 *  4     0424 383      65.   6614.9  5549.6 *  5     2024 583      44.   6454.2  5549.0
   2     1236 184     226.   7005.1  5550.9 *  4     0436 384      64.   6613.9  5549.6 *  5     2036 584      44.   6453.5  5549.0
   2     1248 185     224.   7001.4  5550.8 *  4     0448 385      64.   6612.9  5549.5 *  5     2048 585      44.   6452.7  5549.0
   2     1300 186     222.   6997.8  5550.8 *  4     0500 386      64.   6611.9  5549.5 *  5     2100 586      44.   6452.0  5549.0
   2     1312 187     220.   6994.1  5550.8 *  4     0512 387      63.   6610.8  5549.5 *  5     2112 587      44.   6451.3  5549.0
   2     1324 188     218.   6990.5  5550.8 *  4     0524 388      63.   6609.8  5549.5 *  5     2124 588      44.   6450.5  5549.0
   2     1336 189     216.   6987.0  5550.8 *  4     0536 389      63.   6608.8  5549.5 *  5     2136 589      44.   6449.8  5549.0
   2     1348 190     214.   6983.4  5550.8 *  4     0548 390      63.   6607.8  5549.5 *  5     2148 590      44.   6449.1  5549.0
   2     1400 191     212.   6979.9  5550.8 *  4     0600 391      62.   6606.7  5549.5 *  5     2200 591      44.   6448.4  5549.0
   2     1412 192     211.   6976.4  5550.8 *  4     0612 392      62.   6605.7  5549.5 *  5     2212 592      44.   6447.6  5549.0
   2     1424 193     209.   6972.9  5550.8 *  4     0624 393      62.   6604.7  5549.5 *  5     2224 593      44.   6446.9  5549.0
   2     1436 194     207.   6969.6  5550.7 *  4     0636 394      62.   6603.7  5549.5 *  5     2236 594      44.   6446.2  5549.0
   2     1448 195     205.   6966.2  5550.7 *  4     0648 395      61.   6602.6  5549.5 *  5     2248 595      44.   6445.4  5549.0
   2     1500 196     204.   6962.8  5550.7 *  4     0700 396      61.   6601.6  5549.5 *  5     2300 596      44.   6444.7  5549.0
   2     1512 197     202.   6959.5  5550.7 *  4     0712 397      61.   6600.6  5549.5 *  5     2312 597      44.   6444.0  5549.0
   2     1524 198     200.   6956.1  5550.7 *  4     0724 398      61.   6599.6  5549.5 *  5     2324 598      44.   6443.2  5549.0
   2     1536 199     199.   6952.9  5550.7 *  4     0736 399      60.   6598.5  5549.5 *  5     2336 599      44.   6442.5  5549.0
   2     1548 200     197.   6949.7  5550.7 *  4     0748 400      60.   6597.5  5549.5 *  5     2348 600      44.   6441.8  5549.0
                                        *                                                     *
 ********************************************************************************************************************************************************

 PEAK OUTFLOW IS      404. AT TIME  19.20 HOURS


  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR     119.80-HR
+   (CFS)       (HR)
                      (CFS)
+     404.     19.20                401.         346.         191.          130.
                     (INCHES)       .000         .000         .000          .000
                      (AC-FT)       199.         687.        1135.         1291.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                  6-HR        24-HR        72-HR     119.80-HR
+  (AC-FT)      (HR)
     7300.     19.20               7296.        7209.        6902.         6696.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR     119.80-HR
+   (FEET)      (HR)
   5551.84     19.20              5551.83     5551.54     5550.52      5549.72

                       CUMULATIVE AREA =     .00 SQ MI

1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                           FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                        TIME TO PEAK IN HOURS


                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                       1.00

 HYDROGRAPH AT
```

```
+                 Cove        .00     1   FLOW        3524.
                                          TIME       12.00

 ROUTED TO
+                 Cove        .00     1   FLOW         404.
                                          TIME       19.20

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     5551.84
                                           TIME       19.20
1                                   SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION    Cove
                                  (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED  DURING BREACH FORMATION)


      PLAN  1 ..............                  INITIAL VALUE     SPILLWAY CREST     TOP OF DAM
                                  ELEVATION        5545.50           5549.20          5552.00
                                  STORAGE             5845.             6508.            7347.
                                  OUTFLOW                0.               45.              435.


                     RATIO     MAXIMUM      MAXIMUM    MAXIMUM    MAXIMUM    DURATION     TIME OF     TIME OF
                       OF     RESERVOIR      DEPTH     STORAGE    OUTFLOW    OVER TOP   MAX OUTFLOW   FAILURE
                      PMF      W.S.ELEV    OVER DAM     AC-FT       CFS       HOURS        HOURS       HOURS

                     1.00      5551.84         .00       7300.       404.       .00        19.20         .00


 *** NORMAL END OF HEC-1 ***
```

Spillway Analysis

```
*******************************************************************************
SITES XEQ 08/20/2020   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
     VER 2005.1.8              (USER MANUAL - DATED DECEMBER 2005)
     TIME 06:12:11

************************ 80-80 LIST OF INPUT Data **************************

SITES     01/01/2005COVRES    COV RES                       4.74      C3
SAVMOV    0    101
SAVMOV    101  1                                                      1
STRUCTURE STR1      Cove Res
                    5470                                    0.18
                    5480                                    62.26
                    5490                                    303.40
                    5500                                    738.03
                    5510                                    1400.09
                    5520                                    2323.02
                    5530                                    3541.97
                    5540                                    5073.81
                    5545.5                                  6055.03
                    5550                                    6934.92
                    5552                                    7347.18
                    5552.5                                  7450.25
ENDTABLE
HYD       1                 Principal Spillway
                    1
                    0         11        14        15        15
                    15        15        15        15        15
                    15        16        16        16        16
                    16        16        16        16        16
                    16        17        17        17        17
                    17        17        17        17        17
                    17        18        18        18        18
                    18        18        18        18        19
                    19        19        19        19        19
                    20        20        20        20        20
                    20        21        21        21        21
                    21        21        22        22        22
                    22        23        23        23        23
                    24        24        24        24        25
                    25        25        26        26        26
                    27        27        27        28        28
                    29        29        29        30        30
                    31        31        32        33        33
                    34        35        35        36        37
                    38        39        40        41        42
                    43        45        46        48        49
                    51        53        56        58        61
                    65        69        74        80        87
                    96        109       127       157       219
                    850       479       259       172       132
                    111       98        88        81        75
                    70        65        62        59        56
                    54        51        50        48        46
                    45        43        42        41        40
                    39        38        37        36        35
                    35        34        33        33        32
                    32        31        30        30        29
                    29        29        28        28        27
                    27        27        26        26        26
                    25        25        25        24        24
                    24        24        23        23        23
                    23        22        22        22        22
                    22        21        21        21        21
                    21        20        20        20        20
                    20        20        19        19        19
                    19        19        19        19        18
                    18        18        18        18        18
                    18        17        17        17        17
                    17        17        17        17        17
                    17        16        16        16        16
                    16        16        16        16        16
                    16        15        15        15        15
                    15        15        15        15        15
                    15        4         1
ENDTABLE
HYD       3                 Auxiliary Spillway (Local)
                    0.3
                    0         0         0         0         0
                    6         39        194       687       1365
                    2027      2180      1955      1683      1441
                    1248      1107      1001      924       874
                    833       748       589       423       283
                    180       112       73        47        28
                    16        9         5         3         1
                    1         0
ENDTABLE
HYD       5                 Freeboard (General)
                    1.2
                    0         0         4         35        84
                    195       425       1352      3365      3296
                    2008      1331      1060      912       792
```

```
                  742       664       624       613       611
                  547       262       90        24        5
                  1         0
ENDTABLE
WSDATA    2C CR               4.74
PDIRECT                                 9.40      16.00
POOLDATA  ELEV                5545.5              5552      5435      SC
PSINLET             1         3.75
PSDATA    1         1000      30                  0.012     5450
ASSPRFL   41
          0         5530      75        5549.2    155       5549.2
          237       5517.6    600       5481.7    1049      5453.3
          1170      5435
ENDTABLE
ASSURFACE 41        1170      1
          0         1170      1         0         1
ENDTABLE
ASDATA    41                            2                             1
BTMWIDTH  FEET      30
ASMATERIAL
          1         50        1         75        115       .2
ENDTABLE
ASCOORD    1        W.Shale   N
          0         5530      75        5550      125       5565
          200       5552      250       5520      600       5485
          1050      5460      1150      5435      1300      5432.4
ENDTABLE
GRAPHICS  I
GO,DESIGN LP        TYPE2     24
SAVMOV    2    101  1                   STR1
ENDJOB

********************************************************************************

***** MESSAGE - DEFAULT TOPSOIL FILL MATERIAL PARAMETERS USED.

***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO  5549.20
               FROM THE ASSPRFL RECORDS.

***** MESSAGE - ASSURFACE REACH  1: ZERO ROOTING DEPTH IS DEFAULTED TO 0.5 FT.


1SITES ----------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                       WSID= COVRES
 VER 2005.1.8                        Cove Res                      SUBW= CR
 TIME 06:12:11           SITE = STR1             PASS=    1     PART=   1



**********    MATERIAL PROPERTIES    **************************
                        DRY                  PERCENT       DETACH.      REP.
     MATERIAL       PI  DENSITY       Kh       CLAY         RATE      DIAMETER
                       lbs/CuFt                        (Ft/H)/(lb/SqFt)  inches
    W.Shale        50.      115.     0.20       75.0          --        1.00000
    TS_FILL         0.      100.     0.05        0.0          --        0.05000
    GEN_FILL       50.      115.     0.20       75.0          --        1.00000

**************************    BASIC Data    ********************************
HUMID- SUBHUMID CLIMATE AREA                    DESIGN CLASS  C

INFLOW HYDROGRAPH(S) ENTERED

PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD          P-FB
              0.00          0.00          9.40         16.00

WSDATA -       CN          DA-SM          TC/L           -/H          QRF
              0.00          4.74          0.00          0.00         0.00

SITEDATA- PERM POOL     CREST PS        FP SED       VALLEY FL        378?
              0.00       5545.50          0.00       5435.00           NO

          BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
              0.00          0.00          0.00         DESIGN

PSDATA -  NO. COND        COND L         DIA/W           -/H
              1.00       1000.00         30.00          0.00

               PS N            KE         WEIR L        TW EL
             0.012          1.00          3.75       5450.00

           2ND STG         ORF H          ORF L      START AUX.
              0.00          0.00          0.00          0.00

ASCRESTS -   AUX.1         AUX.2         AUX.3         AUX.4         AUX.5
            5549.20          0.00          0.00          0.00         0.00

AUX.Data -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00       155.00             0

AUX.Data - INLET Ci    SIDE SLOPE       EXIT Ci     EXIT SLOPE     ACTUAL AUX?
             1.000          2.00         1.000          0.385           NO
```

```
 BTM WIDTH -    BW1           BW2           BW3           BW4           BW5
   ft         30.00          0.00          0.00          0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ----------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                        WSID= COVRES
 VER 2005.1.8                        Cove Res                       SUBW= CR
 TIME 06:12:11            SITE = STR1              PASS=    1     PART=   2

MESSAGE ---- Climatic Index changed from 0.0 to 1.0 for this run.

 CREST PS       5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 SED ACCUM      5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 START ELEV     5545.50 FT    6055.0 ACFT      0.00 AC       0.0 CFS

 INFLOW HYDROGRAPH PROVIDED IN LOCATION  1,  PEAK=    850.00 CFS, AT 120.00 HRS.
 TITLE = Principal Spillway


 CREST PS       5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 SED ACCUM      5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 START ELEV     5545.50 FT    6055.0 ACFT      0.00 AC       0.0 CFS


 NRCS-PSH  RAINFALL   1-DAY =   0.00 IN    10-DAY =   0.00 IN    DA =   4.74 SM
           RUNOFF     1-DAY =   0.00 IN    10-DAY =   0.00 IN

      CLIMATIC INDEX = 1.00    CN 10-DAY =  0.    CN 1-DAY =   0.

      PEAK =       850.0 CFS, AT  120.0 HRS.


 ROUTED RESULT - HYD TYPE      EMAX         VOL-MAX        AMAX         QMAX
                 NRCS-PSH   5547.76 FT    6496.1 ACFT      0.00 AC     40.0 CFS

      PS STORAGE     441.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 DRAWDOWN (DDT) TEST       5545.84 FT    6121.2 ACFT      4.35 CFS
      CONTROL IS 0.150 DETENTION STORAGE

      TIME LIMIT REACHED = 10.00 DAYS. FLOW WAS     9.73 CFS,  ELEV =  5546.26
      (ELEVATION TO START ROUTING SDH AND/OR FBH HAS BEEN RAISED.)

      TIME TO DDT TEST DISCHARGE IS 15.79 DAYS - DRAWDOWN STOPPED.

 ***** NOTE - CREST OF AUX. RAISED TO HOLD   148.03 ACFT NOT EVACUATED IN
              DRAWDOWN TIME LIMIT.  TOTAL STORAGE REQUIRED =  6644.08 ACFT,
              NEW ELEVATION OF AUXILIARY SPILLWAY CREST    =  5548.51 FT.

 PLOT OF PRINCIPAL SPILLWAY HYDROGRAPH,  1 INCH=     200. CFS
                                                    0.      200.      400.      600.      800.     1000.     1200.     1400.
  Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
  0.00   0.0   0.0 5545.5  6055.5   0.0          .
  1.00  11.0   0.0 5545.5  6055.5   0.0          .I
  2.00  14.0   0.1 5545.5  6056.5   0.0          .I
  3.00  15.0   0.2 5545.5  6057.7   0.0          .I
  4.00  15.0   0.3 5545.5  6058.9   0.0          .I
  5.00  15.0   0.3 5545.5  6060.1   0.0          .I
  6.00  15.0   0.4 5545.5  6061.3   0.0          .I
  7.00  15.0   0.5 5545.5  6062.5   0.0          .I
  8.00  15.0   0.6 5545.5  6063.7   0.0          .I
  9.00  15.0   0.7 5545.6  6064.9   0.0          .I
 10.00  15.0   0.7 5545.6  6066.1   0.0          .I
 11.00  16.0   0.8 5545.6  6067.3   0.0          .I
 12.00  16.0   0.9 5545.6  6068.6   0.0          .I
 13.00  16.0   1.0 5545.6  6069.8   0.0          .I
 14.00  16.0   1.1 5545.6  6071.1   0.0          .I
 15.00  16.0   1.1 5545.6  6072.3   0.0          .I
 16.00  16.0   1.2 5545.6  6073.5   0.0          .I
 17.00  16.0   1.3 5545.6  6074.7   0.0          .I
 18.00  16.0   1.4 5545.6  6076.0   0.0          .I
 19.00  16.0   1.5 5545.6  6077.2   0.0          .I
 20.00  16.0   1.5 5545.6  6078.4   0.0          .I
 21.00  17.0   1.6 5545.6  6079.6   0.0          .I
 22.00  17.0   1.7 5545.6  6080.9   0.0          .I
 23.00  17.0   1.8 5545.6  6082.1   0.0          .I
 24.00  17.0   1.9 5545.6  6083.4   0.0          .I
 25.00  17.0   1.9 5545.7  6084.6   0.0          .I
 26.00  17.0   2.0 5545.7  6085.9   0.0          .I
 27.00  17.0   2.1 5545.7  6087.1   0.0          .I
 28.00  17.0   2.2 5545.7  6088.3   0.0          .I
 29.00  17.0   2.3 5545.7  6089.5   0.0          .I
 30.00  17.0   2.3 5545.7  6090.8   0.0          .I
 31.00  18.0   2.4 5545.7  6092.0   0.0          .I
 32.00  18.0   2.5 5545.7  6093.3   0.0          .I
 33.00  18.0   2.6 5545.7  6094.6   0.0          .I
```

```
 34.00  18.0   2.7 5545.7  6095.8   0.0         .I
 35.00  18.0   2.8 5545.7  6097.1   0.0         .I
 36.00  18.0   2.8 5545.7  6098.4   0.0         .I
 37.00  18.0   2.9 5545.7  6099.6   0.0         .I
 38.00  18.0   3.0 5545.7  6100.8   0.0         .I
 39.00  19.0   3.1 5545.7  6102.1   0.0         .I
 40.00  19.0   3.2 5545.7  6103.4   0.0         .I
 41.00  19.0   3.3 5545.8  6104.7   0.0         .I
 42.00  19.0   3.4 5545.8  6106.0   0.0         .I
 43.00  19.0   3.4 5545.8  6107.3   0.0         .I
 44.00  19.0   3.5 5545.8  6108.6   0.0         .I
 45.00  20.0   3.6 5545.8  6109.9   0.0         .I
 46.00  20.0   3.7 5545.8  6111.3   0.0         .I
 47.00  20.0   3.8 5545.8  6112.6   0.0         .I
 48.00  20.0   3.9 5545.8  6114.0   0.0         .I
 49.00  20.0   4.0 5545.8  6115.3   0.0         .I
 50.00  20.0   4.0 5545.8  6116.6   0.0         .I
 51.00  21.0   4.1 5545.8  6118.0   0.0         .I
 52.00  21.0   4.2 5545.8  6119.4   0.0         .I
 53.00  21.0   4.3 5545.8  6120.7   0.0         .I
 54.00  21.0   4.4 5545.8  6122.1   0.0         .I
 55.00  21.0   4.5 5545.9  6123.5   0.0         .I
 56.00  21.0   4.6 5545.9  6124.8   0.0         .I
 57.00  22.0   4.7 5545.9  6126.2   0.0         .I
 58.00  22.0   4.8 5545.9  6127.7   0.0         .I
 59.00  22.0   4.9 5545.9  6129.1   0.0         .I
 60.00  22.0   5.0 5545.9  6130.5   0.0         .I
 61.00  23.0   5.1 5545.9  6131.9   0.0         .I
 62.00  23.0   5.2 5545.9  6133.4   0.0         .I
 63.00  23.0   5.2 5545.9  6134.9   0.0         .I
 64.00  23.0   5.3 5545.9  6136.4   0.0         .I
 65.00  24.0   5.4 5545.9  6137.8   0.0         .I
 66.00  24.0   5.5 5545.9  6139.4   0.0         .I
 67.00  24.0   5.6 5545.9  6140.9   0.0         .I
 68.00  24.0   5.7 5545.9  6142.4   0.0         .I
 69.00  25.0   5.8 5546.0  6144.0   0.0         .I
 70.00  25.0   5.9 5546.0  6145.5   0.0         .I
 71.00  25.0   6.1 5546.0  6147.1   0.0         .I
 72.00  26.0   6.2 5546.0  6148.7   0.0         .I
 73.00  26.0   6.3 5546.0  6150.3   0.0         .I
 74.00  26.0   6.4 5546.0  6152.0   0.0         .I
 75.00  27.0   6.5 5546.0  6153.6   0.0         .I
 76.00  27.0   6.6 5546.0  6155.3   0.0         .I
 77.00  27.0   6.7 5546.0  6157.0   0.0         .I
 78.00  28.0   6.8 5546.0  6158.7   0.0         .I
 79.00  28.0   6.9 5546.0  6160.5   0.0         .I
 80.00  29.0   7.0 5546.0  6162.2   0.0         .I
 81.00  29.0   7.2 5546.1  6164.1   0.0         .I
 82.00  29.0   7.3 5546.1  6165.9   0.0         .I
 83.00  30.0   7.4 5546.1  6167.7   0.0         . I
 84.00  30.0   7.5 5546.1  6169.5   0.0         . I
 85.00  31.0   7.7 5546.1  6171.4   0.0         . I
 86.00  31.0   7.8 5546.1  6173.4   0.0         . I
 87.00  32.0   7.9 5546.1  6175.3   0.0         . I
 88.00  33.0   8.0 5546.1  6177.3   0.0         . I
 89.00  33.0   8.2 5546.1  6179.4   0.0         . I
 90.00  34.0   8.3 5546.1  6181.5   0.0         . I
 91.00  35.0   8.5 5546.2  6183.6   0.0         . I
 92.00  35.0   8.6 5546.2  6185.8   0.0         . I
 93.00  36.0   8.7 5546.2  6188.1   0.0         . I
 94.00  37.0   8.9 5546.2  6190.3   0.0         . I
 95.00  38.0   9.0 5546.2  6192.7   0.0         . I
 96.00  39.0   9.2 5546.2  6195.1   0.0         . I
 97.00  40.0   9.4 5546.2  6197.6   0.0         . I
 98.00  41.0   9.5 5546.2  6200.2   0.0         . I
 99.00  42.0   9.7 5546.3  6202.8   0.0         . I
100.00  43.0   9.9 5546.3  6205.5   0.0         . I
101.00  45.0  10.1 5546.3  6208.3   0.0         .PI
102.00  46.0  10.3 5546.3  6211.3   0.0         .PI
103.00  48.0  10.5 5546.3  6214.3   0.0         .PI
104.00  49.0  10.7 5546.3  6217.4   0.0         .PI
105.00  51.0  10.9 5546.3  6220.7   0.0         .P I
106.00  53.0  11.1 5546.4  6224.0   0.0         .P I
107.00  56.0  11.3 5546.4  6227.6   0.0         .P I
108.00  58.0  11.6 5546.4  6231.4   0.0         .P I
109.00  61.0  11.9 5546.4  6235.3   0.0         .P I
110.00  65.0  12.1 5546.4  6239.5   0.0         .P I
111.00  69.0  12.4 5546.5  6244.1   0.0         .P I
112.00  74.0  12.7 5546.5  6248.9   0.0         .P  I
113.00  80.0  13.1 5546.5  6254.2   0.0         .P  I
114.00  87.0  13.5 5546.5  6260.0   0.0         .P  I
115.00  96.0  13.9 5546.6  6266.5   0.0         .P   I
116.00 109.0  14.4 5546.6  6273.8   0.0         .P   I
117.00 127.0  14.9 5546.7  6282.3   0.0         .P    I
118.00 157.0  15.6 5546.7  6292.8   0.0         .P      I
119.00 219.0  17.3 5546.8  6307.0   0.0         .P         I
120.00 850.0  22.4 5547.0  6349.5   0.0         .P                                      X
121.00 479.0  28.7 5547.3  6402.3   0.0         .P                    I
122.00 259.0  32.1 5547.4  6430.3   0.0         . P         I
123.00 172.0  33.9 5547.5  6445.4   0.0         . P      I
124.00 132.0  35.1 5547.5  6455.1   0.0         . P    I
125.00 111.0  35.9 5547.6  6462.2   0.0         . P   I
```

126.00	98.0	36.6	5547.6	6467.8	0.0	. P I
127.00	88.0	37.2	5547.6	6472.5	0.0	. P I
128.00	81.0	37.6	5547.7	6476.4	0.0	. P I
129.00	75.0	38.0	5547.7	6479.7	0.0	. P I
130.00	70.0	38.4	5547.7	6482.5	0.0	. P I
131.00	65.0	38.7	5547.7	6484.9	0.0	. PI
132.00	62.0	38.9	5547.7	6487.0	0.0	. PI
133.00	59.0	39.1	5547.7	6488.7	0.0	. PI
134.00	56.0	39.3	5547.7	6490.2	0.0	. PI
135.00	54.0	39.4	5547.7	6491.5	0.0	. PI
136.00	51.0	39.6	5547.7	6492.6	0.0	. PI
137.00	50.0	39.7	5547.7	6493.5	0.0	. PI
138.00	48.0	39.8	5547.7	6494.3	0.0	. P
139.00	46.0	39.8	5547.7	6494.9	0.0	. P
140.00	45.0	39.9	5547.8	6495.3	0.0	. P
141.00	43.0	39.9	5547.8	6495.7	0.0	. P
142.00	42.0	40.0	5547.8	6495.9	0.0	. P
143.00	41.0	40.0	5547.8	6496.0	0.0	. P
144.00	40.0	40.0	5547.8	6496.1	0.0	. X
145.00	39.0	40.0	5547.8	6496.0	0.0	. P
146.00	38.0	40.0	5547.8	6495.9	0.0	. P
147.00	37.0	39.9	5547.8	6495.7	0.0	. P
148.00	36.0	39.9	5547.8	6495.4	0.0	. P
149.00	35.0	39.9	5547.8	6495.0	0.0	. P
150.00	35.0	39.8	5547.7	6494.6	0.0	. P
151.00	34.0	39.8	5547.7	6494.2	0.0	. P
152.00	33.0	39.7	5547.7	6493.7	0.0	. P
153.00	33.0	39.6	5547.7	6493.1	0.0	. P
154.00	32.0	39.6	5547.7	6492.6	0.0	. P
155.00	32.0	39.5	5547.7	6491.9	0.0	. P
156.00	31.0	39.4	5547.7	6491.3	0.0	. P
157.00	30.0	39.3	5547.7	6490.5	0.0	. P
158.00	30.0	39.2	5547.7	6489.8	0.0	. P
159.00	29.0	39.1	5547.7	6489.0	0.0	.IP
160.00	29.0	39.0	5547.7	6488.1	0.0	.IP
161.00	29.0	38.9	5547.7	6487.3	0.0	.IP
162.00	28.0	38.8	5547.7	6486.5	0.0	.IP
163.00	28.0	38.7	5547.7	6485.6	0.0	.IP
164.00	27.0	38.6	5547.7	6484.6	0.0	.IP
165.00	27.0	38.5	5547.7	6483.7	0.0	.IP
166.00	27.0	38.4	5547.7	6482.7	0.0	.IP
167.00	26.0	38.3	5547.7	6481.8	0.0	.IP
168.00	26.0	38.1	5547.7	6480.8	0.0	.IP
169.00	26.0	38.0	5547.7	6479.8	0.0	.IP
170.00	25.0	37.9	5547.7	6478.7	0.0	.IP
171.00	25.0	37.8	5547.7	6477.7	0.0	.IP
172.00	25.0	37.7	5547.7	6476.6	0.0	.IP
173.00	24.0	37.5	5547.7	6475.5	0.0	.IP
174.00	24.0	37.4	5547.6	6474.4	0.0	.IP
175.00	24.0	37.3	5547.6	6473.3	0.0	.IP
176.00	24.0	37.1	5547.6	6472.2	0.0	.IP
177.00	23.0	37.0	5547.6	6471.1	0.0	.IP
178.00	23.0	36.9	5547.6	6470.0	0.0	.IP
179.00	23.0	36.7	5547.6	6468.8	0.0	.IP
180.00	23.0	36.6	5547.6	6467.7	0.0	.IP
181.00	22.0	36.4	5547.6	6466.5	0.0	.IP
182.00	22.0	36.3	5547.6	6465.3	0.0	.IP
183.00	22.0	36.2	5547.6	6464.2	0.0	.IP
184.00	22.0	36.0	5547.6	6463.0	0.0	.IP
185.00	22.0	35.9	5547.6	6461.8	0.0	.IP
186.00	21.0	35.7	5547.6	6460.7	0.0	.IP
187.00	21.0	35.6	5547.6	6459.5	0.0	.IP
188.00	21.0	35.4	5547.6	6458.3	0.0	.IP
189.00	21.0	35.3	5547.6	6457.1	0.0	.IP
190.00	21.0	35.2	5547.6	6455.9	0.0	.IP
191.00	20.0	35.0	5547.5	6454.7	0.0	.IP
192.00	20.0	34.9	5547.5	6453.4	0.0	.IP
193.00	20.0	34.7	5547.5	6452.2	0.0	.IP
194.00	20.0	34.6	5547.5	6451.0	0.0	.IP
195.00	20.0	34.4	5547.5	6449.8	0.0	.IP
196.00	20.0	34.3	5547.5	6448.6	0.0	.IP
197.00	19.0	34.1	5547.5	6447.4	0.0	.IP
198.00	19.0	34.0	5547.5	6446.2	0.0	.IP
199.00	19.0	33.8	5547.5	6444.9	0.0	.IP
200.00	19.0	33.7	5547.5	6443.7	0.0	.IP
201.00	19.0	33.6	5547.5	6442.5	0.0	.IP
202.00	19.0	33.4	5547.5	6441.3	0.0	.IP
203.00	19.0	33.3	5547.5	6440.1	0.0	.IP
204.00	18.0	33.1	5547.5	6438.9	0.0	.IP
205.00	18.0	33.0	5547.5	6437.7	0.0	.IP
206.00	18.0	32.8	5547.5	6436.4	0.0	.IP
207.00	18.0	32.7	5547.4	6435.2	0.0	.IP
208.00	18.0	32.5	5547.4	6434.0	0.0	.IP
209.00	18.0	32.4	5547.4	6432.8	0.0	.IP
210.00	18.0	32.2	5547.4	6431.6	0.0	.IP
211.00	17.0	32.1	5547.4	6430.4	0.0	.IP
212.00	17.0	32.0	5547.4	6429.2	0.0	.IP
213.00	17.0	31.8	5547.4	6427.9	0.0	.IP
214.00	17.0	31.7	5547.4	6426.7	0.0	.IP
215.00	17.0	31.5	5547.4	6425.5	0.0	.IP
216.00	17.0	31.4	5547.4	6424.3	0.0	.IP
217.00	17.0	31.2	5547.4	6423.1	0.0	.IP

```
218.00  17.0  31.1 5547.4  6422.0   0.0          .IP
219.00  17.0  30.9 5547.4  6420.8   0.0          .IP
220.00  17.0  30.8 5547.4  6419.7   0.0          .IP
221.00  16.0  30.7 5547.4  6418.5   0.0          .IP
222.00  16.0  30.5 5547.4  6417.3   0.0          .IP
223.00  16.0  30.4 5547.3  6416.1   0.0          .IP
224.00  16.0  30.2 5547.3  6414.9   0.0          .IP
225.00  16.0  30.1 5547.3  6413.7   0.0          .IP
226.00  16.0  30.0 5547.3  6412.6   0.0          .P
227.00  16.0  29.8 5547.3  6411.4   0.0          .P
228.00  16.0  29.7 5547.3  6410.3   0.0          .P
229.00  16.0  29.5 5547.3  6409.2   0.0          .P
230.00  16.0  29.4 5547.3  6408.1   0.0          .P
231.00  15.0  29.3 5547.3  6406.9   0.0          .P
232.00  15.0  29.1 5547.3  6405.7   0.0          .P
233.00  15.0  29.0 5547.3  6404.6   0.0          .P
234.00  15.0  28.9 5547.3  6403.4   0.0          .P
235.00  15.0  28.7 5547.3  6402.3   0.0          .P
236.00  15.0  28.6 5547.3  6401.2   0.0          .P
237.00  15.0  28.5 5547.3  6400.0   0.0          .P
238.00  15.0  28.3 5547.3  6398.9   0.0          .P
239.00  15.0  28.2 5547.3  6397.8   0.0          .P
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.      200.      400.      600.      800.     1000.     1200.     1400.
        END NRCS-PSH   PLOT


**********************************************************************
RATING TABLE DEVELOPED, SITE = STR1 :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.


RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1  5545.50      0.00      0.00      0.00   6055.03      0.00
  2  5546.72     15.71     15.71      0.00   6294.00      0.00
  3  5547.94     44.43     44.43      0.00   6532.97      0.00
  4  5549.17     81.62     81.62      0.00   6771.95      0.00
                                          FULL CONDUIT FLOW, ELEV = 5550.39 FT
  5  5550.39    125.65    125.65      0.00   7015.04      0.00
  6  5550.65    125.84    125.84      0.00   7069.39      0.00
  7  5550.92    126.01    126.01      0.00   7123.74      0.00
  8  5551.18    126.17    126.17      0.00   7178.09      0.00
  9  5551.44    126.34    126.34      0.00   7232.44      0.00
 10  5551.71    126.50    126.50      0.00   7286.79      0.00
 11  5551.97    126.67    126.67      0.00   7341.14      0.00
 12  5552.23    126.83    126.83      0.00   7395.49      0.00
 13  5552.50    126.99    126.99      0.00   7449.85      0.00

INFLOW HYDROGRAPH PROVIDED IN LOCATION  3,  PEAK=   2180.00 CFS, AT   3.30 HRS.
TITLE = Auxiliary Spillway (Local)


INFLOW HYDROGRAPH PROVIDED IN LOCATION  5,  PEAK=   3365.00 CFS, AT   9.60 HRS.
TITLE = Freeboard (General)



1SITES ---------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                       WSID= COVRES
 VER 2005.1.8                        Cove Res                      SUBW= CR
 TIME 06:12:11            SITE = STR1              PASS=    1     PART=   3


 AUX. CREST     5548.51 FT    6644.1 ACFT      0.00 AC      61.7 CFS

      PS STORAGE    589.1 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     5546.26 FT    6203.0 ACFT      0.00 AC       9.7 CFS

 ***** WARNING - AUXILIARY CREST LOWER THAN LOW POINT IN SITE.

 NRCS-SDH   INFLOW HYDROGRAPH INPUT, DA =    4.74 SQUARE MILES

      PEAK =      2180.0 CFS, AT    3.3 HRS.

 NRCS-FBH   INFLOW HYDROGRAPH INPUT, DA =    4.74 SQUARE MILES

      PEAK =      3365.0 CFS, AT    9.6 HRS.

 ***** WARNING - MAXIMUM AUX. SURFACE PROFILE ELEVATION ( 5549.20) AND AUXILIARY
                 CREST ( 5548.51) ELEVATION Do NOT MATCH.  MAXIMUM AUX. SURFACE
                 PROFILE ELEVATION USED IN WSPVRT PROCEDURE.


 ***** MESSAGE - INPUT(5549.14) TO INTERPOLATION ROUTINE IS BELOW
                 ARRAY LIMIT(5549.20).


 **********************************************************************
```

RATING TABLE DEVELOPED, SITE = STR1 :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	5545.50	0.00	0.00	0.00	6055.03	0.00
2	5545.83	2.25	2.25	0.00	6120.52	0.00
3	5546.17	6.37	6.37	0.00	6186.02	0.00
4	5546.50	11.71	11.71	0.00	6251.52	0.00
5	5546.84	18.03	18.03	0.00	6317.01	0.00
6	5547.17	25.20	25.20	0.00	6382.51	0.00
7	5547.51	33.12	33.12	0.00	6448.00	0.00
8	5547.84	41.74	41.74	0.00	6513.50	0.00
9	5548.18	50.99	50.99	0.00	6578.99	0.00
10	5548.51	60.85	60.85	0.00	6644.49	0.00
11	5549.14	80.67	80.67	0.00	6766.41	0.00
12	5549.76	126.50	102.35	24.15	6888.71	0.00
				FULL CONDUIT FLOW, ELEV = 5550.39 FT		
13	5550.39	223.05	125.67	97.38	7015.14	0.00
14	5550.49	237.89	125.75	112.14	7036.88	0.00
15	5550.60	255.98	125.81	130.16	7058.62	0.00
16	5550.79	290.40	125.93	164.47	7097.77	0.00
17	5551.02	332.53	126.08	206.45	7145.68	0.00
18	5551.44	422.70	126.34	296.36	7232.64	0.00
19	5551.97	551.57	126.67	424.90	7341.44	0.00
20	5552.50	697.75	126.99	570.75	7450.25	0.00

 ****

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX	VEGETAL COVER FACTOR	MAINT. CODE +	ROOTING DEPTH (ft)	REACH LOCATION *
1	0.	75.	-25.6	1.000	**	**	**	INLET
2	75.	155.	0.0	1.000	**	**	**	CREST
3	155.	237.	38.5	1.000	0.00	1		EXIT !
4	237.	600.	9.9	1.000	0.00	1		EXIT
5	600.	1049.	6.3	1.000	0.00	1		EXIT
6	1049.	1170.	15.1	1.000	0.00	1		EXIT

 + The minimum maintenance code value of 2 is used in INTEGRITY computations
     (the program changes values of 1 to 2 during computation).
 * Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and
     rooting depth for inlet and crest reaches in computations.
 ! Reach   3 used in computing exit channel velocities.
 ****

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
NRCS-SDH	30.0	5548.67	6675.5	0.0	0.16	31.0

	PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
	DISCHARGE =	65.7	0.2	65.9

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
AUXILIARY SPILLWAY ---	FT 0.01	FT/SEC 0.57	FT/FT 0.148	FT/FT 0.308

AUXILIARY SPILLWAY DURATION FLOW = 8.7 HOURS

PLOT NRCS-SDH 1 IN = 500. CFS EXIT SLOPE = 0.385

Time	Qin	Qout	Elev	Vol	Area	ExtVel	0. 500. 1000. 1500. 2000. 2500. 3000. 3500.
1.50	0	8	5546.3	6203.0	0.0	0.00	.
1.80	6	8	5546.3	6203.0	0.0	0.00	.
2.10	39	8	5546.3	6203.4	0.0	0.00	.I
2.40	194	8	5546.3	6206.1	0.0	0.00	. I
2.70	687	9	5546.3	6216.8	0.0	0.00	. I
3.00	1365	11	5546.5	6242.0	0.0	0.00	. I
3.30	2027	15	5546.7	6283.7	0.0	0.00	. I
3.60	2180	20	5546.9	6335.4	0.0	0.00	. X
3.90	1955	26	5547.2	6386.1	0.0	0.00	.P I
4.20	1683	31	5547.4	6430.5	0.0	0.00	.P I
4.50	1441	36	5547.6	6468.4	0.0	0.00	.P I
4.80	1248	40	5547.8	6500.8	0.0	0.00	.P I
5.10	1107	44	5547.9	6528.9	0.0	0.00	.P I
5.40	1001	47	5548.1	6553.9	0.0	0.00	.P I
5.70	924	51	5548.2	6576.6	0.0	0.00	.P I
6.00	874	54	5548.3	6597.6	0.0	0.00	.P I
6.30	833	57	5548.4	6617.4	0.0	0.00	.P I
6.60	748	60	5548.5	6635.5	0.0	0.00	.P I
6.90	589	62	5548.5	6650.6	0.0	0.00	.A I
7.20	423	64	5548.6	6661.6	0.0	0.00	.A I
7.50	283	65	5548.6	6668.8	0.0	0.00	.A I
7.80	180	65	5548.7	6672.9	0.0	0.00	.A I
8.10	112	66	5548.7	6674.9	0.0	0.00	.AI

8.40	73	66	5548.7	6675.5	0.0	0.00	.X
8.70	47	66	5548.7	6675.4	0.0	0.00	.A
9.00	28	66	5548.7	6674.7	0.0	0.00	.A
9.30	16	66	5548.7	6673.6	0.0	0.00	.A
9.60	9	65	5548.7	6672.3	0.0	0.00	.A
9.90	5	65	5548.6	6670.8	0.0	0.00	.A
10.20	3	65	5548.6	6669.3	0.0	0.00	.A
10.50	1	65	5548.6	6667.8	0.0	0.00	.A
10.80	1	64	5548.6	6666.2	0.0	0.00	.A
11.10	0	64	5548.6	6664.6	0.0	0.00	.A
11.40	0	64	5548.6	6663.1	0.0	0.00	.A
11.70	0	64	5548.6	6661.5	0.0	0.00	.A
12.00	0	63	5548.6	6660.0	0.0	0.00	.A
12.30	0	63	5548.6	6658.4	0.0	0.00	.A
12.60	0	63	5548.6	6656.9	0.0	0.00	.A
12.90	0	63	5548.6	6655.4	0.0	0.00	.A
13.20	0	62	5548.6	6653.8	0.0	0.00	.A
13.50	0	62	5548.6	6652.3	0.0	0.00	.A
13.80	0	62	5548.5	6650.8	0.0	0.00	.A
14.10	0	62	5548.5	6649.3	0.0	0.00	.A
14.40	0	61	5548.5	6647.8	0.0	0.00	.A
14.70	0	61	5548.5	6646.3	0.0	0.00	.A
15.00	0	61	5548.5	6644.8	0.0	0.00	.A
15.30	0	61	5548.5	6643.3	0.0	0.00	.P
15.60	0	60	5548.5	6641.9	0.0	0.00	.P
15.90	0	60	5548.5	6640.4	0.0	0.00	.P
16.20	0	60	5548.5	6638.9	0.0	0.00	.P
16.50	0	60	5548.5	6637.5	0.0	0.00	.P
16.80	0	60	5548.5	6636.0	0.0	0.00	.P
17.10	0	59	5548.5	6634.5	0.0	0.00	.P
17.40	0	59	5548.5	6633.1	0.0	0.00	.P
17.70	0	59	5548.4	6631.7	0.0	0.00	.P
18.00	0	59	5548.4	6630.2	0.0	0.00	.P
18.30	0	58	5548.4	6628.8	0.0	0.00	.P
18.60	0	58	5548.4	6627.4	0.0	0.00	.P
18.90	0	58	5548.4	6626.0	0.0	0.00	.P
19.20	0	58	5548.4	6624.6	0.0	0.00	.P
19.50	0	58	5548.4	6623.1	0.0	0.00	.P
19.80	0	57	5548.4	6621.7	0.0	0.00	.P
20.10	0	57	5548.4	6620.3	0.0	0.00	.P
20.40	0	57	5548.4	6619.0	0.0	0.00	.P
20.70	0	57	5548.4	6617.6	0.0	0.00	.P
21.00	0	57	5548.4	6616.2	0.0	0.00	.P
21.30	0	56	5548.4	6614.8	0.0	0.00	.P
21.60	0	56	5548.4	6613.4	0.0	0.00	.P
21.90	0	56	5548.3	6612.1	0.0	0.00	.P
22.20	0	56	5548.3	6610.7	0.0	0.00	.P
22.50	0	56	5548.3	6609.4	0.0	0.00	.P
22.80	0	55	5548.3	6608.0	0.0	0.00	.P
23.10	0	55	5548.3	6606.7	0.0	0.00	.P
23.40	0	55	5548.3	6605.3	0.0	0.00	.P
23.70	0	55	5548.3	6604.0	0.0	0.00	.P
24.00	0	55	5548.3	6602.7	0.0	0.00	.P
24.30	0	54	5548.3	6601.3	0.0	0.00	.P
24.60	0	54	5548.3	6600.0	0.0	0.00	.P
24.90	0	54	5548.3	6598.7	0.0	0.00	.P
25.20	0	54	5548.3	6597.4	0.0	0.00	.P
25.50	0	54	5548.3	6596.1	0.0	0.00	.P
25.80	0	53	5548.3	6594.8	0.0	0.00	.P
26.10	0	53	5548.3	6593.5	0.0	0.00	.P
26.40	0	53	5548.2	6592.2	0.0	0.00	.P
26.70	0	53	5548.2	6590.9	0.0	0.00	.P
27.00	0	53	5548.2	6589.6	0.0	0.00	.P
27.30	0	52	5548.2	6588.4	0.0	0.00	.P
27.60	0	52	5548.2	6587.1	0.0	0.00	.P
27.90	0	52	5548.2	6585.8	0.0	0.00	.P
28.20	0	52	5548.2	6584.5	0.0	0.00	.P
28.50	0	52	5548.2	6583.3	0.0	0.00	.P
28.80	0	51	5548.2	6582.0	0.0	0.00	.P
29.10	0	51	5548.2	6580.8	0.0	0.00	.P
29.40	0	51	5548.2	6579.5	0.0	0.00	.P
29.70	0	51	5548.2	6578.3	0.0	0.00	.P
30.00	0	51	5548.2	6577.1	0.0	0.00	.P
30.30	0	51	5548.2	6575.8	0.0	0.00	.P
30.60	0	50	5548.2	6574.6	0.0	0.00	.P
30.90	0	50	5548.2	6573.4	0.0	0.00	.P
31.20	0	50	5548.1	6572.2	0.0	0.00	.P
31.50	0	50	5548.1	6571.0	0.0	0.00	.P
31.80	0	50	5548.1	6569.8	0.0	0.00	.P
32.10	0	50	5548.1	6568.5	0.0	0.00	.P
32.40	0	49	5548.1	6567.3	0.0	0.00	.P
32.70	0	49	5548.1	6566.1	0.0	0.00	.P
33.00	0	49	5548.1	6565.0	0.0	0.00	.P
33.30	0	49	5548.1	6563.8	0.0	0.00	.P
33.60	0	49	5548.1	6562.6	0.0	0.00	.P
33.90	0	49	5548.1	6561.4	0.0	0.00	.P
34.20	0	48	5548.1	6560.2	0.0	0.00	.P
34.50	0	48	5548.1	6559.1	0.0	0.00	.P
34.80	0	48	5548.1	6557.9	0.0	0.00	.P
35.10	0	48	5548.1	6556.7	0.0	0.00	.P
35.40	0	48	5548.1	6555.6	0.0	0.00	.P
35.70	0	48	5548.1	6554.4	0.0	0.00	.P

```
36.00     0    47 5548.0  6553.3   0.0   0.00   .P
36.30     0    47 5548.0  6552.1   0.0   0.00   .P
36.60     0    47 5548.0  6551.0   0.0   0.00   .P
36.90     0    47 5548.0  6549.8   0.0   0.00   .P
37.20     0    47 5548.0  6548.7   0.0   0.00   .P
37.50     0    47 5548.0  6547.6   0.0   0.00   .P
37.80     0    46 5548.0  6546.4   0.0   0.00   .P
38.10     0    46 5548.0  6545.3   0.0   0.00   .P
38.40     0    46 5548.0  6544.2   0.0   0.00   .P
38.70     0    46 5548.0  6543.1   0.0   0.00   .P
39.00     0    46 5548.0  6542.0   0.0   0.00   .P
39.30     0    46 5548.0  6540.9   0.0   0.00   .P
39.60     0    45 5548.0  6539.8   0.0   0.00   .P
39.90     0    45 5548.0  6538.7   0.0   0.00   .P
40.20     0    45 5548.0  6537.6   0.0   0.00   .P
40.50     0    45 5548.0  6536.5   0.0   0.00   .P
40.80     0    45 5548.0  6535.4   0.0   0.00   .P
41.10     0    45 5548.0  6534.3   0.0   0.00   .P
41.40     0    45 5547.9  6533.2   0.0   0.00   .P
41.70     0    44 5547.9  6532.1   0.0   0.00   .P
42.00     0    44 5547.9  6531.1   0.0   0.00   .P
42.30     0    44 5547.9  6530.0   0.0   0.00   .P
42.60     0    44 5547.9  6528.9   0.0   0.00   .P
42.90     0    44 5547.9  6527.9   0.0   0.00   .P
43.20     0    44 5547.9  6526.8   0.0   0.00   .P
43.50     0    43 5547.9  6525.7   0.0   0.00   .P
43.80     0    43 5547.9  6524.7   0.0   0.00   .P
44.10     0    43 5547.9  6523.6   0.0   0.00   .P
44.40     0    43 5547.9  6522.6   0.0   0.00   .P
44.70     0    43 5547.9  6521.6   0.0   0.00   .P
45.00     0    43 5547.9  6520.5   0.0   0.00   .P
45.30     0    43 5547.9  6519.5   0.0   0.00   .P
45.60     0    42 5547.9  6518.5   0.0   0.00   .P
45.90     0    42 5547.9  6517.4   0.0   0.00   .P
46.20     0    42 5547.9  6516.4   0.0   0.00   .P
46.50     0    42 5547.9  6515.4   0.0   0.00   .P
46.80     0    42 5547.8  6514.4   0.0   0.00   .P
47.10     0    42 5547.8  6513.4   0.0   0.00   .P
47.40     0    42 5547.8  6512.4   0.0   0.00   .P
47.70     0    41 5547.8  6511.4   0.0   0.00   .P
48.00     0    41 5547.8  6510.4   0.0   0.00   .P
48.30     0    41 5547.8  6509.4   0.0   0.00   .P
48.60     0    41 5547.8  6508.4   0.0   0.00   .P
48.90     0    41 5547.8  6507.4   0.0   0.00   .P
49.20     0    41 5547.8  6506.4   0.0   0.00   .P
49.50     0    41 5547.8  6505.4   0.0   0.00   .P
49.80     0    41 5547.8  6504.4   0.0   0.00   .P
50.10     0    40 5547.8  6503.4   0.0   0.00   .P
50.40     0    40 5547.8  6502.5   0.0   0.00   .P
50.70     0    40 5547.8  6501.5   0.0   0.00   .P
51.00     0    40 5547.8  6500.5   0.0   0.00   .P
51.30     0    40 5547.8  6499.6   0.0   0.00   .P
51.60     0    40 5547.8  6498.6   0.0   0.00   .P
51.90     0    40 5547.8  6497.6   0.0   0.00   .P
52.20     0    40 5547.8  6496.7   0.0   0.00   .P
52.50     0    39 5547.8  6495.7   0.0   0.00   .P
52.80     0    39 5547.7  6494.8   0.0   0.00   .P
53.10     0    39 5547.7  6493.8   0.0   0.00   .P
53.40     0    39 5547.7  6492.9   0.0   0.00   .P
53.70     0    39 5547.7  6491.9   0.0   0.00   .P
54.00     0    39 5547.7  6491.0   0.0   0.00   .P
54.30     0    39 5547.7  6490.1   0.0   0.00   .P
54.60     0    39 5547.7  6489.1   0.0   0.00   .P
54.90     0    38 5547.7  6488.2   0.0   0.00   .P
55.20     0    38 5547.7  6487.3   0.0   0.00   .P
55.50     0    38 5547.7  6486.4   0.0   0.00   .P
55.80     0    38 5547.7  6485.4   0.0   0.00   .P
56.10     0    38 5547.7  6484.5   0.0   0.00   .P
56.40     0    38 5547.7  6483.6   0.0   0.00   .P
56.70     0    38 5547.7  6482.7   0.0   0.00   .P
57.00     0    38 5547.7  6481.8   0.0   0.00   .P
57.30     0    37 5547.7  6480.9   0.0   0.00   .P
57.60     0    37 5547.7  6480.0   0.0   0.00   .P
57.90     0    37 5547.7  6479.1   0.0   0.00   .P
58.20     0    37 5547.7  6478.2   0.0   0.00   .P
58.50     0    37 5547.7  6477.3   0.0   0.00   .P
58.80     0    37 5547.7  6476.4   0.0   0.00   .P
59.10     0    37 5547.7  6475.5   0.0   0.00   .P
59.40     0    37 5547.6  6474.6   0.0   0.00   .P
59.70     0    37 5547.6  6473.7   0.0   0.00   .P
60.00     0    36 5547.6  6472.9   0.0   0.00   .P
60.30     0    36 5547.6  6472.0   0.0   0.00   .P
60.60     0    36 5547.6  6471.1   0.0   0.00   .P
60.90     0    36 5547.6  6470.2   0.0   0.00   .P
61.20     0    36 5547.6  6469.4   0.0   0.00   .P
61.50     0    36 5547.6  6468.5   0.0   0.00   .P
61.80     0    36 5547.6  6467.7   0.0   0.00   .P
62.10     0    36 5547.6  6466.8   0.0   0.00   .P
62.40     0    35 5547.6  6465.9   0.0   0.00   .P
62.70     0    35 5547.6  6465.1   0.0   0.00   .P
63.00     0    35 5547.6  6464.2   0.0   0.00   .P
63.30     0    35 5547.6  6463.4   0.0   0.00   .P
```

```
63.60     0    35 5547.6  6462.5   0.0   0.00   .P
63.90     0    35 5547.6  6461.7   0.0   0.00   .P
64.20     0    35 5547.6  6460.9   0.0   0.00   .P
64.50     0    35 5547.6  6460.0   0.0   0.00   .P
64.80     0    35 5547.6  6459.2   0.0   0.00   .P
65.10     0    34 5547.6  6458.4   0.0   0.00   .P
65.40     0    34 5547.6  6457.5   0.0   0.00   .P
65.70     0    34 5547.6  6456.7   0.0   0.00   .P
66.00     0    34 5547.5  6455.9   0.0   0.00   .P
66.30     0    34 5547.5  6455.1   0.0   0.00   .P
66.60     0    34 5547.5  6454.2   0.0   0.00   .P
66.90     0    34 5547.5  6453.4   0.0   0.00   .P
67.20     0    34 5547.5  6452.6   0.0   0.00   .P
67.50     0    34 5547.5  6451.8   0.0   0.00   .P
67.80     0    34 5547.5  6451.0   0.0   0.00   .P
68.10     0    33 5547.5  6450.2   0.0   0.00   .P
68.40     0    33 5547.5  6449.4   0.0   0.00   .P
68.70     0    33 5547.5  6448.6   0.0   0.00   .P
69.00     0    33 5547.5  6447.8   0.0   0.00   .P
69.30     0    33 5547.5  6447.0   0.0   0.00   .P
69.60     0    33 5547.5  6446.2   0.0   0.00   .P
69.90     0    33 5547.5  6445.4   0.0   0.00   .P
70.20     0    33 5547.5  6444.6   0.0   0.00   .P
70.50     0    33 5547.5  6443.8   0.0   0.00   .P
70.80     0    33 5547.5  6443.1   0.0   0.00   .P
71.10     0    32 5547.5  6442.3   0.0   0.00   .P
71.40     0    32 5547.5  6441.5   0.0   0.00   .P
71.70     0    32 5547.5  6440.7   0.0   0.00   .P
72.00     0    32 5547.5  6439.9   0.0   0.00   .P
72.30     0    32 5547.5  6439.2   0.0   0.00   .P
72.60     0    32 5547.5  6438.4   0.0   0.00   .P
72.90     0    32 5547.5  6437.6   0.0   0.00   .P
73.20     0    32 5547.5  6436.9   0.0   0.00   .P
73.50     0    32 5547.4  6436.1   0.0   0.00   .P
73.80     0    32 5547.4  6435.4   0.0   0.00   .P
74.10     0    31 5547.4  6434.6   0.0   0.00   .P
74.40     0    31 5547.4  6433.8   0.0   0.00   .P
74.70     0    31 5547.4  6433.1   0.0   0.00   .P
75.00     0    31 5547.4  6432.3   0.0   0.00   .P
75.30     0    31 5547.4  6431.6   0.0   0.00   .P
75.60     0    31 5547.4  6430.8   0.0   0.00   .P
75.90     0    31 5547.4  6430.1   0.0   0.00   .P
76.20     0    31 5547.4  6429.4   0.0   0.00   .P
76.50     0    31 5547.4  6428.6   0.0   0.00   .P
76.80     0    31 5547.4  6427.9   0.0   0.00   .P
77.10     0    31 5547.4  6427.1   0.0   0.00   .P
77.40     0    31 5547.4  6426.4   0.0   0.00   .P
77.70     0    30 5547.4  6425.7   0.0   0.00   .P
78.00     0    30 5547.4  6425.0   0.0   0.00   .P
78.30     0    30 5547.4  6424.2   0.0   0.00   .P
78.60     0    30 5547.4  6423.5   0.0   0.00   .P
78.90     0    30 5547.4  6422.8   0.0   0.00   .P
79.20     0    30 5547.4  6422.1   0.0   0.00   .P
79.50     0    30 5547.4  6421.3   0.0   0.00   .P
79.80     0    30 5547.4  6420.6   0.0   0.00   .P
80.10     0    30 5547.4  6419.9   0.0   0.00   .P
80.40     0    30 5547.4  6419.2   0.0   0.00   .P
80.70     0    30 5547.4  6418.5   0.0   0.00   .P
81.00     0    29 5547.4  6417.8   0.0   0.00   .P
81.30     0    29 5547.4  6417.1   0.0   0.00   .P
81.60     0    29 5547.3  6416.4   0.0   0.00   .P
81.90     0    29 5547.3  6415.7   0.0   0.00   .P
82.20     0    29 5547.3  6415.0   0.0   0.00   .P
82.50     0    29 5547.3  6414.3   0.0   0.00   .P
82.80     0    29 5547.3  6413.6   0.0   0.00   .P
83.10     0    29 5547.3  6412.9   0.0   0.00   .P
83.40     0    29 5547.3  6412.2   0.0   0.00   .P
83.70     0    29 5547.3  6411.5   0.0   0.00   .P
84.00     0    29 5547.3  6410.8   0.0   0.00   .P
84.30     0    29 5547.3  6410.2   0.0   0.00   .P
84.60     0    28 5547.3  6409.5   0.0   0.00   .P
84.90     0    28 5547.3  6408.8   0.0   0.00   .P
85.20     0    28 5547.3  6408.1   0.0   0.00   .P
85.50     0    28 5547.3  6407.4   0.0   0.00   .P
85.80     0    28 5547.3  6406.8   0.0   0.00   .P
86.10     0    28 5547.3  6406.1   0.0   0.00   .P
86.40     0    28 5547.3  6405.4   0.0   0.00   .P
86.70     0    28 5547.3  6404.8   0.0   0.00   .P
87.00     0    28 5547.3  6404.1   0.0   0.00   .P
87.30     0    28 5547.3  6403.4   0.0   0.00   .P
87.60     0    28 5547.3  6402.8   0.0   0.00   .P
87.90     0    28 5547.3  6402.1   0.0   0.00   .P
88.20     0    27 5547.3  6401.4   0.0   0.00   .P
88.50     0    27 5547.3  6400.8   0.0   0.00   .P
88.80     0    27 5547.3  6400.1   0.0   0.00   .P
89.10     0    27 5547.3  6399.5   0.0   0.00   .P
89.40     0    27 5547.3  6398.8   0.0   0.00   .P
89.70     0    27 5547.3  6398.2   0.0   0.00   .P
90.00     0    27 5547.3  6397.5   0.0   0.00   .P
90.30     0    27 5547.2  6396.9   0.0   0.00   .P
90.60     0    27 5547.2  6396.3   0.0   0.00   .P
90.90     0    27 5547.2  6395.6   0.0   0.00   .P
```

```
 91.20     0    27 5547.2  6395.0   0.0   0.00   .P
 91.50     0    27 5547.2  6394.3   0.0   0.00   .P
 91.80     0    27 5547.2  6393.7   0.0   0.00   .P
 92.10     0    26 5547.2  6393.1   0.0   0.00   .P
 92.40     0    26 5547.2  6392.4   0.0   0.00   .P
 92.70     0    26 5547.2  6391.8   0.0   0.00   .P
 93.00     0    26 5547.2  6391.2   0.0   0.00   .P
 93.30     0    26 5547.2  6390.6   0.0   0.00   .P
 93.60     0    26 5547.2  6389.9   0.0   0.00   .P
 93.90     0    26 5547.2  6389.3   0.0   0.00   .P
 94.20     0    26 5547.2  6388.7   0.0   0.00   .P
 94.50     0    26 5547.2  6388.1   0.0   0.00   .P
 94.80     0    26 5547.2  6387.5   0.0   0.00   .P
 95.10     0    26 5547.2  6386.9   0.0   0.00   .P
 95.40     0    26 5547.2  6386.2   0.0   0.00   .P
 95.70     0    26 5547.2  6385.6   0.0   0.00   .P
 96.00     0    26 5547.2  6385.0   0.0   0.00   .P
 96.30     0    25 5547.2  6384.4   0.0   0.00   .P
 96.60     0    25 5547.2  6383.8   0.0   0.00   .P
 96.90     0    25 5547.2  6383.2   0.0   0.00   .P
 97.20     0    25 5547.2  6382.6   0.0   0.00   .P
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.      500.     1000.     1500.     2000.     2500.     3000.     3500.
        END NRCS-SDH   PLOT

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH          30.0   5552.32    7413.5       0.0      3.81     769.0

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =     126.9     521.5     648.3

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     2.01      7.61     0.008     0.011

          INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
           (The auxiliary spillway began flow at time =    9.6 hours
            and peaked at time =   20.4 hours.)


            REACH   3: FROM STATION    155. TO    237. ON   38.5% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =   12.0 hours.


            REACH   4: FROM STATION    237. TO    600. ON    9.9% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =   12.0 hours.


            REACH   5: FROM STATION    600. TO   1049. ON    6.3% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =   12.0 hours.


            REACH   6: FROM STATION   1049. TO   1170. ON   15.1% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =   12.0 hours.


          INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

            The headcut BREACHED the spillway crest at
            time equal approximately    27.6 hours.
            Computations terminated at that point!

            The most upstream headcut began at station    237.
            and progressed upstream to station     75.
            The final height of the headcut was   36.2 ft.

            The deepest headcut is also the furthest upstream.

          THE HYDROGRAPH WAS NOT ADJUSTED FOR THE EFFECTS OF EROSION.

                          DURATION    ATTACK   DIST. FROM MOST U/S
                            FLOW       OE/B    HEADCUT TO U/S EDGE
          AUXILIARY          HRS     ACFT/FT     AUX. CREST, FT
          SPILLWAY----      74.4      27.8         >>>BREACH<<<
                                                Depth =   36.2 ft

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  25.9 FT/SEC
                                           EXIT SLOPE  = 0.385 FT/FT
                                           FLOW DEPTH  =   0.6 FT

          PLOT NRCS-FBH                 1 IN =    500. CFS                                    EXIT SLOPE = 0.385
                                                 0.      500.     1000.     1500.     2000.     2500.     3000.     3500.
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
  2.40     0     8 5546.3  6203.0   0.0   0.00   .
  3.60     4     8 5546.3  6203.0   0.0   0.00   .
  4.80    35     8 5546.3  6204.0   0.0   0.00   .I
```

```
  6.00    84     8 5546.3  6209.1   0.0   0.00   . I
  7.20   195     9 5546.4  6222.1   0.0   0.00   .   I
  8.40   425    12 5546.5  6251.8   0.0   0.00   .       I
  9.60  1352    20 5546.9  6338.3   0.0   0.00   .                        I
 10.80  3365    50 5548.1  6568.7   0.0   0.00   .P                                                    X
 12.00  3296   128 5549.8  6890.2   0.0   7.93   .  A                                                  I
 13.20  2008   320 5551.0  7131.1   0.0  17.72   .     A                                  I
 14.40  1331   453 5551.6  7258.3   0.0  21.69   .        A               I
 15.60  1060   535 5551.9  7327.8   0.0  23.63   .          A         I
 16.80   912   590 5552.1  7369.8   0.0  24.78   .           A     I
 18.00   792   622 5552.2  7394.2   0.0  25.43   .           A   I
 19.20   742   641 5552.3  7407.7   0.0  25.78   .            A I
 20.40   664   648 5552.3  7413.5   0.0  25.92   .            X
 21.60   624   648 5552.3  7413.1   0.0  25.91   .           IA
 22.80   613   644 5552.3  7410.3   0.0  25.85   .           IA
 24.00   611   640 5552.3  7407.4   0.0  25.77   .           IA
 25.20   547   632 5552.3  7401.7   0.0  25.62   .          I A
 26.40   262   604 5552.2  7380.5   0.0  25.07   .    I      A
 27.60    90   551 5552.0  7340.7   0.0  23.96   . I       A
 28.80    24   496 5551.7  7294.4   0.0  22.73   .        A
 30.00     5   442 5551.5  7249.3   0.0  21.41   .       A
 31.20     1   397 5551.3  7208.0   0.0  20.18   .      A
 32.40     0   358 5551.1  7170.6   0.0  19.01   .     A
 33.60     0   325 5551.0  7136.9   0.0  17.90   .     A
 34.80     0   298 5550.8  7106.1   0.0  16.91   .     A
 36.00     0   273 5550.7  7077.9   0.0  15.92   .    A
 37.20     0   251 5550.6  7052.0   0.0  14.93   .    A
 38.40     0   232 5550.5  7028.2   0.0  14.02   .    A
 39.60     0   216 5550.3  7006.1   0.0  13.26   .   A
 40.80     0   200 5550.2  6985.5   0.0  12.56   .   A
 42.00     0   186 5550.2  6966.5   0.0  11.85   .   A
 43.20     0   172 5550.1  6948.8   0.0  11.12   .  A
 44.40     0   160 5550.0  6932.4   0.0  10.38   .  A
 45.60     0   148 5549.9  6917.2   0.0   9.61   .  A
 46.80     0   138 5549.8  6903.2   0.0   8.80   .  A
 48.00     0   128 5549.8  6890.1   0.0   7.92   .  A
 49.20     0   122 5549.7  6877.8   0.0   7.54   . A
 50.40     0   118 5549.6  6866.0   0.0   7.23   . A
 51.60     0   114 5549.6  6854.6   0.0   6.89   . A
 52.80     0   110 5549.5  6843.6   0.0   6.55   . A
 54.00     0   106 5549.5  6833.1   0.0   6.18   . A
 55.20     0   102 5549.4  6822.9   0.0   5.80   . A
 56.40     0    98 5549.4  6813.1   0.0   5.38   . A
 57.60     0    95 5549.3  6803.6   0.0   4.92   . A
 58.80     0    91 5549.3  6794.5   0.0   4.40   . A
 60.00     0    88 5549.2  6785.7   0.0   3.68   . A
 61.20     0    85 5549.2  6777.2   0.0   2.77   . A
 62.40     0    82 5549.2  6769.1   0.0   1.37   . A
 63.60     0    80 5549.1  6761.2   0.0   0.00   . A
 64.80     0    79 5549.1  6753.4   0.0   0.00   . A
 66.00     0    77 5549.0  6745.8   0.0   0.00   . A
 67.20     0    76 5549.0  6738.3   0.0   0.00   . A
 68.40     0    75 5549.0  6730.9   0.0   0.00   .A
 69.60     0    74 5548.9  6723.6   0.0   0.00   .A
 70.80     0    73 5548.9  6716.5   0.0   0.00   .A
 72.00     0    71 5548.8  6709.4   0.0   0.00   .A
 73.20     0    70 5548.8  6702.5   0.0   0.00   .A
 74.40     0    69 5548.8  6695.7   0.0   0.00   .A
 75.60     0    68 5548.7  6689.0   0.0   0.00   .A
 76.80     0    67 5548.7  6682.4   0.0   0.00   .A
 78.00     0    66 5548.7  6675.9   0.0   0.00   .A
 79.20     0    65 5548.6  6669.5   0.0   0.00   .A
 80.40     0    64 5548.6  6663.2   0.0   0.00   .A
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.      500.     1000.     1500.     2000.     2500.     3000.     3500.
        END NRCS-FBH   PLOT
 ------------------------------------------------------------------------------

 Inflow Hyd 1 PSH-Peak =         39.99 CFS  at  143.00 hrs.,  Location Point

 Inflow Hyd 1 SDH-Peak =         65.90 CFS  at    8.10 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =        648.34 CFS  at   19.20 hrs.,  Location Point
HYDOUT   1     STR1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 COVRES        COV RES

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       3 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

 ******************************************************************************
```

```
 SITES.....COMPUTATIONS COMPLETE


                              SUMMARY TABLE  1          SITES VERSION 2005.1.8
                             ----------------                 DATED 01/01/2005


 WATERSHED ID                       RUN DATE                           RUN TIME
 ------------                       --------                           --------
 COVRES                            08/20/2020                          06:12:11

 >>>   SITE    SUBWS    SUBWS DA   CURVE     TC   TOTAL DA   TYPE     STRUC    <<<
         ID      ID      (SQ MI)    NO.     (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   ---------   -----   ----   --------   -----   -----
       STR1     CR         4.74      0.   0.00       4.74    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.     MAX.     EMB.  INTEGR.*  EXIT*     TYPE
  NO.  WIDTH     ELEV    WIDTH   HP      ELEV     VOL.   DIST.     VEL.      HYD
      (IN/FT)   (FT)     (FT)  (FT)     (FT)     (CY)   (FT)   (FT/SEC)
 ----  -----  --------  ------  ----  --------  --------  -----  ------  ----------
    1   30.0   5548.5    30.0   3.8   5552.3       0.<BREACH>   25.9  NRCS-FBH


 *  INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED
    HYDROGRAPH SHOWN UNDER TYPE HYD.



 SITES.......SUMMARY TABLE 1 COMPLETED.


                    NRCS  SITES    VERSION 2005.1.8  ,01/01/2005
                             COVRES   FILES

INPUT  = c:\USDA\SITES\080620-PSH-ASHL-FBHG.d2c
OUTPUT = c:\USDA\SITES\080620-PSH-ASHL-FBHG.OUT
         DATED 08/20/2020 06:12:11

                          GRAPHICS FILES GENERATED

OPTION "L"  = c:\USDA\SITES\080620-PSH-ASHL-FBHG.DRG DATED 08/20/2020 06:12:11

OPTION "P"  = c:\USDA\SITES\080620-PSH-ASHL-FBHG.DHY DATED 08/20/2020 06:12:11

OPTION "E"  = c:\USDA\SITES\080620-PSH-ASHL-FBHG.DEM DATED 08/20/2020 06:12:11

AUX.GRAPHICS = c:\USDA\SITES\080620-PSH-ASHL-FBHG.DG* DATED 08/20/2020 06:12:11
```

```
********************************************************************************
SITES XEQ 08/20/2020   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
     VER 2005.1.8              (USER MANUAL - DATED DECEMBER 2005)
     TIME 06:12:11

************************ 80-80 LIST OF INPUT Data **************************

SITES     01/01/2005COVRES    COV RES                       4.74      C3
SAVMOV    0    101
SAVMOV    101  1                                                      1
STRUCTURE STR1      Cove Res
                    5470                                    0.18
                    5480                                    62.26
                    5490                                    303.40
                    5500                                    738.03
                    5510                                    1400.09
                    5520                                    2323.02
                    5530                                    3541.97
                    5540                                    5073.81
                    5545.5                                  6055.03
                    5550                                    6934.92
                    5552                                    7347.18
                    5552.5                                  7450.25
ENDTABLE
HYD       1                 Principal Spillway
                    1
                    0         11        14        15        15
                    15        15        15        15        15
                    15        16        16        16        16
                    16        16        16        16        16
                    16        17        17        17        17
                    17        17        17        17        17
                    17        18        18        18        18
                    18        18        18        18        19
                    19        19        19        19        19
                    20        20        20        20        20
                    20        21        21        21        21
                    21        21        22        22        22
                    22        23        23        23        23
                    24        24        24        24        25
                    25        25        26        26        26
                    27        27        27        28        28
                    29        29        29        30        30
                    31        31        32        33        33
                    34        35        35        36        37
                    38        39        40        41        42
                    43        45        46        48        49
                    51        53        56        58        61
                    65        69        74        80        87
                    96        109       127       157       219
                    850       479       259       172       132
                    111       98        88        81        75
                    70        65        62        59        56
                    54        51        50        48        46
                    45        43        42        41        40
                    39        38        37        36        35
                    35        34        33        33        32
                    32        31        30        30        29
                    29        29        28        28        27
                    27        27        26        26        26
                    25        25        25        24        24
                    24        24        23        23        23
                    23        22        22        22        22
                    22        21        21        21        21
                    21        20        20        20        20
                    20        20        19        19        19
                    19        19        19        19        18
                    18        18        18        18        18
                    18        17        17        17        17
                    17        17        17        17        17
                    17        16        16        16        16
                    16        16        16        16        16
                    16        15        15        15        15
                    15        15        15        15        15
                    15        4         1
ENDTABLE
HYD       3                 Auxiliary Spillway (Local)
                    0.3
                    0         0         0         0         0
                    6         39        194       687       1365
                    2027      2180      1955      1683      1441
                    1248      1107      1001      924       874
                    833       748       589       423       283
                    180       112       73        47        28
                    16        9         5         3         1
                    1         0
ENDTABLE
HYD       5                 Freeboard (Local)
                    0.3
                    0         0         0         8         43
                    129       306       824       2325      4867
                    6395      6123      5053      4063      3364
```

```
                    2855      2500      2228      2039      1913
                    1819      1614      1240      851       540
                    332       201       113       62        34
                    18        9         5         2         1
                    0
 ENDTABLE
 WSDATA    2C CR               4.74
 PDIRECT                                 9.40      16.00
 POOLDATA  ELEV                5545.5              5552      5435      SC
 PSINLET             1         3.75
 PSDATA    1         1000      30                  0.012     5450
 ASSPRFL   41
           0         5530      75        5549.2    155       5549.2
           237       5517.6    600       5481.7    1049      5453.3
           1170      5435
 ENDTABLE
 ASSURFACE 41        1170      1
           0         1170      1         0         1
 ENDTABLE
 ASDATA    41                            2                               1
 BTMWIDTH  FEET      30
 ASMATERIAL
           1         50        1         75        115       .2
 ENDTABLE
 ASCOORD    1        W.Shale   N
           0         5530      75        5550      125       5565
           200       5552      250       5520      600       5485
           1050      5460      1150      5435      1300      5432.4
 ENDTABLE
 GRAPHICS  I
 GO,DESIGN LCP       TYPE2     24
 SAVMOV    2    101  1                   STR1
 ENDJOB

 ********************************************************************************

 ***** MESSAGE - DEFAULT TOPSOIL FILL MATERIAL PARAMETERS USED.

 ***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO  5549.20
                FROM THE ASSPRFL RECORDS.

 ***** MESSAGE - ASSURFACE REACH  1: ZERO ROOTING DEPTH IS DEFAULTED TO 0.5 FT.


1SITES ----------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                       WSID= COVRES
 VER 2005.1.8                        Cove Res                      SUBW= CR
 TIME 06:12:11            SITE = STR1              PASS=    1     PART=   1


 **********************    MATERIAL PROPERTIES    ***************************
                            DRY                  PERCENT       DETACH.      REP.
      MATERIAL       PI   DENSITY        Kh        CLAY         RATE      DIAMETER
                          lbs/CuFt                          (Ft/H)/(lb/SqFt)  inches
     W.Shale        50.      115.      0.20        75.0          --        1.00000
     TS_FILL         0.      100.      0.05         0.0          --        0.05000
     GEN_FILL       50.      115.      0.20        75.0          --        1.00000

 ***************************    BASIC Data    ********************************
 HUMID- SUBHUMID CLIMATE AREA                    DESIGN CLASS  C

 INFLOW HYDROGRAPH(S) ENTERED

 PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD          P-FB
               0.00          0.00          9.40         16.00

 WSDATA -       CN          DA-SM          TC/L           -/H          QRF
               0.00          4.74          0.00          0.00         0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
               0.00       5545.50          0.00        5435.00           NO

           BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
               0.00          0.00          0.00         DESIGN

 PSDATA -  NO. COND        COND L         DIA/W           -/H
               1.00       1000.00         30.00          0.00

              PS N            KE         WEIR L         TW EL
             0.012          1.00          3.75        5450.00

            2ND STG         ORF H          ORF L      START AUX.
               0.00          0.00          0.00          0.00

 ASCRESTS -   AUX.1         AUX.2         AUX.3         AUX.4         AUX.5
             5549.20          0.00          0.00          0.00         0.00

 AUX.Data -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00        155.00             0

 AUX.Data - INLET Ci    SIDE SLOPE       EXIT Ci     EXIT SLOPE     ACTUAL AUX?
```

```
             1.000          2.00         1.000          0.385            NO

 BTM WIDTH -    BW1           BW2           BW3           BW4           BW5
   ft         30.00          0.00          0.00          0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

1*********************     DETAILED LIST OF BASIC Data     **********************
 WEIR COEF. FOR ORIFICES.......... 3.10    RATIO OF Ia TO S (CH.10,NEH4). 0.20
 WEIR COEF. FOR DROP INLET........ 3.10    TIME INCS TO PEAK OF UNIT HYD.  10.
 DISCHARGE COEF. FOR ORIFICES..... 0.60    NO. POINTS FOR DESIGN HYD. ... 5000

 HOOD, WEIR INLET COEF. .......... 0.60    DRAWDOWN TIME LIMIT - DAYS.... 10.0
 HOOD, PIPE ENTRANCE COEF. ....... 0.60    DRAWDOWN RATIO STORAGE LIMIT.. 0.15
 HOOD, SLUG FLOW COEF. ........... 0.00    OTHER DRAWDOWN RATIOS APPLY ?.   NO

 PS ACCURACY OF FULL FLOW CALC.,FT 0.01    WSP ALLOWABLE FSS VEL. CHANGE. 0.05
 FILLET SIZE FOR BOX CONDUITS..... 6.00    WSP FSS CALC. PRECISION, FT.. 0.005

 GRAVITATIONAL CONSTANT.......... 32.16    AUX. SPILLWAY MIN. CAP. COEF. 237.0
 MIN. NHCP378 PS PIPE AREA SQFT.. 0.545    AUX. SPILLWAY MIN. CAP. EXP.  0.493

 MIN. TR60 DEPTH AUX. TO TOP DAM.. 3.00    MIN. AUX. BW IN BW SOLUTION,FT 20.0
 MIN. NHCP378 DEPTH AUX.TO TOP DAM 2.00    PRECISION OF BW SOLUTION......  1.0
 MIN. NHCP378 DEPTH PS - AUX.CREST 1.00    OLD TR60 CRITERIA USED .......   NO
 MIN. NHCP378 DEPTH DESIGN Q - TOD 1.00    OLD NHCP378 CRITERIA USED ....   NO

 EMBANKMENT TEMPLATE:  TOP WIDTH = (calc.),  MAX. CROWN = 0.667 ft,
 SIDE SLOPE   WAVE BERM   MULTIPLE STABILITY BERMS    SEPARATE STABILITY BERMS
    RATIOS      WIDTH      U&D/S WIDTHS   DELTA H     WIDTHS, ft   HEIGHTS, ft
   U/S  D/S       ft             ft          ft       U/S   D/S    U/S   D/S
  2.50 2.50      10.0            0.0        0.00       0.00  0.00   0.00  0.00


 DIMENSIONLESS UNIT HYDROGRAPH
 STANDARD DIMENSIONLESS UNIT HYDROGRAPH
 PEAK FACTOR = 484.0 | TIME INC. =0.020 | NO. INC. TO PEAK =  10.
 VOLUME FACTOR =  48.3429

      0.0000     0.0300     0.1000     0.1900     0.3100
      0.4700     0.6600     0.8200     0.9300     0.9900
      1.0000     0.9900     0.9300     0.8600     0.7800
      0.6800     0.5600     0.4600     0.3900     0.3300
      0.2800     0.2410     0.2070     0.1740     0.1470
      0.1260     0.1070     0.0910     0.0770     0.0660
      0.0550     0.0470     0.0400     0.0340     0.0290
      0.0250     0.0210     0.0180     0.0150     0.0130
      0.0110     0.0090     0.0080     0.0070     0.0060
      0.0050     0.0040     0.0030     0.0020     0.0010
      0.0000

 EXISTING NATURAL SURFACE AT AUXILIARY SPILLWAY SITE - X,Y COORDINATES:

               0.     5530.00
              75.     5550.00
             125.     5565.00
             200.     5552.00
             250.     5520.00
             600.     5485.00
            1050.     5460.00
            1150.     5435.00


1NRCS DESIGN STORM RAINFALL DISTRIBUTION  (CHAPTER 21, NEH4 & TR-60).

       0.000      0.008      0.016      0.025      0.033
       0.043      0.052      0.063      0.074      0.086
       0.099      0.112      0.126      0.142      0.160
       0.180      0.205      0.255      0.345      0.437
       0.530      0.603      0.633      0.660      0.684
       0.705      0.724      0.742      0.759      0.775
       0.790      0.804      0.818      0.831      0.844
       0.856      0.868      0.879      0.890      0.900
       0.910      0.920      0.930      0.939      0.948
       0.957      0.966      0.975      0.983      0.992
       1.000


 24 HOUR TYPE II RAINFALL DISTRIBUTION
 IDENTIFICATION NAME IS TYPE2  GIVEN DURATION =  24.0 HRS

       0.000      0.001      0.002      0.003      0.004
       0.005      0.006      0.007      0.008      0.009
       0.010      0.012      0.013      0.014      0.015
       0.016      0.017      0.018      0.020      0.021
       0.022      0.023      0.024      0.026      0.027
       0.028      0.029      0.031      0.032      0.033
       0.034      0.036      0.037      0.038      0.040
       0.041      0.042      0.044      0.045      0.047
       0.048      0.049      0.051      0.052      0.054
       0.055      0.057      0.058      0.060      0.061
       0.063      0.065      0.066      0.068      0.070
```

```
      0.071     0.073     0.075     0.076     0.078
      0.080     0.082     0.084     0.085     0.087
      0.089     0.091     0.093     0.095     0.097
      0.099     0.101     0.103     0.105     0.107
      0.109     0.111     0.113     0.116     0.118
      0.120     0.122     0.125     0.127     0.130
      0.132     0.135     0.138     0.141     0.144
      0.147     0.150     0.153     0.157     0.160
      0.163     0.166     0.170     0.173     0.177
      0.181     0.185     0.189     0.194     0.199
      0.204     0.209     0.215     0.221     0.228
      0.235     0.243     0.251     0.261     0.271
      0.283     0.307     0.354     0.431     0.568
      0.663     0.682     0.699     0.713     0.725
      0.735     0.743     0.751     0.759     0.766
      0.772     0.778     0.784     0.789     0.794
      0.799     0.804     0.808     0.812     0.816
      0.820     0.824     0.827     0.831     0.834
      0.838     0.841     0.844     0.847     0.850
      0.854     0.856     0.859     0.862     0.865
      0.868     0.870     0.873     0.875     0.878
      0.880     0.882     0.885     0.887     0.889
      0.891     0.893     0.895     0.898     0.900
      0.902     0.904     0.906     0.908     0.910
      0.912     0.914     0.915     0.917     0.919
      0.921     0.923     0.925     0.926     0.928
      0.930     0.931     0.933     0.935     0.936
      0.938     0.939     0.941     0.942     0.944
      0.945     0.947     0.948     0.949     0.951
      0.952     0.953     0.955     0.956     0.957
      0.958     0.960     0.961     0.962     0.964
      0.965     0.966     0.967     0.968     0.970
      0.971     0.972     0.973     0.975     0.976
      0.977     0.978     0.979     0.981     0.982
      0.983     0.984     0.985     0.986     0.988
      0.989     0.990     0.991     0.992     0.993
      0.994     0.996     0.997     0.998     0.999
      1.000


1SITES ------------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                       WSID= COVRES
 VER 2005.1.8                        Cove Res                      SUBW= CR
 TIME 06:12:11           SITE = STR1             PASS=    1     PART=   2

MESSAGE ---- Climatic Index changed from 0.0 to 1.0 for this run.

 CREST PS       5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 SED ACCUM      5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 START ELEV     5545.50 FT    6055.0 ACFT      0.00 AC       0.0 CFS

 INFLOW HYDROGRAPH PROVIDED IN LOCATION  1,  PEAK=    850.00 CFS, AT 120.00 HRS.
 TITLE = Principal Spillway


 CREST PS       5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 SED ACCUM      5545.50 FT    6055.0 ACFT      0.00 AC     126.3 CFS

 START ELEV     5545.50 FT    6055.0 ACFT      0.00 AC       0.0 CFS


 NRCS-PSH  RAINFALL   1-DAY =   0.00 IN    10-DAY =   0.00 IN    DA =   4.74 SM
           RUNOFF     1-DAY =   0.00 IN    10-DAY =   0.00 IN

      CLIMATIC INDEX = 1.00    CN 10-DAY =  0.    CN 1-DAY =   0.

      PEAK =       850.0 CFS, AT  120.0 HRS.


 ROUTED RESULT - HYD TYPE      EMAX         VOL-MAX        AMAX         QMAX
                 NRCS-PSH   5547.76 FT    6496.1 ACFT      0.00 AC     40.0 CFS

      PS STORAGE     441.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 DRAWDOWN (DDT) TEST       5545.84 FT    6121.2 ACFT      4.35 CFS
      CONTROL IS 0.150 DETENTION STORAGE

      TIME LIMIT REACHED = 10.00 DAYS. FLOW WAS     9.73 CFS,  ELEV =  5546.26
      (ELEVATION TO START ROUTING SDH AND/OR FBH HAS BEEN RAISED.)

      TIME TO DDT TEST DISCHARGE IS 15.79 DAYS - DRAWDOWN STOPPED.

 ***** NOTE - CREST OF AUX. RAISED TO HOLD   148.03 ACFT NOT EVACUATED IN
             DRAWDOWN TIME LIMIT.  TOTAL STORAGE REQUIRED =  6644.08 ACFT,
             NEW ELEVATION OF AUXILIARY SPILLWAY CREST    =  5548.51 FT.

 PLOT OF PRINCIPAL SPILLWAY HYDROGRAPH,  1 INCH=     200. CFS
                                              0.      200.      400.      600.      800.     1000.     1200.     1400.
  Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
```

0.00	0.0	0.0	5545.5	6055.5	0.0	.
1.00	11.0	0.0	5545.5	6055.5	0.0	.I
2.00	14.0	0.1	5545.5	6056.5	0.0	.I
3.00	15.0	0.2	5545.5	6057.7	0.0	.I
4.00	15.0	0.3	5545.5	6058.9	0.0	.I
5.00	15.0	0.3	5545.5	6060.1	0.0	.I
6.00	15.0	0.4	5545.5	6061.3	0.0	.I
7.00	15.0	0.5	5545.5	6062.5	0.0	.I
8.00	15.0	0.6	5545.5	6063.7	0.0	.I
9.00	15.0	0.7	5545.6	6064.9	0.0	.I
10.00	15.0	0.7	5545.6	6066.1	0.0	.I
11.00	16.0	0.8	5545.6	6067.3	0.0	.I
12.00	16.0	0.9	5545.6	6068.6	0.0	.I
13.00	16.0	1.0	5545.6	6069.8	0.0	.I
14.00	16.0	1.1	5545.6	6071.1	0.0	.I
15.00	16.0	1.1	5545.6	6072.3	0.0	.I
16.00	16.0	1.2	5545.6	6073.5	0.0	.I
17.00	16.0	1.3	5545.6	6074.7	0.0	.I
18.00	16.0	1.4	5545.6	6076.0	0.0	.I
19.00	16.0	1.5	5545.6	6077.2	0.0	.I
20.00	16.0	1.5	5545.6	6078.4	0.0	.I
21.00	17.0	1.6	5545.6	6079.6	0.0	.I
22.00	17.0	1.7	5545.6	6080.9	0.0	.I
23.00	17.0	1.8	5545.6	6082.1	0.0	.I
24.00	17.0	1.9	5545.6	6083.4	0.0	.I
25.00	17.0	1.9	5545.7	6084.6	0.0	.I
26.00	17.0	2.0	5545.7	6085.9	0.0	.I
27.00	17.0	2.1	5545.7	6087.1	0.0	.I
28.00	17.0	2.2	5545.7	6088.3	0.0	.I
29.00	17.0	2.3	5545.7	6089.5	0.0	.I
30.00	17.0	2.3	5545.7	6090.8	0.0	.I
31.00	18.0	2.4	5545.7	6092.0	0.0	.I
32.00	18.0	2.5	5545.7	6093.3	0.0	.I
33.00	18.0	2.6	5545.7	6094.6	0.0	.I
34.00	18.0	2.7	5545.7	6095.8	0.0	.I
35.00	18.0	2.8	5545.7	6097.1	0.0	.I
36.00	18.0	2.8	5545.7	6098.4	0.0	.I
37.00	18.0	2.9	5545.7	6099.6	0.0	.I
38.00	18.0	3.0	5545.7	6100.8	0.0	.I
39.00	19.0	3.1	5545.7	6102.1	0.0	.I
40.00	19.0	3.2	5545.7	6103.4	0.0	.I
41.00	19.0	3.3	5545.8	6104.7	0.0	.I
42.00	19.0	3.4	5545.8	6106.0	0.0	.I
43.00	19.0	3.4	5545.8	6107.3	0.0	.I
44.00	19.0	3.5	5545.8	6108.6	0.0	.I
45.00	20.0	3.6	5545.8	6109.9	0.0	.I
46.00	20.0	3.7	5545.8	6111.3	0.0	.I
47.00	20.0	3.8	5545.8	6112.6	0.0	.I
48.00	20.0	3.9	5545.8	6114.0	0.0	.I
49.00	20.0	4.0	5545.8	6115.3	0.0	.I
50.00	20.0	4.0	5545.8	6116.6	0.0	.I
51.00	21.0	4.1	5545.8	6118.0	0.0	.I
52.00	21.0	4.2	5545.8	6119.4	0.0	.I
53.00	21.0	4.3	5545.8	6120.7	0.0	.I
54.00	21.0	4.4	5545.8	6122.1	0.0	.I
55.00	21.0	4.5	5545.9	6123.5	0.0	.I
56.00	21.0	4.6	5545.9	6124.8	0.0	.I
57.00	22.0	4.7	5545.9	6126.2	0.0	.I
58.00	22.0	4.8	5545.9	6127.7	0.0	.I
59.00	22.0	4.9	5545.9	6129.1	0.0	.I
60.00	22.0	5.0	5545.9	6130.5	0.0	.I
61.00	23.0	5.1	5545.9	6131.9	0.0	.I
62.00	23.0	5.2	5545.9	6133.4	0.0	.I
63.00	23.0	5.2	5545.9	6134.9	0.0	.I
64.00	23.0	5.3	5545.9	6136.4	0.0	.I
65.00	24.0	5.4	5545.9	6137.8	0.0	.I
66.00	24.0	5.5	5545.9	6139.4	0.0	.I
67.00	24.0	5.6	5545.9	6140.9	0.0	.I
68.00	24.0	5.7	5545.9	6142.4	0.0	.I
69.00	25.0	5.8	5546.0	6144.0	0.0	.I
70.00	25.0	5.9	5546.0	6145.5	0.0	.I
71.00	25.0	6.1	5546.0	6147.1	0.0	.I
72.00	26.0	6.2	5546.0	6148.7	0.0	.I
73.00	26.0	6.3	5546.0	6150.3	0.0	.I
74.00	26.0	6.4	5546.0	6152.0	0.0	.I
75.00	27.0	6.5	5546.0	6153.6	0.0	.I
76.00	27.0	6.6	5546.0	6155.3	0.0	.I
77.00	27.0	6.7	5546.0	6157.0	0.0	.I
78.00	28.0	6.8	5546.0	6158.7	0.0	.I
79.00	28.0	6.9	5546.0	6160.5	0.0	.I
80.00	29.0	7.0	5546.0	6162.2	0.0	.I
81.00	29.0	7.2	5546.1	6164.1	0.0	.I
82.00	29.0	7.3	5546.1	6165.9	0.0	.I
83.00	30.0	7.4	5546.1	6167.7	0.0	. I
84.00	30.0	7.5	5546.1	6169.5	0.0	. I
85.00	31.0	7.7	5546.1	6171.4	0.0	. I
86.00	31.0	7.8	5546.1	6173.4	0.0	. I
87.00	32.0	7.9	5546.1	6175.3	0.0	. I
88.00	33.0	8.0	5546.1	6177.3	0.0	. I
89.00	33.0	8.2	5546.1	6179.4	0.0	. I
90.00	34.0	8.3	5546.1	6181.5	0.0	. I
91.00	35.0	8.5	5546.2	6183.6	0.0	. I

```
 92.00  35.0   8.6 5546.2  6185.8   0.0         . I
 93.00  36.0   8.7 5546.2  6188.1   0.0         . I
 94.00  37.0   8.9 5546.2  6190.3   0.0         . I
 95.00  38.0   9.0 5546.2  6192.7   0.0         . I
 96.00  39.0   9.2 5546.2  6195.1   0.0         . I
 97.00  40.0   9.4 5546.2  6197.6   0.0         . I
 98.00  41.0   9.5 5546.2  6200.2   0.0         . I
 99.00  42.0   9.7 5546.3  6202.8   0.0         . I
100.00  43.0   9.9 5546.3  6205.5   0.0         . I
101.00  45.0  10.1 5546.3  6208.3   0.0         .PI
102.00  46.0  10.3 5546.3  6211.3   0.0         .PI
103.00  48.0  10.5 5546.3  6214.3   0.0         .PI
104.00  49.0  10.7 5546.3  6217.4   0.0         .PI
105.00  51.0  10.9 5546.3  6220.7   0.0         .P I
106.00  53.0  11.1 5546.4  6224.0   0.0         .P I
107.00  56.0  11.3 5546.4  6227.6   0.0         .P I
108.00  58.0  11.6 5546.4  6231.4   0.0         .P I
109.00  61.0  11.9 5546.4  6235.3   0.0         .P I
110.00  65.0  12.1 5546.4  6239.5   0.0         .P I
111.00  69.0  12.4 5546.5  6244.1   0.0         .P I
112.00  74.0  12.7 5546.5  6248.9   0.0         .P  I
113.00  80.0  13.1 5546.5  6254.2   0.0         .P  I
114.00  87.0  13.5 5546.5  6260.0   0.0         .P  I
115.00  96.0  13.9 5546.6  6266.5   0.0         .P   I
116.00 109.0  14.4 5546.6  6273.8   0.0         .P   I
117.00 127.0  14.9 5546.7  6282.3   0.0         .P    I
118.00 157.0  15.6 5546.7  6292.8   0.0         .P      I
119.00 219.0  17.3 5546.8  6307.0   0.0         .P        I
120.00 850.0  22.4 5547.0  6349.5   0.0         .P                                      X
121.00 479.0  28.7 5547.3  6402.3   0.0         .P                    I
122.00 259.0  32.1 5547.4  6430.3   0.0         . P         I
123.00 172.0  33.9 5547.5  6445.4   0.0         . P      I
124.00 132.0  35.1 5547.5  6455.1   0.0         . P    I
125.00 111.0  35.9 5547.6  6462.2   0.0         . P   I
126.00  98.0  36.6 5547.6  6467.8   0.0         . P  I
127.00  88.0  37.2 5547.6  6472.5   0.0         . P I
128.00  81.0  37.6 5547.7  6476.4   0.0         . P I
129.00  75.0  38.0 5547.7  6479.7   0.0         . P I
130.00  70.0  38.4 5547.7  6482.5   0.0         . P I
131.00  65.0  38.7 5547.7  6484.9   0.0         . PI
132.00  62.0  38.9 5547.7  6487.0   0.0         . PI
133.00  59.0  39.1 5547.7  6488.7   0.0         . PI
134.00  56.0  39.3 5547.7  6490.2   0.0         . PI
135.00  54.0  39.4 5547.7  6491.5   0.0         . PI
136.00  51.0  39.6 5547.7  6492.6   0.0         . PI
137.00  50.0  39.7 5547.7  6493.5   0.0         . PI
138.00  48.0  39.8 5547.7  6494.3   0.0         . P
139.00  46.0  39.8 5547.7  6494.9   0.0         . P
140.00  45.0  39.9 5547.8  6495.3   0.0         . P
141.00  43.0  39.9 5547.8  6495.7   0.0         . P
142.00  42.0  40.0 5547.8  6495.9   0.0         . P
143.00  41.0  40.0 5547.8  6496.0   0.0         . P
144.00  40.0  40.0 5547.8  6496.1   0.0         . X
145.00  39.0  40.0 5547.8  6496.0   0.0         . P
146.00  38.0  40.0 5547.8  6495.9   0.0         . P
147.00  37.0  39.9 5547.8  6495.7   0.0         . P
148.00  36.0  39.9 5547.8  6495.4   0.0         . P
149.00  35.0  39.9 5547.8  6495.0   0.0         . P
150.00  35.0  39.8 5547.7  6494.6   0.0         . P
151.00  34.0  39.8 5547.7  6494.2   0.0         . P
152.00  33.0  39.7 5547.7  6493.7   0.0         . P
153.00  33.0  39.6 5547.7  6493.1   0.0         . P
154.00  32.0  39.6 5547.7  6492.6   0.0         . P
155.00  32.0  39.5 5547.7  6491.9   0.0         . P
156.00  31.0  39.4 5547.7  6491.3   0.0         . P
157.00  30.0  39.3 5547.7  6490.5   0.0         . P
158.00  30.0  39.2 5547.7  6489.8   0.0         . P
159.00  29.0  39.1 5547.7  6489.0   0.0         .IP
160.00  29.0  39.0 5547.7  6488.1   0.0         .IP
161.00  29.0  38.9 5547.7  6487.3   0.0         .IP
162.00  28.0  38.8 5547.7  6486.5   0.0         .IP
163.00  28.0  38.7 5547.7  6485.6   0.0         .IP
164.00  27.0  38.6 5547.7  6484.6   0.0         .IP
165.00  27.0  38.5 5547.7  6483.7   0.0         .IP
166.00  27.0  38.4 5547.7  6482.7   0.0         .IP
167.00  26.0  38.3 5547.7  6481.8   0.0         .IP
168.00  26.0  38.1 5547.7  6480.8   0.0         .IP
169.00  26.0  38.0 5547.7  6479.8   0.0         .IP
170.00  25.0  37.9 5547.7  6478.7   0.0         .IP
171.00  25.0  37.8 5547.7  6477.7   0.0         .IP
172.00  25.0  37.7 5547.7  6476.6   0.0         .IP
173.00  24.0  37.5 5547.7  6475.5   0.0         .IP
174.00  24.0  37.4 5547.6  6474.4   0.0         .IP
175.00  24.0  37.3 5547.6  6473.3   0.0         .IP
176.00  24.0  37.1 5547.6  6472.2   0.0         .IP
177.00  23.0  37.0 5547.6  6471.1   0.0         .IP
178.00  23.0  36.9 5547.6  6470.0   0.0         .IP
179.00  23.0  36.7 5547.6  6468.8   0.0         .IP
180.00  23.0  36.6 5547.6  6467.7   0.0         .IP
181.00  22.0  36.4 5547.6  6466.5   0.0         .IP
182.00  22.0  36.3 5547.6  6465.3   0.0         .IP
183.00  22.0  36.2 5547.6  6464.2   0.0         .IP
```

```
184.00  22.0  36.0 5547.6  6463.0   0.0          .IP
185.00  22.0  35.9 5547.6  6461.8   0.0          .IP
186.00  21.0  35.7 5547.6  6460.7   0.0          .IP
187.00  21.0  35.6 5547.6  6459.5   0.0          .IP
188.00  21.0  35.4 5547.6  6458.3   0.0          .IP
189.00  21.0  35.3 5547.6  6457.1   0.0          .IP
190.00  21.0  35.2 5547.6  6455.9   0.0          .IP
191.00  20.0  35.0 5547.5  6454.7   0.0          .IP
192.00  20.0  34.9 5547.5  6453.4   0.0          .IP
193.00  20.0  34.7 5547.5  6452.2   0.0          .IP
194.00  20.0  34.6 5547.5  6451.0   0.0          .IP
195.00  20.0  34.4 5547.5  6449.8   0.0          .IP
196.00  20.0  34.3 5547.5  6448.6   0.0          .IP
197.00  19.0  34.1 5547.5  6447.4   0.0          .IP
198.00  19.0  34.0 5547.5  6446.2   0.0          .IP
199.00  19.0  33.8 5547.5  6444.9   0.0          .IP
200.00  19.0  33.7 5547.5  6443.7   0.0          .IP
201.00  19.0  33.6 5547.5  6442.5   0.0          .IP
202.00  19.0  33.4 5547.5  6441.3   0.0          .IP
203.00  19.0  33.3 5547.5  6440.1   0.0          .IP
204.00  18.0  33.1 5547.5  6438.9   0.0          .IP
205.00  18.0  33.0 5547.5  6437.7   0.0          .IP
206.00  18.0  32.8 5547.5  6436.4   0.0          .IP
207.00  18.0  32.7 5547.4  6435.2   0.0          .IP
208.00  18.0  32.5 5547.4  6434.0   0.0          .IP
209.00  18.0  32.4 5547.4  6432.8   0.0          .IP
210.00  18.0  32.2 5547.4  6431.6   0.0          .IP
211.00  17.0  32.1 5547.4  6430.4   0.0          .IP
212.00  17.0  32.0 5547.4  6429.2   0.0          .IP
213.00  17.0  31.8 5547.4  6427.9   0.0          .IP
214.00  17.0  31.7 5547.4  6426.7   0.0          .IP
215.00  17.0  31.5 5547.4  6425.5   0.0          .IP
216.00  17.0  31.4 5547.4  6424.3   0.0          .IP
217.00  17.0  31.2 5547.4  6423.1   0.0          .IP
218.00  17.0  31.1 5547.4  6422.0   0.0          .IP
219.00  17.0  30.9 5547.4  6420.8   0.0          .IP
220.00  17.0  30.8 5547.4  6419.7   0.0          .IP
221.00  16.0  30.7 5547.4  6418.5   0.0          .IP
222.00  16.0  30.5 5547.4  6417.3   0.0          .IP
223.00  16.0  30.4 5547.3  6416.1   0.0          .IP
224.00  16.0  30.2 5547.3  6414.9   0.0          .IP
225.00  16.0  30.1 5547.3  6413.7   0.0          .IP
226.00  16.0  30.0 5547.3  6412.6   0.0          .P
227.00  16.0  29.8 5547.3  6411.4   0.0          .P
228.00  16.0  29.7 5547.3  6410.3   0.0          .P
229.00  16.0  29.5 5547.3  6409.2   0.0          .P
230.00  16.0  29.4 5547.3  6408.1   0.0          .P
231.00  15.0  29.3 5547.3  6406.9   0.0          .P
232.00  15.0  29.1 5547.3  6405.7   0.0          .P
233.00  15.0  29.0 5547.3  6404.6   0.0          .P
234.00  15.0  28.9 5547.3  6403.4   0.0          .P
235.00  15.0  28.7 5547.3  6402.3   0.0          .P
236.00  15.0  28.6 5547.3  6401.2   0.0          .P
237.00  15.0  28.5 5547.3  6400.0   0.0          .P
238.00  15.0  28.3 5547.3  6398.9   0.0          .P
239.00  15.0  28.2 5547.3  6397.8   0.0          .P
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.      200.      400.      600.      800.     1000.     1200.     1400.
       END NRCS-PSH   PLOT


*********************************************************************************
RATING TABLE DEVELOPED, SITE = STR1 :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.


RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1  5545.50      0.00      0.00      0.00   6055.03      0.00
  2  5546.72     15.71     15.71      0.00   6294.00      0.00
  3  5547.94     44.43     44.43      0.00   6532.97      0.00
  4  5549.17     81.62     81.62      0.00   6771.95      0.00
                                         FULL CONDUIT FLOW, ELEV = 5550.39 FT
  5  5550.39    125.65    125.65      0.00   7015.04      0.00
  6  5550.65    125.84    125.84      0.00   7069.39      0.00
  7  5550.92    126.01    126.01      0.00   7123.74      0.00
  8  5551.18    126.17    126.17      0.00   7178.09      0.00
  9  5551.44    126.34    126.34      0.00   7232.44      0.00
 10  5551.71    126.50    126.50      0.00   7286.79      0.00
 11  5551.97    126.67    126.67      0.00   7341.14      0.00
 12  5552.23    126.83    126.83      0.00   7395.49      0.00
 13  5552.50    126.99    126.99      0.00   7449.85      0.00

INFLOW HYDROGRAPH PROVIDED IN LOCATION  3,  PEAK=   2180.00 CFS, AT   3.30 HRS.
TITLE = Auxiliary Spillway (Local)


INFLOW HYDROGRAPH PROVIDED IN LOCATION  5,  PEAK=   6395.00 CFS, AT   3.00 HRS.
TITLE = Freeboard (Local)
```

```
1SITES ------------------------------------------------------------------------
 XEQ 08/20/2020                    COV RES                        WSID= COVRES
 VER 2005.1.8                        Cove Res                       SUBW= CR
 TIME 06:12:11            SITE = STR1              PASS=    1     PART=   3


 AUX. CREST     5548.51 FT    6644.1 ACFT      0.00 AC      61.7 CFS

      PS STORAGE    589.1 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     5546.26 FT    6203.0 ACFT      0.00 AC       9.7 CFS

 ***** WARNING - AUXILIARY CREST LOWER THAN LOW POINT IN SITE.

 NRCS-SDH   INFLOW HYDROGRAPH INPUT, DA =    4.74 SQUARE MILES

      PEAK =      2180.0 CFS, AT    3.3 HRS.

 NRCS-FBH   INFLOW HYDROGRAPH INPUT, DA =    4.74 SQUARE MILES

      PEAK =      6395.0 CFS, AT    3.0 HRS.

 ***** WARNING - MAXIMUM AUX. SURFACE PROFILE ELEVATION ( 5549.20) AND AUXILIARY
                 CREST ( 5548.51) ELEVATION Do NOT MATCH.  MAXIMUM AUX. SURFACE
                 PROFILE ELEVATION USED IN WSPVRT PROCEDURE.


 ***** MESSAGE - INPUT(5549.14) TO INTERPOLATION ROUTINE IS BELOW
                 ARRAY LIMIT(5549.20).


 ******************************************************************************
 RATING TABLE DEVELOPED, SITE = STR1 :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.


 RATING TABLE NUMBER  2
        ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
        FEET       CFS       CFS       CFS      AC-FT     ACRE
   1  5545.50      0.00      0.00      0.00   6055.03      0.00
   2  5545.83      2.25      2.25      0.00   6120.52      0.00
   3  5546.17      6.37      6.37      0.00   6186.02      0.00
   4  5546.50     11.71     11.71      0.00   6251.52      0.00
   5  5546.84     18.03     18.03      0.00   6317.01      0.00
   6  5547.17     25.20     25.20      0.00   6382.51      0.00
   7  5547.51     33.12     33.12      0.00   6448.00      0.00
   8  5547.84     41.74     41.74      0.00   6513.50      0.00
   9  5548.18     50.99     50.99      0.00   6578.99      0.00
  10  5548.51     60.85     60.85      0.00   6644.49      0.00
  11  5549.14     80.67     80.67      0.00   6766.41      0.00
  12  5549.76    126.50    102.35     24.15   6888.71      0.00
                                           FULL CONDUIT FLOW, ELEV = 5550.39 FT
  13  5550.39    223.05    125.67     97.38   7015.14      0.00
  14  5550.49    237.89    125.75    112.14   7036.88      0.00
  15  5550.60    255.98    125.81    130.16   7058.62      0.00
  16  5550.79    290.40    125.93    164.47   7097.77      0.00
  17  5551.02    332.53    126.08    206.45   7145.68      0.00
  18  5551.44    422.70    126.34    296.36   7232.64      0.00
  19  5551.97    551.57    126.67    424.90   7341.44      0.00
  20  5552.50    697.75    126.99    570.75   7450.25      0.00
  ******************************************************************************

 SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

 REACH  FROM     TO   SLOPE  RETARDANCE  VEGETAL  MAINT. ROOTING  REACH
        STA     STA           CURVE      COVER    CODE   DEPTH  LOCATION
        (ft)    (ft)   (%)    INDEX      FACTOR     +    (ft)     *
 -----  ----    ----  ------ ----------  -------  -----  ------- --------
   1      0.     75.  -25.6     1.000       **       **     **    INLET
   2     75.    155.    0.0     1.000       **       **     **    CREST
   3    155.    237.   38.5     1.000     0.00       1            EXIT !
   4    237.    600.    9.9     1.000     0.00       1            EXIT
   5    600.   1049.    6.3     1.000     0.00       1            EXIT
   6   1049.   1170.   15.1     1.000     0.00       1            EXIT

  + The minimum maintenance code value of 2 is used in INTEGRITY computations
      (the program changes values of 1 to 2 during computation).
  * Upper case indicates a reach of constructed spillway channel.
 ** The program does not use vegetal cover factor, maintenance code, and
      rooting depth for inlet and crest reaches in computations.
  ! Reach   3 used in computing exit channel velocities.
  ******************************************************************************

 ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
 RESULTS          FT        FT       ACFT      AC         FT       ACFT
 NRCS-SDH          30.0   5548.67    6675.5       0.0      0.16      31.0

           PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
           DISCHARGE  =      65.7       0.2      65.9
```

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
	FT	FT/SEC	FT/FT	FT/FT
AUXILIARY SPILLWAY ---	0.01	0.57	0.148	0.308

AUXILIARY SPILLWAY DURATION FLOW = 8.7 HOURS

PLOT NRCS-SDH 1 IN = 500. CFS EXIT SLOPE = 0.385

Time	Qin	Qout	Elev	Vol	Area	ExtVel	0. I	500. I	1000. I	1500. I	2000. I	2500. I	3000. I	3500. I
1.50	0	8	5546.3	6203.0	0.0	0.00	.							
1.80	6	8	5546.3	6203.0	0.0	0.00	.							
2.10	39	8	5546.3	6203.4	0.0	0.00	.I							
2.40	194	8	5546.3	6206.1	0.0	0.00	. I							
2.70	687	9	5546.3	6216.8	0.0	0.00	. I							
3.00	1365	11	5546.5	6242.0	0.0	0.00	. I							
3.30	2027	15	5546.7	6283.7	0.0	0.00	. I							
3.60	2180	20	5546.9	6335.4	0.0	0.00	. X							
3.90	1955	26	5547.2	6386.1	0.0	0.00	.P I							
4.20	1683	31	5547.4	6430.5	0.0	0.00	.P I							
4.50	1441	36	5547.6	6468.4	0.0	0.00	.P I							
4.80	1248	40	5547.8	6500.8	0.0	0.00	.P I							
5.10	1107	44	5547.9	6528.9	0.0	0.00	.P I							
5.40	1001	47	5548.1	6553.9	0.0	0.00	.P I							
5.70	924	51	5548.2	6576.6	0.0	0.00	.P I							
6.00	874	54	5548.3	6597.6	0.0	0.00	.P I							
6.30	833	57	5548.4	6617.4	0.0	0.00	.P I							
6.60	748	60	5548.5	6635.5	0.0	0.00	.P I							
6.90	589	62	5548.5	6650.6	0.0	0.00	.A I							
7.20	423	64	5548.6	6661.6	0.0	0.00	.A I							
7.50	283	65	5548.6	6668.8	0.0	0.00	.A I							
7.80	180	65	5548.7	6672.9	0.0	0.00	.A I							
8.10	112	66	5548.7	6674.9	0.0	0.00	.AI							
8.40	73	66	5548.7	6675.5	0.0	0.00	.X							
8.70	47	66	5548.7	6675.4	0.0	0.00	.A							
9.00	28	66	5548.7	6674.7	0.0	0.00	.A							
9.30	16	66	5548.7	6673.6	0.0	0.00	.A							
9.60	9	65	5548.7	6672.3	0.0	0.00	.A							
9.90	5	65	5548.6	6670.8	0.0	0.00	.A							
10.20	3	65	5548.6	6669.3	0.0	0.00	.A							
10.50	1	65	5548.6	6667.8	0.0	0.00	.A							
10.80	1	64	5548.6	6666.2	0.0	0.00	.A							
11.10	0	64	5548.6	6664.6	0.0	0.00	.A							
11.40	0	64	5548.6	6663.1	0.0	0.00	.A							
11.70	0	64	5548.6	6661.5	0.0	0.00	.A							
12.00	0	63	5548.6	6660.0	0.0	0.00	.A							
12.30	0	63	5548.6	6658.4	0.0	0.00	.A							
12.60	0	63	5548.6	6656.9	0.0	0.00	.A							
12.90	0	63	5548.6	6655.4	0.0	0.00	.A							
13.20	0	62	5548.6	6653.8	0.0	0.00	.A							
13.50	0	62	5548.6	6652.3	0.0	0.00	.A							
13.80	0	62	5548.5	6650.8	0.0	0.00	.A							
14.10	0	62	5548.5	6649.3	0.0	0.00	.A							
14.40	0	61	5548.5	6647.8	0.0	0.00	.A							
14.70	0	61	5548.5	6646.3	0.0	0.00	.A							
15.00	0	61	5548.5	6644.8	0.0	0.00	.A							
15.30	0	61	5548.5	6643.3	0.0	0.00	.P							
15.60	0	60	5548.5	6641.9	0.0	0.00	.P							
15.90	0	60	5548.5	6640.4	0.0	0.00	.P							
16.20	0	60	5548.5	6638.9	0.0	0.00	.P							
16.50	0	60	5548.5	6637.5	0.0	0.00	.P							
16.80	0	60	5548.5	6636.0	0.0	0.00	.P							
17.10	0	59	5548.5	6634.5	0.0	0.00	.P							
17.40	0	59	5548.5	6633.1	0.0	0.00	.P							
17.70	0	59	5548.4	6631.7	0.0	0.00	.P							
18.00	0	59	5548.4	6630.2	0.0	0.00	.P							
18.30	0	58	5548.4	6628.8	0.0	0.00	.P							
18.60	0	58	5548.4	6627.4	0.0	0.00	.P							
18.90	0	58	5548.4	6626.0	0.0	0.00	.P							
19.20	0	58	5548.4	6624.6	0.0	0.00	.P							
19.50	0	58	5548.4	6623.1	0.0	0.00	.P							
19.80	0	57	5548.4	6621.7	0.0	0.00	.P							
20.10	0	57	5548.4	6620.3	0.0	0.00	.P							
20.40	0	57	5548.4	6619.0	0.0	0.00	.P							
20.70	0	57	5548.4	6617.6	0.0	0.00	.P							
21.00	0	57	5548.4	6616.2	0.0	0.00	.P							
21.30	0	56	5548.4	6614.8	0.0	0.00	.P							
21.60	0	56	5548.4	6613.4	0.0	0.00	.P							
21.90	0	56	5548.3	6612.1	0.0	0.00	.P							
22.20	0	56	5548.3	6610.7	0.0	0.00	.P							
22.50	0	56	5548.3	6609.4	0.0	0.00	.P							
22.80	0	55	5548.3	6608.0	0.0	0.00	.P							
23.10	0	55	5548.3	6606.7	0.0	0.00	.P							
23.40	0	55	5548.3	6605.3	0.0	0.00	.P							
23.70	0	55	5548.3	6604.0	0.0	0.00	.P							
24.00	0	55	5548.3	6602.7	0.0	0.00	.P							
24.30	0	54	5548.3	6601.3	0.0	0.00	.P							
24.60	0	54	5548.3	6600.0	0.0	0.00	.P							
24.90	0	54	5548.3	6598.7	0.0	0.00	.P							
25.20	0	54	5548.3	6597.4	0.0	0.00	.P							
25.50	0	54	5548.3	6596.1	0.0	0.00	.P							

```
25.80     0    53 5548.3  6594.8   0.0   0.00   .P
26.10     0    53 5548.3  6593.5   0.0   0.00   .P
26.40     0    53 5548.2  6592.2   0.0   0.00   .P
26.70     0    53 5548.2  6590.9   0.0   0.00   .P
27.00     0    53 5548.2  6589.6   0.0   0.00   .P
27.30     0    52 5548.2  6588.4   0.0   0.00   .P
27.60     0    52 5548.2  6587.1   0.0   0.00   .P
27.90     0    52 5548.2  6585.8   0.0   0.00   .P
28.20     0    52 5548.2  6584.5   0.0   0.00   .P
28.50     0    52 5548.2  6583.3   0.0   0.00   .P
28.80     0    51 5548.2  6582.0   0.0   0.00   .P
29.10     0    51 5548.2  6580.8   0.0   0.00   .P
29.40     0    51 5548.2  6579.5   0.0   0.00   .P
29.70     0    51 5548.2  6578.3   0.0   0.00   .P
30.00     0    51 5548.2  6577.1   0.0   0.00   .P
30.30     0    51 5548.2  6575.8   0.0   0.00   .P
30.60     0    50 5548.2  6574.6   0.0   0.00   .P
30.90     0    50 5548.2  6573.4   0.0   0.00   .P
31.20     0    50 5548.1  6572.2   0.0   0.00   .P
31.50     0    50 5548.1  6571.0   0.0   0.00   .P
31.80     0    50 5548.1  6569.8   0.0   0.00   .P
32.10     0    50 5548.1  6568.5   0.0   0.00   .P
32.40     0    49 5548.1  6567.3   0.0   0.00   .P
32.70     0    49 5548.1  6566.1   0.0   0.00   .P
33.00     0    49 5548.1  6565.0   0.0   0.00   .P
33.30     0    49 5548.1  6563.8   0.0   0.00   .P
33.60     0    49 5548.1  6562.6   0.0   0.00   .P
33.90     0    49 5548.1  6561.4   0.0   0.00   .P
34.20     0    48 5548.1  6560.2   0.0   0.00   .P
34.50     0    48 5548.1  6559.1   0.0   0.00   .P
34.80     0    48 5548.1  6557.9   0.0   0.00   .P
35.10     0    48 5548.1  6556.7   0.0   0.00   .P
35.40     0    48 5548.1  6555.6   0.0   0.00   .P
35.70     0    48 5548.1  6554.4   0.0   0.00   .P
36.00     0    47 5548.0  6553.3   0.0   0.00   .P
36.30     0    47 5548.0  6552.1   0.0   0.00   .P
36.60     0    47 5548.0  6551.0   0.0   0.00   .P
36.90     0    47 5548.0  6549.8   0.0   0.00   .P
37.20     0    47 5548.0  6548.7   0.0   0.00   .P
37.50     0    47 5548.0  6547.6   0.0   0.00   .P
37.80     0    46 5548.0  6546.4   0.0   0.00   .P
38.10     0    46 5548.0  6545.3   0.0   0.00   .P
38.40     0    46 5548.0  6544.2   0.0   0.00   .P
38.70     0    46 5548.0  6543.1   0.0   0.00   .P
39.00     0    46 5548.0  6542.0   0.0   0.00   .P
39.30     0    46 5548.0  6540.9   0.0   0.00   .P
39.60     0    45 5548.0  6539.8   0.0   0.00   .P
39.90     0    45 5548.0  6538.7   0.0   0.00   .P
40.20     0    45 5548.0  6537.6   0.0   0.00   .P
40.50     0    45 5548.0  6536.5   0.0   0.00   .P
40.80     0    45 5548.0  6535.4   0.0   0.00   .P
41.10     0    45 5548.0  6534.3   0.0   0.00   .P
41.40     0    45 5547.9  6533.2   0.0   0.00   .P
41.70     0    44 5547.9  6532.1   0.0   0.00   .P
42.00     0    44 5547.9  6531.1   0.0   0.00   .P
42.30     0    44 5547.9  6530.0   0.0   0.00   .P
42.60     0    44 5547.9  6528.9   0.0   0.00   .P
42.90     0    44 5547.9  6527.9   0.0   0.00   .P
43.20     0    44 5547.9  6526.8   0.0   0.00   .P
43.50     0    43 5547.9  6525.7   0.0   0.00   .P
43.80     0    43 5547.9  6524.7   0.0   0.00   .P
44.10     0    43 5547.9  6523.6   0.0   0.00   .P
44.40     0    43 5547.9  6522.6   0.0   0.00   .P
44.70     0    43 5547.9  6521.6   0.0   0.00   .P
45.00     0    43 5547.9  6520.5   0.0   0.00   .P
45.30     0    43 5547.9  6519.5   0.0   0.00   .P
45.60     0    42 5547.9  6518.5   0.0   0.00   .P
45.90     0    42 5547.9  6517.4   0.0   0.00   .P
46.20     0    42 5547.9  6516.4   0.0   0.00   .P
46.50     0    42 5547.9  6515.4   0.0   0.00   .P
46.80     0    42 5547.8  6514.4   0.0   0.00   .P
47.10     0    42 5547.8  6513.4   0.0   0.00   .P
47.40     0    42 5547.8  6512.4   0.0   0.00   .P
47.70     0    41 5547.8  6511.4   0.0   0.00   .P
48.00     0    41 5547.8  6510.4   0.0   0.00   .P
48.30     0    41 5547.8  6509.4   0.0   0.00   .P
48.60     0    41 5547.8  6508.4   0.0   0.00   .P
48.90     0    41 5547.8  6507.4   0.0   0.00   .P
49.20     0    41 5547.8  6506.4   0.0   0.00   .P
49.50     0    41 5547.8  6505.4   0.0   0.00   .P
49.80     0    41 5547.8  6504.4   0.0   0.00   .P
50.10     0    40 5547.8  6503.4   0.0   0.00   .P
50.40     0    40 5547.8  6502.5   0.0   0.00   .P
50.70     0    40 5547.8  6501.5   0.0   0.00   .P
51.00     0    40 5547.8  6500.5   0.0   0.00   .P
51.30     0    40 5547.8  6499.6   0.0   0.00   .P
51.60     0    40 5547.8  6498.6   0.0   0.00   .P
51.90     0    40 5547.8  6497.6   0.0   0.00   .P
52.20     0    40 5547.8  6496.7   0.0   0.00   .P
52.50     0    39 5547.8  6495.7   0.0   0.00   .P
52.80     0    39 5547.7  6494.8   0.0   0.00   .P
53.10     0    39 5547.7  6493.8   0.0   0.00   .P
```

```
53.40     0    39 5547.7  6492.9   0.0   0.00   .P
53.70     0    39 5547.7  6491.9   0.0   0.00   .P
54.00     0    39 5547.7  6491.0   0.0   0.00   .P
54.30     0    39 5547.7  6490.1   0.0   0.00   .P
54.60     0    39 5547.7  6489.1   0.0   0.00   .P
54.90     0    38 5547.7  6488.2   0.0   0.00   .P
55.20     0    38 5547.7  6487.3   0.0   0.00   .P
55.50     0    38 5547.7  6486.4   0.0   0.00   .P
55.80     0    38 5547.7  6485.4   0.0   0.00   .P
56.10     0    38 5547.7  6484.5   0.0   0.00   .P
56.40     0    38 5547.7  6483.6   0.0   0.00   .P
56.70     0    38 5547.7  6482.7   0.0   0.00   .P
57.00     0    38 5547.7  6481.8   0.0   0.00   .P
57.30     0    37 5547.7  6480.9   0.0   0.00   .P
57.60     0    37 5547.7  6480.0   0.0   0.00   .P
57.90     0    37 5547.7  6479.1   0.0   0.00   .P
58.20     0    37 5547.7  6478.2   0.0   0.00   .P
58.50     0    37 5547.7  6477.3   0.0   0.00   .P
58.80     0    37 5547.7  6476.4   0.0   0.00   .P
59.10     0    37 5547.7  6475.5   0.0   0.00   .P
59.40     0    37 5547.6  6474.6   0.0   0.00   .P
59.70     0    37 5547.6  6473.7   0.0   0.00   .P
60.00     0    36 5547.6  6472.9   0.0   0.00   .P
60.30     0    36 5547.6  6472.0   0.0   0.00   .P
60.60     0    36 5547.6  6471.1   0.0   0.00   .P
60.90     0    36 5547.6  6470.2   0.0   0.00   .P
61.20     0    36 5547.6  6469.4   0.0   0.00   .P
61.50     0    36 5547.6  6468.5   0.0   0.00   .P
61.80     0    36 5547.6  6467.7   0.0   0.00   .P
62.10     0    36 5547.6  6466.8   0.0   0.00   .P
62.40     0    35 5547.6  6465.9   0.0   0.00   .P
62.70     0    35 5547.6  6465.1   0.0   0.00   .P
63.00     0    35 5547.6  6464.2   0.0   0.00   .P
63.30     0    35 5547.6  6463.4   0.0   0.00   .P
63.60     0    35 5547.6  6462.5   0.0   0.00   .P
63.90     0    35 5547.6  6461.7   0.0   0.00   .P
64.20     0    35 5547.6  6460.9   0.0   0.00   .P
64.50     0    35 5547.6  6460.0   0.0   0.00   .P
64.80     0    35 5547.6  6459.2   0.0   0.00   .P
65.10     0    34 5547.6  6458.4   0.0   0.00   .P
65.40     0    34 5547.6  6457.5   0.0   0.00   .P
65.70     0    34 5547.6  6456.7   0.0   0.00   .P
66.00     0    34 5547.5  6455.9   0.0   0.00   .P
66.30     0    34 5547.5  6455.1   0.0   0.00   .P
66.60     0    34 5547.5  6454.2   0.0   0.00   .P
66.90     0    34 5547.5  6453.4   0.0   0.00   .P
67.20     0    34 5547.5  6452.6   0.0   0.00   .P
67.50     0    34 5547.5  6451.8   0.0   0.00   .P
67.80     0    34 5547.5  6451.0   0.0   0.00   .P
68.10     0    33 5547.5  6450.2   0.0   0.00   .P
68.40     0    33 5547.5  6449.4   0.0   0.00   .P
68.70     0    33 5547.5  6448.6   0.0   0.00   .P
69.00     0    33 5547.5  6447.8   0.0   0.00   .P
69.30     0    33 5547.5  6447.0   0.0   0.00   .P
69.60     0    33 5547.5  6446.2   0.0   0.00   .P
69.90     0    33 5547.5  6445.4   0.0   0.00   .P
70.20     0    33 5547.5  6444.6   0.0   0.00   .P
70.50     0    33 5547.5  6443.8   0.0   0.00   .P
70.80     0    33 5547.5  6443.1   0.0   0.00   .P
71.10     0    32 5547.5  6442.3   0.0   0.00   .P
71.40     0    32 5547.5  6441.5   0.0   0.00   .P
71.70     0    32 5547.5  6440.7   0.0   0.00   .P
72.00     0    32 5547.5  6439.9   0.0   0.00   .P
72.30     0    32 5547.5  6439.2   0.0   0.00   .P
72.60     0    32 5547.5  6438.4   0.0   0.00   .P
72.90     0    32 5547.5  6437.6   0.0   0.00   .P
73.20     0    32 5547.5  6436.9   0.0   0.00   .P
73.50     0    32 5547.4  6436.1   0.0   0.00   .P
73.80     0    32 5547.4  6435.4   0.0   0.00   .P
74.10     0    31 5547.4  6434.6   0.0   0.00   .P
74.40     0    31 5547.4  6433.8   0.0   0.00   .P
74.70     0    31 5547.4  6433.1   0.0   0.00   .P
75.00     0    31 5547.4  6432.3   0.0   0.00   .P
75.30     0    31 5547.4  6431.6   0.0   0.00   .P
75.60     0    31 5547.4  6430.8   0.0   0.00   .P
75.90     0    31 5547.4  6430.1   0.0   0.00   .P
76.20     0    31 5547.4  6429.4   0.0   0.00   .P
76.50     0    31 5547.4  6428.6   0.0   0.00   .P
76.80     0    31 5547.4  6427.9   0.0   0.00   .P
77.10     0    31 5547.4  6427.1   0.0   0.00   .P
77.40     0    31 5547.4  6426.4   0.0   0.00   .P
77.70     0    30 5547.4  6425.7   0.0   0.00   .P
78.00     0    30 5547.4  6425.0   0.0   0.00   .P
78.30     0    30 5547.4  6424.2   0.0   0.00   .P
78.60     0    30 5547.4  6423.5   0.0   0.00   .P
78.90     0    30 5547.4  6422.8   0.0   0.00   .P
79.20     0    30 5547.4  6422.1   0.0   0.00   .P
79.50     0    30 5547.4  6421.3   0.0   0.00   .P
79.80     0    30 5547.4  6420.6   0.0   0.00   .P
80.10     0    30 5547.4  6419.9   0.0   0.00   .P
80.40     0    30 5547.4  6419.2   0.0   0.00   .P
80.70     0    30 5547.4  6418.5   0.0   0.00   .P
```

```
 81.00     0    29 5547.4  6417.8   0.0   0.00   .P
 81.30     0    29 5547.4  6417.1   0.0   0.00   .P
 81.60     0    29 5547.3  6416.4   0.0   0.00   .P
 81.90     0    29 5547.3  6415.7   0.0   0.00   .P
 82.20     0    29 5547.3  6415.0   0.0   0.00   .P
 82.50     0    29 5547.3  6414.3   0.0   0.00   .P
 82.80     0    29 5547.3  6413.6   0.0   0.00   .P
 83.10     0    29 5547.3  6412.9   0.0   0.00   .P
 83.40     0    29 5547.3  6412.2   0.0   0.00   .P
 83.70     0    29 5547.3  6411.5   0.0   0.00   .P
 84.00     0    29 5547.3  6410.8   0.0   0.00   .P
 84.30     0    29 5547.3  6410.2   0.0   0.00   .P
 84.60     0    28 5547.3  6409.5   0.0   0.00   .P
 84.90     0    28 5547.3  6408.8   0.0   0.00   .P
 85.20     0    28 5547.3  6408.1   0.0   0.00   .P
 85.50     0    28 5547.3  6407.4   0.0   0.00   .P
 85.80     0    28 5547.3  6406.8   0.0   0.00   .P
 86.10     0    28 5547.3  6406.1   0.0   0.00   .P
 86.40     0    28 5547.3  6405.4   0.0   0.00   .P
 86.70     0    28 5547.3  6404.8   0.0   0.00   .P
 87.00     0    28 5547.3  6404.1   0.0   0.00   .P
 87.30     0    28 5547.3  6403.4   0.0   0.00   .P
 87.60     0    28 5547.3  6402.8   0.0   0.00   .P
 87.90     0    28 5547.3  6402.1   0.0   0.00   .P
 88.20     0    27 5547.3  6401.4   0.0   0.00   .P
 88.50     0    27 5547.3  6400.8   0.0   0.00   .P
 88.80     0    27 5547.3  6400.1   0.0   0.00   .P
 89.10     0    27 5547.3  6399.5   0.0   0.00   .P
 89.40     0    27 5547.3  6398.8   0.0   0.00   .P
 89.70     0    27 5547.3  6398.2   0.0   0.00   .P
 90.00     0    27 5547.3  6397.5   0.0   0.00   .P
 90.30     0    27 5547.2  6396.9   0.0   0.00   .P
 90.60     0    27 5547.2  6396.3   0.0   0.00   .P
 90.90     0    27 5547.2  6395.6   0.0   0.00   .P
 91.20     0    27 5547.2  6395.0   0.0   0.00   .P
 91.50     0    27 5547.2  6394.3   0.0   0.00   .P
 91.80     0    27 5547.2  6393.7   0.0   0.00   .P
 92.10     0    26 5547.2  6393.1   0.0   0.00   .P
 92.40     0    26 5547.2  6392.4   0.0   0.00   .P
 92.70     0    26 5547.2  6391.8   0.0   0.00   .P
 93.00     0    26 5547.2  6391.2   0.0   0.00   .P
 93.30     0    26 5547.2  6390.6   0.0   0.00   .P
 93.60     0    26 5547.2  6389.9   0.0   0.00   .P
 93.90     0    26 5547.2  6389.3   0.0   0.00   .P
 94.20     0    26 5547.2  6388.7   0.0   0.00   .P
 94.50     0    26 5547.2  6388.1   0.0   0.00   .P
 94.80     0    26 5547.2  6387.5   0.0   0.00   .P
 95.10     0    26 5547.2  6386.9   0.0   0.00   .P
 95.40     0    26 5547.2  6386.2   0.0   0.00   .P
 95.70     0    26 5547.2  6385.6   0.0   0.00   .P
 96.00     0    26 5547.2  6385.0   0.0   0.00   .P
 96.30     0    25 5547.2  6384.4   0.0   0.00   .P
 96.60     0    25 5547.2  6383.8   0.0   0.00   .P
 96.90     0    25 5547.2  6383.2   0.0   0.00   .P
 97.20     0    25 5547.2  6382.6   0.0   0.00   .P
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.      500.     1000.     1500.     2000.     2500.     3000.     3500.
        END NRCS-SDH   PLOT

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH          30.0   5552.00    7347.2       0.0      3.49     702.7

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =     126.7     432.6     559.2

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     1.79      7.21     0.008     0.011

          INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
           (The auxiliary spillway began flow at time =    3.3 hours
            and peaked at time =    7.5 hours.)


            REACH   3: FROM STATION    155. TO    237. ON   38.5% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =    4.2 hours.


            REACH   4: FROM STATION    237. TO    600. ON    9.9% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =    4.2 hours.


            REACH   5: FROM STATION    600. TO   1049. ON    6.3% SLOPE.
               Non-vegetated conditions implied: flow concentration
                assumed with minimal flow: Time =    4.2 hours.


            REACH   6: FROM STATION   1049. TO   1170. ON   15.1% SLOPE.
```

Non-vegetated conditions implied: flow concentration
assumed with minimal flow: Time = 4.2 hours.

INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

The most upstream headcut began at station 155.
and progressed upstream to station 153.
The final height of the headcut was 6.9 ft.

The deepest headcut is also the furthest upstream.

THE HYDROGRAPH WAS NOT ADJUSTED FOR THE EFFECTS OF EROSION.

	DURATION FLOW HRS	ATTACK OE/B ACFT/FT	DIST. FROM MOST U/S HEADCUT TO U/S EDGE AUX. CREST, FT
AUXILIARY SPILLWAY ---	61.5	12.1	78.

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY= 24.1 FT/SEC
EXIT SLOPE = 0.385 FT/FT
FLOW DEPTH = 0.6 FT

>>>>> MINIMUM FLOW IN AUXILIARY SPILLWAY FROM TR60 (510. CFS).

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
MIN. AUX.	30.0	5552.28	7405.2	0.0	3.77	760.7

	Q-PS	Q-AUX.	Q-TOT.
PEAK - CFS DISCHARGE =	126.9	510.4	637.3

	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
AUXILIARY SPILLWAY ---	1.99	7.57	0.008	0.011

PLOT NRCS-FBH 1 IN = 1000. CFS EXIT SLOPE = 0.385

0. 1000. 2000. 3000. 4000. 5000. 6000. 7000.

Time	Qin	Qout	Elev	Vol	Area	ExtVel	Plot
0.90	0	8	5546.3	6203.0	0.0	0.00	.
1.20	8	8	5546.3	6203.0	0.0	0.00	.
1.50	43	8	5546.3	6203.5	0.0	0.00	.
1.80	129	8	5546.3	6205.4	0.0	0.00	.I
2.10	306	8	5546.3	6210.6	0.0	0.00	. I
2.40	824	9	5546.4	6224.4	0.0	0.00	. I
2.70	2325	13	5546.6	6263.1	0.0	0.00	. I
3.00	4867	22	5547.0	6351.9	0.0	0.00	. I
3.30	6395	39	5547.7	6490.7	0.0	0.00	. X
3.60	6123	61	5548.5	6644.7	0.0	0.00	.A I
3.90	5053	86	5549.2	6781.4	0.0	3.25	.A I
4.20	4063	129	5549.8	6891.7	0.0	8.04	.A I
4.50	3364	196	5550.2	6979.8	0.0	12.35	. A I
4.80	2855	250	5550.6	7051.3	0.0	14.90	. A I
5.10	2500	302	5550.9	7110.9	0.0	17.07	. A I
5.40	2228	349	5551.1	7161.4	0.0	18.71	. A I
5.70	2039	394	5551.3	7205.1	0.0	20.09	. A I
6.00	1913	436	5551.5	7243.8	0.0	21.24	. A I
6.30	1819	477	5551.7	7278.8	0.0	22.29	. A I
6.60	1614	513	5551.8	7309.0	0.0	23.13	. A I
6.90	1240	540	5551.9	7331.4	0.0	23.72	. A I
7.20	851	555	5552.0	7343.7	0.0	24.05	. A I
7.50	540	559	5552.0	7347.2	0.0	24.15	. IX
7.80	332	555	5552.0	7344.1	0.0	24.06	. I A
8.10	201	546	5552.0	7337.1	0.0	23.87	. I A
8.40	113	535	5551.9	7327.6	0.0	23.62	.I A
8.70	62	522	5551.9	7316.6	0.0	23.34	.I A
9.00	34	508	5551.8	7305.1	0.0	23.02	. A
9.30	18	495	5551.7	7293.3	0.0	22.70	. A
9.60	9	481	5551.7	7281.5	0.0	22.37	. A
9.90	5	467	5551.6	7269.9	0.0	22.03	. A
10.20	2	453	5551.6	7258.6	0.0	21.70	. A
10.50	1	440	5551.5	7247.6	0.0	21.36	. A
10.80	0	428	5551.5	7236.8	0.0	21.02	. A
11.10	0	416	5551.4	7226.4	0.0	20.71	. A
11.40	0	406	5551.4	7216.2	0.0	20.42	. A
11.70	0	395	5551.3	7206.3	0.0	20.13	. A
12.00	0	385	5551.3	7196.7	0.0	19.84	. A
12.30	0	376	5551.2	7187.3	0.0	19.55	. A
12.60	0	366	5551.2	7178.1	0.0	19.26	. A
12.90	0	357	5551.1	7169.2	0.0	18.97	. A
13.20	0	348	5551.1	7160.4	0.0	18.68	. A
13.50	0	339	5551.1	7152.0	0.0	18.39	. A
13.80	0	331	5551.0	7143.7	0.0	18.11	. A
14.10	0	324	5551.0	7135.6	0.0	17.86	. A
14.40	0	317	5550.9	7127.7	0.0	17.62	. A
14.70	0	310	5550.9	7119.9	0.0	17.37	. A
15.00	0	303	5550.9	7112.4	0.0	17.12	. A
15.30	0	297	5550.8	7104.9	0.0	16.88	. A
15.60	0	290	5550.8	7097.7	0.0	16.63	. A
15.90	0	284	5550.8	7090.6	0.0	16.38	. A

```
16.20     0   278 5550.7  7083.7   0.0  16.13   .  A
16.50     0   272 5550.7  7076.9   0.0  15.88   .  A
16.80     0   266 5550.7  7070.2   0.0  15.63   .  A
17.10     0   260 5550.6  7063.7   0.0  15.38   .  A
17.40     0   255 5550.6  7057.3   0.0  15.13   .  A
17.70     0   250 5550.6  7051.1   0.0  14.89   . A
18.00     0   245 5550.5  7045.0   0.0  14.65   . A
18.30     0   240 5550.5  7039.0   0.0  14.41   . A
18.60     0   235 5550.5  7033.2   0.0  14.20   . A
18.90     0   231 5550.4  7027.4   0.0  14.00   . A
19.20     0   228 5550.4  7021.7   0.0  13.79   . A
19.50     0   224 5550.4  7016.2   0.0  13.59   . A
19.80     0   220 5550.4  7010.7   0.0  13.41   . A
20.10     0   216 5550.3  7005.3   0.0  13.24   . A
20.40     0   212 5550.3  7000.1   0.0  13.06   . A
20.70     0   208 5550.3  6994.9   0.0  12.89   . A
21.00     0   204 5550.3  6989.8   0.0  12.71   . A
21.30     0   200 5550.2  6984.8   0.0  12.54   . A
21.60     0   196 5550.2  6979.9   0.0  12.36   . A
21.90     0   193 5550.2  6975.2   0.0  12.18   . A
22.20     0   189 5550.2  6970.5   0.0  12.01   . A
22.50     0   185 5550.1  6965.8   0.0  11.83   . A
22.80     0   182 5550.1  6961.3   0.0  11.65   . A
23.10     0   179 5550.1  6956.9   0.0  11.46   . A
23.40     0   175 5550.1  6952.5   0.0  11.28   . A
23.70     0   172 5550.1  6948.2   0.0  11.10   . A
24.00     0   169 5550.0  6944.0   0.0  10.91   . A
24.30     0   166 5550.0  6939.9   0.0  10.73   . A
24.60     0   163 5550.0  6935.9   0.0  10.54   . A
24.90     0   159 5550.0  6931.9   0.0  10.35   . A
25.20     0   157 5550.0  6928.0   0.0  10.16   . A
25.50     0   154 5549.9  6924.2   0.0   9.97   . A
25.80     0   151 5549.9  6920.4   0.0   9.78   . A
26.10     0   148 5549.9  6916.8   0.0   9.58   .A
26.40     0   145 5549.9  6913.1   0.0   9.38   .A
26.70     0   142 5549.9  6909.6   0.0   9.18   .A
27.00     0   140 5549.9  6906.1   0.0   8.98   .A
27.30     0   137 5549.8  6902.7   0.0   8.77   .A
27.60     0   135 5549.8  6899.4   0.0   8.56   .A
27.90     0   132 5549.8  6896.1   0.0   8.34   .A
28.20     0   130 5549.8  6892.9   0.0   8.12   .A
28.50     0   127 5549.8  6889.7   0.0   7.89   .A
28.80     0   126 5549.8  6886.6   0.0   7.77   .A
29.10     0   125 5549.7  6883.5   0.0   7.69   .A
29.40     0   123 5549.7  6880.5   0.0   7.61   .A
29.70     0   122 5549.7  6877.5   0.0   7.53   .A
30.00     0   121 5549.7  6874.5   0.0   7.46   .A
30.30     0   120 5549.7  6871.5   0.0   7.38   .A
30.60     0   119 5549.7  6868.6   0.0   7.30   .A
30.90     0   118 5549.6  6865.7   0.0   7.22   .A
31.20     0   117 5549.6  6862.8   0.0   7.13   .A
31.50     0   116 5549.6  6859.9   0.0   7.05   .A
31.80     0   115 5549.6  6857.1   0.0   6.97   .A
32.10     0   114 5549.6  6854.3   0.0   6.88   .A
32.40     0   113 5549.6  6851.5   0.0   6.80   .A
32.70     0   112 5549.6  6848.7   0.0   6.71   .A
33.00     0   110 5549.5  6846.0   0.0   6.62   .A
33.30     0   109 5549.5  6843.3   0.0   6.54   .A
33.60     0   108 5549.5  6840.6   0.0   6.45   .A
33.90     0   107 5549.5  6838.0   0.0   6.36   .A
34.20     0   107 5549.5  6835.4   0.0   6.27   .A
34.50     0   106 5549.5  6832.8   0.0   6.17   .A
34.80     0   105 5549.5  6830.2   0.0   6.08   .A
35.10     0   104 5549.5  6827.6   0.0   5.98   .A
35.40     0   103 5549.4  6825.1   0.0   5.88   .A
35.70     0   102 5549.4  6822.6   0.0   5.78   .A
36.00     0   101 5549.4  6820.1   0.0   5.68   .A
36.30     0   100 5549.4  6817.6   0.0   5.58   .A
36.60     0    99 5549.4  6815.2   0.0   5.47   .A
36.90     0    98 5549.4  6812.8   0.0   5.36   .A
37.20     0    97 5549.4  6810.4   0.0   5.25   .A
37.50     0    96 5549.4  6808.0   0.0   5.14   .A
37.80     0    95 5549.3  6805.7   0.0   5.02   .A
38.10     0    95 5549.3  6803.3   0.0   4.90   .A
38.40     0    94 5549.3  6801.0   0.0   4.78   .A
38.70     0    93 5549.3  6798.7   0.0   4.65   .A
39.00     0    92 5549.3  6796.5   0.0   4.52   .A
39.30     0    91 5549.3  6794.2   0.0   4.39   .A
39.60     0    90 5549.3  6792.0   0.0   4.22   .A
39.90     0    89 5549.3  6789.8   0.0   4.04   .A
40.20     0    89 5549.2  6787.6   0.0   3.85   .A
40.50     0    88 5549.2  6785.4   0.0   3.66   .A
40.80     0    87 5549.2  6783.3   0.0   3.45   .A
41.10     0    86 5549.2  6781.2   0.0   3.23   .A
41.40     0    85 5549.2  6779.1   0.0   2.99   .A
41.70     0    85 5549.2  6777.0   0.0   2.74   .A
42.00     0    84 5549.2  6774.9   0.0   2.46   .A
42.30     0    83 5549.2  6772.9   0.0   2.14   .A
42.60     0    82 5549.2  6770.9   0.0   1.77   .A
42.90     0    82 5549.2  6768.9   0.0   1.29   .A
43.20     0    81 5549.1  6766.9   0.0   0.00   .A
43.50     0    80 5549.1  6764.9   0.0   0.00   .A
```

43.80	0	80	5549.1	6762.9	0.0	0.00	.A
44.10	0	80	5549.1	6761.0	0.0	0.00	.A
44.40	0	79	5549.1	6759.0	0.0	0.00	.A
44.70	0	79	5549.1	6757.1	0.0	0.00	.A
45.00	0	79	5549.1	6755.1	0.0	0.00	.A
45.30	0	79	5549.1	6753.2	0.0	0.00	.A
45.60	0	78	5549.1	6751.3	0.0	0.00	.A
45.90	0	78	5549.1	6749.4	0.0	0.00	.A
46.20	0	78	5549.0	6747.5	0.0	0.00	.A
46.50	0	77	5549.0	6745.6	0.0	0.00	.A
46.80	0	77	5549.0	6743.7	0.0	0.00	.A
47.10	0	77	5549.0	6741.8	0.0	0.00	.A
47.40	0	76	5549.0	6740.0	0.0	0.00	.A
47.70	0	76	5549.0	6738.1	0.0	0.00	.A
48.00	0	76	5549.0	6736.2	0.0	0.00	.A
48.30	0	75	5549.0	6734.4	0.0	0.00	.A
48.60	0	75	5549.0	6732.5	0.0	0.00	.A
48.90	0	75	5549.0	6730.7	0.0	0.00	.A
49.20	0	75	5548.9	6728.9	0.0	0.00	.A
49.50	0	74	5548.9	6727.1	0.0	0.00	.A
49.80	0	74	5548.9	6725.2	0.0	0.00	.A
50.10	0	74	5548.9	6723.4	0.0	0.00	.A
50.40	0	73	5548.9	6721.6	0.0	0.00	.A
50.70	0	73	5548.9	6719.8	0.0	0.00	.A
51.00	0	73	5548.9	6718.1	0.0	0.00	.A
51.30	0	73	5548.9	6716.3	0.0	0.00	.A
51.60	0	72	5548.9	6714.5	0.0	0.00	.A
51.90	0	72	5548.9	6712.8	0.0	0.00	.A
52.20	0	72	5548.9	6711.0	0.0	0.00	.A
52.50	0	71	5548.8	6709.2	0.0	0.00	.A
52.80	0	71	5548.8	6707.5	0.0	0.00	.A
53.10	0	71	5548.8	6705.8	0.0	0.00	.A
53.40	0	71	5548.8	6704.0	0.0	0.00	.A
53.70	0	70	5548.8	6702.3	0.0	0.00	.A
54.00	0	70	5548.8	6700.6	0.0	0.00	.A
54.30	0	70	5548.8	6698.9	0.0	0.00	.A
54.60	0	69	5548.8	6697.2	0.0	0.00	.A
54.90	0	69	5548.8	6695.5	0.0	0.00	.A
55.20	0	69	5548.8	6693.8	0.0	0.00	.A
55.50	0	69	5548.8	6692.1	0.0	0.00	.A
55.80	0	68	5548.8	6690.5	0.0	0.00	.A
56.10	0	68	5548.7	6688.8	0.0	0.00	.A
56.40	0	68	5548.7	6687.1	0.0	0.00	.A
56.70	0	68	5548.7	6685.5	0.0	0.00	.A
57.00	0	67	5548.7	6683.9	0.0	0.00	.A
57.30	0	67	5548.7	6682.2	0.0	0.00	.A
57.60	0	67	5548.7	6680.6	0.0	0.00	.A
57.90	0	66	5548.7	6679.0	0.0	0.00	.A
58.20	0	66	5548.7	6677.3	0.0	0.00	.A
58.50	0	66	5548.7	6675.7	0.0	0.00	.A
58.80	0	66	5548.7	6674.1	0.0	0.00	.A
59.10	0	65	5548.7	6672.5	0.0	0.00	.A
59.40	0	65	5548.6	6670.9	0.0	0.00	.A
59.70	0	65	5548.6	6669.3	0.0	0.00	.A
60.00	0	65	5548.6	6667.8	0.0	0.00	.A
60.30	0	64	5548.6	6666.2	0.0	0.00	.A
60.60	0	64	5548.6	6664.6	0.0	0.00	.A
60.90	0	64	5548.6	6663.0	0.0	0.00	.A
61.20	0	64	5548.6	6661.5	0.0	0.00	.A
61.50	0	63	5548.6	6659.9	0.0	0.00	.A
61.80	0	63	5548.6	6658.4	0.0	0.00	.A
62.10	0	63	5548.6	6656.9	0.0	0.00	.A
62.40	0	63	5548.6	6655.3	0.0	0.00	.A
62.70	0	62	5548.6	6653.8	0.0	0.00	.A
63.00	0	62	5548.6	6652.3	0.0	0.00	.A
63.30	0	62	5548.5	6650.8	0.0	0.00	.A
63.60	0	62	5548.5	6649.3	0.0	0.00	.A
63.90	0	61	5548.5	6647.8	0.0	0.00	.A
64.20	0	61	5548.5	6646.3	0.0	0.00	.A
64.50	0	61	5548.5	6644.8	0.0	0.00	.A
64.80	0	61	5548.5	6643.3	0.0	0.00	.P
65.10	0	60	5548.5	6641.8	0.0	0.00	.P
65.40	0	60	5548.5	6640.4	0.0	0.00	.P
65.70	0	60	5548.5	6638.9	0.0	0.00	.P
66.00	0	60	5548.5	6637.4	0.0	0.00	.P
66.30	0	60	5548.5	6636.0	0.0	0.00	.P
66.60	0	59	5548.5	6634.5	0.0	0.00	.P
66.90	0	59	5548.5	6633.1	0.0	0.00	.P
67.20	0	59	5548.4	6631.6	0.0	0.00	.P
67.50	0	59	5548.4	6630.2	0.0	0.00	.P
67.80	0	58	5548.4	6628.8	0.0	0.00	.P
68.10	0	58	5548.4	6627.4	0.0	0.00	.P
68.40	0	58	5548.4	6625.9	0.0	0.00	.P
68.70	0	58	5548.4	6624.5	0.0	0.00	.P
69.00	0	58	5548.4	6623.1	0.0	0.00	.P
69.30	0	57	5548.4	6621.7	0.0	0.00	.P
69.60	0	57	5548.4	6620.3	0.0	0.00	.P
69.90	0	57	5548.4	6618.9	0.0	0.00	.P
70.20	0	57	5548.4	6617.6	0.0	0.00	.P
70.50	0	57	5548.4	6616.2	0.0	0.00	.P
70.80	0	56	5548.4	6614.8	0.0	0.00	.P
71.10	0	56	5548.4	6613.4	0.0	0.00	.P

```
 71.40     0    56 5548.3  6612.1   0.0   0.00   .P
 71.70     0    56 5548.3  6610.7   0.0   0.00   .P
 Time    Qin  Qout   Elev    Vol   Area  ExtVel  I         I         I         I         I         I         I         I
                                                 0.     1000.     2000.     3000.     4000.     5000.     6000.     7000.
        END NRCS-FBH   PLOT
 ------------------------------------------------------------------------------

 Inflow Hyd 1 PSH-Peak =         39.99 CFS  at  143.00 hrs.,  Location Point

 Inflow Hyd 1 SDH-Peak =         65.90 CFS  at    8.10 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =        559.24 CFS  at    7.20 hrs.,  Location Point
HYDOUT   1     STR1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 COVRES        COV RES

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       3 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

 ******************************************************************************



 SITES.....COMPUTATIONS COMPLETE


                              SUMMARY TABLE  1          SITES VERSION 2005.1.8
                             ----------------               DATED 01/01/2005


 WATERSHED ID                        RUN DATE                          RUN TIME
 ------------                        --------                          --------
 COVRES                             08/20/2020                         06:12:11

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
        -----   ----   --------   -----   ----   -------   -----   -----
        STR1     CR        4.74      0.   0.00      4.74    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.    MAX.    EMB.  INTEGR.*  EXIT*    TYPE
  NO.  WIDTH    ELEV    WIDTH   HP     ELEV    VOL.   DIST.     VEL.     HYD
      (IN/FT)   (FT)     (FT)  (FT)    (FT)    (CY)   (FT)   (FT/SEC)
 ----  -----  -------  ------  ----  -------  -------  -----  ------  ---------
    1   30.0   5548.5    30.0   3.8   5552.3       0.    78.    24.1  MIN. AUX.


 *  INTEGRITY DIST. AND EXIT VEL. ARE BASED ON THE ROUTED HYDROGRAPH
    AND WILL NOT RELATE TO THE MAX. ELEV. (TOP OF DAM),
    WHICH IS SET BY MINIMUM DESIGN CRITERIA.



 SITES.......SUMMARY TABLE 1 COMPLETED.


                   NRCS  SITES    VERSION 2005.1.8  ,01/01/2005
                           COVRES   FILES

INPUT  = c:\USDA\SITES\080620-PSH-ASHL-FBHL.d2c
OUTPUT = c:\USDA\SITES\080620-PSH-ASHL-FBHL.OUT
         DATED 08/20/2020 06:12:11

                         GRAPHICS FILES GENERATED

OPTION "L"  = c:\USDA\SITES\080620-PSH-ASHL-FBHL.DRG DATED 08/20/2020 06:12:11

OPTION "P"  = c:\USDA\SITES\080620-PSH-ASHL-FBHL.DHY DATED 08/20/2020 06:12:11

OPTION "E"  = c:\USDA\SITES\080620-PSH-ASHL-FBHL.DEM DATED 08/20/2020 06:12:11

AUX.GRAPHICS = c:\USDA\SITES\080620-PSH-ASHL-FBHL.DG* DATED 08/20/2020 06:12:11
```

Breach Analysis

Sunny Day

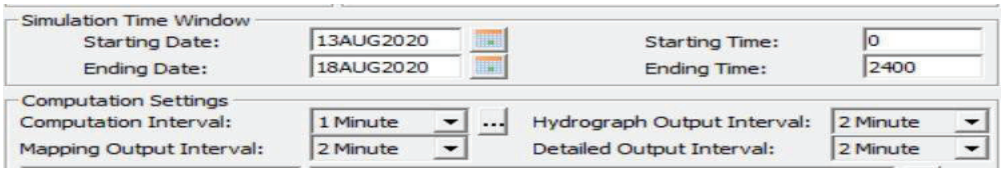
Unsteady Flow Data

	Storage/2D Flow Areas		Boundary Condition
1	CoveReservoir		Flow Hydrograph
2	Downstream2D	BCLine: Downstream	
3	Downstream2D	BCLine: Upstream	
4	Downstream2D	BCLine: DownStream	Normal Depth

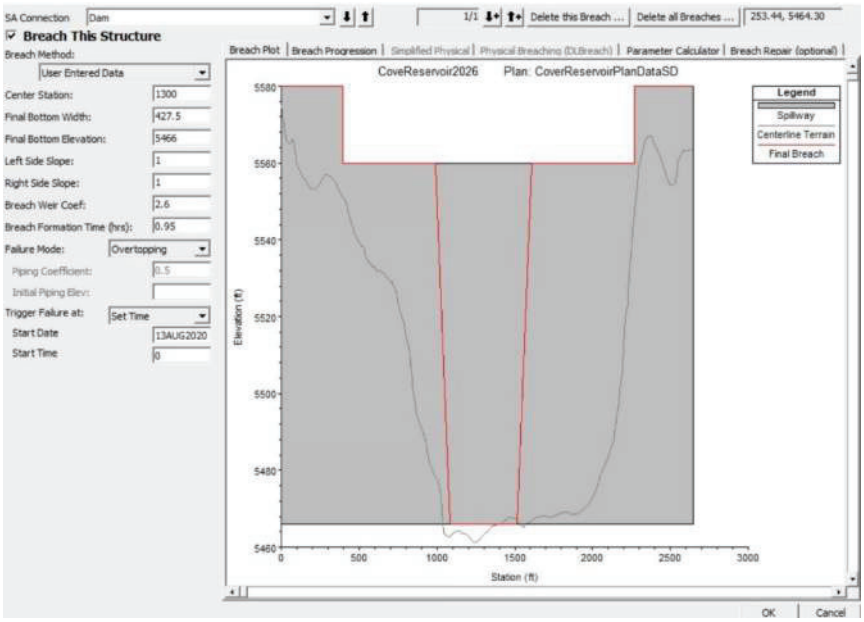
Flow Hydrograph = No Storm

	SA/2D/IC Point	Initial Elevation
1	SA: CoveReservoir	5550
2	2D: Downstream2D	

Unsteady Flow Analysis



Storage Area Connection Breach Data



Rainy Day

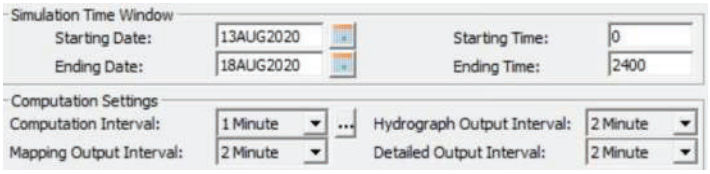
Unsteady Flow Data

	Storage/2D Flow Areas		Boundary Condition
1	CoveReservoir		Flow Hydrograph
2	Downstream2D	BCLine: DownStream	
3	Downstream2D	BCLine: Upstream	Flow Hydrograph
4	Downstream2D	BCLine: Downstream	Normal Depth

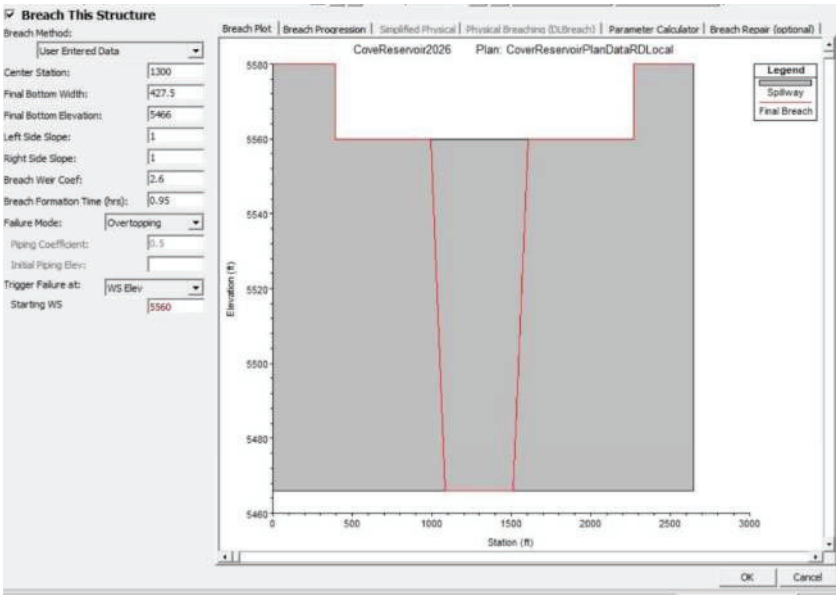
Flow Hydrograph = FBH-L

	SA/2D/IC Point	Initial Elevation
1	SA: CoveReservoir	5550
2	2D: Downstream2D	

Unsteady Flow Analysis



Storage Area Connection Breach Data



Water Model Report: Cove Reservoir
Addendum #1
Design Report

July 21, 2026

The following additional information and clarifications shall be incorporated into the design report for the *Water Model Report: Cove Reservoir – Updated July 2026.*

Item #1:

Additional analysis was performed to compare pre- and post-reservoir river flows in the Virgin River to the USGS gauge records at Springdale and Mount Carmel. The Springdale analysis utilized the USGS 09405500 North Fork Virgin River Near Springdale, Utah gauge, and the Mount Carmel analysis utilized the USGS 09404700 East Fork Virgin River Near Mount Carmel Junction, Utah gauge. Section **3: Flow Regime Comparison, Appendix C: Flow Regime Comparisons Calcs,** & **Appendix D: Model Output Without WCWCD Delivery** has been added to the report to document this analysis.

Item #2:

It was identified that the original water model did not reflect the flow diverted by the MCIC in the final modeled river flows. The model results in **Appendix A** have been updated along with the values reports in **Section 2: Water Model, Section D: Downstream River Changes (Pages 12-15)**.

Item #3

Paragraph 3 on page 10 has been changed to read the following:

"The GIC, OIC, and MCIC will divert water as required by the consumptive use of the crop being irrigated with sprinkler **and some flood** irrigation methods. This results in a more efficient use of the water requiring less water to be diverted. However, the depletion of water remains the same according to the Division of Water Rights. The benefit of the reservoir is supplying water to the agricultural areas when it is needed thus providing higher crop yields."

End of Addendum #1

Updated August 2026

Table of Contents

Table of Contents **1**
Section 1 Introduction **2**
Section 2 Water Model **4**
A. Model Constraints **4**
a. Water Gauge Flow Data 4
b. Water Rights 5
c. Irrigation Efficiency 7
d. Instream River Flows 8
e. Evaporation and Seepage 8
B. Model Results **9**
a. Reservoir Diversion 9
b. Local Irrigation Companies 10
C. Washington County Water Conservancy District **11**
D. Downstream River Changes **12**
Section 3 Flow Regime Comparison **16**
A. Purpose **16**
B. Objective **16**
C. Methodology **16**
D. Assumptions and Limitations **17**
E. Summary of Findings **18**
a. Mount Carmel Gauge 18
b. Springdale Gauge 18
F. Conclusions **19**
G. References **19**
Appendix A. Model Output
Appendix B. Irrigation Company Historical Data
Appendix C. Flow Regime Comparisons Calcs
Appendix D. Model Output Without WCWD Delivery

Section 1 Introduction

The Kane County Water Conservancy District (KCWCD) and its partners are proposing to install a new reservoir known as Cove Reservoir with associated facilities located near Orderville, Utah. The reservoir is a joint venture between KCWCD, the Washington County Water Conservancy District (WCWCD), and local irrigation companies. The system will store water rights from local irrigation companies and the WCWCD for use throughout the year. This reservoir was contemplated as part of the Zion National Park Water Rights Settlement Agreement.

The project includes the construction of an off-stream reservoir less than one mile off the main drainage course, East Fork Virgin River (see **Figure 1** below). The reservoir is designed to hold approximately 6,000 acre-feet of water. The dam is expected to be an earthen structure with principal and emergency spillways adjacent to the left abutment[1]. To convey flows to and from the reservoir, new piping will be installed to connect into existing water transmission facilities.

This report is being prepared as an analysis of the reservoir function as it relates to water diversion and usage in the area and the increased availability that would come with the project along with its associated affects. A model of the entire Virgin River was prepared previously by the Utah State Division of Water Resources (DOWR) that included the Cove Reservoir and was used in the development of the Zion National

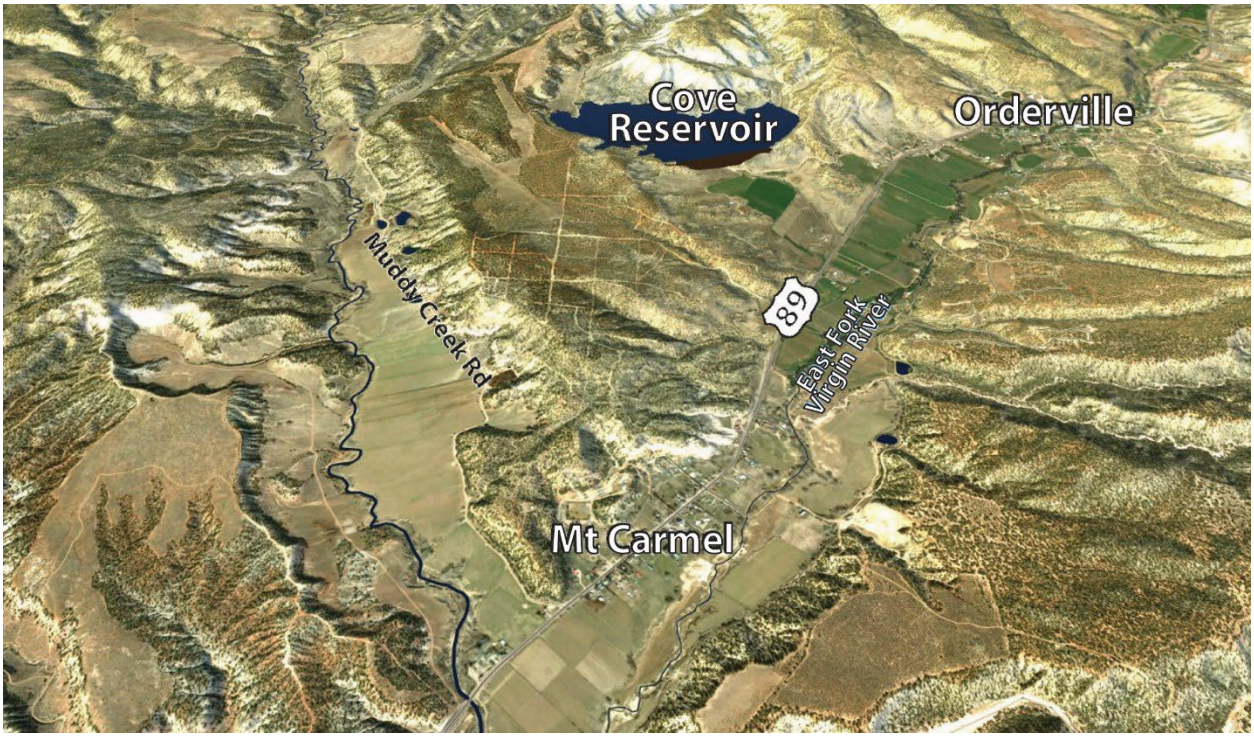


Figure 1 Cove Reservoir Location

[1] Cove Dam Feasibility Report June 2004 RB&G Engineering

Park Agreement. This model provides localized information relative to the actual proposed reservoir to establish project yield, conservation efficiencies, and anticipated changes in river conditions.

Section 2 Water Model

A. Model Constraints

a. Water Gauge Flow Data

The basis for the model was from USGS gauging station 09404450 which is located just above Glendale below the Glendale Irrigation Company (GIC) Diversion Dam. Modeling is based on monthly discharge data from this station, which has a continuous record from 1967 to 2020. **Figure 2** below shows the average monthly discharge in the river. The gauge data were analyzed across the entire 54-year period of record and across the last 20 years recognizing that the recent time period has exhibited a drier hydrology and may be indicative of reliable future expectations

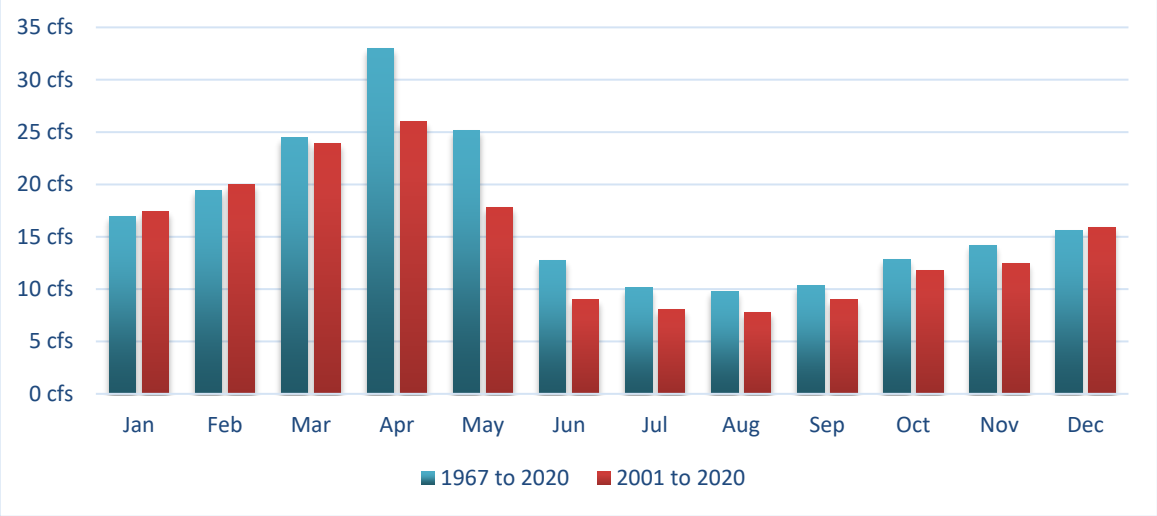


Figure 2 Average 09404450 Glendale USGS Gauge Data

It should be noted that the diversion for the Glendale Irrigation Company is above the USGS Gauging Station. In addition, there is additional drainage area that contributes flow to the East Fork of the Virgin River as the stream channel traverses between the various irrigation company diversion dams. Using a program developed by the USGS referred to as Streamstats, stream flows available for diversion were increased or decreased from the USGS gauge based on the following percentages:

Location	Drainage Area Square Miles	USGS Streamstats Ave. Flow CFS	% Change
Glendale Diversion	58.3	15.8	-19%
Glendale USGS Stream Gauge	74.5	19.4	0%
Orderville Diversion Dam	92.8	23.3	20%
Mt. Carmel Diversion Dam	106	25.9	13%

Table 1 Stream Flow Percentage Increases

The diversion for the Glendale Irrigation Company (GIC) is upstream of the gauging station so the gauging station does not capture the amount of water that has been diverted. The flows at each of the diversion dams were increased or decreased based on the percentage changes as noted in the table above.

b. *Water Rights*

The total combined water right for these three companies are broken down as:

- Glendale Irrigation Company (GIC): 434 acres (ac).
- Orderville Irrigation Company (OIC): 286 ac.
- Mt Carmel Irrigation Company (MCIC): 404 ac.
- **TOTAL: 1,124 ac.**

Annual usage for the three irrigation companies has been established at 5 acre feet per acre. It is anticipated that with this project that the acres being irrigated will be able to be reduced from the usage of 5-acre feet per acre. Shown below in **Figure 3** is the distribution of these water rights throughout the irrigation season, based on consumptive use requirements for alfalfa per Utah State University Research Report 145[2] (USU Report 145) for the Orderville area.

[2] Consumptive Use of Irrigated Crops in Utah Research Report 145, Reprinted February 1998

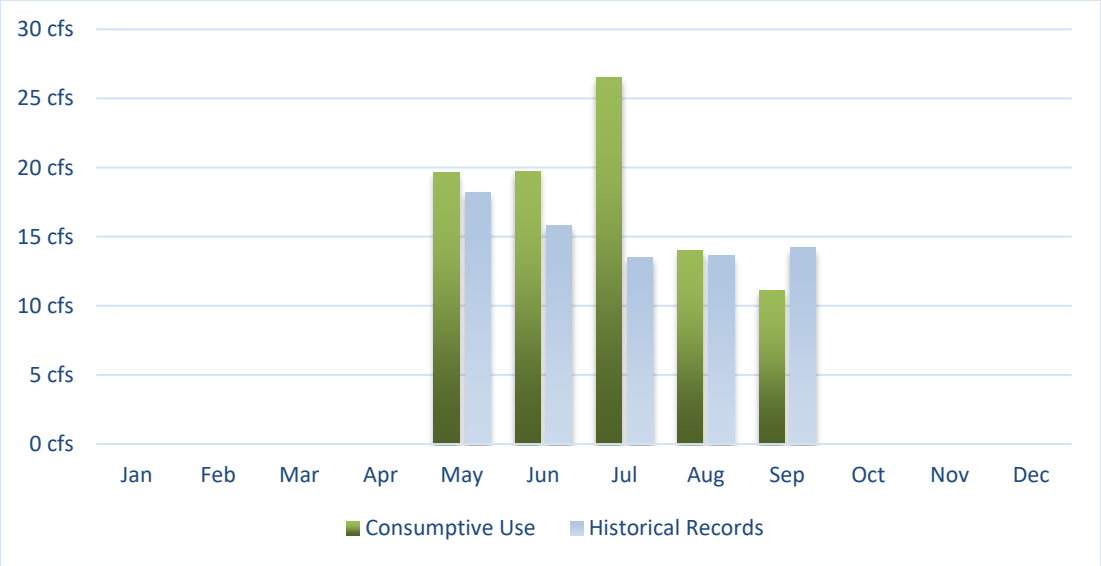


Figure 3 Consumptive Use for Irrigation Companies

Historical diversion data was taken from the Division of Water Rights website and is provided in **Appendix B**. The average monthly historical river diversions are shown for the GIC, OIC, and MCIC in comparison to the calculated crop consumptive use in **Figure 3**. The data were analyzed to determine which years there were adequate river flows to meet the crop demands. Since the irrigation companies share equally in reduction of diversions due to lower river flows; they equally do not meet irrigation demands. The information shown is based on averages. Depending on the year there are several months that do not meet minimum crop requirements. Reviewing **Figure 3** it appears diversions were made outside of the consumptive use requirements of the crops being irrigated. The water rights of the three irrigation companies allow the diversion of water year-round. With the reservoir in place water in excess of crop requirements within the irrigation companies' diversion right could be stored and delivered during low river flow periods.

Figure 4 shows the river discharge available for diversion, including tributary flows between the USGS gauging station and Mt. Carmel, in comparison to the irrigation demand for the three irrigation companies.

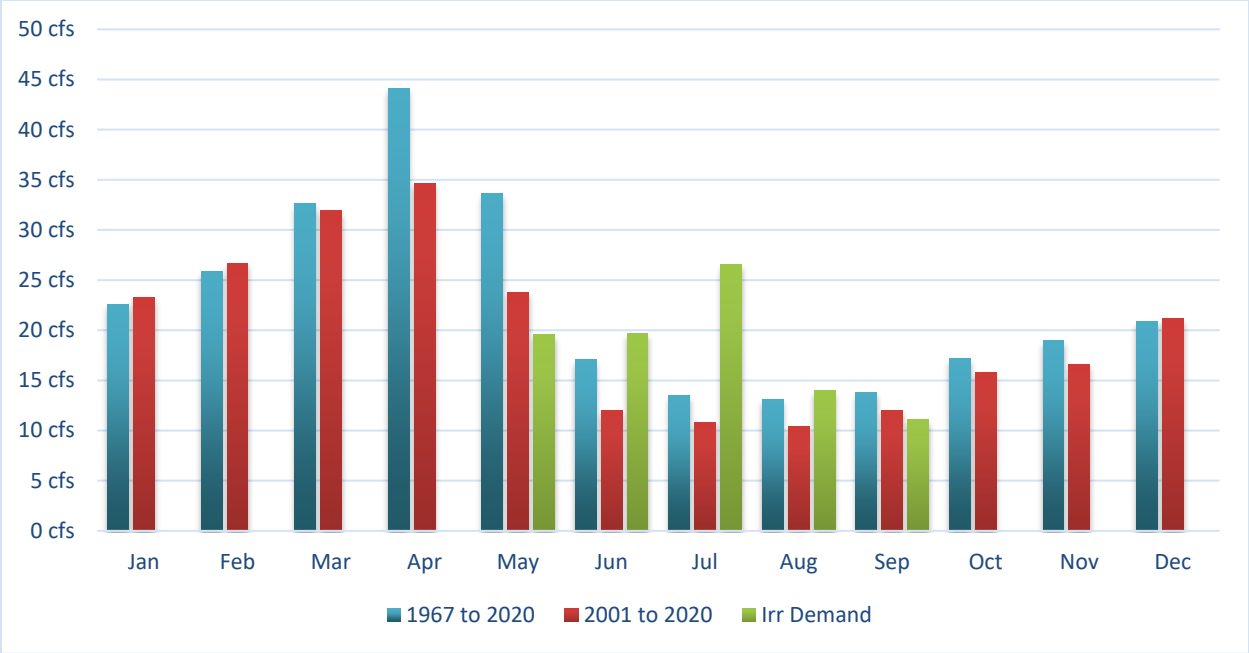


Figure 4 River Discharge and Irrigation Demand

As illustrated in the above chart, the deficiency in available river discharge would likely begin in June but become more deficient as the summer progresses. While there appears to be available river discharge September through May, demand cannot be met without any facilities to store the available river discharge. It should be noted that while each of the three irrigation companies use a different amount of water, the percentage of the water demand received by each company is the same due to cooperative river management.

c. *Irrigation Efficiency*

The local duty of 5-acre feet per acre allows for 60 inches of water applied to the crops. As is present in the local area, dominantly sprinkler irrigation and some flood irrigation are occurring. Assuming an efficient system and process, alfalfa in this area requires 41.17 inches of water, or 3.43 acre-feet/acre[3] expected efficiency. If the entire irrigation area is converted to pressurized irrigation, it becomes more efficient and requires less water.

Currently all the system is not effective and functional because water is not available when the crop requires it. As noted earlier, the irrigators have historically overwatered in times of water availability and not meeting the needs of the crops when river levels are low. The goal of this project is to meet irrigation needs and crop production by storing water during periods of availability and then using it to meet crop needs.

[3] Consumptive Use of Irrigated Crops in Utah Research Report 145, Reprinted February 1998 – Orderville area

System efficiency in the Mt. Carmel Irrigation Company area will also be improved by piping existing open unlined ditches. The areas served by the opened unlined ditches currently are using flood irrigation to water their crops. The new piping will provide for future on-farm pressurized irrigation which will provide for additional efficiency. Approximately 50% of the Mt. Carmel Irrigation system uses flood irrigation. The remainder of the irrigation systems in the Glendale, Orderville, and Mt. Carmel irrigation companies use sprinkler irrigation, which is more efficient, but an adequate water supply is typically not available during the hot summer months. The net effect will be the reduction of water usage required for the three irrigation companies from 5 to 3.43 acre-feet per acre or 1,741 acre-feet which could be diverted and released from the reservoir in such a way as to satisfy downstream water rights and comply with the terms of the 1996 Zion Water Rights Settlement Agreement.

d. *Instream River Flows*

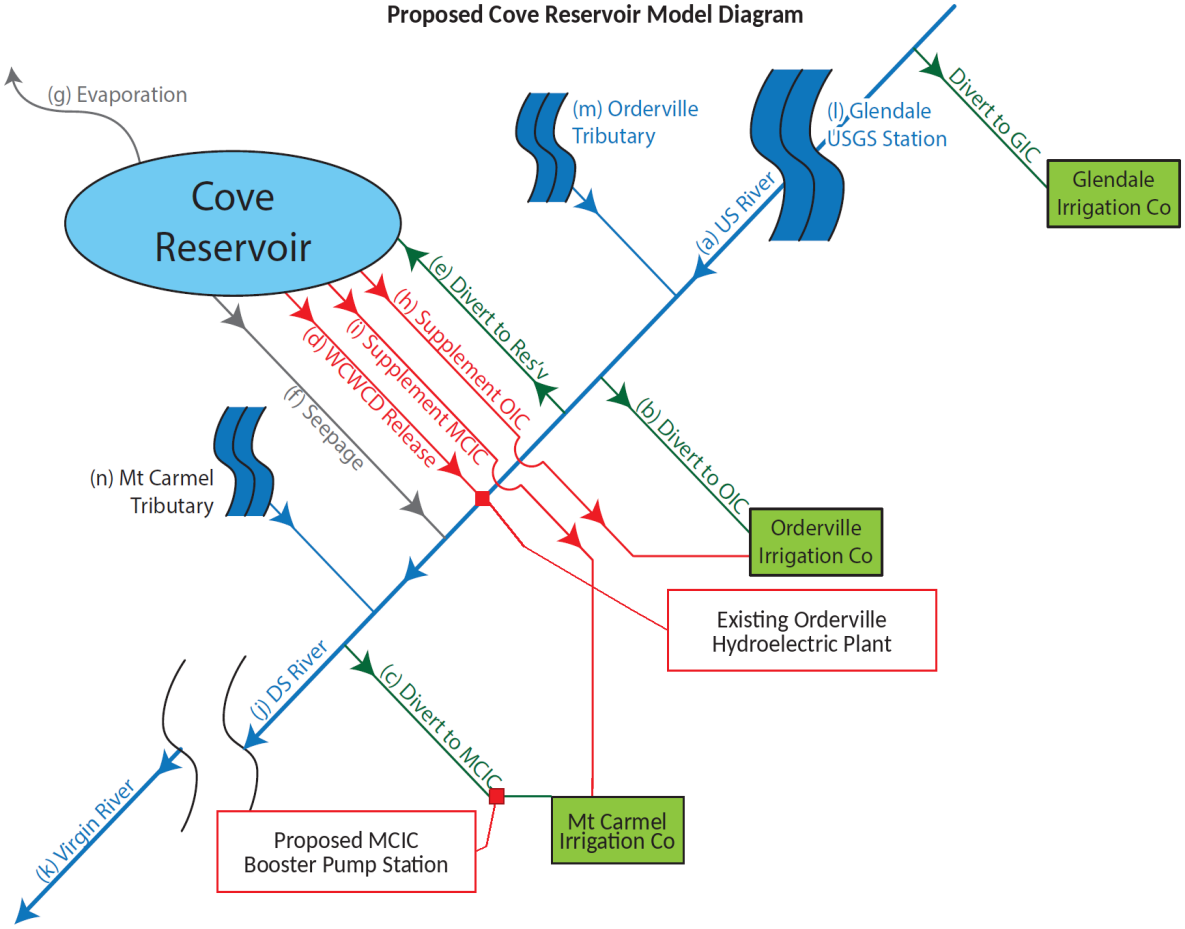
An agreement was established between the KCWCD, OIC, US Fish and Wildlife Service and Utah Division of Wildlife Resources in 2001 which requires a minimum discharge of 3.5 cfs below the OIC diversion dam when neither the MCIC or the OIC are diverting water for irrigation purposes, which is normally during the winter. This requirement is incorporated into the water model.

e. *Evaporation and Seepage*

Evaporation calculations were based on estimates from USU Report 145 for the Orderville area and monthly rates range from 0.18 to 4.95 inches, for a total of 26.61 inches annually. The model takes the modeled surface area of the reservoir and monthly evaporation rate into consideration when calculating evaporation quantities. RB&G Engineering[4] has provided estimated seepage rates of approximately 1/8 inch/day when the reservoir is full to zero when the reservoir is empty. Seepage losses are prorated based on reservoir elevation. This information is used in the model created for the reservoir. Based on geotechnical studies[5], seepage from the reservoir will return to the East Fork of the Virgin River stream channel. It is estimated there will be an average of 1 cfs (608 acre-feet/year) from the reservoir which will return to the stream channel below the reservoir.

[4] RB&G Tech Memo dated 5-19-2022
[5] RB&G Tech Memo dated 5-19-2022

B. Model Results



With information presented above, a model was created simulating the Cove Reservoir (See attached **Appendix B** for output). A diagram of the model is shown on **Figure 5**.

a. *Reservoir Diversion*

Water is currently piped through an existing 24-inch irrigation pipeline from the OIC diversion dam during periods of non-use by the irrigation companies for power production, while maintaining 3.5 cfs minimum water flow in the river below the OIC diversion during the winter months (or existing stream flow if below 3.5 cfs).

For purposes of modeling, the capacity of the existing diversion and piping system was evaluated. The irrigation pipeline has a capacity to deliver 22.2 cfs from the OIC diversion to the reservoir when it is empty and 12.6 cfs when full, based on head difference between diversion and reservoir level. Flows are released from the reservoir during the irrigation season to meet the consumptive use requirements for the irrigation companies. **Figure 6** shows the amount of water diverted to the reservoir throughout the year.

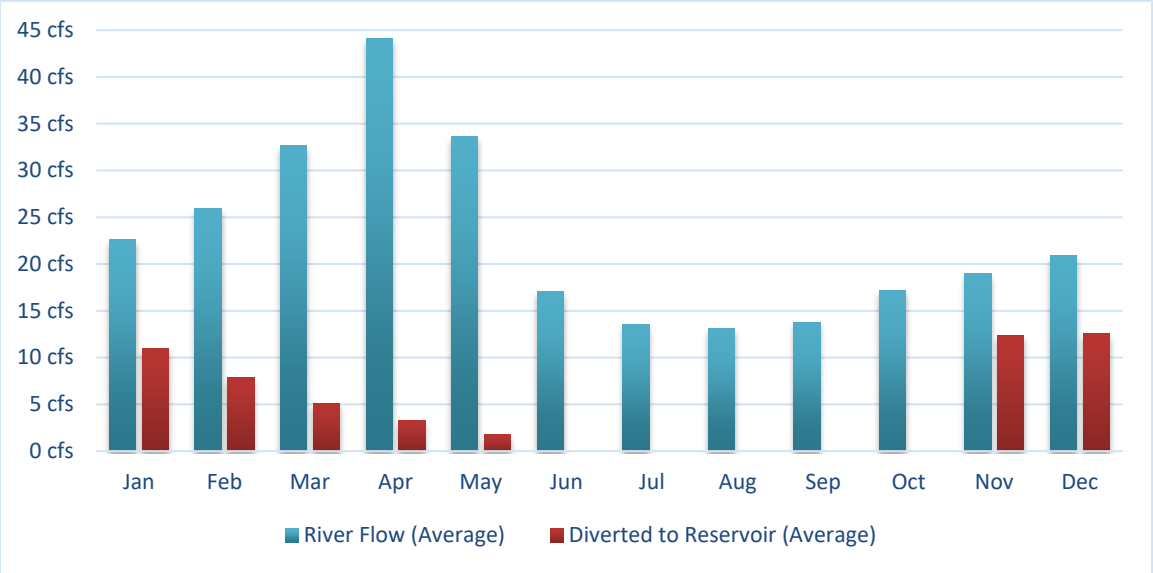


Figure 6 Average Diversion Rate to Cove Reservoir

b. *Local Irrigation Companies*

Prior to the proposed Cove Reservoir, water right demand has not fully been met 48 of 54 years of record, or a total of 6 years that water rights were fully met. This assumes 5 acre-feet of water required per irrigation acre. The three irrigation companies only had enough water to provide for full irrigation of 302 acres of their 1,109 acres during 90% of the years of record.

The three irrigation companies have the right to divert water year-round, not to exceed their maximum diversion rate and allotted annual diversion quantity. With implementation of the Cove Reservoir, the irrigation companies can store excess water when the crops do not require it and release stored water when the river flows do not meet crop demands. Water use demands would have been meet all 54 years of record for the GIC, OIC and MCIC. An average of 1,412 acre-feet of water is required to allow these irrigation companies to meet their full water right during the USGS period of record.

The GIC, OIC, and MCIC will divert water as required by the consumptive use of the crop being irrigated with sprinkler and some flood irrigation methods. This results in a more efficient use of the water requiring less water to be diverted. However, the depletion of water remains the same according to the Division of Water Rights. The benefit of the reservoir is supplying water to the agricultural areas when it is needed thus providing higher crop yields.

It is not possible to supplement Glendale Irrigation Company from the reservoir because the system is located higher than the reservoir, but the three irrigation companies work cooperatively and additional flows can be released to OIC and MCIC to satisfy their requirements while allowing GIC to divert their full water right. This increases the required demand supplemented from the reservoir to the OIC and MCIC, but not the overall demand when considering the three companies. **Figure 7** shows the irrigation demand for all three irrigation companies throughout the year, including average flows supplemented with this project.

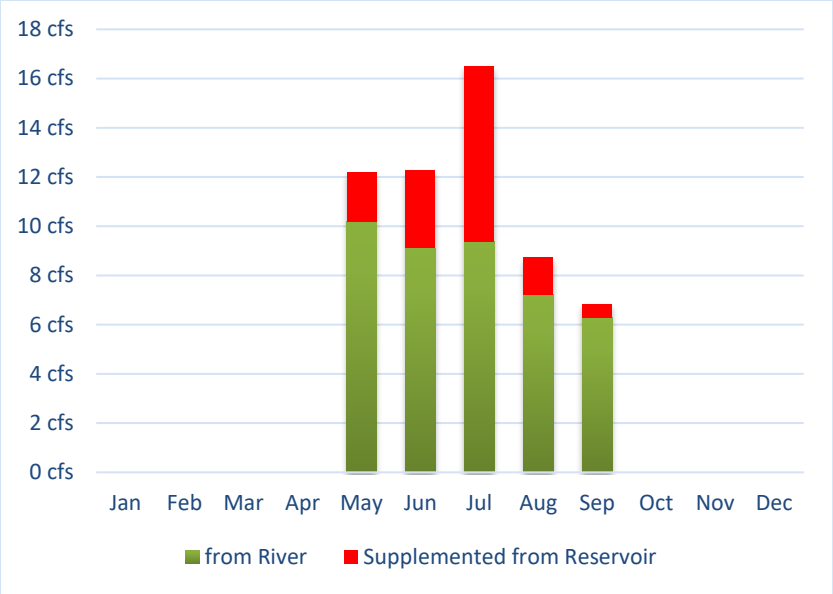


Figure 7 Irrigation Demand with Supplemented Flows

C. Washington County Water Conservancy District

The DOWR Model indicates the Cove Reservoir will provide up to an additional yield of approximately 700 acre-feet of water for use by the WCWCD with the WCWCD having water priority on the Virgin River. This is accomplished by diverting water during the non-irrigation season, November 1st to May 31st, when the existing downstream water rights are met and there is excess water available in the system when the Quail Creek Pipeline is full. This model shows a slightly different yield to the WCWCD as it does not model the Quail Creek Pipeline capacity.

The WCWCD will have the ability to store water during wet years and release water on dry years. **Figure 8** shows a conceptual release of 1,350-acre feet of water during a dry year to the WCWCD during the peak agricultural use period of June through August.

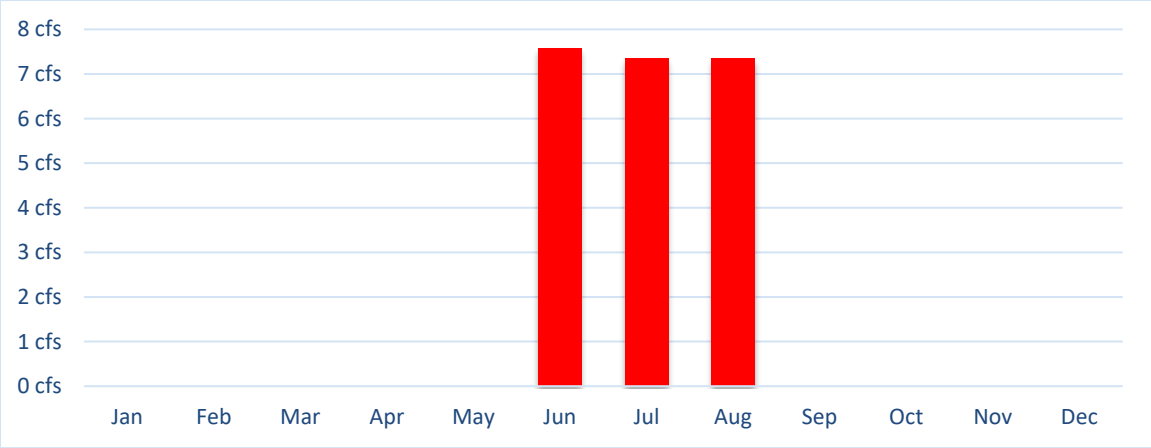


Figure 8 Flows Released to WCWCD

The WCWCD will be contracting with the Hurricane Canal Company (HCC) and providing water to its system in the Bench Lake area as well as provide for Municipal and Industrial use. During most years, there is not enough water in the river system to meet HCC's needs.

D. Downstream River Changes

An analysis was completed to determine the downstream effects to the East Fork of the Virgin River at Springdale as a result of the project, specifically analyzing water release from Cove Reservoir downstream to the WCWCD during June, July and August. The following are modeled stream stage and width changes expected as a result of changes in winter diversion of water and summer release:

- *Maximum Increase in river discharge: **+0.9 cfs** in August (**+2%** average discharge at Springdale)*
- *Maximum Decrease in Flow: **-11.7 cfs** in December (**-19%** average discharge at Springdale)*

The stream cross-section at the *East Fork at Springdale* USGS Gauging Station 9404900 is described in **Table 2**. The water depth and stream width in the channel is a function of river discharge.

Distance	Elevation	Distance	Elevation	Distance	Elevation
0	10.989	20	3.989	36	5.089
5	7.889	25	3.789	40	7.389
16	5.089	30	4.089	45	9.589
17	4.689	35	4.389		

Table 2 Stream Cross-Section at USGS Gauging Station 9404900 (Dimensions shown are in feet)

The rating curve is:

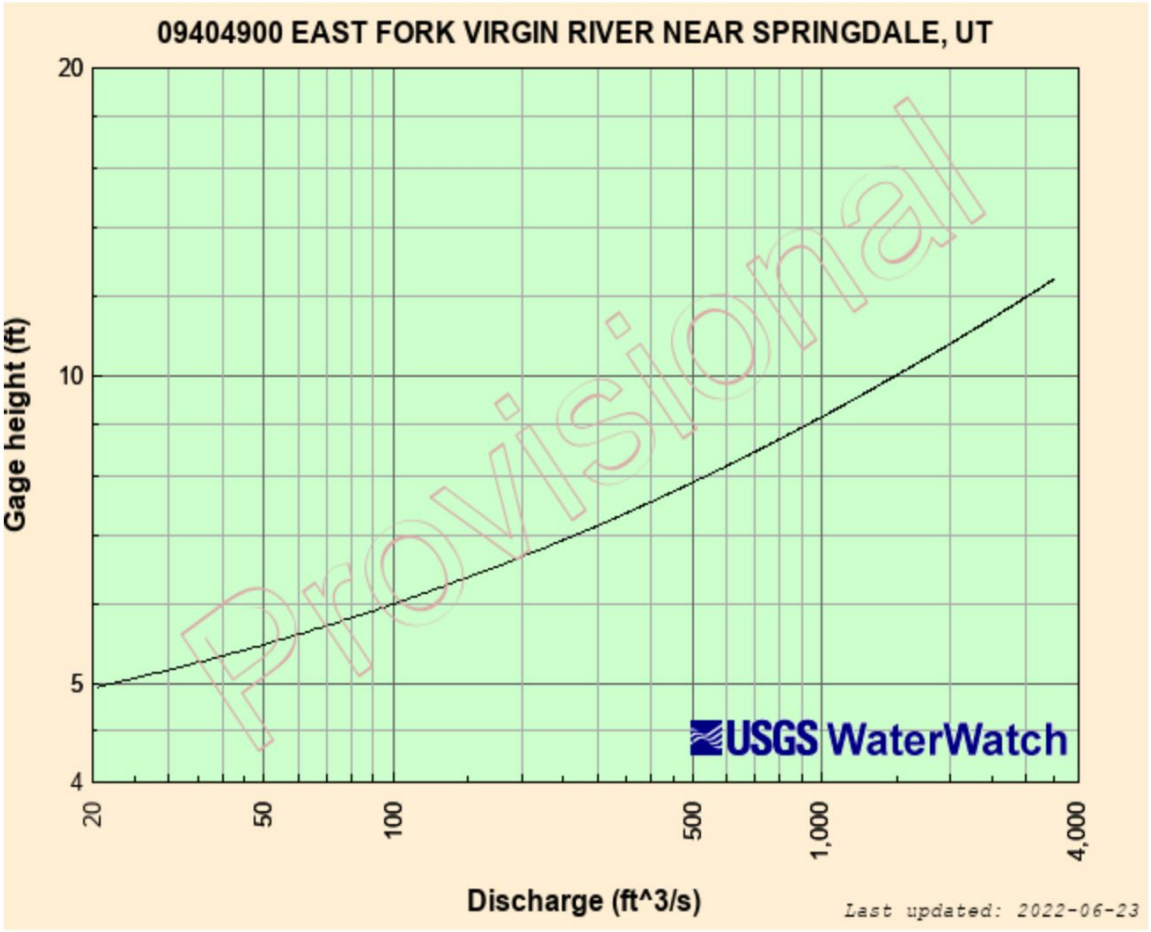


Figure 9 USGS rating curve for the East Fork Virgin River Near Springdale (USGS reference)

The maximum increase and depletion flows were incorporated into the stream gauge data and discharge rating curve to determine the change in the river cross-section (gauge height and stream cross-section width). The maximum increase in discharge was added to the wettest and driest August on record, while the maximum decrease in flow was subtracted from the wettest and driest December on record. The results are summarized below. In the tables on the following pages, "Elevation" reflects vertical depth and "Station" represents distance (spread) along the river section.

<u>Increase (+0.9 cfs in August)</u>

Wettest year discharge at Springdale (2022): 82.2 cfs
Driest year discharge at Springdale (2009): 34.8 cfs

Wettest Year (2013)

Depth

Before Project: 1.71 ft After Project: 1.72 ft

Width

Before Project: 22.31 ft After Project: 22.36 ft

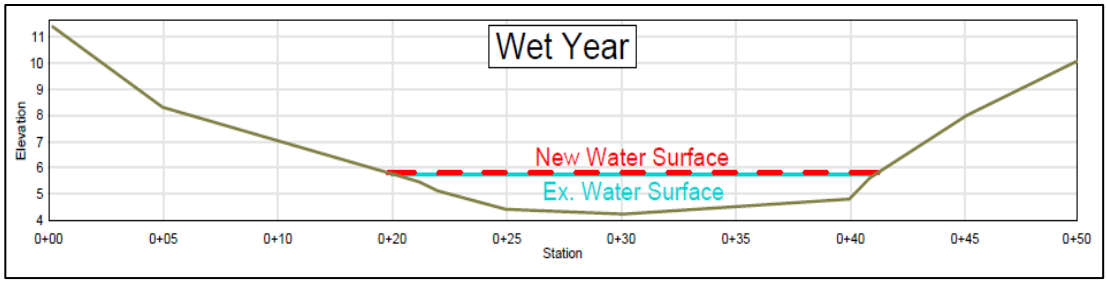


Figure 10 Increase in river cross-section (August) during wet year

Driest Year (2009)

Depth

Before Project: 1.13 ft After Project: 1.14 ft

Width

Before Project: 19.32 ft After Project: 19.37 ft

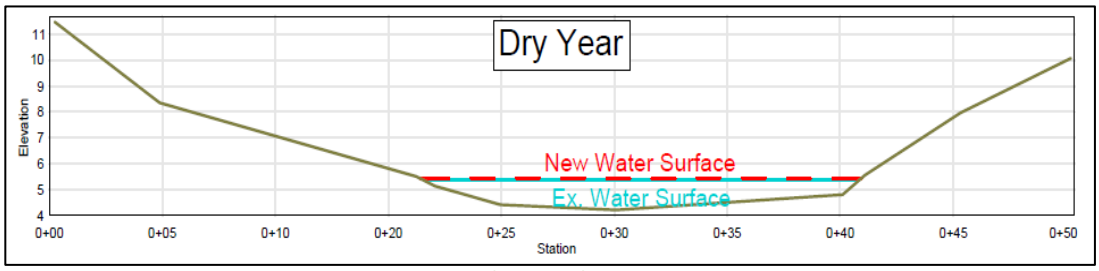


Figure 11 Increase in river cross-section (August) during dry year

<u>Decrease (-11.7 cfs in December)</u>

Wettest Year discharge in Channel at Springdale (2019): 64.9 cfs

Driest Year discharge in Channel at Springdale (2002): 44.7 cfs

Wettest Year (2019)

Depth

Before Project: 1.52 ft After Project: 1.38 ft

Width

Before Project: 21.24 ft After Project: 20.43 ft

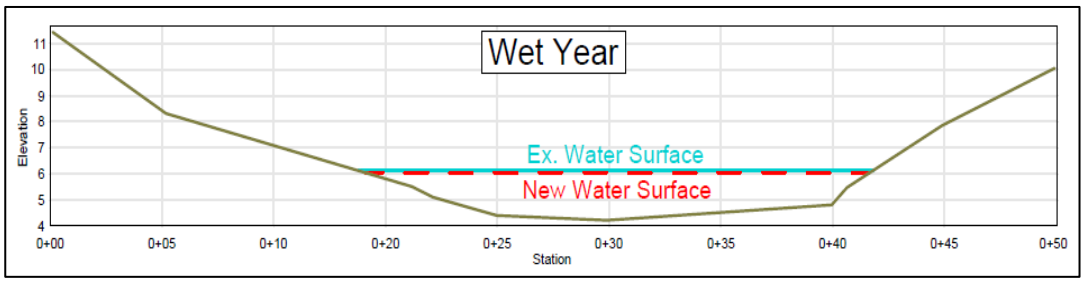


Figure 12 Decrease in river cross-section (December) during wet year

Driest Year (2002)

Depth

Before Project: 1.27 ft After Project: 1.10 ft

Width

Before Project: 19.86 ft After Project: 19.21 ft

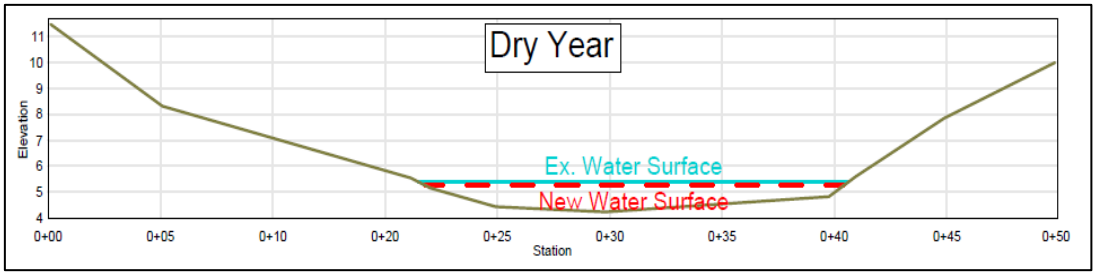


Figure 13 Decrease in river cross-section (December) during dry year

Highest and lowest discharge conditions were evaluated to capture the range of conditions that might occur on the river. Often average conditions in a data set, such as river discharge, may not be as meaningful or insightful.

Modelling of the change in low flow summer condition when 0.9 cfs of water would be released from the proposed Cove Reservoir to the East Fork of the Virgin River shows a net increase in river depth of 0.01 feet (0.12 inches) in the wettest August on record and a net increase in river depth of 0.01 feet (0.12 inches) in the driest August on record. Similarly, the same water release during the wettest and driest August on record shows the river width increasing 0.05 feet (0.6 inches) and 0.05 feet (0.6 inches), respectively.

Stream modeling of the winter conditions under which water would be diverted upstream from Cove Reservoir suggests a 11.7 cfs decrease in river discharge at the East Fork of the Virgin River at Springdale USGS gauge. This would be a net decrease in river depth of 0.14 feet (1.7 inches) and a net decrease in channel width of 0.81 ft in the wettest year on record for December. The net decrease in river depth would be 0.17 feet (2 inches) with a 0.65 ft decrease in channel width in the driest year on record for December.

Section 3 Flow Regime Comparison

A. Purpose

This analysis has been prepared to evaluate the anticipated changes in river flow associated with the proposed Cove Reservoir project. The purpose of this evaluation is to compare existing gauge records with modeled post-project river flows under conditions both without Washington County Water Conservancy District (WCWCD) deliveries and with an assumed WCWCD delivery of 15 cubic feet per second (cfs).

The analysis evaluates river flows at the Mount Carmel and Springdale gauges during average, driest, and wettest hydrologic conditions for each month of the year. Detailed results of the analysis are provided in **Appendix C** and **Appendix D** for water model results without WCWCD Delivery.

B. Objective

The objective of this analysis is to quantify anticipated changes in river flow resulting from reservoir operations and water deliveries. The analysis provides estimated changes in flow rates at the Mount Carmel and Springdale gauge locations.

The evaluation considers:

- Average monthly conditions.
- Driest recorded monthly conditions.
- Wettest recorded monthly conditions.
- Conditions without WCWCD delivery.
- Conditions with an assumed 15 cfs WCWCD delivery.

C. Methodology

The Water Model utilized historical streamflow data from the USGS Glendale Gauge (USGS 09404450 East Fork Virgin River Near Glendale, Utah) as the primary model input. Monthly flow records from January 1967 through December 2020 were used to develop representative hydrologic conditions and simulate reservoir operations.

The hydraulic model extends from the proposed reservoir to a downstream location near the Mount Carmel gauge. Model results were compared to observed flow records at the Mount Carmel and Springdale gauges to evaluate anticipated post-project river flows.

The Mount Carmel gauge (USGS 09404700 East Fork Virgin River Near Mount Carmel Junction, UT) is located immediately downstream of the modeled reach and therefore provides a direct

comparison between modeled conditions and observed river flows. Consequently, comparisons at the Mount Carmel gauge are considered representative of anticipated project impacts.

The Springdale gauge (USGS 09405500 North Fork Virgin River Near Springdale, Utah) is located approximately 20 miles downstream of the Mount Carmel gauge and receives additional tributary inflows and watershed contributions that are not represented within the original hydraulic model. Therefore, direct comparison between the model results and the Springdale gauge is not appropriate.

To estimate post-project conditions at Springdale, the differences between the observed Mount Carmel East Fork Virgin River gauge data and the modeled Mount Carmel results were applied to the observed Springdale East Fork Virgin River gauge records. This methodology provides an estimated post-project flow condition at the Springdale location while accounting for the additional downstream watershed contributions.

Additional analyses were performed to compare pre- and post-reservoir flows at both gauge locations under average, driest, and wettest hydrologic conditions.

Detailed monthly results and supporting figures are included in **Appendix C**.

D. Assumptions and Limitations

The following assumptions apply to this analysis:

- Historical flow records from the USGS Glendale gauge (January 1967 through December 2020) were used as the primary input to the original water model.
- The model simulates river conditions from the proposed reservoir to a location immediately downstream near the Mount Carmel gauge.
- Comparisons at the Mount Carmel gauge are considered representative because the gauge is located near the downstream extent of the modeled reach.
- The Springdale gauge includes additional tributary inflows and watershed contributions that are not represented in the original hydraulic model.
- Estimated post-project Springdale flows were developed by applying the modeled differences at Mount Carmel to the observed Springdale gauge records.
- An assumed WCWCD delivery of 15 cfs per scenario was evaluated separately from the hydraulic model.
- Any releases to the WCWCD would adhere to the settlement agreement which specifies releases from the reservoir “shall not increase the flow measured at the U.S. Geological Survey (USGS) gage on the East Fork Virgin River near Springdale (USGS No. 09404900), by more than 25 cfs during any 7-day period and shall not exceed the long-term monthly average at the Springdale gage by more than 15 cfs."

- The WCWCD delivery was not incorporated into the reservoir water surface calculations. Consequently, actual reservoir elevations under delivery conditions may be slightly lower than those predicted by the model.
- Results presented herein represent planning-level estimates and actual river flows may vary due to hydrologic conditions, operational practices, climate variability, and future water demands.

E. Summary of Findings

a. *Mount Carmel Gauge*

Under average monthly conditions without WCWCD delivery, modeled river flows generally decrease slightly during winter and spring months and increase during portions of the runoff season. Average monthly changes typically range from approximately -57 percent to +59 percent corresponding to a change in flow ranging from -11.0 cfs to +2.5 cfs in the months of November & July respectively.

During driest conditions, the project produces the largest relative changes. Without WCWCD delivery, reductions of approximately -70 percent to well over +3,400 percent occur, corresponding to a change in flow ranging from -11.9 cfs to +3.4 cfs in the months of December & August respectively.

Under wettest conditions, river flows generally remain similar to existing conditions, with changes ranging from approximately -16 percent to increases of +149 percent, corresponding to a change in flow ranging from -4.2 cfs to +97.0 cfs in the months of November & May respectively.

When the assumed 15 cfs WCWCD delivery is included, average monthly flows increase substantially. Average conditions show increases ranging from approximately +22 percent (+4.1 cfs in November) to well above +471 percent (+16.5 cfs in July). Driest conditions exhibit the largest relative increases, with December exceeding +18 percent (+3.1 cfs) and August exceeding 18,400 percent (+18.5 cfs) due to the relatively small existing flows. Wettest months average monthly flows shows increases ranging from +7% in March to 292% in July with corresponding river flow increases of 6.8 and 27.7 cfs.

b. *Springdale Gauge*

Because of additional watershed inflows between Mount Carmel and Springdale, the relative changes at the Springdale gauge are generally smaller.

Without WCWCD delivery, average monthly changes range from approximately -20 percent (-10.9 cfs in November) to +16 percent (+12.2 cfs in April). Driest conditions range from decreases of approximately -27 percent (-11.9 cfs in December) to increases of approximately +13 percent (+4.8 cfs in April & +4.6 cfs in October). Wettest conditions range from approximately -6 percent (-4.2 cfs in November) to increases of approximately 68 percent (+97.0 cfs in May).

With the assumed 15 cfs WCWCD delivery, average monthly flows at Springdale increase approximately +7 percent (+4.1 cfs in November) to +41 percent (+17.0 cfs in June). Driest conditions increase approximately +7 percent (+3.1 cfs in December) to +60 percent (+17.7 cfs in September), while wettest conditions increase approximately +4 percent (+6.8 cfs in March) to +78 percent (+112.0 cfs in May).

Overall, the analysis indicates that the relative effects of the project are greatest during low-flow periods and least during high-flow conditions when natural runoff dominates river flows.

F. Conclusions

The modeling indicates that the proposed project will result in measurable changes in river flows at both the Mount Carmel and Springdale gauges. The magnitude of change varies seasonally and is dependent upon hydrologic conditions.

The largest relative changes occur during dry periods when existing flows are relatively small. During wet periods, natural runoff generally dominates river conditions and the relative impacts become smaller.

The assumed 15 cfs WCWCD delivery substantially increases river flows under all hydrologic conditions. Because this delivery was not directly incorporated into the hydraulic model, actual reservoir water surface elevations under delivery conditions may be somewhat higher than those predicted by the model.

The tables and figures included with this addendum provide the detailed monthly flow comparisons and percentage changes for both gauge locations.

G. References

- USGS 09404700 East Fork Virgin River Near Mount Carmel Junction, Utah (January 1993 through October 2002).
- USGS 09405500 North Fork Virgin River Near Springdale, Utah (January 1992 through December 2025).
- USGS 09404500 East Fork Virgin River Near Glendale, Utah (January 1967 through December 2020).
- USGS 9404900 East Fork Virgin River Near Springdale Utah (October 1995 to December 2020).

Appendix A. Model Output

Model Parameters

Miscellaneous Parameters			
	Start Volume	0	af
Spillway Elevation		5550	ft
	Conservation	500	af
Volume at Spillway Crest		6032	af
Minimum flow in river		3.5	cfs
	Seepage	0.125	in/day

Hydro Parameters			
Hydro Elevation		5358	ft
Max Flow to Hydro		18	cfs
Hydro Efficiency		75%	
	Price per kW	$0.040	/kW

Tributary Parameters	Streamstats Average	% increase
Glendale USGS	19.4	0%
Orderville	23.3	20%
Mt Carmel	25.9	13%
pre-GIC USGS	15.8	-19%

Cove Reservoir Vlookup Parameters						
Elevation	Area, ac	Volume, af	Elevation[1]	Area, ac[1]	Volume, af[1]	Elevation
0	0	0	5470	0	0	0
5470	0	0	5472	0.1	0.1	5470
5472	0.1	0.1	5474	0.4	0.5	5472
5474	0.4	0.5	5476	2	2.8	5474
5476	2	2.8	5478	4.4	9.3	5476
5478	4.4	9.3	5480	7.2	20.9	5478
5480	7.2	20.9	5482	11.3	39.4	5480
5482	11.3	39.4	5484	14.5	65.2	5482
5484	14.5	65.2	5486	18.6	98.3	5484
5486	18.6	98.3	5488	22.2	139.2	5486
5488	22.2	139.2	5490	25.7	187.1	5488
5490	25.7	187.1	5492	29.8	242.6	5490
5492	29.8	242.6	5494	33.6	306	5492
5494	33.6	306	5496	37.2	276.8	5494
5496	37.2	276.8	5498	41.7	455.7	5496
5498	41.7	455.7	5500	45.8	543.1	5498
5500	45.8	543.1	5502	49.9	638.8	5500
5502	49.9	638.8	5504	54	742.7	5502
5504	54	742.7	5506	58.3	855	5504
5506	58.3	855	5508	63	976.3	5506
5508	63	976.3	5510	67.9	1107.2	5508
5510	67.9	1107.2	5512	73.1	1248.2	5510
5512	73.1	1248.2	5514	78	1399.3	5512
5514	78	1399.3	5516	82.4	1559.7	5514
5516	82.4	1559.7	5518	87.3	1729.4	5516
5518	87.3	1729.4	5520	92.3	1909	5518
5520	92.3	1909	5522	97.7	2098.9	5520
5522	97.7	2098.9	5524	103.3	2299.9	5522
5524	103.3	2299.9	5526	109.7	2513	5524
5526	109.7	2513	5528	115.7	2738.3	5526
5528	115.7	2738.3	5530	121.5	2975.5	5528
5530	121.5	2975.5	5532	127.4	3224.4	5530
5532	127.4	3224.4	5534	133.1	3484.9	5532
5534	133.1	3484.9	5536	139.2	3757.1	5534
5536	139.2	3757.1	5538	145.7	4042	5536
5538	145.7	4042	5540	152.4	4340	5538
5540	152.4	4340	5542	159.5	4652	5540
5542	159.5	4652	5544	166	4977.5	5542
5544	166	4977.5	5546	172.2	5315.7	5544
5546	172.2	5315.7	5548	178.8	5666.7	5546
5548	178.8	5666.7	5550	186.6	6032	5548
5550	186.6	6032	5552	193.2	6411.8	5550
5552	193.2	6411.8	5554	200.7	6805.7	5552
5554	200.7	6805.7	5556	206	7212.4	5554
5556	206	7212.4	5558	211.3	7629.7	5556
5558	211.3	7629.7	5560	217	8058	5558
5560	217	8058	0	0	0	5560

Monthly Parameters				
	Irrigate?	Max Hydro	ET	Divert?
Jan	n	0	0.00	y
Feb	n	0	0.00	y
Mar	n	0	0.71	y
Apr	n	0	2.53	y
May	y	0	4.31	y
Jun	y	0	4.95	n
Jul	y	0	4.95	n
Aug	y	0	3.96	n
Sep	y	0	3.23	n
Oct	n	0	1.79	n
Nov	n	0	0.18	y
Dec	n	0	0.00	y

Diversion to Cove based on Reservoir Water Level			
5470	22.2	cfs	
5560	12.6	cfs	

Water Right Calcs											
Required	5.00	af/ac		Irr Hours per Day		24.0					<< model outpu
Efficiency	45%	<< calc'd									
				GIC	434.00	OIC	286.00	MCIC	404.00	WC	
Month	Irr Days	Rate, in	Req'd Rate, in	GIC, af	GIC, cfs	OIC, af	OIC, cfs	MCIC, af	MCIC, cfs	YIELD, af	YIELD, cfs
January	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
February	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
April	0	0.05	0.1	4.1	0.0	2.7	0.0	3.8	0.0	0.0	0.0
May	31	5.82	13.1	472.1	7.7	311.1	5.1	439.5	7.1	0.0	0.0
June	30	5.66	12.7	459.1	7.7	302.6	5.1	427.4	7.2	451.3	7.6
July	31	7.87	17.7	638.4	10.4	420.7	6.8	594.3	9.7	451.3	7.3
August	31	4.16	9.3	337.5	5.5	222.4	3.6	314.1	5.1	451.3	7.3
September	30	3.19	7.2	258.8	4.3	170.5	2.9	240.9	4.0	0.0	0.0
October	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
November	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
December	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual	153	26.75	60.00	2170.00	7.2	1430.00	4.7	2020.00	6.7	1354.00	4.5

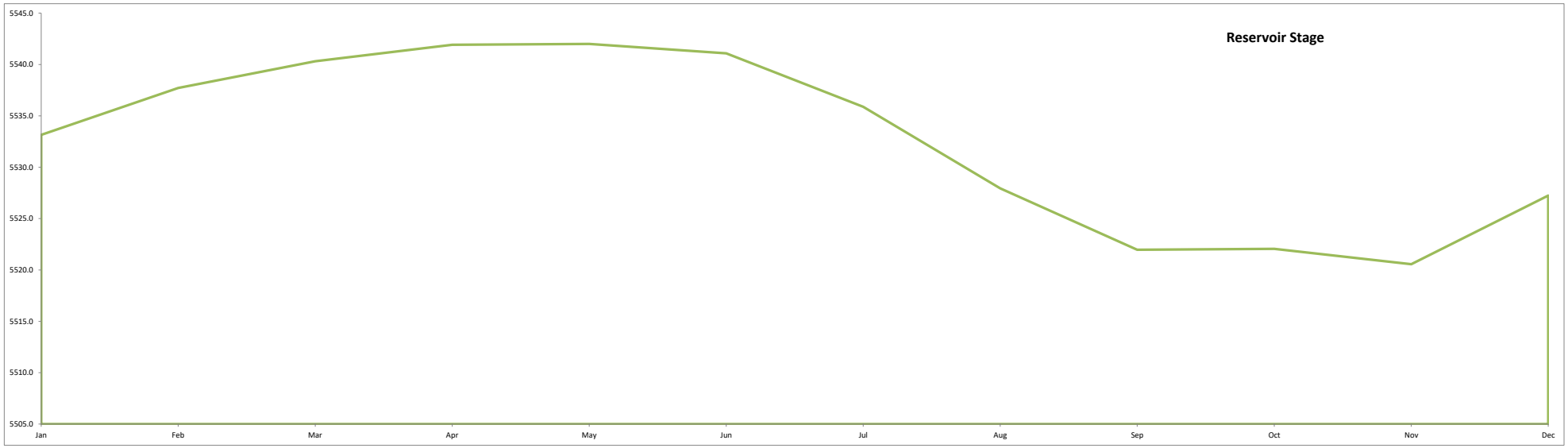
AF to CFS Calculator			
94,525,200.0	cf/yr	6.0	mo/yr
15,754,200.0	cf/irr mo	30	d/mo
525,140.0	cf/d	12.0	h/d
43,761.7	cf/h		
729.4	cf/m		
12.2	cfs		

5620.00

Average Annual Summary

Cove Reservoir Average Annual Simulation

	Reservoir at Beginning of Month			Pre-Glendale USGS Data	Glendale USGS Data	Orderville Tributary		Mt Carmel Tributary		Glendal Irr Co	Orderville Irr Co			Mt Carmel Irr Co			OIC + MCIC			Total Irr Co			WCWCD	Divert to Res'v	Losses		Supp to Irr Co	Supp to Irr Co & WCWCD	Final River (inc WCWCD)	Res'v Flux	Change in River
	Reservoir Stage	Reservoir Volume	Reservoir Surface Area	Flow	Flow	Flow	Cumulative Flow	Flow	Cumulative Flow	Demand	Demand	Demand, from River	Demand, from Res'v	Demand	Demand, from River	Demand, from Res'v	Demand	Demand, from River	Demand, from Res'v	Demand	Prorated Demand, from River	Prorated Demand, from Res'v	Release, from Res'v	In	Seepage	Evaporation	Out	Out	Flow	Volume	Flow
	ft	ac-ft	ac	cfs	cfs	cfs		cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	ac-ft	cfs
Jan	5533.2	3,374.3	130.7	13.8	16.9	3.4	20.3	2.3	22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.9	0.0	0.0	0.0	12.4	626.7	-10.2
Feb	5537.7	4,001.0	144.8	15.8	19.4	3.9	23.3	2.6	25.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.9	0.0	0.0	0.0	18.9	387.6	-7.0
Mar	5540.3	4,388.6	153.5	19.9	24.4	4.9	29.4	3.3	32.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.9	0.2	0.0	0.0	28.4	250.8	-4.3
Apr	5541.9	4,639.4	159.2	26.9	33.0	6.6	39.7	4.4	44.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	1.0	0.7	0.0	0.0	41.7	102.4	-2.4
May	5542.0	4,652.0	159.5	20.5	25.2	5.1	30.2	3.4	33.6	7.7	5.1	4.9	0.1	7.1	5.3	1.9	12.2	10.2	2.0	19.9	16.6	3.3	0.0	1.7	1.0	1.1	2.0	2.0	22.7	-142.9	-11.0
Jun	5541.1	4,509.1	156.2	10.4	12.8	2.6	15.3	1.7	17.0	7.7	5.1	4.6	0.5	7.2	4.6	2.6	12.3	9.1	3.2	20.0	14.8	5.1	7.6	0.0	0.9	1.2	3.2	10.7	16.4	-768.3	-0.6
Jul	5535.9	3,740.8	138.8	8.2	10.1	2.0	12.1	1.4	13.5	10.4	6.8	5.3	1.6	9.7	4.1	5.5	16.5	9.4	7.1	26.9	15.3	11.6	7.3	0.0	0.9	1.1	7.1	14.5	12.3	-1,008.6	-1.2
Aug	5527.9	2,732.2	115.5	8.0	9.8	2.0	11.8	1.3	13.1	5.5	3.6	3.4	0.2	5.1	3.8	1.3	8.7	7.2	1.5	14.2	11.7	2.5	7.3	0.0	0.7	0.8	1.5	8.9	14.0	-636.7	0.9
Sep	5522.0	2,095.4	97.6	8.4	10.3	2.1	12.4	1.4	13.8	4.3	2.9	2.8	0.0	4.0	3.5	0.5	6.9	6.3	0.6	11.3	10.2	0.9	-0.1	0.0	0.7	0.6	0.6	0.5	8.1	-103.6	-5.7
				10.5	12.9	2.6	15.5	1.7	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3	0.0	0.0	17.8	-57.7	0.6
Nov	5520.6	1,962.0	93.8	11.6	14.2	2.9	17.1	1.9	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	0.7	0.0	0.0	0.0	7.3	690.2	-11.6
Dec	5527.2	2,652.2	113.4	12.7	15.6	3.1	18.8	2.1	20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	0.8	0.0	0.0	0.0	9.1	722.1	-11.7
Average			**130**	**13.9**	**17.1**	**3.4**		**2.3**				**1.7**	**0.2**		**1.8**	**1.0**		**3.5**	**1.2**		**5.7**	**2.0**	**1.9**	**4.5**	**0.8**	**0.5**		**3.0**	**17.4**		
Total AF				**10056**	**12347**	**2482**		**1655**				**1265**	**151**		**1280**	**716**		**2546**	**867**		**4147**	**1412**	**1340**	**3267**	**607**	**355**		**2206**	**12618**		



Model Simulation

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River	to OIC				to COVE				Reservoir Int1			Seepage		Evaporation		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full	Full?	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full	Full?	Hydraulic Cap	to Fill Resv	Control	River	Volume	Elevation	Area					Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs	af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
1967	Jan	500.0	5499.0	43.8	14.7	0.0	0.0	0.0	Yes	Yes	18.0	3.6	21.6	0.0	0.0	Yes	Yes	19.1	90.0	19.1	18.1	1614.1	5516.6	84.0	27.1	0.4	0.0	0.0	1,587.0	5,516.3	83.2	2.4	0.4	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	1,587.0	5,516.3	83.2
1967	Feb	1587.0	5516.3	83.2	16.1	0.0	0.0	0.0	Yes	Yes	19.8	4.0	23.8	0.0	0.0	Yes	Yes	17.3	80.0	17.3	17.3	2545.5	5526.3	110.6	32.2	0.6	0.0	0.0	2,513.2	5,526.0	109.7	2.7	0.6	9.8	0.0	0.0	Yes	Yes	0.0	9.8	0.0	2,513.2	5,526.0	109.7
1967	Mar	2513.2	5526.0	109.7	17.8	0.0	0.0	0.0	Yes	Yes	21.9	4.4	26.3	0.0	0.0	Yes	Yes	16.2	57.2	16.2	16.2	3510.9	5534.2	133.7	43.2	0.7	7.9	0.1	3,459.9	5,533.8	132.6	2.9	0.7	13.7	0.0	0.0	Yes	Yes	0.0	13.7	0.0	3,459.9	5,533.8	132.6
1967	Apr	3459.9	5533.8	132.6	19.5	0.0	0.0	0.0	Yes	Yes	23.9	4.8	28.7	0.0	0.0	Yes	Yes	15.4	43.2	15.4	15.4	4375.9	5540.2	153.2	47.9	0.8	32.3	0.5	4,295.7	5,539.7	151.4	3.2	0.8	17.3	0.0	0.0	Yes	Yes	0.0	17.3	0.0	4,295.7	5,539.7	151.4
1967	May	4295.7	5539.7	151.4	16.9	7.7	0.0	0.0	Yes	Yes	20.7	4.2	24.9	5.1	0.0	Yes	Yes	14.8	28.2	14.8	14.8	5203.6	5545.3	170.1	54.9	0.9	61.1	1.0	5,087.5	5,544.7	168.0	2.8	0.9	8.7	5.2	1.9	Yes	Yes	0.0	3.5	1.9	4,968.0	5,543.9	165.8
1967	Jun	4968.0	5543.9	165.8	15.2	7.7	0.0	0.0	Yes	Yes	18.7	3.8	22.5	5.1	0.0	Yes	Yes	14.3	17.9	0.0	0.0	4968.0	5543.9	165.8	51.8	0.9	68.4	1.1	4,847.8	5,543.2	163.4	2.5	0.9	20.8	7.2	0.0	Yes	Yes	7.6	21.2	7.6	4,396.5	5,540.4	153.7
1967	Jul	4396.5	5540.4	153.7	10.9	10.4	0.0	0.0	Yes	Yes	13.4	2.7	16.1	6.8	0.0	Yes	Yes	14.7	26.6	0.0	0.0	4396.5	5540.4	153.7	49.6	0.8	63.4	1.0	4,283.4	5,539.6	151.1	1.8	0.8	11.9	8.4	1.3	No	Yes	7.3	10.8	8.7	3,751.5	5,536.0	139.1
1967	Aug	3751.5	5536.0	139.1	12.6	5.5	0.0	0.0	Yes	Yes	15.5	3.1	18.6	3.6	0.0	Yes	Yes	15.2	37.1	0.0	0.0	3751.5	5536.0	139.1	44.9	0.7	45.9	0.7	3,660.7	5,535.3	137.0	2.1	0.7	17.8	5.1	0.0	Yes	Yes	7.3	20.0	7.3	3,209.4	5,531.9	127.0
1967	Sep	3209.4	5531.9	127.0	14.6	4.3	0.0	0.0	Yes	Yes	17.9	3.6	21.5	2.9	0.0	Yes	Yes	15.6	47.4	0.0	0.0	3209.4	5531.9	127.0	39.7	0.7	34.2	0.6	3,135.5	5,531.3	125.3	2.4	0.7	21.7	4.0	0.0	Yes	Yes	0.0	17.7	0.0	3,135.5	5,531.3	125.3
1967	Oct	3135.5	5531.3	125.3	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4	0.0	0.0	Yes	Yes	15.7	47.1	0.0	0.0	3135.5	5531.3	125.3	40.5	0.7	18.7	0.3	3,076.3	5,530.8	123.9	1.9	0.7	20.0	0.0	0.0	Yes	Yes	0.0	20.0	0.0	3,076.3	5,530.8	123.9
1967	Nov	3076.3	5530.8	123.9	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0	0.0	0.0	Yes	Yes	15.7	49.7	15.7	15.5	3997.2	5537.7	144.7	45.2	0.8	2.2	0.0	3,949.8	5,537.4	143.6	2.1	0.8	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	3,949.8	5,537.4	143.6
1967	Dec	3949.8	5537.4	143.6	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5	0.0	0.0	Yes	Yes	15.0	33.9	15.0	15.0	4873.1	5543.4	163.9	52.9	0.9	0.0	0.0	4,820.2	5,543.0	162.9	2.3	0.9	8.7	0.0	0.0	Yes	Yes	0.0	8.7	0.0	4,820.2	5,543.0	162.9
1968	Jan	4820.2	5543.0	162.9	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes	14.4	19.7	14.4	14.4	5706.2	5548.2	179.6	58.0	0.9	0.0	0.0	5,648.2	5,547.9	178.5	2.3	0.9	9.6	0.0	0.0	Yes	Yes	0.0	9.6	0.0	5,648.2	5,547.9	178.5
1968	Feb	5648.2	5547.9	178.5	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4	0.0	0.0	Yes	Yes	13.9	6.9	6.9	6.9	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.9	1.0	23.4	0.0	0.0	Yes	Yes	0.0	23.4	0.0	5,977.6	5,549.7	185.4
1968	Mar	5977.6	5549.7	185.4	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.4	1.0	33.6	0.0	0.0	Yes	Yes	0.0	33.6	0.0	5,960.7	5,549.6	185.1
1968	Apr	5960.7	5549.6	185.1	21.5	0.0	0.0	0.0	Yes	Yes	26.4	5.3	31.7	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.5	1.0	35.0	0.0	0.0	Yes	Yes	0.0	35.0	0.0	5,934.3	5,549.5	184.5
1968	May	5934.3	5549.5	184.5	18.1	7.7	0.0	0.0	Yes	Yes	22.2	4.5	26.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	3.0	1.0	24.0	7.1	0.0	Yes	Yes	0.0	16.8	0.0	5,904.7	5,549.3	183.9
1968	Jun	5904.7	5549.3	183.9	12.8	7.7	0.0	0.0	Yes	Yes	15.7	3.2	18.9	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	2.1	1.0	16.8	7.2	0.0	Yes	Yes	7.6	17.2	7.6	5,320.1	5,546.0	172.3
1968	Jul	5320.1	5546.0	172.3	11.7	10.4	0.0	0.0	Yes	Yes	14.4	2.9	17.3	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.9	0.9	13.3	9.7	0.0	No	Yes	7.3	11.0	7.3	4,742.0	5,542.6	161.3
1968	Aug	4742.0	5542.6	161.3	14.6	5.5	0.0	0.0	Yes	Yes	17.9	3.6	21.5	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9	4,636.7	5,541.9	159.2	2.4	0.8	21.1	5.1	0.0	Yes	Yes	7.3	23.4	7.3	4,185.4	5,539.0	148.9
1968	Sep	4185.4	5539.0	148.9	9.5	4.3	0.0	0.0	Yes	Yes	11.7	2.4	14.1	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.8	5,538.4	147.0	1.6	0.8	13.5	4.0	0.0	Yes	Yes	0.0	9.5	0.0	4,098.8	5,538.4	147.0
1968	Oct	4098.8	5538.4	147.0	10.8	0.0	0.0	0.0	Yes	Yes	13.3	2.7	16.0	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4	4,029.4	5,537.9	145.4	1.8	0.8	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	4,029.4	5,537.9	145.4
1968	Nov	4029.4	5537.9	145.4	12.0	0.0	0.0	0.0	Yes	Yes	14.7	3.0	17.7	0.0	0.0	Yes	Yes	15.0	33.7	15.0	14.2	4871.7	5543.3	163.9	51.2	0.9	2.5	0.0	4,818.0	5,543.0	162.8	2.0	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,818.0	5,543.0	162.8
1968	Dec	4818.0	5543.0	162.8	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8	0.0	0.0	Yes	Yes	14.4	19.7	14.4	14.3	5695.8	5548.2	179.4	57.9	0.9	0.0	0.0	5,637.8	5,547.8	178.3	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,637.8	5,547.8	178.3
1969	Jan	5637.8	5547.8	178.3	20.4	0.0	0.0	0.0	Yes	Yes	25.0	5.0	30.0	0.0	0.0	Yes	Yes	13.9	6.4	6.4	6.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.4	1.0	27.9	0.0	0.0	Yes	Yes	0.0	27.9	0.0	5,971.7	5,549.7	185.3
1969	Feb	5971.7	5549.7	185.3	17.8	0.0	0.0	0.0	Yes	Yes	21.8	4.4	26.2	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.9	1.0	29.0	0.0	0.0	Yes	Yes	0.0	29.0	0.0	5,977.6	5,549.7	185.4
1969	Mar	5977.6	5549.7	185.4	25.7	0.0	0.0	0.0	Yes	Yes	31.5	6.3	37.8	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	4.2	1.0	42.1	0.0	0.0	Yes	Yes	0.0	42.1	0.0	5,960.7	5,549.6	185.1
1969	Apr	5960.7	5549.6	185.1	107.5	0.0	0.0	0.0	Yes	Yes	132.0	26.5	158.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	17.7	1.0	176.0	0.0	0.0	Yes	Yes	0.0	176.0	0.0	5,934.3	5,549.5	184.5
1969	May	5934.3	5549.5	184.5	63.5	7.7	0.0	0.0	Yes	Yes	78.0	15.7	93.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	10.5	1.0	98.5	7.1	0.0	Yes	Yes	0.0	91.3	0.0	5,904.7	5,549.3	183.9
1969	Jun	5904.7	5549.3	183.9	26.8	7.7	0.0	0.0	Yes	Yes	32.9	6.6	39.5	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	4.4	1.0	39.8	7.2	0.0	Yes	Yes	7.6	40.2	7.6	5,320.1	5,546.0	172.3
1969	Jul	5320.1	5546.0	172.3	22.7	10.4	0.0	0.0	Yes	Yes	27.9	5.6	33.5	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	3.7	0.9	31.3	9.7	0.0	Yes	Yes	7.3	29.0	7.3	4,742.0	5,542.6	161.3
1969	Aug	4742.0	5542.6	161.3	16.9	5.5	0.0	0.0	Yes	Yes	20.8	4.2	25.0	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9	4,636.7	5,541.9	159.2	2.8	0.8	25.0	5.1	0.0	Yes	Yes	7.3	27.2	7.3	4,185.4	5,539.0	148.9
1969	Sep	4185.4	5539.0	148.9	13.5	4.3	0.0	0.0	Yes	Yes	16.6	3.3	19.9	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.8	5,538.4	147.0	2.2	0.8	20.1	4.0	0.0	Yes	Yes	0.0	16.0	0.0	4,098.8	5,538.4	147.0
1969	Oct	4098.8	5538.4	147.0	15.0	0.0	0.0	0.0	Yes	Yes	18.4	3.7	22.1	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4	4,029.4	5,537.9	145.4	2.5	0.8	25.3	0.0	0.0	Yes	Yes	0.0	25.3	0.0	4,029.4	5,537.9	145.4
1969	Nov	4029.4	5537.9	145.4	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9	0.0	0.0	Yes	Yes	15.0	33.7	15.0	15.0	4919.3	5543.6	164.8	51.5	0.9	2.5	0.0	4,865.4	5,543.3	163.8	2.6	0.9	11.4	0.0	0.0	Yes	Yes	0.0	11.4	0.0	4,865.4	5,543.3	163.8
1969	Dec	4865.4	5543.3	163.8	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes	14.4	19.0	14.4	14.4	5749.6	5548.5	180.6	58.3	0.9	0.0	0.0	5,691.2	5,548.1	179.3	2.3	0.9	9.7	0.0	0.0	Yes	Yes	0.0	9.7	0.0	5,691.2	5,548.1	179.3
1970	Jan	5691.2	5548.1	179.3	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	18.9	0.0	0.0	Yes	Yes	0.0	18.9	0.0	5,971.7	5,549.7	185.3
1970	Feb	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.6	1.0	26.1	0.0	0.0	Yes	Yes	0.0	26.1	0.0	5,977.6	5,549.7	185.4
1970	Mar	5977.6	5549.7	185.4	17.2	0.0	0.0	0.0	Yes	Yes	21.1	4.2	25.3	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.8	1.0	28.3	0.0	0.0	Yes	Yes	0.0	28.3	0.0	5,960.7	5,549.6	185.1
1970	Apr	5960.7	5549.6	185.1	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.2	1.0	21.5	0.0	0.0	Yes	Yes	0.0	21.5	0.0	5,934.3	5,549.5	184.5
1970	May	5934.3	5549.5	184.5	11.8	7.7	0.0	0.0	Yes	Yes	14.5	2.9	17.4	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.9	1.0	13.7	7.1	0.0	Yes	Yes	0.0	6.5	0.0	5,904.7	5,549.3	183.9
1970	Jun	5904.7	5549.3	183.9	9.6	7.7	0.0	0.0	Yes	Yes	11.8	2.4	14.2	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.6	1.0	11.6	7.2	0.0	No	Yes	7.6	12.0	7.6	5,320.1	5,546.0	172.3
1970	Jul	5320.1	5546.0	172.3	9.0	9.0	0.0	0.0	No	No	11.0	2.2	13.2	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.5	0.9	8.7	5.2	4.4	No	Yes	7.3	10.8	11.8	4,470.4	5,540.8	155.4
1970	Aug	4470.4	5540.8	155.4	8.9	5.5	0.0	0.0	Yes	Yes	10.9	2.2	13.1	3.6	0.0	Yes	Yes	14.6	25.4	0.0	0.0	4470.4	5540.8	155.4	50.2	0.8	51.3	0.8	4,369.0	5,540.2	153.1	1.5	0.8	11.8	5.1	0.0	Yes	Yes	7.3	14.0	7.3	3,917.7	5,537.1	142.9
1970	Sep	3917.7	5537.1	142.9	9.0	4.3	0.0	0.0	Yes	Yes	11.0	2.2	13.2	2.9	0.0	Yes	Yes	15.0	35.5	0.0	0.0	3917.7	5537.1	142.9	44.6	0.8	38.5	0.6	3,834.6	5,536.5	141.0	1.5	0.8	12.6	4.0	0.0	Yes	Yes	0.0	8.5	0.0	3,834.6	5,536.5	141.0
1970	Oct	3834.6	5536.5	141.0	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6	0.0	0.0	Yes	Yes	15.1	35.7	0.0	0.0	3834.6	5536.5	141.0	45.5	0.7	21.0	0.3	3,768.0	5,536.1	139.4	1.7	0.7	18.1	0.0	0.0	Yes	Yes	0.0	18.1	0.0	3,768.0	5,536.1	139.4
1970	Nov	3768.0	5536.1	139.4	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes	15.2	38.0	15.2	15.2	4669.6	5542.1	159.9	50.0	0.8	2.4	0.0	4,617.3	5,541.8	158.7	2.1	0.8	7.0	0.0	0.0	Yes	Yes	0.0	7.0	0.0	4,617.3	5,541.8	158.7
1970	Dec	4617.3	5541.8	158.7	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes	14.5	23.0	14.5	14.5	5511.5	5547.1	175.9	56.8	0.9	0.0	0.0	5,454.7	5,546.8	174.8	2.1	0.9	7.6	0.0	0.0	Yes	Yes	0.0	7.6	0.0	5,454.7	5,546.8	174.8
1971	Jan	5454.7	5546.8	174.8	14.7	0.0	0.0	0.0	Yes	Yes	18.0	3.6	21.6	0.0	0.0	Yes	Yes	14.0	9.4	9.4	9.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	15.6	0.0	0.0	Yes	Yes	0.0	15.6	0.0	5,971.7	5,549.7	185.3
1971	Feb	5971.7	5549.7	185.3	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.3	1.0	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	5,977.6	5,549.7	185.4
1971	Mar	5977.6	5549.7	185.4	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.3	1.0	22.7	0.0	0.0	Yes	Yes	0.0	22.7	0.0	5,960.7	5,549.6	185.1
1971	Apr	5960.7	5549.6	185.1	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.8	1.0	18.1	0.0	0.0	Yes	Yes	0.0	18.1	0.0	5,934.3	5,549.5	184.5
1971	May	5934.3	5549.5	184.5	12.5	7.7	0.0	0.0	Yes	Yes	15.3	3.1	18.4	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.1	1.0	14.8	7.1	0.0	Yes	Yes	0.0	7.6	0.0	5,904.7	5,549.3	183.9
1971	Jun	5904.7	5549.3	183.9	9.0	7.7	0.0	0.0	Yes	Yes	11.0	2.2	13.2	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.5	1.0	10.6	7.1	0.1	No	Yes	7.6	11.1	7.7	5,313.1	5,546.0	172.2
1971	Jul	5313.1	5546.0	172.2	7.5	7.5	0.0	0.0	No	No	9.2	1.8	11.0	6.8	0.0	Yes	Yes	14.1	11.7	0.0	0.0	5313.1	5546.0	172.2	55.6	0.9	71.0	1.2	5,186.5	5,545.2	169.8	1.2	0.9	6.3	2.8	6.8	No	Yes	7.3	10.8	14.2	4,315.8	5,539.8	151.9
1971	Aug	4315.8	5539.8	151.9	8.6	5.5	0.0	0.0	Yes	Yes	10.6	2.1	12.7	3.6	0.0	Yes	Yes	14.8	27.9	0.0	0.0	4315.8	5539.8	151.9	49.0	0.8	50.1	0.8	4,216.7	5,539.2	149.6	1.4	0.8	11.3	5.1	0.0	Yes	Yes	7.3	13.6	7.3	3,765.3	5,536.1	139.4
1971	Sep	3765.3	5536.1	139.4	7.6	4.3	0.0	0.0	Yes	Yes	9.3	1.9	11.2	2.9	0.0	Yes	Yes	15.2	38.1	0.0	0.0	3765.3	5536.1	139.4	43.6	0.7	37.5	0.6	3,684.2	5,535.5	137.6	1.2	0.7	10.3	4.0	0.0	Yes	Yes	0.0	6.3	0.0	3,684.2	5,535.5	137.6
1971	Oct	3684.2	5535.5	137.6	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7	0.0	0.0	Yes	Yes	15.2	38.2	0.0	0.0	3684.2	5535.5	137.6	44.4	0.7	20.5	0.3	3,619.3	5,535.0	136.1	1.8	0.7	18.2	0.0	0.0	Yes	Yes	0.0	18.2	0.0	3,619.3	5,535.0	136.1
1971	Nov	3619.3	5535.0	136.1	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5	0.0	0.0	Yes	Yes	15.3	40.5	15.3	13.0	4390.1	5540.3	153.5	48.0	0.8	2.3	0.0	4,339.8	5,540.0	152.4	1.8	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,339.8	5,540.0	152.4
1971	Dec	4339.8	5540.0	152.4	19.1	0.0	0.0	0.0	Yes	Yes	23.5	4.7	28.2	0.0	0.0	Yes	Yes	14.7	27.5	14.7	14.7	5245.8	5545.6	170.9	55.2	0.9	0.0	0.0	5,190.6	5,545.3	169.9	3.1	0.9	17.5	0.0	0.0	Yes	Yes	0.0	17.5	0.0	5,190.6	5,545.3	169.9
1972	Jan	5190.6	5545.3	169.9	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0	0.0	0.0	Yes	Yes	14.2	13.7	13.7	13.7	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.0	1.0	7.3	0.0	0.0	Yes	Yes	0.0	7.3	0.0	5,971.7	5,549.7	185.3
1972	Feb	5971.7	5549.7	185.3	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.2	1.0	21.7	0.0	0.0	Yes	Yes	0.0	21.7	0.0	5,977.6	5,549.7	185.4
1972	Mar	5977.6	5549.7	185.4	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	1.9	1.0	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,960.7	5,549.6	185.1
1972	Apr	5960.7	5549.6	185.1	10.3	0.0	0.0	0.0	Yes	Yes	12.6	2.5	15.1	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.7	1.0	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	5,934.3	5,549.5	184.5
1972	May	5934.3	5549.5	184.5	8.6	7.7	0.0	0.0	Yes	Yes	10.6	2.1	12.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.4	1.0	8.5	5.0	2.2	No	Yes	0.0	3.5	2.2	5,771.6	5,548.6	181.0
1972	Jun	5771.6	5548.6	181.0	9.8	7.7	0.0	0.0	Yes	Yes	12.0	2.4	14.4	5.1	0.0	Yes	Yes	13.8	4.4	0.0	0.0	5771.6	5548.6	181.0	56.6	1.0	74.7	1.3	5,640.4	5,547.9	178.3	1.6	1.0	11.9	7.2	0.0	Yes	Yes	7.6	12.3	7.6	5,189.1	5,545.3	169.9
1972	Jul	5189.1	5545.3	169.9	6.5	6.5	0.0	0.0	No	No	8.0	1.6	9.5	6.0	0.8	No	Yes	14.2	13.7	0.0	0.0	5189.1	5545.3	169.9	54.9	0.9	70.1	1.1	5,064.1	5,544.5	167.6	1.1	0.9	5.5	2.0	7.7	No	Yes	7.3	10.8	15.8	4,090.0	5,538.3	146.8
1972	Aug	4090.0	5538.3	146.8	6.9	5.5	0.0	0.0	Yes	Yes	8.5	1.7	10.2	3.6	0.0	Yes	Yes	14.9	31.6	0.0	0.0	4090.0	5538.3	146.8	47.4	0.8	48.4	0.8	3,994.2	5,537.7	144.6	1.1	0.8	8.5	5.0	0.1	No	Yes	7.3	10.8	7.5	3,534.7	5,534.4	134.2
1972	Sep	3534.7	5534.4	134.2	10.3	4.3	0.0	0.0	Yes	Yes	12.6	2.5	15.1	2.9	0.0	Yes	Yes	15.3	42.0	0.0	0.0	3534.7	5534.4	134.2	41.9	0.7	36.1	0.6	3,456.6	5,533.8	132.5	1.7	0.7	14.7	4.0	0.0	Yes	Yes	0.0	10.6	0.0	3,456.6	5,533.8	132.5
1972	Oct	3456.6	5533.8	132.5	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7	0.0	0.0	Yes	Yes	15.4	41.9	0.0	0.0	3456.6	5533.8	132.5	42.8	0.7	19.8	0.3	3,394.0	5,533.3	131.1	2.2	0.7	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	3,394.0	5,533.3	131.1
1972	Nov	3394.0	5533.3	131.1	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes	15.4	44.3	15.4	15.4	4313.3	5539.8	151.8	47.4	0.8	2.3	0.0	4,263.5	5,539.5	150.7	2.1	0.8	6.7	0.0	0.0	Yes	Yes	0.0	6.7	0.0	4,263.5	5,539.5	150.7
1972	Dec	4263.5	5539.5	150.7	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0	0.0	0.0	Yes	Yes	14.8	28.8	14.8	14.8	5172.8	5545.2	169.6	54.8	0.9	0.0	0.0	5,118.1	5,544.8	168.6	2.1	0.9	7.2	0.0	0.0	Yes	Yes	0.0	7.2	0.0	5,118.1	5,544.8	168.6
1973	Jan	5118.1	5544.8	168.6	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9	0.0	0.0	Yes	Yes	14.2	14.9	14.2	14.2	5992.3	5549.8	185.8	60.0	1.0	0.0	0.0	5,932.3	5,549.5	184.5	2.2	1.0	8.9	0.0	0.0	Yes	Yes	0.0	8.9	0.0	5,932.3	5,549.5	184.5
1973	Feb	5932.3	5549.5	184.5	14.7	0.0	0.0	0.0	Yes	Yes	18.1	3.6	21.7	0.0	0.0	Yes	Yes	13.7	1.8	1.8	1.8	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.4	1.0	23.3	0.0	0.0	Yes	Yes	0.0	23.3	0.0	5,977.6	5,549.7	185.4
1973	Mar	5977.6	5549.7	185.4	17.7	0.0	0.0	0.0	Yes	Yes	21.7	4.4	26.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.9	1.0	29.1	0.0	0.0	Yes	Yes	0.0	29.1	0.0	5,960.7	5,549.6	185.1
1973	Apr	5960.7	5549.6	185.1	56.9	0.0	0.0	0.0	Yes	Yes	69.9	14.1	84.0	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	9.4	1.0	93.1	0.0	0.0	Yes	Yes	0.0	93.1	0.0	5,934.3	5,549.5	184.5
1973	May	5934.3	5549.5	184.5	54.3	7.7	0.0	0.0	Yes	Yes	66.7	13.4	80.1	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	8.9	1.0	83.4	7.1	0.0	Yes	Yes	0.0	76.2	0.0	5,904.7	5,549.3	183.9
1973	Jun	5904.7	5549.3	183.9	21.2	7.7	0.0	0.0	Yes	Yes	26.0	5.2	31.2	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	3.5	1.0	30.6	7.2	0.0	Yes	Yes	7.6	31.0	7.6	5,320.1	5,546.0	172.3
1973	Jul	5320.1	5546.0	172.3	11.6	10.4	0.0	0.0	Yes	Yes	14.3	2.9	17.2	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.9	0.9	13.2	9.7	0.0	No	Yes	7.3	10.8	7.4	4,741.3	5,542.5	161.3
1973	Aug	4741.3	5542.5	161.3	10.0	5.5	0.0	0.0	Yes	Yes	12.3	2.5	14.8	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4741.3	5542.5	161.3	52.1	0.8	53.2	0.9	4,636.0	5,541.9	159.1	1.6	0.8	13.7	5.1	0.0	Yes	Yes	7.3	15.9	7.3	4,184.7	5,539.0	148.9
1973	Sep	4184.7	5539.0	148.9	9.8	4.3	0.0	0.0	Yes	Yes	12.0	2.4	14.4	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4184.7	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.1	5,538.4	147.0	1.6	0.8	13.9	4.0	0.0	Yes	Yes	0.0	9.9	0.0	4,098.1	5,538.4	147.0
1973	Oct	4098.1	5538.4	147.0	10.5	0.0	0.0	0.0	Yes	Yes	12.9	2.6	15.5	0.0	0.0	Yes	Yes	14.9	31.5	0.0	0.0	4098.1	5538.4	147.0	47.5	0.8	21.9	0.4	4,028.7	5,537.9	145.4	1.7	0.8	18.0	0.0	0.0	Yes	Yes	0.0	18.0	0.0	4,028.7	5,537.9	145.4
1973	Nov	4028.7	5537.9	145.4	12.3	0.0	0.0	0.0	Yes	Yes	15.1	3.0	18.1	0.0	0.0	Yes	Yes	15.0	33.7	15.0	14.6	4899.6	5543.5	164.4	51.4	0.9	2.5	0.0	4,845.7	5,543.2	163.4	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	4,845.7	5,543.2	163.4
1973	Dec	4845.7	5543.2	163.4	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes	14.4	19.3	14.4	14.4	5730.7	5548.4	180.2	58.2	0.9	0.0	0.0	5,672.5	5,548.0	178.9	2.1	0.9	7.8	0.0	0.0	Yes	Yes	0.0	7.8	0.0	5,672.5	5,548.0	178.9
1974	Jan	5672.5	5548.0	178.9	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4	0.0	0.0	Yes	Yes	13.9	5.8	5.8	5.8	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.3	1.0	17.8	0.0	0.0	Yes	Yes	0.0	17.8	0.0	5,971.7	5,549.7	185.3
1974	Feb	5971.7	5549.7	185.3	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.3	1.0	22.5	0.0	0.0	Yes	Yes	0.0	22.5	0.0	5,977.6	5,549.7	185.4
1974	Mar	5977.6	5549.7	185.4	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.6	1.0	25.6	0.0	0.0	Yes	Yes	0.0	25.6	0.0	5,960.7	5,549.6	185.1
1974	Apr	5960.7	5549.6	185.1	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.1	1.0	20.6	0.0	0.0	Yes	Yes	0.0	20.6	0.0	5,934.3	5,549.5	184.5
1974	May	5934.3	5549.5	184.5	11.2	7.7	0.0	0.0	Yes	Yes	13.8	2.8	16.6	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.8	1.0	12.8	7.1	0.0	Yes	Yes	0.0	5.6	0.0	5,904.7	5,549.3	183.9
1974	Jun	5904.7	5549.3	183.9	9.7	7.7	0.0	0.0	Yes	Yes	11.9	2.4	14.3	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.6	1.0	11.8	7.2	0.0	Yes	Yes	7.6	12.2	7.6	5,320.1	5,546.0	172.3
1974	Jul	5320.1	5546.0	172.3	8.4	8.4	0.0	0.0	No	No	10.3	2.1	12.4	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.4	0.9	7.8	4.3	5.4	No	Yes	7.3	10.8	12.7	4,413.0	5,540.5	154.1
1974	Aug	4413.0	5540.5	154.1	7.0	5.5	0.0	0.0	Yes	Yes	8.6	1.7	10.3	3.6	0.0	Yes	Yes	14.7	26.3	0.0	0.0	4413.0	5540.5	154.1	49.7	0.8	50.8	0.8	4,312.4	5,539.8	151.8	1.2	0.8	8.7	5.1	0.0	No	Yes	7.3	10.9	7.3	3,861.1	5,536.7	141.6
1974	Sep	3861.1	5536.7	141.6	7.6	4.3	0.0	0.0	Yes	Yes	9.4	1.9	11.2	2.9	0.0	Yes	Yes	15.1	36.5	0.0	0.0	3861.1	5536.7	141.6	44.2	0.7	38.1	0.6	3,778.7	5,536.2	139.7	1.3	0.7	10.4	4.0	0.0	Yes	Yes	0.0	6.3	0.0	3,778.7	5,536.2	139.7
1974	Oct	3778.7	5536.2	139.7	10.8	0.0	0.0	0.0	Yes	Yes	13.2	2.7	15.9	0.0	0.0	Yes	Yes	15.1	36.6	0.0	0.0	3778.7	5536.2	139.7	45.1	0.7	20.8	0.3	3,712.8	5,535.7	138.2	1.8	0.7	18.4	0.0	0.0	Yes	Yes	0.0	18.4	0.0	3,712.8	5,535.7	138.2
1974	Nov	3712.8	5535.7	138.2	13.2	0.0	0.0	0.0	Yes	Yes	16.2	3.3	19.5	0.0	0.0	Yes	Yes	15.2	39.0	15.2	15.2	4616.9	5541.8	158.7	49.6	0.8	2.4	0.0	4,564.9	5,541.4	157.5	2.2	0.8	7.3	0.0	0.0	Yes	Yes	0.0	7.3	0.0	4,564.9	5,541.4	157.5
1974	Dec	4564.9	5541.4	157.5	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9	0.0	0.0	Yes	Yes	14.6	23.9	14.6	14.4	5450.1	5546.8	174.7	56.4	0.9	0.0	0.0	5,393.7	5,546.4	173.7	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,393.7	5,546.4	173.7
1975	Jan	5393.7	5546.4	173.7	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9	0.0	0.0	Yes	Yes	14.0	10.4	10.4	10.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.0	1.0	10.5	0.0	0.0	Yes	Yes	0.0	10.5	0.0	5,971.7	5,549.7	185.3
1975	Feb	5971.7	5549.7	185.3	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.1	1.0	20.7	0.0	0.0	Yes	Yes	0.0	20.7	0.0	5,977.6	5,549.7	185.4
1975	Mar	5977.6	5549.7	185.4	17.0	0.0	0.0	0.0	Yes	Yes	20.9	4.2	25.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.8	1.0	28.0	0.0	0.0	Yes	Yes	0.0	28.0	0.0	5,960.7	5,549.6	185.1
1975	Apr	5960.7	5549.6	185.1	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.7	1.0	26.9	0.0	0.0	Yes	Yes	0.0	26.9	0.0	5,934.3	5,549.5	184.5
1975	May	5934.3	5549.5	184.5	13.3	7.7	0.0	0.0	Yes	Yes	16.3	3.3	19.6	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.2	1.0	16.1	7.1	0.0	Yes	Yes	0.0	8.9	0.0	5,904.7	5,549.3	183.9
1975	Jun	5904.7	5549.3	183.9	10.1	7.7	0.0	0.0	Yes	Yes	12.4	2.5	14.9	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.7	1.0	12.4	7.2	0.0	Yes	Yes	7.6	12.8	7.6	5,320.1	5,546.0	172.3
1975	Jul	5320.1	5546.0	172.3	8.7	8.7	0.0	0.0	No	No	10.7	2.2	12.9	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.4	0.9	8.3	4.8	4.8	No	Yes	7.3	10.8	12.2	4,445.8	5,540.7	154.8
1975	Aug	4445.8	5540.7	154.8	7.6	5.5	0.0	0.0	Yes	Yes	9.3	1.9	11.2	3.6	0.0	Yes	Yes	14.7	25.8	0.0	0.0	4445.8	5540.7	154.8	50.0	0.8	51.1	0.8	4,344.7	5,540.0	152.5	1.2	0.8	9.6	5.1	0.0	Yes	Yes	7.3	11.8	7.3	3,893.4	5,537.0	142.3
1975	Sep	3893.4	5537.0	142.3	8.2	4.3	0.0	0.0	Yes	Yes	10.1	2.0	12.1	2.9	0.0	Yes	Yes	15.1	35.9	0.0	0.0	3893.4	5537.0	142.3	44.5	0.7	38.3	0.6	3,810.6	5,536.4	140.4	1.4	0.7	11.4	4.0	0.0	Yes	Yes	0.0	7.3	0.0	3,810.6	5,536.4	140.4
1975	Oct	3810.6	5536.4	140.4	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes	15.1	36.1	0.0	0.0	3810.6	5536.4	140.4	45.3	0.7	20.9	0.3	3,744.3	5,535.9	138.9	1.5	0.7	15.8	0.0	0.0	Yes	Yes	0.0	15.8	0.0	3,744.3	5,535.9	138.9
1975	Nov	3744.3	5535.9	138.9	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8	0.0	0.0	Yes	Yes	15.2	38.4	15.2	13.3	4536.6	5541.3	156.9	49.0	0.8	2.4	0.0	4,485.2	5,540.9	155.7	1.9	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,485.2	5,540.9	155.7
1975	Dec	4485.2	5540.9	155.7	12.4	0.0	0.0	0.0	Yes	Yes	15.2	3.1	18.3	0.0	0.0	Yes	Yes	14.6	25.2	14.6	14.6	5385.0	5546.4	173.5	56.0	0.9	0.0	0.0	5,329.0	5,546.1	172.5	2.0	0.9	6.6	0.0	0.0	Yes	Yes	0.0	6.6	0.0	5,329.0	5,546.1	172.5
1976	Jan	5329.0	5546.1	172.5	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7	0.0	0.0	Yes	Yes	14.1	11.4	11.4	11.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	1.8	1.0	7.0	0.0	0.0	Yes	Yes	0.0	7.0	0.0	5,971.7	5,549.7	185.3
1976	Feb	5971.7	5549.7	185.3	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.5	1.0	24.3	0.0	0.0	Yes	Yes	0.0	24.3	0.0	5,977.6	5,549.7	185.4
1976	Mar	5977.6	5549.7	185.4	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.2	1.0	22.4	0.0	0.0	Yes	Yes	0.0	22.4	0.0	5,960.7	5,549.6	185.1
1976	Apr	5960.7	5549.6	185.1	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.1	1.0	21.0	0.0	0.0	Yes	Yes	0.0	21.0	0.0	5,934.3	5,549.5	184.5
1976	May	5934.3	5549.5	184.5	10.2	7.7	0.0	0.0	Yes	Yes	12.5	2.5	15.0	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.7	1.0	11.0	7.1	0.0	Yes	Yes	0.0	3.9	0.0	5,904.7	5,549.3	183.9
1976	Jun	5904.7	5549.3	183.9	7.2	7.2	0.0	0.0	No	No	8.9	1.8	10.7	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.2	1.0	7.7	4.2	3.0	No	Yes	7.6	11.1	10.5	5,143.9	5,545.0	169.1
1976	Jul	5143.9	5545.0	169.1	7.9	7.9	0.0	0.0	No	No	9.7	2.0	11.7	6.8	0.0	Yes	Yes	14.2	14.4	0.0	0.0	5143.9	5545.0	169.1	54.6	0.9	69.7	1.1	5,019.6	5,544.2	166.8	1.3	0.9	7.0	3.5	6.2	No	Yes	7.3	10.8	13.5	4,188.9	5,539.0	149.0
1976	Aug	4188.9	5539.0	149.0	7.7	5.5	0.0	0.0	Yes	Yes	9.5	1.9	11.4	3.6	0.0	Yes	Yes	14.8	30.0	0.0	0.0	4188.9	5539.0	149.0	48.1	0.8	49.2	0.8	4,091.6	5,538.3	146.8	1.3	0.8	9.8	5.1	0.0	Yes	Yes	7.3	12.1	7.3	3,640.3	5,535.1	136.6
1976	Sep	3640.3	5535.1	136.6	8.4	4.3	0.0	0.0	Yes	Yes	10.3	2.1	12.4	2.9	0.0	Yes	Yes	15.3	40.2	0.0	0.0	3640.3	5535.1	136.6	42.7	0.7	36.8	0.6	3,560.9	5,534.6	134.8	1.4	0.7	11.6	4.0	0.0	Yes	Yes	0.0	7.6	0.0	3,560.9	5,534.6	134.8

ALPHA ENGINEERING

Date Yr	Date Mo	Reservoir Start Volume (af)	Reservoir Start Elevation (ft)	Reservoir Start Area (ac)	Glendale USGS Data Backed to Glendale Ave Flow (cfs)	to GIC From River (cfs)	to GIC Max Supp	to GIC Supp (cfs)	to GIC Pre Cove Ful	to GIC Full?	Glendale USGS Data Ave Flow (cfs)	Orderville Tributary Ave Flow (cfs)	River Ave Flow (cfs)	to OIC River (cfs)	to OIC Supp (cfs)	to OIC Pre Cove Ful	to OIC Full?	to COVE Hydraulic Ca (cfs)	to COVE to Fill Resv (cfs)	to COVE Control (cfs)	to COVE River (cfs)	Reservoir Int1 Volume (af)	Reservoir Int1 Elevation (ft)	Reservoir Int1 Area (ac)	Seepage (af)	Seepage (cfs)	Evaporation (af)	Evaporation (cfs)	Reservoir Int2 Volume (af)	Reservoir Int2 Elevation (ft)	Reservoir Int2 Area (ac)	Mt Carmel Tributary Ave Flow (cfs)	Seepage Return Ave Flow (cfs)	River Ave Flow (cfs)	to MCIC River (cfs)	to MCIC Supp (cfs)	to MCIC Pre Cove Ful	to MCIC Full?	WC Release Supp (cfs)	River Ave Flow (cfs)	Sum Supp (cfs)	Reservoir End Volume (af)	Reservoir End Elevation (ft)	Reservoir End Area (ac)
1976	Oct	3560.9	5534.6	134.8	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes	15.3	40.2	0.0	0.0	3560.9	5534.6	134.8	43.5	0.7	20.1	0.3	3,497.2	5,534.1	133.4	1.6	0.7	16.5	0.0	0.0	Yes	Yes	0.0	16.5	0.0	3,497.2	5,534.1	133.4
1976	Nov	3497.2	5534.1	133.4	8.8	0.0	0.0	0.0	Yes	Yes	10.8	2.2	13.0	0.0	0.0	Yes	Yes	15.4	42.6	15.4	9.5	4060.8	5538.1	146.1	45.7	0.8	2.2	0.0	4,012.9	5,537.8	145.0	1.4	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,012.9	5,537.8	145.0
1976	Dec	4012.9	5537.8	145.0	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes	15.0	32.8	15.0	10.3	4647.0	5542.0	159.4	51.5	0.8	0.0	0.0	4,595.5	5,541.6	158.2	1.5	0.8	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	4,595.5	5,541.6	158.2
1977	Jan	4595.5	5541.6	158.2	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes	14.6	23.4	14.6	10.7	5251.7	5545.6	171.0	55.2	0.9	0.0	0.0	5,196.5	5,545.3	170.0	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,196.5	5,545.3	170.0
1977	Feb	5196.5	5545.3	170.0	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	14.2	15.0	14.2	11.0	5809.2	5548.8	181.8	53.0	1.0	0.0	0.0	5,756.2	5,548.5	180.7	1.6	1.0	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	5,756.2	5,548.5	180.7
1977	Mar	5756.2	5548.5	180.7	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes	13.8	4.5	4.5	4.5	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	1.5	1.0	11.8	0.0	0.0	Yes	Yes	0.0	11.8	0.0	5,960.7	5,549.6	185.1
1977	Apr	5960.7	5549.6	185.1	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.5	1.0	14.5	0.0	0.0	Yes	Yes	0.0	14.5	0.0	5,934.3	5,549.5	184.5
1977	May	5934.3	5549.5	184.5	10.1	7.7	0.0	0.0	Yes	Yes	12.4	2.5	14.9	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.7	1.0	10.9	7.1	0.0	Yes	Yes	0.0	3.7	0.0	5,904.7	5,549.3	183.9
1977	Jun	5904.7	5549.3	183.9	7.3	7.3	0.0	0.0	No	No	8.9	1.8	10.7	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.2	1.0	7.8	4.3	2.9	No	Yes	7.6	11.1	10.5	5,147.9	5,545.0	169.1
1977	Jul	5147.9	5545.0	169.1	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7	6.2	0.7	No	Yes	14.2	14.4	0.0	0.0	5147.9	5545.0	169.1	54.6	0.9	69.8	1.1	5,023.5	5,544.3	166.8	1.1	0.9	5.5	2.0	7.7	No	Yes	7.3	10.8	15.7	4,058.2	5,538.1	146.1
1977	Aug	4058.2	5538.1	146.1	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.6	9.8	3.6	0.0	Yes	Yes	14.9	32.1	0.0	0.0	4058.2	5538.1	146.1	47.2	0.8	48.2	0.8	3,962.9	5,537.4	143.9	1.1	0.8	8.1	4.6	0.5	No	Yes	7.3	10.8	7.9	3,479.3	5,534.0	133.0
1977	Sep	3479.3	5534.0	133.0	7.0	4.3	0.0	0.0	Yes	Yes	8.6	1.7	10.4	2.9	0.0	Yes	Yes	15.4	42.9	0.0	0.0	3479.3	5534.0	133.0	41.6	0.7	35.8	0.6	3,401.9	5,533.4	131.3	1.2	0.7	9.3	4.0	0.0	Yes	Yes	0.0	5.3	0.0	3,401.9	5,533.4	131.3
1977	Oct	3401.9	5533.4	131.3	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5	0.0	0.0	Yes	Yes	15.4	42.8	0.0	0.0	3401.9	5533.4	131.3	42.4	0.7	19.6	0.3	3,340.0	5,532.9	129.9	1.4	0.7	14.6	0.0	0.0	Yes	Yes	0.0	14.6	0.0	3,340.0	5,532.9	129.9
1977	Nov	3340.0	5532.9	129.9	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes	15.5	45.2	15.5	10.7	3975.0	5537.5	144.2	45.1	0.8	2.2	0.0	3,927.8	5,537.2	143.1	1.6	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,927.8	5,537.2	143.1
1977	Dec	3927.8	5537.2	143.1	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	15.0	34.2	15.0	11.0	4606.1	5541.7	158.5	51.2	0.8	0.0	0.0	4,555.0	5,541.4	157.3	1.6	0.8	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	4,555.0	5,541.4	157.3
1978	Jan	4555.0	5541.4	157.3	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes	14.6	24.0	14.6	13.6	5388.4	5546.4	173.6	56.0	0.9	0.0	0.0	5,332.4	5,546.1	172.5	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,332.4	5,546.1	172.5
1978	Feb	5332.4	5546.1	172.5	14.5	0.0	0.0	0.0	Yes	Yes	17.8	3.6	21.4	0.0	0.0	Yes	Yes	14.1	12.6	12.6	12.6	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.4	1.0	12.1	0.0	0.0	Yes	Yes	0.0	12.1	0.0	5,977.6	5,549.7	185.4
1978	Mar	5977.6	5549.7	185.4	27.9	0.0	0.0	0.0	Yes	Yes	34.3	6.9	41.2	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	4.6	1.0	45.9	0.0	0.0	Yes	Yes	0.0	45.9	0.0	5,960.7	5,549.6	185.1
1978	Apr	5960.7	5549.6	185.1	38.9	0.0	0.0	0.0	Yes	Yes	47.8	9.6	57.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	6.4	1.0	63.6	0.0	0.0	Yes	Yes	0.0	63.6	0.0	5,934.3	5,549.5	184.5
1978	May	5934.3	5549.5	184.5	25.1	7.7	0.0	0.0	Yes	Yes	30.8	6.2	37.0	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	4.1	1.0	35.5	7.1	0.0	Yes	Yes	0.0	28.3	0.0	5,904.7	5,549.3	183.9
1978	Jun	5904.7	5549.3	183.9	13.2	7.7	0.0	0.0	Yes	Yes	16.2	3.3	19.5	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	2.2	1.0	17.5	7.2	0.0	Yes	Yes	7.6	17.9	7.6	5,320.1	5,546.0	172.3
1978	Jul	5320.1	5546.0	172.3	10.2	10.2	0.0	0.0	No	No	12.5	2.5	15.0	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.7	0.9	10.8	7.3	2.4	No	Yes	7.3	10.8	9.8	4,593.6	5,541.6	158.2
1978	Aug	4593.6	5541.6	158.2	9.2	5.5	0.0	0.0	Yes	Yes	11.3	2.3	13.6	3.6	0.0	Yes	Yes	14.6	23.4	0.0	0.0	4593.6	5541.6	158.2	51.1	0.8	52.2	0.8	4,490.3	5,541.0	155.8	1.5	0.8	12.3	5.1	0.0	Yes	Yes	7.3	14.5	7.3	4,039.0	5,538.0	145.6
1978	Sep	4039.0	5538.0	145.6	9.2	4.3	0.0	0.0	Yes	Yes	11.3	2.3	13.6	2.9	0.0	Yes	Yes	14.9	33.5	0.0	0.0	4039.0	5538.0	145.6	45.5	0.8	39.2	0.7	3,954.3	5,537.4	143.7	1.5	0.8	13.0	4.0	0.0	Yes	Yes	0.0	8.9	0.0	3,954.3	5,537.4	143.7
1978	Oct	3954.3	5537.4	143.7	9.8	0.0	0.0	0.0	Yes	Yes	12.0	2.4	14.4	0.0	0.0	Yes	Yes	15.0	33.8	0.0	0.0	3954.3	5537.4	143.7	46.4	0.8	21.4	0.3	3,886.4	5,536.9	142.2	1.6	0.8	16.8	0.0	0.0	Yes	Yes	0.0	16.8	0.0	3,886.4	5,536.9	142.2
1978	Nov	3886.4	5536.9	142.2	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4	0.0	0.0	Yes	Yes	15.1	36.1	15.1	15.1	4782.7	5542.8	162.1	50.7	0.9	2.4	0.0	4,729.7	5,542.5	161.1	2.6	0.9	11.8	0.0	0.0	Yes	Yes	0.0	11.8	0.0	4,729.7	5,542.5	161.1
1978	Dec	4729.7	5542.5	161.1	13.4	0.0	0.0	0.0	Yes	Yes	16.5	3.3	19.8	0.0	0.0	Yes	Yes	14.5	21.2	14.5	14.5	5619.3	5547.7	177.9	57.4	0.9	0.0	0.0	5,561.9	5,547.4	176.8	2.2	0.9	8.5	0.0	0.0	Yes	Yes	0.0	8.5	0.0	5,561.9	5,547.4	176.8
1979	Jan	5561.9	5547.4	176.8	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes	13.9	7.6	7.6	7.6	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	16.8	0.0	0.0	Yes	Yes	0.0	16.8	0.0	5,971.7	5,549.7	185.3
1979	Feb	5971.7	5549.7	185.3	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.6	1.0	25.4	0.0	0.0	Yes	Yes	0.0	25.4	0.0	5,977.6	5,549.7	185.4
1979	Mar	5977.6	5549.7	185.4	26.5	0.0	0.0	0.0	Yes	Yes	32.5	6.5	39.0	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	4.4	1.0	43.5	0.0	0.0	Yes	Yes	0.0	43.5	0.0	5,960.7	5,549.6	185.1
1979	Apr	5960.7	5549.6	185.1	108.3	0.0	0.0	0.0	Yes	Yes	133.0	26.7	159.7	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	17.8	1.0	177.3	0.0	0.0	Yes	Yes	0.0	177.3	0.0	5,934.3	5,549.5	184.5
1979	May	5934.3	5549.5	184.5	83.9	7.7	0.0	0.0	Yes	Yes	103.0	20.7	123.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	13.8	1.0	131.8	7.1	0.0	Yes	Yes	0.0	124.7	0.0	5,904.7	5,549.3	183.9
1979	Jun	5904.7	5549.3	183.9	25.9	7.7	0.0	0.0	Yes	Yes	31.8	6.4	38.2	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	4.3	1.0	38.3	7.2	0.0	Yes	Yes	7.6	38.7	7.6	5,320.1	5,546.0	172.3
1979	Jul	5320.1	5546.0	172.3	15.3	10.4	0.0	0.0	Yes	Yes	18.8	3.8	22.6	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	2.5	0.9	19.2	9.7	0.0	Yes	Yes	7.3	16.8	7.3	4,742.0	5,542.6	161.3
1979	Aug	4742.0	5542.6	161.3	14.4	5.5	0.0	0.0	Yes	Yes	17.7	3.6	21.3	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9	4,636.7	5,541.9	159.2	2.4	0.8	20.9	5.1	0.0	Yes	Yes	7.3	23.1	7.3	4,185.4	5,539.0	148.9
1979	Sep	4185.4	5539.0	148.9	12.0	4.3	0.0	0.0	Yes	Yes	14.7	3.0	17.7	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.8	5,538.4	147.0	2.0	0.8	17.5	4.0	0.0	Yes	Yes	0.0	13.5	0.0	4,098.8	5,538.4	147.0
1979	Oct	4098.8	5538.4	147.0	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4	4,029.4	5,537.9	145.4	2.1	0.8	22.1	0.0	0.0	Yes	Yes	0.0	22.1	0.0	4,029.4	5,537.9	145.4
1979	Nov	4029.4	5537.9	145.4	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes	15.0	33.7	15.0	15.0	4919.3	5543.6	164.8	51.5	0.9	2.5	0.0	4,865.4	5,543.3	163.8	2.3	0.9	9.0	0.0	0.0	Yes	Yes	0.0	9.0	0.0	4,865.4	5,543.3	163.8
1979	Dec	4865.4	5543.3	163.8	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0	0.0	0.0	Yes	Yes	14.4	19.0	14.4	14.4	5749.6	5548.5	180.6	58.3	0.9	0.0	0.0	5,691.2	5,548.1	179.3	2.5	0.9	11.0	0.0	0.0	Yes	Yes	0.0	11.0	0.0	5,691.2	5,548.1	179.3
1980	Jan	5691.2	5548.1	179.3	21.3	0.0	0.0	0.0	Yes	Yes	26.2	5.3	31.5	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.5	1.0	30.4	0.0	0.0	Yes	Yes	0.0	30.4	0.0	5,971.7	5,549.7	185.3
1980	Feb	5971.7	5549.7	185.3	29.6	0.0	0.0	0.0	Yes	Yes	36.4	7.3	43.7	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	4.9	1.0	48.5	0.0	0.0	Yes	Yes	0.0	48.5	0.0	5,977.6	5,549.7	185.4
1980	Mar	5977.6	5549.7	185.4	34.9	0.0	0.0	0.0	Yes	Yes	42.9	8.6	51.5	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	5.7	1.0	57.4	0.0	0.0	Yes	Yes	0.0	57.4	0.0	5,960.7	5,549.6	185.1
1980	Apr	5960.7	5549.6	185.1	118.1	0.0	0.0	0.0	Yes	Yes	145.0	29.1	174.1	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	19.4	1.0	193.4	0.0	0.0	Yes	Yes	0.0	193.4	0.0	5,934.3	5,549.5	184.5
1980	May	5934.3	5549.5	184.5	106.7	7.7	0.0	0.0	Yes	Yes	131.0	26.3	157.3	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	17.6	1.0	169.2	7.1	0.0	Yes	Yes	0.0	162.1	0.0	5,904.7	5,549.3	183.9
1980	Jun	5904.7	5549.3	183.9	35.5	7.7	0.0	0.0	Yes	Yes	43.6	8.8	52.4	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	5.8	1.0	54.1	7.2	0.0	Yes	Yes	7.6	54.5	7.6	5,320.1	5,546.0	172.3
1980	Jul	5320.1	5546.0	172.3	22.8	10.4	0.0	0.0	Yes	Yes	28.0	5.6	33.6	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	3.8	0.9	31.4	9.7	0.0	Yes	Yes	7.3	29.1	7.3	4,742.0	5,542.6	161.3
1980	Aug	4742.0	5542.6	161.3	21.1	5.5	0.0	0.0	Yes	Yes	25.9	5.2	31.1	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9	4,636.7	5,541.9	159.2	3.5	0.8	31.8	5.1	0.0	Yes	Yes	7.3	34.0	7.3	4,185.4	5,539.0	148.9
1980	Sep	4185.4	5539.0	148.9	20.1	4.3	0.0	0.0	Yes	Yes	24.7	5.0	29.7	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.8	5,538.4	147.0	3.3	0.8	30.9	4.0	0.0	Yes	Yes	0.0	26.8	0.0	4,098.8	5,538.4	147.0
1980	Oct	4098.8	5538.4	147.0	18.2	0.0	0.0	0.0	Yes	Yes	22.3	4.5	26.8	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4	4,029.4	5,537.9	145.4	3.0	0.8	30.5	0.0	0.0	Yes	Yes	0.0	30.5	0.0	4,029.4	5,537.9	145.4
1980	Nov	4029.4	5537.9	145.4	17.7	0.0	0.0	0.0	Yes	Yes	21.7	4.4	26.1	0.0	0.0	Yes	Yes	15.0	33.7	15.0	15.0	4919.3	5543.6	164.8	51.5	0.9	2.5	0.0	4,865.4	5,543.3	163.8	2.9	0.9	14.9	0.0	0.0	Yes	Yes	0.0	14.9	0.0	4,865.4	5,543.3	163.8
1980	Dec	4865.4	5543.3	163.8	18.2	0.0	0.0	0.0	Yes	Yes	22.4	4.5	26.9	0.0	0.0	Yes	Yes	14.4	19.0	14.4	14.4	5749.6	5548.5	180.6	58.3	0.9	0.0	0.0	5,691.2	5,548.1	179.3	3.0	0.9	16.5	0.0	0.0	Yes	Yes	0.0	16.5	0.0	5,691.2	5,548.1	179.3
1981	Jan	5691.2	5548.1	179.3	17.8	0.0	0.0	0.0	Yes	Yes	21.8	4.4	26.2	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.9	1.0	24.5	0.0	0.0	Yes	Yes	0.0	24.5	0.0	5,971.7	5,549.7	185.3
1981	Feb	5971.7	5549.7	185.3	18.2	0.0	0.0	0.0	Yes	Yes	22.4	4.5	26.9	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.0	1.0	29.8	0.0	0.0	Yes	Yes	0.0	29.8	0.0	5,977.6	5,549.7	185.4
1981	Mar	5977.6	5549.7	185.4	21.3	0.0	0.0	0.0	Yes	Yes	26.2	5.3	31.5	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.5	1.0	35.1	0.0	0.0	Yes	Yes	0.0	35.1	0.0	5,960.7	5,549.6	185.1
1981	Apr	5960.7	5549.6	185.1	18.0	0.0	0.0	0.0	Yes	Yes	22.1	4.4	26.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.0	1.0	29.3	0.0	0.0	Yes	Yes	0.0	29.3	0.0	5,934.3	5,549.5	184.5
1981	May	5934.3	5549.5	184.5	14.7	7.7	0.0	0.0	Yes	Yes	18.1	3.6	21.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.4	1.0	18.5	7.1	0.0	Yes	Yes	0.0	11.3	0.0	5,904.7	5,549.3	183.9
1981	Jun	5904.7	5549.3	183.9	11.2	7.7	0.0	0.0	Yes	Yes	13.7	2.8	16.5	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.8	1.0	14.2	7.2	0.0	Yes	Yes	7.6	14.6	7.6	5,320.1	5,546.0	172.3
1981	Jul	5320.1	5546.0	172.3	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.6	0.9	9.7	6.2	3.5	No	Yes	7.3	10.8	10.8	4,527.9	5,541.2	156.7
1981	Aug	4527.9	5541.2	156.7	10.1	5.5	0.0	0.0	Yes	Yes	12.4	2.5	14.9	3.6	0.0	Yes	Yes	14.6	24.5	0.0	0.0	4527.9	5541.2	156.7	50.6	0.8	51.7	0.8	4,425.6	5,540.5	154.3	1.7	0.8	13.8	5.1	0.0	Yes	Yes	7.3	16.0	7.3	3,974.3	5,537.5	144.2
1981	Sep	3974.3	5537.5	144.2	10.7	4.3	0.0	0.0	Yes	Yes	13.1	2.6	15.7	2.9	0.0	Yes	Yes	15.0	34.6	0.0	0.0	3974.3	5537.5	144.2	45.0	0.8	38.8	0.7	3,890.4	5,536.9	142.2	1.8	0.8	15.4	4.0	0.0	Yes	Yes	0.0	11.3	0.0	3,890.4	5,536.9	142.2
1981	Oct	3890.4	5536.9	142.2	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7	0.0	0.0	Yes	Yes	15.1	34.8	0.0	0.0	3890.4	5536.9	142.2	45.9	0.7	21.2	0.3	3,823.3	5,536.5	140.7	2.2	0.7	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	3,823.3	5,536.5	140.7
1981	Nov	3823.3	5536.5	140.7	13.2	0.0	0.0	0.0	Yes	Yes	16.2	3.3	19.5	0.0	0.0	Yes	Yes	15.1	37.1	15.1	15.1	4722.4	5542.4	160.9	50.3	0.8	2.4	0.0	4,669.7	5,542.1	159.9	2.2	0.8	7.4	0.0	0.0	Yes	Yes	0.0	7.4	0.0	4,669.7	5,542.1	159.9
1981	Dec	4669.7	5542.1	159.9	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7	0.0	0.0	Yes	Yes	14.5	22.2	14.5	14.5	5561.8	5547.4	176.8	57.1	0.9	0.0	0.0	5,504.7	5,547.1	175.8	2.2	0.9	8.3	0.0	0.0	Yes	Yes	0.0	8.3	0.0	5,504.7	5,547.1	175.8
1982	Jan	5504.7	5547.1	175.8	14.4	0.0	0.0	0.0	Yes	Yes	17.7	3.6	21.3	0.0	0.0	Yes	Yes	14.0	8.6	8.6	8.6	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	16.0	0.0	0.0	Yes	Yes	0.0	16.0	0.0	5,971.7	5,549.7	185.3
1982	Feb	5971.7	5549.7	185.3	16.7	0.0	0.0	0.0	Yes	Yes	20.5	4.1	24.6	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.7	1.0	27.3	0.0	0.0	Yes	Yes	0.0	27.3	0.0	5,977.6	5,549.7	185.4
1982	Mar	5977.6	5549.7	185.4	22.9	0.0	0.0	0.0	Yes	Yes	28.1	5.6	33.7	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.8	1.0	37.6	0.0	0.0	Yes	Yes	0.0	37.6	0.0	5,960.7	5,549.6	185.1
1982	Apr	5960.7	5549.6	185.1	22.7	0.0	0.0	0.0	Yes	Yes	27.9	5.6	33.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.7	1.0	37.0	0.0	0.0	Yes	Yes	0.0	37.0	0.0	5,934.3	5,549.5	184.5
1982	May	5934.3	5549.5	184.5	15.5	7.7	0.0	0.0	Yes	Yes	19.0	3.8	22.8	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.5	1.0	19.7	7.1	0.0	Yes	Yes	0.0	12.6	0.0	5,904.7	5,549.3	183.9
1982	Jun	5904.7	5549.3	183.9	10.3	7.7	0.0	0.0	Yes	Yes	12.7	2.6	15.3	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.7	1.0	12.8	7.2	0.0	Yes	Yes	7.6	13.2	7.6	5,320.1	5,546.0	172.3
1982	Jul	5320.1	5546.0	172.3	9.2	9.2	0.0	0.0	No	No	11.3	2.3	13.6	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.5	0.9	9.1	5.6	4.0	No	Yes	7.3	10.8	11.4	4,495.1	5,541.0	155.9
1982	Aug	4495.1	5541.0	155.9	10.4	5.5	0.0	0.0	Yes	Yes	12.8	2.6	15.4	3.6	0.0	Yes	Yes	14.6	25.0	0.0	0.0	4495.1	5541.0	155.9	50.4	0.8	51.5	0.8	4,393.3	5,540.3	153.6	1.7	0.8	14.3	5.1	0.0	Yes	Yes	7.3	16.5	7.3	3,941.9	5,537.3	143.4
1982	Sep	3941.9	5537.3	143.4	11.4	4.3	0.0	0.0	Yes	Yes	14.0	2.8	16.8	2.9	0.0	Yes	Yes	15.0	35.1	0.0	0.0	3941.9	5537.3	143.4	44.8	0.8	38.6	0.6	3,858.5	5,536.7	141.5	1.9	0.8	16.6	4.0	0.0	Yes	Yes	0.0	12.5	0.0	3,858.5	5,536.7	141.5
1982	Oct	3858.5	5536.7	141.5	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes	15.1	35.3	0.0	0.0	3858.5	5536.7	141.5	45.7	0.7	21.1	0.3	3,791.7	5,536.2	140.0	2.1	0.7	21.2	0.0	0.0	Yes	Yes	0.0	21.2	0.0	3,791.7	5,536.2	140.0
1982	Nov	3791.7	5536.2	140.0	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes	15.1	37.6	15.1	15.1	4692.2	5542.2	160.3	50.1	0.8	2.4	0.0	4,639.7	5,541.9	159.2	2.8	0.8	14.0	0.0	0.0	Yes	Yes	0.0	14.0	0.0	4,639.7	5,541.9	159.2
1982	Dec	4639.7	5541.9	159.2	18.8	0.0	0.0	0.0	Yes	Yes	23.1	4.6	27.7	0.0	0.0	Yes	Yes	14.5	22.6	14.5	14.5	5533.1	5547.2	176.3	56.9	0.9	0.0	0.0	5,476.1	5,546.9	175.2	3.1	0.9	17.2	0.0	0.0	Yes	Yes	0.0	17.2	0.0	5,476.1	5,546.9	175.2
1983	Jan	5476.1	5546.9	175.2	16.0	0.0	0.0	0.0	Yes	Yes	19.7	4.0	23.7	0.0	0.0	Yes	Yes	14.0	9.0	9.0	9.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	18.2	0.0	0.0	Yes	Yes	0.0	18.2	0.0	5,971.7	5,549.7	185.3
1983	Feb	5971.7	5549.7	185.3	20.2	0.0	0.0	0.0	Yes	Yes	24.8	5.0	29.8	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.3	1.0	33.0	0.0	0.0	Yes	Yes	0.0	33.0	0.0	5,977.6	5,549.7	185.4
1983	Mar	5977.6	5549.7	185.4	41.1	0.0	0.0	0.0	Yes	Yes	50.5	10.2	60.7	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	6.8	1.0	67.5	0.0	0.0	Yes	Yes	0.0	67.5	0.0	5,960.7	5,549.6	185.1
1983	Apr	5960.7	5549.6	185.1	77.9	0.0	0.0	0.0	Yes	Yes	95.6	19.2	114.8	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	12.8	1.0	127.4	0.0	0.0	Yes	Yes	0.0	127.4	0.0	5,934.3	5,549.5	184.5
1983	May	5934.3	5549.5	184.5	104.2	7.7	0.0	0.0	Yes	Yes	128.0	25.7	153.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	17.2	1.0	165.2	7.1	0.0	Yes	Yes	0.0	158.1	0.0	5,904.7	5,549.3	183.9
1983	Jun	5904.7	5549.3	183.9	34.5	7.7	0.0	0.0	Yes	Yes	42.4	8.5	50.9	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	5.7	1.0	52.5	7.2	0.0	Yes	Yes	7.6	52.9	7.6	5,320.1	5,546.0	172.3
1983	Jul	5320.1	5546.0	172.3	23.0	10.4	0.0	0.0	Yes	Yes	28.3	5.7	34.0	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	3.8	0.9	31.8	9.7	0.0	Yes	Yes	7.3	29.5	7.3	4,742.0	5,542.6	161.3
1983	Aug	4742.0	5542.6	161.3	21.7	5.5	0.0	0.0	Yes	Yes	26.6	5.3	31.9	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9	4,636.7	5,541.9	159.2	3.6	0.8	32.7	5.1	0.0	Yes	Yes	7.3	35.0	7.3	4,185.4	5,539.0	148.9
1983	Sep	4185.4	5539.0	148.9	14.4	4.3	0.0	0.0	Yes	Yes	17.7	3.6	21.3	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7	4,098.8	5,538.4	147.0	2.4	0.8	21.5	4.0	0.0	Yes	Yes	0.0	17.5	0.0	4,098.8	5,538.4	147.0
1983	Oct	4098.8	5538.4	147.0	18.3	0.0	0.0	0.0	Yes	Yes	22.5	4.5	27.0	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4	4,029.4	5,537.9	145.4	3.0	0.8	30.8	0.0	0.0	Yes	Yes	0.0	30.8	0.0	4,029.4	5,537.9	145.4
1983	Nov	4029.4	5537.9	145.4	20.0	0.0	0.0	0.0	Yes	Yes	24.6	4.9	29.5	0.0	0.0	Yes	Yes	15.0	33.7	15.0	15.0	4919.3	5543.6	164.8	51.5	0.9	2.5	0.0	4,865.4	5,543.3	163.8	3.3	0.9	18.8	0.0	0.0	Yes	Yes	0.0	18.8	0.0	4,865.4	5,543.3	163.8
1983	Dec	4865.4	5543.3	163.8	20.0	0.0	0.0	0.0	Yes	Yes	24.6	4.9	29.5	0.0	0.0	Yes	Yes	14.4	19.0	14.4	14.4	5749.6	5548.5	180.6	58.3	0.9	0.0	0.0	5,691.2	5,548.1	179.3	3.3	0.9	19.4	0.0	0.0	Yes	Yes	0.0	19.4	0.0	5,691.2	5,548.1	179.3
1984	Jan	5691.2	5548.1	179.3	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.4	1.0	28.9	0.0	0.0	Yes	Yes	0.0	28.9	0.0	5,971.7	5,549.7	185.3
1984	Feb	5971.7	5549.7	185.3	19.3	0.0	0.0	0.0	Yes	Yes	23.7	4.8	28.5	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.2	1.0	31.5	0.0	0.0	Yes	Yes	0.0	31.5	0.0	5,977.6	5,549.7	185.4
1984	Mar	5977.6	5549.7	185.4	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.4	1.0	33.6	0.0	0.0	Yes	Yes	0.0	33.6	0.0	5,960.7	5,549.6	185.1
1984	Apr	5960.7	5549.6	185.1	18.6	0.0	0.0	0.0	Yes	Yes	22.8	4.6	27.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.1	1.0	30.2	0.0	0.0	Yes	Yes	0.0	30.2	0.0	5,934.3	5,549.5	184.5
1984	May	5934.3	5549.5	184.5	12.9	7.7	0.0	0.0	Yes	Yes	15.8	3.2	19.0	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.1	1.0	15.4	7.1	0.0	Yes	Yes	0.0	8.3	0.0	5,904.7	5,549.3	183.9
1984	Jun	5904.7	5549.3	183.9	10.2	7.7	0.0	0.0	Yes	Yes	12.5	2.5	15.0	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.7	1.0	12.6	7.2	0.0	Yes	Yes	7.6	13.0	7.6	5,320.1	5,546.0	172.3
1984	Jul	5320.1	5546.0	172.3	10.3	10.3	0.0	0.0	No	No	12.6	2.5	15.1	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.7	0.9	10.9	7.4	2.3	No	Yes	7.3	10.8	9.6	4,601.8	5,541.7	158.4
1984	Aug	4601.8	5541.7	158.4	11.1	5.5	0.0	0.0	Yes	Yes	13.6	2.7	16.3	3.6	0.0	Yes	Yes	14.6	23.3	0.0	0.0	4601.8	5541.7	158.4	51.1	0.8	52.3	0.8	4,498.4	5,541.0	156.0	1.8	0.8	15.4	5.1	0.0	Yes	Yes	7.3	17.6	7.3	4,047.1	5,538.0	145.8
1984	Sep	4047.1	5538.0	145.8	9.7	4.3	0.0	0.0	Yes	Yes	11.9	2.4	14.3	2.9	0.0	Yes	Yes	14.9	33.4	0.0	0.0	4047.1	5538.0	145.8	45.6	0.8	39.2	0.7	3,962.2	5,537.4	143.9	1.6	0.8	13.8	4.0	0.0	Yes	Yes	0.0	9.7	0.0	3,962.2	5,537.4	143.9
1984	Oct	3962.2	5537.4	143.9	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes	15.0	33.7	0.0	0.0	3962.2	5537.4	143.9	46.5	0.8	21.5	0.3	3,894.3	5,537.0	142.3	2.1	0.8	22.0	0.0	0.0	Yes	Yes	0.0	22.0	0.0	3,894.3	5,537.0	142.3
1984	Nov	3894.3	5537.0	142.3	14.2	0.0	0.0	0.0	Yes	Yes	17.4	3.5	20.9	0.0	0.0	Yes	Yes	15.1	35.9	15.1	15.1	4790.3	5542.8	162.3	50.7	0.9	2.4	0.0	4,737.1	5,542.5	161.2	2.3	0.9	9.0	0.0	0.0	Yes	Yes	0.0	9.0	0.0	4,737.1	5,542.5	161.2
1984	Dec	4737.1	5542.5	161.2	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4	0.0	0.0	Yes	Yes	14.5	21.1	14.5	14.5	5626.5	5547.8	178.0	57.5	0.9	0.0	0.0	5,569.0	5,547.4	177.0	2.7	0.9	13.6	0.0	0.0	Yes	Yes	0.0	13.6	0.0	5,569.0	5,547.4	177.0
1985	Jan	5569.0	5547.4	177.0	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4	0.0	0.0	Yes	Yes	13.9	7.5	7.5	7.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.7	1.0	20.6	0.0	0.0	Yes	Yes	0.0	20.6	0.0	5,971.7	5,549.7	185.3
1985	Feb	5971.7	5549.7	185.3	16.8	0.0	0.0	0.0	Yes	Yes	20.6	4.1	24.7	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.8	1.0	27.4	0.0	0.0	Yes	Yes	0.0	27.4	0.0	5,977.6	5,549.7	185.4
1985	Mar	5977.6	5549.7	185.4	21.7	0.0	0.0	0.0	Yes	Yes	26.6	5.3	31.9	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.6	1.0	35.6	0.0	0.0	Yes	Yes	0.0	35.6	0.0	5,960.7	5,549.6	185.1
1985	Apr	5960.7	5549.6	185.1	28.1	0.0	0.0	0.0	Yes	Yes	34.5	6.9	41.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	4.6	1.0	45.8	0.0	0.0	Yes	Yes	0.0	45.8	0.0	5,934.3	5,549.5	184.5
1985	May	5934.3	5549.5	184.5	19.3	7.7	0.0	0.0	Yes	Yes	23.7	4.8	28.5	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	3.2	1.0	26.0	7.1	0.0	Yes	Yes	0.0	18.8	0.0	5,904.7	5,549.3	183.9
1985	Jun	5904.7	5549.3	183.9	11.1	7.7	0.0	0.0	Yes	Yes	13.6	2.7	16.3	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.8	1.0	14.0	7.2	0.0	Yes	Yes	7.6	14.4	7.6	5,320.1	5,546.0	172.3
1985	Jul	5320.1	5546.0	172.3	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2	5,193.4	5,545.3	170.0	1.6	0.9	9.7	6.2	3.5	No	Yes	7.3	10.8	10.8	4,527.9	5,541.2	156.7
1985	Aug	4527.9	5541.2	156.7	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9	3.6	0.0	Yes	Yes	14.6	24.5	0.0	0.0	4527.9	5541.2	156.7	50.6	0.8	51.7	0.8	4,425.6	5,540.5	154.3	0.9	0.8	6.0	2.5	2.6	No	Yes	7.3	10.8	9.9	3,815.7	5,536.4	140.5
1985	Sep	3815.7	5536.4	140.5	7.2	4.3	0.0	0.0	Yes	Yes	8.9	1.8	10.7	2.9	0.0	Yes	Yes	15.1	37.2	0.0	0.0	3815.7	5536.4	140.5	43.9	0.7	37.8	0.6	3,734.0	5,535.8	138.7	1.2	0.7	9.7	4.0	0.0	Yes	Yes	0.0	5.7	0.0	3,734.0	5,535.8	138.7
1985	Oct	3734.0	5535.8	138.7	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7	0.0	0.0	Yes	Yes	15.2	37.4	0.0	0.0	3734.0	5535.8	138.7	44.8	0.7	20.7	0.3	3,668.5	5,535.3	137.2	2.1	0.7	21.6	0.0	0.0	Yes	Yes	0.0	21.6	0.0	3,668.5	5,535.3	137.2
1985	Nov	3668.5	5535.3	137.2	14.7	0.0	0.0	0.0	Yes	Yes	18.1	3.6	21.7	0.0	0.0	Yes	Yes	15.2	39.7	15.2	15.2	4574.7	5541.5	157.7	49.3	0.8	2.4	0.0	4,523.1	5,541.2	156.6	2.4	0.8	9.8	0.0	0.0	Yes	Yes	0.0	9.8	0.0	4,523.1	5,541.2	156.6
1985	Dec	4523.1	5541.2	156.6	15.3	0.0	0.0	0.0	Yes	Yes	18.8	3.8	22.6	0.0	0.0	Yes	Yes	14.6	24.5	14.6	14.6	5421.3	5546.6	174.2	56.2	0.9	0.0	0.0	5,365.1	5,546.3	173.1	2.5	0.9	11.4	0.0	0.0	Yes	Yes	0.0	11.4	0.0	5,365.1	5,546.3	173.1
1986	Jan	5365.1	5546.3	173.1	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes	14.1	10.8	10.8	10.8	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	16.3	0.0	0.0	Yes	Yes	0.0	16.3	0.0	5,971.7	5,549.7	185.3
1986	Feb	5971.7	5549.7	185.3	23.2	0.0	0.0	0.0	Yes	Yes	28.5	5.7	34.2	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.8	1.0	37.9	0.0	0.0	Yes	Yes	0.0	37.9	0.0	5,977.6	5,549.7	185.4
1986	Mar	5977.6	5549.7	185.4	19.8	0.0	0.0	0.0	Yes	Yes	24.3	4.9	29.2	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.3	1.0	32.5	0.0	0.0	Yes	Yes	0.0	32.5	0.0	5,960.7	5,549.6	185.1
1986	Apr	5960.7	5549.6	185.1	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.9	1.0	29.2	0.0	0.0	Yes	Yes	0.0	29.2	0.0	5,934.3	5,549.5	184.5
1986	May	5934.3	5549.5	184.5	11.1	7.7	0.0	0.0	Yes	Yes	13.6	2.7	16.3	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.8	1.0	12.5	7.1	0.0	Yes	Yes	0.0	5.3	0.0	5,904.7	5,549.3	183.9
1986	Jun	5904.7	5549.3	183.9	8.0	7.7	0.0	0.0	Yes	Yes	9.9	2.0	11.8	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.3	1.0	9.0	5.5	1.6	No	Yes	7.6	11.1	9.2	5,222.6	5,545.4	170.5

ALPHA ENGINEERING

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full	Full?	Ave Flow	Ave Flow	Ave Flow
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs
1986	Jul	5222.6	5545.4	170.5	5.9	5.9	0.0	0.0	No	No	7.2	1.5	8.7
	Aug	4065.0	5538.2	146.2	6.9	5.5	0.0	0.0	Yes	Yes	8.4	1.7	10.1
	Sep	3505.7	5534.2	133.6	11.2	4.3	0.0	0.0	Yes	Yes	13.8	2.8	16.6
	Oct	3428.0	5533.6	131.9	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9
	Nov	3365.8	5533.1	130.5	15.5	0.0	0.0	0.0	Yes	Yes	19.0	3.8	22.8
	Dec	4236.9	5539.3	150.1	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0
1987	Jan	5092.7	5544.7	168.1	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0
	Feb	5908.1	5549.3	184.0	15.2	0.0	0.0	0.0	Yes	Yes	18.7	3.8	22.5
	Mar	5977.6	5549.7	185.4	18.8	0.0	0.0	0.0	Yes	Yes	23.1	4.6	27.7
	Apr	5960.7	5549.6	185.1	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5
	May	5934.3	5549.5	184.5	8.3	7.7	0.0	0.0	Yes	Yes	10.2	2.1	12.3
	Jun	5738.8	5548.4	180.3	5.6	5.6	0.0	0.0	No	No	6.9	1.4	8.3
	Jul	4824.6	5543.1	162.9	6.7	6.7	0.0	0.0	No	No	8.3	1.7	9.9
	Aug	3753.0	5536.0	139.1	8.9	5.5	0.0	0.0	Yes	Yes	10.9	2.2	13.1
	Sep	3210.9	5531.9	127.1	5.2	4.3	0.0	0.0	Yes	Yes	6.4	1.3	7.7
	Oct	3064.6	5530.7	123.6	7.9	0.0	0.0	0.0	Yes	Yes	9.7	1.9	11.6
	Nov	3006.3	5530.2	122.2	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0
	Dec	3897.9	5537.0	142.4	11.5	0.0	0.0	0.0	Yes	Yes	14.1	2.8	16.9
1988	Jan	4672.0	5542.1	159.9	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4
	Feb	5470.7	5546.9	175.1	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0
	Mar	5977.6	5549.7	185.4	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9
	Apr	5960.7	5549.6	185.1	15.1	0.0	0.0	0.0	Yes	Yes	18.6	3.7	22.3
	May	5934.3	5549.5	184.5	12.8	7.7	0.0	0.0	Yes	Yes	15.7	3.2	18.9
	Jun	5904.7	5549.3	183.9	6.8	6.8	0.0	0.0	No	No	8.4	1.7	10.0
	Jul	5103.4	5544.7	168.3	5.9	5.9	0.0	0.0	No	No	7.2	1.5	8.7
	Aug	3945.1	5537.3	143.5	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.7	9.9
	Sep	3371.1	5533.1	130.6	5.2	4.3	0.0	0.0	Yes	Yes	6.4	1.3	7.7
	Oct	3227.1	5532.0	127.5	8.2	0.0	0.0	0.0	Yes	Yes	10.1	2.0	12.1
	Nov	3166.9	5531.5	126.0	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2
	Dec	3756.0	5536.0	139.2	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7
1989	Jan	4457.8	5540.8	155.1	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8
	Feb	5221.1	5545.4	170.5	13.7	0.0	0.0	0.0	Yes	Yes	16.8	3.4	20.2
	Mar	5952.8	5549.6	184.9	16.8	0.0	0.0	0.0	Yes	Yes	20.6	4.1	24.7
	Apr	5960.7	5549.6	185.1	7.3	0.0	0.0	0.0	Yes	Yes	8.9	1.8	10.7
	May	5934.3	5549.5	184.5	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7
	Jun	5426.0	5546.6	174.3	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.2
	Jul	4374.4	5540.2	153.2	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7
	Aug	3089.4	5530.9	124.2	4.9	4.9	0.0	0.0	No	No	6.1	1.2	7.3
	Sep	2342.0	5524.4	104.6	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.1
	Oct	2099.3	5522.0	97.7	5.4	0.0	0.0	0.0	Yes	Yes	6.6	1.3	7.9
	Nov	2053.2	5521.5	96.4	6.8	0.0	0.0	0.0	Yes	Yes	8.4	1.7	10.1
	Dec	2408.5	5525.0	106.6	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5
1990	Jan	2862.2	5529.0	118.7	7.9	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.7
	Feb	3324.8	5532.8	129.6	9.1	0.0	0.0	0.0	Yes	Yes	11.2	2.3	13.5
	Mar	3836.1	5536.6	141.0	11.1	0.0	0.0	0.0	Yes	Yes	13.6	2.7	16.3
	Apr	4564.5	5541.4	157.5	8.4	0.0	0.0	0.0	Yes	Yes	10.3	2.1	12.4
	May	5004.4	5544.2	166.5	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9
	Jun	4518.1	5541.1	156.5	4.5	4.5	0.0	0.0	No	No	5.5	1.1	6.6
	Jul	3501.7	5534.1	133.5	4.7	4.7	0.0	0.0	No	No	5.7	1.1	6.9
	Aug	2234.7	5523.4	101.5	4.7	4.7	0.0	0.0	No	No	5.7	1.2	6.9
	Sep	1468.5	5514.9	79.9	5.3	4.3	0.0	0.0	Yes	Yes	6.5	1.3	7.8
	Oct	1343.6	5513.3	76.2	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	10.9
	Nov	1307.7	5512.8	75.0	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5
	Dec	1753.6	5518.3	88.0	7.9	0.0	0.0	0.0	Yes	Yes	9.7	2.0	11.7
1991	Jan	2224.7	5523.3	101.2	7.7	0.0	0.0	0.0	Yes	Yes	9.4	1.9	11.3
	Feb	2666.6	5527.4	113.8	8.1	0.0	0.0	0.0	Yes	Yes	9.9	2.0	11.9
	Mar	3096.0	5531.0	124.4	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2
	Apr	3882.1	5536.9	142.1	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1
	May	4428.2	5540.6	154.4	6.6	6.6	0.0	0.0	No	No	8.2	1.6	9.8
	Jun	4075.3	5538.2	146.4	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.0
	Jul	3218.0	5531.9	127.2	4.5	4.5	0.0	0.0	No	No	5.6	1.1	6.7
	Aug	1939.5	5520.3	93.2	4.7	4.7	0.0	0.0	No	No	5.7	1.1	6.9
	Sep	1175.3	5511.0	70.4	5.4	4.3	0.0	0.0	Yes	Yes	6.7	1.3	8.0
	Oct	1067.3	5509.4	66.4	7.1	0.0	0.0	0.0	Yes	Yes	8.8	1.8	10.5
	Nov	1035.9	5508.9	65.2	7.9	0.0	0.0	0.0	Yes	Yes	9.7	2.0	11.7
	Dec	1497.1	5515.2	80.7	8.0	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.8
1992	Jan	1975.6	5520.7	94.2	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7
	Feb	2507.5	5525.9	109.5	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6
	Mar	3143.4	5531.3	125.5	17.0	0.0	0.0	0.0	Yes	Yes	20.9	4.2	25.1
	Apr	4049.9	5538.1	145.9	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4
	May	4852.5	5543.2	163.5	9.0	7.7	0.0	0.0	Yes	Yes	11.1	2.2	13.3
	Jun	4737.1	5542.5	161.2	7.5	7.5	0.0	0.0	No	No	9.2	1.8	11.0
	Jul	4009.5	5537.8	145.0	5.6	5.6	0.0	0.0	No	No	6.8	1.4	8.2
	Aug	2829.6	5528.8	117.9	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.7	9.9
	Sep	2262.4	5523.6	102.3	6.5	4.3	0.0	0.0	Yes	Yes	8.0	1.6	9.6
	Oct	2202.9	5523.0	100.6	8.7	0.0	0.0	0.0	Yes	Yes	10.7	2.2	12.9
	Nov	2155.5	5522.6	99.3	7.3	0.0	0.0	0.0	Yes	Yes	9.0	1.8	10.8
	Dec	2551.0	5526.3	110.7	9.0	0.0	0.0	0.0	Yes	Yes	11.1	2.2	13.3
1993	Jan	3114.9	5531.1	124.8	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8
	Feb	3945.9	5537.3	143.5	15.3	0.0	0.0	0.0	Yes	Yes	18.8	3.8	22.6
	Mar	4732.7	5542.5	161.1	44.2	0.0	0.0	0.0	Yes	Yes	54.3	10.9	65.2
	Apr	5554.3	5547.4	176.7	108.3	0.0	0.0	0.0	Yes	Yes	133.0	26.7	159.7
	May	5934.3	5549.5	184.5	51.9	7.7	0.0	0.0	Yes	Yes	63.7	12.8	76.5
	Jun	5904.7	5549.3	183.9	22.6	7.7	0.0	0.0	Yes	Yes	27.7	5.6	33.3
	Jul	5320.1	5546.0	172.3	10.4	10.4	0.0	0.0	Yes	Yes	12.8	2.6	15.4
	Aug	4618.2	5541.8	158.7	11.3	5.5	0.0	0.0	Yes	Yes	13.9	2.8	16.7
	Sep	4063.2	5538.1	146.2	9.6	4.3	0.0	0.0	Yes	Yes	11.8	2.4	14.2
	Oct	3978.2	5537.6	144.2	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0
	Nov	3910.1	5537.1	142.7	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
	Dec	4720.8	5542.4	160.9	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
1994	Jan	5553.4	5547.4	176.7	12.5	0.0	0.0	0.0	Yes	Yes	15.4	3.1	18.5
	Feb	5971.7	5549.7	185.3	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9
	Mar	5977.6	5549.7	185.4	21.6	0.0	0.0	0.0	Yes	Yes	26.5	5.3	31.8
	Apr	5960.7	5549.6	185.1	12.5	0.0	0.0	0.0	Yes	Yes	15.4	3.1	18.5
	May	5934.3	5549.5	184.5	8.2	7.7	0.0	0.0	Yes	Yes	10.1	2.0	12.1
	Jun	5730.6	5548.3	180.2	5.7	5.7	0.0	0.0	No	No	7.0	1.4	8.4
	Jul	4821.2	5543.0	162.9	4.7	4.7	0.0	0.0	No	No	5.8	1.2	6.9
	Aug	3544.5	5534.4	134.4	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.6
	Sep	2818.3	5528.7	117.7	5.9	4.3	0.0	0.0	Yes	Yes	7.3	1.5	8.7
	Oct	2744.5	5528.1	115.9	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
	Nov	2689.8	5527.6	114.4	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2
	Dec	3403.0	5533.4	131.3	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7
1995	Jan	4166.0	5538.8	148.5	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6
	Feb	5025.4	5544.3	166.9	19.7	0.0	0.0	0.0	Yes	Yes	24.2	4.9	29.1
	Mar	5765.2	5548.5	180.9	40.8	0.0	0.0	0.0	Yes	Yes	50.1	10.1	60.2
	Apr	5960.7	5549.6	185.1	31.2	0.0	0.0	0.0	Yes	Yes	38.3	7.7	46.0
	May	5934.3	5549.5	184.5	32.0	7.7	0.0	0.0	Yes	Yes	39.3	7.9	47.2
	Jun	5904.7	5549.3	183.9	19.4	7.7	0.0	0.0	Yes	Yes	23.8	4.8	28.6
	Jul	5320.1	5546.0	172.3	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1
	Aug	4527.9	5541.2	156.7	7.1	5.5	0.0	0.0	Yes	Yes	8.7	1.7	10.4
	Sep	3974.3	5537.5	144.2	7.6	4.3	0.0	0.0	Yes	Yes	9.4	1.9	11.3
	Oct	3890.4	5536.9	142.2	10.8	0.0	0.0	0.0	Yes	Yes	13.2	2.7	15.9
	Nov	3823.3	5536.5	140.7	12.0	0.0	0.0	0.0	Yes	Yes	14.7	3.0	17.7
	Dec	4613.2	5541.8	158.6	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1
1996	Jan	5206.8	5545.4	170.2	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5
	Feb	5971.7	5549.7	185.3	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4
	Mar	5977.6	5549.7	185.4	15.4	0.0	0.0	0.0	Yes	Yes	18.9	3.8	22.7

Date		to OIC				to COVE				Reservoir Int1			Seepage		Evaporation	
Yr	Mo	River	Supp	Pre Cove Full	Full?	Hydraulic Ca	to Fill Resv	Control	River	Volume	Elevation	Area				
		cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs
1986	Jul	5.2	1.6	No	Yes	14.2	13.2	0.0	0.0	5222.6	5545.4	170.5	55.1	0.9	70.3	1.1
	Aug	3.6	0.0	Yes	Yes	14.9	32.0	0.0	0.0	4065.0	5538.2	146.2	47.2	0.8	48.3	0.8
	Sep	2.9	0.0	Yes	Yes	15.4	42.5	0.0	0.0	3505.7	5534.2	133.6	41.7	0.7	36.0	0.6
	Oct	0.0	0.0	Yes	Yes	15.4	42.3	0.0	0.0	3428.0	5533.6	131.9	42.6	0.7	19.7	0.3
	Nov	0.0	0.0	Yes	Yes	15.5	44.8	15.5	15.5	4286.4	5539.6	151.2	47.2	0.8	2.3	0.0
	Dec	0.0	0.0	Yes	Yes	14.8	29.2	14.8	14.8	5147.3	5545.0	169.1	54.6	0.9	0.0	0.0
1987	Jan	0.0	0.0	Yes	Yes	14.2	15.3	14.2	14.2	5967.9	5549.6	185.2	59.8	1.0	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	13.7	2.2	2.2	2.2	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
	Jun	4.8	0.3	No	Yes	13.8	4.9	0.0	0.0	5738.8	5548.4	180.3	56.4	0.9	74.4	1.3
	Jul	6.4	0.4	No	Yes	14.4	19.6	0.0	0.0	4824.6	5543.1	162.9	52.6	0.9	67.2	1.1
	Aug	3.6	0.0	Yes	Yes	15.2	37.1	0.0	0.0	3753.0	5536.0	139.1	44.9	0.7	45.9	0.7
	Sep	2.9	0.0	Yes	Yes	15.6	47.4	0.0	0.0	3210.9	5531.9	127.1	39.7	0.7	34.2	0.6
	Oct	0.0	0.0	Yes	Yes	15.7	48.3	0.0	0.0	3064.6	5530.7	123.6	39.9	0.6	18.4	0.3
	Nov	0.0	0.0	Yes	Yes	15.8	50.8	15.8	15.8	3944.9	5537.3	143.5	44.8	0.8	2.2	0.0
	Dec	0.0	0.0	Yes	Yes	15.1	34.7	15.1	13.4	4723.9	5542.4	160.9	52.0	0.8	0.0	0.0
1988	Jan	0.0	0.0	Yes	Yes	14.5	22.1	14.5	13.9	5527.6	5547.2	176.2	56.9	0.9	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	14.0	10.1	10.1	10.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
	Jul	5.2	1.7	No	Yes	14.2	15.1	0.0	0.0	5103.4	5544.7	168.3	54.3	0.9	69.4	1.1
	Aug	3.6	0.0	Yes	Yes	15.0	33.9	0.0	0.0	3945.1	5537.3	143.5	46.3	0.8	47.4	0.8
	Sep	2.9	0.0	Yes	Yes	15.5	44.7	0.0	0.0	3371.1	5533.1	130.6	40.8	0.7	35.2	0.6
	Oct	0.0	0.0	Yes	Yes	15.6	45.6	0.0	0.0	3227.1	5532.0	127.5	41.2	0.7	19.0	0.3
	Nov	0.0	0.0	Yes	Yes	15.6	48.1	15.6	10.7	3802.0	5536.3	140.2	43.8	0.7	2.1	0.0
	Dec	0.0	0.0	Yes	Yes	15.2	37.0	15.2	12.2	4508.2	5541.1	156.2	50.4	0.8	0.0	0.0
1989	Jan	0.0	0.0	Yes	Yes	14.7	25.6	14.7	13.3	5276.5	5545.8	171.5	55.4	0.9	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	14.2	14.6	14.2	14.2	6007.1	5549.9	186.1	54.3	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.7	1.3	1.3	1.3	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	4.2	0.9	No	Yes	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1
	Jun	2.7	2.4	No	Yes	14.0	10.2	0.0	0.0	5426.0	5546.6	174.3	54.5	0.9	71.9	1.2
	Jul	3.2	3.6	No	Yes	14.7	27.0	0.0	0.0	4374.4	5540.2	153.2	49.5	0.8	63.2	1.0
	Aug	3.6	0.0	Yes	Yes	15.7	47.9	0.0	0.0	3089.4	5530.9	124.2	40.1	0.7	41.0	0.7
	Sep	2.6	0.2	No	Yes	16.4	62.0	0.0	0.0	2342.0	5524.4	104.6	32.7	0.5	28.1	0.5
	Oct	0.0	0.0	Yes	Yes	16.7	64.0	0.0	0.0	2099.3	5522.0	97.7	31.6	0.5	14.6	0.2
	Nov	0.0	0.0	Yes	Yes	16.7	66.9	16.7	6.6	2443.8	5525.4	107.6	33.6	0.6	1.6	0.0
	Dec	0.0	0.0	Yes	Yes	16.3	58.9	16.3	8.0	2900.8	5529.4	119.7	38.6	0.6	0.0	0.0
1990	Jan	0.0	0.0	Yes	Yes	15.9	51.6	15.9	8.2	3367.0	5533.1	130.5	42.1	0.7	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	15.5	48.7	15.5	10.0	3877.5	5536.8	141.9	41.4	0.7	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	15.1	35.7	15.1	12.8	4625.2	5541.8	158.9	51.3	0.8	9.4	0.2
	Apr	0.0	0.0	Yes	Yes	14.6	24.7	14.6	8.9	5092.4	5544.7	168.1	52.5	0.9	35.4	0.6
	May	4.4	0.7	No	Yes	14.3	16.7	14.3	0.0	5004.4	5544.2	166.5	53.8	0.9	59.8	1.0
	Jun	3.1	2.0	No	Yes	14.6	25.4	0.0	0.0	4518.1	5541.1	156.5	48.9	0.8	64.5	1.1
	Jul	3.4	3.5	No	Yes	15.4	41.2	0.0	0.0	3501.7	5534.1	133.5	43.1	0.7	55.1	0.9
	Aug	3.4	0.2	No	Yes	16.5	61.8	0.0	0.0	2234.7	5523.4	101.5	32.8	0.5	33.5	0.5
	Sep	2.9	0.0	Yes	Yes	17.4	76.7	0.0	0.0	1468.5	5514.9	79.9	25.0	0.4	21.5	0.4
	Oct	0.0	0.0	Yes	Yes	17.6	76.2	0.0	0.0	1343.6	5513.3	76.2	24.6	0.4	11.4	0.2
	Nov	0.0	0.0	Yes	Yes	17.6	79.4	17.6	8.0	1782.6	5518.6	88.8	27.7	0.5	1.3	0.0
	Dec	0.0	0.0	Yes	Yes	17.1	69.6	17.1	8.2	2257.6	5523.6	102.1	33.0	0.5	0.0	0.0
1991	Jan	0.0	0.0	Yes	Yes	16.5	61.9	16.5	7.8	2703.6	5527.7	114.8	37.1	0.6	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	16.1	60.6	16.1	8.4	3132.5	5531.3	125.2	36.5	0.7	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	15.7	47.7	15.7	13.7	3936.8	5537.3	143.3	46.3	0.8	8.5	0.1
	Apr	0.0	0.0	Yes	Yes	15.1	36.1	15.1	10.6	4510.0	5541.1	156.3	48.8	0.8	32.9	0.6
	May	5.1	0.0	Yes	Yes	14.7	26.1	14.7	1.2	4503.7	5541.0	156.1	50.4	0.8	56.1	0.9
	Jun	5.1	0.0	Yes	Yes	14.9	32.9	0.0	0.0	4075.3	5538.2	146.4	45.8	0.8	60.4	1.0
	Jul	3.2	3.7	No	Yes	15.6	45.8	0.0	0.0	3218.0	5531.9	127.2	41.1	0.7	52.5	0.9
	Aug	3.4	0.2	No	Yes	16.8	66.6	0.0	0.0	1939.5	5520.3	93.2	30.1	0.5	30.7	0.5
	Sep	2.9	0.0	Yes	Yes	17.8	81.6	0.0	0.0	1175.3	5511.0	70.4	22.0	0.4	19.0	0.3
	Oct	0.0	0.0	Yes	Yes	18.0	80.7	0.0	0.0	1067.3	5509.4	66.4	21.4	0.3	9.9	0.2
	Nov	0.0	0.0	Yes	Yes	18.0	84.0	18.0	8.2	1523.8	5515.6	81.4	25.4	0.4	1.2	0.0
	Dec	0.0	0.0	Yes	Yes	17.4	73.8	17.4	8.3	2006.3	5521.0	95.1	30.7	0.5	0.0	0.0
1992	Jan	0.0	0.0	Yes	Yes	16.8	66.0	16.8	9.2	2543.2	5526.3	110.5	35.7	0.6	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	16.2	63.5	16.2	12.1	3180.3	5531.6	126.4	36.9	0.7	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	15.7	47.0	15.7	15.7	4106.1	5538.4	147.1	47.5	0.8	8.7	0.1
	Apr	0.0	0.0	Yes	Yes	14.9	33.3	14.9	14.9	4938.9	5543.8	165.2	51.6	0.9	34.8	0.6
	May	5.1	0.0	Yes	Yes	14.4	19.2	14.4	4.8	5145.8	5545.0	169.1	54.6	0.9	60.7	1.0
	Jun	5.1	0.0	Yes	Yes	14.5	21.8	0.0	0.0	4737.1	5542.5	161.2	50.4	0.8	66.5	1.1
	Jul	4.7	2.1	No	Yes	15.0	32.9	0.0	0.0	4009.5	5537.8	145.0	46.8	0.8	59.8	1.0
	Aug	3.6	0.0	Yes	Yes	15.9	52.1	0.0	0.0	2829.6	5528.8	117.9	38.1	0.6	38.9	0.6
	Sep	2.9	0.0	Yes	Yes	16.5	63.3	0.0	0.0	2262.4	5523.6	102.3	32.0	0.5	27.5	0.5
	Oct	0.0	0.0	Yes	Yes	16.5	62.3	0.0	0.0	2202.9	5523.0	100.6	32.5	0.5	15.0	0.2
	Nov	0.0	0.0	Yes	Yes	16.6	65.1	16.6	7.3	2587.5	5526.7	111.7	34.9	0.6	1.7	0.0
	Dec	0.0	0.0	Yes	Yes	16.2	56.6	16.2	9.8	3155.5	5531.4	125.8	40.6	0.7	0.0	0.0
1993	Jan	0.0	0.0	Yes	Yes	15.7	47.4	15.7	14.3	3992.6	5537.7	144.6	46.7	0.8	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	15.0	37.6	15.0	15.0	4780.0	5542.8	162.1	47.3	0.9	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	14.5	21.1	14.5	14.5	5622.3	5547.7	178.0	57.5	0.9	10.5	0.2
	Apr	0.0	0.0	Yes	Yes	13.9	8.0	8.0	8.0	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
	Jul	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
	Aug	3.6	0.0	Yes	Yes	14.5	23.0	0.0	0.0	4618.2	5541.8	158.7	51.3	0.8	52.4	0.9
	Sep	2.9	0.0	Yes	Yes	14.9	33.1	0.0	0.0	4063.2	5538.1	146.2	45.7	0.8	39.3	0.7
	Oct	0.0	0.0	Yes	Yes	15.0	33.4	0.0	0.0	3978.2	5537.6	144.2	46.6	0.8	21.5	0.3
	Nov	0.0	0.0	Yes	Yes	15.0	35.7	15.0	14.5	4773.8	5542.7	161.9	50.6	0.9	2.4	0.0
	Dec	0.0	0.0	Yes	Yes	14.5	21.3	14.5	14.5	5610.8	5547.7	177.7	57.4	0.9	0.0	0.0
1994	Jan	0.0	0.0	Yes	Yes	13.9	7.8	7.8	7.8	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
	Jun	4.9	0.2	No	Yes	13.8	5.1	0.0	0.0	5730.6	5548.3	180.2	56.3	0.9	74.3	1.2
	Jul	3.4	3.4	No	Yes	14.4	19.7	0.0	0.0	4821.2	5543.0	162.9	52.6	0.9	67.2	1.1
	Aug	3.6	0.0	Yes	Yes	15.3	40.5	0.0	0.0	3544.5	5534.4	134.4	43.4	0.7	44.4	0.7
	Sep	2.9	0.0	Yes	Yes	15.9	54.0	0.0	0.0	2818.3	5528.7	117.7	36.8	0.6	31.7	0.5
	Oct	0.0	0.0	Yes	Yes	16.0	53.5	0.0	0.0	2744.5	5528.1	115.9	37.4	0.6	17.3	0.3
	Nov	0.0	0.0	Yes	Yes	16.1	56.2	16.1	12.7	3446.3	5533.7	132.3	41.3	0.7	2.0	0.0
	Dec	0.0	0.0	Yes	Yes	15.4	42.8	15.4	13.2	4214.3	5539.2	149.6	48.3	0.8	0.0	0.0
1995	Jan	0.0	0.0	Yes	Yes	14.9	30.3	14.9	14.9	5079.6	5544.6	167.9	54.2	0.9	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	14.3	18.1	14.3	14.3	5818.3	5548.8	182.0	53.1	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.8	4.3	4.3	4.3	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
	Jul	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
	Aug	3.6	0.0	Yes	Yes	14.6	24.5	0.0	0.0	4527.9	5541.2	156.7	50.6	0.8	51.7	0.8
	Sep	2.9	0.0	Yes	Yes	15.0	34.6	0.0	0.0	3974.3	5537.5	144.2	45.0	0.8	38.8	0.7
	Oct	0.0	0.0	Yes	Yes	15.1	34.8	0.0	0.0	3890.4	5536.9	142.2	45.9	0.7	21.2	0.3
	Nov	0.0	0.0	Yes	Yes	15.1	37.1	15.1	14.2	4665.6	5542.1	159.8	49.9	0.8	2.4	0.0
	Dec	0.0	0.0	Yes	Yes	14.5	23.1	14.5	10.6	5262.1	5545.7	171.2	55.3	0.9	0.0	0.0
1996	Jan	0.0	0.0	Yes	Yes	14.2	13.4	13.4	13.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2

Date		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
1986	Jul	5,097.2	5,544.7	168.2	1.0	0.9	5.4	1.9	7.8	No	Yes	7.3	10.8	16.8	4,065.0	5,538.2	146.2
	Aug	3,969.6	5,537.5	144.0	1.1	0.8	8.4	4.9	0.2	No	Yes	7.3	10.8	7.5	3,505.7	5,534.2	133.6
	Sep	3,428.0	5,533.6	131.9	1.8	0.7	16.3	4.0	0.0	Yes	Yes	0.0	12.2	0.0	3,428.0	5,533.6	131.9
	Oct	3,365.8	5,533.1	130.5	2.4	0.7	25.0	0.0	0.0	Yes	Yes	0.0	25.0	0.0	3,365.8	5,533.1	130.5
	Nov	4,236.9	5,539.3	150.1	2.5	0.8	10.7	0.0	0.0	Yes	Yes	0.0	10.7	0.0	4,236.9	5,539.3	150.1
	Dec	5,092.7	5,544.7	168.1	2.5	0.9	10.5	0.0	0.0	Yes	Yes	0.0	10.5	0.0	5,092.7	5,544.7	168.1
1987	Jan	5,908.1	5,549.3	184.0	2.3	1.0	10.1	0.0	0.0	Yes	Yes	0.0	10.1	0.0	5,908.1	5,549.3	184.0
	Feb	5,977.6	5,549.7	185.4	2.5	1.0	23.7	0.0	0.0	Yes	Yes	0.0	23.7	0.0	5,977.6	5,549.7	185.4
	Mar	5,960.7	5,549.6	185.1	3.1	1.0	30.9	0.0	0.0	Yes	Yes	0.0	30.9	0.0	5,960.7	5,549.6	185.1
	Apr	5,934.3	5,549.5	184.5	2.3	1.0	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	5,934.3	5,549.5	184.5
	May	5,904.7	5,549.3	183.9	1.4	1.0	7.9	4.4	2.7	No	Yes	0.0	3.5	2.7	5,738.8	5,548.4	180.3
	Jun	5,608.1	5,547.7	177.7	0.9	0.9	5.4	1.9	5.3	No	Yes	7.6	11.1	13.2	4,824.6	5,543.1	162.9
	Jul	4,704.7	5,542.3	160.6	1.1	0.9	5.5	2.0	7.7	No	Yes	7.3	10.8	15.5	3,753.0	5,536.0	139.1
	Aug	3,662.2	5,535.3	137.1	1.5	0.7	11.7	5.1	0.0	Yes	Yes	7.3	13.9	7.3	3,210.9	5,531.9	127.1
	Sep	3,137.0	5,531.3	125.3	0.9	0.7	6.3	2.8	1.2	No	Yes	0.0	3.5	1.2	3,064.6	5,530.7	123.6
	Oct	3,006.3	5,530.2	122.2	1.3	0.6	13.6	0.0	0.0	Yes	Yes	0.0	13.6	0.0	3,006.3	5,530.2	122.2
	Nov	3,897.9	5,537.0	142.4	2.3	0.8	8.3	0.0	0.0	Yes	Yes	0.0	8.3	0.0	3,897.9	5,537.0	142.4
	Dec	4,672.0	5,542.1	159.9	1.9	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,672.0	5,542.1	159.9
1988	Jan	5,470.7	5,546.9	175.1	1.9	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,470.7	5,546.9	175.1
	Feb	5,977.6	5,549.7	185.4	2.5	1.0	15.3	0.0	0.0	Yes	Yes	0.0	15.3	0.0	5,977.6	5,549.7	185.4
	Mar	5,960.7	5,549.6	185.1	2.4	1.0	24.4	0.0	0.0	Yes	Yes	0.0	24.4	0.0	5,960.7	5,549.6	185.1
	Apr	5,934.3	5,549.5	184.5	2.5	1.0	24.6	0.0	0.0	Yes	Yes	0.0	24.6	0.0	5,934.3	5,549.5	184.5
	May	5,904.7	5,549.3	183.9	2.1	1.0	15.3	7.1	0.0	Yes	Yes	0.0	8.1	0.0	5,904.7	5,549.3	183.9
	Jun	5,771.4	5,548.6	181.0	1.1	1.0	7.0	3.5	3.6	No	Yes	7.6	11.1	11.2	5,103.4	5,544.7	168.3
	Jul	4,979.6	5,544.0	166.0	1.0	0.9	5.4	1.9	7.8	No	Yes	7.3	10.8	16.8	3,945.1	5,537.3	143.5
	Aug	3,851.4	5,536.7	141.4	1.1	0.8	8.1	4.6	0.5	No	Yes	7.3	10.8	7.8	3,371.1	5,533.1	130.6
	Sep	3,295.2	5,532.5	128.9	0.9	0.7	6.4	2.9	1.1	No	Yes	0.0	3.5	1.1	3,227.1	5,532.0	127.5
	Oct	3,166.9	5,531.5	126.0	1.4	0.7	14.2	0.0	0.0	Yes	Yes	0.0	14.2	0.0	3,166.9	5,531.5	126.0
	Nov	3,756.0	5,536.0	139.2	1.6	0.7	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,756.0	5,536.0	139.2
	Dec	4,457.8	5,540.8	155.1	1.8	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,457.8	5,540.8	155.1
1989	Jan	5,221.1	5,545.4	170.5	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,221.1	5,545.4	170.5
	Feb	5,952.8	5,549.6	184.9	2.3	1.0	9.3	0.0	0.0	Yes	Yes	0.0	9.3	0.0	5,952.8	5,549.6	184.9
	Mar	5,960.7	5,549.6	185.1	2.8	1.0	27.2	0.0	0.0	Yes	Yes	0.0	27.2	0.0	5,960.7	5,549.6	185.1
	Apr	5,934.3	5,549.5	184.5	1.2	1.0	11.7	0.0	0.0	Yes	Yes	0.0	11.7	0.0	5,934.3	5,549.5	184.5
	May	5,808.5	5,548.8	181.8	0.9	1.0	5.3	1.8	5.3	No	Yes	0.0	3.5	6.2	5,426.0	5,546.6	174.3
	Jun	5,299.6	5,545.9	171.9	0.7	0.9	5.1	1.6	5.6	No	Yes	7.6	11.1	15.5	4,374.4	5,540.2	153.2
	Jul	4,261.8	5,539.5	150.6	0.8	0.8	5.1	1.6	8.1	No	Yes	7.3	10.8	19.1	3,089.4	5,530.9	124.2
	Aug	3,008.3	5,530.3	122.3	0.8	0.7	5.1	1.6	3.5	No	Yes	7.3	10.8	10.8	2,342.0	5,524.4	104.6
	Sep	2,281.2	5,523.8	102.8	0.7	0.5	4.7	1.2	2.8	No	Yes	0.0	3.5	3.1	2,099.3	5,522.0	97.7
	Oct	2,053.2	5,521.5	96.4	0.9	0.5	9.3	0.0	0.0	Yes	Yes	0.0	9.3	0.0	2,053.2	5,521.5	96.4
	Nov	2,408.5	5,525.0	106.6	1.1	0.6	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	2,408.5	5,525.0	106.6
	Dec	2,862.2	5,529.0	118.7	1.3	0.6	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	2,862.2	5,529.0	118.7
1990	Jan	3,324.8	5,532.8	129.6	1.3	0.7	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	3,324.8	5,532.8	129.6
	Feb	3,836.1	5,536.6	141.0	1.5	0.7	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	3,836.1	5,536.6	141.0
	Mar	4,564.5	5,541.4	157.5	1.8	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,564.5	5,541.4	157.5
	Apr	5,004.4	5,544.2	166.5	1.4	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	5,004.4	5,544.2	166.5
	May	4,890.8	5,543.5	164.3	0.9	0.9	5.3	1.8	5.4	No	Yes	0.0	3.5	6.1	4,518.1	5,541.1	156.5
	Jun	4,404.7	5,540.4	153.9	0.7	0.8	5.1	1.6	5.6	No	Yes	7.6	11.1	15.2	3,501.7	5,534.1	133.5
	Jul	3,403.5	5,533.4	131.3	0.8	0.7	5.0	1.5	8.2	No	Yes	7.3	10.8	19.0	2,234.7	5,523.4	101.5
	Aug	2,168.4	5,522.7	99.6	0.8	0.5	4.8	1.3	3.8	No	Yes	7.3	10.8	11.4	1,468.5	5,514.9	79.9
	Sep	1,422.0	5,514.3	78.6	0.9	0.4	6.2	2.7	1.3	No	Yes	0.0	3.5	1.3	1,343.6	5,513.3	76.2
	Oct	1,307.7	5,512.8	75.0	1.2	0.4	12.6	0.0	0.0	Yes	Yes	0.0	12.6	0.0	1,307.7	5,512.8	75.0
	Nov	1,753.6	5,518.3	88.0	1.3	0.5	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	1,753.6	5,518.3	88.0
	Dec	2,224.7	5,523.3	101.2	1.3	0.5	5.3	0.0	0.0	Yes	Yes	0.0	5.3	0.0	2,224.7	5,523.3	101.2
1991	Jan	2,666.6	5,527.4	113.8	1.3	0.6	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	2,666.6	5,527.4	113.8
	Feb	3,096.0	5,531.0	124.4	1.3	0.7	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	3,096.0	5,531.0	124.4
	Mar	3,882.1	5,536.9	142.1	1.9	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	3,882.1	5,536.9	142.1
	Apr	4,428.2	5,540.6	154.4	1.6	0.8	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	4,428.2	5,540.6	154.4
	May	4,397.2	5,540.4	153.7	1.1	0.8	5.4	1.9	5.2	No	Yes	0.0	3.5	5.2	4,075.3	5,538.2	146.4
	Jun	3,969.1	5,537.5	144.0	1.0	0.8	5.6	2.1	5.0	No	Yes	7.6	11.1	12.6	3,218.0	5,531.9	127.2
	Jul	3,124.4	5,531.2	125.0	0.7	0.7	4.9	1.4	8.3	No	Yes	7.3	10.8	19.3	1,939.5	5,520.3	93.2
	Aug	1,878.7	5,519.7	91.5	0.8	0.5	4.8	1.3	3.9	No	Yes	7.3	10.8	11.4	1,175.3	5,511.0	70.4
	Sep	1,134.3	5,510.4	68.9	0.9	0.4	6.4	2.9	1.1	No	Yes	0.0	3.5	1.1	1,067.3	5,509.4	66.4
	Oct	1,035.9	5,508.9	65.2	1.2	0.3	12.1	0.0	0.0	Yes	Yes	0.0	12.1	0.0	1,035.9	5,508.9	65.2
	Nov	1,497.1	5,515.2	80.7	1.3	0.4	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	1,497.1	5,515.2	80.7
	Dec	1,975.6	5,520.7	94.2	1.3	0.5	5.3	0.0	0.0	Yes	Yes	0.0	5.3	0.0	1,975.6	5,520.7	94.2
1992	Jan	2,507.5	5,525.9	109.5	1.4	0.6	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	2,507.5	5,525.9	109.5
	Feb	3,143.4	5,531.3	125.5	1.7	0.7	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	3,143.4	5,531.3	125.5
	Mar	4,049.9	5,538.1	145.9	2.8	0.8	13.0	0.0	0.0	Yes	Yes	0.0	13.0	0.0	4,049.9	5,538.1	145.9
	Apr	4,852.5	5,543.2	163.5	2.3	0.9	8.6	0.0	0.0	Yes	Yes	0.0	8.6	0.0	4,852.5	5,543.2	163.5
	May	5,030.5	5,544.3	167.0	1.5	0.9	5.9	2.4	4.8	No	Yes	0.0	3.5	4.8	4,737.1	5,542.5	161.2
	Jun	4,620.2	5,541.8	158.8	1.2	0.8	8.0	4.5	2.7	No	Yes	7.6	11.1	10.3	4,009.5	5,537.8	145.0
	Jul	3,902.9	5,537.0	142.5	0.9	0.8	5.2	1.7	8.0	No	Yes	7.3	10.8	17.5	2,829.6	5,528.8	117.9
	Aug	2,752.6	5,528.1	116.1	1.1	0.6	8.0	4.5	0.6	No	Yes	7.3	10.8	8.0	2,262.4	5,523.6	102.3
	Sep	2,202.9	5,523.0	100.6	1.1	0.5	8.3	4.0	0.0	Yes	Yes	0.0	4.3	0.0	2,202.9	5,523.0	100.6
	Oct	2,155.5	5,522.6	99.3	1.4	0.5	14.8	0.0	0.0	Yes	Yes	0.0	14.8	0.0	2,155.5	5,522.6	99.3
	Nov	2,551.0	5,526.3	110.7	1.2	0.6	5.3	0.0	0.0	Yes	Yes	0.0	5.3	0.0	2,551.0	5,526.3	110.7
	Dec	3,114.9	5,531.1	124.8	1.5	0.7	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	3,114.9	5,531.1	124.8
1993	Jan	3,945.9	5,537.3	143.5	2.0	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	3,945.9	5,537.3	143.5
	Feb	4,732.7	5,542.5	161.1	2.5	0.9	10.9	0.0	0.0	Yes	Yes	0.0	10.9	0.0	4,732.7	5,542.5	161.1
	Mar	5,554.3	5,547.4	176.7	7.3	0.9	59.0	0.0	0.0	Yes	Yes	0.0	59.0	0.0	5,554.3	5,547.4	176.7
	Apr	5,934.3	5,549.5	184.5	17.8	1.0	170.5	0.0	0.0	Yes	Yes	0.0	170.5	0.0	5,934.3	5,549.5	184.5
	May	5,904.7	5,549.3	183.9	8.5	1.0	79.4	7.1	0.0	Yes	Yes	0.0	72.2	0.0	5,904.7	5,549.3	183.9
	Jun	5,771.4	5,548.6	181.0	3.7	1.0	32.9	7.2	0.0	Yes	Yes	7.6	33.3	7.6	5,320.1	5,546.0	172.3
	Jul	5,193.4	5,545.3	170.0	1.7	0.9	11.2	7.7	2.0	No	Yes	7.3	10.8	9.4	4,618.2	5,541.8	158.7
	Aug	4,514.6	5,541.1	156.4	1.9	0.8	15.8	5.1	0.0	Yes	Yes	7.3	18.0	7.3	4,063.2	5,538.1	146.2
	Sep	3,978.2	5,537.6	144.2	1.6	0.8	13.7	4.0	0.0	Yes	Yes	0.0	9.6	0.0	3,978.2	5,537.6	144.2
	Oct	3,910.1	5,537.1	142.7	2.1	0.8	21.9	0.0	0.0	Yes	Yes	0.0	21.9	0.0	3,910.1	5,537.1	142.7
	Nov	4,720.8	5,542.4	160.9	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	4,720.8	5,542.4	160.9
	Dec	5,553.4	5,547.4	176.7	2.0	0.9	6.5	0.0	0.0	Yes	Yes	0.0	6.5	0.0	5,553.4	5,547.4	176.7
1994	Jan	5,971.7	5,549.7	185.3	2.1	1.0	13.8	0.0	0.0	Yes	Yes	0.0	13.8	0.0	5,971.7	5,549.7	185.3
	Feb	5,977.6	5,549.7	185.4	2.4	1.0	24.2	0.0	0.0	Yes	Yes	0.0	24.2	0.0	5,977.6	5,549.7	185.4
	Mar	5,960.7	5,549.6	185.1	3.6	1.0	35.5	0.0	0.0	Yes	Yes	0.0	35.5	0.0	5,960.7	5,549.6	185.1
	Apr	5,934.3	5,549.5	184.5	2.1	1.0	20.3	0.0	0.0	Yes	Yes	0.0	20.3	0.0	5,934.3	5,549.5	184.5
	May	5,904.7	5,549.3	183.9	1.4	1.0	7.8	4.3	2.8	No	Yes	0.0	3.5	2.8	5,730.6	5,548.3	180.2
	Jun	5,600.0	5,547.6	177.5	0.9	0.9	5.4	1.9	5.3	No	Yes	7.6	11.1	13.1	4,821.2	5,543.0	162.9
	Jul	4,701.4	5,542.3	160.5	0.8	0.9	5.1	1.6	8.0	No	Yes	7.3	10.8	18.8	3,544.5	5,534.4	134.4
	Aug	3,456.7	5,533.8	132.5	0.9	0.7	5.6	2.1	3.0	No	Yes	7.3	10.8	10.4	2,818.3	5,528.7	117.7
	Sep	2,749.9	5,528.1	116.0	1.0	0.6	7.5	4.0	0.1	No	Yes	0.0	3.5	0.1	2,744.5	5,528.1	115.9
	Oct	2,689.8	5,527.6	114.4	1.7	0.6	17.3	0.0	0.0	Yes	Yes	0.0	17.3	0.0	2,689.8	5,527.6	114.4
	Nov	3,403.0	5,533.4	131.3	1.8	0.7	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	3,403.0	5,533.4	131.3
	Dec	4,166.0	5,538.8	148.5	1.9	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,166.0	5,538.8	148.5
1995	Jan	5,025.4	5,544.3	166.9	2.2	0.9	7.8	0.0	0.0	Yes	Yes	0.0	7.8	0.0	5,025.4	5,544.3	166.9
	Feb	5,765.2	5,548.5	180.9	3.2	1.0	19.0	0.0	0.0	Yes	Yes	0.0	19.0	0.0	5,765.2	5,548.5	180.9
	Mar	5,960.7	5,549.6	185.1	6.7	1.0	63.5	0.0	0.0	Yes	Yes	0.0	63.5	0.0	5,960.7	5,549.6	185.1
	Apr	5,934.3	5,549.5	184.5	5.1	1.0	50.9	0.0	0.0	Yes	Yes	0.0	50.9	0.0	5,934.3	5,549.5	184.5
	May	5,904.7	5,549.3	183.9	5.3	1.0	46.8	7.1	0.0	Yes	Yes	0.0	39.7	0.0	5,904.7	5,549.3	183.9
	Jun	5,771.4	5,548.6	181.0	3.2	1.0	27.7	7.2	0.0	Yes	Yes	7.6	28.1	7.6	5,320.1	5,546.0	172.3
	Jul	5,193.4	5,545.3	170.0	1.6	0.9	9.7	6.2	3.5	No	Yes	7.3	10.8	10.8	4,527.9	5,541.2	156.7
	Aug	4,425.6	5,540.5	154.3	1.2	0.8	8.8	5.1	0.0	No	Yes	7.3	11.0	7.3	3,974.3	5,537.5	144.2
	Sep	3,890.4	5,536.9	142.2	1.3	0.8	10.4	4.0	0.0	Yes	Yes	0.0	6.4	0.0	3,890.4	5,536.9	142.2
	Oct	3,823.3	5,536.5	140.7	1.8	0.7	18.4	0.0	0.0	Yes	Yes	0.0	18.4	0.0	3,823.3	5,536.5	140.7
	Nov	4,613.2	5,541.8	158.6	2.0	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,613.2	5,541.8	158.6
	Dec	5,206.8	5,545.4	170.2	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,206.8	5,545.4	170.2
1996	Jan	5,971.7	5,549.7	185.3	2.0	1.0	7.1	0.0	0.0	Yes	Yes	0.0	7.1	0.0	5,971.7	5,549.7	185.3
	Feb	5,977.6	5,549.7	185.4	2.9	1.0	29.3	0.0	0.0	Yes	Yes	0.0	29.3	0.0	5,977.6	5,549.7	185.4
	Mar	5,960.7	5,549.6	185.1	2.5	1.0	25.3	0.0	0.0	Yes	Yes	0.0	25.3	0.0	5,960.7	5,549.6	185.1

ALPHA ENGINEERING

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River	to OIC			
Yr	Mo	Volume (af)	Elevation (ft)	Area (ac)	Ave Flow (cfs)	From River (cfs)	Max Supp	Supp (cfs)	Pre Cove Full	Full?	Ave Flow (cfs)	Ave Flow (cfs)	Ave Flow (cfs)	River (cfs)	Supp (cfs)	Pre Cove Full	Full?
1996	Apr	5960.7	5549.6	185.1	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes
1996	May	5934.3	5549.5	184.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7	5.1	0.0	Yes	Yes
1996	Jun	5565.8	5547.4	176.9	4.6	4.6	0.0	0.0	No	No	5.7	1.1	6.8	3.3	1.7	No	Yes
1996	Jul	4556.1	5541.4	157.3	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7	3.2	3.6	No	Yes
1996	Aug	3270.1	5532.4	128.4	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.1	2.6	1.0	No	Yes
1996	Sep	2443.4	5525.3	107.6	6.0	4.3	0.0	0.0	Yes	Yes	7.4	1.5	8.9	2.9	0.0	Yes	Yes
1996	Oct	2380.2	5524.8	105.7	8.0	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.8	0.0	0.0	Yes	Yes
1996	Nov	2330.3	5524.3	104.2	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9	0.0	0.0	Yes	Yes
1996	Dec	3145.4	5531.4	125.5	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes
1997	Jan	4012.9	5537.8	145.0	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes
1997	Feb	4880.0	5543.4	164.1	11.5	0.0	0.0	0.0	Yes	Yes	14.1	2.8	16.9	0.0	0.0	Yes	Yes
1997	Mar	5574.2	5547.5	177.1	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1	0.0	0.0	Yes	Yes
1997	Apr	5960.7	5549.6	185.1	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8	0.0	0.0	Yes	Yes
1997	May	5934.3	5549.5	184.5	7.3	7.3	0.0	0.0	No	No	9.0	1.8	10.8	5.1	0.0	Yes	Yes
1997	Jun	5641.9	5547.9	178.3	5.9	5.9	0.0	0.0	No	No	7.3	1.5	8.7	5.1	0.0	Yes	Yes
1997	Jul	4757.1	5542.6	161.6	4.3	4.3	0.0	0.0	No	No	5.2	1.1	6.3	2.8	4.1	No	Yes
1997	Aug	3438.3	5533.6	132.1	5.9	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.7	3.6	0.0	Yes	Yes
1997	Sep	2783.5	5528.4	116.8	9.9	4.3	0.0	0.0	Yes	Yes	12.2	2.5	14.7	2.9	0.0	Yes	Yes
1997	Oct	2715.5	5527.8	115.1	9.8	0.0	0.0	0.0	Yes	Yes	12.0	2.4	14.4	0.0	0.0	Yes	Yes
1997	Nov	2661.2	5527.3	113.6	10.1	0.0	0.0	0.0	Yes	Yes	12.4	2.5	14.9	0.0	0.0	Yes	Yes
1997	Dec	3296.6	5532.6	129.0	9.4	0.0	0.0	0.0	Yes	Yes	11.6	2.3	13.9	0.0	0.0	Yes	Yes
1998	Jan	3891.7	5536.9	142.3	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6	0.0	0.0	Yes	Yes
1998	Feb	4585.1	5541.6	158.0	15.7	0.0	0.0	0.0	Yes	Yes	19.3	3.9	23.2	0.0	0.0	Yes	Yes
1998	Mar	5343.4	5546.2	172.7	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes
1998	Apr	5960.7	5549.6	185.1	27.0	0.0	0.0	0.0	Yes	Yes	33.1	6.7	39.8	0.0	0.0	Yes	Yes
1998	May	5934.3	5549.5	184.5	24.8	7.7	0.0	0.0	Yes	Yes	30.4	6.1	36.5	5.1	0.0	Yes	Yes
1998	Jun	5904.7	5549.3	183.9	12.0	7.7	0.0	0.0	Yes	Yes	14.7	3.0	17.7	5.1	0.0	Yes	Yes
1998	Jul	5320.1	5546.0	172.3	8.2	8.2	0.0	0.0	No	No	10.1	2.0	12.1	6.8	0.0	Yes	Yes
1998	Aug	4396.6	5540.4	153.7	5.9	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.6	3.6	0.0	Yes	Yes
1998	Sep	3733.0	5535.8	138.7	14.1	4.3	0.0	0.0	Yes	Yes	17.3	3.5	20.8	2.9	0.0	Yes	Yes
1998	Oct	3652.3	5535.2	136.9	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4	0.0	0.0	Yes	Yes
1998	Nov	3587.7	5534.8	135.4	15.7	0.0	0.0	0.0	Yes	Yes	19.3	3.9	23.2	0.0	0.0	Yes	Yes
1998	Dec	4446.6	5540.7	154.8	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3	0.0	0.0	Yes	Yes
1999	Jan	5292.3	5545.9	171.8	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes
1999	Feb	5971.7	5549.7	185.3	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes
1999	Mar	5977.6	5549.7	185.4	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes
1999	Apr	5960.7	5549.6	185.1	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes
1999	May	5934.3	5549.5	184.5	9.0	7.7	0.0	0.0	Yes	Yes	11.1	2.2	13.3	5.1	0.0	Yes	Yes
1999	Jun	5812.7	5548.8	181.9	7.7	7.7	0.0	0.0	No	No	9.4	1.9	11.3	5.1	0.0	Yes	Yes
1999	Jul	5095.6	5544.7	168.2	8.1	8.1	0.0	0.0	No	No	10.0	2.0	12.0	6.8	0.0	Yes	Yes
1999	Aug	4165.6	5538.8	148.5	6.8	5.5	0.0	0.0	Yes	Yes	8.4	1.7	10.1	3.6	0.0	Yes	Yes
1999	Sep	3600.6	5534.9	135.7	6.8	4.3	0.0	0.0	Yes	Yes	8.4	1.7	10.1	2.9	0.0	Yes	Yes
1999	Oct	3521.7	5534.3	133.9	7.5	0.0	0.0	0.0	Yes	Yes	9.2	1.9	11.1	0.0	0.0	Yes	Yes
1999	Nov	3458.5	5533.8	132.5	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3	0.0	0.0	Yes	Yes
1999	Dec	3931.9	5537.2	143.2	8.1	0.0	0.0	0.0	Yes	Yes	10.0	2.0	12.0	0.0	0.0	Yes	Yes
2000	Jan	4405.1	5540.4	153.9	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7	0.0	0.0	Yes	Yes
2000	Feb	5036.6	5544.3	167.1	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes
2000	Mar	5775.9	5548.6	181.1	17.4	0.0	0.0	0.0	Yes	Yes	21.4	4.3	25.7	0.0	0.0	Yes	Yes
2000	Apr	5960.7	5549.6	185.1	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes
2000	May	5934.3	5549.5	184.5	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.1	5.1	0.0	Yes	Yes
2000	Jun	5521.0	5547.2	176.1	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.4	2.9	2.2	No	Yes
2000	Jul	4479.8	5540.9	155.6	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.8	2.3	4.6	No	Yes
2000	Aug	3128.1	5531.2	125.1	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.7	2.2	1.4	No	Yes
2000	Sep	2273.7	5523.7	102.6	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.3	2.8	0.0	No	Yes
2000	Oct	2045.8	5521.4	96.2	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7	0.0	0.0	Yes	Yes
2000	Nov	2000.4	5521.0	94.9	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5	0.0	0.0	Yes	Yes
2000	Dec	2733.1	5528.0	115.6	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6	0.0	0.0	Yes	Yes
2001	Jan	3435.0	5533.6	132.0	10.0	0.0	0.0	0.0	Yes	Yes	12.3	2.5	14.8	0.0	0.0	Yes	Yes
2001	Feb	4080.4	5538.3	146.6	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5	0.0	0.0	Yes	Yes
2001	Mar	4812.2	5543.0	162.7	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes
2001	Apr	5629.9	5547.8	178.1	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1	0.0	0.0	Yes	Yes
2001	May	5934.3	5549.5	184.5	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.5	5.1	0.0	Yes	Yes
2001	Jun	5684.6	5548.1	179.2	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7	4.2	0.9	No	Yes
2001	Jul	4728.8	5542.5	161.0	4.4	4.4	0.0	0.0	No	No	5.5	1.1	6.6	3.1	3.8	No	Yes
2001	Aug	3429.0	5533.6	131.9	5.7	5.5	0.0	0.0	Yes	Yes	7.0	1.4	8.4	3.6	0.0	Yes	Yes
2001	Sep	2757.9	5528.2	116.2	4.6	4.3	0.0	0.0	Yes	Yes	5.6	1.1	6.7	2.9	0.0	Yes	Yes
2001	Oct	2551.8	5526.3	110.7	6.5	0.0	0.0	0.0	Yes	Yes	8.0	1.6	9.7	0.0	0.0	Yes	Yes
2001	Nov	2499.5	5525.9	109.3	8.4	0.0	0.0	0.0	Yes	Yes	10.3	2.1	12.4	0.0	0.0	Yes	Yes
2001	Dec	2987.1	5530.1	121.8	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes
2002	Jan	3775.2	5536.1	139.6	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2	0.0	0.0	Yes	Yes
2002	Feb	4506.1	5541.1	156.2	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5	0.0	0.0	Yes	Yes
2002	Mar	5235.5	5545.5	170.7	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8	0.0	0.0	Yes	Yes
2002	Apr	5960.7	5549.6	185.1	6.9	0.0	0.0	0.0	Yes	Yes	8.5	1.7	10.1	0.0	0.0	Yes	Yes
2002	May	5934.3	5549.5	184.5	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.4	2.9	2.1	No	Yes
2002	Jun	5340.6	5546.1	172.7	3.1	3.1	0.0	0.0	No	No	3.8	0.8	4.6	1.1	4.0	No	Yes
2002	Jul	4184.1	5539.0	148.9	3.3	3.3	0.0	0.0	No	No	4.0	0.8	4.8	1.3	5.5	No	Yes
2002	Aug	2771.9	5528.3	116.5	2.9	2.9	0.0	0.0	No	No	3.5	0.7	4.2	0.7	2.9	No	Yes
2002	Sep	1817.7	5519.0	89.8	4.4	4.3	0.0	0.0	Yes	Yes	5.4	1.1	6.5	2.9	0.0	Yes	Yes
2002	Oct	1605.2	5516.5	83.7	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	10.9	0.0	0.0	Yes	Yes
2002	Nov	1565.7	5516.1	82.6	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3	0.0	0.0	Yes	Yes
2002	Dec	2054.5	5521.5	96.4	7.0	0.0	0.0	0.0	Yes	Yes	8.6	1.7	10.3	0.0	0.0	Yes	Yes
2003	Jan	2438.6	5525.3	107.5	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5	0.0	0.0	Yes	Yes
2003	Feb	2952.1	5529.8	120.9	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes
2003	Mar	3505.6	5534.2	133.6	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0	0.0	0.0	Yes	Yes
2003	Apr	4339.4	5540.0	152.4	8.2	0.0	0.0	0.0	Yes	Yes	10.1	2.0	12.1	0.0	0.0	Yes	Yes
2003	May	4767.3	5542.7	161.8	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9	5.1	0.0	Yes	Yes
2003	Jun	4348.3	5540.1	152.6	3.7	3.7	0.0	0.0	No	No	4.6	0.9	5.5	2.0	3.1	No	Yes
2003	Jul	3258.0	5532.3	128.1	3.1	3.1	0.0	0.0	No	No	3.9	0.8	4.6	1.1	5.7	No	Yes
2003	Aug	1840.5	5519.2	90.4	3.7	3.7	0.0	0.0	No	No	4.6	0.9	5.5	2.0	1.6	No	Yes
2003	Sep	982.7	5508.1	63.2	3.8	3.8	0.0	0.0	No	No	4.7	0.9	5.6	2.1	0.7	No	Yes
2003	Oct	718.6	5503.5	53.0	4.3	0.0	0.0	0.0	Yes	Yes	5.3	1.1	6.4	0.0	0.0	Yes	Yes
2003	Nov	693.5	5503.1	52.1	5.3	0.0	0.0	0.0	Yes	Yes	6.5	1.3	7.8	0.0	0.0	Yes	Yes
2003	Dec	929.5	5507.2	61.2	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5	0.0	0.0	Yes	Yes
2004	Jan	1396.4	5514.0	77.9	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1	0.0	0.0	Yes	Yes
2004	Feb	1955.6	5520.5	93.6	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes
2004	Mar	2483.0	5525.7	108.8	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes
2004	Apr	3431.7	5533.6	131.9	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7	0.0	0.0	Yes	Yes
2004	May	4138.5	5538.6	147.9	4.4	4.4	0.0	0.0	No	No	5.5	1.1	6.5	3.0	2.0	No	Yes
2004	Jun	3567.0	5534.6	134.9	3.1	3.1	0.0	0.0	No	No	3.9	0.8	4.6	1.1	4.0	No	Yes
2004	Jul	2427.6	5525.2	107.1	3.5	3.5	0.0	0.0	No	No	4.3	0.9	5.1	1.6	5.2	No	Yes
2004	Aug	1052.4	5509.2	65.8	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.6	3.6	0.0	Yes	Yes
2004	Sep	348.8	5496.8	39.0	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.2	2.7	0.0	No	No
2004	Oct	500.0	5499.0	43.8	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7	0.0	0.0	Yes	Yes
2004	Nov	500.0	5499.0	43.8	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3	0.0	0.0	Yes	Yes
2004	Dec	1473.1	5514.9	80.0	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2	0.0	0.0	Yes	Yes
2005	Jan	2280.4	5523.8	102.8	34.6	0.0	0.0	0.0	Yes	Yes	42.5	8.5	51.0	0.0	0.0	Yes	Yes
2005	Feb	3250.9	5532.2	128.0	25.6	0.0	0.0	0.0	Yes	Yes	31.4	6.3	37.7	0.0	0.0	Yes	Yes
2005	Mar	4072.4	5538.2	146.4	50.6	0.0	0.0	0.0	Yes	Yes	62.1	12.5	74.6	0.0	0.0	Yes	Yes
2005	Apr	4926.6	5543.7	165.0	113.4	0.0	0.0	0.0	Yes	Yes	139.2	28.0	167.2	0.0	0.0	Yes	Yes
2005	May	5685.0	5548.1	179.2	78.4	7.7	0.0	0.0	Yes	Yes	96.3	19.4	115.7	5.1	0.0	Yes	Yes
2005	Jun	5904.7	5549.3	183.9	25.2	7.7	0.0	0.0	Yes	Yes	31.0	6.2	37.2	5.1	0.0	Yes	Yes
2005	Jul	5320.1	5546.0	172.3	12.1	10.4	0.0	0.0	Yes	Yes	14.9	3.0	17.9	6.8	0.0	Yes	Yes
2005	Aug	4742.0	5542.6	161.3	14.0	5.5	0.0	0.0	Yes	Yes	17.2	3.5	20.7	3.6	0.0	Yes	Yes
2005	Sep	4185.4	5539.0	148.9	10.4	4.3	0.0	0.0	Yes	Yes	12.8	2.6	15.4	2.9	0.0	Yes	Yes
2005	Oct	4098.8	5538.4	147.0	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7	0.0	0.0	Yes	Yes
2005	Nov	4029.4	5537.9	145.4	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2005	Dec	4865.4	5543.3	163.8	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes

Date		to COVE				Reservoir Int1			Seepage		Evaporation	
Yr	Mo	Hydraulic Ca (cfs)	to Fill Resv (cfs)	Control (cfs)	River (cfs)	Volume (af)	Elevation (ft)	Area (ac)	af	cfs	af	cfs
1996	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1996	May	13.7	1.6	1.6	1.2	6005.4	5549.9	186.0	60.1	1.0	66.8	1.1
1996	Jun	13.9	7.8	0.0	0.0	5565.8	5547.4	176.9	55.3	0.9	73.0	1.2
1996	Jul	14.6	24.0	0.0	0.0	4556.1	5541.4	157.3	50.8	0.8	64.9	1.1
1996	Aug	15.5	44.9	0.0	0.0	3270.1	5532.4	128.4	41.5	0.7	42.4	0.7
1996	Sep	16.3	60.3	0.0	0.0	2443.4	5525.3	107.6	33.6	0.6	29.0	0.5
1996	Oct	16.4	59.4	0.0	0.0	2380.2	5524.8	105.7	34.1	0.6	15.8	0.3
1996	Nov	16.4	62.2	16.4	14.4	3186.9	5531.7	126.5	39.5	0.7	1.9	0.0
1996	Dec	15.7	46.9	15.7	14.9	4060.1	5538.1	146.1	47.2	0.8	0.0	0.0
1997	Jan	15.0	32.8	15.0	15.0	4933.3	5543.7	165.1	53.3	0.9	0.0	0.0
1997	Feb	14.4	20.7	14.4	13.4	5626.1	5547.8	178.0	51.9	0.9	0.0	0.0
1997	Mar	13.9	7.4	7.4	7.4	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1997	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1997	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1997	Jun	13.9	6.6	0.0	0.0	5641.9	5547.9	178.3	55.7	0.9	73.6	1.2
1997	Jul	14.5	20.7	0.0	0.0	4757.1	5542.6	161.6	52.2	0.8	66.7	1.1
1997	Aug	15.4	42.2	0.0	0.0	3438.3	5533.6	132.1	42.7	0.7	43.6	0.7
1997	Sep	16.0	54.6	0.0	0.0	2783.5	5528.4	116.8	36.5	0.6	31.4	0.5
1997	Oct	16.0	53.9	0.0	0.0	2715.5	5527.8	115.1	37.2	0.6	17.2	0.3
1997	Nov	16.1	56.6	16.1	11.4	3339.1	5532.9	129.9	40.6	0.7	1.9	0.0
1997	Dec	15.5	44.5	15.5	10.4	3938.0	5537.3	143.3	46.3	0.8	0.0	0.0
1998	Jan	15.1	34.8	15.1	12.1	4636.5	5541.9	159.1	51.4	0.8	0.0	0.0
1998	Feb	14.6	26.1	14.6	14.6	5394.1	5546.4	173.7	50.7	0.9	0.0	0.0
1998	Mar	14.1	11.2	11.2	11.2	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1998	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1998	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1998	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1998	Jul	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
1998	Aug	14.7	26.6	0.0	0.0	4396.6	5540.4	153.7	49.6	0.8	50.7	0.8
1998	Sep	15.2	38.6	0.0	0.0	3733.0	5535.8	138.7	43.3	0.7	37.3	0.6
1998	Oct	15.2	38.7	0.0	0.0	3652.3	5535.2	136.9	44.2	0.7	20.4	0.3
1998	Nov	15.3	41.1	15.3	15.3	4497.7	5541.0	156.0	48.7	0.8	2.3	0.0
1998	Dec	14.7	25.8	14.7	14.7	5348.1	5546.2	172.8	55.8	0.9	0.0	0.0
1999	Jan	14.1	12.0	12.0	12.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1999	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1999	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1999	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1999	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1999	Jun	13.8	3.7	0.0	0.0	5812.7	5548.8	181.9	56.8	1.0	75.0	1.3
1999	Jul	14.2	15.2	0.0	0.0	5095.6	5544.7	168.2	54.3	0.9	69.4	1.1
1999	Aug	14.9	30.4	0.0	0.0	4165.6	5538.8	148.5	47.9	0.8	49.0	0.8
1999	Sep	15.3	40.9	0.0	0.0	3600.6	5534.9	135.7	42.4	0.7	36.5	0.6
1999	Oct	15.3	40.8	0.0	0.0	3521.7	5534.3	133.9	43.2	0.7	20.0	0.3
1999	Nov	15.4	43.2	15.4	8.8	3979.2	5537.6	144.3	45.1	0.8	2.2	0.0
1999	Dec	15.0	34.2	15.0	8.5	4455.2	5540.7	155.0	50.1	0.8	0.0	0.0
2000	Jan	14.7	26.5	14.7	11.2	5090.9	5544.7	168.1	54.3	0.9	0.0	0.0
2000	Feb	14.3	17.9	14.3	14.3	5829.1	5548.9	182.3	53.2	1.0	0.0	0.0
2000	Mar	13.8	4.2	4.2	4.2	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2000	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2000	May	13.7	1.6	1.6	0.5	5964.8	5549.6	185.2	59.8	1.0	66.5	1.1
2000	Jun	14.0	8.6	0.0	0.0	5521.0	5547.2	176.1	55.0	0.9	72.6	1.2
2000	Jul	14.6	25.2	0.0	0.0	4479.8	5540.9	155.6	50.2	0.8	64.2	1.0
2000	Aug	15.7	47.2	0.0	0.0	3128.1	5531.2	125.1	40.4	0.7	41.3	0.7
2000	Sep	16.5	63.2	0.0	0.0	2273.7	5523.7	102.6	32.1	0.5	27.6	0.5
2000	Oct	16.7	64.8	0.0	0.0	2045.8	5521.4	96.2	31.1	0.5	14.3	0.2
2000	Nov	16.8	67.8	16.8	13.0	2771.2	5528.3	116.5	36.4	0.6	1.7	0.0
2000	Dec	16.0	53.7	16.0	12.1	3477.9	5533.9	132.9	42.9	0.7	0.0	0.0
2001	Jan	15.4	42.2	15.4	11.3	4128.1	5538.6	147.6	47.7	0.8	0.0	0.0
2001	Feb	14.9	35.1	14.9	14.0	4859.9	5543.3	163.7	47.7	0.9	0.0	0.0
2001	Mar	14.4	19.8	14.4	14.4	5698.5	5548.2	179.5	58.0	0.9	10.6	0.2
2001	Apr	13.9	6.8	6.8	6.8	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2001	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2001	Jun	13.9	5.8	0.0	0.0	5684.6	5548.1	179.2	56.0	0.9	73.9	1.2
2001	Jul	14.5	21.2	0.0	0.0	4728.8	5542.5	161.0	52.0	0.8	66.4	1.1
2001	Aug	15.4	42.3	0.0	0.0	3429.0	5533.6	131.9	42.6	0.7	43.5	0.7
2001	Sep	16.0	55.0	0.0	0.0	2757.9	5528.2	116.2	36.3	0.6	31.3	0.5
2001	Oct	16.2	56.6	0.0	0.0	2551.8	5526.3	110.7	35.8	0.6	16.5	0.3
2001	Nov	16.2	59.4	16.2	8.9	3027.3	5530.4	122.7	38.4	0.6	1.8	0.0
2001	Dec	15.8	49.5	15.8	13.6	3820.6	5536.4	140.6	45.4	0.7	0.0	0.0
2002	Jan	15.1	36.7	15.1	12.7	4556.9	5541.4	157.3	50.8	0.8	0.0	0.0
2002	Feb	14.6	27.5	14.6	14.0	5285.6	5545.8	171.6	50.1	0.9	0.0	0.0
2002	Mar	14.1	13.0	13.0	13.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2002	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2002	May	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1
2002	Jun	14.1	11.6	0.0	0.0	5340.6	5546.1	172.7	54.0	0.9	71.2	1.2
2002	Jul	14.8	30.1	0.0	0.0	4184.1	5539.0	148.9	48.1	0.8	61.4	1.0
2002	Aug	16.0	53.0	0.0	0.0	2771.9	5528.3	116.5	37.6	0.6	38.5	0.6
2002	Sep	17.0	70.8	0.0	0.0	1817.7	5519.0	89.8	28.0	0.5	24.2	0.4
2002	Oct	17.2	72.0	0.0	0.0	1605.2	5516.5	83.7	27.0	0.4	12.5	0.2
2002	Nov	17.3	75.1	17.3	8.8	2086.4	5521.9	97.3	30.4	0.5	1.5	0.0
2002	Dec	16.7	64.7	16.7	6.8	2473.7	5525.6	108.5	35.0	0.6	0.0	0.0
2003	Jan	16.3	58.4	16.3	9.0	2991.4	5530.1	121.9	39.4	0.6	0.0	0.0
2003	Feb	15.8	55.5	15.8	10.7	3544.8	5534.4	134.4	39.2	0.7	0.0	0.0
2003	Mar	15.4	41.1	15.4	14.5	4398.1	5540.4	153.7	49.6	0.8	9.1	0.1
2003	Apr	14.7	28.4	14.7	8.6	4852.9	5543.2	163.5	51.1	0.9	34.5	0.6
2003	May	14.4	20.6	14.4	0.3	4785.3	5542.8	162.2	52.4	0.9	58.2	0.9
2003	Jun	14.7	28.3	0.0	0.0	4348.3	5540.1	152.6	47.7	0.8	62.9	1.1
2003	Jul	15.6	45.1	0.0	0.0	3258.0	5532.3	128.1	41.4	0.7	52.9	0.9
2003	Aug	16.9	68.2	0.0	0.0	1840.5	5519.2	90.4	29.2	0.5	29.8	0.5
2003	Sep	18.1	84.9	0.0	0.0	982.7	5508.1	63.2	19.8	0.3	17.0	0.3
2003	Oct	18.6	86.4	0.0	0.0	718.6	5503.5	53.0	17.1	0.3	7.9	0.1
2003	Nov	18.7	89.7	18.7	4.3	949.8	5507.6	62.0	19.4	0.3	0.9	0.0
2003	Dec	18.2	83.0	18.2	8.0	1421.8	5514.3	78.6	25.4	0.4	0.0	0.0
2004	Jan	17.5	75.4	17.5	9.6	1986.1	5520.8	94.5	30.5	0.5	0.0	0.0
2004	Feb	16.8	73.4	16.8	10.1	2515.0	5526.0	109.8	32.0	0.6	0.0	0.0
2004	Mar	16.3	57.7	16.3	16.3	3482.5	5534.0	133.0	43.0	0.7	7.9	0.1
2004	Apr	15.4	43.7	15.4	13.2	4216.8	5539.2	149.6	46.8	0.8	31.5	0.5
2004	May	14.9	30.8	14.9	0.0	4138.5	5538.6	147.9	47.7	0.8	53.1	0.9
2004	Jun	15.3	41.4	0.0	0.0	3567.0	5534.6	134.9	42.2	0.7	55.7	0.9
2004	Jul	16.3	58.6	0.0	0.0	2427.6	5525.2	107.1	34.6	0.6	44.2	0.7
2004	Aug	18.0	81.0	0.0	0.0	1052.4	5509.2	65.8	21.3	0.3	21.7	0.4
2004	Sep	19.3	95.5	0.0	0.0	348.8	5496.8	39.0	12.2	0.2	10.5	0.2
2004	Oct	19.1	90.0	0.0	0.0	500.0	5499.0	43.8	14.1	0.2	6.5	0.1
2004	Nov	19.1	93.0	19.1	16.8	1499.5	5515.2	80.7	25.2	0.4	1.2	0.0
2004	Dec	17.4	74.1	17.4	13.7	2313.9	5524.1	103.7	33.5	0.5	0.0	0.0
2005	Jan	16.5	61.0	16.5	16.5	3292.5	5532.5	128.9	41.6	0.7	0.0	0.0
2005	Feb	15.6	50.1	15.6	15.6	4115.3	5538.5	147.3	43.0	0.8	0.0	0.0
2005	Mar	14.9	31.9	14.9	14.9	4990.1	5544.1	166.2	53.7	0.9	9.8	0.2
2005	Apr	14.3	18.6	14.3	14.3	5779.8	5548.6	181.2	56.6	1.0	38.2	0.6
2005	May	13.9	5.6	5.6	5.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2005	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2005	Jul	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
2005	Aug	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9
2005	Sep	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7
2005	Oct	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4
2005	Nov	15.0	33.7	15.0	15.0	4919.3	5543.6	164.8	51.5	0.9	2.5	0.0
2005	Dec	14.4	19.0	14.4	14.4	5749.6	5548.5	180.6	58.3	0.9	0.0	0.0

Date		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume (af)	Elevation (ft)	Area (ac)	Ave Flow (cfs)	Ave Flow (cfs)	Ave Flow (cfs)	River (cfs)	Supp (cfs)	Pre Cove Full	Full?	Supp (cfs)	Ave Flow (cfs)	Sum Supp (cfs)	Volume (af)	Elevation (ft)	Area (ac)
1996	Apr	5,934.3	5,549.5	184.5	1.5	1.0	14.9	0.0	0.0	Yes	Yes	0.0	14.9	0.0	5,934.3	5,549.5	184.5
1996	May	5,878.6	5,549.2	183.3	1.1	1.0	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,565.8	5,547.4	176.9
1996	Jun	5,437.6	5,546.7	174.5	0.8	0.9	5.2	1.7	5.5	No	Yes	7.6	11.1	14.8	4,556.1	5,541.4	157.3
1996	Jul	4,440.4	5,540.6	154.7	0.8	0.8	5.1	1.6	8.1	No	Yes	7.3	10.8	19.0	3,270.1	5,532.4	128.4
1996	Aug	3,186.3	5,531.7	126.5	0.7	0.7	4.9	1.4	3.8	No	Yes	7.3	10.8	12.1	2,443.4	5,525.3	107.6
1996	Sep	2,380.8	5,524.8	105.7	1.0	0.6	7.5	4.0	0.0	No	Yes	0.0	3.5	0.0	2,380.2	5,524.8	105.7
1996	Oct	2,330.3	5,524.3	104.2	1.3	0.6	13.7	0.0	0.0	Yes	Yes	0.0	13.7	0.0	2,330.3	5,524.3	104.2
1996	Nov	3,145.4	5,531.4	125.5	2.0	0.7	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	3,145.4	5,531.4	125.5
1996	Dec	4,012.9	5,537.8	145.0	2.1	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,012.9	5,537.8	145.0
1997	Jan	4,880.0	5,543.4	164.1	2.6	0.9	12.1	0.0	0.0	Yes	Yes	0.0	12.1	0.0	4,880.0	5,543.4	164.1
1997	Feb	5,574.2	5,547.5	177.1	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,574.2	5,547.5	177.1
1997	Mar	5,960.7	5,549.6	185.1	2.2	1.0	15.8	0.0	0.0	Yes	Yes	0.0	15.8	0.0	5,960.7	5,549.6	185.1
1997	Apr	5,934.3	5,549.5	184.5	1.9	1.0	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	5,934.3	5,549.5	184.5
1997	May	5,904.7	5,549.3	183.9	1.2	1.0	6.4	2.9	4.3	No	Yes	0.0	3.5	4.3	5,641.9	5,547.9	178.3
1997	Jun	5,512.7	5,547.1	175.9	1.0	0.9	5.6	2.1	5.1	No	Yes	7.6	11.1	12.7	4,757.1	5,542.6	161.6
1997	Jul	4,638.3	5,541.9	159.2	0.7	0.8	5.0	1.5	8.1	No	Yes	7.3	10.8	19.5	3,438.3	5,533.6	132.1
1997	Aug	3,352.0	5,533.0	130.2	1.0	0.7	6.7	3.2	1.9	No	Yes	7.3	10.8	9.2	2,783.5	5,528.4	116.8
1997	Sep	2,715.5	5,527.8	115.1	1.6	0.6	14.0	4.0	0.0	Yes	Yes	0.0	10.0	0.0	2,715.5	5,527.8	115.1
1997	Oct	2,661.2	5,527.3	113.6	1.6	0.6	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	2,661.2	5,527.3	113.6
1997	Nov	3,296.6	5,532.6	129.0	1.7	0.7	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,296.6	5,532.6	129.0
1997	Dec	3,891.7	5,536.9	142.3	1.6	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,891.7	5,536.9	142.3
1998	Jan	4,585.1	5,541.6	158.0	1.7	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,585.1	5,541.6	158.0
1998	Feb	5,343.4	5,546.2	172.7	2.6	0.9	12.1	0.0	0.0	Yes	Yes	0.0	12.1	0.0	5,343.4	5,546.2	172.7
1998	Mar	5,960.7	5,549.6	185.1	2.8	1.0	18.1	0.0	0.0	Yes	Yes	0.0	18.1	0.0	5,960.7	5,549.6	185.1
1998	Apr	5,934.3	5,549.5	184.5	4.4	1.0	44.0	0.0	0.0	Yes	Yes	0.0	44.0	0.0	5,934.3	5,549.5	184.5
1998	May	5,904.7	5,549.3	183.9	4.1	1.0	34.9	7.1	0.0	Yes	Yes	0.0	27.8	0.0	5,904.7	5,549.3	183.9
1998	Jun	5,771.4	5,548.6	181.0	2.0	1.0	15.5	7.2	0.0	Yes	Yes	7.6	15.9	7.6	5,320.1	5,546.0	172.3
1998	Jul	5,193.4	5,545.3	170.0	1.4	0.9	7.5	4.0	5.6	No	Yes	7.3	10.8	13.0	4,396.6	5,540.4	153.7
1998	Aug	4,296.2	5,539.7	151.4	1.0	0.8	6.8	3.3	1.8	No	Yes	7.3	10.8	9.2	3,733.0	5,535.8	138.7
1998	Sep	3,652.3	5,535.2	136.9	2.3	0.7	21.0	4.0	0.0	Yes	Yes	0.0	16.9	0.0	3,652.3	5,535.2	136.9
1998	Oct	3,587.7	5,534.8	135.4	2.3	0.7	23.4	0.0	0.0	Yes	Yes	0.0	23.4	0.0	3,587.7	5,534.8	135.4
1998	Nov	4,446.6	5,540.7	154.8	2.6	0.8	11.3	0.0	0.0	Yes	Yes	0.0	11.3	0.0	4,446.6	5,540.7	154.8
1998	Dec	5,292.3	5,545.9	171.8	2.2	0.9	7.7	0.0	0.0	Yes	Yes	0.0	7.7	0.0	5,292.3	5,545.9	171.8
1999	Jan	5,971.7	5,549.7	185.3	2.1	1.0	10.2	0.0	0.0	Yes	Yes	0.0	10.2	0.0	5,971.7	5,549.7	185.3
1999	Feb	5,977.6	5,549.7	185.4	2.1	1.0	21.3	0.0	0.0	Yes	Yes	0.0	21.3	0.0	5,977.6	5,549.7	185.4
1999	Mar	5,960.7	5,549.6	185.1	1.5	1.0	15.4	0.0	0.0	Yes	Yes	0.0	15.4	0.0	5,960.7	5,549.6	185.1
1999	Apr	5,934.3	5,549.5	184.5	1.9	1.0	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,934.3	5,549.5	184.5
1999	May	5,904.7	5,549.3	183.9	1.5	1.0	9.2	5.7	1.5	No	Yes	0.0	3.5	1.5	5,812.7	5,548.8	181.9
1999	Jun	5,680.8	5,548.1	179.1	1.3	1.0	8.4	4.9	2.2	No	Yes	7.6	11.1	9.8	5,095.6	5,544.7	168.2
1999	Jul	4,971.9	5,544.0	165.9	1.3	0.9	7.4	3.9	5.8	No	Yes	7.3	10.8	13.1	4,165.6	5,538.8	148.5
1999	Aug	4,068.6	5,538.2	146.3	1.1	0.8	8.3	4.8	0.3	No	Yes	7.3	10.8	7.6	3,600.6	5,534.9	135.7
1999	Sep	3,521.7	5,534.3	133.9	1.1	0.7	9.1	4.0	0.0	Yes	Yes	0.0	5.0	0.0	3,521.7	5,534.3	133.9
1999	Oct	3,458.5	5,533.8	132.5	1.2	0.7	13.0	0.0	0.0	Yes	Yes	0.0	13.0	0.0	3,458.5	5,533.8	132.5
1999	Nov	3,931.9	5,537.2	143.2	1.4	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	3,931.9	5,537.2	143.2
1999	Dec	4,405.1	5,540.4	153.9	1.3	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,405.1	5,540.4	153.9
2000	Jan	5,036.6	5,544.3	167.1	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,036.6	5,544.3	167.1
2000	Feb	5,775.9	5,548.6	181.1	2.1	1.0	7.9	0.0	0.0	Yes	Yes	0.0	7.9	0.0	5,775.9	5,548.6	181.1
2000	Mar	5,960.7	5,549.6	185.1	2.9	1.0	25.4	0.0	0.0	Yes	Yes	0.0	25.4	0.0	5,960.7	5,549.6	185.1
2000	Apr	5,934.3	5,549.5	184.5	1.6	1.0	15.9	0.0	0.0	Yes	Yes	0.0	15.9	0.0	5,934.3	5,549.5	184.5
2000	May	5,838.5	5,548.9	182.5	1.0	1.0	5.5	2.0	5.2	No	Yes	0.0	3.5	5.2	5,521.0	5,547.2	176.1
2000	Jun	5,393.3	5,546.4	173.7	0.7	0.9	5.1	1.6	5.5	No	Yes	7.6	11.1	15.4	4,479.8	5,540.9	155.6
2000	Jul	4,365.4	5,540.2	153.0	0.6	0.8	5.0	1.5	8.2	No	Yes	7.3	10.8	20.1	3,128.1	5,531.2	125.1
2000	Aug	3,046.4	5,530.6	123.2	0.6	0.7	4.8	1.3	3.8	No	Yes	7.3	10.8	12.6	2,273.7	5,523.7	102.6
2000	Sep	2,214.0	5,523.1	100.9	0.7	0.5	4.7	1.2	2.8	No	Yes	0.0	3.5	2.8	2,045.8	5,521.4	96.2
2000	Oct	2,000.4	5,521.0	94.9	1.6	0.5	16.8	0.0	0.0	Yes	Yes	0.0	16.8	0.0	2,000.4	5,521.0	94.9
2000	Nov	2,733.1	5,528.0	115.6	1.8	0.6	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	2,733.1	5,528.0	115.6
2000	Dec	3,435.0	5,533.6	132.0	1.7	0.7	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	3,435.0	5,533.6	132.0
2001	Jan	4,080.4	5,538.3	146.6	1.6	0.8	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	4,080.4	5,538.3	146.6
2001	Feb	4,812.2	5,543.0	162.7	2.0	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,812.2	5,543.0	162.7
2001	Mar	5,629.9	5,547.8	178.1	2.4	0.9	10.0	0.0	0.0	Yes	Yes	0.0	10.0	0.0	5,629.9	5,547.8	178.1
2001	Apr	5,934.3	5,549.5	184.5	2.2	1.0	16.5	0.0	0.0	Yes	Yes	0.0	16.5	0.0	5,934.3	5,549.5	184.5
2001	May	5,904.7	5,549.3	183.9	1.3	1.0	7.1	3.6	3.6	No	Yes	0.0	3.5	3.6	5,684.6	5,548.1	179.2
2001	Jun	5,554.7	5,547.4	176.7	0.9	0.9	5.3	1.8	5.4	No	Yes	7.6	11.1	13.9	4,728.8	5,542.5	161.0
2001	Jul	4,610.3	5,541.7	158.6	0.7	0.8	5.1	1.6	8.1	No	Yes	7.3	10.8	19.2	3,429.0	5,533.6	131.9
2001	Aug	3,342.9	5,532.9	130.0	0.9	0.7	6.4	2.9	2.2	No	Yes	7.3	10.8	9.5	2,757.9	5,528.2	116.2
2001	Sep	2,690.3	5,527.6	114.4	0.8	0.6	5.2	1.7	2.3	No	Yes	0.0	3.5	2.3	2,551.8	5,526.3	110.7
2001	Oct	2,499.5	5,525.9	109.3	1.1	0.6	11.3	0.0	0.0	Yes	Yes	0.0	11.3	0.0	2,499.5	5,525.9	109.3
2001	Nov	2,987.1	5,530.1	121.8	1.4	0.6	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	2,987.1	5,530.1	121.8
2001	Dec	3,775.2	5,536.1	139.6	1.9	0.7	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	3,775.2	5,536.1	139.6
2002	Jan	4,506.1	5,541.1	156.2	1.8	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,506.1	5,541.1	156.2
2002	Feb	5,235.5	5,545.5	170.7	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,235.5	5,545.5	170.7
2002	Mar	5,960.7	5,549.6	185.1	2.0	1.0	7.8	0.0	0.0	Yes	Yes	0.0	7.8	0.0	5,960.7	5,549.6	185.1
2002	Apr	5,934.3	5,549.5	184.5	1.1	1.0	11.1	0.0	0.0	Yes	Yes	0.0	11.1	0.0	5,934.3	5,549.5	184.5
2002	May	5,808.5	5,548.8	181.8	0.7	1.0	5.2	1.7	5.5	No	Yes	0.0	3.5	7.6	5,340.6	5,546.1	172.7
2002	Jun	5,215.4	5,545.4	170.4	0.5	0.9	4.9	1.4	5.8	No	Yes	7.6	11.1	17.3	4,184.1	5,539.0	148.9
2002	Jul	4,074.6	5,538.2	146.4	0.5	0.8	4.8	1.3	8.3	No	Yes	7.3	10.8	21.2	2,771.9	5,528.3	116.5
2002	Aug	2,695.8	5,527.6	114.6	0.5	0.6	4.6	1.1	4.0	No	Yes	7.3	10.8	14.3	1,817.7	5,519.0	89.8
2002	Sep	1,765.5	5,518.4	88.3	0.7	0.5	4.9	1.4	2.7	No	Yes	0.0	3.5	2.7	1,605.2	5,516.5	83.7
2002	Oct	1,565.7	5,516.1	82.6	1.2	0.4	12.5	0.0	0.0	Yes	Yes	0.0	12.5	0.0	1,565.7	5,516.1	82.6
2002	Nov	2,054.5	5,521.5	96.4	1.4	0.5	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	2,054.5	5,521.5	96.4
2002	Dec	2,438.6	5,525.3	107.5	1.2	0.6	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	2,438.6	5,525.3	107.5
2003	Jan	2,952.1	5,529.8	120.9	1.4	0.6	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	2,952.1	5,529.8	120.9
2003	Feb	3,505.6	5,534.2	133.6	1.6	0.7	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,505.6	5,534.2	133.6
2003	Mar	4,339.4	5,540.0	152.4	2.0	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,339.4	5,540.0	152.4
2003	Apr	4,767.3	5,542.7	161.8	1.4	0.9	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,767.3	5,542.7	161.8
2003	May	4,674.7	5,542.1	160.0	1.0	0.9	5.3	1.8	5.3	No	Yes	0.0	3.5	5.3	4,348.3	5,540.1	152.6
2003	Jun	4,237.6	5,539.3	150.1	0.6	0.8	4.9	1.4	5.8	No	Yes	7.6	11.1	16.5	3,258.0	5,532.3	128.1
2003	Jul	3,163.8	5,531.5	126.0	0.5	0.7	4.7	1.2	8.5	No	Yes	7.3	10.8	21.5	1,840.5	5,519.2	90.4
2003	Aug	1,781.4	5,518.6	88.7	0.6	0.5	4.6	1.1	4.0	No	Yes	7.3	10.8	13.0	982.7	5,508.1	63.2
2003	Sep	945.9	5,507.5	61.8	0.6	0.3	4.5	1.0	3.1	No	Yes	0.0	3.5	3.8	718.6	5,503.5	53.0
2003	Oct	693.5	5,503.1	52.1	0.7	0.3	7.4	0.0	0.0	Yes	Yes	0.0	7.4	0.0	693.5	5,503.1	52.1
2003	Nov	929.5	5,507.2	61.2	0.9	0.3	4.7	0.0	0.0	Yes	Yes	0.0	4.7	0.0	929.5	5,507.2	61.2
2003	Dec	1,396.4	5,514.0	77.9	1.3	0.4	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	1,396.4	5,514.0	77.9
2004	Jan	1,955.6	5,520.5	93.6	1.5	0.5	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	1,955.6	5,520.5	93.6
2004	Feb	2,483.0	5,525.7	108.8	1.5	0.6	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	2,483.0	5,525.7	108.8
2004	Mar	3,431.7	5,533.6	131.9	2.8	0.7	12.7	0.0	0.0	Yes	Yes	0.0	12.7	0.0	3,431.7	5,533.6	131.9
2004	Apr	4,138.5	5,538.6	147.9	1.9	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,138.5	5,538.6	147.9
2004	May	4,037.7	5,538.0	145.6	0.7	0.8	5.0	1.5	5.6	No	Yes	0.0	3.5	7.7	3,567.0	5,534.6	134.9
2004	Jun	3,469.1	5,533.9	132.8	0.5	0.7	4.7	1.2	6.0	No	Yes	7.6	11.1	17.5	2,427.6	5,525.2	107.1
2004	Jul	2,348.8	5,524.5	104.8	0.6	0.6	4.6	1.1	8.5	No	Yes	7.3	10.8	21.1	1,052.4	5,509.2	65.8
2004	Aug	1,009.4	5,508.5	64.2	0.9	0.3	5.2	1.7	3.4	No	Yes	7.3	10.8	10.7	348.8	5,496.8	39.0
2004	Sep	326.1	5,496.6	38.4	0.7	0.2	4.4	0.9	0.0	No	No	-2.9	0.6	-2.9	500.0	5,499.0	43.8
2004	Oct	479.3	5,498.5	42.8	2.3	0.2	23.2	0.0	0.0	Yes	Yes	-0.3	22.9	-0.3	500.0	5,499.0	43.8
2004	Nov	1,473.1	5,514.9	80.0	2.3	0.4	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	1,473.1	5,514.9	80.0
2004	Dec	2,280.4	5,523.8	102.8	1.9	0.5	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	2,280.4	5,523.8	102.8
2005	Jan	3,250.9	5,532.2	128.0	5.7	0.7	41.0	0.0	0.0	Yes	Yes	0.0	41.0	0.0	3,250.9	5,532.2	128.0
2005	Feb	4,072.4	5,538.2	146.4	4.2	0.8	27.1	0.0	0.0	Yes	Yes	0.0	27.1	0.0	4,072.4	5,538.2	146.4
2005	Mar	4,926.6	5,543.7	165.0	8.3	0.9	68.9	0.0	0.0	Yes	Yes	0.0	68.9	0.0	4,926.6	5,543.7	165.0
2005	Apr	5,685.0	5,548.1	179.2	18.7	1.0	172.5	0.0	0.0	Yes	Yes	0.0	172.5	0.0	5,685.0	5,548.1	179.2
2005	May	5,904.7	5,549.3	183.9	12.9	1.0	118.8	7.1	0.0	Yes	Yes	0.0	111.7	0.0	5,904.7	5,549.3	183.9
2005	Jun	5,771.4	5,548.6	181.0	4.2	1.0	37.3	7.2	0.0	Yes	Yes	7.6	37.7	7.6	5,320.1	5,546.0	172.3
2005	Jul	5,193.4	5,545.3	170.0	2.0	0.9	14.0	9.7	0.0	No	Yes	7.3	11.6	7.3	4,742.0	5,542.6	161.3
2005	Aug	4,636.7	5,541.9	159.2	2.3	0.8	20.2	5.1	0.0	Yes	Yes	7.3	22.4	7.3	4,185.4	5,539.0	148.9
2005	Sep	4,098.8	5,538.4	147.0	1.7	0.8	15.0	4.0	0.0	Yes	Yes	0.0	11.0	0.0	4,098.8	5,538.4	147.0
2005	Oct	4,029.4	5,537.9	145.4	2.3	0.8	23.7	0.0	0.0	Yes	Yes	0.0	23.7	0.0	4,029.4	5,537.9	145.4
2005	Nov	4,865.4	5,543.3	163.8	2.3	0.9	9.0	0.0	0.0	Yes	Yes	0.0	9.0	0.0	4,865.4	5,543.3	163.8
2005	Dec	5,691.2	5,548.1	179.3	2.3	0.9	9.7	0.0	0.0	Yes	Yes	0.0	9.7	0.0	5,691.2	5,548.1	179.3

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Ful	Full?	Ave Flow	Ave Flow	Ave Flow
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs
2006	Jan	5691.2	5548.1	179.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8
2006	Feb	5971.7	5549.7	185.3	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0
2006	Mar	5977.6	5549.7	185.4	18.6	0.0	0.0	0.0	Yes	Yes	22.8	4.6	27.4
2006	Apr	5960.7	5549.6	185.1	16.4	0.0	0.0	0.0	Yes	Yes	20.1	4.0	24.1
2006	May	5934.3	5549.5	184.5	9.4	7.7	0.0	0.0	Yes	Yes	11.6	2.3	13.9
2006	Jun	5853.7	5549.0	182.8	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7
2006	Jul	5031.4	5544.3	167.0	7.0	7.0	0.0	0.0	No	No	8.6	1.7	10.4
2006	Aug	3990.3	5537.6	144.5	6.0	5.5	0.0	0.0	Yes	Yes	7.4	1.5	8.8
2006	Sep	3342.9	5532.9	130.0	6.8	4.3	0.0	0.0	Yes	Yes	8.3	1.7	10.0
2006	Oct	3267.2	5532.3	128.3	12.4	0.0	0.0	0.0	Yes	Yes	15.2	3.1	18.3
2006	Nov	3206.7	5531.9	127.0	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2
2006	Dec	3972.8	5537.5	144.1	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2
2007	Jan	4702.4	5542.3	160.5	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
2007	Feb	5354.1	5546.2	172.9	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1
2007	Mar	5977.6	5549.7	185.4	10.3	0.0	0.0	0.0	Yes	Yes	12.7	2.6	15.3
2007	Apr	5960.7	5549.6	185.1	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6
2007	May	5934.3	5549.5	184.5	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9
2007	Jun	5509.6	5547.1	175.8	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.2
2007	Jul	4460.5	5540.8	155.1	3.4	3.4	0.0	0.0	No	No	4.2	0.8	5.0
2007	Aug	3055.7	5530.6	123.4	3.7	3.7	0.0	0.0	No	No	4.5	0.9	5.4
2007	Sep	2182.9	5522.8	100.0	4.7	4.3	0.0	0.0	Yes	Yes	5.8	1.2	7.0
2007	Oct	1997.1	5520.9	94.8	6.8	0.0	0.0	0.0	Yes	Yes	8.4	1.7	10.1
2007	Nov	1952.3	5520.5	93.5	6.9	0.0	0.0	0.0	Yes	Yes	8.5	1.7	10.2
2007	Dec	2315.8	5524.1	103.8	10.3	0.0	0.0	0.0	Yes	Yes	12.7	2.6	15.3
2008	Jan	2998.7	5530.2	122.1	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2
2008	Feb	3735.3	5535.8	138.7	12.3	0.0	0.0	0.0	Yes	Yes	15.1	3.0	18.1
2008	Mar	4502.3	5541.0	156.1	16.7	0.0	0.0	0.0	Yes	Yes	20.5	4.1	24.6
2008	Apr	5335.0	5546.1	172.6	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4
2008	May	5934.3	5549.5	184.5	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4
2008	Jun	5683.8	5548.1	179.2	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9
2008	Jul	4744.6	5542.6	161.3	4.7	4.7	0.0	0.0	No	No	5.7	1.2	6.9
2008	Aug	3467.7	5533.9	132.7	4.1	4.1	0.0	0.0	No	No	5.1	1.0	6.1
2008	Sep	2637.1	5527.1	113.0	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.8
2008	Oct	2371.4	5524.7	105.4	5.9	0.0	0.0	0.0	Yes	Yes	7.2	1.5	8.7
2008	Nov	2321.7	5524.2	104.0	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5
2008	Dec	2758.3	5528.2	116.2	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1
2009	Jan	3306.0	5532.6	129.2	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4
2009	Feb	4113.7	5538.5	147.3	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0
2009	Mar	4892.7	5543.5	164.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8
2009	Apr	5706.6	5548.2	179.7	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
2009	May	5934.3	5549.5	184.5	7.7	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4
2009	Jun	5678.1	5548.1	179.0	5.8	5.8	0.0	0.0	No	No	7.1	1.4	8.5
2009	Jul	4777.1	5542.8	162.0	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.3
2009	Aug	3456.4	5533.8	132.5	3.9	3.9	0.0	0.0	No	No	4.7	1.0	5.7
2009	Sep	2598.7	5526.8	112.0	4.1	4.1	0.0	0.0	No	No	5.1	1.0	6.1
2009	Oct	2352.4	5524.5	104.9	5.4	0.0	0.0	0.0	Yes	Yes	6.6	1.3	7.9
2009	Nov	2302.9	5524.0	103.4	7.4	0.0	0.0	0.0	Yes	Yes	9.0	1.8	10.9
2009	Dec	2702.8	5527.7	114.8	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5
2010	Jan	3338.9	5532.9	129.9	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8
2010	Feb	4168.4	5538.8	148.5	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5
2010	Mar	4944.9	5543.8	165.3	18.4	0.0	0.0	0.0	Yes	Yes	22.6	4.5	27.1
2010	Apr	5756.3	5548.5	180.7	21.7	0.0	0.0	0.0	Yes	Yes	26.6	5.3	31.9
2010	May	5934.3	5549.5	184.5	14.1	7.7	0.0	0.0	Yes	Yes	17.3	3.5	20.8
2010	Jun	5904.7	5549.3	183.9	7.7	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4
2010	Jul	5193.2	5545.3	170.0	5.3	5.3	0.0	0.0	No	No	6.5	1.3	7.8
2010	Aug	3973.5	5537.5	144.1	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7
2010	Sep	3245.8	5532.2	127.9	4.5	4.3	0.0	0.0	Yes	Yes	5.5	1.1	6.6
2010	Oct	3026.2	5530.4	122.7	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2
2010	Nov	2968.3	5529.9	121.3	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7
2010	Dec	3473.7	5533.9	132.9	53.9	0.0	0.0	0.0	Yes	Yes	66.2	13.3	79.5
2011	Jan	4369.7	5540.2	153.1	23.5	0.0	0.0	0.0	Yes	Yes	28.8	5.8	34.6
2011	Feb	5219.1	5545.4	170.4	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4
2011	Mar	5950.9	5549.6	184.9	32.1	0.0	0.0	0.0	Yes	Yes	39.4	7.9	47.3
2011	Apr	5960.7	5549.6	185.1	81.4	0.0	0.0	0.0	Yes	Yes	100.0	20.1	120.1
2011	May	5934.3	5549.5	184.5	56.8	7.7	0.0	0.0	Yes	Yes	69.7	14.0	83.7
2011	Jun	5904.7	5549.3	183.9	18.3	7.7	0.0	0.0	Yes	Yes	22.5	4.5	27.0
2011	Jul	5320.1	5546.0	172.3	12.6	10.4	0.0	0.0	Yes	Yes	15.5	3.1	18.6
2011	Aug	4742.0	5542.6	161.3	9.9	5.5	0.0	0.0	Yes	Yes	12.1	2.4	14.5
2011	Sep	4185.4	5539.0	148.9	10.5	4.3	0.0	0.0	Yes	Yes	12.9	2.6	15.5
2011	Oct	4098.8	5538.4	147.0	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9
2011	Nov	4029.4	5537.9	145.4	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4
2011	Dec	4860.6	5543.3	163.7	15.5	0.0	0.0	0.0	Yes	Yes	19.0	3.8	22.8
2012	Jan	5686.7	5548.1	179.2	15.0	0.0	0.0	0.0	Yes	Yes	18.4	3.7	22.1
2012	Feb	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.7	4.0	23.7
2012	Mar	5977.6	5549.7	185.4	17.1	0.0	0.0	0.0	Yes	Yes	21.0	4.2	25.2
2012	Apr	5960.7	5549.6	185.1	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3
2012	May	5934.3	5549.5	184.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7
2012	Jun	5565.0	5547.4	176.9	4.8	4.8	0.0	0.0	No	No	6.0	1.2	7.1
2012	Jul	4575.1	5541.5	157.8	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9
2012	Aug	3436.0	5533.6	132.0	9.0	5.5	0.0	0.0	Yes	Yes	11.1	2.2	13.3
2012	Sep	2898.4	5529.4	119.6	8.5	4.3	0.0	0.0	Yes	Yes	10.4	2.1	12.5
2012	Oct	2828.8	5528.8	117.9	10.5	0.0	0.0	0.0	Yes	Yes	12.9	2.6	15.5
2012	Nov	2773.2	5528.3	116.6	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3
2012	Dec	3549.6	5534.5	134.6	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3
2013	Jan	4441.5	5540.7	154.7	10.9	0.0	0.0	0.0	Yes	Yes	13.4	2.7	16.1
2014	Feb	5160.8	5545.1	169.4	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8
2013	Mar	5846.7	5549.0	182.6	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3
2013	Apr	5960.7	5549.6	185.1	8.6	0.0	0.0	0.0	Yes	Yes	10.5	2.1	12.6
2013	May	5934.3	5549.5	184.5	8.1	7.7	0.0	0.0	Yes	Yes	10.0	2.0	12.0
2013	Jun	5722.4	5548.3	180.0	5.0	5.0	0.0	0.0	No	No	6.1	1.2	7.3
2013	Jul	4742.4	5542.6	161.3	21.1	10.4	0.0	0.0	Yes	Yes	25.9	5.2	31.1
2013	Aug	4172.4	5538.9	148.6	9.8	5.5	0.0	0.0	Yes	Yes	12.0	2.4	14.4
2013	Sep	3624.0	5535.0	136.2	11.9	4.3	0.0	0.0	Yes	Yes	14.6	2.9	17.5
2013	Oct	3544.8	5534.4	134.4	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5
2013	Nov	3481.3	5534.0	133.0	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1
2013	Dec	4061.0	5538.1	146.1	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2
2014	Jan	4606.6	5541.7	158.5	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7
2014	Feb	5236.9	5545.5	170.8	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8
2014	Mar	5968.0	5549.6	185.2	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7
2014	Apr	5960.7	5549.6	185.1	7.6	0.0	0.0	0.0	Yes	Yes	9.3	1.9	11.2
2014	May	5934.3	5549.5	184.5	7.3	7.3	0.0	0.0	No	No	9.0	1.8	10.8
2014	Jun	5641.9	5547.9	178.3	4.7	4.7	0.0	0.0	No	No	5.8	1.2	6.9
2014	Jul	4638.0	5541.9	159.2	4.1	4.1	0.0	0.0	No	No	5.0	1.0	6.0
2014	Aug	3301.2	5532.6	129.1	6.1	5.5	0.0	0.0	Yes	Yes	7.5	1.5	9.0
2014	Sep	2672.9	5527.4	114.0	11.3	4.3	0.0	0.0	Yes	Yes	13.9	2.8	16.7
2014	Oct	2606.6	5526.8	112.2	8.8	0.0	0.0	0.0	Yes	Yes	10.8	2.2	13.0
2014	Nov	2553.6	5526.4	110.8	7.9	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.7
2014	Dec	3001.8	5530.2	122.1	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1
2015	Jan	3547.8	5534.5	134.5	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6
2015	Feb	4119.1	5538.5	147.4	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
2015	Mar	4711.4	5542.4	160.7	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1
2015	Apr	5534.0	5547.2	176.3	8.6	0.0	0.0	0.0	Yes	Yes	10.5	2.1	12.6
2015	May	5934.3	5549.5	184.5	9.4	7.7	0.0	0.0	Yes	Yes	11.5	2.3	13.8
2015	Jun	5845.5	5549.0	182.6	6.2	6.2	0.0	0.0	No	No	7.7	1.5	9.2
2015	Jul	4989.1	5544.1	166.2	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.8
2015	Aug	3905.6	5537.0	142.6	6.4	5.5	0.0	0.0	Yes	Yes	7.8	1.6	9.4
2015	Sep	3297.4	5532.6	129.0	8.6	4.3	0.0	0.0	Yes	Yes	10.5	2.1	12.6

Date		to OIC				to COVE				Reservoir Int1			Seepage		Evaporation	
Yr	Mo	River	Supp	Pre Cove Ful	Full?	Hydraulic Ca	to Fill Resv	Control	River	Volume	Elevation	Area				
		cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs
2006	Jan	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
2006	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
2006	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2006	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2006	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2006	Jun	5.1	0.0	Yes	Yes	13.8	3.0	0.0	0.0	5853.7	5549.0	182.8	57.1	1.0	75.4	1.3
2006	Jul	6.8	0.0	Yes	Yes	14.3	16.3	0.0	0.0	5031.4	5544.3	167.0	53.9	0.9	68.9	1.1
2006	Aug	3.6	0.0	Yes	Yes	15.0	33.2	0.0	0.0	3990.3	5537.6	144.5	46.7	0.8	47.7	0.8
2006	Sep	2.9	0.0	Yes	Yes	15.5	45.2	0.0	0.0	3342.9	5532.9	130.0	40.6	0.7	35.0	0.6
2006	Oct	0.0	0.0	Yes	Yes	15.6	45.0	0.0	0.0	3267.2	5532.3	128.3	41.4	0.7	19.1	0.3
2006	Nov	0.0	0.0	Yes	Yes	15.6	47.5	15.6	13.7	4020.4	5537.8	145.2	45.4	0.8	2.2	0.0
2006	Dec	0.0	0.0	Yes	Yes	15.0	33.5	15.0	12.7	4754.6	5542.6	161.5	52.2	0.8	0.0	0.0
2007	Jan	0.0	0.0	Yes	Yes	14.5	21.6	14.5	11.5	5410.3	5546.5	174.0	56.2	0.9	0.0	0.0
2007	Feb	0.0	0.0	Yes	Yes	14.1	12.2	12.2	12.2	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
2007	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2007	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2007	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	0.3	5954.5	5549.6	184.9	59.7	1.0	66.4	1.1
2007	Jun	2.7	2.3	No	Yes	14.0	8.8	0.0	0.0	5509.6	5547.1	175.8	55.0	0.9	72.5	1.2
2007	Jul	1.5	5.4	No	Yes	14.7	25.6	0.0	0.0	4460.5	5540.8	155.1	50.1	0.8	64.0	1.0
2007	Aug	1.9	1.7	No	Yes	15.7	48.4	0.0	0.0	3055.7	5530.6	123.4	39.8	0.6	40.7	0.7
2007	Sep	2.9	0.0	Yes	Yes	16.6	64.7	0.0	0.0	2182.9	5522.8	100.0	31.3	0.5	26.9	0.5
2007	Oct	0.0	0.0	Yes	Yes	16.8	65.6	0.0	0.0	1997.1	5520.9	94.8	30.6	0.5	14.1	0.2
2007	Nov	0.0	0.0	Yes	Yes	16.8	68.6	16.8	6.7	2350.1	5524.5	104.8	32.8	0.6	1.6	0.0
2007	Dec	0.0	0.0	Yes	Yes	16.4	60.4	16.4	11.8	3038.4	5530.5	123.0	39.7	0.6	0.0	0.0
2008	Jan	0.0	0.0	Yes	Yes	15.8	49.3	15.8	12.7	3780.5	5536.2	139.7	45.1	0.7	0.0	0.0
2008	Feb	0.0	0.0	Yes	Yes	15.2	41.4	15.2	14.6	4548.1	5541.3	157.1	45.8	0.8	0.0	0.0
2008	Mar	0.0	0.0	Yes	Yes	14.6	24.9	14.6	14.6	5401.4	5546.5	173.8	56.1	0.9	10.3	0.2
2008	Apr	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2008	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2008	Jun	4.4	0.7	No	Yes	13.9	5.9	0.0	0.0	5683.8	5548.1	179.2	56.0	0.9	73.9	1.2
2008	Jul	3.4	3.4	No	Yes	14.5	20.9	0.0	0.0	4744.6	5542.6	161.3	52.1	0.8	66.6	1.1
2008	Aug	2.6	1.0	No	Yes	15.4	41.7	0.0	0.0	3467.7	5533.9	132.7	42.9	0.7	43.8	0.7
2008	Sep	2.3	0.6	No	Yes	16.1	57.1	0.0	0.0	2637.1	5527.1	113.0	35.3	0.6	30.4	0.5
2008	Oct	0.0	0.0	Yes	Yes	16.4	59.5	0.0	0.0	2371.4	5524.7	105.4	34.1	0.6	15.7	0.3
2008	Nov	0.0	0.0	Yes	Yes	16.4	62.4	16.4	8.0	2796.6	5528.5	117.1	36.6	0.6	1.8	0.0
2008	Dec	0.0	0.0	Yes	Yes	16.0	53.2	16.0	9.6	3348.0	5532.9	130.1	42.0	0.7	0.0	0.0
2009	Jan	0.0	0.0	Yes	Yes	15.5	44.3	15.5	13.9	4161.6	5538.8	148.4	47.9	0.8	0.0	0.0
2009	Feb	0.0	0.0	Yes	Yes	14.9	34.5	14.9	14.9	4940.9	5543.8	165.3	48.2	0.9	0.0	0.0
2009	Mar	0.0	0.0	Yes	Yes	14.4	18.5	14.4	14.4	5775.8	5548.6	181.1	58.5	1.0	10.7	0.2
2009	Apr	0.0	0.0	Yes	Yes	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2009	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2009	Jun	5.0	0.1	No	Yes	13.9	5.9	0.0	0.0	5678.1	5548.1	179.0	56.0	0.9	73.9	1.2
2009	Jul	2.8	4.1	No	Yes	14.4	20.4	0.0	0.0	4777.1	5542.8	162.0	52.3	0.9	66.8	1.1
2009	Aug	2.2	1.4	No	Yes	15.4	41.9	0.0	0.0	3456.4	5533.8	132.5	42.8	0.7	43.7	0.7
2009	Sep	2.6	0.3	No	Yes	16.1	57.7	0.0	0.0	2598.7	5526.8	112.0	35.0	0.6	30.1	0.5
2009	Oct	0.0	0.0	Yes	Yes	16.4	59.8	0.0	0.0	2352.4	5524.5	104.9	33.9	0.6	15.6	0.3
2009	Nov	0.0	0.0	Yes	Yes	16.4	62.7	16.4	7.4	2740.7	5528.0	115.8	36.2	0.6	1.7	0.0
2009	Dec	0.0	0.0	Yes	Yes	16.0	54.1	16.0	11.0	3381.2	5533.2	130.8	42.2	0.7	0.0	0.0
2010	Jan	0.0	0.0	Yes	Yes	15.5	43.8	15.5	14.3	4216.7	5539.2	149.6	48.3	0.8	0.0	0.0
2010	Feb	0.0	0.0	Yes	Yes	14.9	33.6	14.9	14.9	4993.4	5544.1	166.3	48.5	0.9	0.0	0.0
2010	Mar	0.0	0.0	Yes	Yes	14.3	17.7	14.3	14.3	5825.9	5548.9	182.2	58.8	1.0	10.8	0.2
2010	Apr	0.0	0.0	Yes	Yes	13.8	4.6	4.6	4.6	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2010	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2010	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2010	Jul	4.3	2.6	No	Yes	14.2	13.6	0.0	0.0	5193.2	5545.3	170.0	54.9	0.9	70.1	1.1
2010	Aug	3.6	0.0	Yes	Yes	15.0	33.5	0.0	0.0	3973.5	5537.5	144.1	46.5	0.8	47.6	0.8
2010	Sep	2.9	0.0	Yes	Yes	15.6	46.8	0.0	0.0	3245.8	5532.2	127.9	40.0	0.7	34.4	0.6
2010	Oct	0.0	0.0	Yes	Yes	15.8	48.9	0.0	0.0	3026.2	5530.4	122.7	39.6	0.6	18.3	0.3
2010	Nov	0.0	0.0	Yes	Yes	15.8	51.5	15.8	9.2	3517.5	5534.2	133.8	41.8	0.7	2.0	0.0
2010	Dec	0.0	0.0	Yes	Yes	15.4	41.6	15.4	15.4	4419.5	5540.5	154.2	49.8	0.8	0.0	0.0
2011	Jan	0.0	0.0	Yes	Yes	14.7	27.0	14.7	14.7	5274.4	5545.8	171.4	55.4	0.9	0.0	0.0
2011	Feb	0.0	0.0	Yes	Yes	14.2	14.6	14.2	14.2	6005.1	5549.9	186.0	54.3	1.0	0.0	0.0
2011	Mar	0.0	0.0	Yes	Yes	13.7	1.3	1.3	1.3	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2011	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2011	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2011	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2011	Jul	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
2011	Aug	3.6	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.0	5542.6	161.3	52.1	0.8	53.2	0.9
2011	Sep	2.9	0.0	Yes	Yes	14.8	31.0	0.0	0.0	4185.4	5539.0	148.9	46.5	0.8	40.1	0.7
2011	Oct	0.0	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4098.8	5538.4	147.0	47.5	0.8	21.9	0.4
2011	Nov	0.0	0.0	Yes	Yes	15.0	33.7	15.0	14.9	4914.6	5543.6	164.7	51.5	0.9	2.5	0.0
2011	Dec	0.0	0.0	Yes	Yes	14.4	19.1	14.4	14.4	5745.0	5548.4	180.5	58.3	0.9	0.0	0.0
2012	Jan	0.0	0.0	Yes	Yes	13.9	5.6	5.6	5.6	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
2012	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
2012	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2012	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2012	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.1	6004.7	5549.9	186.0	60.1	1.0	66.8	1.1
2012	Jun	3.6	1.4	No	Yes	13.9	7.8	0.0	0.0	5565.0	5547.4	176.9	55.3	0.9	73.0	1.2
2012	Jul	5.4	1.5	No	Yes	14.6	23.7	0.0	0.0	4575.1	5541.5	157.8	50.9	0.8	65.1	1.1
2012	Aug	3.6	0.0	Yes	Yes	15.4	42.2	0.0	0.0	3436.0	5533.6	132.0	42.6	0.7	43.6	0.7
2012	Sep	2.9	0.0	Yes	Yes	15.9	52.7	0.0	0.0	2898.4	5529.4	119.6	37.4	0.6	32.2	0.5
2012	Oct	0.0	0.0	Yes	Yes	15.9	52.1	0.0	0.0	2828.8	5528.8	117.9	38.1	0.6	17.6	0.3
2012	Nov	0.0	0.0	Yes	Yes	16.0	54.8	16.0	13.8	3594.0	5534.8	135.5	42.4	0.7	2.0	0.0
2012	Dec	0.0	0.0	Yes	Yes	15.3	40.4	15.3	15.3	4491.8	5541.0	155.9	50.3	0.8	0.0	0.0
2013	Jan	0.0	0.0	Yes	Yes	14.7	25.9	14.7	12.6	5215.8	5545.4	170.4	55.0	0.9	0.0	0.0
2014	Feb	0.0	0.0	Yes	Yes	14.2	15.7	14.2	13.3	5900.3	5549.3	183.8	53.6	1.0	0.0	0.0
2013	Mar	0.0	0.0	Yes	Yes	13.8	3.0	3.0	3.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2013	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2013	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2013	Jun	3.8	1.3	No	Yes	13.8	5.2	0.0	0.0	5722.4	5548.3	180.0	56.2	0.9	74.2	1.2
2013	Jul	6.8	0.0	Yes	Yes	14.5	21.0	0.0	0.0	4742.4	5542.6	161.3	52.1	0.8	66.5	1.1
2013	Aug	3.6	0.0	Yes	Yes	14.9	30.2	0.0	0.0	4172.4	5538.9	148.6	48.0	0.8	49.0	0.8
2013	Sep	2.9	0.0	Yes	Yes	15.3	40.5	0.0	0.0	3624.0	5535.0	136.2	42.6	0.7	36.7	0.6
2013	Oct	0.0	0.0	Yes	Yes	15.3	40.5	0.0	0.0	3544.8	5534.4	134.4	43.4	0.7	20.1	0.3
2013	Nov	0.0	0.0	Yes	Yes	15.4	42.9	15.4	10.6	4109.2	5538.5	147.2	46.0	0.8	2.2	0.0
2013	Dec	0.0	0.0	Yes	Yes	14.9	32.1	14.9	9.7	4658.1	5542.0	159.6	51.5	0.8	0.0	0.0
2014	Jan	0.0	0.0	Yes	Yes	14.6	23.2	14.6	11.2	5292.3	5545.9	171.8	55.5	0.9	0.0	0.0
2014	Feb	0.0	0.0	Yes	Yes	14.1	14.3	14.1	14.1	6022.3	5549.9	186.4	54.4	1.0	0.0	0.0
2014	Mar	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2014	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2014	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2014	Jun	3.4	1.6	No	Yes	13.9	6.6	0.0	0.0	5641.9	5547.9	178.3	55.7	0.9	73.6	1.2
2014	Jul	2.5	4.3	No	Yes	14.5	22.7	0.0	0.0	4638.0	5541.9	159.2	51.4	0.8	65.7	1.1
2014	Aug	3.6	0.0	Yes	Yes	15.5	44.4	0.0	0.0	3301.2	5532.6	129.1	41.7	0.7	42.6	0.7
2014	Sep	2.9	0.0	Yes	Yes	16.1	56.5	0.0	0.0	2672.9	5527.4	114.0	35.6	0.6	30.7	0.5
2014	Oct	0.0	0.0	Yes	Yes	16.1	55.7	0.0	0.0	2606.6	5526.8	112.2	36.2	0.6	16.7	0.3
2014	Nov	0.0	0.0	Yes	Yes	16.2	58.5	16.2	8.2	3042.1	5530.5	123.1	38.5	0.6	1.8	0.0
2014	Dec	0.0	0.0	Yes	Yes	15.8	49.3	15.8	9.6	3591.6	5534.8	135.5	43.8	0.7	0.0	0.0
2015	Jan	0.0	0.0	Yes	Yes	15.3	40.4	15.3	10.1	4167.1	5538.8	148.5	48.0	0.8	0.0	0.0
2015	Feb	0.0	0.0	Yes	Yes	14.9	34.4	14.9	11.5	4758.5	5542.7	161.6	47.1	0.8	0.0	0.0
2015	Mar	0.0	0.0	Yes	Yes	14.5	21.5	14.5	14.5	5601.8	5547.6	177.6	57.3	0.9	10.5	0.2
2015	Apr	0.0	0.0	Yes	Yes	14.0	8.4	8.4	8.4	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2015	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2015	Jun	5.1	0.0	Yes	Yes	13.8	3.1	0.0	0.0	5845.5	5549.0	182.6	57.1	1.0	75.3	1.3
2015	Jul	6.3	0.6	No	Yes	14.3	17.0	0.0	0.0	4989.1	5544.1	166.2	53.7	0.9	68.6	1.1
2015	Aug	3.6	0.0	Yes	Yes	15.0	34.6	0.0	0.0	3905.6	5537.0	142.6	46.0	0.7	47.1	0.8
2015	Sep	2.9	0.0	Yes	Yes	15.5	46.0	0.0	0.0	3297.4	5532.6	129.0	40.3	0.7	34.7	0.6

Date		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Ful	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
2006	Jan	5,971.7	5,549.7	185.3	2.3	1.0	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	5,971.7	5,549.7	185.3
2006	Feb	5,977.6	5,549.7	185.4	2.3	1.0	23.3	0.0	0.0	Yes	Yes	0.0	23.3	0.0	5,977.6	5,549.7	185.4
2006	Mar	5,960.7	5,549.6	185.1	3.1	1.0	30.5	0.0	0.0	Yes	Yes	0.0	30.5	0.0	5,960.7	5,549.6	185.1
2006	Apr	5,934.3	5,549.5	184.5	2.7	1.0	26.6	0.0	0.0	Yes	Yes	0.0	26.6	0.0	5,934.3	5,549.5	184.5
2006	May	5,904.7	5,549.3	183.9	1.6	1.0	9.8	6.3	0.8	No	Yes	0.0	3.5	0.8	5,853.7	5,549.0	182.8
2006	Jun	5,721.2	5,548.3	180.0	1.1	1.0	6.7	3.2	4.0	No	Yes	7.6	11.1	11.6	5,031.4	5,544.3	167.0
2006	Jul	4,908.6	5,543.6	164.6	1.2	0.9	5.6	2.1	7.6	No	Yes	7.3	10.8	14.9	3,990.3	5,537.6	144.5
2006	Aug	3,895.9	5,537.0	142.4	1.0	0.8	7.0	3.5	1.7	No	Yes	7.3	10.8	9.0	3,342.9	5,532.9	130.0
2006	Sep	3,267.2	5,532.3	128.3	1.1	0.7	8.9	4.0	0.0	Yes	Yes	0.0	4.8	0.0	3,267.2	5,532.3	128.3
2006	Oct	3,206.7	5,531.9	127.0	2.0	0.7	21.0	0.0	0.0	Yes	Yes	0.0	21.0	0.0	3,206.7	5,531.9	127.0
2006	Nov	3,972.8	5,537.5	144.1	1.9	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	3,972.8	5,537.5	144.1
2006	Dec	4,702.4	5,542.3	160.5	1.8	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,702.4	5,542.3	160.5
2007	Jan	5,354.1	5,546.2	172.9	1.7	0.9	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	5,354.1	5,546.2	172.9
2007	Feb	5,977.6	5,549.7	185.4	1.9	1.0	7.7	0.0	0.0	Yes	Yes	0.0	7.7	0.0	5,977.6	5,549.7	185.4
2007	Mar	5,960.7	5,549.6	185.1	1.7	1.0	17.0	0.0	0.0	Yes	Yes	0.0	17.0	0.0	5,960.7	5,549.6	185.1
2007	Apr	5,934.3	5,549.5	184.5	1.5	1.0	14.9	0.0	0.0	Yes	Yes	0.0	14.9	0.0	5,934.3	5,549.5	184.5
2007	May	5,828.3	5,548.9	182.3	1.0	1.0	5.5	2.0	5.2	No	Yes	0.0	3.5	5.2	5,509.6	5,547.1	175.8
2007	Jun	5,382.1	5,546.4	173.4	0.7	0.9	5.1	1.6	5.6	No	Yes	7.6	11.1	15.5	4,460.5	5,540.8	155.1
2007	Jul	4,346.4	5,540.0	152.5	0.6	0.8	4.9	1.4	8.3	No	Yes	7.3	10.8	21.0	3,055.7	5,530.6	123.4
2007	Aug	2,975.1	5,530.0	121.5	0.6	0.6	4.8	1.3	3.9	No	Yes	7.3	10.8	12.9	2,182.9	5,522.8	100.0
2007	Sep	2,124.7	5,522.3	98.4	0.8	0.5	5.4	1.9	2.1	No	Yes	0.0	3.5	2.1	1,997.1	5,520.9	94.8
2007	Oct	1,952.3	5,520.5	93.5	1.1	0.5	11.7	0.0	0.0	Yes	Yes	0.0	11.7	0.0	1,952.3	5,520.5	93.5
2007	Nov	2,315.8	5,524.1	103.8	1.1	0.6	5.2	0.0	0.0	Yes	Yes	0.0	5.2	0.0	2,315.8	5,524.1	103.8
2007	Dec	2,998.7	5,530.2	122.1	1.7	0.6	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	2,998.7	5,530.2	122.1
2008	Jan	3,735.3	5,535.8	138.7	1.8	0.7	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	3,735.3	5,535.8	138.7
2008	Feb	4,502.3	5,541.0	156.1	2.0	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,502.3	5,541.0	156.1
2008	Mar	5,335.0	5,546.1	172.6	2.7	0.9	13.7	0.0	0.0	Yes	Yes	0.0	13.7	0.0	5,335.0	5,546.1	172.6
2008	Apr	5,934.3	5,549.5	184.5	1.9	1.0	8.6	0.0	0.0	Yes	Yes	0.0	8.6	0.0	5,934.3	5,549.5	184.5
2008	May	5,904.7	5,549.3	183.9	1.3	1.0	7.1	3.6	3.6	No	Yes	0.0	3.5	3.6	5,683.8	5,548.1	179.2
2008	Jun	5,553.9	5,547.4	176.7	0.9	0.9	5.3	1.8	5.4	No	Yes	7.6	11.1	13.6	4,744.6	5,542.6	161.3
2008	Jul	4,626.0	5,541.8	158.9	0.8	0.8	5.1	1.6	8.0	No	Yes	7.3	10.8	18.8	3,467.7	5,533.9	132.7
2008	Aug	3,381.1	5,533.2	130.8	0.7	0.7	4.9	1.4	3.7	No	Yes	7.3	10.8	12.1	2,637.1	5,527.1	113.0
2008	Sep	2,571.3	5,526.5	111.3	0.6	0.6	4.7	1.2	2.8	No	Yes	0.0	3.5	3.4	2,371.4	5,524.7	105.4
2008	Oct	2,321.7	5,524.2	104.0	1.0	0.6	10.2	0.0	0.0	Yes	Yes	0.0	10.2	0.0	2,321.7	5,524.2	104.0
2008	Nov	2,758.3	5,528.2	116.2	1.3	0.6	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	2,758.3	5,528.2	116.2
2008	Dec	3,306.0	5,532.6	129.2	1.5	0.7	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	3,306.0	5,532.6	129.2
2009	Jan	4,113.7	5,538.5	147.3	1.9	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,113.7	5,538.5	147.3
2009	Feb	4,892.7	5,543.5	164.3	2.1	0.9	7.1	0.0	0.0	Yes	Yes	0.0	7.1	0.0	4,892.7	5,543.5	164.3
2009	Mar	5,706.6	5,548.2	179.7	2.3	1.0	9.7	0.0	0.0	Yes	Yes	0.0	9.7	0.0	5,706.6	5,548.2	179.7
2009	Apr	5,934.3	5,549.5	184.5	2.0	1.0	15.5	0.0	0.0	Yes	Yes	0.0	15.5	0.0	5,934.3	5,549.5	184.5
2009	May	5,904.7	5,549.3	183.9	1.3	1.0	7.0	3.5	3.7	No	Yes	0.0	3.5	3.7	5,678.1	5,548.1	179.0
2009	Jun	5,548.3	5,547.3	176.6	0.9	0.9	5.4	1.9	5.3	No	Yes	7.6	11.1	13.0	4,777.1	5,542.8	162.0
2009	Jul	4,657.9	5,542.0	159.6	0.7	0.9	5.0	1.5	8.1	No	Yes	7.3	10.8	19.5	3,456.4	5,533.8	132.5
2009	Aug	3,369.9	5,533.1	130.6	0.6	0.7	4.8	1.3	3.8	No	Yes	7.3	10.8	12.5	2,598.7	5,526.8	112.0
2009	Sep	2,533.6	5,526.2	110.2	0.7	0.6	4.8	1.3	2.8	No	Yes	0.0	3.5	3.0	2,352.4	5,524.5	104.9
2009	Oct	2,302.9	5,524.0	103.4	0.9	0.6	9.3	0.0	0.0	Yes	Yes	0.0	9.3	0.0	2,302.9	5,524.0	103.4
2009	Nov	2,702.8	5,527.7	114.8	1.2	0.6	5.3	0.0	0.0	Yes	Yes	0.0	5.3	0.0	2,702.8	5,527.7	114.8
2009	Dec	3,338.9	5,532.9	129.9	1.6	0.7	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	3,338.9	5,532.9	129.9
2010	Jan	4,168.4	5,538.8	148.5	2.0	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,168.4	5,538.8	148.5
2010	Feb	4,944.9	5,543.8	165.3	2.3	0.9	8.8	0.0	0.0	Yes	Yes	0.0	8.8	0.0	4,944.9	5,543.8	165.3
2010	Mar	5,756.3	5,548.5	180.7	3.0	1.0	16.8	0.0	0.0	Yes	Yes	0.0	16.8	0.0	5,756.3	5,548.5	180.7
2010	Apr	5,934.3	5,549.5	184.5	3.6	1.0	31.9	0.0	0.0	Yes	Yes	0.0	31.9	0.0	5,934.3	5,549.5	184.5
2010	May	5,904.7	5,549.3	183.9	2.3	1.0	17.4	7.1	0.0	Yes	Yes	0.0	10.3	0.0	5,904.7	5,549.3	183.9
2010	Jun	5,771.4	5,548.6	181.0	1.3	1.0	8.6	5.1	2.1	No	Yes	7.6	11.1	9.7	5,193.2	5,545.3	170.0
2010	Jul	5,068.2	5,544.5	167.7	0.9	0.9	5.3	1.8	7.9	No	Yes	7.3	10.8	17.8	3,973.5	5,537.5	144.1
2010	Aug	3,879.4	5,536.9	142.0	0.9	0.8	5.6	2.1	3.0	No	Yes	7.3	10.8	10.3	3,245.8	5,532.2	127.9
2010	Sep	3,171.4	5,531.6	126.1	0.7	0.7	5.1	1.6	2.4	No	Yes	0.0	3.5	2.4	3,026.2	5,530.4	122.7
2010	Oct	2,968.3	5,529.9	121.3	1.5	0.6	15.3	0.0	0.0	Yes	Yes	0.0	15.3	0.0	2,968.3	5,529.9	121.3
2010	Nov	3,473.7	5,533.9	132.9	1.4	0.7	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	3,473.7	5,533.9	132.9
2010	Dec	4,369.7	5,540.2	153.1	8.9	0.8	73.8	0.0	0.0	Yes	Yes	0.0	73.8	0.0	4,369.7	5,540.2	153.1
2011	Jan	5,219.1	5,545.4	170.4	3.9	0.9	24.6	0.0	0.0	Yes	Yes	0.0	24.6	0.0	5,219.1	5,545.4	170.4
2011	Feb	5,950.9	5,549.6	184.9	2.6	1.0	12.9	0.0	0.0	Yes	Yes	0.0	12.9	0.0	5,950.9	5,549.6	184.9
2011	Mar	5,960.7	5,549.6	185.1	5.3	1.0	52.3	0.0	0.0	Yes	Yes	0.0	52.3	0.0	5,960.7	5,549.6	185.1
2011	Apr	5,934.3	5,549.5	184.5	13.4	1.0	133.3	0.0	0.0	Yes	Yes	0.0	133.3	0.0	5,934.3	5,549.5	184.5
2011	May	5,904.7	5,549.3	183.9	9.3	1.0	87.4	7.1	0.0	Yes	Yes	0.0	80.2	0.0	5,904.7	5,549.3	183.9
2011	Jun	5,771.4	5,548.6	181.0	3.0	1.0	25.9	7.2	0.0	Yes	Yes	7.6	26.3	7.6	5,320.1	5,546.0	172.3
2011	Jul	5,193.4	5,545.3	170.0	2.1	0.9	14.8	9.7	0.0	Yes	Yes	7.3	12.4	7.3	4,742.0	5,542.6	161.3
2011	Aug	4,636.7	5,541.9	159.2	1.6	0.8	13.4	5.1	0.0	Yes	Yes	7.3	15.6	7.3	4,185.4	5,539.0	148.9
2011	Sep	4,098.8	5,538.4	147.0	1.7	0.8	15.1	4.0	0.0	Yes	Yes	0.0	11.1	0.0	4,098.8	5,538.4	147.0
2011	Oct	4,029.4	5,537.9	145.4	2.0	0.8	20.7	0.0	0.0	Yes	Yes	0.0	20.7	0.0	4,029.4	5,537.9	145.4
2011	Nov	4,860.6	5,543.3	163.7	2.1	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	4,860.6	5,543.3	163.7
2011	Dec	5,686.7	5,548.1	179.2	2.5	0.9	11.9	0.0	0.0	Yes	Yes	0.0	11.9	0.0	5,686.7	5,548.1	179.2
2012	Jan	5,971.7	5,549.7	185.3	2.5	1.0	19.9	0.0	0.0	Yes	Yes	0.0	19.9	0.0	5,971.7	5,549.7	185.3
2012	Feb	5,977.6	5,549.7	185.4	2.6	1.0	26.2	0.0	0.0	Yes	Yes	0.0	26.2	0.0	5,977.6	5,549.7	185.4
2012	Mar	5,960.7	5,549.6	185.1	2.8	1.0	28.1	0.0	0.0	Yes	Yes	0.0	28.1	0.0	5,960.7	5,549.6	185.1
2012	Apr	5,934.3	5,549.5	184.5	2.2	1.0	21.3	0.0	0.0	Yes	Yes	0.0	21.3	0.0	5,934.3	5,549.5	184.5
2012	May	5,877.8	5,549.2	183.3	1.1	1.0	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,565.0	5,547.4	176.9
2012	Jun	5,436.7	5,546.7	174.5	0.8	0.9	5.2	1.7	5.5	No	Yes	7.6	11.1	14.5	4,575.1	5,541.5	157.8
2012	Jul	4,459.1	5,540.8	155.1	1.0	0.8	5.3	1.8	7.8	No	Yes	7.3	10.8	16.6	3,436.0	5,533.6	132.0
2012	Aug	3,349.8	5,533.0	130.1	1.5	0.7	11.9	5.1	0.0	Yes	Yes	7.3	14.1	7.3	2,898.4	5,529.4	119.6
2012	Sep	2,828.8	5,528.8	117.9	1.4	0.6	11.6	4.0	0.0	Yes	Yes	0.0	7.6	0.0	2,828.8	5,528.8	117.9
2012	Oct	2,773.2	5,528.3	116.6	1.7	0.6	17.8	0.0	0.0	Yes	Yes	0.0	17.8	0.0	2,773.2	5,528.3	116.6
2012	Nov	3,549.6	5,534.5	134.6	1.9	0.7	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	3,549.6	5,534.5	134.6
2012	Dec	4,441.5	5,540.7	154.7	2.2	0.8	7.0	0.0	0.0	Yes	Yes	0.0	7.0	0.0	4,441.5	5,540.7	154.7
2013	Jan	5,160.8	5,545.1	169.4	1.8	0.9	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	5,160.8	5,545.1	169.4
2014	Feb	5,846.7	5,549.0	182.6	1.9	1.0	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,846.7	5,549.0	182.6
2013	Mar	5,960.7	5,549.6	185.1	1.9	1.0	17.2	0.0	0.0	Yes	Yes	0.0	17.2	0.0	5,960.7	5,549.6	185.1
2013	Apr	5,934.3	5,549.5	184.5	1.4	1.0	13.8	0.0	0.0	Yes	Yes	0.0	13.8	0.0	5,934.3	5,549.5	184.5
2013	May	5,904.7	5,549.3	183.9	1.3	1.0	7.7	4.2	3.0	No	Yes	0.0	3.5	3.0	5,722.4	5,548.3	180.0
2013	Jun	5,591.9	5,547.6	177.4	0.8	0.9	5.3	1.8	5.4	No	Yes	7.6	11.1	14.3	4,742.4	5,542.6	161.3
2013	Jul	4,623.7	5,541.8	158.9	3.5	0.8	28.6	9.7	0.0	Yes	Yes	7.3	26.3	7.3	4,172.4	5,538.9	148.6
2013	Aug	4,075.4	5,538.2	146.5	1.6	0.8	13.2	5.1	0.0	Yes	Yes	7.3	15.4	7.3	3,624.0	5,535.0	136.2
2013	Sep	3,544.8	5,534.4	134.4	2.0	0.7	17.3	4.0	0.0	Yes	Yes	0.0	13.3	0.0	3,544.8	5,534.4	134.4
2013	Oct	3,481.3	5,534.0	133.0	1.4	0.7	14.6	0.0	0.0	Yes	Yes	0.0	14.6	0.0	3,481.3	5,534.0	133.0
2013	Nov	4,061.0	5,538.1	146.1	1.6	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,061.0	5,538.1	146.1
2013	Dec	4,606.6	5,541.7	158.5	1.5	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,606.6	5,541.7	158.5
2014	Jan	5,236.9	5,545.5	170.8	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,236.9	5,545.5	170.8
2014	Feb	5,968.0	5,549.6	185.2	2.3	1.0	9.9	0.0	0.0	Yes	Yes	0.0	9.9	0.0	5,968.0	5,549.6	185.2
2014	Mar	5,960.7	5,549.6	185.1	1.4	1.0	14.1	0.0	0.0	Yes	Yes	0.0	14.1	0.0	5,960.7	5,549.6	185.1
2014	Apr	5,934.3	5,549.5	184.5	1.3	1.0	12.3	0.0	0.0	Yes	Yes	0.0	12.3	0.0	5,934.3	5,549.5	184.5
2014	May	5,904.7	5,549.3	183.9	1.2	1.0	6.4	2.9	4.3	No	Yes	0.0	3.5	4.3	5,641.9	5,547.9	178.3
2014	Jun	5,512.7	5,547.1	175.9	0.8	0.9	5.2	1.7	5.5	No	Yes	7.6	11.1	14.7	4,638.0	5,541.9	159.2
2014	Jul	4,520.9	5,541.2	156.5	0.7	0.8	5.0	1.5	8.2	No	Yes	7.3	10.8	19.8	3,301.2	5,532.6	129.1
2014	Aug	3,216.9	5,531.9	127.2	1.0	0.7	7.1	3.6	1.5	No	Yes	7.3	10.8	8.8	2,672.9	5,527.4	114.0
2014	Sep	2,606.6	5,526.8	112.2	1.9	0.6	16.3	4.0	0.0	Yes	Yes	0.0	12.2	0.0	2,606.6	5,526.8	112.2
2014	Oct	2,553.6	5,526.4	110.8	1.4	0.6	15.0	0.0	0.0	Yes	Yes	0.0	15.0	0.0	2,553.6	5,526.4	110.8
2014	Nov	3,001.8	5,530.2	122.1	1.3	0.6	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	3,001.8	5,530.2	122.1
2014	Dec	3,547.8	5,534.5	134.5	1.5	0.7	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	3,547.8	5,534.5	134.5
2015	Jan	4,119.1	5,538.5	147.4	1.5	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,119.1	5,538.5	147.4
2015	Feb	4,711.4	5,542.4	160.7	1.7	0.8	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	4,711.4	5,542.4	160.7
2015	Mar	5,534.0	5,547.2	176.3	2.4	0.9	9.9	0.0	0.0	Yes	Yes	0.0	9.9	0.0	5,534.0	5,547.2	176.3
2015	Apr	5,934.3	5,549.5	184.5	1.4	1.0	6.6	0.0	0.0	Yes	Yes	0.0	6.6	0.0	5,934.3	5,549.5	184.5
2015	May	5,904.7	5,549.3	183.9	1.5	1.0	9.7	6.2	1.0	No	Yes	0.0	3.5	1.0	5,845.5	5,549.0	182.6
2015	Jun	5,713.1	5,548.3	179.8	1.0	1.0	6.1	2.6	4.6	No	Yes	7.6	11.1	12.2	4,989.1	5,544.1	166.2
2015	Jul	4,866.9	5,543.3	163.8	1.1	0.9	5.5	2.0	7.7	No	Yes	7.3	10.8	15.6	3,905.6	5,537.0	142.6
2015	Aug	3,812.5	5,536.4	140.5	1.0	0.7	7.6	4.1	1.0	No	Yes	7.3	10.8	8.4	3,297.4	5,532.6	129.0
2015	Sep	3,222.4	5,532.0	127.4	1.4	0.7	11.8	4.0	0.0	Yes	Yes	0.0	7.8	0.0	3,222.4	5,532.0	127.4

ALPHA ENGINEERING

Date Yr	Date Mo	Reservoir Start Volume (af)	Reservoir Start Elevation (ft)	Reservoir Start Area (ac)	Glendale USGS Data Backed to Glendale Ave Flow (cfs)	to GIC From River (cfs)	to GIC Max Supp	to GIC Supp (cfs)	to GIC Pre Cove Ful	to GIC Full?	Glendale USGS Data Ave Flow (cfs)	Orderville Tributary Ave Flow (cfs)	River Ave Flow (cfs)
2015	Oct	3222.4	5532.0	127.4	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9
2015	Nov	3162.3	5531.5	125.9	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
2015	Dec	3801.1	5536.3	140.2	8.7	0.0	0.0	0.0	Yes	Yes	10.7	2.2	12.9
2016	Jan	4326.6	5539.9	152.1	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
2016	Feb	4980.5	5544.0	166.1	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4
2016	Mar	5722.1	5548.3	180.0	16.6	0.0	0.0	0.0	Yes	Yes	20.4	4.1	24.5
2016	Apr	5960.7	5549.6	185.1	16.6	0.0	0.0	0.0	Yes	Yes	20.4	4.1	24.5
2016	May	5934.3	5549.5	184.5	14.0	7.7	0.0	0.0	Yes	Yes	17.2	3.5	20.7
2016	Jun	5904.7	5549.3	183.9	6.1	6.1	0.0	0.0	No	No	7.6	1.5	9.1
2016	Jul	5039.1	5544.4	167.1	4.9	4.9	0.0	0.0	No	No	6.0	1.2	7.2
2016	Aug	3780.3	5536.2	139.7	7.1	5.5	0.0	0.0	Yes	Yes	8.7	1.7	10.4
2016	Sep	3237.7	5532.1	127.7	9.0	4.3	0.0	0.0	Yes	Yes	11.0	2.2	13.2
2016	Oct	3163.5	5531.5	126.0	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3
2016	Nov	3104.0	5531.0	124.5	7.3	0.0	0.0	0.0	Yes	Yes	8.9	1.8	10.7
2016	Dec	3488.6	5534.0	133.2	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9
2017	Jan	4383.7	5540.3	153.4	33.1	0.0	0.0	0.0	Yes	Yes	40.7	8.2	48.9
2017	Feb	5232.4	5545.5	170.7	44.8	0.0	0.0	0.0	Yes	Yes	55.0	11.1	66.1
2017	Mar	5963.7	5549.6	185.1	33.1	0.0	0.0	0.0	Yes	Yes	40.7	8.2	48.9
2017	Apr	5960.7	5549.6	185.1	16.4	0.0	0.0	0.0	Yes	Yes	20.1	4.0	24.1
2017	May	5934.3	5549.5	184.5	10.5	7.7	0.0	0.0	Yes	Yes	12.9	2.6	15.5
2017	Jun	5904.7	5549.3	183.9	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4
2017	Jul	5196.4	5545.3	170.0	7.1	7.1	0.0	0.0	No	No	8.7	1.7	10.4
2017	Aug	4155.6	5538.8	148.3	6.1	5.5	0.0	0.0	Yes	Yes	7.4	1.5	8.9
2017	Sep	3513.5	5534.2	133.7	8.9	4.3	0.0	0.0	Yes	Yes	10.9	2.2	13.1
2017	Oct	3435.7	5533.6	132.0	9.3	0.0	0.0	0.0	Yes	Yes	11.4	2.3	13.7
2017	Nov	3373.4	5533.1	130.7	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5
2017	Dec	3982.2	5537.6	144.3	11.2	0.0	0.0	0.0	Yes	Yes	13.8	2.8	16.6
2018	Jan	4733.8	5542.5	161.1	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8
2018	Feb	5554.1	5547.4	176.7	16.1	0.0	0.0	0.0	Yes	Yes	19.8	4.0	23.8
2018	Mar	5977.6	5549.7	185.4	10.1	0.0	0.0	0.0	Yes	Yes	12.4	2.5	14.9
2018	Apr	5960.7	5549.6	185.1	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	11.0
2018	May	5934.3	5549.5	184.5	4.7	4.7	0.0	0.0	No	No	5.8	1.2	7.0
2018	Jun	5377.5	5546.4	173.4	6.0	6.0	0.0	0.0	No	No	7.3	1.5	8.8
2018	Jul	4497.2	5541.0	156.0	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7
2018	Aug	3211.8	5531.9	127.1	4.4	4.4	0.0	0.0	No	No	5.4	1.1	6.4
2018	Sep	2406.0	5525.0	106.5	7.7	4.3	0.0	0.0	Yes	Yes	9.5	1.9	11.4
2018	Oct	2344.0	5524.4	104.6	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5
2018	Nov	2294.6	5523.9	103.2	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5
2018	Dec	3025.0	5530.4	122.7	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0
2019	Jan	3930.0	5537.2	143.1	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4
2019	Feb	4791.9	5542.9	162.3	28.7	0.0	0.0	0.0	Yes	Yes	35.2	7.1	42.3
2019	Mar	5541.5	5547.3	176.4	43.7	0.0	0.0	0.0	Yes	Yes	53.7	10.8	64.5
2019	Apr	5960.7	5549.6	185.1	27.4	0.0	0.0	0.0	Yes	Yes	33.7	6.8	40.5
2019	May	5934.3	5549.5	184.5	18.6	7.7	0.0	0.0	Yes	Yes	22.8	4.6	27.4
2019	Jun	5904.7	5549.3	183.9	10.9	7.7	0.0	0.0	Yes	Yes	13.4	2.7	16.1
2019	Jul	5320.1	5546.0	172.3	8.6	8.6	0.0	0.0	No	No	10.5	2.1	12.6
2019	Aug	4429.4	5540.6	154.4	8.0	5.5	0.0	0.0	Yes	Yes	9.8	2.0	11.8
2019	Sep	3877.2	5536.8	141.9	10.4	4.3	0.0	0.0	Yes	Yes	12.8	2.6	15.4
2019	Oct	3794.7	5536.3	140.1	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7
2019	Nov	3728.5	5535.8	138.6	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5
2019	Dec	4579.9	5541.5	157.9	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4
2020	Jan	5419.1	5546.6	174.1	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5
2020	Feb	5971.7	5549.7	185.3	19.5	0.0	0.0	0.0	Yes	Yes	24.0	4.8	28.8
2020	Mar	5977.6	5549.7	185.4	17.1	0.0	0.0	0.0	Yes	Yes	21.0	4.2	25.2
2020	Apr	5960.7	5549.6	185.1	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7
2020	May	5934.3	5549.5	184.5	8.0	7.7	0.0	0.0	Yes	Yes	9.9	2.0	11.8
2020	Jun	5710.1	5548.2	179.7	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.0
2020	Jul	4841.4	5543.2	163.3	5.3	5.3	0.0	0.0	No	No	6.5	1.3	7.8
2020	Aug	3624.4	5535.0	136.2	5.8	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.6
2020	Sep	2963.3	5529.9	121.2	8.0	4.3	0.0	0.0	Yes	Yes	9.8	2.0	11.8
2020	Oct	2892.8	5529.3	119.5	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3
2020	Nov	2836.4	5528.8	118.1	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3
2020	Dec	3733.0	5535.8	138.7	4.1	0.0	0.0	0.0	Yes	Yes	5.0	1.0	6.0

Date Yr	Date Mo	to OIC River (cfs)	to OIC Supp (cfs)	to OIC Pre Cove Ful	to OIC Full?	to COVE Hydraulic Ca (cfs)	to COVE to Fill Resv (cfs)	to COVE Control (cfs)	to COVE River (cfs)	Reservoir Int1 Volume (af)	Reservoir Int1 Elevation (ft)	Reservoir Int1 Area (ac)	Seepage (af)	Seepage (cfs)	Evaporation (af)	Evaporation (cfs)
2015	Oct	0.0	0.0	Yes	Yes	15.6	45.7	0.0	0.0	3222.4	5532.0	127.4	41.1	0.7	19.0	0.3
2015	Nov	0.0	0.0	Yes	Yes	15.6	48.2	15.6	11.5	3847.3	5536.6	141.3	44.1	0.7	2.1	0.0
2015	Dec	0.0	0.0	Yes	Yes	15.1	36.3	15.1	9.4	4376.0	5540.2	153.2	49.5	0.8	0.0	0.0
2016	Jan	0.0	0.0	Yes	Yes	14.7	27.7	14.7	11.5	5034.5	5544.3	167.0	53.9	0.9	0.0	0.0
2016	Feb	0.0	0.0	Yes	Yes	14.3	18.9	14.3	14.3	5775.0	5548.6	181.1	52.8	1.0	0.0	0.0
2016	Mar	0.0	0.0	Yes	Yes	13.8	5.0	5.0	5.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2016	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2016	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2016	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2016	Jul	3.7	3.1	No	Yes	14.3	16.1	0.0	0.0	5039.1	5544.4	167.1	54.0	0.9	68.9	1.1
2016	Aug	3.6	0.0	Yes	Yes	15.1	36.6	0.0	0.0	3780.3	5536.2	139.7	45.1	0.7	46.1	0.7
2016	Sep	2.9	0.0	Yes	Yes	15.6	47.0	0.0	0.0	3237.7	5532.1	127.7	39.9	0.7	34.4	0.6
2016	Oct	0.0	0.0	Yes	Yes	15.6	46.7	0.0	0.0	3163.5	5531.5	126.0	40.7	0.7	18.8	0.3
2016	Nov	0.0	0.0	Yes	Yes	15.7	49.2	15.7	7.2	3532.5	5534.3	134.2	41.9	0.7	2.0	0.0
2016	Dec	0.0	0.0	Yes	Yes	15.4	41.4	15.4	15.4	4433.7	5540.6	154.5	49.9	0.8	0.0	0.0
2017	Jan	0.0	0.0	Yes	Yes	14.7	26.8	14.7	14.7	5287.8	5545.8	171.7	55.4	0.9	0.0	0.0
2017	Feb	0.0	0.0	Yes	Yes	14.1	14.4	14.1	14.1	6018.0	5549.9	186.3	54.3	1.0	0.0	0.0
2017	Mar	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2017	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2017	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2017	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2017	Jul	6.8	0.0	Yes	Yes	14.2	13.6	0.0	0.0	5196.4	5545.3	170.0	54.9	0.9	70.1	1.1
2017	Aug	3.6	0.0	Yes	Yes	14.9	30.5	0.0	0.0	4155.6	5538.8	148.3	47.9	0.8	48.9	0.8
2017	Sep	2.9	0.0	Yes	Yes	15.4	42.3	0.0	0.0	3513.5	5534.2	133.7	41.8	0.7	36.0	0.6
2017	Oct	0.0	0.0	Yes	Yes	15.4	42.2	0.0	0.0	3435.7	5533.6	132.0	42.6	0.7	19.7	0.3
2017	Nov	0.0	0.0	Yes	Yes	15.5	44.7	15.5	11.0	4029.9	5537.9	145.4	45.4	0.8	2.2	0.0
2017	Dec	0.0	0.0	Yes	Yes	15.0	33.3	15.0	13.1	4786.1	5542.8	162.2	52.4	0.9	0.0	0.0
2018	Jan	0.0	0.0	Yes	Yes	14.5	21.1	14.5	14.3	5611.5	5547.7	177.8	57.4	0.9	0.0	0.0
2018	Feb	0.0	0.0	Yes	Yes	13.9	8.6	8.6	8.6	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
2018	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2018	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2018	May	3.5	1.6	No	Yes	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1
2018	Jun	5.1	0.0	Yes	Yes	14.1	11.0	0.0	0.0	5377.5	5546.4	173.4	54.2	0.9	71.5	1.2
2018	Jul	3.2	3.6	No	Yes	14.6	25.0	0.0	0.0	4497.2	5541.0	156.0	50.4	0.8	64.3	1.0
2018	Aug	2.9	0.7	No	Yes	15.6	45.9	0.0	0.0	3211.8	5531.9	127.1	41.0	0.7	41.9	0.7
2018	Sep	2.9	0.0	Yes	Yes	16.3	60.9	0.0	0.0	2406.0	5525.0	106.5	33.3	0.6	28.7	0.5
2018	Oct	0.0	0.0	Yes	Yes	16.4	60.0	0.0	0.0	2344.0	5524.4	104.6	33.8	0.5	15.6	0.3
2018	Nov	0.0	0.0	Yes	Yes	16.4	62.8	16.4	13.0	3065.5	5530.7	123.6	38.6	0.6	1.9	0.0
2018	Dec	0.0	0.0	Yes	Yes	15.8	48.9	15.8	15.5	3976.6	5537.5	144.2	46.6	0.8	0.0	0.0
2019	Jan	0.0	0.0	Yes	Yes	15.0	34.2	15.0	14.9	4844.7	5543.2	163.3	52.7	0.9	0.0	0.0
2019	Feb	0.0	0.0	Yes	Yes	14.4	22.3	14.4	14.4	5593.2	5547.6	177.4	51.7	0.9	0.0	0.0
2019	Mar	0.0	0.0	Yes	Yes	14.0	8.0	8.0	8.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2019	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2019	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2019	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
2019	Jul	6.8	0.0	Yes	Yes	14.1	11.6	0.0	0.0	5320.1	5546.0	172.3	55.6	0.9	71.1	1.2
2019	Aug	3.6	0.0	Yes	Yes	14.7	26.1	0.0	0.0	4429.4	5540.6	154.4	49.9	0.8	51.0	0.8
2019	Sep	2.9	0.0	Yes	Yes	15.1	36.2	0.0	0.0	3877.2	5536.8	141.9	44.4	0.7	38.2	0.6
2019	Oct	0.0	0.0	Yes	Yes	15.1	36.4	0.0	0.0	3794.7	5536.3	140.1	45.2	0.7	20.9	0.3
2019	Nov	0.0	0.0	Yes	Yes	15.2	38.7	15.2	15.2	4632.0	5541.9	159.0	49.7	0.8	2.4	0.0
2019	Dec	0.0	0.0	Yes	Yes	14.6	23.6	14.6	14.6	5475.7	5546.9	175.2	56.6	0.9	0.0	0.0
2020	Jan	0.0	0.0	Yes	Yes	14.0	10.0	10.0	10.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
2020	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
2020	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
2020	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
2020	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
2020	Jun	5.1	0.0	Yes	Yes	13.9	5.4	0.0	0.0	5710.1	5548.2	179.7	56.2	0.9	74.1	1.2
2020	Jul	4.3	2.6	No	Yes	14.4	19.4	0.0	0.0	4841.4	5543.2	163.3	52.7	0.9	67.4	1.1
2020	Aug	3.6	0.0	Yes	Yes	15.3	39.2	0.0	0.0	3624.4	5535.0	136.2	44.0	0.7	45.0	0.7
2020	Sep	2.9	0.0	Yes	Yes	15.8	51.6	0.0	0.0	2963.3	5529.9	121.2	37.9	0.6	32.6	0.5
2020	Oct	0.0	0.0	Yes	Yes	15.9	51.1	0.0	0.0	2892.8	5529.3	119.5	38.6	0.6	17.8	0.3
2020	Nov	0.0	0.0	Yes	Yes	15.9	53.7	15.9	15.8	3778.8	5536.2	139.7	43.7	0.7	2.1	0.0
2020	Dec	0.0	0.0	Yes	Yes	15.2	37.4	15.2	2.5	3887.1	5536.9	142.2	45.9	0.7	0.0	0.0

Date Yr	Date Mo	Reservoir Int2 Volume (af)	Reservoir Int2 Elevation (ft)	Reservoir Int2 Area (ac)	Mt Carmel Tributary Ave Flow (cfs)	Seepage Return Ave Flow (cfs)	River Ave Flow (cfs)	to MCIC River (cfs)	to MCIC Supp (cfs)	to MCIC Pre Cove Ful	to MCIC Full?	WC Release Supp (cfs)	River Ave Flow (cfs)	Sum Supp (cfs)	Reservoir End Volume (af)	Reservoir End Elevation (ft)	Reservoir End Area (ac)
2015	Oct	3,162.3	5,531.5	125.9	2.2	0.7	22.8	0.0	0.0	Yes	Yes	0.0	22.8	0.0	3,162.3	5,531.5	125.9
2015	Nov	3,801.1	5,536.3	140.2	1.7	0.7	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	3,801.1	5,536.3	140.2
2015	Dec	4,326.6	5,539.9	152.1	1.4	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,326.6	5,539.9	152.1
2016	Jan	4,980.5	5,544.0	166.1	1.7	0.9	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,980.5	5,544.0	166.1
2016	Feb	5,722.1	5,548.3	180.0	2.6	1.0	12.7	0.0	0.0	Yes	Yes	0.0	12.7	0.0	5,722.1	5,548.3	180.0
2016	Mar	5,960.7	5,549.6	185.1	2.7	1.0	23.2	0.0	0.0	Yes	Yes	0.0	23.2	0.0	5,960.7	5,549.6	185.1
2016	Apr	5,934.3	5,549.5	184.5	2.7	1.0	27.0	0.0	0.0	Yes	Yes	0.0	27.0	0.0	5,934.3	5,549.5	184.5
2016	May	5,904.7	5,549.3	183.9	2.3	1.0	17.3	7.1	0.0	Yes	Yes	0.0	10.1	0.0	5,904.7	5,549.3	183.9
2016	Jun	5,771.4	5,548.6	181.0	1.0	1.0	6.0	2.5	4.7	No	Yes	7.6	11.1	12.3	5,039.1	5,544.4	167.1
2016	Jul	4,916.2	5,543.6	164.8	0.8	0.9	5.2	1.7	8.0	No	Yes	7.3	10.8	18.5	3,780.3	5,536.2	139.7
2016	Aug	3,689.1	5,535.5	137.7	1.2	0.7	8.7	5.1	0.0	No	Yes	7.3	10.9	7.3	3,237.7	5,532.1	127.7
2016	Sep	3,163.5	5,531.5	126.0	1.5	0.7	12.5	4.0	0.0	Yes	Yes	0.0	8.4	0.0	3,163.5	5,531.5	126.0
2016	Oct	3,104.0	5,531.0	124.5	1.4	0.7	14.3	0.0	0.0	Yes	Yes	0.0	14.3	0.0	3,104.0	5,531.0	124.5
2016	Nov	3,488.6	5,534.0	133.2	1.2	0.7	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	3,488.6	5,534.0	133.2
2016	Dec	4,383.7	5,540.3	153.4	2.2	0.8	7.6	0.0	0.0	Yes	Yes	0.0	7.6	0.0	4,383.7	5,540.3	153.4
2017	Jan	5,232.4	5,545.5	170.7	5.5	0.9	40.5	0.0	0.0	Yes	Yes	0.0	40.5	0.0	5,232.4	5,545.5	170.7
2017	Feb	5,963.7	5,549.6	185.1	7.4	1.0	60.3	0.0	0.0	Yes	Yes	0.0	60.3	0.0	5,963.7	5,549.6	185.1
2017	Mar	5,960.7	5,549.6	185.1	5.5	1.0	54.2	0.0	0.0	Yes	Yes	0.0	54.2	0.0	5,960.7	5,549.6	185.1
2017	Apr	5,934.3	5,549.5	184.5	2.7	1.0	26.6	0.0	0.0	Yes	Yes	0.0	26.6	0.0	5,934.3	5,549.5	184.5
2017	May	5,904.7	5,549.3	183.9	1.7	1.0	11.6	7.1	0.0	Yes	Yes	0.0	4.4	0.0	5,904.7	5,549.3	183.9
2017	Jun	5,771.4	5,548.6	181.0	1.3	1.0	8.6	5.1	2.1	No	Yes	7.6	11.1	9.7	5,196.4	5,545.3	170.0
2017	Jul	5,071.3	5,544.6	167.7	1.2	0.9	5.6	2.1	7.6	No	Yes	7.3	10.8	14.9	4,155.6	5,538.8	148.3
2017	Aug	4,058.8	5,538.1	146.1	1.0	0.8	7.1	3.6	1.5	No	Yes	7.3	10.8	8.9	3,513.5	5,534.2	133.7
2017	Sep	3,435.7	5,533.6	132.0	1.5	0.7	12.4	4.0	0.0	Yes	Yes	0.0	8.3	0.0	3,435.7	5,533.6	132.0
2017	Oct	3,373.4	5,533.1	130.7	1.5	0.7	15.9	0.0	0.0	Yes	Yes	0.0	15.9	0.0	3,373.4	5,533.1	130.7
2017	Nov	3,982.2	5,537.6	144.3	1.6	0.8	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	3,982.2	5,537.6	144.3
2017	Dec	4,733.8	5,542.5	161.1	1.8	0.9	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,733.8	5,542.5	161.1
2018	Jan	5,554.1	5,547.4	176.7	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,554.1	5,547.4	176.7
2018	Feb	5,977.6	5,549.7	185.4	2.7	1.0	18.8	0.0	0.0	Yes	Yes	0.0	18.8	0.0	5,977.6	5,549.7	185.4
2018	Mar	5,960.7	5,549.6	185.1	1.7	1.0	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	5,960.7	5,549.6	185.1
2018	Apr	5,934.3	5,549.5	184.5	1.2	1.0	12.0	0.0	0.0	Yes	Yes	0.0	12.0	0.0	5,934.3	5,549.5	184.5
2018	May	5,808.5	5,548.8	181.8	0.8	1.0	5.2	1.7	5.4	No	Yes	0.0	3.5	7.0	5,377.5	5,546.4	173.4
2018	Jun	5,251.9	5,545.6	171.0	1.0	0.9	5.6	2.1	5.1	No	Yes	7.6	11.1	12.7	4,497.2	5,541.0	156.0
2018	Jul	4,382.5	5,540.3	153.4	0.8	0.8	5.1	1.6	8.1	No	Yes	7.3	10.8	19.0	3,211.8	5,531.9	127.1
2018	Aug	3,128.8	5,531.2	125.1	0.7	0.7	4.9	1.4	3.7	No	Yes	7.3	10.8	11.8	2,406.0	5,525.0	106.5
2018	Sep	2,344.0	5,524.4	104.6	1.3	0.6	10.3	4.0	0.0	Yes	Yes	0.0	6.3	0.0	2,344.0	5,524.4	104.6
2018	Oct	2,294.6	5,523.9	103.2	1.6	0.5	16.7	0.0	0.0	Yes	Yes	0.0	16.7	0.0	2,294.6	5,523.9	103.2
2018	Nov	3,025.0	5,530.4	122.7	1.8	0.6	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	3,025.0	5,530.4	122.7
2018	Dec	3,930.0	5,537.2	143.1	2.1	0.8	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	3,930.0	5,537.2	143.1
2019	Jan	4,791.9	5,542.9	162.3	2.1	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	4,791.9	5,542.9	162.3
2019	Feb	5,541.5	5,547.3	176.4	4.7	0.9	33.5	0.0	0.0	Yes	Yes	0.0	33.5	0.0	5,541.5	5,547.3	176.4
2019	Mar	5,960.7	5,549.6	185.1	7.2	1.0	64.7	0.0	0.0	Yes	Yes	0.0	64.7	0.0	5,960.7	5,549.6	185.1
2019	Apr	5,934.3	5,549.5	184.5	4.5	1.0	44.8	0.0	0.0	Yes	Yes	0.0	44.8	0.0	5,934.3	5,549.5	184.5
2019	May	5,904.7	5,549.3	183.9	3.1	1.0	24.8	7.1	0.0	Yes	Yes	0.0	17.6	0.0	5,904.7	5,549.3	183.9
2019	Jun	5,771.4	5,548.6	181.0	1.8	1.0	13.8	7.2	0.0	Yes	Yes	7.6	14.2	7.6	5,320.1	5,546.0	172.3
2019	Jul	5,193.4	5,545.3	170.0	1.4	0.9	8.1	4.6	5.1	No	Yes	7.3	10.8	12.4	4,429.4	5,540.6	154.4
2019	Aug	4,328.6	5,539.9	152.1	1.3	0.8	10.3	5.1	0.0	Yes	Yes	7.3	12.5	7.3	3,877.2	5,536.8	141.9
2019	Sep	3,794.7	5,536.3	140.1	1.7	0.7	15.0	4.0	0.0	Yes	Yes	0.0	10.9	0.0	3,794.7	5,536.3	140.1
2019	Oct	3,728.5	5,535.8	138.6	2.3	0.7	23.7	0.0	0.0	Yes	Yes	0.0	23.7	0.0	3,728.5	5,535.8	138.6
2019	Nov	4,579.9	5,541.5	157.9	2.8	0.8	14.0	0.0	0.0	Yes	Yes	0.0	14.0	0.0	4,579.9	5,541.5	157.9
2019	Dec	5,419.1	5,546.6	174.1	2.6	0.9	12.4	0.0	0.0	Yes	Yes	0.0	12.4	0.0	5,419.1	5,546.6	174.1
2020	Jan	5,971.7	5,549.7	185.3	2.6	1.0	17.2	0.0	0.0	Yes	Yes	0.0	17.2	0.0	5,971.7	5,549.7	185.3
2020	Feb	5,977.6	5,549.7	185.4	3.2	1.0	31.9	0.0	0.0	Yes	Yes	0.0	31.9	0.0	5,977.6	5,549.7	185.4
2020	Mar	5,960.7	5,549.6	185.1	2.8	1.0	28.1	0.0	0.0	Yes	Yes	0.0	28.1	0.0	5,960.7	5,549.6	185.1
2020	Apr	5,934.3	5,549.5	184.5	1.9	1.0	18.3	0.0	0.0	Yes	Yes	0.0	18.3	0.0	5,934.3	5,549.5	184.5
2020	May	5,904.7	5,549.3	183.9	1.3	1.0	7.5	4.0	3.2	No	Yes	0.0	3.5	3.2	5,710.1	5,548.2	179.7
2020	Jun	5,579.8	5,547.5	177.2	1.0	0.9	5.9	2.4	4.8	No	Yes	7.6	11.1	12.4	4,841.4	5,543.2	163.3
2020	Jul	4,721.3	5,542.4	160.9	0.9	0.9	5.2	1.7	7.9	No	Yes	7.3	10.8	17.8	3,624.4	5,535.0	136.2
2020	Aug	3,535.5	5,534.4	134.2	1.0	0.7	6.6	3.1	2.0	No	Yes	7.3	10.8	9.3	2,963.3	5,529.9	121.2
2020	Sep	2,892.8	5,529.3	119.5	1.3	0.6	10.9	4.0	0.0	Yes	Yes	0.0	6.8	0.0	2,892.8	5,529.3	119.5
2020	Oct	2,836.4	5,528.8	118.1	1.9	0.6	19.9	0.0	0.0	Yes	Yes	0.0	19.9	0.0	2,836.4	5,528.8	118.1
2020	Nov	3,733.0	5,535.8	138.7	2.2	0.7	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	3,733.0	5,535.8	138.7
2020	Dec	3,841.1	5,536.6	141.1	0.7	0.7	4.9	0.0	0.0	Yes	Yes	0.0	4.9	0.0	3,841.1	5,536.6	141.1

Appendix B. Irrigation Company Historical Data

Utah Division of Water Rights
Distribution System Daily Records Summary

EAST FORK VIRGIN RIVER GLENDALE

COMMON DESCRIPTION: Diversion in river feeds pipe to sluice top exit
DIVERTING WORKS: Headgate at diversion dam to pipe to sluice basin
MEASURING DEVICE: 3` CIPOLETTI WEIR 10% split BFords
RECORDS RATING: Unrated
LOCATION: 358051.57 East, 4134186.13 North (NAD83 UTM Coordinates)

ACFT Monthly Summary of Mean daily discharge in CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1991					482.	358.	227.	232.	266.	291.			1857.
1992					460.	313.	314.	336.	317.				1739.
1993				215.	476.	460.	467.	443.	459.	482.			3002.
1994						341.	276.	282.	299.	275.			1473.
1995				307.	475.	447.	443.	472.	411.	475.			3030.
1997				337.	464.	402.	215.	300.	383.	475.			2577.
1999					428.	284.	271.	387.	379.	317.			2067.
2000				390.	456.	328.	262.	272.	401.	416.			2527.
2001				479.	475.	347.	313.	324.	288.	336.			2561.
2002				267.	360.	265.	275.	235.	248.	383.			2033.
2003				302.	449.	293.	260.	302.	292.	342.			2240.
2004				322.	429.	319.	224.	266.	261.	307.			2128.
2005				446.	461.	446.	461.	461.	446.	461.		3179.	6358.
2006				365.	492.	462.	461.	405.	433.	492.			3109.
2007					397.	282.	259.	326.	265.	280.			1808.
2009				202.	433.	425.	273.	155.	250.	279.			2018.
2010				27.	343.	290.	267.	289.	292.	374.			1882.
2011				70.	625.	582.	555.	449.	476.	262.			3019.
2012				333.	573.	255.	198.	296.	483.	232.			2370.
2013				377.	320.	216.	455.	388.	295.	320.			2372.
2014				412.	619.	344.	313.	329.	336.	151.			2505.
2015				397.	414.	338.	296.	308.	277.	259.	0.		2289.
2016				449.	511.	346.	282.	305.	271.	328.			2491.
2017				0.	493.	553.	412.	357.	295.	123.			2234.
2018			53.	389.	330.	285.	224.	279.	266.	264.			2090.
2019				0.	220.	274.	403.	415.	375.	271.			1959.
2020				386.	401.	338.	320.	270.	266.	278.	17.		2275.
2021				367.	287.	285.	192.	256.	247.	210.			1845.
2022				211.	239.	242.	220.	124.					1036.
Mean			53.	294.	433.	349.	315.	319.	331.	322.	8.	3179.	2376.

Utah Division of Water Rights
Distribution System Daily Records Summary

EAST FORK VIRGIN RIVER ORDERVILLE IRRIGATION

COMMON DESCRIPTION: W Side of River N of Orderville, thur corral LWX
DIVERTING WORKS: Conc Div struct w side gate to pipe, still basin
MEASURING DEVICE: 10` CIPOLETTI Weir, Desilting basin
RECORDS RATING: Unrated
LOCATION: 356880.53 East, 4129395.96 North (NAD83 UTM Coordinates)

ACFT Monthly Summary of Mean daily discharge in CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1963					236.	171.	151.	30.	154.				743.
1964				50.	335.	238.	198.	168.	162.				1151.
1965					338.	392.	267.	166.	219.				1382.
1966				146.	347.	248.	188.	192.	206.				1326.
1967					140.	316.	261.	312.	228.				1257.
1968				67.	366.	366.	235.	259.	245.				1538.
1969					490.	499.	494.	342.	287.				2113.
1974				349.	331.	238.	184.	175.	149.				1426.
1975					298.	372.	312.	219.	211.	124.			1535.
1976					391.	232.	182.	233.	234.	187.			1459.
1977				159.	267.	236.	219.	189.	183.	224.			1476.
1990					6.	25.	13.	26.	10.	7.			87.
1991					31.	183.	140.	142.	170.	185.			851.
1992					213.	207.	190.	154.	192.				957.
1993				134.	291.	282.	280.	268.	262.	273.			1790.
1994				193.	272.	226.	162.	156.	149.				1158.
1995				179.	279.	266.	258.	243.	221.	237.			1683.
1996				219.	249.	166.	158.	150.	227.	256.			1425.
1997				193.	265.	232.	149.	174.	217.	272.			1502.
1998				138.	279.	253.	246.	255.	263.	151.			1586.
1999					238.	187.	130.	179.	215.	178.			1126.
2000				229.	252.	170.	140.	134.	209.				1135.
2001				253.	256.	196.	205.	187.	172.	197.			1465.
2002				148.	232.	155.	140.	613.	149.	222.			1660.
2003				231.	295.	168.	159.	178.	166.	203.			1401.
2004				185.	245.	195.	128.	150.	148.	176.			1228.
2005				252.	260.	252.	260.	260.	252.	260.			1795.
2006				202.	272.	256.	269.	230.	244.	261.			1735.
2007				40.	241.	158.	144.	189.	221.	273.			1267.
2008				285.	361.	256.	134.	236.	157.	158.			1587.
2009				239.	356.	264.	155.	134.	148.	150.			1447.
2010					681.	402.	158.	229.	178.	380.			2028.
2011					500.	662.	525.	427.	368.	232.			2714.
2012				353.	427.	172.	165.	319.	409.	165.			2010.
2013				330.	588.	159.	259.	202.	229.	305.			2073.
2014				258.	344.	173.	185.	215.	203.	101.			1479.
2015				631.	565.	490.	224.	223.	287.	330.			2751.
2016				325.	442.	378.	203.	209.	194.	323.			2073.
2017				100.	1044.	552.	280.	275.	317.	178.			2746.
2018			148.	573.	387.	189.	269.	247.	285.	254.	250.		2603.
2019				0.	297.	615.	426.	342.	279.	86.			2045.
2020				422.	457.	245.	207.	179.	203.	274.	45.		2033.
2021			57.	440.	218.	167.	132.	135.	185.	536.	677.		2546.
2022				476.	419.	158.	141.	99.					1292.
Mean			103.	244.	336.	267.	212.	215.	214.	224.	324.		1606.

Utah Division of Water Rights
Distribution System Daily Records Summary

EAST FORK VIRGIN RIVER MT. CARMEL

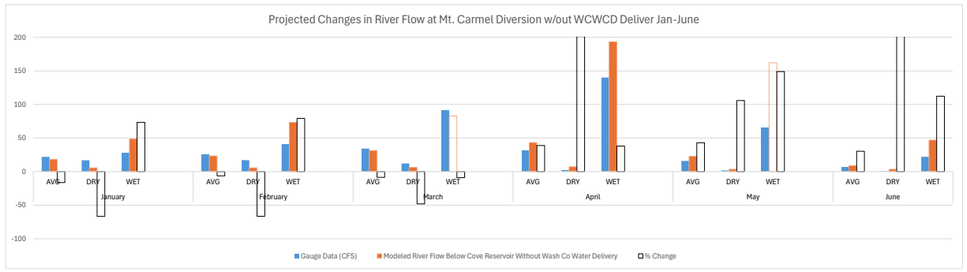
COMMON DESCRIPTION: 37 15 59 N/112 38 49 W
DIVERTING WORKS: CONCRETE AND ROCK DAM SCREW GATES, GRATED INTAKE
MEASURING DEVICE: 4 FT Contracted Rectanglar Weir
RECORDS RATING: Good
LOCATION: 353957.31 East, 4125713.44 North (NAD83 UTM Coordinates)

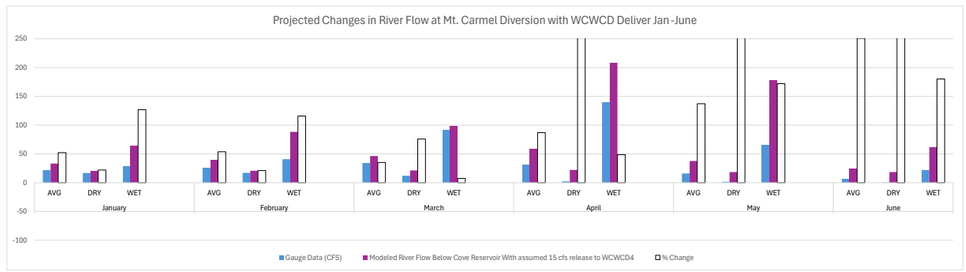
ACFT Monthly Summary of Mean daily discharge in CFS

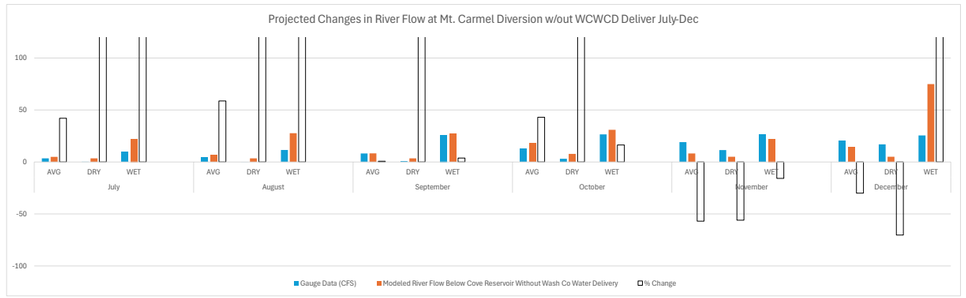
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1991					354.	298.	211.	214.	235.	306.			1618.
1992				175.	359.	310.	285.	314.	322.				1764.
1993				227.	495.	482.	459.	384.	401.	457.			2905.
1994				287.	405.	333.	240.	224.	343.	234.			2066.
1997				308.	417.	318.	241.	272.	310.	414.			2280.
1998				196.	414.	366.	378.	383.	397.	221.			2355.
1999					334.	252.	195.	329.	325.	247.			1681.
2000				339.	384.	249.	236.	217.	275.	352.			2052.
2001				372.	377.	315.	309.	269.	236.	283.			2160.
2002				256.	333.	219.	210.	251.	221.	297.			1788.
2003				248.	356.	257.	228.	258.	244.	292.			1881.
2004				274.	363.	285.	675.	223.	259.	276.			2355.
2005				370.	382.	370.	382.	382.	370.	382.			2636.
2006				300.	405.	379.	398.	333.	360.	392.			2566.
2007				32.	324.	261.	214.	259.	245.	349.			1685.
2008				125.	316.	278.	237.	257.	210.	303.			1727.
2009				152.	334.	311.	275.	222.	220.	260.			1774.
2010					255.	381.	286.	354.	258.	248.			1782.
2011					260.	452.	453.	452.	432.	99.			2148.
2012				76.	436.	260.	219.	378.	320.	184.			1873.
2013				337.	463.	185.	269.	209.	163.	158.			1783.
2014				314.	443.	264.	238.	295.	273.	116.			1944.
2015				346.	456.	338.	235.	268.	247.	273.			2164.
2016				305.	340.	303.	185.	248.	427.	426.			2234.
2017				274.	536.	481.	410.	426.	409.	281.			2817.
2018				407.	362.	227.	273.	266.	273.	282.			2089.
2019				0.	373.	434.	377.	340.	339.	172.			2035.
2020				309.	484.	405.	328.	273.	306.	316.	0.		2421.
2021			26.	415.	356.	255.	217.	246.	252.		11.		1778.
2022				160.	281.	184.	178.	130.					933.
Mean			26.	254.	380.	315.	295.	289.	299.	282.	5.		2043.

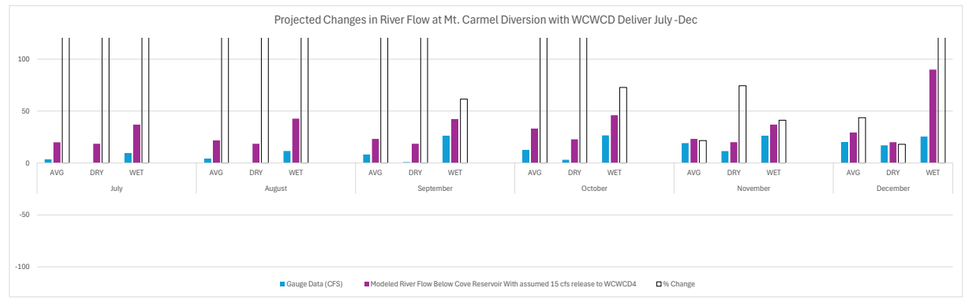
Appendix C. Flow Regime Comparisons Calcs

IMPACTS	January				February				March				April				May				June				July				August				September				October				November				December		
Mt. Carmel Gauge	AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET
Gauge Data (CFS)	21.9	16.9	28		25	17.1	40.9		34.3	12.1	91.2		31.2	2.4	140.1		15.9	1.7	65.1		6.8	0.7	22.1		3.5	0.2	9.5		4.2	0.1	11.6		8.2	0.8	26		12.6	3.1	26.6		19.1	11.5	26.3		20.4	17	25.5
Year		2001	1993			2002	1993			2002	1993			2002	1993			2002	1993			2002	1993			2002	1999			2002	1993			2002	1997			2002	1993			2002	1993			1999	1993
Modeled River Flow Below Cove Reservoir Without Wash Co Water Delivery	18.3	5.6	48.5		23.4	5.7	73.3		31.4	6.3	83.0		43.3	7.2	193.4		22.7	3.5	162.1		8.9	3.5	46.9		5.0	3.5	22.2		6.7	3.5	27.7		8.3	3.5	27.0		18.0	7.8	31.0		8.2	5.1	22.1		14.3	5.1	74.9
% Change	-16	-67	73		-6	-67	79		-9	-48	-9		39	201	38		43	106	149		30	400	112		42	1650	134		59	3400	139		1	338	4		43	151	16		-57	-56	-16		-30	-70	194
Modeled River Flow Below Cove Reservoir With assumed 15 cfs release to WCWCD[4]	33.3	20.6	63.5		38.4	20.7	88.3		46.4	21.3	98.0		58.3	22.2	208.4		37.7	18.5	177.1		23.9	18.5	61.9		20.0	18.5	37.2		21.7	18.5	42.7		23.3	18.5	42.0		33.0	22.8	46.0		23.2	20.1	37.1		29.3	20.1	89.9
% Change	52	22	127		54	21	116		35	76	7		87	826	49		137	988	172		251	2543	180		471	9150	292		416	18400	268		184	2213	61		162	635	73		22	74	41		44	18	253









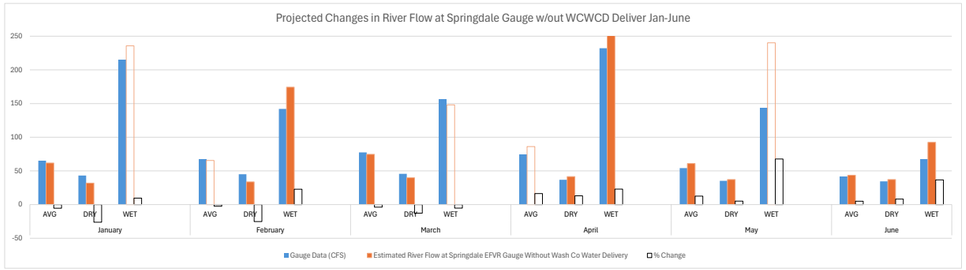
IMPACTS--MT CARMEL EFVR GAUGE

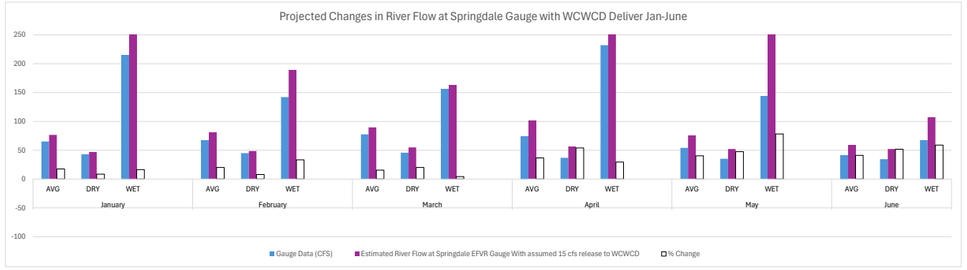
			Gauge Data(cfs)[5]	Year	Modeled River Flow Below Cove Reservoir Without Wash Co Water Delivery	% Change	Modeled River Flow Below Cove Reservoir With assumed 15 cfs release to WCWCD[4,7]	% Change
January--average year			21.9		18.3	-16	33.3	52
January--driest year			16.9	2001	5.6	-67	20.6	22
January--wettest year			28	1993	48.5	73	63.5	127
February--average year			25.0		23.4	-6	38.4	54
February--driest year			17.1	2002	5.7	-67	20.7	21
February--wettest year			40.9	1993	73.3	79	88.3	116
March--average year			34.3		31.4	-9	46.4	35
March--driest year			12.1	2002	6.3	-48	21.3	76
March--wettest year			91.2	1993	83.0	-9	98.0	7
April--average year			31.2		43.3	39	58.3	87
April--driest year			2.4	2002	7.2	201	22.2	826
April--wettest year			140.1	1993	193.4	38	208.4	49
May--average year			15.9		22.7	43	37.7	137
May--driest year			1.7	2002	3.5	106	18.5	988
May--wettest year			65.1	1993	162.1	149	177.1	172
June--average year			6.8		8.9	30	23.9	251
June--driest year			0.7	2002	3.5	400	18.5	2543
June--wettest year			22.1	1993	46.9	112	61.9	180
July--average year			3.5		5.0	42	20.0	471
July--driest year			0.2	2002	3.5	1650	18.5	9150
July--wettest year			9.5	1999	22.2	134	37.2	292
August--average year			4.2		6.7	59	21.7	416
August--driest year[6]			0.1	2002	3.5	3400	18.5	18400
August--wettest year			11.6	1993	27.7	139	42.7	268
September--average year			8.2		8.3	1	23.3	184
September--driest year			0.8	2002	3.5	338	18.5	2213
September--wettest year			26.0	1997	27.0	4	42.0	61
October--average year			12.6		18.0	43	33.0	162
October--driest year			3.1	2002	7.8	151	22.8	635
October--wettest year			26.6	1993	31.0	16	46.0	73
November--average year			19.1		8.2	-57	23.2	22
November--driest year			11.5	2002	5.1	-56	20.1	74
November--wettest year			26.3	1993	22.1	-16	37.1	41
December--average year			20.4		14.3	-30	29.3	44
December--driest year			17.0	1999	5.1	-70	20.1	18
December--wettest year			25.5	1993	74.9	194	89.9	253

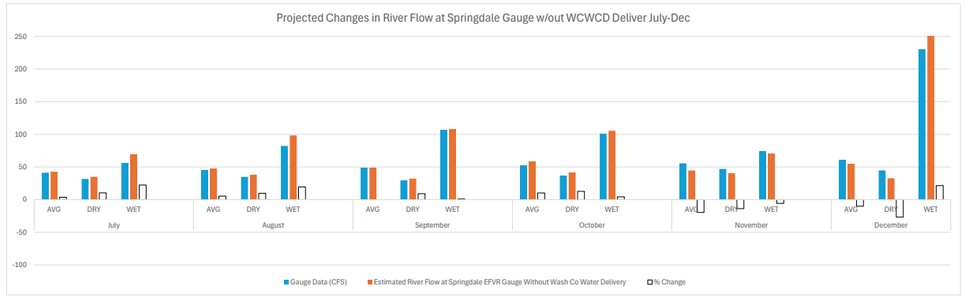
Notes

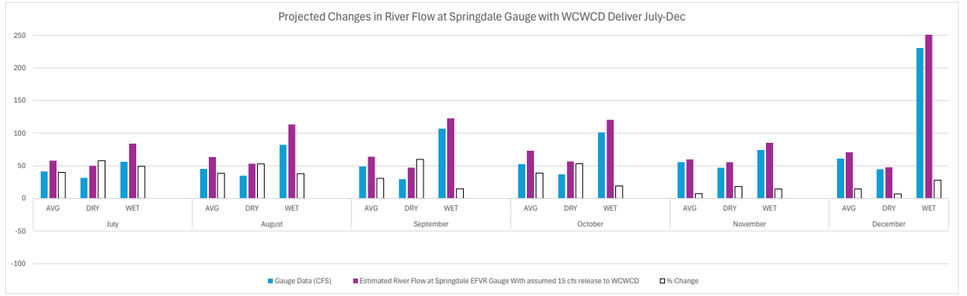
1. Average year: the mean CFS for all Januarys on record
2. Driest year: the mean CFS for driest January on record
3. Wettest year: the mean CFS for wettest January on record
4. Because the WCWCD delivery flow of 15 cfs was assumed independently for each scenario rather than being incorporated directly into the hydraulic model, the resulting river flow rates will be higher than those simulated. Since this additional 15 cfs was not included in the model calculations used to determine reservoir water surface elevations, the modeled elevations may underestimate the actual reservoir elevations that would occur under the assumed delivery conditions.
5. This analysis compares Average, Driest, and Wettest years recorded at three different gauging stations namely:
USGS Glendale Gauge 1966-2020
USGS Mt. Carmel Gauge 1992-2002
USGS Springdale Gauge 1991-2025
6. This valve was originally 0.0 cfs. It was changed to 0.1 cfs for calculation purposes.
7. Any releases to the WCWCD would adhere to the settlement agreement which specifies releases from the reservoir "shall not increase the flow measured at the U.S. Geological Survey (USGS) gage on the East Fork Virgin River near Springdale (USGS No. 09404900), by more than 25 cfs during any 7-day period and shall not exceed the long-term monthly average at the Springdale gage by more than 15 cfs."

IMPACTS Springdale EFVR Gauge	January				February				March				April				May				June				July				August				September				October				November				December		
	AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET		AVG	DRY	WET
Gauge Data (CFS)	65.2	43.2	215.3		67.01559	45	142		77.52515	45.7	156.2		73.93694	36.8	232.1		54.08974	35.281	143.219		41.48074	34.4	67.56		41.373529	31.658	56.445		45.413824	34.806	82.206		48.913412	29.53	107.037		52.564559	36.952	101.103		55.605794	46.96	74.35		61.422118	44.706	230.419
Year		2003	2005			2015	2005			2002	2005			2002	2023			2002	2005			1996	2005			2002	2013			2009	2022			2002	2014			2003	2004			2002	2004			2002	2010
Estimated River Flow at Springdale EFVR Gauge Without Wash Co Water Delivery	61.6	31.9	235.8		65.4	33.6	174.4		74.6	39.9	148.0		86.1	41.6	285.4		60.9	37.1	240.2		43.5	37.2	92.4		42.8	35.0	69.2		47.9	38.2	98.3		49.0	32.2	108.0		58.0	41.6	105.5		44.7	40.5	70.2		55.3	32.8	279.8
% Change	-5	-26	10		-2	-25	23		-4	-13	-5		16	13	23		13	5	68		5	8	37		4	10	23		5	10	20		0	9	1		10	13	4		-20	-14	-6		-10	-27	21
Estimated River Flow at Springdale EFVR Gauge With assumed 15 cfs release to WCWCD	76.6	46.9	250.8		80.4	48.6	189.4		89.6	54.9	163.0		101.1	56.6	300.4		75.9	52.1	255.2		58.5	52.2	107.4		57.8	50.0	84.2		62.9	53.2	113.3		64.0	47.2	123.0		73.0	56.6	120.5		59.7	55.5	85.2		70.3	47.8	294.8
% Change	18	9	17		20	8	33		16	20	4		37	54	29		40	48	78		41	52	59		40	58	49		38	53	38		31	60	15		39	53	19		7	18	15		14	7	28









IMPACTS--SPRINGDALE EFVR GAUGE

			Gauge Data (cfs)	Year	Estimated River Flow at Springdale EFVR Gauge Without Wash Co Water Delivery[6]	% Change	Estimated River Flow at Springdale EFVR Gauge With assumed 15 cfs release to WCWCD[4,7]	% Change
January--average year			65.2		61.6	-5	76.6	18
January--driest year			43.2	2003	31.9	-26	46.9	9
January--wettest year			215.3	2005	235.8	10	250.8	17
February--average year			67.0		65.4	-2	80.4	20
February--driest year			45	2015	33.6	-25	48.6	8
February--wettest year			142	2005	174.4	23	189.4	33
March--average year			77.5		74.6	-4	89.6	16
March--driest year			45.7	2002	39.9	-13	54.9	20
March--wettest year			156.2	2005	148.0	-5	163.0	4
April--average year			73.9		86.1	16	101.1	37
April--driest year			36.8	2002	41.6	13	56.6	54
April--wettest year			232.1	2023	285.4	23	300.4	29
May--average year			54.1		60.9	13	75.9	40
May--driest year			35.3	2002	37.1	5	52.1	48
May--wettest year			143.2	2005	240.2	68	255.2	78
June--average year			41.5		43.5	5	58.5	41
June--driest year			34.4	1996	37.2	8	52.2	52
June--wettest year			67.6	2005	92.4	37	107.4	59
July--average year			41.4		42.8	4	57.8	40
July--driest year			31.7	2002	35.0	10	50.0	58
July--wettest year			56.4	2013	69.2	23	84.2	49
August--average year			45.4		47.9	5	62.9	38
August--driest year			34.8	2009	38.2	10	53.2	53
August--wettest year			82.2	2022	98.3	20	113.3	38
September--average year			48.9		49.0	0	64.0	31
September--driest year			29.5	2002	32.2	9	47.2	60
September--wettest year			107.0	2014	108.0	1	123.0	15
October--average year			52.6		58.0	10	73.0	39
October--driest year			37.0	2003	41.6	13	56.6	53
October--wettest year			101.1	2004	105.5	4	120.5	19
November--average year			55.6		44.7	-20	59.7	7
November--driest year			47.0	2002	40.5	-14	55.5	18
November--wettest year			74.4	2004	70.2	-6	85.2	15
December--average year			61.4		55.3	-10	70.3	14
December--driest year			44.7	2002	32.8	-27	47.8	7
December--wettest year			230.4	2010	279.8	21	294.8	28

Notes

1. Average year: the mean CFS for all Januarys on record
2. Driest year: the mean CFS for driest January on record
3. Wettest year: the mean CFS for wettest January on record
4. Because the WCWCD delivery flow of 15 cfs was assumed independently for each scenario rather than being incorporated directly into the hydraulic model, the resulting river flow rates will be higher than those simulated. Since this additional 15 cfs was not included in the model calculations used to determine reservoir water surface elevations, the modeled elevations may underestimate the actual reservoir elevations that would occur under the assumed delivery conditions.
5. This analysis compares Average, Driest, and Wettest years recorded at three different gauging stations namely:
USGS Glendale Gauge 1966-2020
USGS Mt. Carmel Gauge 1992-2002
USGS Springdale Gauge 1991-2025
6. This value was calculated by applying the difference between the Mt. Carmel EFVR gauge data and the model results to the Springdale EFVR gauge data. The Springdale gauge is located approximately 20 miles downstream of the Mt. Carmel gauge.
7. Any releases to the WCWCD would adhere to the settlement agreement which specifies releases from the reservoir "shall not increase the flow measured at the U.S. Geological Survey (USGS) gage on the East Fork Virgin River near Springdale (USGS No. 09404900), by more than 25 cfs during any 7-day period and shall not exceed the long-term monthly average at the Springdale gage by more than 15 cfs."

Appendix D. Model Output Without WCWD Delivery

Model Parameters

Miscellaneous Parameters			
	Start Volume	0	af
Spillway Elevation		5550	ft
	Conservation	500	af
Volume at Spillway Crest		6032	af
Minimum flow in river		3.5	cfs
	Seepage	0.125	in/day

Hydro Parameters			
Hydro Elevation		5358	ft
Max Flow to Hydro		18	cfs
Hydro Efficiency		75%	
	Price per kW	$0.040	/kW

Tributary Parameters	Streamstats Average	% increase
Glendale USGS	19.4	0%
Orderville	23.3	20%
Mt Carmel	25.9	13%
pre-GIC USGS	15.8	-19%

Cove Reservoir Vlookup Parameters						
Elevation	Area, ac	Volume, af	Elevation[1]	Area, ac[1]	Volume, af[1]	Elevation
0	0	0	5470	0	0	0
5470	0	0	5472	0.1	0.1	5470
5472	0.1	0.1	5474	0.4	0.5	5472
5474	0.4	0.5	5476	2	2.8	5474
5476	2	2.8	5478	4.4	9.3	5476
5478	4.4	9.3	5480	7.2	20.9	5478
5480	7.2	20.9	5482	11.3	39.4	5480
5482	11.3	39.4	5484	14.5	65.2	5482
5484	14.5	65.2	5486	18.6	98.3	5484
5486	18.6	98.3	5488	22.2	139.2	5486
5488	22.2	139.2	5490	25.7	187.1	5488
5490	25.7	187.1	5492	29.8	242.6	5490
5492	29.8	242.6	5494	33.6	306	5492
5494	33.6	306	5496	37.2	276.8	5494
5496	37.2	276.8	5498	41.7	455.7	5496
5498	41.7	455.7	5500	45.8	543.1	5498
5500	45.8	543.1	5502	49.9	638.8	5500
5502	49.9	638.8	5504	54	742.7	5502
5504	54	742.7	5506	58.3	855	5504
5506	58.3	855	5508	63	976.3	5506
5508	63	976.3	5510	67.9	1107.2	5508
5510	67.9	1107.2	5512	73.1	1248.2	5510
5512	73.1	1248.2	5514	78	1399.3	5512
5514	78	1399.3	5516	82.4	1559.7	5514
5516	82.4	1559.7	5518	87.3	1729.4	5516
5518	87.3	1729.4	5520	92.3	1909	5518
5520	92.3	1909	5522	97.7	2098.9	5520
5522	97.7	2098.9	5524	103.3	2299.9	5522
5524	103.3	2299.9	5526	109.7	2513	5524
5526	109.7	2513	5528	115.7	2738.3	5526
5528	115.7	2738.3	5530	121.5	2975.5	5528
5530	121.5	2975.5	5532	127.4	3224.4	5530
5532	127.4	3224.4	5534	133.1	3484.9	5532
5534	133.1	3484.9	5536	139.2	3757.1	5534
5536	139.2	3757.1	5538	145.7	4042	5536
5538	145.7	4042	5540	152.4	4340	5538
5540	152.4	4340	5542	159.5	4652	5540
5542	159.5	4652	5544	166	4977.5	5542
5544	166	4977.5	5546	172.2	5315.7	5544
5546	172.2	5315.7	5548	178.8	5666.7	5546
5548	178.8	5666.7	5550	186.6	6032	5548
5550	186.6	6032	5552	193.2	6411.8	5550
5552	193.2	6411.8	5554	200.7	6805.7	5552
5554	200.7	6805.7	5556	206	7212.4	5554
5556	206	7212.4	5558	211.3	7629.7	5556
5558	211.3	7629.7	5560	217	8058	5558
5560	217	8058	0	0	0	5560

Monthly Parameters				
	Irrigate?	Max Hydro	ET	Divert?
Jan	n	0	0.00	y
Feb	n	0	0.00	y
Mar	n	0	0.71	y
Apr	n	0	2.53	y
May	y	0	4.31	y
Jun	y	0	4.95	n
Jul	y	0	4.95	n
Aug	y	0	3.96	n
Sep	y	0	3.23	n
Oct	n	0	1.79	n
Nov	n	0	0.18	y
Dec	n	0	0.00	y

Diversion to Cove based on Reservoir Water Level		
5470	22.2	cfs
5560	12.6	cfs

Water Right Calcs											
Required	5.00	af/ac		Irr Hours per Day		24.0					<< model output
Efficiency	45%	<< calc'd									
				GIC	434.00	OIC	286.00	MCIC	404.00	WC	
Month	Irr Days	Rate, in	Req'd Rate, in	GIC, af	GIC, cfs	OIC, af	OIC, cfs	MCIC, af	MCIC, cfs	YIELD, af	YIELD, cfs
January	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
February	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
April	0	0.05	0.1	4.1	0.0	2.7	0.0	3.8	0.0	0.0	0.0
May	31	5.82	13.1	472.1	7.7	311.1	5.1	439.5	7.1	0.0	0.0
June	30	5.66	12.7	459.1	7.7	302.6	5.1	427.4	7.2	0.0	0.0
July	31	7.87	17.7	638.4	10.4	420.7	6.8	594.3	9.7	0.0	0.0
August	31	4.16	9.3	337.5	5.5	222.4	3.6	314.1	5.1	0.0	0.0
September	30	3.19	7.2	258.8	4.3	170.5	2.9	240.9	4.0	0.0	0.0
October	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
November	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
December	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual	153	26.75	60.00	2170.00	7.2	1430.00	4.7	2020.00	6.7	0.00	0.0

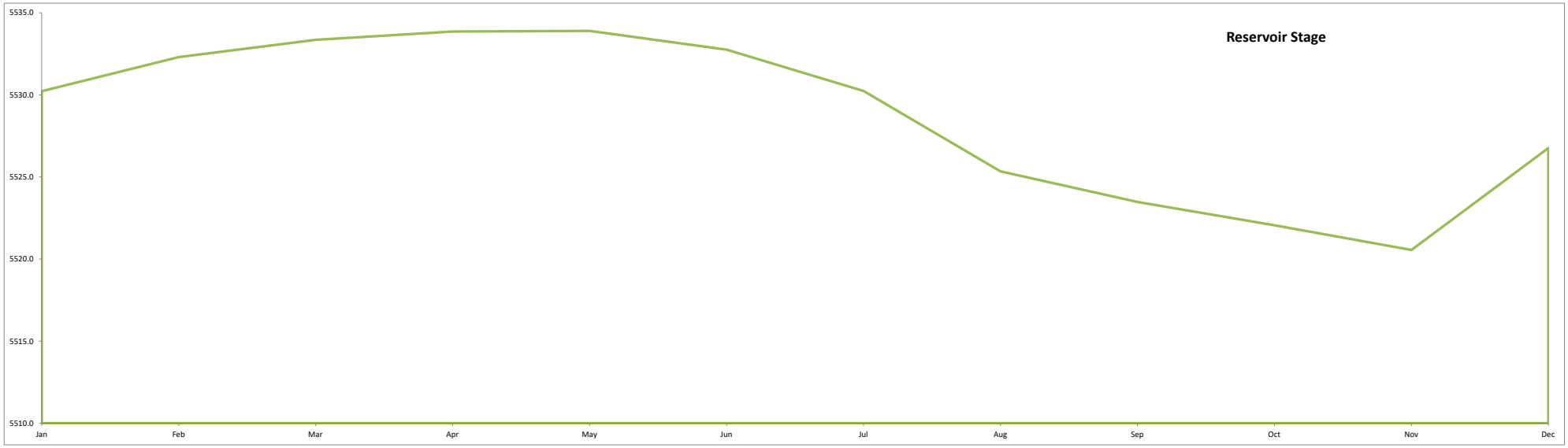
AF to CFS Calculator			
94,525,200.0	cf/yr	6.0	mo/yr
15,754,200.0	cf/irr mo	30	d/mo
525,140.0	cf/d	12.0	h/d
43,761.7	cf/h		
729.4	cf/m		
12.2	cfs		

5620.00

Average Annual Summary

Cove Reservoir Average Annual Simulation

	Reservoir at Beginning of Month			Pre-Glendale USGS Data	Glendale USGS Data	Orderville Tributary		Mt Carmel Tributary		Glendal Irr Co	Orderville Irr Co			Mt Carmel Irr Co			OIC + MCIC			Total Irr Co			WCWCD	Divert to Res'v	Losses		Supp to Irr Co	Supp to Irr Co	Final River	Res'v Flux	Change in River
	Reservoir Stage	Reservoir Volume	Reservoir Surface Area	Flow	Flow	Flow	Cumulative Flow	Flow	Cumulative Flow	Demand	Demand	Demand, from River	Demand, from Res'v	Demand	Demand, from River	Demand, from Res'v	Demand	Demand, from River	Demand, from Res'v	Demand	Prorated Demand, from River	Prorated Demand, from Res'v	Release, from Res'v	In	Seepage	Evaporation	Out	Out	Flow	Volume	Flow
	ft	ac-ft	ac	cfs	cfs	cfs		cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	ac-ft	cfs
Jan	5530.2	3,003.0	122.2	13.8	16.9	3.4	20.3	2.3	22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.9	0.0	0.0	0.0	18.3	260.0	-4.2
Feb	5532.3	3,263.0	128.2	15.8	19.4	3.9	23.3	2.6	25.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	1.0	0.0	0.0	0.0	23.4	137.2	-2.5
Mar	5533.3	3,400.2	131.2	19.9	24.4	4.9	29.4	3.3	32.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	1.0	0.2	0.0	0.0	31.4	66.4	-1.3
Apr	5533.9	3,466.6	132.7	26.9	33.0	6.6	39.7	4.4	44.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.0	0.7	0.0	0.0	43.3	4.5	-0.7
May	5533.9	3,471.1	132.8	20.5	25.2	5.1	30.2	3.4	33.6	7.7	5.1	4.9	0.1	7.1	5.3	1.8	12.2	10.3	1.9	19.9	16.7	3.2	0.0	1.6	1.0	1.1	1.9	1.9	22.7	-148.4	-10.9
Jun	5532.8	3,322.8	129.6	10.4	12.8	2.6	15.3	1.7	17.0	7.7	5.1	4.6	0.5	7.2	4.6	2.6	12.3	9.1	3.1	20.0	14.9	5.1	0.0	0.0	0.9	1.3	3.1	3.1	8.9	-318.0	-8.2
Jul	5530.2	3,004.8	122.2	8.2	10.1	2.0	12.1	1.4	13.5	10.4	6.8	5.3	1.6	9.7	4.2	5.5	16.5	9.4	7.1	26.9	15.4	11.5	0.0	0.0	0.9	1.2	7.1	7.1	5.0	-562.5	-8.5
Aug	5525.3	2,442.3	107.6	8.0	9.8	2.0	11.8	1.3	13.1	5.5	3.6	3.4	0.2	5.1	3.9	1.2	8.7	7.3	1.4	14.2	11.9	2.4	0.0	0.0	0.9	0.9	1.4	1.4	6.7	-195.4	-6.4
Sep	5523.5	2,246.9	101.8	8.4	10.3	2.1	12.4	1.4	13.8	4.3	2.9	2.8	0.0	4.0	3.5	0.5	6.9	6.3	0.6	11.3	10.3	0.9	0.0	0.0	0.8	0.7	0.6	0.6	8.3	-126.3	-5.5
				10.5	12.9	2.6	15.5	1.7	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.4	0.0	0.0	18.0	-73.8	0.8
Nov	5520.6	1,962.0	93.8	11.6	14.2	2.9	17.1	1.9	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	0.9	0.0	0.0	0.0	8.2	636.0	-10.7
Dec	5526.8	2,598.0	112.0	12.7	15.6	3.1	18.8	2.1	20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.9	0.0	0.0	0.0	14.3	405.0	-6.6
Average			**118**	**13.9**	**17.1**	**3.4**		**2.3**				**1.7**	**0.2**		**1.8**	**1.0**		**3.5**	**1.2**		**5.8**	**1.9**	**0.0**	**2.8**	**0.9**	**0.5**		**1.2**	**17.4**		
Total AF				**10056**	**12347**	**2482**		**1655**				**1265**	**151**		**1297**	**703**		**2562**	**854**		**4173**	**1391**	**0**	**2008**	**666**	**384**		**854**	**12580**		



Model Simulation

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River
Yr	Mo	Volume (af)	Elevation (ft)	Area (ac)	Ave Flow (cfs)	From River (cfs)	Max Supp	Supp (cfs)	Pre Cove Full?	Full?	Ave Flow (cfs)	Ave Flow (cfs)	Ave Flow (cfs)
1967	Jan	500.0	5499.0	43.8	14.7	0.0	0.0	0.0	Yes	Yes	18.0	3.6	21.6
1967	Feb	1587.0	5516.3	83.2	16.1	0.0	0.0	0.0	Yes	Yes	19.8	4.0	23.8
1967	Mar	2513.2	5526.0	109.7	17.8	0.0	0.0	0.0	Yes	Yes	21.9	4.4	26.3
1967	Apr	3459.9	5533.8	132.6	19.5	0.0	0.0	0.0	Yes	Yes	23.9	4.8	28.7
1967	May	4295.7	5539.7	151.4	16.9	7.7	0.0	0.0	Yes	Yes	20.7	4.2	24.9
1967	Jun	4968.0	5543.9	165.8	15.2	7.7	0.0	0.0	Yes	Yes	18.7	3.8	22.5
1967	Jul	4847.8	5543.2	163.4	10.9	10.4	0.0	0.0	Yes	Yes	13.4	2.7	16.1
1967	Aug	4650.2	5542.0	159.5	12.6	5.5	0.0	0.0	Yes	Yes	15.5	3.1	18.6
1967	Sep	4546.0	5541.3	157.1	14.6	4.3	0.0	0.0	Yes	Yes	17.9	3.6	21.5
1967	Oct	4454.7	5540.7	155.0	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4
1967	**Nov**	**4381.5**	**5540.3**	**153.3**	**12.9**	**0.0**	**0.0**	**0.0**	**Yes**	**Yes**	**15.8**	**3.2**	**19.0**
1967	Dec	5200.5	5545.3	170.1	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5
1968	Jan	5971.7	5549.7	185.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8
1968	Feb	5971.7	5549.7	185.3	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4
1968	Mar	5977.6	5549.7	185.4	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1
1968	Apr	5960.7	5549.6	185.1	21.5	0.0	0.0	0.0	Yes	Yes	26.4	5.3	31.7
1968	May	5934.3	5549.5	184.5	18.1	7.7	0.0	0.0	Yes	Yes	22.2	4.5	26.7
1968	Jun	5904.7	5549.3	183.9	12.8	7.7	0.0	0.0	Yes	Yes	15.7	3.2	18.9
1968	Jul	5771.4	5548.6	181.0	11.7	10.4	0.0	0.0	Yes	Yes	14.4	2.9	17.3
1968	Aug	5638.3	5547.8	178.3	14.6	5.5	0.0	0.0	Yes	Yes	17.9	3.6	21.5
1968	Sep	5521.9	5547.2	176.1	9.5	4.3	0.0	0.0	Yes	Yes	11.7	2.4	14.1
1968	Oct	5419.5	5546.6	174.2	10.8	0.0	0.0	0.0	Yes	Yes	13.3	2.7	16.0
1968	Nov	5337.2	5546.1	172.6	12.0	0.0	0.0	0.0	Yes	Yes	14.7	3.0	17.7
1968	Dec	5970.9	5549.7	185.3	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8
1969	Jan	5971.7	5549.7	185.3	20.4	0.0	0.0	0.0	Yes	Yes	25.0	5.0	30.0
1969	Feb	5971.7	5549.7	185.3	17.8	0.0	0.0	0.0	Yes	Yes	21.8	4.4	26.2
1969	Mar	5977.6	5549.7	185.4	25.7	0.0	0.0	0.0	Yes	Yes	31.5	6.3	37.8
1969	Apr	5960.7	5549.6	185.1	107.5	0.0	0.0	0.0	Yes	Yes	132.0	26.5	158.5
1969	May	5934.3	5549.5	184.5	63.5	7.7	0.0	0.0	Yes	Yes	78.0	15.7	93.7
1969	Jun	5904.7	5549.3	183.9	26.8	7.7	0.0	0.0	Yes	Yes	32.9	6.6	39.5
1969	Jul	5771.4	5548.6	181.0	22.7	10.4	0.0	0.0	Yes	Yes	27.9	5.6	33.5
1969	Aug	5638.3	5547.8	178.3	16.9	5.5	0.0	0.0	Yes	Yes	20.8	4.2	25.0
1969	Sep	5521.9	5547.2	176.1	13.5	4.3	0.0	0.0	Yes	Yes	16.6	3.3	19.9
1969	Oct	5419.5	5546.6	174.2	15.0	0.0	0.0	0.0	Yes	Yes	18.4	3.7	22.1
1969	Nov	5337.2	5546.1	172.6	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9
1969	Dec	5970.9	5549.7	185.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8
1970	Jan	5971.7	5549.7	185.3	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1
1970	Feb	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5
1970	Mar	5977.6	5549.7	185.4	17.2	0.0	0.0	0.0	Yes	Yes	21.1	4.2	25.3
1970	Apr	5960.7	5549.6	185.1	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6
1970	May	5934.3	5549.5	184.5	11.8	7.7	0.0	0.0	Yes	Yes	14.5	2.9	17.4
1970	Jun	5904.7	5549.3	183.9	9.6	7.7	0.0	0.0	Yes	Yes	11.8	2.4	14.2
1970	Jul	5771.4	5548.6	181.0	9.0	9.0	0.0	0.0	No	No	11.0	2.2	13.2
1970	Aug	5369.5	5546.3	173.2	8.9	5.5	0.0	0.0	Yes	Yes	10.9	2.2	13.1
1970	Sep	5256.4	5545.6	171.1	9.0	4.3	0.0	0.0	Yes	Yes	11.0	2.2	13.2
1970	Oct	5156.9	5545.1	169.3	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6
1970	Nov	5077.0	5544.6	167.8	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2
1970	Dec	5864.2	5549.1	183.0	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1
1971	Jan	5971.7	5549.7	185.3	14.7	0.0	0.0	0.0	Yes	Yes	18.0	3.6	21.6
1971	Feb	5971.7	5549.7	185.3	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4
1971	Mar	5977.6	5549.7	185.4	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3
1971	Apr	5960.7	5549.6	185.1	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5
1971	May	5934.3	5549.5	184.5	12.5	7.7	0.0	0.0	Yes	Yes	15.3	3.1	18.4
1971	Jun	5904.7	5549.3	183.9	9.0	7.7	0.0	0.0	Yes	Yes	11.0	2.2	13.2
1971	Jul	5764.5	5548.5	180.9	7.5	7.5	0.0	0.0	No	No	9.2	1.8	11.0
1971	Aug	5214.9	5545.4	170.4	8.6	5.5	0.0	0.0	Yes	Yes	10.6	2.1	12.7
1971	Sep	5103.6	5544.7	168.3	7.6	4.3	0.0	0.0	Yes	Yes	9.3	1.9	11.2
1971	Oct	5005.7	5544.2	166.5	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7
1971	Nov	4927.1	5543.7	165.0	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5
1971	Dec	5639.2	5547.8	178.3	19.1	0.0	0.0	0.0	Yes	Yes	23.5	4.7	28.2
1972	Jan	5971.7	5549.7	185.3	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
1972	Feb	5971.7	5549.7	185.3	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6
1972	Mar	5977.6	5549.7	185.4	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7
1972	Apr	5960.7	5549.6	185.1	10.3	0.0	0.0	0.0	Yes	Yes	12.6	2.5	15.1
1972	May	5934.3	5549.5	184.5	8.6	7.7	0.0	0.0	Yes	Yes	10.6	2.1	12.7
1972	Jun	5771.6	5548.6	181.0	9.8	7.7	0.0	0.0	Yes	Yes	12.0	2.4	14.4
1972	Jul	5640.4	5547.9	178.3	6.5	6.5	0.0	0.0	No	No	8.0	1.6	9.5
1972	Aug	4989.2	5544.1	166.2	6.9	5.5	0.0	0.0	Yes	Yes	8.5	1.7	10.2
1972	Sep	4878.8	5543.4	164.0	10.3	4.3	0.0	0.0	Yes	Yes	12.6	2.5	15.1
1972	Oct	4783.4	5542.8	162.1	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7
1972	Nov	4706.8	5542.3	160.6	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2
1972	Dec	5510.7	5547.1	175.9	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0
1973	Jan	5971.7	5549.7	185.3	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9
1973	Feb	5971.7	5549.7	185.3	14.7	0.0	0.0	0.0	Yes	Yes	18.1	3.6	21.7
1973	Mar	5977.6	5549.7	185.4	17.7	0.0	0.0	0.0	Yes	Yes	21.7	4.4	26.1
1973	Apr	5960.7	5549.6	185.1	56.9	0.0	0.0	0.0	Yes	Yes	69.9	14.1	84.0
1973	May	5934.3	5549.5	184.5	54.3	7.7	0.0	0.0	Yes	Yes	66.7	13.4	80.1
1973	Jun	5904.7	5549.3	183.9	21.2	7.7	0.0	0.0	Yes	Yes	26.0	5.2	31.2
1973	Jul	5771.4	5548.6	181.0	11.6	10.4	0.0	0.0	Yes	Yes	14.3	2.9	17.2
1973	Aug	5638.3	5547.8	178.3	10.0	5.5	0.0	0.0	Yes	Yes	12.3	2.5	14.8
1973	Sep	5521.9	5547.2	176.1	9.8	4.3	0.0	0.0	Yes	Yes	12.0	2.4	14.4
1973	Oct	5419.5	5546.6	174.2	10.5	0.0	0.0	0.0	Yes	Yes	12.9	2.6	15.5
1973	Nov	5337.2	5546.1	172.6	12.3	0.0	0.0	0.0	Yes	Yes	15.1	3.0	18.1
1973	Dec	5970.9	5549.7	185.3	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1
1974	Jan	5971.7	5549.7	185.3	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4
1974	Feb	5971.7	5549.7	185.3	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3
1974	Mar	5977.6	5549.7	185.4	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9
1974	Apr	5960.7	5549.6	185.1	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7
1974	May	5934.3	5549.5	184.5	11.2	7.7	0.0	0.0	Yes	Yes	13.8	2.8	16.6
1974	Jun	5904.7	5549.3	183.9	9.7	7.7	0.0	0.0	Yes	Yes	11.9	2.4	14.3
1974	Jul	5771.4	5548.6	181.0	8.4	8.4	0.0	0.0	No	No	10.3	2.1	12.4
1974	Aug	5312.0	5546.0	172.1	7.0	5.5	0.0	0.0	Yes	Yes	8.6	1.7	10.3
1974	Sep	5199.6	5545.3	170.1	7.6	4.3	0.0	0.0	Yes	Yes	9.4	1.9	11.2
1974	Oct	5100.7	5544.7	168.3	10.8	0.0	0.0	0.0	Yes	Yes	13.2	2.7	15.9
1974	Nov	5021.3	5544.3	166.8	13.2	0.0	0.0	0.0	Yes	Yes	16.2	3.3	19.5
1974	Dec	5811.0	5548.8	181.9	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9
1975	Jan	5971.7	5549.7	185.3	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9
1975	Feb	5971.7	5549.7	185.3	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7
1975	Mar	5977.6	5549.7	185.4	17.0	0.0	0.0	0.0	Yes	Yes	20.9	4.2	25.1
1975	Apr	5960.7	5549.6	185.1	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4
1975	May	5934.3	5549.5	184.5	13.3	7.7	0.0	0.0	Yes	Yes	16.3	3.3	19.6
1975	Jun	5904.7	5549.3	183.9	10.1	7.7	0.0	0.0	Yes	Yes	12.4	2.5	14.9
1975	Jul	5771.4	5548.6	181.0	8.7	8.7	0.0	0.0	No	No	10.7	2.2	12.9
1975	Aug	5344.9	5546.2	172.7	7.6	5.5	0.0	0.0	Yes	Yes	9.3	1.9	11.2
1975	Sep	5232.1	5545.5	170.7	8.2	4.3	0.0	0.0	Yes	Yes	10.1	2.0	12.1
1975	Oct	5132.8	5544.9	168.8	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6
1975	Nov	5053.1	5544.4	167.4	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8
1975	Dec	5785.6	5548.7	181.3	12.4	0.0	0.0	0.0	Yes	Yes	15.2	3.1	18.3
1976	Jan	5971.7	5549.7	185.3	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7
1976	Feb	5971.7	5549.7	185.3	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0
1976	Mar	5977.6	5549.7	185.4	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1
1976	Apr	5960.7	5549.6	185.1	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1
1976	May	5934.3	5549.5	184.5	10.2	7.7	0.0	0.0	Yes	Yes	12.5	2.5	15.0
1976	Jun	5904.7	5549.3	183.9	7.2	7.2	0.0	0.0	No	No	8.9	1.8	10.7
1976	Jul	5595.3	5547.6	177.5	7.9	7.9	0.0	0.0	No	No	9.7	2.0	11.7
1976	Aug	5088.1	5544.7	168.0	7.7	5.5	0.0	0.0	Yes	Yes	9.5	1.9	11.4
1976	Sep	4978.4	5544.0	166.0	8.4	4.3	0.0	0.0	Yes	Yes	10.3	2.1	12.4
1976	Oct	4881.8	5543.4	164.1	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2
1976	Nov	4804.4	5542.9	162.5	8.8	0.0	0.0	0.0	Yes	Yes	10.8	2.2	13.0

Date		to OIC				to COVE				Reservoir Int1			Seepage		Evaporation	
Yr	Mo	River (cfs)	Supp (cfs)	Pre Cove Full	Full?	Hydraulic Cap (cfs)	to Fill Resv (cfs)	Control (cfs)	River (cfs)	Volume (af)	Elevation (ft)	Area (ac)	af	cfs	af	cfs
1967	Jan	0.0	0.0	Yes	Yes	19.1	90.0	19.1	18.1	1614.1	5516.6	84.0	27.1	0.4	0.0	0.0
1967	Feb	0.0	0.0	Yes	Yes	17.3	80.0	17.3	17.3	2545.5	5526.3	110.6	32.2	0.6	0.0	0.0
1967	Mar	0.0	0.0	Yes	Yes	16.2	57.2	16.2	16.2	3510.9	5534.2	133.7	43.2	0.7	7.9	0.1
1967	Apr	0.0	0.0	Yes	Yes	15.4	43.2	15.4	15.4	4375.9	5540.2	153.2	47.9	0.8	32.3	0.5
1967	May	5.1	0.0	Yes	Yes	14.8	28.2	14.8	14.8	5203.6	5545.3	170.1	54.9	0.9	61.1	1.0
1967	Jun	5.1	0.0	Yes	Yes	14.3	17.9	0.0	0.0	4968.0	5543.9	165.8	51.8	0.9	68.4	1.1
1967	Jul	6.8	0.0	Yes	Yes	14.4	19.3	0.0	0.0	4847.8	5543.2	163.4	52.8	0.9	67.4	1.1
1967	Aug	3.6	0.0	Yes	Yes	14.5	22.5	0.0	0.0	4650.2	5542.0	159.5	51.5	0.8	52.6	0.9
1967	Sep	2.9	0.0	Yes	Yes	14.6	25.0	0.0	0.0	4546.0	5541.3	157.1	49.1	0.8	42.3	0.7
1967	Oct	0.0	0.0	Yes	Yes	14.7	25.7	0.0	0.0	4454.7	5540.7	155.0	50.1	0.8	23.1	0.4
1967	**Nov**	**0.0**	**0.0**	**Yes**	**Yes**	**14.7**	**27.7**	**14.7**	**14.7**	**5256.5**	**5545.6**	**171.1**	**53.5**	**0.9**	**2.6**	**0.0**
1967	Dec	0.0	0.0	Yes	Yes	14.2	13.5	13.5	13.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1968	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1968	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1968	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1968	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1968	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1968	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1968	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1968	Aug	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0
1968	Sep	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8
1968	Oct	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4
1968	Nov	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0
1968	Dec	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1969	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1969	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1969	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1969	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1969	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1969	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1969	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1969	Aug	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0
1969	Sep	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8
1969	Oct	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4
1969	Nov	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0
1969	Dec	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1970	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1970	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1970	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1970	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1970	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1970	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1970	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1970	Aug	3.6	0.0	Yes	Yes	14.1	10.8	0.0	0.0	5369.5	5546.3	173.2	55.9	0.9	57.2	0.9
1970	Sep	2.9	0.0	Yes	Yes	14.1	13.0	0.0	0.0	5256.4	5545.6	171.1	53.5	0.9	46.1	0.8
1970	Oct	0.0	0.0	Yes	Yes	14.2	14.2	0.0	0.0	5156.9	5545.1	169.3	54.7	0.9	25.3	0.4
1970	Nov	0.0	0.0	Yes	Yes	14.2	16.1	14.2	14.2	5924.5	5549.4	184.3	57.6	1.0	2.8	0.0
1970	Dec	0.0	0.0	Yes	Yes	13.8	2.7	2.7	2.7	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1971	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1971	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1971	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1971	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1971	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1971	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1971	Jul	6.8	0.0	Yes	Yes	13.8	4.4	0.0	0.0	5764.5	5548.5	180.9	58.4	0.9	74.6	1.2
1971	Aug	3.6	0.0	Yes	Yes	14.2	13.3	0.0	0.0	5214.9	5545.4	170.4	55.0	0.9	56.2	0.9
1971	Sep	2.9	0.0	Yes	Yes	14.2	15.6	0.0	0.0	5103.6	5544.7	168.3	52.6	0.9	45.3	0.8
1971	Oct	0.0	0.0	Yes	Yes	14.3	16.7	0.0	0.0	5005.7	5544.2	166.5	53.8	0.9	24.8	0.4
1971	Nov	0.0	0.0	Yes	Yes	14.3	18.6	14.3	13.0	5698.0	5548.2	179.5	56.1	0.9	2.7	0.0
1971	Dec	0.0	0.0	Yes	Yes	13.9	6.4	6.4	6.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1972	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1972	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1972	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1972	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1972	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1972	Jun	5.1	0.0	Yes	Yes	13.8	4.4	0.0	0.0	5771.6	5548.6	181.0	56.6	1.0	74.7	1.3
1972	Jul	6.0	0.8	No	Yes	13.9	6.4	0.0	0.0	5640.4	5547.9	178.3	57.6	0.9	73.6	1.2
1972	Aug	3.6	0.0	Yes	Yes	14.3	17.0	0.0	0.0	4989.2	5544.1	166.2	53.7	0.9	54.9	0.9
1972	Sep	2.9	0.0	Yes	Yes	14.4	19.4	0.0	0.0	4878.8	5543.4	164.0	51.3	0.9	44.2	0.7
1972	Oct	0.0	0.0	Yes	Yes	14.4	20.3	0.0	0.0	4783.4	5542.8	162.1	52.4	0.9	24.2	0.4
1972	Nov	0.0	0.0	Yes	Yes	14.5	22.3	14.5	14.5	5568.7	5547.4	177.0	55.3	0.9	2.7	0.0
1972	Dec	0.0	0.0	Yes	Yes	14.0	8.5	8.5	8.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1973	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1973	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1973	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1973	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1973	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1973	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1973	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1973	Aug	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0
1973	Sep	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8
1973	Oct	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4
1973	Nov	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0
1973	Dec	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1974	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1974	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1974	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1974	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1974	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1974	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1974	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1974	Aug	3.6	0.0	Yes	Yes	14.1	11.7	0.0	0.0	5312.0	5546.0	172.1	55.6	0.9	56.8	0.9
1974	Sep	2.9	0.0	Yes	Yes	14.2	14.0	0.0	0.0	5199.6	5545.3	170.1	53.1	0.9	45.8	0.8
1974	Oct	0.0	0.0	Yes	Yes	14.2	15.1	0.0	0.0	5100.7	5544.7	168.3	54.3	0.9	25.1	0.4
1974	Nov	0.0	0.0	Yes	Yes	14.3	17.0	14.3	14.3	5870.9	5549.1	183.2	57.2	1.0	2.7	0.0
1974	Dec	0.0	0.0	Yes	Yes	13.8	3.6	3.6	3.6	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1975	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1975	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1975	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1975	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1975	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1975	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1975	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1975	Aug	3.6	0.0	Yes	Yes	14.1	11.2	0.0	0.0	5344.9	5546.2	172.7	55.8	0.9	57.0	0.9
1975	Sep	2.9	0.0	Yes	Yes	14.1	13.4	0.0	0.0	5232.1	5545.5	170.7	53.3	0.9	45.9	0.8
1975	Oct	0.0	0.0	Yes	Yes	14.2	14.6	0.0	0.0	5132.8	5544.9	168.8	54.5	0.9	25.2	0.4
1975	Nov	0.0	0.0	Yes	Yes	14.3	16.5	14.3	13.3	5845.4	5549.0	182.6	57.1	1.0	2.7	0.0
1975	Dec	0.0	0.0	Yes	Yes	13.8	4.0	4.0	4.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1976	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1976	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1976	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1976	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1976	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1976	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1976	Jul	6.8	0.0	Yes	Yes	13.9	7.1	0.0	0.0	5595.3	5547.6	177.5	57.3	0.9	73.2	1.2
1976	Aug	3.6	0.0	Yes	Yes	14.2	15.4	0.0	0.0	5088.1	5544.7	168.0	54.3	0.9	55.4	0.9
1976	Sep	2.9	0.0	Yes	Yes	14.3	17.7	0.0	0.0	4978.4	5544.0	166.0	51.9	0.9	44.7	0.8
1976	Oct	0.0	0.0	Yes	Yes	14.4	18.7	0.0	0.0	4881.8	5543.4	164.1	53.0	0.9	24.5	0.4
1976	Nov	0.0	0.0	Yes	Yes	14.4	20.6	14.4	9.5	5367.9	5546.3	173.2	54.1	0.9	2.6	0.0

Date		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume (af)	Elevation (ft)	Area (ac)	Ave Flow (cfs)	Ave Flow (cfs)	Ave Flow (cfs)	River (cfs)	Supp (cfs)	Pre Cove Full?	Full?	Supp (cfs)	Ave Flow (cfs)	Sum Supp (cfs)	Volume (af)	Elevation (ft)	Area (ac)
1967	Jan	1,587.0	5,516.3	83.2	2.4	0.4	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	1,587.0	5,516.3	83.2
1967	Feb	2,513.2	5,526.0	109.7	2.7	0.6	9.8	0.0	0.0	Yes	Yes	0.0	9.8	0.0	2,513.2	5,526.0	109.7
1967	Mar	3,459.9	5,533.8	132.6	2.9	0.7	13.7	0.0	0.0	Yes	Yes	0.0	13.7	0.0	3,459.9	5,533.8	132.6
1967	Apr	4,295.7	5,539.7	151.4	3.2	0.8	17.3	0.0	0.0	Yes	Yes	0.0	17.3	0.0	4,295.7	5,539.7	151.4
1967	May	5,087.5	5,544.7	168.0	2.8	0.9	8.7	5.2	1.9	Yes	Yes	0.0	3.5	1.9	4,968.0	5,543.9	165.8
1967	Jun	4,847.8	5,543.2	163.4	2.5	0.9	20.8	7.2	0.0	Yes	Yes	0.0	13.6	0.0	4,847.8	5,543.2	163.4
1967	Jul	4,727.6	5,542.5	161.0	1.8	0.9	11.9	8.4	1.3	No	Yes	0.0	3.5	1.3	4,650.2	5,542.0	159.5
1967	Aug	4,546.0	5,541.3	157.1	2.1	0.8	17.9	5.1	0.0	Yes	Yes	0.0	12.8	0.0	4,546.0	5,541.3	157.1
1967	Sep	4,454.7	5,540.7	155.0	2.4	0.8	21.9	4.0	0.0	Yes	Yes	0.0	17.8	0.0	4,454.7	5,540.7	155.0
1967	Oct	4,381.5	5,540.3	153.3	1.9	0.8	20.2	0.0	0.0	Yes	Yes	0.0	20.2	0.0	4,381.5	5,540.3	153.3
1967	**Nov**	**5,200.5**	**5,545.3**	**170.1**	**2.1**	**0.9**	**7.3**	**0.0**	**0.0**	**Yes**	**Yes**	**0.0**	**7.3**	**0.0**	**5,200.5**	**5,545.3**	**170.1**
1967	Dec	5,971.7	5,549.7	185.3	2.3	1.0	10.3	0.0	0.0	Yes	Yes	0.0	10.3	0.0	5,971.7	5,549.7	185.3
1968	Jan	5,971.7	5,549.7	185.3	2.3	1.0	23.1	0.0	0.0	Yes	Yes	0.0	23.1	0.0	5,971.7	5,549.7	185.3
1968	Feb	5,977.6	5,549.7	185.4	2.9	1.0	29.3	0.0	0.0	Yes	Yes	0.0	29.3	0.0	5,977.6	5,549.7	185.4
1968	Mar	5,960.7	5,549.6	185.1	3.4	1.0	33.6	0.0	0.0	Yes	Yes	0.0	33.6	0.0	5,960.7	5,549.6	185.1
1968	Apr	5,934.3	5,549.5	184.5	3.5	1.0	35.0	0.0	0.0	Yes	Yes	0.0	35.0	0.0	5,934.3	5,549.5	184.5
1968	May	5,904.7	5,549.3	183.9	3.0	1.0	24.0	7.1	0.0	Yes	Yes	0.0	16.8	0.0	5,904.7	5,549.3	183.9
1968	Jun	5,771.4	5,548.6	181.0	2.1	1.0	16.8	7.2	0.0	Yes	Yes	0.0	9.7	0.0	5,771.4	5,548.6	181.0
1968	Jul	5,638.3	5,547.8	178.3	1.9	1.0	13.3	9.7	0.0	No	Yes	0.0	3.7	0.0	5,638.3	5,547.8	178.3
1968	Aug	5,521.9	5,547.2	176.1	2.4	0.9	21.2	5.1	0.0	Yes	Yes	0.0	16.1	0.0	5,521.9	5,547.2	176.1
1968	Sep	5,419.5	5,546.6	174.2	1.6	0.9	13.7	4.0	0.0	Yes	Yes	0.0	9.6	0.0	5,419.5	5,546.6	174.2
1968	Oct	5,337.2	5,546.1	172.6	1.8	0.9	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,337.2	5,546.1	172.6
1968	Nov	5,970.9	5,549.7	185.3	2.0	1.0	8.9	0.0	0.0	Yes	Yes	0.0	8.9	0.0	5,970.9	5,549.7	185.3
1968	Dec	5,971.7	5,549.7	185.3	2.0	1.0	19.7	0.0	0.0	Yes	Yes	0.0	19.7	0.0	5,971.7	5,549.7	185.3
1969	Jan	5,971.7	5,549.7	185.3	3.4	1.0	33.4	0.0	0.0	Yes	Yes	0.0	33.4	0.0	5,971.7	5,549.7	185.3
1969	Feb	5,977.6	5,549.7	185.4	2.9	1.0	29.0	0.0	0.0	Yes	Yes	0.0	29.0	0.0	5,977.6	5,549.7	185.4
1969	Mar	5,960.7	5,549.6	185.1	4.2	1.0	42.1	0.0	0.0	Yes	Yes	0.0	42.1	0.0	5,960.7	5,549.6	185.1
1969	Apr	5,934.3	5,549.5	184.5	17.7	1.0	176.0	0.0	0.0	Yes	Yes	0.0	176.0	0.0	5,934.3	5,549.5	184.5
1969	May	5,904.7	5,549.3	183.9	10.5	1.0	98.5	7.1	0.0	Yes	Yes	0.0	91.3	0.0	5,904.7	5,549.3	183.9
1969	Jun	5,771.4	5,548.6	181.0	4.4	1.0	39.8	7.2	0.0	Yes	Yes	0.0	32.6	0.0	5,771.4	5,548.6	181.0
1969	Jul	5,638.3	5,547.8	178.3	3.7	1.0	31.4	9.7	0.0	Yes	Yes	0.0	21.7	0.0	5,638.3	5,547.8	178.3
1969	Aug	5,521.9	5,547.2	176.1	2.8	0.9	25.1	5.1	0.0	Yes	Yes	0.0	20.0	0.0	5,521.9	5,547.2	176.1
1969	Sep	5,419.5	5,546.6	174.2	2.2	0.9	20.2	4.0	0.0	Yes	Yes	0.0	16.2	0.0	5,419.5	5,546.6	174.2
1969	Oct	5,337.2	5,546.1	172.6	2.5	0.9	25.5	0.0	0.0	Yes	Yes	0.0	25.5	0.0	5,337.2	5,546.1	172.6
1969	Nov	5,970.9	5,549.7	185.3	2.6	1.0	14.8	0.0	0.0	Yes	Yes	0.0	14.8	0.0	5,970.9	5,549.7	185.3
1969	Dec	5,971.7	5,549.7	185.3	2.3	1.0	23.1	0.0	0.0	Yes	Yes	0.0	23.1	0.0	5,971.7	5,549.7	185.3
1970	Jan	5,971.7	5,549.7	185.3	2.4	1.0	23.5	0.0	0.0	Yes	Yes	0.0	23.5	0.0	5,971.7	5,549.7	185.3
1970	Feb	5,977.6	5,549.7	185.4	2.6	1.0	26.1	0.0	0.0	Yes	Yes	0.0	26.1	0.0	5,977.6	5,549.7	185.4
1970	Mar	5,960.7	5,549.6	185.1	2.8	1.0	28.3	0.0	0.0	Yes	Yes	0.0	28.3	0.0	5,960.7	5,549.6	185.1
1970	Apr	5,934.3	5,549.5	184.5	2.2	1.0	21.5	0.0	0.0	Yes	Yes	0.0	21.5	0.0	5,934.3	5,549.5	184.5
1970	May	5,904.7	5,549.3	183.9	1.9	1.0	13.7	7.1	0.0	Yes	Yes	0.0	6.5	0.0	5,904.7	5,549.3	183.9
1970	Jun	5,771.4	5,548.6	181.0	1.6	1.0	11.6	7.2	0.0	No	Yes	0.0	4.5	0.0	5,771.4	5,548.6	181.0
1970	Jul	5,638.3	5,547.8	178.3	1.5	1.0	8.8	5.3	4.4	No	Yes	0.0	3.5	4.4	5,369.5	5,546.3	173.2
1970	Aug	5,256.4	5,545.6	171.1	1.5	0.9	11.8	5.1	0.0	Yes	Yes	0.0	6.7	0.0	5,256.4	5,545.6	171.1
1970	Sep	5,156.9	5,545.1	169.3	1.5	0.9	12.7	4.0	0.0	Yes	Yes	0.0	8.7	0.0	5,156.9	5,545.1	169.3
1970	Oct	5,077.0	5,544.6	167.8	1.7	0.9	18.2	0.0	0.0	Yes	Yes	0.0	18.2	0.0	5,077.0	5,544.6	167.8
1970	Nov	5,864.2	5,549.1	183.0	2.1	1.0	8.1	0.0	0.0	Yes	Yes	0.0	8.1	0.0	5,864.2	5,549.1	183.0
1970	Dec	5,971.7	5,549.7	185.3	2.1	1.0	19.5	0.0	0.0	Yes	Yes	0.0	19.5	0.0	5,971.7	5,549.7	185.3
1971	Jan	5,971.7	5,549.7	185.3	2.4	1.0	24.0	0.0	0.0	Yes	Yes	0.0	24.0	0.0	5,971.7	5,549.7	185.3
1971	Feb	5,977.6	5,549.7	185.4	2.3	1.0	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	5,977.6	5,549.7	185.4
1971	Mar	5,960.7	5,549.6	185.1	2.3	1.0	22.7	0.0	0.0	Yes	Yes	0.0	22.7	0.0	5,960.7	5,549.6	185.1
1971	Apr	5,934.3	5,549.5	184.5	1.8	1.0	18.1	0.0	0.0	Yes	Yes	0.0	18.1	0.0	5,934.3	5,549.5	184.5
1971	May	5,904.7	5,549.3	183.9	2.1	1.0	14.8	7.1	0.0	Yes	Yes	0.0	7.6	0.0	5,904.7	5,549.3	183.9
1971	Jun	5,771.4	5,548.6	181.0	1.5	1.0	10.6	7.1	0.1	No	Yes	0.0	3.5	0.1	5,764.5	5,548.5	180.9
1971	Jul	5,631.5	5,547.8	178.1	1.2	0.9	6.4	2.9	6.8	No	Yes	0.0	3.5	6.8	5,214.9	5,545.4	170.4
1971	Aug	5,103.6	5,544.7	168.3	1.4	0.9	11.4	5.1	0.0	Yes	Yes	0.0	6.3	0.0	5,103.6	5,544.7	168.3
1971	Sep	5,005.7	5,544.2	166.5	1.2	0.9	10.5	4.0	0.0	Yes	Yes	0.0	6.4	0.0	5,005.7	5,544.2	166.5
1971	Oct	4,927.1	5,543.7	165.0	1.8	0.9	18.4	0.0	0.0	Yes	Yes	0.0	18.4	0.0	4,927.1	5,543.7	165.0
1971	Nov	5,639.2	5,547.8	178.3	1.8	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,639.2	5,547.8	178.3
1971	Dec	5,971.7	5,549.7	185.3	3.1	1.0	26.0	0.0	0.0	Yes	Yes	0.0	26.0	0.0	5,971.7	5,549.7	185.3
1972	Jan	5,971.7	5,549.7	185.3	2.0	1.0	20.0	0.0	0.0	Yes	Yes	0.0	20.0	0.0	5,971.7	5,549.7	185.3
1972	Feb	5,977.6	5,549.7	185.4	2.2	1.0	21.7	0.0	0.0	Yes	Yes	0.0	21.7	0.0	5,977.6	5,549.7	185.4
1972	Mar	5,960.7	5,549.6	185.1	1.9	1.0	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,960.7	5,549.6	185.1
1972	Apr	5,934.3	5,549.5	184.5	1.7	1.0	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	5,934.3	5,549.5	184.5
1972	May	5,904.7	5,549.3	183.9	1.4	1.0	8.5	5.0	2.2	No	Yes	0.0	3.5	2.2	5,771.6	5,548.6	181.0
1972	Jun	5,640.4	5,547.9	178.3	1.6	1.0	11.9	7.2	0.0	Yes	Yes	0.0	4.7	0.0	5,640.4	5,547.9	178.3
1972	Jul	5,509.3	5,547.1	175.8	1.1	0.9	5.5	2.0	7.7	No	Yes	0.0	3.5	8.5	4,989.2	5,544.1	166.2
1972	Aug	4,880.7	5,543.4	164.1	1.1	0.9	8.6	5.1	0.0	No	Yes	0.0	3.5	0.0	4,878.8	5,543.4	164.0
1972	Sep	4,783.4	5,542.8	162.1	1.7	0.9	14.8	4.0	0.0	Yes	Yes	0.0	10.8	0.0	4,783.4	5,542.8	162.1
1972	Oct	4,706.8	5,542.3	160.6	2.2	0.9	22.7	0.0	0.0	Yes	Yes	0.0	22.7	0.0	4,706.8	5,542.3	160.6
1972	Nov	5,510.7	5,547.1	175.9	2.1	0.9	7.8	0.0	0.0	Yes	Yes	0.0	7.8	0.0	5,510.7	5,547.1	175.9
1972	Dec	5,971.7	5,549.7	185.3	2.1	1.0	13.6	0.0	0.0	Yes	Yes	0.0	13.6	0.0	5,971.7	5,549.7	185.3
1973	Jan	5,971.7	5,549.7	185.3	2.2	1.0	22.2	0.0	0.0	Yes	Yes	0.0	22.2	0.0	5,971.7	5,549.7	185.3
1973	Feb	5,977.6	5,549.7	185.4	2.4	1.0	24.1	0.0	0.0	Yes	Yes	0.0	24.1	0.0	5,977.6	5,549.7	185.4
1973	Mar	5,960.7	5,549.6	185.1	2.9	1.0	29.1	0.0	0.0	Yes	Yes	0.0	29.1	0.0	5,960.7	5,549.6	185.1
1973	Apr	5,934.3	5,549.5	184.5	9.4	1.0	93.1	0.0	0.0	Yes	Yes	0.0	93.1	0.0	5,934.3	5,549.5	184.5
1973	May	5,904.7	5,549.3	183.9	8.9	1.0	83.4	7.1	0.0	Yes	Yes	0.0	76.2	0.0	5,904.7	5,549.3	183.9
1973	Jun	5,771.4	5,548.6	181.0	3.5	1.0	30.6	7.2	0.0	Yes	Yes	0.0	23.4	0.0	5,771.4	5,548.6	181.0
1973	Jul	5,638.3	5,547.8	178.3	1.9	1.0	13.2	9.7	0.0	No	Yes	0.0	3.5	0.0	5,638.3	5,547.8	178.3
1973	Aug	5,521.9	5,547.2	176.1	1.6	0.9	13.7	5.1	0.0	Yes	Yes	0.0	8.6	0.0	5,521.9	5,547.2	176.1
1973	Sep	5,419.5	5,546.6	174.2	1.6	0.9	14.1	4.0	0.0	Yes	Yes	0.0	10.0	0.0	5,419.5	5,546.6	174.2
1973	Oct	5,337.2	5,546.1	172.6	1.7	0.9	18.1	0.0	0.0	Yes	Yes	0.0	18.1	0.0	5,337.2	5,546.1	172.6
1973	Nov	5,970.9	5,549.7	185.3	2.0	1.0	9.5	0.0	0.0	Yes	Yes	0.0	9.5	0.0	5,970.9	5,549.7	185.3
1973	Dec	5,971.7	5,549.7	185.3	2.1	1.0	21.2	0.0	0.0	Yes	Yes	0.0	21.2	0.0	5,971.7	5,549.7	185.3
1974	Jan	5,971.7	5,549.7	185.3	2.3	1.0	22.7	0.0	0.0	Yes	Yes	0.0	22.7	0.0	5,971.7	5,549.7	185.3
1974	Feb	5,977.6	5,549.7	185.4	2.3	1.0	22.5	0.0	0.0	Yes	Yes	0.0	22.5	0.0	5,977.6	5,549.7	185.4
1974	Mar	5,960.7	5,549.6	185.1	2.6	1.0	25.6	0.0	0.0	Yes	Yes	0.0	25.6	0.0	5,960.7	5,549.6	185.1
1974	Apr	5,934.3	5,549.5	184.5	2.1	1.0	20.6	0.0	0.0	Yes	Yes	0.0	20.6	0.0	5,934.3	5,549.5	184.5
1974	May	5,904.7	5,549.3	183.9	1.8	1.0	12.8	7.1	0.0	Yes	Yes	0.0	5.6	0.0	5,904.7	5,549.3	183.9
1974	Jun	5,771.4	5,548.6	181.0	1.6	1.0	11.8	7.2	0.0	Yes	Yes	0.0	4.6	0.0	5,771.4	5,548.6	181.0
1974	Jul	5,638.3	5,547.8	178.3	1.4	1.0	7.9	4.4	5.3	No	Yes	0.0	3.5	5.3	5,312.0	5,546.0	172.1
1974	Aug	5,199.6	5,545.3	170.1	1.2	0.9	8.8	5.1	0.0	No	Yes	0.0	3.7	0.0	5,199.6	5,545.3	170.1
1974	Sep	5,100.7	5,544.7	168.3	1.3	0.9	10.5	4.0	0.0	Yes	Yes	0.0	6.5	0.0	5,100.7	5,544.7	168.3
1974	Oct	5,021.3	5,544.3	166.8	1.8	0.9	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	5,021.3	5,544.3	166.8
1974	Nov	5,811.0	5,548.8	181.9	2.2	1.0	8.3	0.0	0.0	Yes	Yes	0.0	8.3	0.0	5,811.0	5,548.8	181.9
1974	Dec	5,971.7	5,549.7	185.3	2.0	1.0	17.3	0.0	0.0	Yes	Yes	0.0	17.3	0.0	5,971.7	5,549.7	185.3
1975	Jan	5,971.7	5,549.7	185.3	2.0	1.0	19.9	0.0	0.0	Yes	Yes	0.0	19.9	0.0	5,971.7	5,549.7	185.3
1975	Feb	5,977.6	5,549.7	185.4	2.1	1.0	20.7	0.0	0.0	Yes	Yes	0.0	20.7	0.0	5,977.6	5,549.7	185.4
1975	Mar	5,960.7	5,549.6	185.1	2.8	1.0	28.0	0.0	0.0	Yes	Yes	0.0	28.0	0.0	5,960.7	5,549.6	185.1
1975	Apr	5,934.3	5,549.5	184.5	2.7	1.0	26.9	0.0	0.0	Yes	Yes	0.0	26.9	0.0	5,934.3	5,549.5	184.5
1975	May	5,904.7	5,549.3	183.9	2.2	1.0	16.1	7.1	0.0	Yes	Yes	0.0	8.9	0.0	5,904.7	5,549.3	183.9
1975	Jun	5,771.4	5,548.6	181.0	1.7	1.0	12.4	7.2	0.0	Yes	Yes	0.0	5.3	0.0	5,771.4	5,548.6	181.0
1975	Jul	5,638.3	5,547.8	178.3	1.4	1.0	8.4	4.9	4.8	No	Yes	0.0	3.5	4.8	5,344.9	5,546.2	172.7
1975	Aug	5,232.1	5,545.5	170.7	1.2	0.9	9.7	5.1	0.0	Yes	Yes	0.0	4.6	0.0	5,232.1	5,545.5	170.7
1975	Sep	5,132.8	5,544.9	168.8	1.4	0.9	11.5	4.0	0.0	Yes	Yes	0.0	7.5	0.0	5,132.8	5,544.9	168.8
1975	Oct	5,053.1	5,544.4	167.4	1.5	0.9	16.0	0.0	0.0	Yes	Yes	0.0	16.0	0.0	5,053.1	5,544.4	167.4
1975	Nov	5,785.6	5,548.7	181.3	1.9	1.0	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,785.6	5,548.7	181.3
1975	Dec	5,971.7	5,549.7	185.3	2.0	1.0	17.3	0.0	0.0	Yes	Yes	0.0	17.3	0.0	5,971.7	5,549.7	185.3
1976	Jan	5,971.7	5,549.7	185.3	1.8	1.0	17.5	0.0	0.0	Yes	Yes	0.0	17.5	0.0	5,971.7	5,549.7	185.3
1976	Feb	5,977.6	5,549.7	185.4	2.5	1.0	24.3	0.0	0.0	Yes	Yes	0.0	24.3	0.0	5,977.6	5,549.7	185.4
1976	Mar	5,960.7	5,549.6	185.1	2.2	1.0	22.4	0.0	0.0	Yes	Yes	0.0	22.4	0.0	5,960.7	5,549.6	185.1
1976	Apr	5,934.3	5,549.5	184.5	2.1	1.0	21.0	0.0	0.0	Yes	Yes	0.0	21.0	0.0	5,934.3	5,549.5	184.5
1976	May	5,904.7	5,549.3	183.9	1.7	1.0	11.0	7.1	0.0	Yes	Yes	0.0	3.9	0.0	5,904.7	5,549.3	183.9
1976	Jun	5,771.4	5,548.6	181.0	1.2	1.0	7.7	4.2	3.0	No	Yes	0.0	3.5	3.0	5,595.3	5,547.6	177.5
1976	Jul	5,464.8	5,546.8	175.0	1.3	0.9	7.0	3.5	6.1	No	Yes	0.0	3.5	6.1	5,088.1	5,544.7	168.0
1976	Aug	4,978.4	5,544.0	166.0	1.3	0.9	9.9	5.1	0.0	Yes	Yes	0.0	4.8	0.0	4,978.4	5,544.0	166.0
1976	Sep	4,881.8	5,543.4	164.1	1.4	0.9	11.8	4.0	0.0	Yes	Yes	0.0	7.7	0.0	4,881.8	5,543.4	164.1
1976	Oct	4,804.4	5,542.9	162.5	1.6	0.9	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	4,804.4	5,542.9	162.5
1976	Nov	5,311.2	5,546.0	172.1	1.4	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,311.2	5,546.0	172.1

ALPHA ENGINEERING

E-384

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River	to OIC				to COVE				Reservoir Int1			Seepage		Evaporation		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full?	Full?	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full	Full?	Hydraulic Cap	to Fill Resv	Control	River	Volume	Elevation	Area					Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full?	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs	af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
1976	Dec	5311.2	5546.0	172.1	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes	14.1	11.7	11.7	10.3	5945.3	5549.5	184.7	59.7	1.0	0.0	0.0	5,885.6	5,549.2	183.5	1.5	1.0	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,885.6	5,549.2	183.5
1977	Jan	5885.6	5549.2	183.5	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes	13.8	2.4	2.4	2.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	1.6	1.0	14.4	0.0	0.0	Yes	Yes	0.0	14.4	0.0	5,971.7	5,549.7	185.3
1977	Feb	5971.7	5549.7	185.3	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	1.6	1.0	16.0	0.0	0.0	Yes	Yes	0.0	16.0	0.0	5,977.6	5,549.7	185.4
1977	Mar	5977.6	5549.7	185.4	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	1.5	1.0	15.4	0.0	0.0	Yes	Yes	0.0	15.4	0.0	5,960.7	5,549.6	185.1
1977	Apr	5960.7	5549.6	185.1	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.5	1.0	14.5	0.0	0.0	Yes	Yes	0.0	14.5	0.0	5,934.3	5,549.5	184.5
1977	May	5934.3	5549.5	184.5	10.1	7.7	0.0	0.0	Yes	Yes	12.4	2.5	14.9	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.7	1.0	10.9	7.1	0.0	Yes	Yes	0.0	3.7	0.0	5,904.7	5,549.3	183.9
1977	Jun	5904.7	5549.3	183.9	7.3	7.3	0.0	0.0	No	No	8.9	1.8	10.7	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.2	1.0	7.8	4.3	2.9	No	Yes	0.0	3.5	2.9	5,599.2	5,547.6	177.5
1977	Jul	5599.2	5547.6	177.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7	6.2	0.7	No	Yes	13.9	7.0	0.0	0.0	5599.2	5547.6	177.5	57.3	0.9	73.2	1.2	5,468.7	5,546.9	175.1	1.1	0.9	5.5	2.0	7.7	No	Yes	0.0	3.5	8.3	4,957.4	5,543.9	165.6
1977	Aug	4957.4	5543.9	165.6	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.6	9.8	3.6	0.0	Yes	Yes	14.3	17.5	0.0	0.0	4957.4	5543.9	165.6	53.5	0.9	54.6	0.9	4,849.3	5,543.2	163.4	1.1	0.9	8.2	4.7	0.4	No	Yes	0.0	3.5	0.4	4,823.4	5,543.1	162.9
1977	Sep	4823.4	5543.1	162.9	7.0	4.3	0.0	0.0	Yes	Yes	8.6	1.7	10.4	2.9	0.0	Yes	Yes	14.4	20.3	0.0	0.0	4823.4	5543.1	162.9	50.9	0.9	43.9	0.7	4,728.6	5,542.5	161.0	1.2	0.9	9.5	4.0	0.0	Yes	Yes	0.0	5.4	0.0	4,728.6	5,542.5	161.0
1977	Oct	4728.6	5542.5	161.0	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5	0.0	0.0	Yes	Yes	14.5	21.2	0.0	0.0	4728.6	5542.5	161.0	52.0	0.8	24.0	0.4	4,652.6	5,542.0	159.5	1.4	0.8	14.7	0.0	0.0	Yes	Yes	0.0	14.7	0.0	4,652.6	5,542.0	159.5
1977	Nov	4652.6	5542.0	159.5	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes	14.5	23.2	14.5	10.7	5287.6	5545.8	171.7	53.7	0.9	2.6	0.0	5,231.4	5,545.5	170.7	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,231.4	5,545.5	170.7
1977	Dec	5231.4	5545.5	170.7	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	14.1	13.0	13.0	11.0	5909.7	5549.3	184.0	59.4	1.0	0.0	0.0	5,850.3	5,549.0	182.7	1.6	1.0	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	5,850.3	5,549.0	182.7
1978	Jan	5850.3	5549.0	182.7	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes	13.8	3.0	3.0	3.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	1.9	1.0	17.0	0.0	0.0	Yes	Yes	0.0	17.0	0.0	5,971.7	5,549.7	185.3
1978	Feb	5971.7	5549.7	185.3	14.5	0.0	0.0	0.0	Yes	Yes	17.8	3.6	21.4	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.4	1.0	23.7	0.0	0.0	Yes	Yes	0.0	23.7	0.0	5,977.6	5,549.7	185.4
1978	Mar	5977.6	5549.7	185.4	27.9	0.0	0.0	0.0	Yes	Yes	34.3	6.9	41.2	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	4.6	1.0	45.9	0.0	0.0	Yes	Yes	0.0	45.9	0.0	5,960.7	5,549.6	185.1
1978	Apr	5960.7	5549.6	185.1	38.9	0.0	0.0	0.0	Yes	Yes	47.8	9.6	57.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	6.4	1.0	63.6	0.0	0.0	Yes	Yes	0.0	63.6	0.0	5,934.3	5,549.5	184.5
1978	May	5934.3	5549.5	184.5	25.1	7.7	0.0	0.0	Yes	Yes	30.8	6.2	37.0	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	4.1	1.0	35.5	7.1	0.0	Yes	Yes	0.0	28.3	0.0	5,904.7	5,549.3	183.9
1978	Jun	5904.7	5549.3	183.9	13.2	7.7	0.0	0.0	Yes	Yes	16.2	3.3	19.5	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	2.2	1.0	17.5	7.2	0.0	Yes	Yes	0.0	10.3	0.0	5,771.4	5,548.6	181.0
1978	Jul	5771.4	5548.6	181.0	10.2	10.2	0.0	0.0	No	No	12.5	2.5	15.0	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.7	1.0	10.8	7.3	2.4	No	Yes	0.0	3.5	2.4	5,492.6	5,547.0	175.5
1978	Aug	5492.6	5547.0	175.5	9.2	5.5	0.0	0.0	Yes	Yes	11.3	2.3	13.6	3.6	0.0	Yes	Yes	14.0	8.8	0.0	0.0	5492.6	5547.0	175.5	56.7	0.9	57.9	0.9	5,378.0	5,546.4	173.4	1.5	0.9	12.4	5.1	0.0	Yes	Yes	0.0	7.3	0.0	5,378.0	5,546.4	173.4
1978	Sep	5378.0	5546.4	173.4	9.2	4.3	0.0	0.0	Yes	Yes	11.3	2.3	13.6	2.9	0.0	Yes	Yes	14.1	11.0	0.0	0.0	5378.0	5546.4	173.4	54.2	0.9	46.7	0.8	5,277.2	5,545.8	171.5	1.5	0.9	13.1	4.0	0.0	Yes	Yes	0.0	9.1	0.0	5,277.2	5,545.8	171.5
1978	Oct	5277.2	5545.8	171.5	9.8	0.0	0.0	0.0	Yes	Yes	12.0	2.4	14.4	0.0	0.0	Yes	Yes	14.1	12.3	0.0	0.0	5277.2	5545.8	171.5	55.4	0.9	25.6	0.4	5,196.2	5,545.3	170.0	1.6	0.9	16.9	0.0	0.0	Yes	Yes	0.0	16.9	0.0	5,196.2	5,545.3	170.0
1978	Nov	5196.2	5545.3	170.0	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4	0.0	0.0	Yes	Yes	14.2	14.0	14.0	14.0	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3	2.6	1.0	13.0	0.0	0.0	Yes	Yes	0.0	13.0	0.0	5,970.9	5,549.7	185.3
1978	Dec	5970.9	5549.7	185.3	13.4	0.0	0.0	0.0	Yes	Yes	16.5	3.3	19.8	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.2	1.0	22.0	0.0	0.0	Yes	Yes	0.0	22.0	0.0	5,971.7	5,549.7	185.3
1979	Jan	5971.7	5549.7	185.3	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	23.5	0.0	0.0	Yes	Yes	0.0	23.5	0.0	5,971.7	5,549.7	185.3
1979	Feb	5971.7	5549.7	185.3	15.6	0.0	0.0	0.0	Yes	Yes	19.1	3.8	22.9	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.6	1.0	25.4	0.0	0.0	Yes	Yes	0.0	25.4	0.0	5,977.6	5,549.7	185.4
1979	Mar	5977.6	5549.7	185.4	26.5	0.0	0.0	0.0	Yes	Yes	32.5	6.5	39.0	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	4.4	1.0	43.5	0.0	0.0	Yes	Yes	0.0	43.5	0.0	5,960.7	5,549.6	185.1
1979	Apr	5960.7	5549.6	185.1	108.3	0.0	0.0	0.0	Yes	Yes	133.0	26.7	159.7	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	17.8	1.0	177.3	0.0	0.0	Yes	Yes	0.0	177.3	0.0	5,934.3	5,549.5	184.5
1979	May	5934.3	5549.5	184.5	83.9	7.7	0.0	0.0	Yes	Yes	103.0	20.7	123.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	13.8	1.0	131.8	7.1	0.0	Yes	Yes	0.0	124.7	0.0	5,904.7	5,549.3	183.9
1979	Jun	5904.7	5549.3	183.9	25.9	7.7	0.0	0.0	Yes	Yes	31.8	6.4	38.2	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	4.3	1.0	38.3	7.2	0.0	Yes	Yes	0.0	31.2	0.0	5,771.4	5,548.6	181.0
1979	Jul	5771.4	5548.6	181.0	15.3	10.4	0.0	0.0	Yes	Yes	18.8	3.8	22.6	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	2.5	1.0	19.2	9.7	0.0	Yes	Yes	0.0	9.5	0.0	5,638.3	5,547.8	178.3
1979	Aug	5638.3	5547.8	178.3	14.4	5.5	0.0	0.0	Yes	Yes	17.7	3.6	21.3	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0	5,521.9	5,547.2	176.1	2.4	0.9	20.9	5.1	0.0	Yes	Yes	0.0	15.8	0.0	5,521.9	5,547.2	176.1
1979	Sep	5521.9	5547.2	176.1	12.0	4.3	0.0	0.0	Yes	Yes	14.7	3.0	17.7	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8	5,419.5	5,546.6	174.2	2.0	0.9	17.7	4.0	0.0	Yes	Yes	0.0	13.6	0.0	5,419.5	5,546.6	174.2
1979	Oct	5419.5	5546.6	174.2	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4	5,337.2	5,546.1	172.6	2.1	0.9	22.3	0.0	0.0	Yes	Yes	0.0	22.3	0.0	5,337.2	5,546.1	172.6
1979	Nov	5337.2	5546.1	172.6	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3	2.3	1.0	12.4	0.0	0.0	Yes	Yes	0.0	12.4	0.0	5,970.9	5,549.7	185.3
1979	Dec	5970.9	5549.7	185.3	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.5	1.0	24.4	0.0	0.0	Yes	Yes	0.0	24.4	0.0	5,971.7	5,549.7	185.3
1980	Jan	5971.7	5549.7	185.3	21.3	0.0	0.0	0.0	Yes	Yes	26.2	5.3	31.5	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.5	1.0	35.0	0.0	0.0	Yes	Yes	0.0	35.0	0.0	5,971.7	5,549.7	185.3
1980	Feb	5971.7	5549.7	185.3	29.6	0.0	0.0	0.0	Yes	Yes	36.4	7.3	43.7	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	4.9	1.0	48.5	0.0	0.0	Yes	Yes	0.0	48.5	0.0	5,977.6	5,549.7	185.4
1980	Mar	5977.6	5549.7	185.4	34.9	0.0	0.0	0.0	Yes	Yes	42.9	8.6	51.5	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	5.7	1.0	57.4	0.0	0.0	Yes	Yes	0.0	57.4	0.0	5,960.7	5,549.6	185.1
1980	Apr	5960.7	5549.6	185.1	118.1	0.0	0.0	0.0	Yes	Yes	145.0	29.1	174.1	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	19.4	1.0	193.4	0.0	0.0	Yes	Yes	0.0	193.4	0.0	5,934.3	5,549.5	184.5
1980	May	5934.3	5549.5	184.5	106.7	7.7	0.0	0.0	Yes	Yes	131.0	26.3	157.3	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	17.6	1.0	169.2	7.1	0.0	Yes	Yes	0.0	162.1	0.0	5,904.7	5,549.3	183.9
1980	Jun	5904.7	5549.3	183.9	35.5	7.7	0.0	0.0	Yes	Yes	43.6	8.8	52.4	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	5.8	1.0	54.1	7.2	0.0	Yes	Yes	0.0	46.9	0.0	5,771.4	5,548.6	181.0
1980	Jul	5771.4	5548.6	181.0	22.8	10.4	0.0	0.0	Yes	Yes	28.0	5.6	33.6	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	3.8	1.0	31.5	9.7	0.0	Yes	Yes	0.0	21.8	0.0	5,638.3	5,547.8	178.3
1980	Aug	5638.3	5547.8	178.3	21.1	5.5	0.0	0.0	Yes	Yes	25.9	5.2	31.1	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0	5,521.9	5,547.2	176.1	3.5	0.9	31.9	5.1	0.0	Yes	Yes	0.0	26.8	0.0	5,521.9	5,547.2	176.1
1980	Sep	5521.9	5547.2	176.1	20.1	4.3	0.0	0.0	Yes	Yes	24.7	5.0	29.7	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8	5,419.5	5,546.6	174.2	3.3	0.9	31.0	4.0	0.0	Yes	Yes	0.0	27.0	0.0	5,419.5	5,546.6	174.2
1980	Oct	5419.5	5546.6	174.2	18.2	0.0	0.0	0.0	Yes	Yes	22.3	4.5	26.8	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4	5,337.2	5,546.1	172.6	3.0	0.9	30.7	0.0	0.0	Yes	Yes	0.0	30.7	0.0	5,337.2	5,546.1	172.6
1980	Nov	5337.2	5546.1	172.6	17.7	0.0	0.0	0.0	Yes	Yes	21.7	4.4	26.1	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3	2.9	1.0	18.3	0.0	0.0	Yes	Yes	0.0	18.3	0.0	5,970.9	5,549.7	185.3
1980	Dec	5970.9	5549.7	185.3	18.2	0.0	0.0	0.0	Yes	Yes	22.4	4.5	26.9	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.0	1.0	29.9	0.0	0.0	Yes	Yes	0.0	29.9	0.0	5,971.7	5,549.7	185.3
1981	Jan	5971.7	5549.7	185.3	17.8	0.0	0.0	0.0	Yes	Yes	21.8	4.4	26.2	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.9	1.0	29.1	0.0	0.0	Yes	Yes	0.0	29.1	0.0	5,971.7	5,549.7	185.3
1981	Feb	5971.7	5549.7	185.3	18.2	0.0	0.0	0.0	Yes	Yes	22.4	4.5	26.9	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.0	1.0	29.8	0.0	0.0	Yes	Yes	0.0	29.8	0.0	5,977.6	5,549.7	185.4
1981	Mar	5977.6	5549.7	185.4	21.3	0.0	0.0	0.0	Yes	Yes	26.2	5.3	31.5	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.5	1.0	35.1	0.0	0.0	Yes	Yes	0.0	35.1	0.0	5,960.7	5,549.6	185.1
1981	Apr	5960.7	5549.6	185.1	18.0	0.0	0.0	0.0	Yes	Yes	22.1	4.4	26.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.0	1.0	29.3	0.0	0.0	Yes	Yes	0.0	29.3	0.0	5,934.3	5,549.5	184.5
1981	May	5934.3	5549.5	184.5	14.7	7.7	0.0	0.0	Yes	Yes	18.1	3.6	21.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.4	1.0	18.5	7.1	0.0	Yes	Yes	0.0	11.3	0.0	5,904.7	5,549.3	183.9
1981	Jun	5904.7	5549.3	183.9	11.2	7.7	0.0	0.0	Yes	Yes	13.7	2.8	16.5	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.8	1.0	14.2	7.2	0.0	Yes	Yes	0.0	7.0	0.0	5,771.4	5,548.6	181.0
1981	Jul	5771.4	5548.6	181.0	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.6	1.0	9.7	6.2	3.4	No	Yes	0.0	3.5	3.4	5,427.0	5,546.6	174.3
1981	Aug	5427.0	5546.6	174.3	10.1	5.5	0.0	0.0	Yes	Yes	12.4	2.5	14.9	3.6	0.0	Yes	Yes	14.0	9.8	0.0	0.0	5427.0	5546.6	174.3	56.3	0.9	57.5	0.9	5,313.2	5,546.0	172.2	1.7	0.9	13.9	5.1	0.0	Yes	Yes	0.0	8.7	0.0	5,313.2	5,546.0	172.2
1981	Sep	5313.2	5546.0	172.2	10.7	4.3	0.0	0.0	Yes	Yes	13.1	2.6	15.7	2.9	0.0	Yes	Yes	14.1	12.1	0.0	0.0	5313.2	5546.0	172.2	53.8	0.9	46.3	0.8	5,213.0	5,545.4	170.3	1.8	0.9	15.5	4.0	0.0	Yes	Yes	0.0	11.5	0.0	5,213.0	5,545.4	170.3
1981	Oct	5213.0	5545.4	170.3	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7	0.0	0.0	Yes	Yes	14.2	13.3	0.0	0.0	5213.0	5545.4	170.3	55.0	0.9	25.4	0.4	5,132.6	5,544.9	168.8	2.2	0.9	22.8	0.0	0.0	Yes	Yes	0.0	22.8	0.0	5,132.6	5,544.9	168.8
1981	Nov	5132.6	5544.9	168.8	13.2	0.0	0.0	0.0	Yes	Yes	16.2	3.3	19.5	0.0	0.0	Yes	Yes	14.2	15.1	14.2	14.2	5978.1	5549.7	185.4	58.0	1.0	2.8	0.0	5,917.4	5,549.4	184.2	2.2	1.0	8.4	0.0	0.0	Yes	Yes	0.0	8.4	0.0	5,917.4	5,549.4	184.2
1981	Dec	5917.4	5549.4	184.2	13.4	0.0	0.0	0.0	Yes	Yes	16.4	3.3	19.7	0.0	0.0	Yes	Yes	13.7	1.9	1.9	1.9	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.2	1.0	21.0	0.0	0.0	Yes	Yes	0.0	21.0	0.0	5,971.7	5,549.7	185.3
1982	Jan	5971.7	5549.7	185.3	14.4	0.0	0.0	0.0	Yes	Yes	17.7	3.6	21.3	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.4	1.0	23.6	0.0	0.0	Yes	Yes	0.0	23.6	0.0	5,971.7	5,549.7	185.3
1982	Feb	5971.7	5549.7	185.3	16.7	0.0	0.0	0.0	Yes	Yes	20.5	4.1	24.6	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.7	1.0	27.3	0.0	0.0	Yes	Yes	0.0	27.3	0.0	5,977.6	5,549.7	185.4
1982	Mar	5977.6	5549.7	185.4	22.9	0.0	0.0	0.0	Yes	Yes	28.1	5.6	33.7	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.8	1.0	37.6	0.0	0.0	Yes	Yes	0.0	37.6	0.0	5,960.7	5,549.6	185.1
1982	Apr	5960.7	5549.6	185.1	22.7	0.0	0.0	0.0	Yes	Yes	27.9	5.6	33.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.7	1.0	37.0	0.0	0.0	Yes	Yes	0.0	37.0	0.0	5,934.3	5,549.5	184.5
1982	May	5934.3	5549.5	184.5	15.5	7.7	0.0	0.0	Yes	Yes	19.0	3.8	22.8	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.5	1.0	19.7	7.1	0.0	Yes	Yes	0.0	12.6	0.0	5,904.7	5,549.3	183.9
1982	Jun	5904.7	5549.3	183.9	10.3	7.7	0.0	0.0	Yes	Yes	12.7	2.6	15.3	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.7	1.0	12.8	7.2	0.0	Yes	Yes	0.0	5.7	0.0	5,771.4	5,548.6	181.0
1982	Jul	5771.4	5548.6	181.0	9.2	9.2	0.0	0.0	No	No	11.3	2.3	13.6	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.5	1.0	9.2	5.7	4.0	No	Yes	0.0	3.5	4.0	5,394.1	5,546.4	173.7
1982	Aug	5394.1	5546.4	173.7	10.4	5.5	0.0	0.0	Yes	Yes	12.8	2.6	15.4	3.6	0.0	Yes	Yes	14.0	10.4	0.0	0.0	5394.1	5546.4	173.7	56.1	0.9	57.3	0.9	5,280.7	5,545.8	171.6	1.7	0.9	14.4	5.1	0.0	Yes	Yes	0.0	9.3	0.0	5,280.7	5,545.8	171.6
1982	Sep	5280.7	5545.8	171.6	11.4	4.3	0.0	0.0	Yes	Yes	14.0	2.8	16.8	2.9	0.0	Yes	Yes	14.1	12.6	0.0	0.0	5280.7	5545.8	171.6	53.6	0.9	46.2	0.8	5,180.9	5,545.2	169.7	1.9	0.9	16.7	4.0	0.0	Yes	Yes	0.0	12.7	0.0	5,180.9	5,545.2	169.7
1982	Oct	5180.9	5545.2	169.7	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes	14.2	13.8	0.0	0.0	5180.9	5545.2	169.7	54.8	0.9	25.3	0.4	5,100.8	5,544.7	168.3	2.1	0.9	21.3	0.0	0.0	Yes	Yes	0.0	21.3	0.0	5,100.8	5,544.7	168.3
1982	Nov	5100.8	5544.7	168.3	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes	14.2	15.6	14.2	14.2	5947.5	5549.5	184.8	57.7	1.0	2.8	0.0	5,887.0	5,549.2	183.5	2.8	1.0	15.0	0.0	0.0	Yes	Yes	0.0	15.0	0.0	5,887.0	5,549.2	183.5
1982	Dec	5887.0	5549.2	183.5	18.8	0.0	0.0	0.0	Yes	Yes	23.1	4.6	27.7	0.0	0.0	Yes	Yes	13.8	2.4	2.4	2.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.1	1.0	29.5	0.0	0.0	Yes	Yes	0.0	29.5	0.0	5,971.7	5,549.7	185.3
1983	Jan	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.7	4.0	23.7	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	26.3	0.0	0.0	Yes	Yes	0.0	26.3	0.0	5,971.7	5,549.7	185.3
1983	Feb	5971.7	5549.7	185.3	20.2	0.0	0.0	0.0	Yes	Yes	24.8	5.0	29.8	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.3	1.0	33.0	0.0	0.0	Yes	Yes	0.0	33.0	0.0	5,977.6	5,549.7	185.4
1983	Mar	5977.6	5549.7	185.4	41.1	0.0	0.0	0.0	Yes	Yes	50.5	10.2	60.7	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	6.8	1.0	67.5	0.0	0.0	Yes	Yes	0.0	67.5	0.0	5,960.7	5,549.6	185.1
1983	Apr	5960.7	5549.6	185.1	77.9	0.0	0.0	0.0	Yes	Yes	95.6	19.2	114.8	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	12.8	1.0	127.4	0.0	0.0	Yes	Yes	0.0	127.4	0.0	5,934.3	5,549.5	184.5
1983	May	5934.3	5549.5	184.5	104.2	7.7	0.0	0.0	Yes	Yes	128.0	25.7	153.7	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	17.2	1.0	165.2	7.1	0.0	Yes	Yes	0.0	158.1	0.0	5,904.7	5,549.3	183.9
1983	Jun	5904.7	5549.3	183.9	34.5	7.7	0.0	0.0	Yes	Yes	42.4	8.5	50.9	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	5.7	1.0	52.5	7.2	0.0	Yes	Yes	0.0	45.3	0.0	5,771.4	5,548.6	181.0
1983	Jul	5771.4	5548.6	181.0	23.0	10.4	0.0	0.0	Yes	Yes	28.3	5.7	34.0	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	3.8	1.0	31.9	9.7	0.0	Yes	Yes	0.0	22.2	0.0	5,638.3	5,547.8	178.3
1983	Aug	5638.3	5547.8	178.3	21.7	5.5	0.0	0.0	Yes	Yes	26.6	5.3	31.9	3.6	0.0	Yes	Yes	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0	5,521.9	5,547.2	176.1	3.6	0.9	32.8	5.1	0.0	Yes	Yes	0.0	27.7	0.0	5,521.9	5,547.2	176.1
1983	Sep	5521.9	5547.2	176.1	14.4	4.3	0.0	0.0	Yes	Yes	17.7	3.6	21.3	2.9	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8	5,419.5	5,546.6	174.2	2.4	0.9	21.7	4.0	0.0	Yes	Yes	0.0	17.6	0.0	5,419.5	5,546.6	174.2
1983	Oct	5419.5	5546.6	174.2	18.3	0.0	0.0	0.0	Yes	Yes	22.5	4.5	27.0	0.0	0.0	Yes	Yes	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4	5,337.2	5,546.1	172.6	3.0	0.9	31.0	0.0	0.0	Yes	Yes	0.0	31.0	0.0	5,337.2	5,546.1	172.6
1983	Nov	5337.2	5546.1	172.6	20.0	0.0	0.0	0.0	Yes	Yes	24.6	4.9	29.5	0.0	0.0	Yes	Yes	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3	3.3	1.0	22.1	0.0	0.0	Yes	Yes	0.0	22.1	0.0	5,970.9	5,549.7	185.3
1983	Dec	5970.9	5549.7	185.3	20.0	0.0	0.0	0.0	Yes	Yes	24.6	4.9	29.5	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.3	1.0	32.8	0.0	0.0	Yes	Yes	0.0	32.8	0.0	5,971.7	5,549.7	185.3
1984	Jan	5971.7	5549.7	185.3	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	3.4	1.0	33.5	0.0	0.0	Yes	Yes	0.0	33.5	0.0	5,971.7	5,549.7	185.3
1984	Feb	5971.7	5549.7	185.3	19.3	0.0	0.0	0.0	Yes	Yes	23.7	4.8	28.5	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.2	1.0	31.5	0.0	0.0	Yes	Yes	0.0	31.5	0.0	5,977.6	5,549.7	185.4
1984	Mar	5977.6	5549.7	185.4	20.4	0.0	0.0	0.0	Yes	Yes	25.1	5.0	30.1	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.4	1.0	33.6	0.0	0.0	Yes	Yes	0.0	33.6	0.0	5,960.7	5,549.6	185.1
1984	Apr	5960.7	5549.6	185.1	18.6	0.0	0.0	0.0	Yes	Yes	22.8	4.6	27.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	3.1	1.0	30.2	0.0	0.0	Yes	Yes	0.0	30.2	0.0	5,934.3	5,549.5	184.5
1984	May	5934.3	5549.5	184.5	12.9	7.7	0.0	0.0	Yes	Yes	15.8	3.2	19.0	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	2.1	1.0	15.4	7.1	0.0	Yes	Yes	0.0	8.3	0.0	5,904.7	5,549.3	183.9
1984	Jun	5904.7	5549.3	183.9	10.2	7.7	0.0	0.0	Yes	Yes	12.5	2.5	15.0	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.7	1.0	12.6	7.2	0.0	Yes	Yes	0.0	5.4	0.0	5,771.4	5,548.6	181.0
1984	Jul	5771.4	5548.6	181.0	10.3	10.3	0.0	0.0	No	No	12.6	2.5	15.1	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.7	1.0	10.9	7.4	2.2	No	Yes	0.0	3.5	2.2	5,500.8	5,547.1	175.7
1984	Aug	5500.8	5547.1	175.7	11.1	5.5	0.0	0.0	Yes	Yes	13.6	2.7	16.3	3.6	0.0	Yes	Yes	14.0	8.6	0.0	0.0	5500.8	5547.1	175.7	56.7	0.9	58.0	0.9	5,386.1	5,546.4	173.5	1.8	0.9	15.5	5.1	0.0	Yes	Yes	0.0	10.4	0.0	5,386.1	5,546.4	173.5
1984	Sep	5386.1	5546.4	173.5	9.7	4.3	0.0	0.0	Yes	Yes	11.9	2.4	14.3	2.9	0.0	Yes	Yes	14.1	10.9	0.0	0.0	5386.1	5546.4	173.5	54.2	0.9	46.7	0.8	5,285.2	5,545.8	171.6	1.6	0.9	13.9	4.0	0.0	Yes	Yes	0.0	9.9	0.0	5,285.2	5,545.8	171.6
1984	Oct	5285.2	5545.8	171.6	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes	14.1	12.1	0.0	0.0	5285.2	5545.8	171.6	55.4	0.9	25.6	0.4	5,204.2	5,545.3	170.2	2.1	0.9	22.1	0.0	0.0	Yes	Yes	0.0	22.1	0.0	5,204.2	5,545.3	170.2
1984	Nov	5204.2	5545.3	170.2	14.2	0.0	0.0	0.0	Yes	Yes	17.4	3.5	20.9	0.0	0.0	Yes	Yes	14.2	13.9	13.9	13.9	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3	2.3	1.0	10.3	0.0	0.0	Yes	Yes	0.0	10.3	0.0	5,970.9	5,549.7	185.3
1984	Dec	5970.9	5549.7	185.3	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.7	1.0	27.1	0.0	0.0	Yes	Yes	0.0	27.1	0.0	5,971.7	5,549.7	185.3
1985	Jan	5971.7	5549.7	185.3	16.5	0.0	0.0	0.0	Yes	Yes	20.3	4.1	24.4	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.7	1.0	27.1	0.0	0.0	Yes	Yes	0.0	27.1	0.0	5,971.7	5,549.7	185.3
1985	Feb	5971.7	5549.7	185.3	16.8	0.0	0.0	0.0	Yes	Yes	20.6	4.1	24.7	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.8	1.0	27.4	0.0	0.0	Yes	Yes	0.0	27.4	0.0	5,977.6	5,549.7	185.4
1985	Mar	5977.6	5549.7	185.4	21.7	0.0	0.0	0.0	Yes	Yes	26.6	5.3	31.9	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.6	1.0	35.6	0.0	0.0	Yes	Yes	0.0	35.6	0.0	5,960.7	5,549.6	185.1
1985	Apr	5960.7	5549.6	185.1	28.1	0.0	0.0	0.0	Yes	Yes	34.5	6.9	41.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	4.6	1.0	45.8	0.0	0.0	Yes	Yes	0.0	45.8	0.0	5,934.3	5,549.5	184.5
1985	May	5934.3	5549.5	184.5	19.3	7.7	0.0	0.0	Yes	Yes	23.7	4.8	28.5	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	3.2	1.0	26.0	7.1	0.0	Yes	Yes	0.0	18.8	0.0	5,904.7	5,549.3	183.9
1985	Jun	5904.7	5549.3	183.9	11.1	7.7	0.0	0.0	Yes	Yes	13.6	2.7	16.3	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.8	1.0	14.0	7.2	0.0	Yes	Yes	0.0	6.9	0.0	5,771.4	5,548.6	181.0
1985	Jul	5771.4	5548.6	181.0	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.6	1.0	9.7	6.2	3.4	No	Yes	0.0	3.5	3.4	5,427.0	5,546.6	174.3
1985	Aug	5427.0	5546.6	174.3	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9	3.6	0.0	Yes	Yes	14.0	9.8	0.0	0.0	5427.0	5546.6	174.3	56.3	0.9	57.5	0.9	5,313.2	5,546.0	172.2	0.9	0.9	6.1	2.6	2.5	No	Yes	0.0	3.5	2.5	5,160.3	5,545.1	169.4
1985	Sep	5160.3	5545.1	169.4	7.2	4.3	0.0	0.0	Yes	Yes	8.9	1.8	10.7	2.9	0.0	Yes	Yes	14.2	14.6	0.0	0.0	5160.3	5545.1	169.4	52.9	0.9	45.6	0.8	5,061.8	5,544.5	167.5	1.2	0.9	9.9	4.0	0.0	Yes	Yes	0.0	5.8	0.0	5,061.8	5,544.5	167.5
1985	Oct	5061.8	5544.5	167.5	12.7	0.0	0.0	0.0	Yes	Yes	15.6	3.1	18.7	0.0	0.0	Yes	Yes	14.3	15.8	0.0	0.0	5061.8	5544.5	167.5	54.1	0.9	25.0	0.4	4,982.7	5,544.0	166.1	2.1	0.9	21.7	0.0	0.0	Yes	Yes	0.0	21.7	0.0	4,982.7	5,544.0	166.1
1985	Nov	4982.7	5544.0	166.1	14.7	0.0	0.0	0.0	Yes	Yes	18.1	3.6	21.7	0.0	0.0	Yes	Yes	14.3	17.6	14.3	14.3	5833.8	5548.9	182.4	57.0	1.0	2.7	0.0	5,774.1	5,548.6	181.1	2.4	1.0	10.8	0.0	0.0	Yes	Yes	0.0	10.8	0.0	5,774.1	5,548.6	181.1
1985	Dec	5774.1	5548.6	181.1	15.3	0.0	0.0	0.0	Yes	Yes	18.8	3.8	22.6	0.0	0.0	Yes	Yes	13.8	4.2	4.2	4.2	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.5	1.0	21.9	0.0	0.0	Yes	Yes	0.0	21.9	0.0	5,971.7	5,549.7	185.3
1986	Jan	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	26.2	0.0	0.0	Yes	Yes	0.0	26.2	0.0	5,971.7	5,549.7	185.3
1986	Feb	5971.7	5549.7	185.3	23.2	0.0	0.0	0.0	Yes	Yes	28.5	5.7	34.2	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.8	1.0	37.9	0.0	0.0	Yes	Yes	0.0	37.9	0.0	5,977.6	5,549.7	185.4
1986	Mar	5977.6	5549.7	185.4	19.8	0.0	0.0	0.0	Yes	Yes	24.3	4.9	29.2	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	3.3	1.0	32.5	0.0	0.0	Yes	Yes	0.0	32.5	0.0	5,960.7	5,549.6	185.1
1986	Apr	5960.7	5549.6	185.1	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.9	1.0	29.2	0.0	0.0	Yes	Yes	0.0	29.2	0.0	5,934.3	5,549.5	184.5
1986	May	5934.3	5549.5	184.5	11.1	7.7	0.0	0.0	Yes	Yes	13.6	2.7	16.3	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.8	1.0	12.5	7.1	0.0	Yes	Yes	0.0	5.3	0.0	5,904.7	5,549.3	183.9
1986	Jun	5904.7	5549.3	183.9	8.0	7.7	0.0	0.0	Yes	Yes	9.9	2.0	11.8	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.3	1.0	9.0	5.5	1.6	No	Yes	0.0	3.5	1.6	5,673.9	5,548.0	179.0
1986	Jul	5673.9	5548.0	179.0	5.9	5.9	0.0	0.0	No	No	7.2	1.5	8.7	5.2	1.6	No	Yes	13.9	5.8	0.0	0.0	5673.9	5548.0	179.0	57.8	0.9	73.8	1.2	5,542.3	5,547.3	176.5	1.0	0.9	5.4	1.9	7.8	No	Yes	0.0	3.5	9.4	4,964.2	5,543.9	165.7
1986	Aug	4964.2	5543.9	165.7	6.9	5.5	0.0	0.0	Yes	Yes	8.4	1.7	10.1	3.6	0.0	Yes	Yes	14.3	17.4	0.0	0.0	4964.2	5543.9	165.7	53.5	0.9	54.7	0.9	4,856.0	5,543.3	163.6	1.1	0.9	8.5	5.0	0.1	No	Yes	0.0	3.5	0.1	4,849.8	5,543.2	163.4
1986	Sep	4849.8	5543.2	163.4	11.2	4.3	0.0	0.0	Yes	Yes	13.8	2.8	16.6	2.9	0.0	Yes	Yes	14.4	19.9	0.0	0.0	4849.8	5543.2	163.4	51.1	0.9	44.0	0.7	4,754.7	5,542.6	161.6	1.8	0.9	16.4	4.0	0.0	Yes	Yes	0.0	12.4	0.0	4,754.7	5,542.6	161.6
1986	Oct	4754.7	5542.6	161.6	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9	0.0	0.0	Yes	Yes	14.5	20.8	0.0	0.0	4754.7	5542.6	161.6	52.2	0.8	24.1	0.4	4,678.5	5,542.2	160.0	2.4	0.8	25.1	0.0	0.0	Yes	Yes	0.0	25.1	0.0	4,678.5	5,542.2	160.0

ALPHA ENGINEERING

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full?	Full?	Ave Flow	Ave Flow	Ave Flow
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs
1986	Nov	4678.5	5542.2	160.0	15.5	0.0	0.0	0.0	Yes	Yes	19.0	3.8	22.8
1986	Dec	5483.6	5547.0	175.4	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0
1987	Jan	5971.7	5549.7	185.3	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0
1987	Feb	5971.7	5549.7	185.3	15.2	0.0	0.0	0.0	Yes	Yes	18.7	3.8	22.5
1987	Mar	5977.6	5549.7	185.4	18.8	0.0	0.0	0.0	Yes	Yes	23.1	4.6	27.7
1987	Apr	5960.7	5549.6	185.1	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5
1987	May	5934.3	5549.5	184.5	8.3	7.7	0.0	0.0	Yes	Yes	10.2	2.1	12.3
1987	Jun	5738.8	5548.4	180.3	5.6	5.6	0.0	0.0	No	No	6.9	1.4	8.3
1987	Jul	5275.9	5545.8	171.5	6.7	6.7	0.0	0.0	No	No	8.3	1.7	9.9
1987	Aug	4652.2	5542.0	159.5	8.9	5.5	0.0	0.0	Yes	Yes	10.9	2.2	13.1
1987	Sep	4548.1	5541.3	157.1	5.2	4.3	0.0	0.0	Yes	Yes	6.4	1.3	7.7
1987	Oct	4393.7	5540.3	153.6	7.9	0.0	0.0	0.0	Yes	Yes	9.7	1.9	11.6
1987	Nov	4321.2	5539.9	152.0	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0
1987	Dec	5143.0	5545.0	169.0	11.5	0.0	0.0	0.0	Yes	Yes	14.1	2.8	16.9
1988	Jan	5909.2	5549.3	184.0	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4
1988	Feb	5971.7	5549.7	185.3	14.9	0.0	0.0	0.0	Yes	Yes	18.3	3.7	22.0
1988	Mar	5977.6	5549.7	185.4	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9
1988	Apr	5960.7	5549.6	185.1	15.1	0.0	0.0	0.0	Yes	Yes	18.6	3.7	22.3
1988	May	5934.3	5549.5	184.5	12.8	7.7	0.0	0.0	Yes	Yes	15.7	3.2	18.9
1988	Jun	5904.7	5549.3	183.9	6.8	6.8	0.0	0.0	No	No	8.4	1.7	10.0
1988	Jul	5554.8	5547.4	176.7	5.9	5.9	0.0	0.0	No	No	7.2	1.5	8.7
1988	Aug	4844.3	5543.2	163.3	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.7	9.9
1988	Sep	4715.1	5542.4	160.8	5.2	4.3	0.0	0.0	Yes	Yes	6.4	1.3	7.7
1988	Oct	4563.0	5541.4	157.5	8.2	0.0	0.0	0.0	Yes	Yes	10.1	2.0	12.1
1988	Nov	4488.6	5541.0	155.8	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2
1988	Dec	5068.4	5544.5	167.7	10.7	0.0	0.0	0.0	Yes	Yes	13.1	2.6	15.7
1989	Jan	5761.8	5548.5	180.8	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8
1989	Feb	5971.7	5549.7	185.3	13.7	0.0	0.0	0.0	Yes	Yes	16.8	3.4	20.2
1989	Mar	5977.6	5549.7	185.4	16.8	0.0	0.0	0.0	Yes	Yes	20.6	4.1	24.7
1989	Apr	5960.7	5549.6	185.1	7.3	0.0	0.0	0.0	Yes	Yes	8.9	1.8	10.7
1989	May	5934.3	5549.5	184.5	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7
1989	Jun	5426.0	5546.6	174.3	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.2
1989	Jul	4825.8	5543.1	163.0	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7
1989	Aug	3988.0	5537.6	144.5	4.9	4.9	0.0	0.0	No	No	6.1	1.2	7.3
1989	Sep	3685.3	5535.5	137.6	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.1
1989	Oct	3433.7	5533.6	132.0	5.4	0.0	0.0	0.0	Yes	Yes	6.6	1.3	7.9
1989	Nov	3371.4	5533.1	130.6	6.8	0.0	0.0	0.0	Yes	Yes	8.4	1.7	10.1
1989	Dec	3716.4	5535.7	138.3	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5
1990	Jan	4160.4	5538.8	148.4	7.9	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.7
1990	Feb	4613.6	5541.8	158.6	9.1	0.0	0.0	0.0	Yes	Yes	11.2	2.3	13.5
1990	Mar	5116.9	5544.8	168.6	11.1	0.0	0.0	0.0	Yes	Yes	13.6	2.7	16.3
1990	Apr	5835.7	5548.9	182.4	8.4	0.0	0.0	0.0	Yes	Yes	10.3	2.1	12.4
1990	May	5934.3	5549.5	184.5	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9
1990	Jun	5441.6	5546.7	174.6	4.5	4.5	0.0	0.0	No	No	5.5	1.1	6.6
1990	Jul	4869.0	5543.3	163.8	4.7	4.7	0.0	0.0	No	No	5.7	1.1	6.9
1990	Aug	4040.8	5538.0	145.7	4.7	4.7	0.0	0.0	No	No	5.7	1.2	6.9
1990	Sep	3711.4	5535.7	138.2	5.3	4.3	0.0	0.0	Yes	Yes	6.5	1.3	7.8
1990	Oct	3570.9	5534.6	135.0	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	10.9
1990	Nov	3507.1	5534.2	133.6	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5
1990	Dec	3934.8	5537.2	143.3	7.9	0.0	0.0	0.0	Yes	Yes	9.7	2.0	11.7
1991	Jan	4388.9	5540.3	153.5	7.7	0.0	0.0	0.0	Yes	Yes	9.4	1.9	11.3
1991	Feb	4815.0	5543.0	162.8	8.1	0.0	0.0	0.0	Yes	Yes	9.9	2.0	11.9
1991	Mar	5230.9	5545.5	170.6	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2
1991	Apr	5960.7	5549.6	185.1	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1
1991	May	5934.3	5549.5	184.5	6.6	6.6	0.0	0.0	No	No	8.2	1.6	9.8
1991	Jun	5570.7	5547.5	177.0	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.0
1991	Jul	5152.1	5545.0	169.2	4.5	4.5	0.0	0.0	No	No	5.6	1.1	6.7
1991	Aug	4307.7	5539.8	151.7	4.7	4.7	0.0	0.0	No	No	5.7	1.1	6.9
1991	Sep	3975.4	5537.5	144.2	5.4	4.3	0.0	0.0	Yes	Yes	6.7	1.3	8.0
1991	Oct	3847.6	5536.6	141.3	7.1	0.0	0.0	0.0	Yes	Yes	8.8	1.8	10.5
1991	Nov	3780.9	5536.2	139.7	7.9	0.0	0.0	0.0	Yes	Yes	9.7	2.0	11.7
1991	Dec	4219.3	5539.2	149.7	8.0	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.8
1992	Jan	4676.6	5542.2	160.0	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7
1992	Feb	5189.0	5545.3	169.9	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6
1992	Mar	5808.4	5548.8	181.8	17.0	0.0	0.0	0.0	Yes	Yes	20.9	4.2	25.1
1992	Apr	5960.7	5549.6	185.1	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4
1992	May	5934.3	5549.5	184.5	9.0	7.7	0.0	0.0	Yes	Yes	11.1	2.2	13.3
1992	Jun	5812.7	5548.8	181.9	7.5	7.5	0.0	0.0	No	No	9.2	1.8	11.0
1992	Jul	5527.9	5547.2	176.2	5.6	5.6	0.0	0.0	No	No	6.8	1.4	8.2
1992	Aug	4786.5	5542.8	162.2	6.7	5.5	0.0	0.0	Yes	Yes	8.2	1.7	9.9
1992	Sep	4656.0	5542.0	159.6	6.5	4.3	0.0	0.0	Yes	Yes	8.0	1.6	9.6
1992	Oct	4563.2	5541.4	157.5	8.7	0.0	0.0	0.0	Yes	Yes	10.7	2.2	12.9
1992	Nov	4488.8	5541.0	155.8	7.3	0.0	0.0	0.0	Yes	Yes	9.0	1.8	10.8
1992	Dec	4866.9	5543.3	163.8	9.0	0.0	0.0	0.0	Yes	Yes	11.1	2.2	13.3
1993	Jan	5414.9	5546.6	174.1	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8
1993	Feb	5971.7	5549.7	185.3	15.3	0.0	0.0	0.0	Yes	Yes	18.8	3.8	22.6
1993	Mar	5977.6	5549.7	185.4	44.2	0.0	0.0	0.0	Yes	Yes	54.3	10.9	65.2
1993	Apr	5960.7	5549.6	185.1	108.3	0.0	0.0	0.0	Yes	Yes	133.0	26.7	159.7
1993	May	5934.3	5549.5	184.5	51.9	7.7	0.0	0.0	Yes	Yes	63.7	12.8	76.5
1993	Jun	5904.7	5549.3	183.9	22.6	7.7	0.0	0.0	Yes	Yes	27.7	5.6	33.3
1993	Jul	5771.4	5548.6	181.0	10.4	10.4	0.0	0.0	Yes	Yes	12.8	2.6	15.4
1993	Aug	5517.3	5547.1	176.0	11.3	5.5	0.0	0.0	Yes	Yes	13.9	2.8	16.7
1993	Sep	5402.3	5546.5	173.8	9.6	4.3	0.0	0.0	Yes	Yes	11.8	2.4	14.2
1993	Oct	5301.2	5545.9	171.9	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0
1993	Nov	5220.1	5545.4	170.4	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
1993	Dec	5970.9	5549.7	185.3	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0
1994	Jan	5971.7	5549.7	185.3	12.5	0.0	0.0	0.0	Yes	Yes	15.4	3.1	18.5
1994	Feb	5971.7	5549.7	185.3	14.8	0.0	0.0	0.0	Yes	Yes	18.2	3.7	21.9
1994	Mar	5977.6	5549.7	185.4	21.6	0.0	0.0	0.0	Yes	Yes	26.5	5.3	31.8
1994	Apr	5960.7	5549.6	185.1	12.5	0.0	0.0	0.0	Yes	Yes	15.4	3.1	18.5
1994	May	5934.3	5549.5	184.5	8.2	7.7	0.0	0.0	Yes	Yes	10.1	2.0	12.1
1994	Jun	5730.6	5548.3	180.2	5.7	5.7	0.0	0.0	No	No	7.0	1.4	8.4
1994	Jul	5272.5	5545.7	171.4	4.7	4.7	0.0	0.0	No	No	5.8	1.2	6.9
1994	Aug	4443.6	5540.7	154.8	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.6
1994	Sep	4162.1	5538.8	148.4	5.9	4.3	0.0	0.0	Yes	Yes	7.3	1.5	8.7
1994	Oct	4075.8	5538.2	146.5	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0
1994	Nov	4006.6	5537.8	144.9	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2
1994	Dec	4710.2	5542.4	160.7	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7
1995	Jan	5464.6	5546.8	175.0	13.3	0.0	0.0	0.0	Yes	Yes	16.3	3.3	19.6
1995	Feb	5971.7	5549.7	185.3	19.7	0.0	0.0	0.0	Yes	Yes	24.2	4.9	29.1
1995	Mar	5977.6	5549.7	185.4	40.8	0.0	0.0	0.0	Yes	Yes	50.1	10.1	60.2
1995	Apr	5960.7	5549.6	185.1	31.2	0.0	0.0	0.0	Yes	Yes	38.3	7.7	46.0
1995	May	5934.3	5549.5	184.5	32.0	7.7	0.0	0.0	Yes	Yes	39.3	7.9	47.2
1995	Jun	5904.7	5549.3	183.9	19.4	7.7	0.0	0.0	Yes	Yes	23.8	4.8	28.6
1995	Jul	5771.4	5548.6	181.0	9.5	9.5	0.0	0.0	No	No	11.7	2.4	14.1
1995	Aug	5427.0	5546.6	174.3	7.1	5.5	0.0	0.0	Yes	Yes	8.7	1.7	10.4
1995	Sep	5313.2	5546.0	172.2	7.6	4.3	0.0	0.0	Yes	Yes	9.4	1.9	11.3
1995	Oct	5213.0	5545.4	170.3	10.8	0.0	0.0	0.0	Yes	Yes	13.2	2.7	15.9
1995	Nov	5132.6	5544.9	168.8	12.0	0.0	0.0	0.0	Yes	Yes	14.7	3.0	17.7
1995	Dec	5914.2	5549.4	184.1	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1
1996	Jan	5971.7	5549.7	185.3	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5
1996	Feb	5971.7	5549.7	185.3	17.9	0.0	0.0	0.0	Yes	Yes	22.0	4.4	26.4
1996	Mar	5977.6	5549.7	185.4	15.4	0.0	0.0	0.0	Yes	Yes	18.9	3.8	22.7
1996	Apr	5960.7	5549.6	185.1	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6
1996	May	5934.3	5549.5	184.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7
1996	Jun	5565.8	5547.4	176.9	4.6	4.6	0.0	0.0	No	No	5.7	1.1	6.8
1996	Jul	5007.4	5544.2	166.5	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7
1996	Aug	4169.0	5538.9	148.6	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.1
1996	Sep	3786.9	5536.2	139.9	6.0	4.3	0.0	0.0	Yes	Yes	7.4	1.5	8.9

Date		to OIC				to COVE				Reservoir Int1			Seepage		Evaporation	
Yr	Mo	River	Supp	Pre Cove Full	Full?	Hydraulic Cap	to Fill Resv	Control	River	Volume	Elevation	Area				
		cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs
1986	Nov	0.0	0.0	Yes	Yes	14.5	22.7	14.5	14.5	5541.4	5547.3	176.4	55.1	0.9	2.6	0.0
1986	Dec	0.0	0.0	Yes	Yes	14.0	8.9	8.9	8.9	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1987	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1987	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1987	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1987	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1987	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1987	Jun	4.8	0.3	No	Yes	13.8	4.9	0.0	0.0	5738.8	5548.4	180.3	56.4	0.9	74.4	1.3
1987	Jul	6.4	0.4	No	Yes	14.1	12.3	0.0	0.0	5275.9	5545.8	171.5	55.4	0.9	70.7	1.2
1987	Aug	3.6	0.0	Yes	Yes	14.5	22.4	0.0	0.0	4652.2	5542.0	159.5	51.5	0.8	52.6	0.9
1987	Sep	2.9	0.0	Yes	Yes	14.6	24.9	0.0	0.0	4548.1	5541.3	157.1	49.1	0.8	42.3	0.7
1987	Oct	0.0	0.0	Yes	Yes	14.7	26.6	0.0	0.0	4393.7	5540.3	153.6	49.6	0.8	22.9	0.4
1987	Nov	0.0	0.0	Yes	Yes	14.7	28.8	14.7	14.7	5198.7	5545.3	170.1	53.1	0.9	2.6	0.0
1987	Dec	0.0	0.0	Yes	Yes	14.2	14.5	14.2	13.4	5969.0	5549.7	185.3	59.8	1.0	0.0	0.0
1988	Jan	0.0	0.0	Yes	Yes	13.7	2.0	2.0	2.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1988	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1988	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1988	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1988	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1988	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1988	Jul	5.2	1.7	No	Yes	13.9	7.8	0.0	0.0	5554.8	5547.4	176.7	57.1	0.9	72.9	1.2
1988	Aug	3.6	0.0	Yes	Yes	14.4	19.3	0.0	0.0	4844.3	5543.2	163.3	52.7	0.9	53.9	0.9
1988	Sep	2.9	0.0	Yes	Yes	14.5	22.1	0.0	0.0	4715.1	5542.4	160.8	50.2	0.8	43.3	0.7
1988	Oct	0.0	0.0	Yes	Yes	14.6	23.9	0.0	0.0	4563.0	5541.4	157.5	50.9	0.8	23.5	0.4
1988	Nov	0.0	0.0	Yes	Yes	14.6	25.9	14.6	10.7	5123.7	5544.9	168.7	52.7	0.9	2.5	0.0
1988	Dec	0.0	0.0	Yes	Yes	14.2	15.7	14.2	12.2	5820.6	5548.8	182.1	58.8	1.0	0.0	0.0
1989	Jan	0.0	0.0	Yes	Yes	13.8	4.4	4.4	4.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1989	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1989	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1989	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1989	May	4.2	0.9	No	Yes	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1
1989	Jun	2.7	2.4	No	Yes	14.0	10.2	0.0	0.0	5426.0	5546.6	174.3	54.5	0.9	71.9	1.2
1989	Jul	3.2	3.6	No	Yes	14.4	19.6	0.0	0.0	4825.8	5543.1	163.0	52.6	0.9	67.2	1.1
1989	Aug	3.6	0.0	Yes	Yes	15.0	33.2	0.0	0.0	3988.0	5537.6	144.5	46.7	0.8	47.7	0.8
1989	Sep	2.6	0.2	No	Yes	15.2	39.4	0.0	0.0	3685.3	5535.5	137.6	43.0	0.7	37.0	0.6
1989	Oct	0.0	0.0	Yes	Yes	15.4	42.3	0.0	0.0	3433.7	5533.6	132.0	42.6	0.7	19.7	0.3
1989	Nov	0.0	0.0	Yes	Yes	15.5	44.7	15.5	6.6	3762.0	5536.0	139.3	43.5	0.7	2.1	0.0
1989	Dec	0.0	0.0	Yes	Yes	15.2	37.7	15.2	8.0	4208.6	5539.1	149.4	48.3	0.8	0.0	0.0
1990	Jan	0.0	0.0	Yes	Yes	14.9	30.4	14.9	8.2	4665.2	5542.1	159.8	51.6	0.8	0.0	0.0
1990	Feb	0.0	0.0	Yes	Yes	14.5	25.5	14.5	10.0	5166.3	5545.1	169.5	49.4	0.9	0.0	0.0
1990	Mar	0.0	0.0	Yes	Yes	14.2	14.9	14.2	12.8	5906.0	5549.3	183.9	59.4	1.0	10.9	0.2
1990	Apr	0.0	0.0	Yes	Yes	13.8	3.3	3.3	3.3	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1990	May	4.4	0.7	No	Yes	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1
1990	Jun	3.1	2.0	No	Yes	14.0	9.9	0.0	0.0	5441.6	5546.7	174.6	54.6	0.9	72.0	1.2
1990	Jul	3.4	3.5	No	Yes	14.4	18.9	0.0	0.0	4869.0	5543.3	163.8	52.9	0.9	67.6	1.1
1990	Aug	3.4	0.2	No	Yes	14.9	32.4	0.0	0.0	4040.8	5538.0	145.7	47.0	0.8	48.1	0.8
1990	Sep	2.9	0.0	Yes	Yes	15.2	39.0	0.0	0.0	3711.4	5535.7	138.2	43.2	0.7	37.2	0.6
1990	Oct	0.0	0.0	Yes	Yes	15.3	40.0	0.0	0.0	3570.9	5534.6	135.0	43.6	0.7	20.1	0.3
1990	Nov	0.0	0.0	Yes	Yes	15.4	42.4	15.4	8.0	3982.1	5537.6	144.3	45.1	0.8	2.2	0.0
1990	Dec	0.0	0.0	Yes	Yes	15.0	34.1	15.0	8.2	4438.9	5540.6	154.6	49.9	0.8	0.0	0.0
1991	Jan	0.0	0.0	Yes	Yes	14.7	26.7	14.7	7.8	4867.9	5543.3	163.8	52.9	0.9	0.0	0.0
1991	Feb	0.0	0.0	Yes	Yes	14.4	21.9	14.4	8.4	5281.0	5545.8	171.6	50.0	0.9	0.0	0.0
1991	Mar	0.0	0.0	Yes	Yes	14.1	13.0	13.0	13.0	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1991	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1991	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.2	6009.9	5549.9	186.1	60.1	1.0	66.9	1.1
1991	Jun	5.1	0.0	Yes	Yes	13.9	7.8	0.0	0.0	5570.7	5547.5	177.0	55.3	0.9	73.0	1.2
1991	Jul	3.2	3.7	No	Yes	14.2	14.3	0.0	0.0	5152.1	5545.0	169.2	54.6	0.9	69.8	1.1
1991	Aug	3.4	0.2	No	Yes	14.8	28.0	0.0	0.0	4307.7	5539.8	151.7	49.0	0.8	50.1	0.8
1991	Sep	2.9	0.0	Yes	Yes	15.0	34.6	0.0	0.0	3975.4	5537.5	144.2	45.1	0.8	38.8	0.7
1991	Oct	0.0	0.0	Yes	Yes	15.1	35.5	0.0	0.0	3847.6	5536.6	141.3	45.6	0.7	21.1	0.3
1991	Nov	0.0	0.0	Yes	Yes	15.1	37.8	15.1	8.2	4268.7	5539.5	150.8	47.1	0.8	2.3	0.0
1991	Dec	0.0	0.0	Yes	Yes	14.8	29.5	14.8	8.3	4728.6	5542.5	161.0	52.0	0.8	0.0	0.0
1992	Jan	0.0	0.0	Yes	Yes	14.5	22.0	14.5	9.2	5244.2	5545.6	170.9	55.2	0.9	0.0	0.0
1992	Feb	0.0	0.0	Yes	Yes	14.2	15.2	14.2	12.1	5861.7	5549.1	183.0	53.4	1.0	0.0	0.0
1992	Mar	0.0	0.0	Yes	Yes	13.8	3.6	3.6	3.6	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1992	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1992	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1992	Jun	5.1	0.0	Yes	Yes	13.8	3.7	0.0	0.0	5812.7	5548.8	181.9	56.8	1.0	75.0	1.3
1992	Jul	4.7	2.1	No	Yes	14.0	8.2	0.0	0.0	5527.9	5547.2	176.2	56.9	0.9	72.7	1.2
1992	Aug	3.6	0.0	Yes	Yes	14.4	20.3	0.0	0.0	4786.5	5542.8	162.2	52.4	0.9	53.5	0.9
1992	Sep	2.9	0.0	Yes	Yes	14.5	23.1	0.0	0.0	4656.0	5542.0	159.6	49.9	0.8	43.0	0.7
1992	Oct	0.0	0.0	Yes	Yes	14.6	23.9	0.0	0.0	4563.2	5541.4	157.5	50.9	0.8	23.5	0.4
1992	Nov	0.0	0.0	Yes	Yes	14.6	25.9	14.6	7.3	4920.9	5543.7	164.9	51.5	0.9	2.5	0.0
1992	Dec	0.0	0.0	Yes	Yes	14.4	18.9	14.4	9.8	5471.4	5546.9	175.1	56.6	0.9	0.0	0.0
1993	Jan	0.0	0.0	Yes	Yes	14.0	10.0	10.0	10.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1993	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1993	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1993	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1993	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1993	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1993	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1993	Aug	3.6	0.0	Yes	Yes	14.0	8.4	0.0	0.0	5517.3	5547.1	176.0	56.8	0.9	58.1	0.9
1993	Sep	2.9	0.0	Yes	Yes	14.0	10.6	0.0	0.0	5402.3	5546.5	173.8	54.3	0.9	46.8	0.8
1993	Oct	0.0	0.0	Yes	Yes	14.1	11.9	0.0	0.0	5301.2	5545.9	171.9	55.5	0.9	25.6	0.4
1993	Nov	0.0	0.0	Yes	Yes	14.2	13.6	13.6	13.6	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0
1993	Dec	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1994	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1994	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1994	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1994	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1994	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1994	Jun	4.9	0.2	No	Yes	13.8	5.1	0.0	0.0	5730.6	5548.3	180.2	56.3	0.9	74.3	1.2
1994	Jul	3.4	3.4	No	Yes	14.1	12.4	0.0	0.0	5272.5	5545.7	171.4	55.4	0.9	70.7	1.1
1994	Aug	3.6	0.0	Yes	Yes	14.7	25.8	0.0	0.0	4443.6	5540.7	154.8	50.0	0.8	51.1	0.8
1994	Sep	2.9	0.0	Yes	Yes	14.9	31.4	0.0	0.0	4162.1	5538.8	148.4	46.4	0.8	39.9	0.7
1994	Oct	0.0	0.0	Yes	Yes	14.9	31.8	0.0	0.0	4075.8	5538.2	146.5	47.3	0.8	21.8	0.4
1994	Nov	0.0	0.0	Yes	Yes	15.0	34.0	15.0	12.7	4763.2	5542.7	161.7	50.5	0.8	2.4	0.0
1994	Dec	0.0	0.0	Yes	Yes	14.5	21.5	14.5	13.2	5521.5	5547.2	176.1	56.9	0.9	0.0	0.0
1995	Jan	0.0	0.0	Yes	Yes	14.0	9.2	9.2	9.2	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1995	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1995	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1995	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1995	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1
1995	Jun	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3
1995	Jul	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2
1995	Aug	3.6	0.0	Yes	Yes	14.0	9.8	0.0	0.0	5427.0	5546.6	174.3	56.3	0.9	57.5	0.9
1995	Sep	2.9	0.0	Yes	Yes	14.1	12.1	0.0	0.0	5313.2	5546.0	172.2	53.8	0.9	46.3	0.8
1995	Oct	0.0	0.0	Yes	Yes	14.2	13.3	0.0	0.0	5213.0	5545.4	170.3	55.0	0.9	25.4	0.4
1995	Nov	0.0	0.0	Yes	Yes	14.2	15.1	14.2	14.2	5974.9	5549.7	185.4	57.9	1.0	2.8	0.0
1995	Dec	0.0	0.0	Yes	Yes	13.7	1.9	1.9	1.9	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1996	Jan	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0
1996	Feb	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0
1996	Mar	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2
1996	Apr	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7
1996	May	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.2	6005.4	5549.9	186.0	60.1	1.0	66.8	1.1
1996	Jun	3.3	1.7	No	Yes	13.9	7.8	0.0	0.0	5565.8	5547.4	176.9	55.3	0.9	73.0	1.2
1996	Jul	3.2	3.6	No	Yes	14.3	16.7	0.0	0.0	5007.4	5544.2	166.5	53.8	0.9	68.7	1.1
1996	Aug	2.6	1.0	No	Yes	14.9	30.3	0.0	0.0	4169.0	5538.9	148.6	48.0	0.8	49.0	0.8
1996	Sep	2.9	0.0	Yes	Yes	15.1	37.7	0.0	0.0	3786.9	5536.2	139.9	43.7	0.7	37.7	0.6

Date		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full?	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
1986	Nov	5,483.6	5,547.0	175.4	2.5	0.9	11.8	0.0	0.0	Yes	Yes	0.0	11.8	0.0	5,483.6	5,547.0	175.4
1986	Dec	5,971.7	5,549.7	185.3	2.5	1.0	16.5	0.0	0.0	Yes	Yes	0.0	16.5	0.0	5,971.7	5,549.7	185.3
1987	Jan	5,971.7	5,549.7	185.3	2.3	1.0	23.4	0.0	0.0	Yes	Yes	0.0	23.4	0.0	5,971.7	5,549.7	185.3
1987	Feb	5,977.6	5,549.7	185.4	2.5	1.0	24.9	0.0	0.0	Yes	Yes	0.0	24.9	0.0	5,977.6	5,549.7	185.4
1987	Mar	5,960.7	5,549.6	185.1	3.1	1.0	30.9	0.0	0.0	Yes	Yes	0.0	30.9	0.0	5,960.7	5,549.6	185.1
1987	Apr	5,934.3	5,549.5	184.5	2.3	1.0	22.6	0.0	0.0	Yes	Yes	0.0	22.6	0.0	5,934.3	5,549.5	184.5
1987	May	5,904.7	5,549.3	183.9	1.4	1.0	7.9	4.4	2.7	No	Yes	0.0	3.5	2.7	5,738.8	5,548.4	180.3
1987	Jun	5,608.1	5,547.7	177.7	0.9	0.9	5.4	1.9	5.3	No	Yes	0.0	3.5	5.6	5,275.9	5,545.8	171.5
1987	Jul	5,149.8	5,545.0	169.2	1.1	0.9	5.5	2.0	7.7	No	Yes	0.0	3.5	8.1	4,652.2	5,542.0	159.5
1987	Aug	4,548.1	5,541.3	157.1	1.5	0.8	11.8	5.1	0.0	Yes	Yes	0.0	6.7	0.0	4,548.1	5,541.3	157.1
1987	Sep	4,456.7	5,540.7	155.1	0.9	0.8	6.5	3.0	1.1	No	Yes	0.0	3.5	1.1	4,393.7	5,540.3	153.6
1987	Oct	4,321.2	5,539.9	152.0	1.3	0.8	13.7	0.0	0.0	Yes	Yes	0.0	13.7	0.0	4,321.2	5,539.9	152.0
1987	Nov	5,143.0	5,545.0	169.0	2.3	0.9	9.5	0.0	0.0	Yes	Yes	0.0	9.5	0.0	5,143.0	5,545.0	169.0
1987	Dec	5,909.2	5,549.3	184.0	1.9	1.0	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,909.2	5,549.3	184.0
1988	Jan	5,971.7	5,549.7	185.3	1.9	1.0	18.3	0.0	0.0	Yes	Yes	0.0	18.3	0.0	5,971.7	5,549.7	185.3
1988	Feb	5,977.6	5,549.7	185.4	2.5	1.0	24.3	0.0	0.0	Yes	Yes	0.0	24.3	0.0	5,977.6	5,549.7	185.4
1988	Mar	5,960.7	5,549.6	185.1	2.4	1.0	24.4	0.0	0.0	Yes	Yes	0.0	24.4	0.0	5,960.7	5,549.6	185.1
1988	Apr	5,934.3	5,549.5	184.5	2.5	1.0	24.6	0.0	0.0	Yes	Yes	0.0	24.6	0.0	5,934.3	5,549.5	184.5
1988	May	5,904.7	5,549.3	183.9	2.1	1.0	15.3	7.1	0.0	Yes	Yes	0.0	8.1	0.0	5,904.7	5,549.3	183.9
1988	Jun	5,771.4	5,548.6	181.0	1.1	1.0	7.0	3.5	3.6	No	Yes	0.0	3.5	3.6	5,554.8	5,547.4	176.7
1988	Jul	5,424.8	5,546.6	174.3	1.0	0.9	5.4	1.9	7.8	No	Yes	0.0	3.5	9.4	4,844.3	5,543.2	163.3
1988	Aug	4,737.7	5,542.5	161.2	1.1	0.9	8.2	4.7	0.4	No	Yes	0.0	3.5	0.4	4,715.1	5,542.4	160.8
1988	Sep	4,621.6	5,541.8	158.8	0.9	0.8	6.6	3.1	1.0	No	Yes	0.0	3.5	1.0	4,563.0	5,541.4	157.5
1988	Oct	4,488.6	5,541.0	155.8	1.4	0.8	14.3	0.0	0.0	Yes	Yes	0.0	14.3	0.0	4,488.6	5,541.0	155.8
1988	Nov	5,068.4	5,544.5	167.7	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,068.4	5,544.5	167.7
1988	Dec	5,761.8	5,548.5	180.8	1.8	1.0	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	5,761.8	5,548.5	180.8
1989	Jan	5,971.7	5,549.7	185.3	1.9	1.0	15.3	0.0	0.0	Yes	Yes	0.0	15.3	0.0	5,971.7	5,549.7	185.3
1989	Feb	5,977.6	5,549.7	185.4	2.3	1.0	22.3	0.0	0.0	Yes	Yes	0.0	22.3	0.0	5,977.6	5,549.7	185.4
1989	Mar	5,960.7	5,549.6	185.1	2.8	1.0	27.6	0.0	0.0	Yes	Yes	0.0	27.6	0.0	5,960.7	5,549.6	185.1
1989	Apr	5,934.3	5,549.5	184.5	1.2	1.0	11.7	0.0	0.0	Yes	Yes	0.0	11.7	0.0	5,934.3	5,549.5	184.5
1989	May	5,808.5	5,548.8	181.8	0.9	1.0	5.3	1.8	5.3	No	Yes	0.0	3.5	6.2	5,426.0	5,546.6	174.3
1989	Jun	5,299.6	5,545.9	171.9	0.7	0.9	5.1	1.6	5.6	No	Yes	0.0	3.5	8.0	4,825.8	5,543.1	163.0
1989	Jul	4,705.9	5,542.3	160.6	0.8	0.9	5.1	1.6	8.1	No	Yes	0.0	3.5	11.7	3,988.0	5,537.6	144.5
1989	Aug	3,893.7	5,537.0	142.3	0.8	0.8	5.2	1.7	3.4	No	Yes	0.0	3.5	3.4	3,685.3	5,535.5	137.6
1989	Sep	3,605.2	5,534.9	135.8	0.7	0.7	4.9	1.4	2.6	No	Yes	0.0	3.5	2.9	3,433.7	5,533.6	132.0
1989	Oct	3,371.4	5,533.1	130.6	0.9	0.7	9.5	0.0	0.0	Yes	Yes	0.0	9.5	0.0	3,371.4	5,533.1	130.6
1989	Nov	3,716.4	5,535.7	138.3	1.1	0.7	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	3,716.4	5,535.7	138.3
1989	Dec	4,160.4	5,538.8	148.4	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,160.4	5,538.8	148.4
1990	Jan	4,613.6	5,541.8	158.6	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,613.6	5,541.8	158.6
1990	Feb	5,116.9	5,544.8	168.6	1.5	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,116.9	5,544.8	168.6
1990	Mar	5,835.7	5,548.9	182.4	1.8	1.0	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,835.7	5,548.9	182.4
1990	Apr	5,934.3	5,549.5	184.5	1.4	1.0	11.4	0.0	0.0	Yes	Yes	0.0	11.4	0.0	5,934.3	5,549.5	184.5
1990	May	5,808.5	5,548.8	181.8	0.9	1.0	5.3	1.8	5.3	No	Yes	0.0	3.5	6.0	5,441.6	5,546.7	174.6
1990	Jun	5,315.0	5,546.0	172.2	0.7	0.9	5.2	1.7	5.5	No	Yes	0.0	3.5	7.5	4,869.0	5,543.3	163.8
1990	Jul	4,748.6	5,542.6	161.4	0.8	0.9	5.1	1.6	8.0	No	Yes	0.0	3.5	11.5	4,040.8	5,538.0	145.7
1990	Aug	3,945.7	5,537.3	143.5	0.8	0.8	5.0	1.5	3.6	No	Yes	0.0	3.5	3.8	3,711.4	5,535.7	138.2
1990	Sep	3,631.0	5,535.1	136.4	0.9	0.7	6.5	3.0	1.0	No	Yes	0.0	3.5	1.0	3,570.9	5,534.6	135.0
1990	Oct	3,507.1	5,534.2	133.6	1.2	0.7	12.9	0.0	0.0	Yes	Yes	0.0	12.9	0.0	3,507.1	5,534.2	133.6
1990	Nov	3,934.8	5,537.2	143.3	1.3	0.8	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	3,934.8	5,537.2	143.3
1990	Dec	4,388.9	5,540.3	153.5	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,388.9	5,540.3	153.5
1991	Jan	4,815.0	5,543.0	162.8	1.3	0.9	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,815.0	5,543.0	162.8
1991	Feb	5,230.9	5,545.5	170.6	1.3	0.9	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	5,230.9	5,545.5	170.6
1991	Mar	5,960.7	5,549.6	185.1	1.9	1.0	7.0	0.0	0.0	Yes	Yes	0.0	7.0	0.0	5,960.7	5,549.6	185.1
1991	Apr	5,934.3	5,549.5	184.5	1.6	1.0	15.4	0.0	0.0	Yes	Yes	0.0	15.4	0.0	5,934.3	5,549.5	184.5
1991	May	5,882.9	5,549.2	183.4	1.1	1.0	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,570.7	5,547.5	177.0
1991	Jun	5,442.4	5,546.7	174.6	1.0	0.9	5.8	2.3	4.9	No	Yes	0.0	3.5	4.9	5,152.1	5,545.0	169.2
1991	Jul	5,027.6	5,544.3	166.9	0.7	0.9	5.1	1.6	8.0	No	Yes	0.0	3.5	11.7	4,307.7	5,539.8	151.7
1991	Aug	4,208.6	5,539.1	149.4	0.8	0.8	5.1	1.6	3.5	No	Yes	0.0	3.5	3.8	3,975.4	5,537.5	144.2
1991	Sep	3,891.6	5,536.9	142.3	0.9	0.8	6.8	3.3	0.7	No	Yes	0.0	3.5	0.7	3,847.6	5,536.6	141.3
1991	Oct	3,780.9	5,536.2	139.7	1.2	0.7	12.5	0.0	0.0	Yes	Yes	0.0	12.5	0.0	3,780.9	5,536.2	139.7
1991	Nov	4,219.3	5,539.2	149.7	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,219.3	5,539.2	149.7
1991	Dec	4,676.6	5,542.2	160.0	1.3	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,676.6	5,542.2	160.0
1992	Jan	5,189.0	5,545.3	169.9	1.4	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	5,189.0	5,545.3	169.9
1992	Feb	5,808.4	5,548.8	181.8	1.7	1.0	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	5,808.4	5,548.8	181.8
1992	Mar	5,960.7	5,549.6	185.1	2.8	1.0	25.2	0.0	0.0	Yes	Yes	0.0	25.2	0.0	5,960.7	5,549.6	185.1
1992	Apr	5,934.3	5,549.5	184.5	2.3	1.0	22.5	0.0	0.0	Yes	Yes	0.0	22.5	0.0	5,934.3	5,549.5	184.5
1992	May	5,904.7	5,549.3	183.9	1.5	1.0	9.2	5.7	1.5	No	Yes	0.0	3.5	1.5	5,812.7	5,548.8	181.9
1992	Jun	5,680.8	5,548.1	179.1	1.2	1.0	8.1	4.6	2.6	No	Yes	0.0	3.5	2.6	5,527.9	5,547.2	176.2
1992	Jul	5,398.3	5,546.5	173.8	0.9	0.9	5.3	1.8	7.8	No	Yes	0.0	3.5	10.0	4,786.5	5,542.8	162.2
1992	Aug	4,680.6	5,542.2	160.1	1.1	0.9	8.2	4.7	0.4	No	Yes	0.0	3.5	0.4	4,656.0	5,542.0	159.6
1992	Sep	4,563.2	5,541.4	157.5	1.1	0.8	8.6	4.0	0.0	Yes	Yes	0.0	4.6	0.0	4,563.2	5,541.4	157.5
1992	Oct	4,488.8	5,541.0	155.8	1.4	0.8	15.1	0.0	0.0	Yes	Yes	0.0	15.1	0.0	4,488.8	5,541.0	155.8
1992	Nov	4,866.9	5,543.3	163.8	1.2	0.9	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,866.9	5,543.3	163.8
1992	Dec	5,414.9	5,546.6	174.1	1.5	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,414.9	5,546.6	174.1
1993	Jan	5,971.7	5,549.7	185.3	2.0	1.0	10.7	0.0	0.0	Yes	Yes	0.0	10.7	0.0	5,971.7	5,549.7	185.3
1993	Feb	5,977.6	5,549.7	185.4	2.5	1.0	25.0	0.0	0.0	Yes	Yes	0.0	25.0	0.0	5,977.6	5,549.7	185.4
1993	Mar	5,960.7	5,549.6	185.1	7.3	1.0	72.6	0.0	0.0	Yes	Yes	0.0	72.6	0.0	5,960.7	5,549.6	185.1
1993	Apr	5,934.3	5,549.5	184.5	17.8	1.0	177.3	0.0	0.0	Yes	Yes	0.0	177.3	0.0	5,934.3	5,549.5	184.5
1993	May	5,904.7	5,549.3	183.9	8.5	1.0	79.4	7.1	0.0	Yes	Yes	0.0	72.2	0.0	5,904.7	5,549.3	183.9
1993	Jun	5,771.4	5,548.6	181.0	3.7	1.0	32.9	7.2	0.0	Yes	Yes	0.0	25.7	0.0	5,771.4	5,548.6	181.0
1993	Jul	5,638.3	5,547.8	178.3	1.7	1.0	11.2	7.7	2.0	No	Yes	0.0	3.5	2.0	5,517.3	5,547.1	176.0
1993	Aug	5,402.3	5,546.5	173.8	1.9	0.9	15.9	5.1	0.0	Yes	Yes	0.0	10.8	0.0	5,402.3	5,546.5	173.8
1993	Sep	5,301.2	5,545.9	171.9	1.6	0.9	13.8	4.0	0.0	Yes	Yes	0.0	9.8	0.0	5,301.2	5,545.9	171.9
1993	Oct	5,220.1	5,545.4	170.4	2.1	0.9	22.0	0.0	0.0	Yes	Yes	0.0	22.0	0.0	5,220.1	5,545.4	170.4
1993	Nov	5,970.9	5,549.7	185.3	2.0	1.0	7.4	0.0	0.0	Yes	Yes	0.0	7.4	0.0	5,970.9	5,549.7	185.3
1993	Dec	5,971.7	5,549.7	185.3	2.0	1.0	20.0	0.0	0.0	Yes	Yes	0.0	20.0	0.0	5,971.7	5,549.7	185.3
1994	Jan	5,971.7	5,549.7	185.3	2.1	1.0	20.6	0.0	0.0	Yes	Yes	0.0	20.6	0.0	5,971.7	5,549.7	185.3
1994	Feb	5,977.6	5,549.7	185.4	2.4	1.0	24.2	0.0	0.0	Yes	Yes	0.0	24.2	0.0	5,977.6	5,549.7	185.4
1994	Mar	5,960.7	5,549.6	185.1	3.6	1.0	35.5	0.0	0.0	Yes	Yes	0.0	35.5	0.0	5,960.7	5,549.6	185.1
1994	Apr	5,934.3	5,549.5	184.5	2.1	1.0	20.3	0.0	0.0	Yes	Yes	0.0	20.3	0.0	5,934.3	5,549.5	184.5
1994	May	5,904.7	5,549.3	183.9	1.4	1.0	7.8	4.3	2.8	No	Yes	0.0	3.5	2.8	5,730.6	5,548.3	180.2
1994	Jun	5,600.0	5,547.6	177.5	0.9	0.9	5.4	1.9	5.3	No	Yes	0.0	3.5	5.5	5,272.5	5,545.7	171.4
1994	Jul	5,146.5	5,545.0	169.1	0.8	0.9	5.2	1.7	8.0	No	Yes	0.0	3.5	11.4	4,443.6	5,540.7	154.8
1994	Aug	4,342.6	5,540.0	152.5	0.9	0.8	5.7	2.2	2.9	No	Yes	0.0	3.5	2.9	4,162.1	5,538.8	148.4
1994	Sep	4,075.8	5,538.2	146.5	1.0	0.8	7.6	4.0	0.0	No	Yes	0.0	3.6	0.0	4,075.8	5,538.2	146.5
1994	Oct	4,006.6	5,537.8	144.9	1.7	0.8	17.5	0.0	0.0	Yes	Yes	0.0	17.5	0.0	4,006.6	5,537.8	144.9
1994	Nov	4,710.2	5,542.4	160.7	1.8	0.8	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	4,710.2	5,542.4	160.7
1994	Dec	5,464.6	5,546.8	175.0	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,464.6	5,546.8	175.0
1995	Jan	5,971.7	5,549.7	185.3	2.2	1.0	13.5	0.0	0.0	Yes	Yes	0.0	13.5	0.0	5,971.7	5,549.7	185.3
1995	Feb	5,977.6	5,549.7	185.4	3.2	1.0	32.2	0.0	0.0	Yes	Yes	0.0	32.2	0.0	5,977.6	5,549.7	185.4
1995	Mar	5,960.7	5,549.6	185.1	6.7	1.0	67.0	0.0	0.0	Yes	Yes	0.0	67.0	0.0	5,960.7	5,549.6	185.1
1995	Apr	5,934.3	5,549.5	184.5	5.1	1.0	50.9	0.0	0.0	Yes	Yes	0.0	50.9	0.0	5,934.3	5,549.5	184.5
1995	May	5,904.7	5,549.3	183.9	5.3	1.0	46.8	7.1	0.0	Yes	Yes	0.0	39.7	0.0	5,904.7	5,549.3	183.9
1995	Jun	5,771.4	5,548.6	181.0	3.2	1.0	27.7	7.2	0.0	Yes	Yes	0.0	20.5	0.0	5,771.4	5,548.6	181.0
1995	Jul	5,638.3	5,547.8	178.3	1.6	1.0	9.7	6.2	3.4	No	Yes	0.0	3.5	3.4	5,427.0	5,546.6	174.3
1995	Aug	5,313.2	5,546.0	172.2	1.2	0.9	8.9	5.1	0.0	No	Yes	0.0	3.8	0.0	5,313.2	5,546.0	172.2
1995	Sep	5,213.0	5,545.4	170.3	1.3	0.9	10.5	4.0	0.0	Yes	Yes	0.0	6.5	0.0	5,213.0	5,545.4	170.3
1995	Oct	5,132.6	5,544.9	168.8	1.8	0.9	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	5,132.6	5,544.9	168.8
1995	Nov	5,914.2	5,549.4	184.1	2.0	1.0	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,914.2	5,549.4	184.1
1995	Dec	5,971.7	5,549.7	185.3	1.6	1.0	14.7	0.0	0.0	Yes	Yes	0.0	14.7	0.0	5,971.7	5,549.7	185.3
1996	Jan	5,971.7	5,549.7	185.3	2.0	1.0	19.5	0.0	0.0	Yes	Yes	0.0	19.5	0.0	5,971.7	5,549.7	185.3
1996	Feb	5,977.6	5,549.7	185.4	2.9	1.0	29.3	0.0	0.0	Yes	Yes	0.0	29.3	0.0	5,977.6	5,549.7	185.4
1996	Mar	5,960.7	5,549.6	185.1	2.5	1.0	25.3	0.0	0.0	Yes	Yes	0.0	25.3	0.0	5,960.7	5,549.6	185.1
1996	Apr	5,934.3	5,549.5	184.5	1.5	1.0	14.9	0.0	0.0	Yes	Yes	0.0	14.9	0.0	5,934.3	5,549.5	184.5
1996	May	5,878.6	5,549.2	183.3	1.1	1.0	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,565.8	5,547.4	176.9
1996	Jun	5,437.6	5,546.7	174.5	0.8	0.9	5.2	1.7	5.5	No	Yes	0.0	3.5	7.2	5,007.4	5,544.2	166.5
1996	Jul	4,884.9	5,543.4	164.2	0.8	0.9	5.1	1.6	8.0	No	Yes	0.0	3.5	11.6	4,169.0	5,538.9	148.6
1996	Aug	4,072.0	5,538.2	146.4	0.7	0.8	5.0	1.5	3.6	No	Yes	0.0	3.5	4.6	3,786.9	5,536.2	139.9
1996	Sep	3,705.5	5,535.6	138.0	1.0	0.7	7.7	4.0	0.0	No	Yes	0.0	3.7	0.0	3,705.5	5,535.6	138.0

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River	to OIC			
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full?	Full?	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full	Full?
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs	cfs	cfs		
1996	Oct	3705.5	5535.6	138.0	8.0	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.8	0.0	0.0	Yes	Yes
1996	Nov	3640.4	5535.1	136.6	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9	0.0	0.0	Yes	Yes
1996	Dec	4445.9	5540.7	154.8	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes
1997	Jan	5291.5	5545.9	171.8	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes
1997	Feb	5971.7	5549.7	185.3	11.5	0.0	0.0	0.0	Yes	Yes	14.1	2.8	16.9	0.0	0.0	Yes	Yes
1997	Mar	5977.6	5549.7	185.4	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1	0.0	0.0	Yes	Yes
1997	Apr	5960.7	5549.6	185.1	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8	0.0	0.0	Yes	Yes
1997	May	5934.3	5549.5	184.5	7.3	7.3	0.0	0.0	No	No	9.0	1.8	10.8	5.1	0.0	Yes	Yes
1997	Jun	5641.9	5547.9	178.3	5.9	5.9	0.0	0.0	No	No	7.3	1.5	8.7	5.1	0.0	Yes	Yes
1997	Jul	5208.5	5545.4	170.2	4.3	4.3	0.0	0.0	No	No	5.2	1.1	6.3	2.8	4.1	No	Yes
1997	Aug	4337.4	5540.0	152.3	5.9	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.7	3.6	0.0	Yes	Yes
1997	Sep	4127.2	5538.6	147.6	9.9	4.3	0.0	0.0	Yes	Yes	12.2	2.5	14.7	2.9	0.0	Yes	Yes
1997	Oct	4041.4	5538.0	145.7	9.8	0.0	0.0	0.0	Yes	Yes	12.0	2.4	14.4	0.0	0.0	Yes	Yes
1997	Nov	3972.6	5537.5	144.1	10.1	0.0	0.0	0.0	Yes	Yes	12.4	2.5	14.9	0.0	0.0	Yes	Yes
1997	Dec	4598.3	5541.7	158.3	9.4	0.0	0.0	0.0	Yes	Yes	11.6	2.3	13.9	0.0	0.0	Yes	Yes
1998	Jan	5184.6	5545.2	169.8	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6	0.0	0.0	Yes	Yes
1998	Feb	5869.8	5549.1	183.1	15.7	0.0	0.0	0.0	Yes	Yes	19.3	3.9	23.2	0.0	0.0	Yes	Yes
1998	Mar	5977.6	5549.7	185.4	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes
1998	Apr	5960.7	5549.6	185.1	27.0	0.0	0.0	0.0	Yes	Yes	33.1	6.7	39.8	0.0	0.0	Yes	Yes
1998	May	5934.3	5549.5	184.5	24.8	7.7	0.0	0.0	Yes	Yes	30.4	6.1	36.5	5.1	0.0	Yes	Yes
1998	Jun	5904.7	5549.3	183.9	12.0	7.7	0.0	0.0	Yes	Yes	14.7	3.0	17.7	5.1	0.0	Yes	Yes
1998	Jul	5771.4	5548.6	181.0	8.2	8.2	0.0	0.0	No	No	10.1	2.0	12.1	6.8	0.0	Yes	Yes
1998	Aug	5295.6	5545.9	171.8	5.9	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.6	3.6	0.0	Yes	Yes
1998	Sep	5077.4	5544.6	167.8	14.1	4.3	0.0	0.0	Yes	Yes	17.3	3.5	20.8	2.9	0.0	Yes	Yes
1998	Oct	4979.8	5544.0	166.0	13.8	0.0	0.0	0.0	Yes	Yes	17.0	3.4	20.4	0.0	0.0	Yes	Yes
1998	Nov	4901.4	5543.5	164.5	15.7	0.0	0.0	0.0	Yes	Yes	19.3	3.9	23.2	0.0	0.0	Yes	Yes
1998	Dec	5696.5	5548.2	179.4	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3	0.0	0.0	Yes	Yes
1999	Jan	5971.7	5549.7	185.3	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes
1999	Feb	5971.7	5549.7	185.3	13.0	0.0	0.0	0.0	Yes	Yes	16.0	3.2	19.2	0.0	0.0	Yes	Yes
1999	Mar	5977.6	5549.7	185.4	9.4	0.0	0.0	0.0	Yes	Yes	11.5	2.3	13.8	0.0	0.0	Yes	Yes
1999	Apr	5960.7	5549.6	185.1	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes
1999	May	5934.3	5549.5	184.5	9.0	7.7	0.0	0.0	Yes	Yes	11.1	2.2	13.3	5.1	0.0	Yes	Yes
1999	Jun	5812.7	5548.8	181.9	7.7	7.7	0.0	0.0	No	No	9.4	1.9	11.3	5.1	0.0	Yes	Yes
1999	Jul	5546.9	5547.3	176.5	8.1	8.1	0.0	0.0	No	No	10.0	2.0	12.0	6.8	0.0	Yes	Yes
1999	Aug	5064.8	5544.5	167.6	6.8	5.5	0.0	0.0	Yes	Yes	8.4	1.7	10.1	3.6	0.0	Yes	Yes
1999	Sep	4944.8	5543.8	165.3	6.8	4.3	0.0	0.0	Yes	Yes	8.4	1.7	10.1	2.9	0.0	Yes	Yes
1999	Oct	4848.7	5543.2	163.4	7.5	0.0	0.0	0.0	Yes	Yes	9.2	1.9	11.1	0.0	0.0	Yes	Yes
1999	Nov	4771.5	5542.7	161.9	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3	0.0	0.0	Yes	Yes
1999	Dec	5236.0	5545.5	170.7	8.1	0.0	0.0	0.0	Yes	Yes	10.0	2.0	12.0	0.0	0.0	Yes	Yes
2000	Jan	5700.9	5548.2	179.5	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7	0.0	0.0	Yes	Yes
2000	Feb	5971.7	5549.7	185.3	12.9	0.0	0.0	0.0	Yes	Yes	15.9	3.2	19.1	0.0	0.0	Yes	Yes
2000	Mar	5977.6	5549.7	185.4	17.4	0.0	0.0	0.0	Yes	Yes	21.4	4.3	25.7	0.0	0.0	Yes	Yes
2000	Apr	5960.7	5549.6	185.1	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes
2000	May	5934.3	5549.5	184.5	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.1	5.1	0.0	Yes	Yes
2000	Jun	5521.0	5547.2	176.1	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.4	2.9	2.2	No	Yes
2000	Jul	4931.1	5543.7	165.1	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.8	2.3	4.6	No	Yes
2000	Aug	4026.9	5537.9	145.4	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.7	2.2	1.4	No	Yes
2000	Sep	3617.1	5535.0	136.1	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.3	2.8	0.0	No	Yes
2000	Oct	3380.2	5533.2	130.8	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7	0.0	0.0	Yes	Yes
2000	Nov	3318.5	5532.7	129.5	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5	0.0	0.0	Yes	Yes
2000	Dec	4041.2	5538.0	145.7	10.6	0.0	0.0	0.0	Yes	Yes	13.0	2.6	15.6	0.0	0.0	Yes	Yes
2001	Jan	4733.7	5542.5	161.1	10.0	0.0	0.0	0.0	Yes	Yes	12.3	2.5	14.8	0.0	0.0	Yes	Yes
2001	Feb	5370.5	5546.3	173.2	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5	0.0	0.0	Yes	Yes
2001	Mar	5977.6	5549.7	185.4	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes
2001	Apr	5960.7	5549.6	185.1	13.6	0.0	0.0	0.0	Yes	Yes	16.7	3.4	20.1	0.0	0.0	Yes	Yes
2001	May	5934.3	5549.5	184.5	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.5	5.1	0.0	Yes	Yes
2001	Jun	5684.6	5548.1	179.2	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7	4.2	0.9	No	Yes
2001	Jul	5180.1	5545.2	169.7	4.4	4.4	0.0	0.0	No	No	5.5	1.1	6.6	3.1	3.8	No	Yes
2001	Aug	4328.1	5539.9	152.1	5.7	5.5	0.0	0.0	Yes	Yes	7.0	1.4	8.4	3.6	0.0	Yes	Yes
2001	Sep	4101.6	5538.4	147.0	4.6	4.3	0.0	0.0	Yes	Yes	5.6	1.1	6.7	2.9	0.0	Yes	Yes
2001	Oct	3887.2	5536.9	142.2	6.5	0.0	0.0	0.0	Yes	Yes	8.0	1.6	9.7	0.0	0.0	Yes	Yes
2001	Nov	3820.1	5536.4	140.6	8.4	0.0	0.0	0.0	Yes	Yes	10.3	2.1	12.4	0.0	0.0	Yes	Yes
2001	Dec	4298.0	5539.7	151.5	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes
2002	Jan	5076.9	5544.6	167.8	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2	0.0	0.0	Yes	Yes
2002	Feb	5799.6	5548.7	181.6	11.9	0.0	0.0	0.0	Yes	Yes	14.6	2.9	17.5	0.0	0.0	Yes	Yes
2002	Mar	5977.6	5549.7	185.4	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8	0.0	0.0	Yes	Yes
2002	Apr	5960.7	5549.6	185.1	6.9	0.0	0.0	0.0	Yes	Yes	8.5	1.7	10.1	0.0	0.0	Yes	Yes
2002	May	5934.3	5549.5	184.5	4.3	4.3	0.0	0.0	No	No	5.3	1.1	6.4	2.9	2.1	No	Yes
2002	Jun	5340.6	5546.1	172.7	3.1	3.1	0.0	0.0	No	No	3.8	0.8	4.6	1.1	4.0	No	Yes
2002	Jul	4635.4	5541.9	159.1	3.3	3.3	0.0	0.0	No	No	4.0	0.8	4.8	1.3	5.5	No	Yes
2002	Aug	3670.4	5535.4	137.3	2.9	2.9	0.0	0.0	No	No	3.5	0.7	4.2	0.7	2.9	No	Yes
2002	Sep	3160.6	5531.5	125.9	4.4	4.3	0.0	0.0	Yes	Yes	5.4	1.1	6.5	2.9	0.0	Yes	Yes
2002	Oct	2938.4	5529.7	120.6	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	10.9	0.0	0.0	Yes	Yes
2002	Nov	2881.5	5529.2	119.2	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3	0.0	0.0	Yes	Yes
2002	Dec	3359.2	5533.0	130.3	7.0	0.0	0.0	0.0	Yes	Yes	8.6	1.7	10.3	0.0	0.0	Yes	Yes
2003	Jan	3733.3	5535.8	138.7	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5	0.0	0.0	Yes	Yes
2003	Feb	4237.2	5539.3	150.1	9.6	0.0	0.0	0.0	Yes	Yes	11.8	2.4	14.2	0.0	0.0	Yes	Yes
2003	Mar	4782.4	5542.8	162.1	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0	0.0	0.0	Yes	Yes
2003	Apr	5601.6	5547.6	177.6	8.2	0.0	0.0	0.0	Yes	Yes	10.1	2.0	12.1	0.0	0.0	Yes	Yes
2003	May	5934.3	5549.5	184.5	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9	5.1	0.0	Yes	Yes
2003	Jun	5507.1	5547.1	175.8	3.7	3.7	0.0	0.0	No	No	4.6	0.9	5.5	2.0	3.1	No	Yes
2003	Jul	4858.6	5543.3	163.6	3.1	3.1	0.0	0.0	No	No	3.9	0.8	4.6	1.1	5.7	No	Yes
2003	Aug	3877.8	5536.8	142.0	3.7	3.7	0.0	0.0	No	No	4.6	0.9	5.5	2.0	1.6	No	Yes
2003	Sep	3454.3	5533.8	132.4	3.8	3.8	0.0	0.0	No	No	4.7	0.9	5.6	2.1	0.7	No	Yes
2003	Oct	3171.6	5531.6	126.1	4.3	0.0	0.0	0.0	Yes	Yes	5.3	1.1	6.4	0.0	0.0	Yes	Yes
2003	Nov	3112.0	5531.1	124.7	5.3	0.0	0.0	0.0	Yes	Yes	6.5	1.3	7.8	0.0	0.0	Yes	Yes
2003	Dec	3325.5	5532.8	129.6	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5	0.0	0.0	Yes	Yes
2004	Jan	3772.4	5536.1	139.5	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1	0.0	0.0	Yes	Yes
2004	Feb	4312.8	5539.8	151.8	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes
2004	Mar	4824.3	5543.1	162.9	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes
2004	Apr	5641.5	5547.9	178.3	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7	0.0	0.0	Yes	Yes
2004	May	5934.3	5549.5	184.5	4.4	4.4	0.0	0.0	No	No	5.5	1.1	6.5	3.0	2.0	No	Yes
2004	Jun	5349.6	5546.2	172.8	3.1	3.1	0.0	0.0	No	No	3.9	0.8	4.6	1.1	4.0	No	Yes
2004	Jul	4645.9	5542.0	159.4	3.5	3.5	0.0	0.0	No	No	4.3	0.9	5.1	1.6	5.2	No	Yes
2004	Aug	3700.5	5535.6	137.9	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.6	3.6	0.0	Yes	Yes
2004	Sep	3424.5	5533.5	131.8	4.2	4.2	0.0	0.0	No	No	5.1	1.0	6.2	2.7	0.2	No	Yes
2004	Oct	3176.9	5531.6	126.3	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7	0.0	0.0	Yes	Yes
2004	Nov	3117.3	5531.1	124.9	13.8	0.0	0.0	0.0	Yes	Yes	16.9	3.4	20.3	0.0	0.0	Yes	Yes
2004	Dec	4002.5	5537.7	144.8	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2	0.0	0.0	Yes	Yes
2005	Jan	4790.5	5542.9	162.3	34.6	0.0	0.0	0.0	Yes	Yes	42.5	8.5	51.0	0.0	0.0	Yes	Yes
2005	Feb	5619.9	5547.7	177.9	25.6	0.0	0.0	0.0	Yes	Yes	31.4	6.3	37.7	0.0	0.0	Yes	Yes
2005	Mar	5977.6	5549.7	185.4	50.6	0.0	0.0	0.0	Yes	Yes	62.1	12.5	74.6	0.0	0.0	Yes	Yes
2005	Apr	5960.7	5549.6	185.1	113.4	0.0	0.0	0.0	Yes	Yes	139.2	28.0	167.2	0.0	0.0	Yes	Yes
2005	May	5934.3	5549.5	184.5	78.4	7.7	0.0	0.0	Yes	Yes	96.3	19.4	115.7	5.1	0.0	Yes	Yes
2005	Jun	5904.7	5549.3	183.9	25.2	7.7	0.0	0.0	Yes	Yes	31.0	6.2	37.2	5.1	0.0	Yes	Yes
2005	Jul	5771.4	5548.6	181.0	12.1	10.4	0.0	0.0	Yes	Yes	14.9	3.0	17.9	6.8	0.0	Yes	Yes
2005	Aug	5638.3	5547.8	178.3	14.0	5.5	0.0	0.0	Yes	Yes	17.2	3.5	20.7	3.6	0.0	Yes	Yes
2005	Sep	5521.9	5547.2	176.1	10.4	4.3	0.0	0.0	Yes	Yes	12.8	2.6	15.4	2.9	0.0	Yes	Yes
2005	Oct	5419.5	5546.6	174.2	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7	0.0	0.0	Yes	Yes
2005	Nov	5337.2	5546.1	172.6	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2005	Dec	5970.9	5549.7	185.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2006	Jan	5971.7	5549.7	185.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2006	Feb	5971.7	5549.7	185.3	14.3	0.0	0.0	0.0	Yes	Yes	17.5	3.5	21.0	0.0	0.0	Yes	Yes
2006	Mar	5977.6	5549.7	185.4	18.6	0.0	0.0	0.0	Yes	Yes	22.8	4.6	27.4	0.0	0.0	Yes	Yes
2006	Apr	5960.7	5549.6	185.1	16.4	0.0	0.0	0.0	Yes	Yes	20.1	4.0	24.1	0.0	0.0	Yes	Yes
2006	May	5934.3	5549.5	184.5	9.4	7.7	0.0	0.0	Yes	Yes	11.6	2.3	13.9	5.1	0.0	Yes	Yes
2006	Jun	5853.7	5549.0	182.8	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7	5.1	0.0	Yes	Yes
2006	Jul	5482.8	5547.0	175.3	7.0	7.0	0.0	0.0	No	No	8.6	1.7	10.4	6.8	0.0	Yes	Yes
2006	Aug	4889.5	5543.5	164.2	6.0	5.5	0.0	0.0	Yes	Yes	7.4	1.5	8.8	3.6	0.0	Yes	Yes

Date		to COVE				Reservoir Int1			Seepage		Evaporation		Reservoir Int2		
Yr	Mo	Hydraulic Cap	to Fill Resv	Control	River	Volume	Elevation	Area					Volume	Elevation	Area
		cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs	af	ft	ac
1996	Oct	15.2	37.8	0.0	0.0	3705.5	5535.6	138.0	44.6	0.7	20.6	0.3	3,640.4	5,535.1	136.6
1996	Nov	15.3	40.2	15.3	14.4	4497.0	5541.0	156.0	48.7	0.8	2.3	0.0	4,445.9	5,540.7	154.8
1996	Dec	14.7	25.8	14.7	14.7	5347.3	5546.2	172.8	55.8	0.9	0.0	0.0	5,291.5	5,545.9	171.8
1997	Jan	14.1	12.0	12.0	12.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
1997	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
1997	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
1997	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
1997	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
1997	Jun	13.9	6.6	0.0	0.0	5641.9	5547.9	178.3	55.7	0.9	73.6	1.2	5,512.7	5,547.1	175.9
1997	Jul	14.2	13.4	0.0	0.0	5208.5	5545.4	170.2	55.0	0.9	70.2	1.1	5,083.3	5,544.6	167.9
1997	Aug	14.7	27.6	0.0	0.0	4337.4	5540.0	152.3	49.2	0.8	50.3	0.8	4,237.9	5,539.3	150.1
1997	Sep	14.9	32.0	0.0	0.0	4127.2	5538.6	147.6	46.1	0.8	39.7	0.7	4,041.4	5,538.0	145.7
1997	Oct	14.9	32.4	0.0	0.0	4041.4	5538.0	145.7	47.0	0.8	21.7	0.4	3,972.6	5,537.5	144.1
1997	Nov	15.0	34.6	15.0	11.4	4650.5	5542.0	159.5	49.8	0.8	2.4	0.0	4,598.3	5,541.7	158.3
1997	Dec	14.6	23.3	14.6	10.4	5239.7	5545.6	170.8	55.2	0.9	0.0	0.0	5,184.6	5,545.2	169.8
1998	Jan	14.2	13.8	13.8	12.1	5929.4	5549.4	184.4	59.5	1.0	0.0	0.0	5,869.8	5,549.1	183.1
1998	Feb	13.8	2.9	2.9	2.9	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
1998	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
1998	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
1998	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
1998	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0
1998	Jul	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3
1998	Aug	14.1	12.0	0.0	0.0	5295.6	5545.9	171.8	55.5	0.9	56.7	0.9	5,183.4	5,545.2	169.8
1998	Sep	14.2	16.0	0.0	0.0	5077.4	5544.6	167.8	52.4	0.9	45.2	0.8	4,979.8	5,544.0	166.0
1998	Oct	14.3	17.1	0.0	0.0	4979.8	5544.0	166.0	53.6	0.9	24.8	0.4	4,901.4	5,543.5	164.5
1998	Nov	14.4	19.0	14.4	14.4	5755.7	5548.5	180.7	56.5	0.9	2.7	0.0	5,696.5	5,548.2	179.4
1998	Dec	13.9	5.5	5.5	5.5	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
1999	Jan	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
1999	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
1999	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
1999	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
1999	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
1999	Jun	13.8	3.7	0.0	0.0	5812.7	5548.8	181.9	56.8	1.0	75.0	1.3	5,680.8	5,548.1	179.1
1999	Jul	14.0	7.9	0.0	0.0	5546.9	5547.3	176.5	57.0	0.9	72.8	1.2	5,417.1	5,546.6	174.1
1999	Aug	14.3	15.7	0.0	0.0	5064.8	5544.5	167.6	54.1	0.9	55.3	0.9	4,955.4	5,543.9	165.6
1999	Sep	14.3	18.3	0.0	0.0	4944.8	5543.8	165.3	51.7	0.9	44.5	0.7	4,848.7	5,543.2	163.4
1999	Oct	14.4	19.2	0.0	0.0	4848.7	5543.2	163.4	52.8	0.9	24.4	0.4	4,771.5	5,542.7	161.9
1999	Nov	14.4	21.2	14.4	8.8	5292.2	5545.9	171.8	53.7	0.9	2.6	0.0	5,236.0	5,545.5	170.7
1999	Dec	14.1	12.9	12.9	8.5	5759.2	5548.5	180.8	58.4	0.9	0.0	0.0	5,700.9	5,548.2	179.5
2000	Jan	13.9	5.4	5.4	5.4	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2000	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2000	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2000	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2000	May	13.7	1.6	1.6	0.5	5964.8	5549.6	185.2	59.8	1.0	66.5	1.1	5,838.5	5,548.9	182.5
2000	Jun	14.0	8.6	0.0	0.0	5521.0	5547.2	176.1	55.0	0.9	72.6	1.2	5,393.3	5,546.4	173.7
2000	Jul	14.3	17.9	0.0	0.0	4931.1	5543.7	165.1	53.3	0.9	68.1	1.1	4,809.7	5,543.0	162.6
2000	Aug	15.0	32.6	0.0	0.0	4026.9	5537.9	145.4	46.9	0.8	48.0	0.8	3,932.0	5,537.2	143.2
2000	Sep	15.3	40.6	0.0	0.0	3617.1	5535.0	136.1	42.5	0.7	36.6	0.6	3,537.9	5,534.4	134.3
2000	Oct	15.5	43.1	0.0	0.0	3380.2	5533.2	130.8	42.2	0.7	19.5	0.3	3,318.5	5,532.7	129.5
2000	Nov	15.5	45.6	15.5	13.0	4089.3	5538.3	146.8	45.9	0.8	2.2	0.0	4,041.2	5,538.0	145.7
2000	Dec	14.9	32.4	14.9	12.1	4786.1	5542.8	162.2	52.4	0.9	0.0	0.0	4,733.7	5,542.5	161.1
2001	Jan	14.5	21.1	14.5	11.3	5426.8	5546.6	174.3	56.3	0.9	0.0	0.0	5,370.5	5,546.3	173.2
2001	Feb	14.1	11.9	11.9	11.9	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2001	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2001	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2001	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2001	Jun	13.9	5.8	0.0	0.0	5684.6	5548.1	179.2	56.0	0.9	73.9	1.2	5,554.7	5,547.4	176.7
2001	Jul	14.2	13.9	0.0	0.0	5180.1	5545.2	169.7	54.8	0.9	70.0	1.1	5,055.3	5,544.5	167.4
2001	Aug	14.7	27.7	0.0	0.0	4328.1	5539.9	152.1	49.1	0.8	50.2	0.8	4,228.8	5,539.3	149.9
2001	Sep	14.9	32.4	0.0	0.0	4101.6	5538.4	147.0	45.9	0.8	39.6	0.7	4,016.1	5,537.8	145.1
2001	Oct	15.1	34.9	0.0	0.0	3887.2	5536.9	142.2	45.9	0.7	21.2	0.3	3,820.1	5,536.4	140.6
2001	Nov	15.1	37.2	15.1	8.9	4347.9	5540.1	152.6	47.7	0.8	2.3	0.0	4,298.0	5,539.7	151.5
2001	Dec	14.8	28.2	14.8	13.6	5131.4	5544.9	168.8	54.5	0.9	0.0	0.0	5,076.9	5,544.6	167.8
2002	Jan	14.2	15.5	14.2	12.7	5858.6	5549.1	182.9	59.1	1.0	0.0	0.0	5,799.6	5,548.7	181.6
2002	Feb	13.8	4.2	4.2	4.2	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2002	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2002	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2002	May	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1	5,808.5	5,548.8	181.8
2002	Jun	14.1	11.6	0.0	0.0	5340.6	5546.1	172.7	54.0	0.9	71.2	1.2	5,215.4	5,545.4	170.4
2002	Jul	14.5	22.7	0.0	0.0	4635.4	5541.9	159.1	51.4	0.8	65.6	1.1	4,518.4	5,541.1	156.5
2002	Aug	15.2	38.4	0.0	0.0	3670.4	5535.4	137.3	44.3	0.7	45.3	0.7	3,580.7	5,534.7	135.2
2002	Sep	15.6	48.3	0.0	0.0	3160.6	5531.5	125.9	39.3	0.7	33.9	0.6	3,087.4	5,530.9	124.2
2002	Oct	15.8	50.3	0.0	0.0	2938.4	5529.7	120.6	38.9	0.6	18.0	0.3	2,881.5	5,529.2	119.2
2002	Nov	15.9	52.9	15.9	8.8	3402.2	5533.4	131.3	41.0	0.7	2.0	0.0	3,359.2	5,533.0	130.3
2002	Dec	15.5	43.5	15.5	6.8	3778.4	5536.1	139.7	45.1	0.7	0.0	0.0	3,733.3	5,535.8	138.7
2003	Jan	15.2	37.4	15.2	9.0	4286.1	5539.6	151.2	48.8	0.8	0.0	0.0	4,237.2	5,539.3	150.1
2003	Feb	14.8	32.3	14.8	10.7	4830.0	5543.1	163.1	47.6	0.9	0.0	0.0	4,782.4	5,542.8	162.1
2003	Mar	14.4	20.3	14.4	14.4	5669.9	5548.0	178.9	57.8	0.9	10.6	0.2	5,601.6	5,547.6	177.6
2003	Apr	13.9	7.2	7.2	7.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2003	May	13.7	1.6	1.6	0.3	5952.3	5549.6	184.9	59.7	1.0	66.4	1.1	5,826.2	5,548.9	182.2
2003	Jun	14.0	8.8	0.0	0.0	5507.1	5547.1	175.8	54.9	0.9	72.5	1.2	5,379.7	5,546.4	173.4
2003	Jul	14.4	19.1	0.0	0.0	4858.6	5543.3	163.6	52.8	0.9	67.5	1.1	4,738.3	5,542.5	161.2
2003	Aug	15.1	35.0	0.0	0.0	3877.8	5536.8	142.0	45.8	0.7	46.8	0.8	3,785.1	5,536.2	139.8
2003	Sep	15.4	43.3	0.0	0.0	3454.3	5533.8	132.4	41.4	0.7	35.6	0.6	3,377.3	5,533.2	130.7
2003	Oct	15.6	46.5	0.0	0.0	3171.6	5531.6	126.1	40.7	0.7	18.8	0.3	3,112.0	5,531.1	124.7
2003	Nov	15.7	49.1	15.7	4.3	3368.3	5533.1	130.5	40.8	0.7	2.0	0.0	3,325.5	5,532.8	129.6
2003	Dec	15.5	44.0	15.5	8.0	3817.8	5536.4	140.6	45.4	0.7	0.0	0.0	3,772.4	5,536.1	139.5
2004	Jan	15.1	36.7	15.1	9.6	4362.1	5540.1	152.9	49.4	0.8	0.0	0.0	4,312.8	5,539.8	151.8
2004	Feb	14.8	31.0	14.8	10.1	4872.1	5543.4	163.9	47.8	0.9	0.0	0.0	4,824.3	5,543.1	162.9
2004	Mar	14.4	19.6	14.4	14.4	5710.2	5548.2	179.7	58.0	0.9	10.6	0.2	5,641.5	5,547.9	178.3
2004	Apr	13.9	6.6	6.6	6.6	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2004	May	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1	5,808.5	5,548.8	181.8
2004	Jun	14.1	11.5	0.0	0.0	5349.6	5546.2	172.8	54.0	0.9	71.3	1.2	5,224.3	5,545.5	170.5
2004	Jul	14.5	22.5	0.0	0.0	4645.9	5542.0	159.4	51.5	0.8	65.7	1.1	4,528.7	5,541.2	156.7
2004	Aug	15.2	37.9	0.0	0.0	3700.5	5535.6	137.9	44.5	0.7	45.5	0.7	3,610.5	5,534.9	135.9
2004	Sep	15.4	43.8	0.0	0.0	3424.5	5533.5	131.8	41.2	0.7	35.5	0.6	3,347.9	5,532.9	130.1
2004	Oct	15.6	46.4	0.0	0.0	3176.9	5531.6	126.3	40.8	0.7	18.8	0.3	3,117.3	5,531.1	124.9
2004	Nov	15.7	49.0	15.7	15.7	4050.2	5538.1	145.9	45.6	0.8	2.2	0.0	4,002.5	5,537.7	144.8
2004	Dec	15.0	33.0	15.0	13.7	4843.3	5543.2	163.3	52.7	0.9	0.0	0.0	4,790.5	5,542.9	162.3
2005	Jan	14.4	20.2	14.4	14.4	5677.8	5548.1	179.0	57.8	0.9	0.0	0.0	5,619.9	5,547.7	177.9
2005	Feb	13.9	7.4	7.4	7.4	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2005	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2005	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2005	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2005	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0
2005	Jul	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3
2005	Aug	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0	5,521.9	5,547.2	176.1
2005	Sep	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8	5,419.5	5,546.6	174.2
2005	Oct	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4	5,337.2	5,546.1	172.6
2005	Nov	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3
2005	Dec	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2006	Jan	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2006	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2006	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2006	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2006	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2006	Jun	13.8	3.0	0.0	0.0	5853.7	5549.0	182.8	57.1	1.0	75.4	1.3	5,721.2	5,548.3	180.0
2006	Jul	14.0	8.9	0.0	0.0	5482.8	5547.0	175.3	56.6	0.9	72.3	1.2	5,353.8	5,546.2	172.9
2006	Aug	14.4	18.6	0.0	0.0	4889.5	5543.5	164.2	53.0	0.9	54.2	0.9	4,782.2	5,542.8	162.1

Date		Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full?	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	af	ft	ac
1996	Oct	1.3	0.7	13.9	0.0	0.0	Yes	Yes	0.0	13.9	0.0	3,640.4	5,535.1	136.6
1996	Nov	2.0	0.8	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,445.9	5,540.7	154.8
1996	Dec	2.1	0.9	6.7	0.0	0.0	Yes	Yes	0.0	6.7	0.0	5,291.5	5,545.9	171.8
1997	Jan	2.6	1.0	15.1	0.0	0.0	Yes	Yes	0.0	15.1	0.0	5,971.7	5,549.7	185.3
1997	Feb	1.9	1.0	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,977.6	5,549.7	185.4
1997	Mar	2.2	1.0	22.4	0.0	0.0	Yes	Yes	0.0	22.4	0.0	5,960.7	5,549.6	185.1
1997	Apr	1.9	1.0	18.5	0.0	0.0	Yes	Yes	0.0	18.5	0.0	5,934.3	5,549.5	184.5
1997	May	1.2	1.0	6.4	2.9	4.3	No	Yes	0.0	3.5	4.3	5,641.9	5,547.9	178.3
1997	Jun	1.0	0.9	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,208.5	5,545.4	170.2
1997	Jul	0.7	0.9	5.1	1.6	8.1	No	Yes	0.0	3.5	12.1	4,337.4	5,540.0	152.3
1997	Aug	1.0	0.8	6.8	3.3	1.8	No	Yes	0.0	3.5	1.8	4,127.2	5,538.6	147.6
1997	Sep	1.6	0.8	14.2	4.0	0.0	Yes	Yes	0.0	10.1	0.0	4,041.4	5,538.0	145.7
1997	Oct	1.6	0.8	16.8	0.0	0.0	Yes	Yes	0.0	16.8	0.0	3,972.6	5,537.5	144.1
1997	Nov	1.7	0.8	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	4,598.3	5,541.7	158.3
1997	Dec	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,184.6	5,545.2	169.8
1998	Jan	1.7	1.0	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	5,869.8	5,549.1	183.1
1998	Feb	2.6	1.0	23.8	0.0	0.0	Yes	Yes	0.0	23.8	0.0	5,977.6	5,549.7	185.4
1998	Mar	2.8	1.0	28.4	0.0	0.0	Yes	Yes	0.0	28.4	0.0	5,960.7	5,549.6	185.1
1998	Apr	4.4	1.0	44.0	0.0	0.0	Yes	Yes	0.0	44.0	0.0	5,934.3	5,549.5	184.5
1998	May	4.1	1.0	34.9	7.1	0.0	Yes	Yes	0.0	27.8	0.0	5,904.7	5,549.3	183.9
1998	Jun	2.0	1.0	15.5	7.2	0.0	Yes	Yes	0.0	8.3	0.0	5,771.4	5,548.6	181.0
1998	Jul	1.4	1.0	7.6	4.1	5.6	No	Yes	0.0	3.5	5.6	5,295.6	5,545.9	171.8
1998	Aug	1.0	0.9	6.9	3.4	1.7	No	Yes	0.0	3.5	1.7	5,077.4	5,544.6	167.8
1998	Sep	2.3	0.9	21.1	4.0	0.0	Yes	Yes	0.0	17.1	0.0	4,979.8	5,544.0	166.0
1998	Oct	2.3	0.9	23.6	0.0	0.0	Yes	Yes	0.0	23.6	0.0	4,901.4	5,543.5	164.5
1998	Nov	2.6	0.9	12.4	0.0	0.0	Yes	Yes	0.0	12.4	0.0	5,696.5	5,548.2	179.4
1998	Dec	2.2	1.0	17.0	0.0	0.0	Yes	Yes	0.0	17.0	0.0	5,971.7	5,549.7	185.3
1999	Jan	2.1	1.0	21.2	0.0	0.0	Yes	Yes	0.0	21.2	0.0	5,971.7	5,549.7	185.3
1999	Feb	2.1	1.0	21.3	0.0	0.0	Yes	Yes	0.0	21.3	0.0	5,977.6	5,549.7	185.4
1999	Mar	1.5	1.0	15.4	0.0	0.0	Yes	Yes	0.0	15.4	0.0	5,960.7	5,549.6	185.1
1999	Apr	1.9	1.0	18.7	0.0	0.0	Yes	Yes	0.0	18.7	0.0	5,934.3	5,549.5	184.5
1999	May	1.5	1.0	9.2	5.7	1.5	No	Yes	0.0	3.5	1.5	5,812.7	5,548.8	181.9
1999	Jun	1.3	1.0	8.4	4.9	2.2	No	Yes	0.0	3.5	2.2	5,546.9	5,547.3	176.5
1999	Jul	1.3	0.9	7.4	3.9	5.7	No	Yes	0.0	3.5	5.7	5,064.8	5,544.5	167.6
1999	Aug	1.1	0.9	8.4	4.9	0.2	No	Yes	0.0	3.5	0.2	4,944.8	5,543.8	165.3
1999	Sep	1.1	0.9	9.2	4.0	0.0	Yes	Yes	0.0	5.2	0.0	4,848.7	5,543.2	163.4
1999	Oct	1.2	0.9	13.2	0.0	0.0	Yes	Yes	0.0	13.2	0.0	4,771.5	5,542.7	161.9
1999	Nov	1.4	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	5,236.0	5,545.5	170.7
1999	Dec	1.3	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	5,700.9	5,548.2	179.5
2000	Jan	1.6	1.0	11.9	0.0	0.0	Yes	Yes	0.0	11.9	0.0	5,971.7	5,549.7	185.3
2000	Feb	2.1	1.0	21.1	0.0	0.0	Yes	Yes	0.0	21.1	0.0	5,977.6	5,549.7	185.4
2000	Mar	2.9	1.0	28.7	0.0	0.0	Yes	Yes	0.0	28.7	0.0	5,960.7	5,549.6	185.1
2000	Apr	1.6	1.0	15.9	0.0	0.0	Yes	Yes	0.0	15.9	0.0	5,934.3	5,549.5	184.5
2000	May	1.0	1.0	5.5	2.0	5.2	No	Yes	0.0	3.5	5.2	5,521.0	5,547.2	176.1
2000	Jun	0.7	0.9	5.1	1.6	5.5	No	Yes	0.0	3.5	7.8	4,931.1	5,543.7	165.1
2000	Jul	0.6	0.9	5.0	1.5	8.2	No	Yes	0.0	3.5	12.7	4,026.9	5,537.9	145.4
2000	Aug	0.6	0.8	4.9	1.4	3.7	No	Yes	0.0	3.5	5.1	3,617.1	5,535.0	136.1
2000	Sep	0.7	0.7	4.9	1.4	2.6	No	Yes	0.0	3.5	2.7	3,380.2	5,533.2	130.8
2000	Oct	1.6	0.7	17.0	0.0	0.0	Yes	Yes	0.0	17.0	0.0	3,318.5	5,532.7	129.5
2000	Nov	1.8	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,041.2	5,538.0	145.7
2000	Dec	1.7	0.9	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,733.7	5,542.5	161.1
2001	Jan	1.6	0.9	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	5,370.5	5,546.3	173.2
2001	Feb	2.0	1.0	8.6	0.0	0.0	Yes	Yes	0.0	8.6	0.0	5,977.6	5,549.7	185.4
2001	Mar	2.4	1.0	23.6	0.0	0.0	Yes	Yes	0.0	23.6	0.0	5,960.7	5,549.6	185.1
2001	Apr	2.2	1.0	22.1	0.0	0.0	Yes	Yes	0.0	22.1	0.0	5,934.3	5,549.5	184.5
2001	May	1.3	1.0	7.1	3.6	3.6	No	Yes	0.0	3.5	3.6	5,684.6	5,548.1	179.2
2001	Jun	0.9	0.9	5.3	1.8	5.4	No	Yes	0.0	3.5	6.3	5,180.1	5,545.2	169.7
2001	Jul	0.7	0.9	5.1	1.6	8.0	No	Yes	0.0	3.5	11.8	4,328.1	5,539.9	152.1
2001	Aug	0.9	0.8	6.5	3.0	2.1	No	Yes	0.0	3.5	2.1	4,101.6	5,538.4	147.0
2001	Sep	0.8	0.8	5.4	1.9	2.2	No	Yes	0.0	3.5	2.2	3,887.2	5,536.9	142.2
2001	Oct	1.1	0.7	11.5	0.0	0.0	Yes	Yes	0.0	11.5	0.0	3,820.1	5,536.4	140.6
2001	Nov	1.4	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,298.0	5,539.7	151.5
2001	Dec	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,076.9	5,544.6	167.8
2002	Jan	1.8	1.0	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,799.6	5,548.7	181.6
2002	Feb	2.0	1.0	16.3	0.0	0.0	Yes	Yes	0.0	16.3	0.0	5,977.6	5,549.7	185.4
2002	Mar	2.0	1.0	19.9	0.0	0.0	Yes	Yes	0.0	19.9	0.0	5,960.7	5,549.6	185.1
2002	Apr	1.1	1.0	11.1	0.0	0.0	Yes	Yes	0.0	11.1	0.0	5,934.3	5,549.5	184.5
2002	May	0.7	1.0	5.2	1.7	5.5	No	Yes	0.0	3.5	7.6	5,340.6	5,546.1	172.7
2002	Jun	0.5	0.9	4.9	1.4	5.8	No	Yes	0.0	3.5	9.7	4,635.4	5,541.9	159.1
2002	Jul	0.5	0.8	4.9	1.4	8.3	No	Yes	0.0	3.5	13.8	3,670.4	5,535.4	137.3
2002	Aug	0.5	0.7	4.7	1.2	3.9	No	Yes	0.0	3.5	6.8	3,160.6	5,531.5	125.9
2002	Sep	0.7	0.7	5.0	1.5	2.5	No	Yes	0.0	3.5	2.5	2,938.4	5,529.7	120.6
2002	Oct	1.2	0.6	12.7	0.0	0.0	Yes	Yes	0.0	12.7	0.0	2,881.5	5,529.2	119.2
2002	Nov	1.4	0.7	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	3,359.2	5,533.0	130.3
2002	Dec	1.2	0.7	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	3,733.3	5,535.8	138.7
2003	Jan	1.4	0.8	5.7	0.0	0.0	Yes	Yes	0.0	5.7	0.0	4,237.2	5,539.3	150.1
2003	Feb	1.6	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	4,782.4	5,542.8	162.1
2003	Mar	2.0	0.9	6.5	0.0	0.0	Yes	Yes	0.0	6.5	0.0	5,601.6	5,547.6	177.6
2003	Apr	1.4	1.0	7.2	0.0	0.0	Yes	Yes	0.0	7.2	0.0	5,934.3	5,549.5	184.5
2003	May	1.0	1.0	5.5	2.0	5.2	No	Yes	0.0	3.5	5.2	5,507.1	5,547.1	175.8
2003	Jun	0.6	0.9	5.0	1.5	5.6	No	Yes	0.0	3.5	8.8	4,858.6	5,543.3	163.6
2003	Jul	0.5	0.9	4.9	1.4	8.3	No	Yes	0.0	3.5	14.0	3,877.8	5,536.8	142.0
2003	Aug	0.6	0.7	4.9	1.4	3.8	No	Yes	0.0	3.5	5.4	3,454.3	5,533.8	132.4
2003	Sep	0.6	0.7	4.8	1.3	2.7	No	Yes	0.0	3.5	3.5	3,171.6	5,531.6	126.1
2003	Oct	0.7	0.7	7.8	0.0	0.0	Yes	Yes	0.0	7.8	0.0	3,112.0	5,531.1	124.7
2003	Nov	0.9	0.7	5.1	0.0	0.0	Yes	Yes	0.0	5.1	0.0	3,325.5	5,532.8	129.6
2003	Dec	1.3	0.7	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	3,772.4	5,536.1	139.5
2004	Jan	1.5	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,312.8	5,539.8	151.8
2004	Feb	1.5	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	4,824.3	5,543.1	162.9
2004	Mar	2.8	0.9	14.8	0.0	0.0	Yes	Yes	0.0	14.8	0.0	5,641.5	5,547.9	178.3
2004	Apr	1.9	1.0	13.0	0.0	0.0	Yes	Yes	0.0	13.0	0.0	5,934.3	5,549.5	184.5
2004	May	0.7	1.0	5.2	1.7	5.4	No	Yes	0.0	3.5	7.5	5,349.6	5,546.2	172.8
2004	Jun	0.5	0.9	4.9	1.4	5.8	No	Yes	0.0	3.5	9.7	4,645.9	5,542.0	159.4
2004	Jul	0.6	0.8	4.9	1.4	8.3	No	Yes	0.0	3.5	13.5	3,700.5	5,535.6	137.9
2004	Aug	0.9	0.7	5.6	2.1	3.0	No	Yes	0.0	3.5	3.0	3,424.5	5,533.5	131.8
2004	Sep	0.7	0.7	4.9	1.4	2.7	No	Yes	0.0	3.5	2.9	3,176.9	5,531.6	126.3
2004	Oct	2.3	0.7	23.6	0.0	0.0	Yes	Yes	0.0	23.6	0.0	3,117.3	5,531.1	124.9
2004	Nov	2.3	0.8	7.7	0.0	0.0	Yes	Yes	0.0	7.7	0.0	4,002.5	5,537.7	144.8
2004	Dec	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,790.5	5,542.9	162.3
2005	Jan	5.7	0.9	43.3	0.0	0.0	Yes	Yes	0.0	43.3	0.0	5,619.9	5,547.7	177.9
2005	Feb	4.2	1.0	35.5	0.0	0.0	Yes	Yes	0.0	35.5	0.0	5,977.6	5,549.7	185.4
2005	Mar	8.3	1.0	83.0	0.0	0.0	Yes	Yes	0.0	83.0	0.0	5,960.7	5,549.6	185.1
2005	Apr	18.7	1.0	185.6	0.0	0.0	Yes	Yes	0.0	185.6	0.0	5,934.3	5,549.5	184.5
2005	May	12.9	1.0	122.9	7.1	0.0	Yes	Yes	0.0	115.7	0.0	5,904.7	5,549.3	183.9
2005	Jun	4.2	1.0	37.3	7.2	0.0	Yes	Yes	0.0	30.1	0.0	5,771.4	5,548.6	181.0
2005	Jul	2.0	1.0	14.0	9.7	0.0	No	Yes	0.0	4.3	0.0	5,638.3	5,547.8	178.3
2005	Aug	2.3	0.9	20.3	5.1	0.0	Yes	Yes	0.0	15.2	0.0	5,521.9	5,547.2	176.1
2005	Sep	1.7	0.9	15.1	4.0	0.0	Yes	Yes	0.0	11.1	0.0	5,419.5	5,546.6	174.2
2005	Oct	2.3	0.9	23.9	0.0	0.0	Yes	Yes	0.0	23.9	0.0	5,337.2	5,546.1	172.6
2005	Nov	2.3	1.0	12.4	0.0	0.0	Yes	Yes	0.0	12.4	0.0	5,970.9	5,549.7	185.3
2005	Dec	2.3	1.0	23.1	0.0	0.0	Yes	Yes	0.0	23.1	0.0	5,971.7	5,549.7	185.3
2006	Jan	2.3	1.0	23.1	0.0	0.0	Yes	Yes	0.0	23.1	0.0	5,971.7	5,549.7	185.3
2006	Feb	2.3	1.0	23.3	0.0	0.0	Yes	Yes	0.0	23.3	0.0	5,977.6	5,549.7	185.4
2006	Mar	3.1	1.0	30.5	0.0	0.0	Yes	Yes	0.0	30.5	0.0	5,960.7	5,549.6	185.1
2006	Apr	2.7	1.0	26.6	0.0	0.0	Yes	Yes	0.0	26.6	0.0	5,934.3	5,549.5	184.5
2006	May	1.6	1.0	9.8	6.3	0.8	No	Yes	0.0	3.5	0.8	5,853.7	5,549.0	182.8
2006	Jun	1.1	1.0	6.7	3.2	4.0	No	Yes	0.0	3.5	4.0	5,482.8	5,547.0	175.3
2006	Jul	1.2	0.9	5.6	2.1	7.6	No	Yes	0.0	3.5	7.6	4,889.5	5,543.5	164.2
2006	Aug	1.0	0.9	7.1	3.6	1.6	No	Yes	0.0	3.5	1.6	4,686.9	5,542.2	160.2

Date Yr	Date Mo	Reservoir Start Volume (af)	Reservoir Start Elevation (ft)	Reservoir Start Area (ac)	Glendale USGS Data Backed to Glendale Ave Flow (cfs)	to GIC From River (cfs)	to GIC Max Supp	to GIC Supp (cfs)	to GIC Pre Cove Full?	to GIC Full?	Glendale USGS Data Ave Flow (cfs)	Orderville Tributary Ave Flow (cfs)	River Ave Flow (cfs)	to OIC River (cfs)	to OIC Supp (cfs)	to OIC Pre Cove Full	to OIC Full?
2006	Sep	4686.9	5542.2	160.2	6.8	4.3	0.0	0.0	Yes	Yes	8.3	1.7	10.0	2.9	0.0	Yes	Yes
2006	Oct	4593.7	5541.6	158.2	12.4	0.0	0.0	0.0	Yes	Yes	15.2	3.1	18.3	0.0	0.0	Yes	Yes
2006	Nov	4519.0	5541.1	156.5	11.6	0.0	0.0	0.0	Yes	Yes	14.3	2.9	17.2	0.0	0.0	Yes	Yes
2006	Dec	5276.2	5545.8	171.5	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2	0.0	0.0	Yes	Yes
2007	Jan	5971.7	5549.7	185.3	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0	0.0	0.0	Yes	Yes
2007	Feb	5971.7	5549.7	185.3	11.6	0.0	0.0	0.0	Yes	Yes	14.2	2.9	17.1	0.0	0.0	Yes	Yes
2007	Mar	5977.6	5549.7	185.4	10.3	0.0	0.0	0.0	Yes	Yes	12.7	2.6	15.3	0.0	0.0	Yes	Yes
2007	Apr	5960.7	5549.6	185.1	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes
2007	May	5934.3	5549.5	184.5	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9	5.1	0.0	Yes	Yes
2007	Jun	5509.6	5547.1	175.8	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.2	2.7	2.3	No	Yes
2007	Jul	4911.9	5543.6	164.7	3.4	3.4	0.0	0.0	No	No	4.2	0.8	5.0	1.5	5.4	No	Yes
2007	Aug	3954.4	5537.4	143.7	3.7	3.7	0.0	0.0	No	No	4.5	0.9	5.4	1.9	1.7	No	Yes
2007	Sep	3526.3	5534.3	134.0	4.7	4.3	0.0	0.0	Yes	Yes	5.8	1.2	7.0	2.9	0.0	Yes	Yes
2007	Oct	3331.3	5532.8	129.7	6.8	0.0	0.0	0.0	Yes	Yes	8.4	1.7	10.1	0.0	0.0	Yes	Yes
2007	Nov	3270.0	5532.4	128.4	6.9	0.0	0.0	0.0	Yes	Yes	8.5	1.7	10.2	0.0	0.0	Yes	Yes
2007	Dec	3622.9	5535.0	136.2	10.3	0.0	0.0	0.0	Yes	Yes	12.7	2.6	15.3	0.0	0.0	Yes	Yes
2008	Jan	4296.3	5539.7	151.4	11.0	0.0	0.0	0.0	Yes	Yes	13.5	2.7	16.2	0.0	0.0	Yes	Yes
2008	Feb	5023.8	5544.3	166.8	12.3	0.0	0.0	0.0	Yes	Yes	15.1	3.0	18.1	0.0	0.0	Yes	Yes
2008	Mar	5763.7	5548.5	180.9	16.7	0.0	0.0	0.0	Yes	Yes	20.5	4.1	24.6	0.0	0.0	Yes	Yes
2008	Apr	5960.7	5549.6	185.1	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4	0.0	0.0	Yes	Yes
2008	May	5934.3	5549.5	184.5	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4	5.1	0.0	Yes	Yes
2008	Jun	5683.8	5548.1	179.2	5.4	5.4	0.0	0.0	No	No	6.6	1.3	7.9	4.4	0.7	No	Yes
2008	Jul	5196.0	5545.3	170.0	4.7	4.7	0.0	0.0	No	No	5.7	1.2	6.9	3.4	3.4	No	Yes
2008	Aug	4366.8	5540.2	153.0	4.1	4.1	0.0	0.0	No	No	5.1	1.0	6.1	2.6	1.0	No	Yes
2008	Sep	3980.8	5537.6	144.3	3.9	3.9	0.0	0.0	No	No	4.8	1.0	5.8	2.3	0.6	No	Yes
2008	Oct	3706.8	5535.6	138.1	5.9	0.0	0.0	0.0	Yes	Yes	7.2	1.5	8.7	0.0	0.0	Yes	Yes
2008	Nov	3641.6	5535.2	136.6	7.8	0.0	0.0	0.0	Yes	Yes	9.6	1.9	11.5	0.0	0.0	Yes	Yes
2008	Dec	4068.3	5538.2	146.3	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1	0.0	0.0	Yes	Yes
2009	Jan	4606.5	5541.7	158.5	11.8	0.0	0.0	0.0	Yes	Yes	14.5	2.9	17.4	0.0	0.0	Yes	Yes
2009	Feb	5405.6	5546.5	173.9	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0	0.0	0.0	Yes	Yes
2009	Mar	5977.6	5549.7	185.4	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2009	Apr	5960.7	5549.6	185.1	12.2	0.0	0.0	0.0	Yes	Yes	15.0	3.0	18.0	0.0	0.0	Yes	Yes
2009	May	5934.3	5549.5	184.5	7.7	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4	5.1	0.0	Yes	Yes
2009	Jun	5678.1	5548.1	179.0	5.8	5.8	0.0	0.0	No	No	7.1	1.4	8.5	5.0	0.1	No	Yes
2009	Jul	5228.4	5545.5	170.6	4.2	4.2	0.0	0.0	No	No	5.2	1.0	6.3	2.8	4.1	No	Yes
2009	Aug	4355.5	5540.1	152.8	3.9	3.9	0.0	0.0	No	No	4.7	1.0	5.7	2.2	1.4	No	Yes
2009	Sep	3942.5	5537.3	143.4	4.1	4.1	0.0	0.0	No	No	5.1	1.0	6.1	2.6	0.3	No	Yes
2009	Oct	3687.7	5535.5	137.6	5.4	0.0	0.0	0.0	Yes	Yes	6.6	1.3	7.9	0.0	0.0	Yes	Yes
2009	Nov	3622.8	5535.0	136.2	7.4	0.0	0.0	0.0	Yes	Yes	9.0	1.8	10.9	0.0	0.0	Yes	Yes
2009	Dec	4012.7	5537.8	145.0	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes
2010	Jan	4639.3	5541.9	159.2	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8	0.0	0.0	Yes	Yes
2010	Feb	5460.2	5546.8	174.9	13.9	0.0	0.0	0.0	Yes	Yes	17.1	3.4	20.5	0.0	0.0	Yes	Yes
2010	Mar	5977.6	5549.7	185.4	18.4	0.0	0.0	0.0	Yes	Yes	22.6	4.5	27.1	0.0	0.0	Yes	Yes
2010	Apr	5960.7	5549.6	185.1	21.7	0.0	0.0	0.0	Yes	Yes	26.6	5.3	31.9	0.0	0.0	Yes	Yes
2010	May	5934.3	5549.5	184.5	14.1	7.7	0.0	0.0	Yes	Yes	17.3	3.5	20.8	5.1	0.0	Yes	Yes
2010	Jun	5904.7	5549.3	183.9	7.7	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4	5.1	0.0	Yes	Yes
2010	Jul	5644.5	5547.9	178.4	5.3	5.3	0.0	0.0	No	No	6.5	1.3	7.8	4.3	2.6	No	Yes
2010	Aug	4872.7	5543.4	163.9	5.2	5.2	0.0	0.0	No	No	6.4	1.3	7.7	3.6	0.0	Yes	Yes
2010	Sep	4589.7	5541.6	158.1	4.5	4.3	0.0	0.0	Yes	Yes	5.5	1.1	6.6	2.9	0.0	Yes	Yes
2010	Oct	4362.1	5540.1	152.9	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2	0.0	0.0	Yes	Yes
2010	Nov	4289.9	5539.7	151.3	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7	0.0	0.0	Yes	Yes
2010	Dec	4785.7	5542.8	162.2	53.9	0.0	0.0	0.0	Yes	Yes	66.2	13.3	79.5	0.0	0.0	Yes	Yes
2011	Jan	5615.3	5547.7	177.8	23.5	0.0	0.0	0.0	Yes	Yes	28.8	5.8	34.6	0.0	0.0	Yes	Yes
2011	Feb	5971.7	5549.7	185.3	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4	0.0	0.0	Yes	Yes
2011	Mar	5977.6	5549.7	185.4	32.1	0.0	0.0	0.0	Yes	Yes	39.4	7.9	47.3	0.0	0.0	Yes	Yes
2011	Apr	5960.7	5549.6	185.1	81.4	0.0	0.0	0.0	Yes	Yes	100.0	20.1	120.1	0.0	0.0	Yes	Yes
2011	May	5934.3	5549.5	184.5	56.8	7.7	0.0	0.0	Yes	Yes	69.7	14.0	83.7	5.1	0.0	Yes	Yes
2011	Jun	5904.7	5549.3	183.9	18.3	7.7	0.0	0.0	Yes	Yes	22.5	4.5	27.0	5.1	0.0	Yes	Yes
2011	Jul	5771.4	5548.6	181.0	12.6	10.4	0.0	0.0	Yes	Yes	15.5	3.1	18.6	6.8	0.0	Yes	Yes
2011	Aug	5638.3	5547.8	178.3	9.9	5.5	0.0	0.0	Yes	Yes	12.1	2.4	14.5	3.6	0.0	Yes	Yes
2011	Sep	5521.9	5547.2	176.1	10.5	4.3	0.0	0.0	Yes	Yes	12.9	2.6	15.5	2.9	0.0	Yes	Yes
2011	Oct	5419.5	5546.6	174.2	12.1	0.0	0.0	0.0	Yes	Yes	14.9	3.0	17.9	0.0	0.0	Yes	Yes
2011	Nov	5337.2	5546.1	172.6	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes
2011	Dec	5970.9	5549.7	185.3	15.5	0.0	0.0	0.0	Yes	Yes	19.0	3.8	22.8	0.0	0.0	Yes	Yes
2012	Jan	5971.7	5549.7	185.3	15.0	0.0	0.0	0.0	Yes	Yes	18.4	3.7	22.1	0.0	0.0	Yes	Yes
2012	Feb	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.7	4.0	23.7	0.0	0.0	Yes	Yes
2012	Mar	5977.6	5549.7	185.4	17.1	0.0	0.0	0.0	Yes	Yes	21.0	4.2	25.2	0.0	0.0	Yes	Yes
2012	Apr	5960.7	5549.6	185.1	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3	0.0	0.0	Yes	Yes
2012	May	5934.3	5549.5	184.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.7	5.1	0.0	Yes	Yes
2012	Jun	5565.0	5547.4	176.9	4.8	4.8	0.0	0.0	No	No	6.0	1.2	7.1	3.6	1.4	No	Yes
2012	Jul	5026.5	5544.3	166.9	6.0	6.0	0.0	0.0	No	No	7.4	1.5	8.9	5.4	1.5	No	Yes
2012	Aug	4334.9	5540.0	152.3	9.0	5.5	0.0	0.0	Yes	Yes	11.1	2.2	13.3	3.6	0.0	Yes	Yes
2012	Sep	4235.4	5539.3	150.0	8.5	4.3	0.0	0.0	Yes	Yes	10.4	2.1	12.5	2.9	0.0	Yes	Yes
2012	Oct	4148.1	5538.7	148.1	10.5	0.0	0.0	0.0	Yes	Yes	12.9	2.6	15.5	0.0	0.0	Yes	Yes
2012	Nov	4078.2	5538.2	146.5	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3	0.0	0.0	Yes	Yes
2012	Dec	4845.2	5543.2	163.4	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3	0.0	0.0	Yes	Yes
2013	Jan	5672.1	5548.0	178.9	10.9	0.0	0.0	0.0	Yes	Yes	13.4	2.7	16.1	0.0	0.0	Yes	Yes
2014	Feb	5971.7	5549.7	185.3	11.4	0.0	0.0	0.0	Yes	Yes	14.0	2.8	16.8	0.0	0.0	Yes	Yes
2013	Mar	5977.6	5549.7	185.4	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3	0.0	0.0	Yes	Yes
2013	Apr	5960.7	5549.6	185.1	8.6	0.0	0.0	0.0	Yes	Yes	10.5	2.1	12.6	0.0	0.0	Yes	Yes
2013	May	5934.3	5549.5	184.5	8.1	7.7	0.0	0.0	Yes	Yes	10.0	2.0	12.0	5.1	0.0	Yes	Yes
2013	Jun	5722.4	5548.3	180.0	5.0	5.0	0.0	0.0	No	No	6.1	1.2	7.3	3.8	1.3	No	Yes
2013	Jul	5193.7	5545.3	170.0	21.1	10.4	0.0	0.0	Yes	Yes	25.9	5.2	31.1	6.8	0.0	Yes	Yes
2013	Aug	5068.7	5544.5	167.7	9.8	5.5	0.0	0.0	Yes	Yes	12.0	2.4	14.4	3.6	0.0	Yes	Yes
2013	Sep	4959.2	5543.9	165.6	11.9	4.3	0.0	0.0	Yes	Yes	14.6	2.9	17.5	2.9	0.0	Yes	Yes
2013	Oct	4862.9	5543.3	163.7	8.5	0.0	0.0	0.0	Yes	Yes	10.4	2.1	12.5	0.0	0.0	Yes	Yes
2013	Nov	4785.6	5542.8	162.2	9.5	0.0	0.0	0.0	Yes	Yes	11.7	2.4	14.1	0.0	0.0	Yes	Yes
2013	Dec	5356.5	5546.2	173.0	9.0	0.0	0.0	0.0	Yes	Yes	11.0	2.2	13.2	0.0	0.0	Yes	Yes
2014	Jan	5893.9	5549.2	183.7	9.9	0.0	0.0	0.0	Yes	Yes	12.2	2.5	14.7	0.0	0.0	Yes	Yes
2014	Feb	5971.7	5549.7	185.3	14.1	0.0	0.0	0.0	Yes	Yes	17.3	3.5	20.8	0.0	0.0	Yes	Yes
2014	Mar	5977.6	5549.7	185.4	8.6	0.0	0.0	0.0	Yes	Yes	10.6	2.1	12.7	0.0	0.0	Yes	Yes
2014	Apr	5960.7	5549.6	185.1	7.6	0.0	0.0	0.0	Yes	Yes	9.3	1.9	11.2	0.0	0.0	Yes	Yes
2014	May	5934.3	5549.5	184.5	7.3	7.3	0.0	0.0	No	No	9.0	1.8	10.8	5.1	0.0	Yes	Yes
2014	Jun	5641.9	5547.9	178.3	4.7	4.7	0.0	0.0	No	No	5.8	1.2	6.9	3.4	1.6	No	Yes
2014	Jul	5089.3	5544.7	168.0	4.1	4.1	0.0	0.0	No	No	5.0	1.0	6.0	2.5	4.3	No	Yes
2014	Aug	4200.2	5539.1	149.3	6.1	5.5	0.0	0.0	Yes	Yes	7.5	1.5	9.0	3.6	0.0	Yes	Yes
2014	Sep	4016.5	5537.8	145.1	11.3	4.3	0.0	0.0	Yes	Yes	13.9	2.8	16.7	2.9	0.0	Yes	Yes
2014	Oct	3932.1	5537.2	143.2	8.8	0.0	0.0	0.0	Yes	Yes	10.8	2.2	13.0	0.0	0.0	Yes	Yes
2014	Nov	3864.5	5536.8	141.7	7.9	0.0	0.0	0.0	Yes	Yes	9.8	2.0	11.7	0.0	0.0	Yes	Yes
2014	Dec	4303.1	5539.8	151.6	8.9	0.0	0.0	0.0	Yes	Yes	10.9	2.2	13.1	0.0	0.0	Yes	Yes
2015	Jan	4839.7	5543.2	163.2	9.2	0.0	0.0	0.0	Yes	Yes	11.3	2.3	13.6	0.0	0.0	Yes	Yes
2015	Feb	5402.5	5546.5	173.8	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0	0.0	0.0	Yes	Yes
2015	Mar	5977.6	5549.7	185.4	14.3	0.0	0.0	0.0	Yes	Yes	17.6	3.5	21.1	0.0	0.0	Yes	Yes
2015	Apr	5960.7	5549.6	185.1	8.6	0.0	0.0	0.0	Yes	Yes	10.5	2.1	12.6	0.0	0.0	Yes	Yes
2015	May	5934.3	5549.5	184.5	9.4	7.7	0.0	0.0	Yes	Yes	11.5	2.3	13.8	5.1	0.0	Yes	Yes
2015	Jun	5845.5	5549.0	182.6	6.2	6.2	0.0	0.0	No	No	7.7	1.5	9.2	5.1	0.0	Yes	Yes
2015	Jul	5440.5	5546.7	174.5	6.6	6.6	0.0	0.0	No	No	8.1	1.6	9.8	6.3	0.6	No	Yes
2015	Aug	4804.8	5542.9	162.6	6.4	5.5	0.0	0.0	Yes	Yes	7.8	1.6	9.4	3.6	0.0	Yes	Yes
2015	Sep	4641.4	5541.9	159.3	8.6	4.3	0.0	0.0	Yes	Yes	10.5	2.1	12.6	2.9	0.0	Yes	Yes
2015	Oct	4548.7	5541.3	157.2	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9	0.0	0.0	Yes	Yes
2015	Nov	4474.6	5540.9	155.5	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0	0.0	0.0	Yes	Yes
2015	Dec	5104.2	5544.7	168.3	8.7	0.0	0.0	0.0	Yes	Yes	10.7	2.2	12.9	0.0	0.0	Yes	Yes
2016	Jan	5621.3	5547.7	177.9	10.2	0.0	0.0	0.0	Yes	Yes	12.5	2.5	15.0	0.0	0.0	Yes	Yes
2016	Feb	5971.7	5549.7	185.3	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4	0.0	0.0	Yes	Yes
2016	Mar	5977.6	5549.7	185.4	16.6	0.0	0.0	0.0	Yes	Yes	20.4	4.1	24.5	0.0	0.0	Yes	Yes
2016	Apr	5960.7	5549.6	185.1	16.6	0.0	0.0	0.0	Yes	Yes	20.4	4.1	24.5	0.0	0.0	Yes	Yes
2016	May	5934.3	5549.5	184.5	14.0	7.7	0.0	0.0	Yes	Yes	17.2	3.5	20.7	5.1	0.0	Yes	Yes
2016	Jun	5904.7	5549.3	183.9	6.1	6.1	0.0	0.0	No	No	7.6	1.5	9.1	5.1	0.0	Yes	Yes
2016	Jul	5490.4	5547.0	175.5	4.9	4.9	0.0	0.0	No	No	6.0	1.2	7.2	3.7	3.1	No	Yes

Date Yr	Date Mo	to COVE Hydraulic Cap (cfs)	to COVE to Fill Resv (cfs)	to COVE Control (cfs)	to COVE River (cfs)	Reservoir Int1 Volume (af)	Reservoir Int1 Elevation (ft)	Reservoir Int1 Area (ac)	Seepage (af)	Seepage (cfs)	Evaporation (af)	Evaporation (cfs)	Reservoir Int2 Volume (af)	Reservoir Int2 Elevation (ft)	Reservoir Int2 Area (ac)
2006	Sep	14.5	22.6	0.0	0.0	4686.9	5542.2	160.2	50.1	0.8	43.1	0.7	4,593.7	5,541.6	158.2
2006	Oct	14.6	23.4	0.0	0.0	4593.7	5541.6	158.2	51.1	0.8	23.6	0.4	4,519.0	5,541.1	156.5
2006	Nov	14.6	25.4	14.6	13.7	5332.7	5546.1	172.5	53.9	0.9	2.6	0.0	5,276.2	5,545.8	171.5
2006	Dec	14.1	12.3	12.3	12.3	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2007	Jan	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2007	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2007	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2007	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2007	May	13.7	1.6	1.6	0.3	5954.5	5549.6	184.9	59.7	1.0	66.4	1.1	5,828.3	5,548.9	182.3
2007	Jun	14.0	8.8	0.0	0.0	5509.6	5547.1	175.8	55.0	0.9	72.5	1.2	5,382.1	5,546.4	173.4
2007	Jul	14.3	18.2	0.0	0.0	4911.9	5543.6	164.7	53.2	0.9	67.9	1.1	4,790.8	5,542.9	162.3
2007	Aug	15.0	33.8	0.0	0.0	3954.4	5537.4	143.7	46.4	0.8	47.4	0.8	3,860.6	5,536.7	141.6
2007	Sep	15.3	42.1	0.0	0.0	3526.3	5534.3	134.0	41.9	0.7	36.1	0.6	3,448.3	5,533.7	132.3
2007	Oct	15.5	43.9	0.0	0.0	3331.3	5532.8	129.7	41.9	0.7	19.4	0.3	3,270.0	5,532.4	128.4
2007	Nov	15.5	46.4	15.5	6.7	3667.8	5535.3	137.2	42.9	0.7	2.1	0.0	3,622.9	5,535.0	136.2
2007	Dec	15.3	39.2	15.3	11.8	4345.5	5540.0	152.5	49.3	0.8	0.0	0.0	4,296.3	5,539.7	151.4
2008	Jan	14.8	28.2	14.8	12.7	5078.0	5544.6	167.8	54.2	0.9	0.0	0.0	5,023.8	5,544.3	166.8
2008	Feb	14.3	18.2	14.3	14.3	5816.8	5548.8	182.0	53.1	1.0	0.0	0.0	5,763.7	5,548.5	180.9
2008	Mar	13.8	4.4	4.4	4.4	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2008	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2008	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2008	Jun	13.9	5.9	0.0	0.0	5683.8	5548.1	179.2	56.0	0.9	73.9	1.2	5,553.9	5,547.4	176.7
2008	Jul	14.2	13.6	0.0	0.0	5196.0	5545.3	170.0	54.9	0.9	70.1	1.1	5,070.9	5,544.6	167.7
2008	Aug	14.7	27.1	0.0	0.0	4366.8	5540.2	153.0	49.4	0.8	50.5	0.8	4,266.9	5,539.5	150.8
2008	Sep	15.0	34.5	0.0	0.0	3980.8	5537.6	144.3	45.1	0.8	38.8	0.7	3,896.9	5,537.0	142.4
2008	Oct	15.2	37.8	0.0	0.0	3706.8	5535.6	138.1	44.6	0.7	20.6	0.3	3,641.6	5,535.2	136.6
2008	Nov	15.3	40.2	15.3	8.0	4116.5	5538.5	147.4	46.1	0.8	2.2	0.0	4,068.3	5,538.2	146.3
2008	Dec	14.9	31.9	14.9	9.6	4658.0	5542.0	159.6	51.5	0.8	0.0	0.0	4,606.5	5,541.7	158.5
2009	Jan	14.6	23.2	14.6	13.9	5462.1	5546.8	175.0	56.5	0.9	0.0	0.0	5,405.6	5,546.5	173.9
2009	Feb	14.0	11.3	11.3	11.3	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2009	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2009	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2009	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2009	Jun	13.9	5.9	0.0	0.0	5678.1	5548.1	179.0	56.0	0.9	73.9	1.2	5,548.3	5,547.3	176.6
2009	Jul	14.1	13.1	0.0	0.0	5228.4	5545.5	170.6	55.1	0.9	70.4	1.1	5,102.9	5,544.7	168.3
2009	Aug	14.7	27.3	0.0	0.0	4355.5	5540.1	152.8	49.3	0.8	50.4	0.8	4,255.8	5,539.4	150.5
2009	Sep	15.0	35.1	0.0	0.0	3942.5	5537.3	143.4	44.8	0.8	38.6	0.6	3,859.0	5,536.7	141.5
2009	Oct	15.2	38.1	0.0	0.0	3687.7	5535.5	137.6	44.4	0.7	20.5	0.3	3,622.8	5,535.0	136.2
2009	Nov	15.3	40.5	15.3	7.4	4060.5	5538.1	146.1	45.7	0.8	2.2	0.0	4,012.7	5,537.8	145.0
2009	Dec	15.0	32.8	15.0	11.0	4691.1	5542.2	160.3	51.8	0.8	0.0	0.0	4,639.3	5,541.9	159.2
2010	Jan	14.5	22.7	14.5	14.3	5517.0	5547.1	176.0	56.8	0.9	0.0	0.0	5,460.2	5,546.8	174.9
2010	Feb	14.0	10.3	10.3	10.3	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2010	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2010	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2010	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2010	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0
2010	Jul	13.9	6.3	0.0	0.0	5644.5	5547.9	178.4	57.6	0.9	73.6	1.2	5,513.3	5,547.1	175.9
2010	Aug	14.4	18.9	0.0	0.0	4872.7	5543.4	163.9	52.9	0.9	54.1	0.9	4,765.6	5,542.7	161.8
2010	Sep	14.6	24.2	0.0	0.0	4589.7	5541.6	158.1	49.4	0.8	42.6	0.7	4,497.8	5,541.0	156.0
2010	Oct	14.7	27.2	0.0	0.0	4362.1	5540.1	152.9	49.4	0.8	22.8	0.4	4,289.9	5,539.7	151.3
2010	Nov	14.8	29.3	14.8	9.2	4839.2	5543.1	163.2	51.0	0.9	2.4	0.0	4,785.7	5,542.8	162.2
2010	Dec	14.4	20.3	14.4	14.4	5673.1	5548.0	178.9	57.8	0.9	0.0	0.0	5,615.3	5,547.7	177.8
2011	Jan	13.9	6.8	6.8	6.8	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2011	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2011	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2011	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2011	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2011	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0
2011	Jul	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3
2011	Aug	13.9	6.4	0.0	0.0	5638.3	5547.8	178.3	57.6	0.9	58.8	1.0	5,521.9	5,547.2	176.1
2011	Sep	14.0	8.6	0.0	0.0	5521.9	5547.2	176.1	55.0	0.9	47.4	0.8	5,419.5	5,546.6	174.2
2011	Oct	14.0	10.0	0.0	0.0	5419.5	5546.6	174.2	56.2	0.9	26.0	0.4	5,337.2	5,546.1	172.6
2011	Nov	14.1	11.7	11.7	11.7	6032.0	5550.0	186.6	58.3	1.0	2.8	0.0	5,970.9	5,549.7	185.3
2011	Dec	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2012	Jan	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2012	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2012	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2012	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2012	May	13.7	1.6	1.6	1.1	6004.7	5549.9	186.0	60.1	1.0	66.8	1.1	5,877.8	5,549.2	183.3
2012	Jun	13.9	7.8	0.0	0.0	5565.0	5547.4	176.9	55.3	0.9	73.0	1.2	5,436.7	5,546.7	174.5
2012	Jul	14.3	16.4	0.0	0.0	5026.5	5544.3	166.9	53.9	0.9	68.8	1.1	4,903.7	5,543.5	164.5
2012	Aug	14.7	27.6	0.0	0.0	4334.9	5540.0	152.3	49.2	0.8	50.3	0.8	4,235.4	5,539.3	150.0
2012	Sep	14.8	30.2	0.0	0.0	4235.4	5539.3	150.0	46.9	0.8	40.4	0.7	4,148.1	5,538.7	148.1
2012	Oct	14.9	30.6	0.0	0.0	4148.1	5538.7	148.1	47.8	0.8	22.1	0.4	4,078.2	5,538.2	146.5
2012	Nov	14.9	32.8	14.9	13.8	4899.1	5543.5	164.4	51.4	0.9	2.5	0.0	4,845.2	5,543.2	163.4
2012	Dec	14.4	19.3	14.4	14.4	5730.2	5548.3	180.2	58.2	0.9	0.0	0.0	5,672.1	5,548.0	178.9
2013	Jan	13.9	5.9	5.9	5.9	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2014	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2013	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2013	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2013	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2013	Jun	13.8	5.2	0.0	0.0	5722.4	5548.3	180.0	56.2	0.9	74.2	1.2	5,591.9	5,547.6	177.4
2013	Jul	14.2	13.6	0.0	0.0	5193.7	5545.3	170.0	54.9	0.9	70.1	1.1	5,068.7	5,544.5	167.7
2013	Aug	14.2	15.7	0.0	0.0	5068.7	5544.5	167.7	54.1	0.9	55.3	0.9	4,959.2	5,543.9	165.6
2013	Sep	14.3	18.0	0.0	0.0	4959.2	5543.9	165.6	51.8	0.9	44.6	0.7	4,862.9	5,543.3	163.7
2013	Oct	14.4	19.0	0.0	0.0	4862.9	5543.3	163.7	52.9	0.9	24.4	0.4	4,785.6	5,542.8	162.2
2013	Nov	14.4	20.9	14.4	10.6	5413.5	5546.6	174.0	54.4	0.9	2.6	0.0	5,356.5	5,546.2	173.0
2013	Dec	14.1	11.0	11.0	9.7	5953.6	5549.6	184.9	59.7	1.0	0.0	0.0	5,893.9	5,549.2	183.7
2014	Jan	13.7	2.2	2.2	2.2	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2014	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2014	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2014	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2014	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2014	Jun	13.9	6.6	0.0	0.0	5641.9	5547.9	178.3	55.7	0.9	73.6	1.2	5,512.7	5,547.1	175.9
2014	Jul	14.2	15.3	0.0	0.0	5089.3	5544.7	168.0	54.3	0.9	69.3	1.1	4,965.7	5,543.9	165.8
2014	Aug	14.8	29.8	0.0	0.0	4200.2	5539.1	149.3	48.2	0.8	49.3	0.8	4,102.8	5,538.4	147.1
2014	Sep	15.0	33.9	0.0	0.0	4016.5	5537.8	145.1	45.3	0.8	39.1	0.7	3,932.1	5,537.2	143.2
2014	Oct	15.0	34.2	0.0	0.0	3932.1	5537.2	143.2	46.2	0.8	21.4	0.3	3,864.5	5,536.8	141.7
2014	Nov	15.1	36.4	15.1	8.2	4353.1	5540.1	152.7	47.7	0.8	2.3	0.0	4,303.1	5,539.8	151.6
2014	Dec	14.8	28.1	14.8	9.6	4892.8	5543.5	164.3	53.1	0.9	0.0	0.0	4,839.7	5,543.2	163.2
2015	Jan	14.4	19.4	14.4	10.1	5459.0	5546.8	174.9	56.5	0.9	0.0	0.0	5,402.5	5,546.5	173.8
2015	Feb	14.0	11.3	11.3	11.3	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2015	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2015	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2015	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2015	Jun	13.8	3.1	0.0	0.0	5845.5	5549.0	182.6	57.1	1.0	75.3	1.3	5,713.1	5,548.3	179.8
2015	Jul	14.0	9.6	0.0	0.0	5440.5	5546.7	174.5	56.4	0.9	72.0	1.2	5,312.1	5,546.0	172.1
2015	Aug	14.4	20.0	0.0	0.0	4804.8	5542.9	162.6	52.5	0.9	53.6	0.9	4,698.7	5,542.3	160.4
2015	Sep	14.5	23.4	0.0	0.0	4641.4	5541.9	159.3	49.8	0.8	42.9	0.7	4,548.7	5,541.3	157.2
2015	Oct	14.6	24.1	0.0	0.0	4548.7	5541.3	157.2	50.7	0.8	23.4	0.4	4,474.6	5,540.9	155.5
2015	Nov	14.6	26.2	14.6	11.5	5159.6	5545.1	169.3	52.9	0.9	2.5	0.0	5,104.2	5,544.7	168.3
2015	Dec	14.2	15.1	14.2	9.4	5679.1	5548.1	179.1	57.8	0.9	0.0	0.0	5,621.3	5,547.7	177.9
2016	Jan	13.9	6.7	6.7	6.7	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3
2016	Feb	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4
2016	Mar	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1
2016	Apr	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5
2016	May	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9
2016	Jun	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0
2016	Jul	14.0	8.8	0.0	0.0	5490.4	5547.0	175.5	56.7	0.9	72.4	1.2	5,361.4	5,546.3	173.1

Date Yr	Date Mo	Mt Carmel Tributary Ave Flow (cfs)	Seepage Return Ave Flow (cfs)	River Ave Flow (cfs)	to MCIC River (cfs)	to MCIC Supp (cfs)	to MCIC Pre Cove Full?	to MCIC Full?	WC Release Supp (cfs)	River Ave Flow (cfs)	Sum Supp (cfs)	Reservoir End Volume (af)	Reservoir End Elevation (ft)	Reservoir End Area (ac)
2006	Sep	1.1	0.8	9.0	4.0	0.0	Yes	Yes	0.0	5.0	0.0	4,593.7	5,541.6	158.2
2006	Oct	2.0	0.8	21.1	0.0	0.0	Yes	Yes	0.0	21.1	0.0	4,519.0	5,541.1	156.5
2006	Nov	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,276.2	5,545.8	171.5
2006	Dec	1.8	1.0	6.7	0.0	0.0	Yes	Yes	0.0	6.7	0.0	5,971.7	5,549.7	185.3
2007	Jan	1.7	1.0	16.7	0.0	0.0	Yes	Yes	0.0	16.7	0.0	5,971.7	5,549.7	185.3
2007	Feb	1.9	1.0	18.9	0.0	0.0	Yes	Yes	0.0	18.9	0.0	5,977.6	5,549.7	185.4
2007	Mar	1.7	1.0	17.0	0.0	0.0	Yes	Yes	0.0	17.0	0.0	5,960.7	5,549.6	185.1
2007	Apr	1.5	1.0	14.9	0.0	0.0	Yes	Yes	0.0	14.9	0.0	5,934.3	5,549.5	184.5
2007	May	1.0	1.0	5.5	2.0	5.2	No	Yes	0.0	3.5	5.2	5,509.6	5,547.1	175.8
2007	Jun	0.7	0.9	5.1	1.6	5.6	No	Yes	0.0	3.5	7.9	4,911.9	5,543.6	164.7
2007	Jul	0.6	0.9	4.9	1.4	8.2	No	Yes	0.0	3.5	13.6	3,954.4	5,537.4	143.7
2007	Aug	0.6	0.8	4.9	1.4	3.7	No	Yes	0.0	3.5	5.4	3,526.3	5,534.3	134.0
2007	Sep	0.8	0.7	5.6	2.1	2.0	No	Yes	0.0	3.5	2.0	3,331.3	5,532.8	129.7
2007	Oct	1.1	0.7	11.9	0.0	0.0	Yes	Yes	0.0	11.9	0.0	3,270.0	5,532.4	128.4
2007	Nov	1.1	0.7	5.4	0.0	0.0	Yes	Yes	0.0	5.4	0.0	3,622.9	5,535.0	136.2
2007	Dec	1.7	0.8	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	4,296.3	5,539.7	151.4
2008	Jan	1.8	0.9	6.2	0.0	0.0	Yes	Yes	0.0	6.2	0.0	5,023.8	5,544.3	166.8
2008	Feb	2.0	1.0	6.8	0.0	0.0	Yes	Yes	0.0	6.8	0.0	5,763.7	5,548.5	180.9
2008	Mar	2.7	1.0	24.0	0.0	0.0	Yes	Yes	0.0	24.0	0.0	5,960.7	5,549.6	185.1
2008	Apr	1.9	1.0	19.1	0.0	0.0	Yes	Yes	0.0	19.1	0.0	5,934.3	5,549.5	184.5
2008	May	1.3	1.0	7.1	3.6	3.6	No	Yes	0.0	3.5	3.6	5,683.8	5,548.1	179.2
2008	Jun	0.9	0.9	5.3	1.8	5.4	No	Yes	0.0	3.5	6.0	5,196.0	5,545.3	170.0
2008	Jul	0.8	0.9	5.2	1.7	8.0	No	Yes	0.0	3.5	11.5	4,366.8	5,540.2	153.0
2008	Aug	0.7	0.8	5.0	1.5	3.6	No	Yes	0.0	3.5	4.7	3,980.8	5,537.6	144.3
2008	Sep	0.6	0.8	4.9	1.4	2.6	No	Yes	0.0	3.5	3.2	3,706.8	5,535.6	138.1
2008	Oct	1.0	0.7	10.4	0.0	0.0	Yes	Yes	0.0	10.4	0.0	3,641.6	5,535.2	136.6
2008	Nov	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,068.3	5,538.2	146.3
2008	Dec	1.5	0.8	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,606.5	5,541.7	158.5
2009	Jan	1.9	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,405.6	5,546.5	173.9
2009	Feb	2.1	1.0	10.8	0.0	0.0	Yes	Yes	0.0	10.8	0.0	5,977.6	5,549.7	185.4
2009	Mar	2.3	1.0	23.2	0.0	0.0	Yes	Yes	0.0	23.2	0.0	5,960.7	5,549.6	185.1
2009	Apr	2.0	1.0	19.8	0.0	0.0	Yes	Yes	0.0	19.8	0.0	5,934.3	5,549.5	184.5
2009	May	1.3	1.0	7.0	3.5	3.7	No	Yes	0.0	3.5	3.7	5,678.1	5,548.1	179.0
2009	Jun	0.9	0.9	5.4	1.9	5.3	No	Yes	0.0	3.5	5.4	5,228.4	5,545.5	170.6
2009	Jul	0.7	0.9	5.1	1.6	8.1	No	Yes	0.0	3.5	12.2	4,355.5	5,540.1	152.8
2009	Aug	0.6	0.8	4.9	1.4	3.7	No	Yes	0.0	3.5	5.1	3,942.5	5,537.3	143.4
2009	Sep	0.7	0.8	4.9	1.4	2.6	No	Yes	0.0	3.5	2.9	3,687.7	5,535.5	137.6
2009	Oct	0.9	0.7	9.5	0.0	0.0	Yes	Yes	0.0	9.5	0.0	3,622.8	5,535.0	136.2
2009	Nov	1.2	0.8	5.5	0.0	0.0	Yes	Yes	0.0	5.5	0.0	4,012.7	5,537.8	145.0
2009	Dec	1.6	0.8	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	4,639.3	5,541.9	159.2
2010	Jan	2.0	0.9	6.4	0.0	0.0	Yes	Yes	0.0	6.4	0.0	5,460.2	5,546.8	174.9
2010	Feb	2.3	1.0	13.5	0.0	0.0	Yes	Yes	0.0	13.5	0.0	5,977.6	5,549.7	185.4
2010	Mar	3.0	1.0	30.3	0.0	0.0	Yes	Yes	0.0	30.3	0.0	5,960.7	5,549.6	185.1
2010	Apr	3.6	1.0	35.3	0.0	0.0	Yes	Yes	0.0	35.3	0.0	5,934.3	5,549.5	184.5
2010	May	2.3	1.0	17.4	7.1	0.0	Yes	Yes	0.0	10.3	0.0	5,904.7	5,549.3	183.9
2010	Jun	1.3	1.0	8.6	5.1	2.1	No	Yes	0.0	3.5	2.1	5,644.5	5,547.9	178.4
2010	Jul	0.9	0.9	5.3	1.8	7.9	No	Yes	0.0	3.5	10.4	4,872.7	5,543.4	163.9
2010	Aug	0.9	0.9	5.7	2.2	2.9	No	Yes	0.0	3.5	2.9	4,589.7	5,541.6	158.1
2010	Sep	0.7	0.8	5.3	1.8	2.3	No	Yes	0.0	3.5	2.3	4,362.1	5,540.1	152.9
2010	Oct	1.5	0.8	15.5	0.0	0.0	Yes	Yes	0.0	15.5	0.0	4,289.9	5,539.7	151.3
2010	Nov	1.4	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,785.7	5,542.8	162.2
2010	Dec	8.9	0.9	74.9	0.0	0.0	Yes	Yes	0.0	74.9	0.0	5,615.3	5,547.7	177.8
2011	Jan	3.9	1.0	32.7	0.0	0.0	Yes	Yes	0.0	32.7	0.0	5,971.7	5,549.7	185.3
2011	Feb	2.6	1.0	25.9	0.0	0.0	Yes	Yes	0.0	25.9	0.0	5,977.6	5,549.7	185.4
2011	Mar	5.3	1.0	52.7	0.0	0.0	Yes	Yes	0.0	52.7	0.0	5,960.7	5,549.6	185.1
2011	Apr	13.4	1.0	133.3	0.0	0.0	Yes	Yes	0.0	133.3	0.0	5,934.3	5,549.5	184.5
2011	May	9.3	1.0	87.4	7.1	0.0	Yes	Yes	0.0	80.2	0.0	5,904.7	5,549.3	183.9
2011	Jun	3.0	1.0	25.9	7.2	0.0	Yes	Yes	0.0	18.7	0.0	5,771.4	5,548.6	181.0
2011	Jul	2.1	1.0	14.8	9.7	0.0	Yes	Yes	0.0	5.1	0.0	5,638.3	5,547.8	178.3
2011	Aug	1.6	0.9	13.5	5.1	0.0	Yes	Yes	0.0	8.4	0.0	5,521.9	5,547.2	176.1
2011	Sep	1.7	0.9	15.3	4.0	0.0	Yes	Yes	0.0	11.2	0.0	5,419.5	5,546.6	174.2
2011	Oct	2.0	0.9	20.8	0.0	0.0	Yes	Yes	0.0	20.8	0.0	5,337.2	5,546.1	172.6
2011	Nov	2.1	1.0	9.7	0.0	0.0	Yes	Yes	0.0	9.7	0.0	5,970.9	5,549.7	185.3
2011	Dec	2.5	1.0	25.4	0.0	0.0	Yes	Yes	0.0	25.4	0.0	5,971.7	5,549.7	185.3
2012	Jan	2.5	1.0	24.6	0.0	0.0	Yes	Yes	0.0	24.6	0.0	5,971.7	5,549.7	185.3
2012	Feb	2.6	1.0	26.2	0.0	0.0	Yes	Yes	0.0	26.2	0.0	5,977.6	5,549.7	185.4
2012	Mar	2.8	1.0	28.1	0.0	0.0	Yes	Yes	0.0	28.1	0.0	5,960.7	5,549.6	185.1
2012	Apr	2.2	1.0	21.3	0.0	0.0	Yes	Yes	0.0	21.3	0.0	5,934.3	5,549.5	184.5
2012	May	1.1	1.0	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	5,565.0	5,547.4	176.9
2012	Jun	0.8	0.9	5.2	1.7	5.5	No	Yes	0.0	3.5	6.9	5,026.5	5,544.3	166.9
2012	Jul	1.0	0.9	5.4	1.9	7.8	No	Yes	0.0	3.5	9.3	4,334.9	5,540.0	152.3
2012	Aug	1.5	0.8	12.0	5.1	0.0	Yes	Yes	0.0	6.9	0.0	4,235.4	5,539.3	150.0
2012	Sep	1.4	0.8	11.8	4.0	0.0	Yes	Yes	0.0	7.8	0.0	4,148.1	5,538.7	148.1
2012	Oct	1.7	0.8	18.0	0.0	0.0	Yes	Yes	0.0	18.0	0.0	4,078.2	5,538.2	146.5
2012	Nov	1.9	0.9	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	4,845.2	5,543.2	163.4
2012	Dec	2.2	0.9	8.0	0.0	0.0	Yes	Yes	0.0	8.0	0.0	5,672.1	5,548.0	178.9
2013	Jan	1.8	1.0	13.0	0.0	0.0	Yes	Yes	0.0	13.0	0.0	5,971.7	5,549.7	185.3
2014	Feb	1.9	1.0	18.6	0.0	0.0	Yes	Yes	0.0	18.6	0.0	5,977.6	5,549.7	185.4
2013	Mar	1.9	1.0	19.3	0.0	0.0	Yes	Yes	0.0	19.3	0.0	5,960.7	5,549.6	185.1
2013	Apr	1.4	1.0	13.8	0.0	0.0	Yes	Yes	0.0	13.8	0.0	5,934.3	5,549.5	184.5
2013	May	1.3	1.0	7.7	4.2	3.0	No	Yes	0.0	3.5	3.0	5,722.4	5,548.3	180.0
2013	Jun	0.8	0.9	5.3	1.8	5.4	No	Yes	0.0	3.5	6.7	5,193.7	5,545.3	170.0
2013	Jul	3.5	0.9	28.6	9.7	0.0	Yes	Yes	0.0	19.0	0.0	5,068.7	5,544.5	167.7
2013	Aug	1.6	0.9	13.3	5.1	0.0	Yes	Yes	0.0	8.2	0.0	4,959.2	5,543.9	165.6
2013	Sep	2.0	0.9	17.5	4.0	0.0	Yes	Yes	0.0	13.4	0.0	4,862.9	5,543.3	163.7
2013	Oct	1.4	0.9	14.7	0.0	0.0	Yes	Yes	0.0	14.7	0.0	4,785.6	5,542.8	162.2
2013	Nov	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,356.5	5,546.2	173.0
2013	Dec	1.5	1.0	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,893.9	5,549.2	183.7
2014	Jan	1.6	1.0	15.0	0.0	0.0	Yes	Yes	0.0	15.0	0.0	5,971.7	5,549.7	185.3
2014	Feb	2.3	1.0	23.0	0.0	0.0	Yes	Yes	0.0	23.0	0.0	5,977.6	5,549.7	185.4
2014	Mar	1.4	1.0	14.2	0.0	0.0	Yes	Yes	0.0	14.2	0.0	5,960.7	5,549.6	185.1
2014	Apr	1.3	1.0	12.3	0.0	0.0	Yes	Yes	0.0	12.3	0.0	5,934.3	5,549.5	184.5
2014	May	1.2	1.0	6.4	2.9	4.3	No	Yes	0.0	3.5	4.3	5,641.9	5,547.9	178.3
2014	Jun	0.8	0.9	5.2	1.7	5.5	No	Yes	0.0	3.5	7.1	5,089.3	5,544.7	168.0
2014	Jul	0.7	0.9	5.1	1.6	8.1	No	Yes	0.0	3.5	12.4	4,200.2	5,539.1	149.3
2014	Aug	1.0	0.8	7.2	3.7	1.4	No	Yes	0.0	3.5	1.4	4,016.5	5,537.8	145.1
2014	Sep	1.9	0.8	16.5	4.0	0.0	Yes	Yes	0.0	12.4	0.0	3,932.1	5,537.2	143.2
2014	Oct	1.4	0.8	15.2	0.0	0.0	Yes	Yes	0.0	15.2	0.0	3,864.5	5,536.8	141.7
2014	Nov	1.3	0.8	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,303.1	5,539.8	151.6
2014	Dec	1.5	0.9	5.8	0.0	0.0	Yes	Yes	0.0	5.8	0.0	4,839.7	5,543.2	163.2
2015	Jan	1.5	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,402.5	5,546.5	173.8
2015	Feb	1.7	1.0	6.3	0.0	0.0	Yes	Yes	0.0	6.3	0.0	5,977.6	5,549.7	185.4
2015	Mar	2.4	1.0	23.6	0.0	0.0	Yes	Yes	0.0	23.6	0.0	5,960.7	5,549.6	185.1
2015	Apr	1.4	1.0	13.8	0.0	0.0	Yes	Yes	0.0	13.8	0.0	5,934.3	5,549.5	184.5
2015	May	1.5	1.0	9.7	6.2	1.0	No	Yes	0.0	3.5	1.0	5,845.5	5,549.0	182.6
2015	Jun	1.0	1.0	6.1	2.6	4.6	No	Yes	0.0	3.5	4.6	5,440.5	5,546.7	174.5
2015	Jul	1.1	0.9	5.5	2.0	7.7	No	Yes	0.0	3.5	8.3	4,804.8	5,542.9	162.6
2015	Aug	1.0	0.9	7.7	4.2	0.9	No	Yes	0.0	3.5	0.9	4,641.4	5,541.9	159.3
2015	Sep	1.4	0.8	12.0	4.0	0.0	Yes	Yes	0.0	7.9	0.0	4,548.7	5,541.3	157.2
2015	Oct	2.2	0.8	23.0	0.0	0.0	Yes	Yes	0.0	23.0	0.0	4,474.6	5,540.9	155.5
2015	Nov	1.7	0.9	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	5,104.2	5,544.7	168.3
2015	Dec	1.4	0.9	5.9	0.0	0.0	Yes	Yes	0.0	5.9	0.0	5,621.3	5,547.7	177.9
2016	Jan	1.7	1.0	11.0	0.0	0.0	Yes	Yes	0.0	11.0	0.0	5,971.7	5,549.7	185.3
2016	Feb	2.6	1.0	25.9	0.0	0.0	Yes	Yes	0.0	25.9	0.0	5,977.6	5,549.7	185.4
2016	Mar	2.7	1.0	27.3	0.0	0.0	Yes	Yes	0.0	27.3	0.0	5,960.7	5,549.6	185.1
2016	Apr	2.7	1.0	27.0	0.0	0.0	Yes	Yes	0.0	27.0	0.0	5,934.3	5,549.5	184.5
2016	May	2.3	1.0	17.3	7.1	0.0	Yes	Yes	0.0	10.1	0.0	5,904.7	5,549.3	183.9
2016	Jun	1.0	1.0	6.0	2.5	4.7	No	Yes	0.0	3.5	4.7	5,490.4	5,547.0	175.5
2016	Jul	0.8	0.9	5.2	1.7	7.9	No	Yes	0.0	3.5	11.1	4,679.5	5,542.2	160.0

Date		Reservoir Start			Glendale USGS Data Backed to Glendale	to GIC					Glendale USGS Data	Orderville Tributary	River	to OIC				to COVE				Reservoir Int1			Seepage		Evaporation		Reservoir Int2			Mt Carmel Tributary	Seepage Return	River	to MCIC				WC Release	River		Reservoir End		
Yr	Mo	Volume	Elevation	Area	Ave Flow	From River		Supp	Pre Cove Full?	Full?	Ave Flow	Ave Flow	Ave Flow	River	Supp	re Cove Full	Full?	Hydraulic Cap	to Fill Resv	Control	River	Volume	Elevation	Area					Volume	Elevation	Area	Ave Flow	Ave Flow	Ave Flow	River	Supp	Pre Cove Full?	Full?	Supp	Ave Flow	Sum Supp	Volume	Elevation	Area
		af	ft	ac	cfs	cfs	Max Supp	cfs			cfs	cfs	cfs	cfs	cfs			cfs	cfs	cfs	cfs	af	ft	ac	af	cfs	af	cfs	af	ft	ac	cfs	cfs	cfs	cfs	cfs			cfs	af	ft	ac
2016	Aug	4679.5	5542.2	160.0	7.1	5.5	0.0	0.0	Yes	Yes	8.7	1.7	10.4	3.6	0.0	Yes	Yes	14.5	22.0	0.0	0.0	4679.5	5542.2	160.0	51.7	0.8	52.8	0.9	4,575.0	5,541.5	157.7	1.2	0.8	8.8	5.1	0.0	No	Yes	0.0	3.7	0.0	4,575.0	5,541.5	157.7
2016	Sep	4575.0	5541.5	157.7	9.0	4.3	0.0	0.0	Yes	Yes	11.0	2.2	13.2	2.9	0.0	Yes	Yes	14.6	24.5	0.0	0.0	4575.0	5541.5	157.7	49.3	0.8	42.5	0.7	4,483.3	5,540.9	155.7	1.5	0.8	12.6	4.0	0.0	Yes	Yes	0.0	8.6	0.0	4,483.3	5,540.9	155.7
2016	Oct	4483.3	5540.9	155.7	8.3	0.0	0.0	0.0	Yes	Yes	10.2	2.1	12.3	0.0	0.0	Yes	Yes	14.6	25.2	0.0	0.0	4483.3	5540.9	155.7	50.3	0.8	23.2	0.4	4,409.8	5,540.4	154.0	1.4	0.8	14.4	0.0	0.0	Yes	Yes	0.0	14.4	0.0	4,409.8	5,540.4	154.0
2016	Nov	4409.8	5540.4	154.0	7.3	0.0	0.0	0.0	Yes	Yes	8.9	1.8	10.7	0.0	0.0	Yes	Yes	14.7	27.3	14.7	7.2	4838.3	5543.1	163.2	51.0	0.9	2.4	0.0	4,784.8	5,542.8	162.2	1.2	0.9	5.6	0.0	0.0	Yes	Yes	0.0	5.6	0.0	4,784.8	5,542.8	162.2
2016	Dec	4784.8	5542.8	162.2	13.5	0.0	0.0	0.0	Yes	Yes	16.6	3.3	19.9	0.0	0.0	Yes	Yes	14.4	20.3	14.4	14.4	5672.3	5548.0	178.9	57.8	0.9	0.0	0.0	5,614.5	5,547.7	177.8	2.2	0.9	8.7	0.0	0.0	Yes	Yes	0.0	8.7	0.0	5,614.5	5,547.7	177.8
2017	Jan	5614.5	5547.7	177.8	33.1	0.0	0.0	0.0	Yes	Yes	40.7	8.2	48.9	0.0	0.0	Yes	Yes	13.9	6.8	6.8	6.8	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	5.5	1.0	48.5	0.0	0.0	Yes	Yes	0.0	48.5	0.0	5,971.7	5,549.7	185.3
2017	Feb	5971.7	5549.7	185.3	44.8	0.0	0.0	0.0	Yes	Yes	55.0	11.1	66.1	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	7.4	1.0	73.3	0.0	0.0	Yes	Yes	0.0	73.3	0.0	5,977.6	5,549.7	185.4
2017	Mar	5977.6	5549.7	185.4	33.1	0.0	0.0	0.0	Yes	Yes	40.7	8.2	48.9	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	5.5	1.0	54.4	0.0	0.0	Yes	Yes	0.0	54.4	0.0	5,960.7	5,549.6	185.1
2017	Apr	5960.7	5549.6	185.1	16.4	0.0	0.0	0.0	Yes	Yes	20.1	4.0	24.1	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	2.7	1.0	26.6	0.0	0.0	Yes	Yes	0.0	26.6	0.0	5,934.3	5,549.5	184.5
2017	May	5934.3	5549.5	184.5	10.5	7.7	0.0	0.0	Yes	Yes	12.9	2.6	15.5	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.7	1.0	11.6	7.1	0.0	Yes	Yes	0.0	4.4	0.0	5,904.7	5,549.3	183.9
2017	Jun	5904.7	5549.3	183.9	7.8	7.7	0.0	0.0	Yes	Yes	9.5	1.9	11.4	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.3	1.0	8.6	5.1	2.1	No	Yes	0.0	3.5	2.1	5,647.7	5,547.9	178.4
2017	Jul	5647.7	5547.9	178.4	7.1	7.1	0.0	0.0	No	No	8.7	1.7	10.4	6.8	0.0	Yes	Yes	13.9	6.3	0.0	0.0	5647.7	5547.9	178.4	57.6	0.9	73.6	1.2	5,516.5	5,547.1	176.0	1.2	0.9	5.7	2.2	7.5	No	Yes	0.0	3.5	7.5	5,054.8	5,544.5	167.4
2017	Aug	5054.8	5544.5	167.4	6.1	5.5	0.0	0.0	Yes	Yes	7.4	1.5	8.9	3.6	0.0	Yes	Yes	14.3	15.9	0.0	0.0	5054.8	5544.5	167.4	54.1	0.9	55.2	0.9	4,945.5	5,543.8	165.4	1.0	0.9	7.2	3.7	1.4	No	Yes	0.0	3.5	1.4	4,857.7	5,543.3	163.6
2017	Sep	4857.7	5543.3	163.6	8.9	4.3	0.0	0.0	Yes	Yes	10.9	2.2	13.1	2.9	0.0	Yes	Yes	14.4	19.7	0.0	0.0	4857.7	5543.3	163.6	51.1	0.9	44.0	0.7	4,762.5	5,542.7	161.7	1.5	0.9	12.5	4.0	0.0	Yes	Yes	0.0	8.5	0.0	4,762.5	5,542.7	161.7
2017	Oct	4762.5	5542.7	161.7	9.3	0.0	0.0	0.0	Yes	Yes	11.4	2.3	13.7	0.0	0.0	Yes	Yes	14.4	20.6	0.0	0.0	4762.5	5542.7	161.7	52.2	0.8	24.1	0.4	4,686.2	5,542.2	160.2	1.5	0.8	16.1	0.0	0.0	Yes	Yes	0.0	16.1	0.0	4,686.2	5,542.2	160.2
2017	Nov	4686.2	5542.2	160.2	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	14.5	22.6	14.5	11.0	5342.7	5546.2	172.7	54.0	0.9	2.6	0.0	5,286.1	5,545.8	171.7	1.6	0.9	6.0	0.0	0.0	Yes	Yes	0.0	6.0	0.0	5,286.1	5,545.8	171.7
2017	Dec	5286.1	5545.8	171.7	11.2	0.0	0.0	0.0	Yes	Yes	13.8	2.8	16.6	0.0	0.0	Yes	Yes	14.1	12.1	12.1	12.1	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	1.8	1.0	7.3	0.0	0.0	Yes	Yes	0.0	7.3	0.0	5,971.7	5,549.7	185.3
2018	Jan	5971.7	5549.7	185.3	12.1	0.0	0.0	0.0	Yes	Yes	14.8	3.0	17.8	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.0	1.0	19.8	0.0	0.0	Yes	Yes	0.0	19.8	0.0	5,971.7	5,549.7	185.3
2018	Feb	5971.7	5549.7	185.3	16.1	0.0	0.0	0.0	Yes	Yes	19.8	4.0	23.8	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	2.7	1.0	26.3	0.0	0.0	Yes	Yes	0.0	26.3	0.0	5,977.6	5,549.7	185.4
2018	Mar	5977.6	5549.7	185.4	10.1	0.0	0.0	0.0	Yes	Yes	12.4	2.5	14.9	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	1.7	1.0	16.6	0.0	0.0	Yes	Yes	0.0	16.6	0.0	5,960.7	5,549.6	185.1
2018	Apr	5960.7	5549.6	185.1	7.4	0.0	0.0	0.0	Yes	Yes	9.1	1.8	11.0	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.2	1.0	12.0	0.0	0.0	Yes	Yes	0.0	12.0	0.0	5,934.3	5,549.5	184.5
2018	May	5934.3	5549.5	184.5	4.7	4.7	0.0	0.0	No	No	5.8	1.2	7.0	3.5	1.6	No	Yes	13.7	1.6	1.6	0.0	5934.3	5549.5	184.5	59.6	1.0	66.3	1.1	5,808.5	5,548.8	181.8	0.8	1.0	5.2	1.7	5.4	No	Yes	0.0	3.5	7.0	5,377.5	5,546.4	173.4
2018	Jun	5377.5	5546.4	173.4	6.0	6.0	0.0	0.0	No	No	7.3	1.5	8.8	5.1	0.0	Yes	Yes	14.1	11.0	0.0	0.0	5377.5	5546.4	173.4	54.2	0.9	71.5	1.2	5,251.9	5,545.6	171.0	1.0	0.9	5.6	2.1	5.1	No	Yes	0.0	3.5	5.1	4,948.5	5,543.8	165.4
2018	Jul	4948.5	5543.8	165.4	4.6	4.6	0.0	0.0	No	No	5.6	1.1	6.7	3.2	3.6	No	Yes	14.3	17.6	0.0	0.0	4948.5	5543.8	165.4	53.4	0.9	68.2	1.1	4,826.8	5,543.1	163.0	0.8	0.9	5.1	1.6	8.0	No	Yes	0.0	3.5	11.6	4,110.6	5,538.5	147.2
2018	Aug	4110.6	5538.5	147.2	4.4	4.4	0.0	0.0	No	No	5.4	1.1	6.4	2.9	0.7	No	Yes	14.9	31.2	0.0	0.0	4110.6	5538.5	147.2	47.5	0.8	48.6	0.8	4,014.4	5,537.8	145.1	0.7	0.8	5.0	1.5	3.6	No	Yes	0.0	3.5	4.3	3,749.4	5,535.9	139.0
2018	Sep	3749.4	5535.9	139.0	7.7	4.3	0.0	0.0	Yes	Yes	9.5	1.9	11.4	2.9	0.0	Yes	Yes	15.2	38.4	0.0	0.0	3749.4	5535.9	139.0	43.4	0.7	37.4	0.6	3,668.6	5,535.3	137.2	1.3	0.7	10.5	4.0	0.0	Yes	Yes	0.0	6.4	0.0	3,668.6	5,535.3	137.2
2018	Oct	3668.6	5535.3	137.2	9.9	0.0	0.0	0.0	Yes	Yes	12.1	2.4	14.5	0.0	0.0	Yes	Yes	15.2	38.4	0.0	0.0	3668.6	5535.3	137.2	44.3	0.7	20.5	0.3	3,603.8	5,534.9	135.8	1.6	0.7	16.9	0.0	0.0	Yes	Yes	0.0	16.9	0.0	3,603.8	5,534.9	135.8
2018	Nov	3603.8	5534.9	135.8	11.2	0.0	0.0	0.0	Yes	Yes	13.7	2.8	16.5	0.0	0.0	Yes	Yes	15.3	40.8	15.3	13.0	4374.6	5540.2	153.2	47.9	0.8	2.3	0.0	4,324.4	5,539.9	152.1	1.8	0.8	6.1	0.0	0.0	Yes	Yes	0.0	6.1	0.0	4,324.4	5,539.9	152.1
2018	Dec	4324.4	5539.9	152.1	12.9	0.0	0.0	0.0	Yes	Yes	15.8	3.2	19.0	0.0	0.0	Yes	Yes	14.7	27.8	14.7	14.7	5231.0	5545.5	170.6	55.1	0.9	0.0	0.0	5,175.9	5,545.2	169.6	2.1	0.9	7.2	0.0	0.0	Yes	Yes	0.0	7.2	0.0	5,175.9	5,545.2	169.6
2019	Jan	5175.9	5545.2	169.6	12.5	0.0	0.0	0.0	Yes	Yes	15.3	3.1	18.4	0.0	0.0	Yes	Yes	14.2	13.9	13.9	13.9	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.1	1.0	7.5	0.0	0.0	Yes	Yes	0.0	7.5	0.0	5,971.7	5,549.7	185.3
2019	Feb	5971.7	5549.7	185.3	28.7	0.0	0.0	0.0	Yes	Yes	35.2	7.1	42.3	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	4.7	1.0	46.9	0.0	0.0	Yes	Yes	0.0	46.9	0.0	5,977.6	5,549.7	185.4
2019	Mar	5977.6	5549.7	185.4	43.7	0.0	0.0	0.0	Yes	Yes	53.7	10.8	64.5	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	7.2	1.0	71.8	0.0	0.0	Yes	Yes	0.0	71.8	0.0	5,960.7	5,549.6	185.1
2019	Apr	5960.7	5549.6	185.1	27.4	0.0	0.0	0.0	Yes	Yes	33.7	6.8	40.5	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	4.5	1.0	44.8	0.0	0.0	Yes	Yes	0.0	44.8	0.0	5,934.3	5,549.5	184.5
2019	May	5934.3	5549.5	184.5	18.6	7.7	0.0	0.0	Yes	Yes	22.8	4.6	27.4	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	3.1	1.0	24.8	7.1	0.0	Yes	Yes	0.0	17.6	0.0	5,904.7	5,549.3	183.9
2019	Jun	5904.7	5549.3	183.9	10.9	7.7	0.0	0.0	Yes	Yes	13.4	2.7	16.1	5.1	0.0	Yes	Yes	13.7	2.1	0.0	0.0	5904.7	5549.3	183.9	57.5	1.0	75.9	1.3	5,771.4	5,548.6	181.0	1.8	1.0	13.8	7.2	0.0	Yes	Yes	0.0	6.6	0.0	5,771.4	5,548.6	181.0
2019	Jul	5771.4	5548.6	181.0	8.6	8.6	0.0	0.0	No	No	10.5	2.1	12.6	6.8	0.0	Yes	Yes	13.8	4.2	0.0	0.0	5771.4	5548.6	181.0	58.5	1.0	74.7	1.2	5,638.3	5,547.8	178.3	1.4	1.0	8.1	4.6	5.0	No	Yes	0.0	3.5	5.0	5,328.5	5,546.1	172.4
2019	Aug	5328.5	5546.1	172.4	8.0	5.5	0.0	0.0	Yes	Yes	9.8	2.0	11.8	3.6	0.0	Yes	Yes	14.1	11.4	0.0	0.0	5328.5	5546.1	172.4	55.7	0.9	56.9	0.9	5,215.9	5,545.4	170.4	1.3	0.9	10.4	5.1	0.0	Yes	Yes	0.0	5.3	0.0	5,215.9	5,545.4	170.4
2019	Sep	5215.9	5545.4	170.4	10.4	4.3	0.0	0.0	Yes	Yes	12.8	2.6	15.4	2.9	0.0	Yes	Yes	14.2	13.7	0.0	0.0	5215.9	5545.4	170.4	53.2	0.9	45.9	0.8	5,116.8	5,544.8	168.6	1.7	0.9	15.1	4.0	0.0	Yes	Yes	0.0	11.1	0.0	5,116.8	5,544.8	168.6
2019	Oct	5116.8	5544.8	168.6	14.0	0.0	0.0	0.0	Yes	Yes	17.2	3.5	20.7	0.0	0.0	Yes	Yes	14.2	14.9	0.0	0.0	5116.8	5544.8	168.6	54.4	0.9	25.1	0.4	5,037.2	5,544.4	167.1	2.3	0.9	23.8	0.0	0.0	Yes	Yes	0.0	23.8	0.0	5,037.2	5,544.4	167.1
2019	Nov	5037.2	5544.4	167.1	17.3	0.0	0.0	0.0	Yes	Yes	21.2	4.3	25.5	0.0	0.0	Yes	Yes	14.3	16.7	14.3	14.3	5886.3	5549.2	183.5	57.3	1.0	2.8	0.0	5,826.2	5,548.9	182.2	2.8	1.0	15.0	0.0	0.0	Yes	Yes	0.0	15.0	0.0	5,826.2	5,548.9	182.2
2019	Dec	5826.2	5548.9	182.2	15.9	0.0	0.0	0.0	Yes	Yes	19.5	3.9	23.4	0.0	0.0	Yes	Yes	13.8	3.3	3.3	3.3	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	23.7	0.0	0.0	Yes	Yes	0.0	23.7	0.0	5,971.7	5,549.7	185.3
2020	Jan	5971.7	5549.7	185.3	16.0	0.0	0.0	0.0	Yes	Yes	19.6	3.9	23.5	0.0	0.0	Yes	Yes	13.7	1.0	1.0	1.0	6032.0	5550.0	186.6	60.3	1.0	0.0	0.0	5,971.7	5,549.7	185.3	2.6	1.0	26.2	0.0	0.0	Yes	Yes	0.0	26.2	0.0	5,971.7	5,549.7	185.3
2020	Feb	5971.7	5549.7	185.3	19.5	0.0	0.0	0.0	Yes	Yes	24.0	4.8	28.8	0.0	0.0	Yes	Yes	13.7	1.1	1.1	1.1	6032.0	5550.0	186.6	54.4	1.0	0.0	0.0	5,977.6	5,549.7	185.4	3.2	1.0	31.9	0.0	0.0	Yes	Yes	0.0	31.9	0.0	5,977.6	5,549.7	185.4
2020	Mar	5977.6	5549.7	185.4	17.1	0.0	0.0	0.0	Yes	Yes	21.0	4.2	25.2	0.0	0.0	Yes	Yes	13.7	0.9	0.9	0.9	6032.0	5550.0	186.6	60.3	1.0	11.0	0.2	5,960.7	5,549.6	185.1	2.8	1.0	28.1	0.0	0.0	Yes	Yes	0.0	28.1	0.0	5,960.7	5,549.6	185.1
2020	Apr	5960.7	5549.6	185.1	11.3	0.0	0.0	0.0	Yes	Yes	13.9	2.8	16.7	0.0	0.0	Yes	Yes	13.7	1.2	1.2	1.2	6032.0	5550.0	186.6	58.3	1.0	39.3	0.7	5,934.3	5,549.5	184.5	1.9	1.0	18.3	0.0	0.0	Yes	Yes	0.0	18.3	0.0	5,934.3	5,549.5	184.5
2020	May	5934.3	5549.5	184.5	8.0	7.7	0.0	0.0	Yes	Yes	9.9	2.0	11.8	5.1	0.0	Yes	Yes	13.7	1.6	1.6	1.6	6032.0	5550.0	186.6	60.3	1.0	67.0	1.1	5,904.7	5,549.3	183.9	1.3	1.0	7.5	4.0	3.2	No	Yes	0.0	3.5	3.2	5,710.1	5,548.2	179.7
2020	Jun	5710.1	5548.2	179.7	6.1	6.1	0.0	0.0	No	No	7.5	1.5	9.0	5.1	0.0	Yes	Yes	13.9	5.4	0.0	0.0	5710.1	5548.2	179.7	56.2	0.9	74.1	1.2	5,579.8	5,547.5	177.2	1.0	0.9	5.9	2.4	4.8	No	Yes	0.0	3.5	4.8	5,292.7	5,545.9	171.8
2020	Jul	5292.7	5545.9	171.8	5.3	5.3	0.0	0.0	No	No	6.5	1.3	7.8	4.3	2.6	No	Yes	14.1	12.0	0.0	0.0	5292.7	5545.9	171.8	55.5	0.9	70.9	1.2	5,166.4	5,545.1	169.5	0.9	0.9	5.3	1.8	7.9	No	Yes	0.0	3.5	10.5	4,523.6	5,541.2	156.6
2020	Aug	4523.6	5541.2	156.6	5.8	5.5	0.0	0.0	Yes	Yes	7.2	1.4	8.6	3.6	0.0	Yes	Yes	14.6	24.5	0.0	0.0	4523.6	5541.2	156.6	50.6	0.8	51.7	0.8	4,421.3	5,540.5	154.3	1.0	0.8	6.8	3.3	1.9	No	Yes	0.0	3.5	1.9	4,307.1	5,539.8	151.7
2020	Sep	4307.1	5539.8	151.7	8.0	4.3	0.0	0.0	Yes	Yes	9.8	2.0	11.8	2.9	0.0	Yes	Yes	14.8	29.0	0.0	0.0	4307.1	5539.8	151.7	47.4	0.8	40.8	0.7	4,218.9	5,539.2	149.7	1.3	0.8	11.0	4.0	0.0	Yes	Yes	0.0	7.0	0.0	4,218.9	5,539.2	149.7
2020	Oct	4218.9	5539.2	149.7	11.7	0.0	0.0	0.0	Yes	Yes	14.4	2.9	17.3	0.0	0.0	Yes	Yes	14.8	29.5	0.0	0.0	4218.9	5539.2	149.7	48.3	0.8	22.3	0.4	4,148.2	5,538.7	148.1	1.9	0.8	20.0	0.0	0.0	Yes	Yes	0.0	20.0	0.0	4,148.2	5,538.7	148.1
2020	Nov	4148.2	5538.7	148.1	13.1	0.0	0.0	0.0	Yes	Yes	16.1	3.2	19.3	0.0	0.0	Yes	Yes	14.9	31.7	14.9	14.9	5033.1	5544.3	167.0	52.2	0.9	2.5	0.0	4,978.4	5,544.0	166.0	2.2	0.9	7.5	0.0	0.0	Yes	Yes	0.0	7.5	0.0	4,978.4	5,544.0	166.0
2020	Dec	4978.4	5544.0	166.0	4.1	0.0	0.0	0.0	Yes	Yes	5.0	1.0	6.0	0.0	0.0	Yes	Yes	14.3	17.1	14.3	2.5	5132.4	5544.9	168.8	54.5	0.9	0.0	0.0	5,077.9	5,544.6	167.8	0.7	0.9	5.1	0.0	0.0	Yes	Yes	0.0	5.1	0.0	5,077.9	5,544.6	167.8

AQUATIC RESOURCE DELINEATION REPORT

Cove–East Fork Virgin River Watershed Project

March 2026

Prepared By:

Eocene Environmental Group, Inc.

444 South Main Street, Suite A6

Cedar City, Utah 84720

Prepared For:

United States Department of Agriculture
Natural Resources Conservation Service

Kane County Water Conservancy District

Washington County Water Conservancy District

EXECUTIVE SUMMARY

An aquatic resource delineation study has been conducted for the Cove–East Fork Virgin River Watershed Project in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual and Regional Supplement to the USACE Wetland Delineation Manual: Arid West Region (USACE 2008).

Within the approximately 719.2-acre survey area, a total of 22 aquatic features were identified, comprising of two isolated, manmade wetlands (0.76-acre total), 17 stream and/or riverine features (4.7187 acres/12,784 linear feet) and three seasonal ponds. The total area of aquatic resources within the survey area amounts to 5.35 acres. Out of the 17 stream and riverine features identified, five were ephemeral, four were intermittent, and eight were perennial, including three sections of the East Fork of the Virgin River. The overall condition of the aquatic features varies; several streams exhibited clear Ordinary High-Water Marks (OHWMs), with some segments showing evidence of recent flows while others lacked surficial connectivity due to anthropogenic alterations. The two wetlands identified were manmade and isolated and, per prior consultation with USACE, are not considered jurisdictional under Section 404 of the Clean Water Act (CWA). It is anticipated that total temporary disturbance would be limited to approximately 0.253 acre and the total permanent disturbance would be limited to 0.021 acre within the OHWM of potentially jurisdictional streams.

TABLE OF CONTENTS

Chapter 1 Introduction 1
1.1 Contact Information 1
1.2 Survey Area Description 1
1.3 Purpose 2
Chapter 2 Location 3
Chapter 3 Methods 4
3.1 Delineation Survey Methods 4
Chapter 4 Existing Conditions 9
4.1 Landscape Setting 9
4.2 Aquatic Resources 13
Chapter 5 Conclusion 26
Chapter 6 References 27

LIST OF TABLES

Table 1: Project Contact Information 1
Table 2: Wetland Indicator Status Ratings Used in the National Wetland Plant List 5
Table 3: National Wetland Inventory Feature Types Within and Near the Survey Area 10
Table 4: Native Soil Types in the Survey Area 12
Table 5: Delineated Wetland Features 14
Table 6: Potentially Jurisdictional Aquatic Features Within the Survey Area 20
Table 7: Impacts to Potentially Jurisdictional Wetlands and Other Waters of the United States 24

LIST OF APPENDICES

Appendix A Aquatic Resource Delineation Maps
Appendix B Supporting Maps
Appendix C On-Site Photographs
Appendix D Wetland Delineation Data Sheets
Appendix E OHWM Data Sheets

ACRONYMS

asl	above sea level
BMP	Best Management Practice
CWA	Clean Water Act
DBH	diameter at breast height
EFVR	East Fork Virgin River
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
KCWCD	Kane County Water Conservancy District
MP	milepost
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OHWM	Ordinary High-Water Mark
OBL	obligate
ROW	right-of-way
UPL	upland
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WCWCD	Washington County Water Conservancy District
Wetland 1	W1
Wetland 2	W2
WOTUS	Waters of the United States

CHAPTER 1 INTRODUCTION

1.1 Contact Information

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), with assistance from the Kane County Water Conservancy District (KCWCD) and Washington County Water Conservancy District (WCWCD), as the project co-sponsors, are considering proposed improvements within the East Fork Virgin River (EFVR) Watershed. Alpha Engineering Company contracted Eocene Environmental Group, Inc. (Eocene) to analyze the proposed project for potential impacts to wetlands and potentially jurisdictional Waters of the United States (WOTUS).

Table 1: Project Contact Information

Role	Company	Name	Address	Phone Number
Project Sponsor	KCWCD	Mike Noel	725 East Kaneplex Drive Kanab, Utah 84741	(435) 616-5603
Project Sponsor	WCWCD	George Elliott	533 East Waterworks Drive St. George, Utah 84770	(435) 922-8118
Lead Federal Agency	NRCS	Anders Fillerup	125 State Street #4010 Salt Lake City, Utah 84138	(385) 245-7709
Engineering Consultant	Alpha Engineering Company	Glen Carnahan	43 South 100 East Suite 100 St. George, Utah 84770	(435) 628-6500
Environmental Consultant	Eocene Environmental Group, Inc.	Emily Paris	1745 South Alma School Road #220 Mesa, Arizona 85210	(775) 296-0819

1.2 Survey Area Description

The survey area is an approximately 719.2-acre polygon surrounding all areas where ground or surface disturbance would occur from project implementation. The survey area is larger than the area of disturbance to account for changes to project details, and therefore, not all identified aquatic features would be impacted. Current proposed improvements being considered include the construction of a new, approximately 6,055-acre-foot capacity reservoir (Cove Reservoir) with principal and auxiliary spillways; the replacement of an approximately 1.7-mile section of existing pipeline in the Glendale irrigation system; addition of earthen and rock fill dam and a 3.2-mile access road; installing approximately 4.5 miles of new pipeline in the Mt. Carmel area; and the creation of a 4.1-acre outdoor recreation area with a boat ramp, picnic facilities, a pavilion, restrooms, overnight and primitive camping sites, and recreation vehicle sites. The proposed project also includes the use of three existing borrow pits (Tait, Lamb, and Esplin) for construction material (e.g., rip rap, gravel, etc.). The total area of disturbance is approximately 375.1 acres. See **Appendix B** for figures of the project.

1.3 Purpose

The purpose of this report is to identify and describe aquatic resources. This report facilitates efforts to do the following:

1. Avoid or minimize impacts to aquatic resources during the design process.

2. Document aquatic resource boundary determinations for review by regulatory authorities.

3. Provide early indications of known sensitive species and historic/cultural properties within the survey area.

4. Provide background information.

The purpose of the proposed project is to enhance the efficiency and reliability of the current agricultural water management in Long Valley, part of the EFVR sub-watershed, while complying with the Zion National Park Water Rights Settlement Agreement of 1996 (United States, Utah, Washington District, & Kane District, 1996). Effective irrigation systems and water management strategies would support farm profitability amid constraints posed by scarce and costly water resources.

The secondary purposes of the proposed project are public recreation and to increase irrigation and Municipal & Industrial water supply to communities in Washington County. The water demand in the WCWCD service area is projected to increase as summer agricultural water shortages continue, and more municipal water providers join and receive water from the WCWCD system.

CHAPTER 2 LOCATION

The proposed project is located adjacent to US-89 and the EFVR near Mt. Carmel, Glendale, and Orderville, in Kane County, Utah, located within Township 40 South, Range 7 West, Sections 23, 26, and 27; Township 41 South, Range 7 West, Sections 5, 6, 8, 9, 17, 18, and 19; and Township 40 South, Range 6 West, Section 35 of the Salt Lake Baseline and Meridian on the Orderville, Glendale, and Mt. Carmel, Utah, 7.5-minute U.S. Geological Survey topographic quadrangles. Please see the **Vicinity Map** in **Appendix B**. Project features would be installed on Utah School and Institutional Trust Lands Administration and private lands as shown on the **Land Ownership Map** in **Appendix B**.

The Tait and Lamb pits are located east of US-89 on private land, and the Esplin pit is located along County Road 3000 approximately 3 miles east of Glendale. The proposed Cove Reservoir area can be accessed from Cove Road off US-89 between milepost (MP) 84.9 and MP 85, and the Glendale Pipeline can be accessed via multiple private roads west of US-89 between MP 87.9 and MP 89.4. The Mt. Carmel Irrigation Improvement Area can be accessed at various locations adjacent to either side of US-89 between MPs 84.5 and 82.5. The Lamb borrow pit is accessed east of US-89 from a dirt road at MP 81.4. The Tait borrow pit can be accessed via Tait Lane, east of Mt. Carmel and US-89. Access to the Esplin Pit can be made by traveling eastbound on County Road 3000 for approximately 3 miles and stopping just northwest of the split in the road where County Road 3035 is located. Access to Glendale Bench Road is located east of US-89 at MP 90. Access to all aquatic features is located on land under the jurisdiction of the Bureau of Land Management Kanab Field Office, Utah School and Institutional Trust Lands Administration, or private ownership.

CHAPTER 3 METHODS

3.1 Delineation Survey Methods

A focused evaluation of potentially jurisdictional WOTUS and any other aquatic features (including wetlands) located within the survey area was performed between October 8, 2018, and October 10, 2018, and follow-up field visits to evaluate additional borrow pits were conducted on April 24, 2019, and September 20, 2019. A survey of the Mt. Carmel Irrigation Improvement Area was conducted on October 24, 2021.

The methods used to delineate potentially jurisdictional WOTUS and locate any other aquatic features (including wetlands) within the survey area were based on the best available resources at the time of survey, including the USACE **Jurisdictional Determination Form Instructional Guidebook** (USACE 2007), **A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States** (Lichvar and McColley 2008), USACE **Wetland Delineation Manual** (USACE 1987), and the **Interim Regional Supplement to the USACE Wetland Delineation Manual: Arid West Region**.

Additionally, this report considers rulemaking as of the revision date (2025), which includes the revised definition of WOTUS as of March 12, 2025 (33 Code of Federal Regulations [CFR] Part 328), considering the Supreme Court's 2023 decision in **Sackett v. Environmental Protection Agency.**

Eocene used two methods to identify wetlands and waters:

1. Locations with previously mapped wetlands and waters were identified in the field and investigated.

2. The survey area was traversed and inspected for signs of wetlands and waters (e.g., changes in vegetation, depression holding water, or channels) and investigated.

Ordinary High-Water Mark (OHWM) data was collected for 15 stream and riverine features within the survey area. Eocene's Aquatic Resource Specialist observed two wetlands; therefore, two wetland delineations were performed. OHWM and photo locations are indicated on the **Aquatic Resource Delineation Map** in **Appendix A**. The data sheets used to collect wetland and OHWM data can be found in **Appendices D and E.** Methods for evaluating the presence of wetlands and other waters employed during the routine determination are described in detail below.

3.1.1 Existing Data

Existing data were reviewed before conducting a field assessment. Information reviewed included the following:

- Recent aerial photography
- U.S. Fish and Wildlife Service (USFWS) National Water Inventory (NWI) (USFWS 2021)
- USDA–NRCS soil maps (NRCS 2022)

3.1.2 Definitions

The survey area was evaluated for the presence or absence of indicators of the three wetland parameters described in the USACE **Manual** (USACE 1987) and the **Arid West Regional Supplement** (USACE 2008): 1) hydrophytic vegetation, 2) wetland hydrology, and 3) hydric soils.

Section 328.3 of the Federal CFR defines wetlands as follows:

> **Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.**

According to the USACE **Manual**, for areas not considered "problem areas" or "atypical situations," the following applies:

> **…evidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination.**

Data on vegetation, hydrology, and soils collected at sample points during the site visit was reported on a Wetland Determination Data Form–Arid West Region forms (**Appendix D**). Once an area was determined to be a potential jurisdictional wetland, its boundaries were delineated using GPS and mapped on a topographic aerial map. Indicators described in the Arid West Regional Supplement were used to make wetland determinations at each sample point in the survey area and are summarized below.

Vegetation

This report discusses botanical species with both their scientific and common names. Plant species identified within the survey area were assigned a wetland status according to the USACE National Wetland Plant List (USACE, 2023). This wetland classification system is based on the expected frequency of species occurrence in wetlands, identified in **Table 2**.

Table 2: Wetland Indicator Status Ratings Used in the National Wetland Plant List

Wetland Indicator Status Rating	Definition
Obligate (OBL)	Almost always occur in wetlands
Facultative Wetland (FACW)	Usually occur in wetlands, but may occur in non-wetlands
Facultative (FAC)	Occur in wetlands and non-wetlands
Facultative Upland (FACU)	Usually occur in non-wetlands, but may occur in wetlands
Upland (UPL)	Almost never occurs in wetlands

The **Arid West Regional Supplement** requires a three-step process to determine if hydrophytic vegetation is present. The procedure first requires the delineator to apply the 50/20 Rule (Indicator 1) described in the manual. To apply the 50/20 Rule, dominant species are chosen independently from each stratum of the community including four strata: tree, sapling/shrub, herbaceous, and woody vine[1]. In general, dominant species are determined for each vegetation stratum from a sampling plot of an appropriate size surrounding the sample point. Dominant species are generally the most abundant species that individually or collectively account for more than 50 percent of total vegetative cover in the stratum, plus any other species that, by itself, accounts for at least 20 percent of the total cover. If greater than 50 percent of the dominant species have an OBL, FACW, or FAC status, the sample point meets the hydrophytic vegetation criterion.

If the sample point fails the application of Indicator 1, and both hydric soil and wetland hydrology are absent, then the sample point does not meet the hydrophytic vegetation criterion unless the site is a problematic wetland situation. However, if the sample point fails Indicator 1 but hydric soils and wetland hydrology are both present, the delineator must apply Indicator 2.

Indicator 2 is the Prevalence Index, which is a weighted average of the wetland indicator status for all plant species within the sampling plot. Each indicator status is given a numeric code: OBL=1, FACW=2, FAC=3, FACU=4, and UPL=5. Application of Indicator 2 requires the delineator to estimate the percent cover of each species in every stratum of the community and sum the cover estimates for any species that are present in more than one stratum. The delineator must then organize all species into groups according to their wetland indicator status and calculate the Prevalence Index using the following formula, where "A" equals total percent cover.

$$PI = \frac{A_{OBL} + 2A_{FACW} + 3A_{FAC} + 4A_{FACU} + 5A_{UPL}}{A_{OBL} + A_{FACW} + A_{FAC} + A_{FACU} + A_{UPL}}$$

The Prevalence Index will yield a number between one and five. If the Prevalence Index is equal to or less than three, the sample point meets the hydrophytic vegetation criterion. However, if the community is greater than three, the delineator must proceed to Indicator 3.

Application of Indicator 3 assesses the presence of morphological adaptations. If more than 50 percent of the individuals of a FACU species have morphological adaptations for life in wetlands, that species is considered to be a hydrophyte, and its indicator status should be reassigned to FAC. If such observations are made, the delineator must recalculate Indicators 1 and 2 using a FAC indicator status for this species. The sample point meets the hydrophytic vegetation criterion if either test is satisfied.

This three-step process was utilized to determine if sample points within the survey area met the hydrophytic vegetation criterion.

[1] The tree stratum includes woody plants, excluding woody vines, approximately 20 feet or more in height and 3 inches or larger in diameter at breast height (DBH). The sapling/shrub stratum includes woody plants, excluding woody vines, less than 3 inches DBH, regardless of height. The herb stratum includes all herbaceous (non-woody) plants, including herbaceous vines regardless of size and woody plants, except woody vines, less than approximately 3 feet in height. The woody vine stratum includes all woody vines regardless of height (USACE 2008).

Hydrology

At the time of the field surveys, the USACE jurisdictional wetland hydrology criterion was satisfied if an area is inundated or saturated long enough to create anoxic soil conditions during the growing season (i.e., a minimum of 14 days in the Arid West Region). Evidence of wetland hydrology can include primary indicators, such as visible inundation or saturation, drift deposits, oxidized root channels, salt crusts; or secondary indicators such as the FAC-neutral test, the presence of a shallow aquitard, or frost-heave hummocks. The Arid West Regional Supplement contains 18 primary hydrology indicators and nine secondary hydrology indicators (USACE 2008). Only one primary indicator is required to meet the wetland hydrology criterion. If secondary indicators are used, at least two secondary indicators must be present to conclude that an area has wetland hydrology.

The presence or absence of the primary or secondary indicators described in the Arid West Regional Supplement was utilized to determine if sample points within the delineation survey area met the wetland hydrology criteria.

Hydric Soils

The NRCS (Vasilas et al. 2010) defines hydric soil as follows:

> **A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.**

Soils formed over long periods of time under wetland (anaerobic) conditions often possess characteristics that indicate they meet the definition of hydric soils. Hydric soils can have a hydrogen sulfide odor (i.e., rotten egg), low chroma matrix color (designated 0, 1, or 2), presence of redox concentrations, gleyed or depleted matrix, or high organic matter content.

Specific indicators that can be used to determine whether a soil is hydric for the purpose of wetland delineation are provided in the NRCS **Field Indicators of Hydric Soils in the United States** (Vasilas et al. 2010). The **Arid West Regional Supplement** provides a list of 19 hydric soil indicators that are known to occur in the Arid West Region (USACE 2008). Where possible, soil samples were collected and described according to the methodology provided in the **Arid West Regional Supplement**. Soil chroma and values were determined by utilizing a standard Munsell soil chart (Munsell 2009).

Hydric soils were determined to be present if any of the soil samples met one or more of the 19 hydric soil indicators described in the 2008 **Arid West Regional Supplement**.

3.1.3 Other Waters of the United States

Identification of the OHWM followed the USACE Regulatory Guidance Letter Number 05-05, OHWM Identification (USACE 2005). The extent of the OHWM was determined using a combination of aerial imagery and field assessment. OHWM data gathered in the field was identified by a break between upland and aquatic characteristics, as identified in the 2008 **Arid West Regional Supplement**. Topographic information from ArcGIS software Esri ArcMap 10.4.1 was used to extend the break throughout the entire feature.

Channel lengths approximated the centerline of main channel flow. Widths and depths were measured from cross-channel measurements conducted in the field, general field observations, and post-field calculations. Delineation of the OHWM of all washes was conducted using handheld sub-meter GPS, in combination with available aerial imagery, to provide an accurate representation of the OHWM at the time of survey. All OHWM data collected at sample points during the site visit were recorded on Arid West Ephemeral and Intermittent Streams OHWM Datasheets (**Appendix E**).

CHAPTER 4 EXISTING CONDITIONS

4.1 Landscape Setting

In October 2018, Eocene conducted an initial aquatic resource impact assessment within the survey area (defined in Chapter 1.1) to identify potential impacts to wetlands and other potentially jurisdictional WOTUS, pursuant to Section 404 of the CWA. Supplementary visits were also conducted on April 24, 2019, September 20, 2019, and October 24, 2021. The survey area for the proposed project is approximately 719.2 acres in size.

Field surveys occurred in October 2018, April and September 2019, and October 2021. October conditions followed a major rainfall event, with saturated soil and debris deposits observed. The timing reflects both post-monsoon and early fall conditions, providing insight into both dry and wet hydrologic states. Surveyors noted some artificial irrigation infrastructure and evidence of historical sheet flow and ponding.

The entire 719.2-acre survey area was field verified except for extremely steep or unstable sections where direct access posed safety risks. These areas (upper reaches of canyons) were observed visually from above. Borrow pits and pipeline alignments were also physically assessed. Unmapped or removed aquatic features were investigated and dismissed based on field conditions.

4.1.1 Topography

The topography of the region is characterized by steep slopes, cliff faces, and various rock formations, and is situated in a distinctive geological area surrounded by the Coral Pink Sand Dunes State Park to the south, Zion National Park to the west, Cedar Breaks National Monument to the northwest, the Grand Staircase-Escalante National Monument to the east, and Bryce Canyon National Park to the northeast. Most of the proposed project extends along the Sevier Fault; Triassic and Jurassic rock formations are exposed in the region across the anticline, including the Glen Canyon Group of Moenave Formation, Kayenta Formation, and Navajo Sandstone. There are also Cretaceous rock formations west of the Sevier Fault in the survey area, including the Wahweap and Straight Cliffs formations, Dakota Sandstone and Cedar Mountain Formation, and the Jurassic Carmel Formation. Elevations in the survey area range from 5,230 feet above sea level (asl) near Lamb pit to approximately 6,300 feet asl in the vicinity of the Esplin borrow pit.

4.1.2 Geological Features

The survey area is located within the Grand Staircase subdivision of the Colorado Plateau physiographic region of southwestern Utah, immediately south of the Basin and Range–Colorado Plateau Transition Zone (Woods et al. 2001). The Grand Staircase subdivision is characterized by a series of slopes, cliffs, and terraces that extend from the Grand Canyon in Arizona, culminating in the High Plateaus of southern Utah. This region is further characterized by many unique linear cliffs that are distinctly colored and display several different geologic ages. Major drainage systems in the survey area include the EFVR and Muddy Creek as well as numerous unnamed intermittent and ephemeral streams, springs, and dry washes.

4.1.3 Major Water Bodies

The general location of potential wetlands and potentially jurisdictional WOTUS was identified using NWI data provided by the USFWS (USFWS 2022). **Table 3** lists the feature types that intersect with the survey area as reported by the NWI. Features shown to intersect the survey area include 16 intermittent stream systems and one wetland approximately 60 feet from the survey area.

Table 3: National Wetland Inventory Feature Types Within and Near the Survey Area

NWI Wetland ID	NWI Feature Type	Feature Type NWI*	Mapped Area (Acres)
1	Riverine	R4SBA	3.97
2	Riverine	R4SBA	1.25
3	Riverine	R4SBA	2.31
4	Riverine	R4SBA	1.23
5	Riverine	R4SBC	5.13
6	Riverine	R4SBJ	30.08
7	Riverine (Perennial; EFVR)	R3UBG	5.12
8	Riverine	R5UBFx	0.91
9	Riverine	R5UBFx	0.16
10	Riverine	R4SBJx	0.64
11	Riverine	R4SBC	4.05
12	Riverine	R4SBC	1.98
13	Riverine	R4SBJ	5.76
14	Freshwater Emergent Wetland	PEM1Fx	0.42
15	Riverine	R4SBJ	1.83
16	Riverine	R4SBJ	0.93
17	Riverine	R4SBC	129.15

*Wetlands and Deepwater Habitats Classification (Cowardin et al. 1979). **System––**P: Palustrine; R: Riverine. **Subsystem––**3: Upper Perennial; 4: Intermittent **Class––**AB: Aquatic Bed; EM: Emergent; SB: Streambed; UB: Unconsolidated Bottom; **Subclass––**1: Persistent; **Modifiers––**C: Seasonally Flooded; F: Semi permanently Flooded; G: Intermittently Exposed; J: Intermittently Flooded; **Special Modifiers––**h: Diked/Impounded; x: Excavated

4.1.4 Surface Water Flow

The proposed project is located within the Upper Virgin River Watershed, with the EFVR intersecting the project limits. Within the project limits, the EFVR is considered perennial, and flowing water was observed during field reconnaissance. Water in the EFVR is derived from runoff via rainfall and snowmelt, and from groundwater entering via seeps and springs. The water from snowmelt makes up the largest percentage of streamflow and usually causes the highest monthly flows to occur in March through May while most low-flow periods occur from June through October (Glancy and Van Denburgh 1969). Water collected within or upstream of the Cove Reservoir and Glendale Pipeline components of the survey area eventually drains into the EFVR.

4.1.5 Community Types

Dominant ecological systems in the survey area include inter-mountain basins big sagebrush, Colorado plateau pinyon-juniper woodland, introduced upland vegetation-shrub, shrub land, inter-mountain basins greasewood flat, rocky mountain lower montane riparian woodland and shrub land, Mogollon chaparral, disturbed/successional–shrub regeneration, and pasture/hay (USGS 2018). Species observed within or adjacent to the survey area were characteristic of these ecosystems and included a mix of native and non-native trees, shrubs, forbs, and grasses.

4.1.6 Existing Vegetation

Vegetation found in the survey area consists of greasewood-salt scrub and transitions into sagebrush-perennial grassland habitat and, eventually, into pinyon-juniper woodland in the higher elevations. The proposed project includes the use of three existing borrow pits (Tait, Lamb, and Esplin). The Esplin pit consists of a mix of pinyon juniper woodland and sagebrush communities. The area of the proposed new pipeline is found in proximity to the EFVR, and portions of this section of the project cross though agricultural fields and along a riparian environment with tamarisk (tamarix sp.), Russian olive (Elaeagnus angustifolia), and cottonwood trees (Populus fremontii).

Dominant native vegetation observed within the survey area included two-needle pinyon pine (Pinus edulis), Utah juniper (Juniperus osteosperma), sagebrush (Artemesia tridentata), salt bush (Atriplex confertifolia), greasewood (Sarcobatus vermiculatus), narrowleaf willow (Salix exigua), cattail (Typhus latifolia), blue bunch wheatgrass (Pseudoroegneria spicata), western wheatgrass (Pascopyrum smithii), and bottlebrush squirreltail (Elymus elymoides).

4.1.7 Current Land Use

The survey area associated with the reservoir is primarily utilized for livestock grazing and recreation, including hiking and off-highway vehicle use. East and south of the survey area are

agricultural fields located on privately owned lands. Much of the survey area associated with the Glendale Pipeline replacement is located along an existing access road. North of this alignment are steep, forested hills, while south is mainly agricultural fields and private residences. Portions of the pipeline traverse through some of these agricultural fields.

4.1.9 Soils

USDA–NRCS soil surveys indicate 12 native soil types in the survey area (NRCS 2022). **Table 4** lists the soil types and whether they meet the NRCS hydric soils criteria. No soil types within the survey area are listed as an NRCS hydric soil type. NRCS custom resource reports, including a description and map for all soils contained within the survey area listed below, are in **Appendix B.**

Table 4: Native Soil Types in the Survey Area

Map Unit Name	Acres in Survey Area	Percent of Survey Area	NRCS Hydric Soil
Catdraw family-Orderville-Quezcan family complex, 15- to 35-percent slopes	0.2	0.1	No
Catdraw-Quezcan-Vessilla complex, 35- to 60-percent slopes	6.5	2.0	No
Elpedro-Plumasano-Teromote family-Flatnose complex, 0- to 8-percent slopes	1.7	0.5	No
Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2- to 8-percent slopes	27.0	8.3	No
Pinepoint-Waumac-Royosa complex, 0- to 4-percent slopes	6.8	2.1	No
Pinepoint-Paria-Parkwash complex, 2- to 8-percent slopes	18.0	5.5	No
Quezcan, deep-Sideshow-Orderville complex, 15- to 35-percent slopes	42.5	13.0	No
Sili-Sideshow-Gypsic Haplustepts complex, 2- to 15-percent slopes	169.0	51.8	No
Tonalea family-Barnac complex, 15- to 65-percent slopes	21.9	6.7	No
Welring-Arabrab-Rock outcrop complex, Carmel Formation, 4- to 35-percent slopes	0.2	0.1	No

Map Unit Name	Acres in Survey Area	Percent of Survey Area	NRCS Hydric Soil
Wetoe family-Flugle-Royosa family-Lava flows complex, 2- to 60-percent slopes	11.9	3.7	No
Zigzag family-Badland-Quezcan complex, 35- to 90-percent slopes	20.5	6.3	No

4.2 Aquatic Resources

4.2.1 Overview

Based on our desktop review and field surveys conducted between October 8, 2018, and October 10, 2018, on April 24, 2019, on September 20, 2019, and on October 24, 2021, it has been determined that that two wetlands, 17 stream or riverine features, and three ponds exist within the approximately 719.2-acre survey area, with 0.20 acre identified as wetlands (**Table 5**) 4.72 acres identified as streams or riverine, and 0.43 acre identified as seasonal ponds (**Table 6**)—totaling 5.35 acres surveyed. Wetland 1 (W1), Wetland 2 (W2), and Streams 1–6, 8–9, and 11 were sampled during the October 2018 visit. Ponds 1 and 3 were also evaluated during these initial visits. Pond 2, Streams 6, 7, 10, and portions of the EFVR were evaluated during the October 2021 visit. All potentially jurisdictional features identified were located within the survey areas associated with the Cove Reservoir, Glendale Pipeline, and the Mt. Carmel Improvement Area portions of the survey area.

Three borrow pits, Esplin (**Appendix A, Sheet 21**), Tait (**Appendix A**, **Sheet 20**), and Lamb (**Appendix A**, **Sheet 19**), were all investigated, and a portion of the EFVR enters the southwest corner of the Lamb pit but not within the disturbance area of the Project (**Appendix A, Sheet 19**). No aquatic features were identified at the Esplin or Tait pits. During our field review, it was also noted that prior anthropogenic disturbances had altered several streams that were identified by the NWI, and these streams no longer exist or no longer exhibit connectivity to other aquatic features downstream. These disturbances included roads, residential developments, and sediment ponds/cattle ponds. Sediment ponds discovered during field surveys were investigated for wetland characteristics; however, none exhibited the required vegetation, hydrology, or soils to be considered wetlands. Representative photos of all potential aquatic resources observed within the survey area are included in **Appendix C**.

Wetlands

W1 is a small, approximately 0.03-acre, artificial pond located approximately 200 feet south of the existing Cove Road, south of the proposed reservoir location (**Appendix A**, **Sheet 7**). Upon field review, W1 was observed to contain a monoculture of cattail (Typha latifolia), a wetland obligate species, and included other hydrophytic vegetation justifying the classification of a wetland (**Appendix C**, **Photo 10**). Investigations of hydrologic and soil conditions resulted in the positive identification of wetland indicators, confirming its status as a wetland, with inundation visible on aerial imagery and abundant redox depressions throughout the soil sample at the site

(**Appendix C**, **Photos 42 to 44**). Underground irrigation hoses were observed around the pond; it appears that it was artificially fed in the past. No outlet or connectivity to other aquatic features was observed, and this appears to be an artificially created isolated wetland feature. The boundaries of the wetland were well defined using the survey methods described in Chapter 3, and surrounding vegetation directly adjacent to W1 consisted of upland dominant species.

W2 is an approximately 0.73-acre, manmade pond located within the right-of-way (ROW) for the Glendale Pipeline portion of the survey area and is adjacent to privately owned agricultural pastures (**Appendix A**, **Sheet 16**). Approximately 0.17 acre of it intersects the survey area. Field review showed the wetland to contain primarily narrowleaf willow (Salix exigua), a facultative wetland species, with a mix of unknown grass species at the herbaceous stratum (**Appendix C**, **Photo 26**). Due to the time of year field surveys were conducted, species identification and thus wetland indicator statuses for these grasses were not attainable. However, because the willow was abundant and noticeably dominant throughout the pond at the sapling/shrub stratum, application of the Dominance Test (more than 50 percent of dominant plant species across all strata are rated OBL, FACW, or FAC) confirmed that hydrophytic vegetation was present. Investigations of the hydrologic and soil conditions also confirmed its status as a wetland, with surface soil cracks present throughout the pond basin and redox depressions throughout the soil sample (**Appendix C**, **Photos 45–46**). No inlet, outlet, or connectivity to other aquatic features was observed, and this appears to be an artificially created isolated wetland feature. Boundaries of the wetland were well defined using the survey methods described in Chapter 3, and surrounding vegetation directly adjacent to W2 consisted of upland dominant species.

Table 5: Delineated Wetland Features

ID	Latitude	Longitude	Wetland Type	Wetland Type NWI*	Acres
W1	37.269568	-112.65711	Isolated Wetland	PABFh	0.03
W2	37.303818	-112.614124	Isolated Wetland	PABFh/PEM1Fh	0.17

*Wetlands and Deepwater Habitats Classification **System––**P: Palustrine; **Class––**AB: Aquatic Bed; EM: Emergent; **Modifiers––**F: Semi permanently Flooded; **Special Modifiers––**h: Diked/Impounded (Cowardin et al. 1979).

Streams or Riverines

Stream 1 is a large ephemeral drainage that bisects the survey area in a southeasterly direction crossing through where the proposed reservoir would be constructed (**Appendix A**, **Sheets 1, 2, 6, and 7**). Sediment and flow carried within this drainage are collected from terrain northwest of the survey area and eventually lead south and out of the survey area, debouching into the EFVR. The northeast portion of Stream 1 within the survey area is situated at the bottom of an approximately 25–30-foot-deep canyon. Here the OHWM was well defined, with large debris and deposition evident of significant flow from the heavy precipitation experienced in the area

days prior to survey. The channel was relatively clear, with some vegetation and sediment consisting of a mix of boulders and clay (**Appendix C**, **Photos 1–7, 11, and 14**). Further downstream, the width of the OHWM and channel characteristics remain the same, and the terrain opens into a large valley. No flowing water was observed although there were numerous areas of pooling and the active floodplain was deeply saturated, making walking the stream difficult to impossible. Stream 1A is a smaller intermittent stream tributary to Stream 1, which carries precipitation and snowmelts directly adjacent and north of the proposed reservoir and access road location (**Appendix A**, **Sheet 6**). This stream has a well-defined channel and deposition at the OHWM (**Appendix C**, **Photos 13 and 14**). No flowing water was observed within this stream at the time of field surveys.

Within the survey area, Stream 1 and Stream 1A encompass approximately 2.71 acres, and their average widths are 12 feet and 3.5 feet respectively.

Stream 2 is an ephemeral drainage that bisects the reservoir portion of the survey area in a southerly direction along the eastern boundary of where the proposed reservoir would be located (**Appendix A**, **Sheets 3 and 7**). Sediment and flow carried within this drainage are collected from terrain northeast of the survey area, leading to the confluence with Stream 1 and eventually to the EFVR downstream (**Appendix C**, **Photo 6**). The upper reaches of Stream 2 are characterized by 50–60-foot-deep slot canyon walls and a narrow channel with some upland vegetation observed growing in the active floodplain and along canyon walls (**Appendix C**, **Photo 18**). Channels were not walked on foot in this area during field surveys because of safety concerns due to the unstable cliff walls; however, the conditions of the channel could be easily viewed from above the edge of the canyon. Downstream, Stream 2 opens up into an open valley landscape where widths of the active floodplain are similar to its upstream segment, but there is more terracing, banks are less steep, and more significant vegetation is present within the channel and floodplain (**Appendix C**, **Photos 19–20**). Stream 2A (**Appendix C**, **Photos 16 and 17**) is a tributary ephemeral drainage that feeds into the upper reach of Stream 2 within the survey area upstream where the proposed reservoir would occur (**Appendix A**, **Sheet 3**). This tributary is formed by sheet flow and runoff north of the survey area that is diverted into a set of two non-functional sediment ponds (**Appendix C**, **Photo 15**) that then spill into an approximately 50-foot canyon and confluence with Stream 2. Saturation was evident throughout Stream 2 and Stream 2A, though no flowing water was observed.

Within the survey area, Stream 2 and Stream 2A encompass approximately 1.37 acres, and their average widths are 17 feet and 24 feet respectively.

Stream 3 and Stream 3A (Stream 3A is tributary to Stream 3) comprise an ephemeral stream system located at the southwest boundary of where the proposed reservoir boundaries are located and run in a generally easterly direction (**Appendix A**, **Sheet 6**). Sediment and flow carried within this small drainage are collected from upland terrain west of the survey area, but the stream does not maintain definition or connectivity downstream. Upstream, Stream 3 and Stream 3A exhibited a clear channel, banks, and a well-defined OHWM (**Appendix C**, **Photos 21 and 23**). Below the confluence of Stream 3 and Stream 3A, this ephemeral stream reaches an existing dirt road downhill where the OHWM is delineated, and all definitions of a channel and OHWM disappear (**Appendix C**, **Photo 22**). Prior to creation of the road, Stream 3 may have had surficial connectivity with Stream 1. Currently flow and sediment carried in the upper reaches of Stream 3 dissipate into sheet flow roughly following the alignment of the road and likely only

reach Stream 1 during heavy or extended precipitation or snowmelt events. No flowing water was observed during field surveys.

Within the survey area, Stream 3 and Stream 3A encompass approximately 0.06 acre, and their average widths are 3 feet and 2 feet respectively.

Stream 4 is an intermittent stream located west of W2 that runs in a southerly direction and bisects the ROW for the Glendale Pipeline portion of the survey area (**Appendix A**, **Sheet 16**). Flow and sediment carried within this stream are collected from mountains directly north of the survey area. The stream had flowing water in its approximately 3-foot-wide channel during the time of surveys and showed evidence of recent heavier flow indicated by downed vegetation and large debris deposition at the OHWM (**Appendix C**, **Photos 27 and 28**). Vegetation surrounding Stream 4 was a mix of upland and riparian species, including cottonwood (Populus spp.), two-needle pinyon pine (Pinus edulis), Utah juniper (Juniperus osteosperma), and oak (Quercus sp.). Stream 4 was one of only two streams that had flowing water in the survey area despite the occurrence of heavy rain a few days prior to field surveys. Flow is likely maintained within this stream much of the year, at least seasonally, and because of its proximity and connectivity to the EFVR, located approximately 0.2 mile south, Stream 4 likely has jurisdictional status as a WOTUS.

Within the survey area, Stream 4 encompasses approximately 0.004 acre, and the average width is 11 feet.

Stream 5 is an intermittent stream located west of W2 and Stream 4 and runs in a southerly direction bisecting the ROW for the Glendale Pipeline portion of the survey area (**Appendix A**, **Sheet 16**). Flow and sediment carried within this stream are collected from mountains directly north of the survey area. Like Stream 4, Stream 5 had flowing water in its channel during the time of surveys and showed evidence of recent flood events as indicated by downed, matted vegetation and debris deposition at the OHWM (**Appendix C**, **Photos 29 and 30**). Vegetation was observed within the channel of the intermittent stream, which consisted of smaller herbaceous species and grasses. Vegetation surrounding the stream consisted of a mix of upland and riparian species including oak, cottonwood, and cattail. Flow is likely maintained within this stream much of the year, though likely less than Stream 4 as the channel contained vegetation and was significantly smaller. Because of observation in the field of flowing water, a clear OHWM, and the connectivity to the EFVR approximately 0.2 mile south, Stream 5 likely has jurisdictional status as a WOTUS.

Within the survey area, Stream 5 encompasses approximately 0.012 acre, and the average width is 5 feet.

Stream 6 is a perennial stream located east of US-89 within the Mt. Carmel Irrigation Improvement Area of the survey area (**Appendix A**, **Sheets 9–10**), and flowing water was present. It appears to follow the natural alignment of Stream 1 to the north but in this area has been heavily affected by anthropogenic influences as it appears to have been dug out and bermed to aid in irrigating the adjacent agricultural lands. Stream 6 flows southeast and drains into the EFVR just outside of the survey area. Flowing water was present within the OHWM during the field survey. The substrate for Stream 6 was mud and organic matter and was surrounded by riparian vegetation and grass (**Appendix C**, **Photos 34–35**).

Within the survey area, Stream 6 encompasses approximately 0.059 acre, and the average width is 7.75 feet.

Stream 7 is a perennial stream located east of US-89 within the Mt. Carmel Improvement Area of the survey area (**Appendix A**, **Sheet 13**), and flowing water was present. It enters the survey area via a pipe culvert and appears to follow the natural alignment of an ephemeral wash northwest of US-89, which is fed by active irrigation. Within the survey area, Stream 7 has been heavily affected by anthropogenic influences as it appears to have been dug out and bermed to aid in irrigating the adjacent agricultural lands. Stream 7 flows southeast and drains into the EFVR. The substrate for Stream 7 was fine mud to cobbles and organic matter and was surrounded by riparian vegetation and grasses (**Appendix C**, **Photo 36**).

Within the survey area, Stream 7 encompasses approximately 0.011 acre, and the average width is 7.5 feet.

Stream 8 is a perennial stream located in the eastern portion of the Mt. Carmel Improvement Area of the survey area (**Appendix A**, **Sheet 9**), and flowing water was present. It appears to convey runoff from active irrigation and the adjacent mountains and unpaved roads. Stream 8 exits the survey area via a pipe culvert and loses definition after exiting the culvert; however, flows from Stream 8 do continue into the EFVR. The substrate for Stream 8 was sand to cobbles and was surrounded by upland vegetation and cottonwoods (**Appendix C**, **Photo 37**).

Within the survey area, Stream 8 encompasses approximately 0.004 acre, and the average width is 3.75 feet.

Stream 9 is a perennial stream located west of US-89 within the Mt. Carmel Irrigation Improvement Area of the survey area (**Appendix A**, **Sheet 12**), and flowing water was present. It appears to convey runoff from active irrigation and the adjacent mountains to the north. The substrate for Stream 9 is sand to cobble and is surrounded by upland vegetation. Stream 9 flows southeast and exits the survey area via a pipe culvert. Flows from Stream 9 cease just north of US-89 and turn into sheet flow at the highway (**Appendix C**, **Photo 38**).

Within the survey area, Stream 9 encompasses approximately 0.004 acre, and the average width is 4 feet.

Stream 10 is a perennial stream located in the eastern portion of Mt. Carmel Irrigation Improvement Area of the survey area (**Appendix A**, **Sheet 13**). It appears to convey runoff from the plateau to the east. The substrate for Stream 10 is fine sand to cobble and is surrounded by upland vegetation. The channel was wet with areas of flowing water at the time of the surveys. A metal pipe carries the irrigation canal waters above Stream 10 and back into the irrigation canal across the stream. Stream 10 flows west and drains into the EFVR (**Appendix C**, **Photo 39**).

Within the survey area, Stream 10 encompasses approximately 0.019 acre, and the average width is 10.35 feet.

Stream 11 is an intermittent stream located west of US-89 and north of Cove Road and Pond 1 within the survey area (**Appendix A, Sheet 4 and 8**). NWI classifies this feature as a riverine (R4SBC). Multiple erosional features converge within proximity of Stream 11 forming sheet flow which leads to the naturally occurring OHWM downstream towards Cove Road. The average

sediment texture within the low-flow channel is fine silt, and vegetation within the channel is absent. Mud cracks, ripples, and drift/debris were observed within the channel. The banks of the channel include early to mid-herbaceous vegetation along steep walled banks. Stream 11 loses OHWM definition downstream as it fans out amongst the surrounding landscape. Below this point of obscurity, a retention pond exists downstream of Stream 11.

Within the survey area, Stream 11 encompasses approximately 0.176 acre, and the average width is 15.36 feet.

The EFVR is classified by the NWI as an upper perennial riverine feature and is formed from precipitation and snowmelt collected from mountains and valleys north of Glendale. Within the survey area, riparian vegetation was abundant, including mixed stands of cottonwood, tamarisk, Russian olive, and willow. The EFVR crosses the survey area three times (**Appendix A, Sheets 10, 13, 19)**.

The north section of the EFVR (EFVR North) then crosses the survey area between Orderville and Mt. Carmel, approximately 1,500 feet southeast of US-89 (**Appendix A**, **Sheet 10**). The proposed Mt. Carmel pipeline may impact this section of the EFVR. Just after the river enters the survey area, there is a concrete dam restricting flows. Additionally, debris has accumulated below the dam and includes garbage and natural materials. Here the river is approximately 13 feet wide and encompasses 0.117 acre (**Appendix C**, **Photo 40**).

Another section of the EFVR (EFVR South) within the survey area occurs at the Pinyon Pine Drive bridge, approximately 850 feet southeast of US-89 (**Appendix A**, **Sheet 13**). Here the river is approximately 10 feet wide and encompasses 0.023 acre (**Appendix C**, **Photo 41**). The proposed Mt. Carmel pipeline may impact this section of the EFVR.

The final crossing of the EFVR (EFVR Lambs) within the survey area occurs within the Lamb pit (Appendix A, Sheet 19). Disturbance is not expected to occur within the section of the Lamb pit, and therefore, no impacts to the EFVR are anticipated.

Irrigation Canals

The Mt Carmel Irrigation Ditch is an existing open ditch conveyance system that parallels portions of Stream 6, Stream 7, Stream 8, Stream 9, and Stream 10, running along the lower slopes near the EFVR. The ditch functions as a man-made water delivery channel, likely used to divert and distribute surface water for agricultural or local land-use needs. Its alignment generally follows the natural topography, staying close to existing streams and water pipelines, and it passes through areas identified for proposed grading, access routes, and pipeline installations. Within the survey area, the Mt. Carmel Irrigation Ditch encompasses approximately 3.376 acres

Ponds

Pond 1 is an ephemeral feature intersected by a NWI identified riverine (R4SBC) (**Appendix A, Sheet 8**). Pond 1 is not identified as an aquatic feature by the NWI or NHD. The pond is located north of Cove Road approximately .05 mile and approximately 0.2 mile northwest of US-89. Based on aerial imagery, the pond appears to retain water periodically, likely during heavy flooding events and collects water via agricultural runoff and the steep mountains surrounding the feature. No vegetation exists within the pond. Upland vegetation borders the pond and

remains consistent with the surrounding landscape. Due to the lack of hydrophytic vegetation and other wetland indicators, an in-depth evaluation of the pond was not conducted during the field assessment.

Within the survey area, Pond 1 encompasses approximately 0.18 acre.

Pond 2 is identified by the NWI as a Freshwater Pond (PUBFx). This feature abuts Muddy Canyon Road, approximately 0.4 mile northwest of US-89, and has been constructed along the east border of an existing agricultural field. This feature appears to be manmade and is utilized as a detention basin. Based on aerial imagery, vegetation does not appear to exist within or near the pond. Upland vegetation exists to the east of the pond across Muddy Canyon Road and to the west of the agricultural field. Due to the lack of hydrophytic vegetation and other wetland indicators, an in-depth evaluation of the pond was not conducted during the field assessment.

Within the survey area, Pond 2 encompasses approximately 0.12 acre.

Pond 3 is identified by the NWI as a Freshwater Pond (PABFh). This feature lies east of Tait Lane and an existing agricultural field with a NWI identified riverine (R5UBFx) flowing between Pond 3 and the field. Based on NWI data, there is no surface connectivity between the riverine and Pond 3. Based on aerial imagery, Pond 3 likely collects stormwater runoff from the surrounding mountains and acts as a detention basin for the nearby agricultural fields. Due to the lack of hydrophytic vegetation and other wetland indicators, an in-depth evaluation of the pond was not conducted during the field assessment. Within the survey area, Pond 3 encompasses approximately 0.12 acre.

Table 6: Potentially Jurisdictional Aquatic Features Within the Survey Area

Feature Name	Wetland Type	Latitude	Longitude	Distinct Banks/ Channelization	Connection to Water Body	Average Width (Feet)	Length (Feet)	Potential Disturbance (Acres)
EFVR North	Perennial	37.266034	-112.64719	Yes	Yes	13	498	0.117
EFVR South	Perennial	37.257743	-112.65519	Yes	Yes	13	111	0.023
EFVR Lambs	Perennial	37.228235	-112.67547	Yes	Yes	13	520	0
Stream 1	Ephemeral	37.274125	-112.66397	Yes	Yes	12	5,712	1.972
Stream 1A	Intermittent	37.274738	-112.6632	Yes	Yes	3.5	305	0.021
Stream 2	Ephemeral	37.275276	-112.65728	Yes	No	17	2,989	1.010
Stream 2A	Ephemeral	37.278002	-112.65601	Yes	No	24	29	0.029
Stream 3	Ephemeral	37.272271	-112.66806	Yes	No	3	597	0.043
Stream 3A	Ephemeral	37.271862	-112.66882	Yes	Yes	2	33	0.002

Feature Name	Wetland Type	Latitude	Longitude	Distinct Banks/ Channelization	Connection to Water Body	Average Width (Feet)	Length (Feet)	Potential Disturbance (Acres)
Stream 4	Intermittent	37.303455	-112.61455	Yes	Yes	11	32	0.004
Stream 5	Intermittent	37.301543	-112.616465	Yes	Yes	5	39	0.012
Stream 6	Perennial	37.262565	-112.651434	Yes	Yes	7.75	738	0.059
Stream 7	Perennial	37.257852	-112.658135	Yes	Yes	7.5	105	0.011
Stream 8	Perennial	37.258596	-112.65212	Yes	Yes	3.75	52	0.004
Stream 9	Perennial	37.256111	-112.659587	Yes	No	4	45	0.004
Stream 10	Perennial	37.254452	-112.653813	Yes	Yes	10.35	110	0.019
Stream 11	Intermittent	37.274707	-112.653335	Yes	No	15.36	536	0.176
Mt. Carmel Irrigation Ditch	Intermittent	37.259118	-112.65626	Yes	Yes	5	29,415	3.376

Feature Name	Wetland Type	Latitude	Longitude	Distinct Banks/ Channelization	Connection to Water Body	Average Width (Feet)	Length (Feet)	Potential Disturbance (Acres)
Pond 1	Ephemeral	37.27245	-112.6531	Yes	No	78	88	0.187
Pond 2	Freshwater Pond	37.24767	-112.6732	Yes	No	65	140	0.12
Pond 3	Freshwater Pond	37.25132	-112.655	Yes	No	241	152	0.12

4.2.2 Impacts

The proposed project is expected to temporarily impact 0.253 acre and permanently impact 0.021 acre of potentially jurisdictional intermittent and perennial streams, including the EFVR, and 3.056 acres or 9,360 linear feet of non-jurisdictional ephemeral streams. Additionally, the proposed project is expected to impact the existing Mt. Carmel Irrigation Ditch, W2, and ponds 1 through 3. However, after coordination with the USACE project lead at the time, Hollis Jencks, following initial review of October 2018 survey results, it was determined that all four of these features are isolated features and would not be considered jurisdictional or be included in the overall impact calculation for the proposed project.

Therefore, the total possible temporary and permanent impacts to potentially jurisdictional WOTUS delineated within the survey area may be approximately 0.274 acre. Impacts to each potential WOTUS are summarized in **Table 7**.

Although the designs of the Cove Reservoir alternative have not been finalized, most project features are not expected to deviate significantly from their currently proposed locations. Permanent impacts would occur to potentially jurisdictional WOTUS where the reservoir, dam, access road, spillways, recreational features (designs yet to be determined), and pipelines would be constructed. All WOTUS within the boundaries of the proposed reservoir would be disturbed during construction and would be permanently inundated once the dam is complete and the reservoir is filled. Access road construction would also necessitate cut-and-fill slope in steeper terrain resulting in permanent impacts outside of the 16-foot travel surface. Impacts to intermittent streams during construction of the access road would also occur should bridges or culverts be constructed or fill be installed at stream crossings.

All impacts associated with the Glendale Pipeline portion of the survey area during pipeline replacement, including impacts to W2, would be temporary. Temporary impacts to WOTUS will occur during construction of the reservoir portion of the proposed project and include disturbance within temporary ROWs for the construction of the spillways and access road. Staging of material and equipment during construction is anticipated to take place within the reservoir basin and would not require additional temporary disturbance. No impacts within the OHWM of the EFVR are anticipated as part of the Glendale Pipeline portion of the survey area.

All impacts associated with the Mt. Carmel Irrigation Improvement Area portion of the survey area during pipeline replacement would be temporary. The impacts would occur during pipeline installation. The EFVR may be impacted by the construction of the new water pipeline, but that has yet to be determined as the proposed pipeline may be constructed outside of the OHWM in addition to being hung on the bridge to avoid impacts to the EFVR.

Development of the one borrow pit, Esplin, would result in a total new surface disturbance of approximately 13.72 acres; however, no WOTUS are found within the boundaries of the pit, and none would be impacted by the use or development of the three collective borrow pits. Temporarily disturbed areas would be returned to pre-construction conditions following construction activities. Best management practices (BMPs) would be employed to minimize long-term surface disturbance.

Table 7: Impacts to Potentially Jurisdictional Wetlands and Other Waters of the United States

ID	Acres within Survey Area	Temporary Impacts (Acres)	Permanent Impacts (Acres)
EFVR—North	0.117	0.117	0.000
EFVR—South	0.023	0.023	0.000
EFVR-Lambs	0.155	0.000	0.000
Stream 1*	2.685	0.000	0.000
Stream 1A	0.021	0.000	0.021
Stream 2*	1.218	0.000	0.000
Stream 2A*	0.150	0.000	0.000
Stream 3*	0.055	0.000	0.000
Stream 3A*	0.004	0.000	0.000
Stream 4	0.004	0.004	0.000
Stream 5	0.012	0.012	0.000
Stream 6	0.059	0.059	0.000
Stream 7	0.011	0.011	0.000
Stream 8	0.004	0.004	0.000
Stream 9	0.004	0.004	0.000

ID	Acres within Survey Area	Temporary Impacts (Acres)	Permanent Impacts (Acres)
Stream 10	0.019	0.019	0.000
Stream 11	0.176	0.000	0.00
W1*	0.033	0.000	0.000
W2*	0.170	0.000	0.000
Mt. Carmel Irrigation Ditch*	3.376	0.000	0.000
Pond 1*	0.187	0.000	0.000
Pond 2*	0.122	0.000	0.000
Pond 3*	0.122	0.000	0.000
TOTAL POTENTIAL IMPACTS		0.253	0.021

*Streams 1, 2, 2A, 3, and 3A are ephemeral and not jurisdictional under the Revised Definition of WOTUS as of March 12, 2025; Wetlands 1, 2, and the Mt. Carmel Irrigation Ditch are isolated, manmade features. Ponds 1, 2, and 3, are seasonal, ephemeral features. Prior communications with USACE have indicated these are not considered jurisdictional features and thus are not used in calculating the sum of anticipated impacts to WOTUS.

CHAPTER 5 CONCLUSION

Based on our desktop review and field reconnaissance, it has been determined that a total of two wetlands, 12 potentially jurisdictional intermittent and perennial streams, five non-jurisdictional ephemeral streams, and three non-jurisdictional ponds occur within the 719.2-acre survey area. Per USACE guidance, both wetlands are considered isolated wetlands and are not considered jurisdictional. It is anticipated that total temporary disturbance would be limited to approximately 0.253 acres and the total permanent disturbance would be limited to approximately 0.021 acres within the OHWM of potentially jurisdictional streams. Although plans for project activities have not yet been finalized, all disturbances would be contained within the survey area analyzed in this report. To limit impacts outside of the proposed project footprint, all aquatic features, both within and near the survey area, would be further protected through the implementation of BMPs to limit erosion and prevent increased sedimentation.

CHAPTER 6 REFERENCES

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79-31. USDI Fish and Wildlife Service, Washington, DC. 103 pp.

Glancy, P.A., and A.S. Van Denburgh. 1969. Water-resources appraisal of the Lower Virgin River Valley Area, Nevada, Arizona, and Utah. U.S. Department of Interior, Geological Survey, and State of Nevada Division of Water Resources.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. **The National Wetland Plant List**; 2016 wetland ratings. Phytoneron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

Lichvar, Robert W. and Shawn M. McColley. 2008. **A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States**. United States Army Engineer Research and Development Center. Vicksburg, Mississippi.

Munsell Color X-Rite (Munsell). 2009. Munsell Soil Color Charts. Grand Rapids, Michigan.

Natural Resources Conservation Service (NRCS). 2022. Custom Soil Resource Report for Kane County Area, Utah.

United States Army Corps of Engineers (USACE). 1987. **Corps of Engineers Wetlands Delineation Manual**. Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi.

_____. 2005. Regulatory Guidance Letter No. 05-05. Ordinary High-Water Mark Identification.

_____. 2007. **U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook**. May 30, 2007. URL: http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/jd_guidebook_051207final.pdf.

_____. 2008. **Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region** (Version 2.0). United States Army Engineer Research and Development Center. Vicksburg, Mississippi.

United States Fish and Wildlife Service (USFWS). 2022. National Wetlands Inventory (NWI), Wetlands Mapper. URL: http://fws.gov/wetlands/Data/Mapper.html.

United States Geological Service (USGS). 2018. Gap Analysis Program (GAP) Land Cover Data Viewer, Version 2. URL: http://gis1.usgs.gov/csas/gap/viewer/land_cover/Map.aspx.

Vasilas, L.M., G.W. Hurt, and C.V. Noble (eds.). 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils. <http://soils.usda.gov/use/hydric/ or ftp://ftp-c.sc.egov.usda.gov/NSSC/Hydric_Soils/FieldIndicators_v7.pdf>.

Weather Underground. 2018. Accessed September 6, 2018. URL: https://www.wunderground.com/

Woods, A.J., Lammers, D.A., Bryce, S.A., Omernik, J.M., Denton, R.L., Domeier, M., and Comstock, J.A., 2001, Ecoregions of Utah (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,175,000).

APPENDIX A

Aquatic Resource Delineation Maps

Sheet 18

Sheet 16

Sheet 17

Sheet 21

Sheet 9

Sheet 10

Sheet 12

Sheet 13

Sheet 11

Sheet 15

Sheet 20

Sheet 14

Sheet 19

Cove Reservoir Project

Drawn By: J. Pfadt
Date: 7/11/2022

Aquatic Resources Detail Map Index

No.		Date	By	Appr.
1	Updates for 2025	3/28/25	MG	

N

0 1 2
Miles

Eocene™ Environmental Group

E-423

Legend

- Study Area (719.8 ac)
- Primary Spillway
- Auxiliary Spillway
- Dam Structure
- Proposed Cove Reservoir
- Proposed Access Road Grading Limits
- Instrumentation Buffer

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation							
Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 1 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-424

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

Stream 1

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 2 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

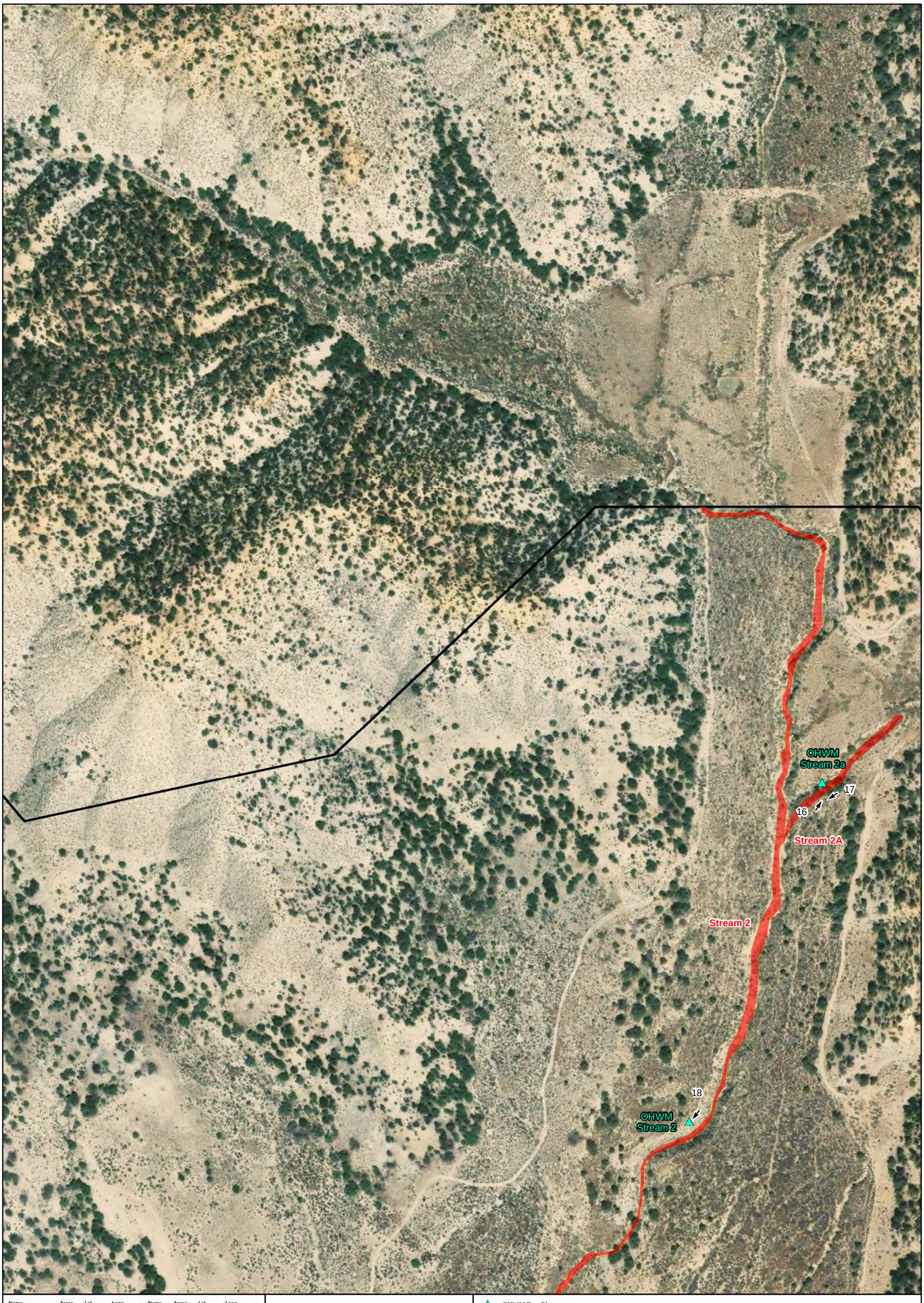
0 200 400
Feet

N

Eocene Environmental Group

OHWM

Study Area (719.2 ac)



Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257652	-112.65614
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 3 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-426

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

15

Stream 11

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation							
Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 4 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

Photo Location/Direction

OHWM

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.226235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 5 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-428

OHWM

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 6 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation							
Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 7 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

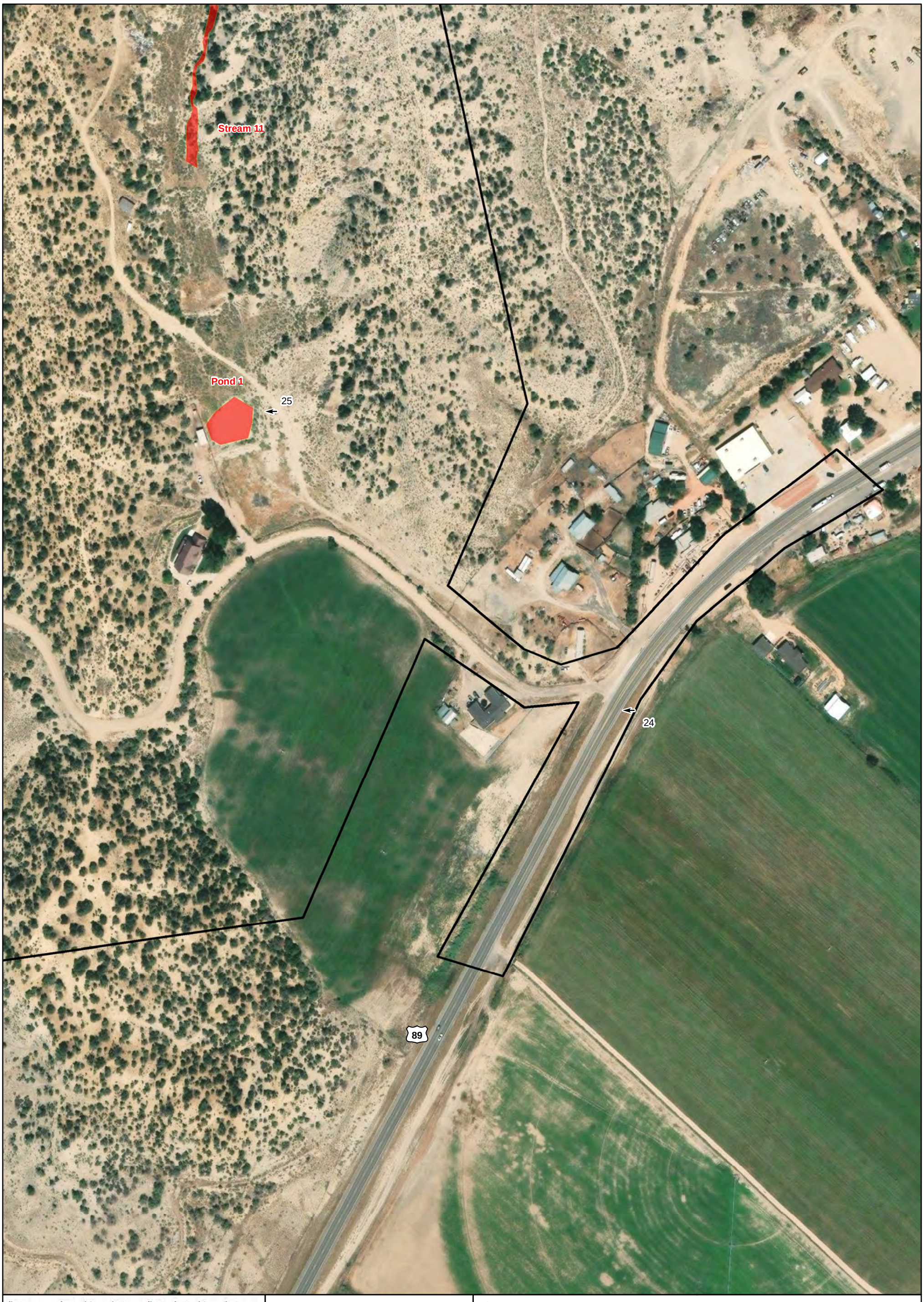
0 200 400
Feet

N

Eocene Environmental Group

E-430

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Soil Pit
- Wetland
- Study Area (719.2 ac)



Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation							
Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 8 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-431

Photo Location/Direction

OHWM

Study Area (719.2 ac)

89

34

Stream 6

Mt. Carmel
Irrigation Ditch

37

OHWM
Stream 8

Stream 8

East Fork Virgin River

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 9 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-432

OHWM Data Plot

Photo Location/Direction

OHWM

Study Area (719.2 ac)

East Fork
of the Virgin River

40

Mt. Carmel
Irrigation Ditch

East Fork Virgin River

OHWM
Stream 6

Stream 6

35

Mt. Carmel
Irrigation Ditch

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 10 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

Pond 2

Mt. Carmel Irrigation Ditch

89

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 11 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058062	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 12 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 13 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-436

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 14 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 15 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-438

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 16 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-439

- OHWM Data Plot
- Photo Location/Direction
- OHWM
- Soil Pit
- Wetland
- Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 17 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-440

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058062	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 18 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

E-441

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.258596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 19 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

Photo Location/Direction

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058862	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65614
East Fork VR South - Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 20 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

N

Eocene Environmental Group

Photo Location/Direction

Study Area (719.2 ac)

Name	Acres	Lat	Long	Name	Acres	Lat	Long
East Fork VR North	0.116664	37.266034	-112.64719	Stream 6	0.058062	37.262565	-112.65143
East Fork VR South	0.022582	37.257743	-112.65519	Stream 7	0.01113	37.257852	-112.65814
East Fork VR South -							
Lamb's Borrow Pit	0.155236	37.228235	-112.67547	Stream 8	0.004199	37.256596	-112.65212
Stream 1	2.685577	37.274125	-112.66397	Stream 9	0.004086	37.256111	-112.65959
Stream 1A	0.021114	37.274738	-112.6632	Stream 10	0.019387	37.254452	-112.63581
Stream 2	1.217954	37.275276	-112.65728	Stream 11	0.176282	37.274707	-112.653335
Stream 2A	0.150142	37.276002	-112.65601	Wetland 1	0.032989	37.269568	-112.65711
Stream 3	0.054881	37.272271	-112.66806	Wetland 2	0.169996	37.393818	-112.61412
Stream 3A	0.004436	37.271862	-112.66882	Pond 1	0.187236	37.272445	-112.653074
Stream 4	0.003977	37.303455	-112.61455	Pond 2	0.121872	37.247673	-112.673194
Stream 5	0.012195	37.301543	-112.61647	Pond 3	0.121969	37.25132	-112.654995
Mt. Carmel Irrigation							
Ditch	3.37638	37.259118	-112.65626				

No.		Date	By	Appr.
1	Updates for 2025	3/28/2025	MG	
2	Updates to show additional features	12/3/2025	KM	
3	Updates to show Existing Irrigation Ditch	2/18/2026	KM	

Aquatic Resources Detail Map (Sheet 21 of 21)

Cove - East Fork Virgin River
Watershed Plan - EIS Project
Drawn By: C Melisi
Date: 7/21/2022

0 200 400
Feet

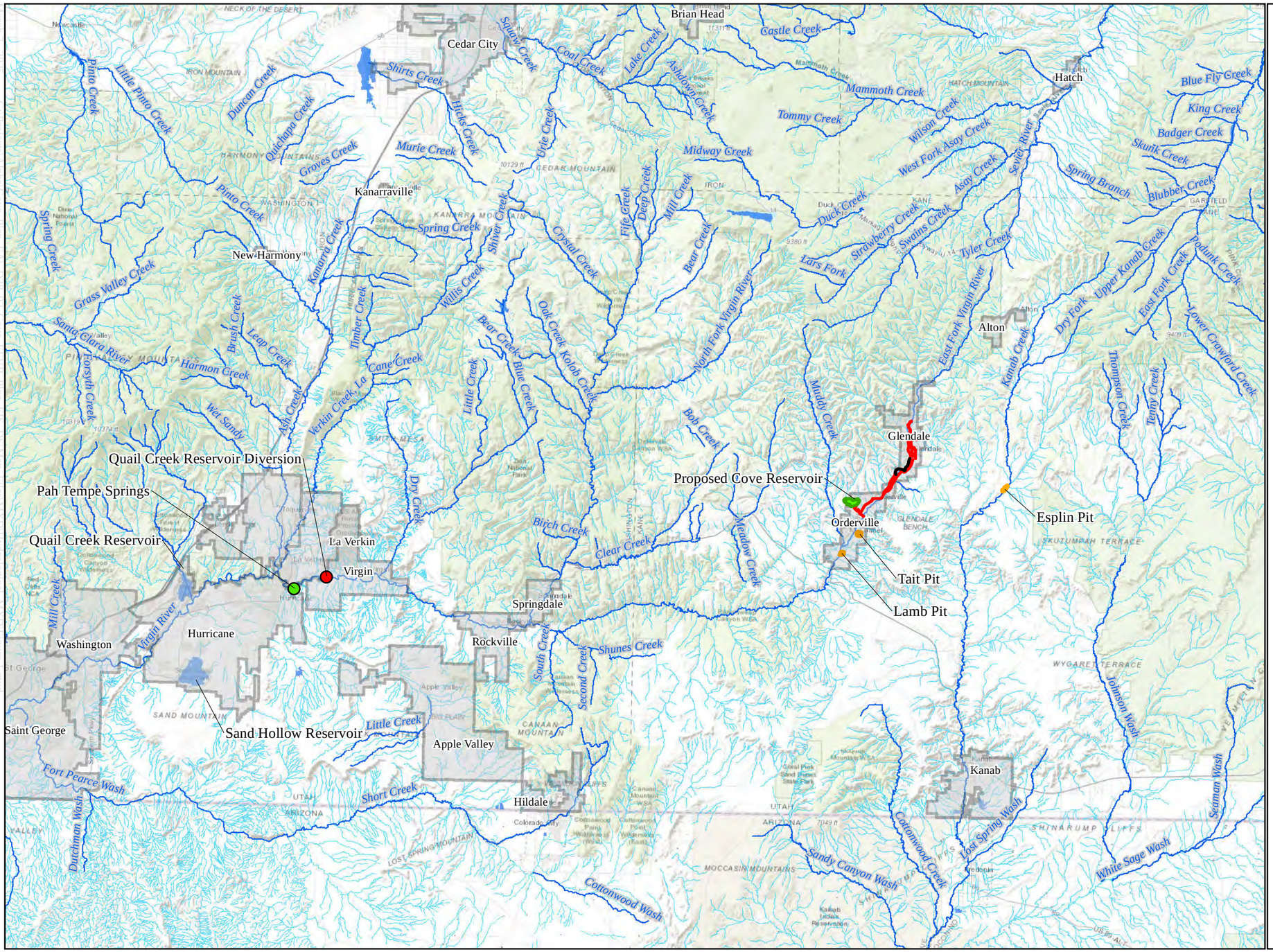
N

Eocene Environmental Group

Study Area (719.2 ac)

APPENDIX B

Supporting Maps



Proposed Cove Reservoir Vicinity Map

Cove - East Fork Virgin River Watershed Plan - EIS Project

Legend

- Proposed Cove Reservoir
- Quail Creek Reservoir Diversion
- Pah Tempe Springs
- Proposed Glendale Pipeline
- Existing Pipeline
- Borrow Pits
- Municipal Boundary
- NHD
- NWI - Lake
- NWI - Riverine

Proposed Cove Reservoir Topographic Map

Cove - East Fork Virgin River Watershed Plan - EIS Project

Legend

- Study Area
- NHD
- NWI - Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- NWI - Freshwater Pond
- NWI - Riverine

Cove Reservoir

Supplemental Survey Area

Mt. Carmel Irrigation Improvements

Tait Pit

Lamb's Pit

Esplin Pit

Glendale

Orderville

Mt Carmel

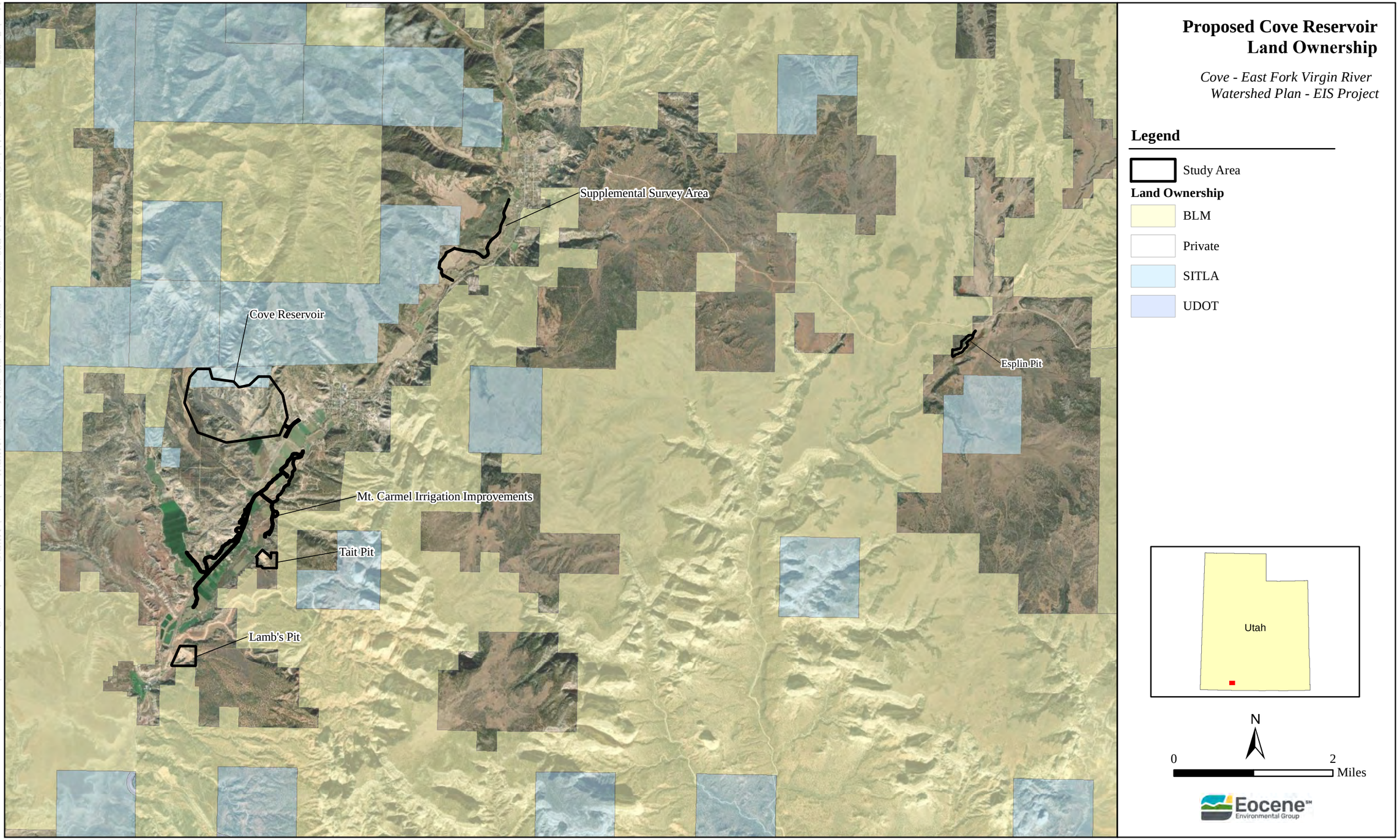
Mt. Carmel Junction

Utah

N

0 2 Miles

Eocene Environmental Group



Proposed Cove Reservoir Land Ownership

Cove - East Fork Virgin River Watershed Plan - EIS Project

Legend

Study Area

Land Ownership

BLM

Private

SITLA

UDOT

March 7, 2025 G:\Projects\Alpha\Cove_Plan_EA_D38_02_Cove_EFVR_Plan_EIS_DS\Map_Files\MXD\Hydrological_MXD\Cove_Aquatic_Overview.mxd

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Kane County Area, Utah

March 24, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Kane County Area, Utah.....14
12—Catdraw family-Orderville-Quezcan family complex, 15 to 35 percent slopes.....14
13—Catdraw-Quezcan-Vessilla complex, 35 to 60 percent slopes.....16
28—Elpedro-Plumasano-Teromote family-Flatnose complex, 0 to 8 percent slopes.....19
55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes.....22
68—Pinepoint-Waumac-Royosa complex, 0 to 4 percent slopes.....25
69—Pinepoint-Paria-Parkwash complex, 2 to 8 percent slopes.....27
72—Quezcan, deep-Sideshow-Orderville complex, 15 to 35 percent slopes.....30
94—Sili-Sideshow-Gypsic Haplustepts complex, 2 to 15 percent slopes...32
98—Tonalea family-Bamac complex, 15 to 65 percent slopes.....35
104—Welring-Arabrab-Rock outcrop complex, Carmel Formation, 4 to 35 percent slopes.....37
105—Wetoe family-Flugle-Royosa family-Lava flows complex, 2 to 60 percent slopes.....39
110—Zigzag family-Badland-Quezcan complex, 35 to 90 percent slopes..41
References.....44

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

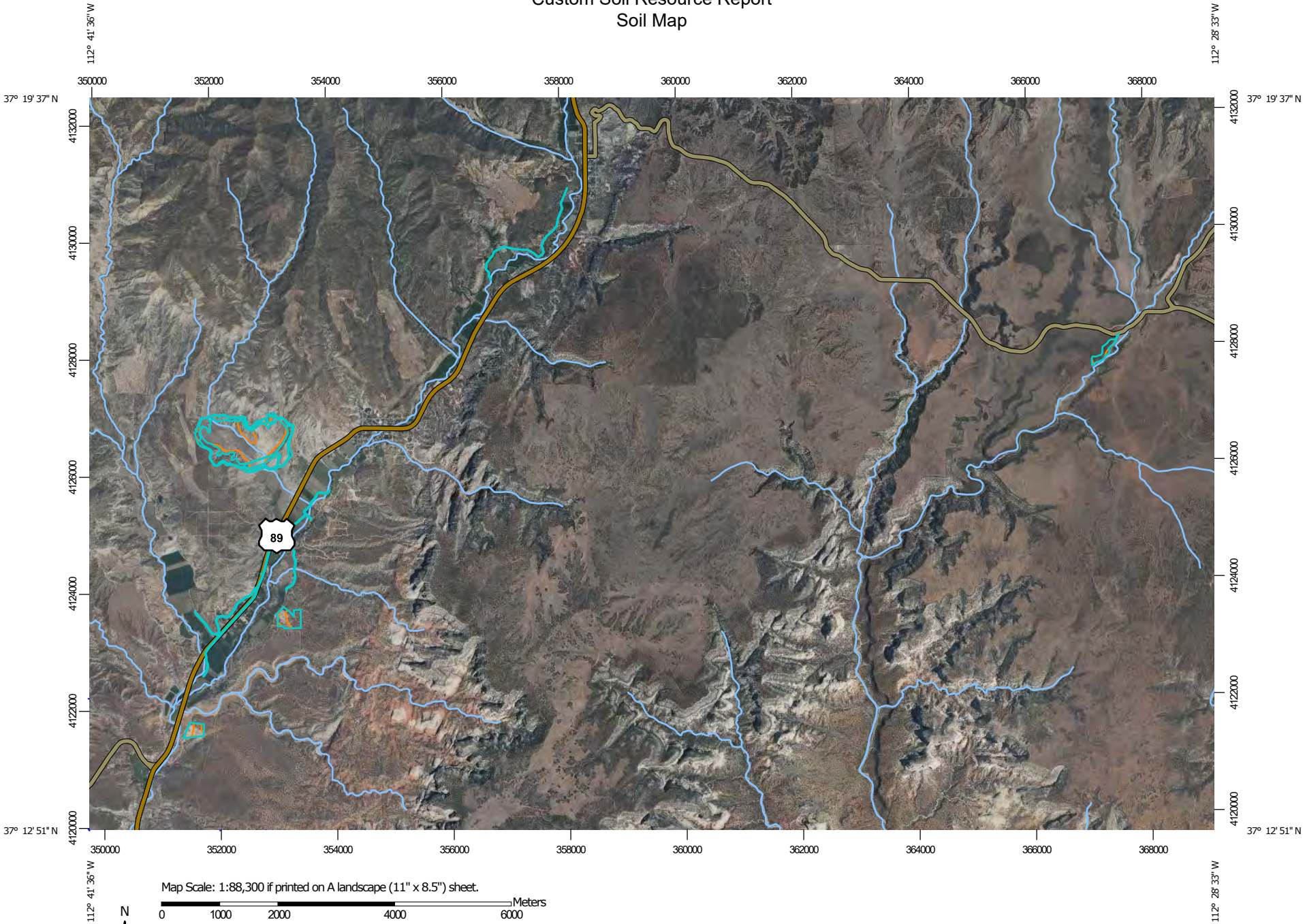
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:63,400.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kane County Area, Utah
Survey Area Data: Version 9, Aug 28, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 5, 2021—Nov 26, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Catdraw family-Orderville-Quezcan family complex, 15 to 35 percent slopes	0.2	0.1%
13	Catdraw-Quezcan-Vessilla complex, 35 to 60 percent slopes	6.5	2.0%
28	Elpedro-Plumasano-Teromote family-Flatnose complex, 0 to 8 percent slopes	1.7	0.5%
55	Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes	27.0	8.3%
68	Pinepoint-Waumac-Royosa complex, 0 to 4 percent slopes	6.8	2.1%
69	Pinepoint-Paria-Parkwash complex, 2 to 8 percent slopes	18.0	5.5%
72	Quezcan, deep-Sideshow-Orderville complex, 15 to 35 percent slopes	42.5	13.0%
94	Sili-Sideshow-Gypsic Haplustepts complex, 2 to 15 percent slopes	169.0	51.8%
98	Tonalea family-Bamac complex, 15 to 65 percent slopes	21.9	6.7%
104	Welring-Arabrab-Rock outcrop complex, Carmel Formation, 4 to 35 percent slopes	0.2	0.1%
105	Wetoe family-Flugle-Royosa family-Lava flows complex, 2 to 60 percent slopes	11.9	3.7%
110	Zigzag family-Badland-Quezcan complex, 35 to 90 percent slopes	20.5	6.3%
Totals for Area of Interest		**326.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named

according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kane County Area, Utah

12—Catdraw family-Orderville-Quezcan family complex, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2ndzc
Elevation: 5,350 to 7,550 feet
Mean annual precipitation: 14 to 17 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 119 days
Farmland classification: Not prime farmland

Map Unit Composition

Catdraw family and similar soils: 40 percent
Orderville and similar soils: 30 percent
Quezcan family and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catdraw Family

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

AC - 0 to 4 inches: loam
C1 - 4 to 9 inches: loam
C2 - 9 to 27 inches: fine sandy loam
R - 27 to 37 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 24 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)

Hydric soil rating: No

Description of Orderville

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: silty clay loam
Bw - 4 to 12 inches: clay loam
Bk1 - 12 to 23 inches: silt loam
Bk2 - 23 to 33 inches: silt loam
Bk3 - 33 to 61 inches: silt loam

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Quezcan Family

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: clay loam
BC - 4 to 15 inches: clay
C1 - 15 to 21 inches: clay loam
C2 - 21 to 24 inches: gravelly clay loam
R - 24 to 34 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent

Depth to restrictive feature: 24 to 33 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R035XY304UT - Upland Clay Loam (Pinyon - Juniper)
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 15 percent
Hydric soil rating: No

13—Catdraw-Quezcan-Vessilla complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2nd10
Elevation: 5,540 to 7,700 feet
Mean annual precipitation: 14 to 17 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 119 days
Farmland classification: Not prime farmland

Map Unit Composition

Catdraw and similar soils: 40 percent
Quezcan and similar soils: 25 percent
Vessilla and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catdraw

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Colluvium derived from sandstone and shale over residuum weathered from sandstone and shale

Typical profile

AC - 0 to 3 inches: gravelly sandy clay loam
C1 - 3 to 15 inches: gravelly silty clay loam
C2 - 15 to 34 inches: silty clay loam
Cy - 34 to 60 inches: silty clay loam

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 15.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R035XY302UT - Upland Dissected Slope (Twoneedle Pinyon-Utah Juniper)
Hydric soil rating: No

Description of Quezcan

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

AC - 0 to 5 inches: gravelly silt loam
C1 - 5 to 19 inches: very paragravelly clay
C2 - 19 to 26 inches: very paragravelly silt loam
R - 26 to 35 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 4.0 percent
Depth to restrictive feature: 22 to 33 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R035XY317UT - Upland Steep Stony Loam (Utah Juniper-Pinyon)
Hydric soil rating: No

Description of Vessilla

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

AC - 0 to 7 inches: gravelly fine sandy loam
R - 7 to 17 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 4 to 16 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R035XY315UT - Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 20 percent
Hydric soil rating: No

28—Elpedro-Plumasano-Teromote family-Flatnose complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2mhbz
Elevation: 5,940 to 7,400 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Elpedro and similar soils: 31 percent
Plumasano and similar soils: 30 percent
Teromote family and similar soils: 20 percent
Flatnose and similar soils: 10 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elpedro

Setting

Landform: Terraces, alluvial flats
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 11 inches: silty clay loam
Btk1 - 11 to 49 inches: silty clay loam
Btk2 - 49 to 65 inches: silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Plumasano

Setting

Landform: Terraces, alluvial flats
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Bw1 - 5 to 13 inches: loam
Bw2 - 13 to 36 inches: fine sandy loam
Bk - 36 to 60 inches: fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Teromote Family

Setting

Landform: Terraces, alluvial flats
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 6 inches: fine sandy loam
Bw - 6 to 19 inches: silt loam
Bk - 19 to 32 inches: sandy clay loam
2C1 - 32 to 41 inches: silt loam

2C2 - 41 to 52 inches: silty clay loam
2C3 - 52 to 63 inches: silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Flatnose

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

C1 - 0 to 2 inches: loamy fine sand
C2 - 2 to 10 inches: sandy clay loam
C3 - 10 to 25 inches: fine sandy loam
C4 - 25 to 59 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B

Ecological site: R035XY306UT - Upland Loam (Basin Big Sagebrush)
Hydric soil rating: No

Minor Components

Unnamed soils
Percent of map unit: 9 percent
Hydric soil rating: No

55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2nczn
Elevation: 6,290 to 7,250 feet
Mean annual precipitation: 14 to 17 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 119 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Naplene and similar soils: 45 percent
Teromote and similar soils: 20 percent
Arboles and similar soils: 15 percent
Oxyaquic ustifluvents and similar soils: 10 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Naplene

Setting
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
A - 0 to 7 inches: silt loam
C1 - 7 to 12 inches: silt loam
C2 - 12 to 33 inches: silt loam
C3 - 33 to 43 inches: silt loam
C4 - 43 to 45 inches: loam
C5 - 45 to 59 inches: loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Teromote

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 6 inches: silt loam
Bw - 6 to 20 inches: clay loam
Bk - 20 to 36 inches: loam
C - 36 to 59 inches: fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Arboles

Setting

Landform: Alluvial flats

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 3 inches: clay loam
Bss1 - 3 to 21 inches: clay
Bss2 - 21 to 30 inches: clay
Ck - 30 to 32 inches: clay
2C - 32 to 43 inches: silty clay loam
3C - 43 to 59 inches: silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY301UT - Upland Clay Loam (Low Sagebrush)
Hydric soil rating: No

Description of Oxyaquic Ustifluvents

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam
AC1 - 5 to 11 inches: silt loam
AC2 - 11 to 22 inches: silt loam
C1 - 22 to 33 inches: silt loam
C2 - 33 to 39 inches: silt loam
C3 - 39 to 49 inches: silt loam
Cg - 49 to 59 inches: silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 12.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B
Ecological site: R035XY010UT - Semiwet Fresh Meadow
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 10 percent
Hydric soil rating: No

68—Pinepoint-Waumac-Royosa complex, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2mz0b
Elevation: 4,530 to 6,360 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Not prime farmland

Map Unit Composition

Pinepoint and similar soils: 50 percent
Waumac and similar soils: 25 percent
Royosa and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinepoint

Setting

Landform: Sand sheets on alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

C1 - 0 to 17 inches: loamy fine sand

C2 - 17 to 71 inches: fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY307UT - Upland Sand (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Waumac

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

C - 0 to 8 inches: loamy fine sand
2C - 8 to 17 inches: sandy clay loam
3C1 - 17 to 54 inches: fine sandy loam
3C2 - 54 to 69 inches: loamy fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.20 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: Rare
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY306UT - Upland Loam (Basin Big Sagebrush)
Hydric soil rating: No

Description of Royosa

Setting

Landform: Sand sheets on alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 4 inches: loamy fine sand
C1 - 4 to 13 inches: loamy fine sand
C2 - 13 to 27 inches: loamy fine sand
C3 - 27 to 61 inches: loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY307UT - Upland Sand (Mountain Big Sagebrush)
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 5 percent
Hydric soil rating: No

69—Pinepoint-Paria-Parkwash complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2ml1v
Elevation: 5,040 to 7,030 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days

Farmland classification: Not prime farmland

Map Unit Composition

Pinepoint and similar soils: 60 percent
Paria and similar soils: 15 percent
Parkwash and similar soils: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinepoint

Setting

Landform: Sand sheets, alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 4 inches: loamy sand
C1 - 4 to 17 inches: loamy sand
C2 - 17 to 48 inches: loamy sand
C3 - 48 to 62 inches: loamy sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY307UT - Upland Sand (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Parkwash

Setting

Landform: Sand sheets
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone over residuum weathered from sandstone

Typical profile

C1 - 0 to 5 inches: loamy sand
C2 - 5 to 12 inches: fine sand
R - 12 to 22 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 8 to 19 inches to lithic bedrock
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.7 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R035XY314UT - Upland Shallow Sand (Pinyon-Utah Juniper)
Hydric soil rating: No

Description of Paria

Setting

Landform: Sand sheets
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands derived from sandstone

Typical profile

C1 - 0 to 7 inches: loamy fine sand
C2 - 7 to 33 inches: loamy fine sand
R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY307UT - Upland Sand (Mountain Big Sagebrush)
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 10 percent

Hydric soil rating: No

72—Quezcan, deep-Sideshow-Orderville complex, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2pfbl
Elevation: 5,370 to 7,570 feet
Mean annual precipitation: 14 to 17 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 119 days
Farmland classification: Not prime farmland

Map Unit Composition

Quezcan, deep, and similar soils: 35 percent
Orderville and similar soils: 25 percent
Sideshow and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quezcan, Deep

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

A - 0 to 3 inches: clay loam
Bk - 3 to 20 inches: clay loam
Ck1 - 20 to 33 inches: silty clay
Ck2 - 33 to 61 inches: silty clay

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R035XY304UT - Upland Clay Loam (Pinyon - Juniper)
Hydric soil rating: No

Description of Orderville

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

A - 0 to 4 inches: silt loam
Bw - 4 to 19 inches: silty clay loam
Bk1 - 19 to 46 inches: silty clay loam
Bk2 - 46 to 63 inches: silty clay loam

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R035XY305UT - Upland Loam (Gambel Oak)
Hydric soil rating: No

Description of Sideshow

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

A - 0 to 4 inches: silty clay
Bwss1 - 4 to 20 inches: clay

Bwss2 - 20 to 31 inches: clay
By - 31 to 53 inches: clay
C - 53 to 61 inches: silty clay loam

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R035XY304UT - Upland Clay Loam (Pinyon - Juniper)
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 15 percent
Hydric soil rating: No

94—Sili-Sideshow-Gypsic Haplustepts complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2nd0z
Elevation: 5,430 to 7,450 feet
Mean annual precipitation: 14 to 17 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 119 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Sili and similar soils: 40 percent
Sideshow and similar soils: 35 percent
Gypsic haplustepts and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sili

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

Ap - 0 to 5 inches: silty clay
Bw - 5 to 41 inches: silty clay
By - 41 to 50 inches: silty clay
Cy - 50 to 61 inches: silty clay

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY301UT - Upland Clay Loam (Low Sagebrush)
Hydric soil rating: No

Description of Sideshow

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

Ap - 0 to 7 inches: silty clay loam
Bss - 7 to 17 inches: silty clay loam
Bw - 17 to 44 inches: silty clay loam
By1 - 44 to 56 inches: silty clay
By2 - 56 to 61 inches: silty clay loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY304UT - Upland Clay Loam (Pinyon - Juniper)
Hydric soil rating: No

Description of Gypsic Haplustepts

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Typical profile

A - 0 to 5 inches: clay loam
Bw - 5 to 24 inches: clay loam
By1 - 24 to 37 inches: clay loam
By2 - 37 to 63 inches: clay loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R035XY301UT - Upland Clay Loam (Low Sagebrush)
Hydric soil rating: No

98—Tonalea family-Bamac complex, 15 to 65 percent slopes

Map Unit Setting

National map unit symbol: 2q7f1
Elevation: 5,190 to 5,980 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Not prime farmland

Map Unit Composition

Tonalea family and similar soils: 50 percent
Bamac and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tonalea Family

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile

A - 0 to 2 inches: gravelly loamy fine sand
C - 2 to 43 inches: loamy fine sand
R - 43 to 53 inches: bedrock

Properties and qualities

Slope: 15 to 65 percent
Surface area covered with cobbles, stones or boulders: 3.0 percent
Depth to restrictive feature: 39 to 49 inches to lithic bedrock
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: A
Ecological site: R035XY321UT - Upland Stony Loam (Pinyon-Utah Juniper)
Hydric soil rating: No

Description of Bamac

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone

Typical profile

AC - 0 to 2 inches: gravelly loamy fine sand
C1 - 2 to 7 inches: very gravelly loamy fine sand
C2 - 7 to 63 inches: very cobbly loamy fine sand

Properties and qualities

Slope: 15 to 65 percent
Surface area covered with cobbles, stones or boulders: 16.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY321UT - Upland Stony Loam (Pinyon-Utah Juniper)
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 20 percent
Hydric soil rating: No

104—Welring-Arabrab-Rock outcrop complex, Carmel Formation, 4 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2mgkc
Elevation: 5,940 to 7,110 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Not prime farmland

Map Unit Composition

Welring and similar soils: 45 percent
Arabrab and similar soils: 25 percent
Rock outcrop, carmel formation: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Welring

Setting

Landform: Structural benches, hillslopes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone over residuum weathered from limestone

Typical profile

A - 0 to 4 inches: channery sandy loam
C - 4 to 13 inches: very channery loam
R - 13 to 23 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 9 to 18 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R035XY315UT - Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3
Hydric soil rating: No

Description of Arabrab

Setting

Landform: Structural benches, hillslopes
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone

Typical profile

A - 0 to 6 inches: fine sandy loam
Bt - 6 to 17 inches: loam
R - 17 to 27 inches: bedrock

Properties and qualities

Slope: 4 to 25 percent
Depth to restrictive feature: 14 to 19 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R035XY315UT - Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3
Hydric soil rating: No

Description of Rock Outcrop, Carmel Formation

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Unnamed soils

Percent of map unit: 15 percent

Hydric soil rating: No

105—Wetoe family-Flugle-Royosa family-Lava flows complex, 2 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2ml1y
Elevation: 5,960 to 7,010 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Not prime farmland

Map Unit Composition

Wetoe family and similar soils: 40 percent
Flugle and similar soils: 30 percent
Lava flows: 15 percent
Royosa family and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wetoe Family

Setting

Landform: Lava flows
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from basalt

Typical profile

A - 0 to 4 inches: very cobbly fine sandy loam
Bt - 4 to 21 inches: very cobbly fine sandy loam
R - 21 to 31 inches: bedrock

Properties and qualities

Slope: 2 to 35 percent
Surface area covered with cobbles, stones or boulders: 25.0 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: R035XY321UT - Upland Stony Loam (Pinyon-Utah Juniper)
Hydric soil rating: No

Description of Flugle

Setting

Landform: Lava flows
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from basalt over residuum weathered from basalt

Typical profile

A - 0 to 4 inches: fine sandy loam
Bt1 - 4 to 26 inches: loam
Bt2 - 26 to 33 inches: loam
Bt3 - 33 to 59 inches: gravelly loam

Properties and qualities

Slope: 2 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R035XY308UT - Upland Loam (Mountain Big Sagebrush)
Hydric soil rating: No

Description of Lava Flows

Setting

Landform: Lava flows
Parent material: Residuum weathered from basalt

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Description of Royosa Family

Setting

Landform: Cinder cones

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from pumice over residuum weathered from pumice

Typical profile

A - 0 to 7 inches: gravelly sandy loam
C1 - 7 to 39 inches: gravelly loamy sand
C2 - 39 to 59 inches: gravelly loamy sand

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 25.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R035XY318UT - Upland Stony Loam (Wyoming Big Sagebrush, Indian Ricegrass)
Hydric soil rating: No

110—Zigzag family-Badland-Quezcan complex, 35 to 90 percent slopes

Map Unit Setting

National map unit symbol: 2nczh
Elevation: 5,440 to 7,480 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 130 to 147 days
Farmland classification: Not prime farmland

Map Unit Composition

Zigzag family and similar soils: 35 percent
Quezcan and similar soils: 25 percent
Badland: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zigzag Family

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from shale

Typical profile

A - 0 to 4 inches: parachannery silty clay loam
Cy1 - 4 to 13 inches: very paragravelly silty clay
Cy2 - 13 to 19 inches: very paragravelly silty clay
Cr - 19 to 29 inches: bedrock

Properties and qualities

Slope: 35 to 90 percent
Surface area covered with cobbles, stones or boulders: 1.0 percent
Depth to restrictive feature: 12 to 19 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Quezcan

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from shale and/or residuum weathered from shale

Typical profile

A - 0 to 6 inches: paragravelly silty clay
C1 - 6 to 11 inches: paragravelly silty clay loam
C2 - 11 to 22 inches: silty clay
Cr - 22 to 31 inches: bedrock

Properties and qualities

Slope: 35 to 90 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 28 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R035XY304UT - Upland Clay Loam (Pinyon - Juniper)
Hydric soil rating: No

Description of Badland

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from shale

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Unnamed soils

Percent of map unit: 15 percent
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX C

On-Site Photographs

Photo 1. View facing north (upstream) of the upstream reaches of Stream 1 showing the clear channel and vegetation lining the banks at the OHWM.

Photo 2. View facing south (downstream) of the upstream portion of Stream 1.

Photo 3. View facing northeast showing the intermittent stream channel and canyon landscape surrounding the upstream portion of Stream 1. No water was observed flowing in Stream 1 despite heavy rains 48–72 hours prior to field surveys.

Photo 4. View facing northwest (upstream) of the lower portion of Stream 1 showing the clear channel and OHWM with evidence of recent flow of precipitation and sediment.

Photo 5. View facing southeast (downstream) of the lower portion of Stream 1 showing the surrounding valley landscape farther downstream.

Photo 6. View facing northwest of the confluence of Stream 1 (left) and Stream 2 (right) at the location where the proposed dam structure would be constructed.

Photo 7. View facing west showing where sheet flow originating from the surrounding valley and Stream 3 further uphill flow along Cove Road and meet Stream 1 (right side; out of view). No OHWM was observed along the road, and Stream 3 no longer has significant surficial connectivity downstream.

Photo 8. View facing southwest of an old manmade pond feature. NWI maps indicated that this may be a wetland; however, field investigations determined that it lacked the necessary indicators characteristic of a wetland.

Photo 9. View facing southeast of a stand of coyote willow adjacent to a cattle trough south of Cove Road. Though vegetation here is FACW, the site lacked any indicators of wetland hydrology or hydric soils.

Photo 10. View facing south of W1 south of Cove Road. This manmade feature exhibited the necessary vegetation, hydrology, and soil indicators to be considered a wetland.

Photo 11. View facing northwest (upstream) of Stream 1 at the southern end of the survey area showing no clear OHWM.

Photo 12. View facing south overlooking the proposed location of the Cove Reservoir alternative.

Photo 13. View facing northwest (upstream) of Stream 1A showing the clear channel and deposition at the OHWM.

Photo 14. View facing north (upstream) of the confluence of Stream 1 (bottom) and Stream 1A.

Photo 15. View facing east of a sediment pond just above Stream 2A. The pond's basin was observed to be mostly full of sediment and does not appear to be currently functional. No wetland indicators were observed here.

Photo 16. View facing northeast (upstream) of Stream 2A. The channel (not shown) was at the bottom of this approximately 50-foot canyon.

Photo 17. View facing southwest (downstream) of Stream 2A.

Photo 18. View facing south (downstream) of the upper reach of Stream 2. The channel (not shown) was at the bottom of this approximately 50–60-foot canyon.

Photo 19. View facing northeast (upstream) of the lower reach of Stream 2 showing the channel and steep-walled banks. Early successional vegetation in the channel indicated that flow within Stream 2 is likely ephemeral.

Photo 20. View facing south (downstream) of the lower reach of Stream 2 showing the channel, active floodplain, and steep-walled banks.

Photo 21. View facing northeast (downstream) of Stream 3 west of the proposed reservoir location. Stream 3 and Stream 3A were small ephemeral streams but showed to have a defined channel and OHWM.

Photo 22. View facing southwest (upstream) of Stream 3A.

Photo 23. View facing southeast of sheet flow along Cove Road originating from Stream 3. Here Stream 3 loses all definition of a bed and bank.

Photo 24. View facing northeast showing the access to the reservoir portion of the survey area at the intersection of US-89 and Cove Road (background).

Photo 25. View facing west of the lower of three sediment ponds found west of the proposed reservoir location but within the survey area.

Photo 26. View facing southwest of W2. Replacement of the Glendale Pipeline would occur within this wetland.

Photo 27. View facing northwest (upstream) of Stream 4 showing flowing water in the channel and matted vegetation due to high flow caused by recent heavy rains.

Photo 28. View facing southeast (downstream) of Stream 4.

Photo 29. View facing northwest (upstream) of Stream 5.

Photo 30. View facing southeast of Stream 5 showing flowing water and matted vegetation due to heavy rains prior to field surveys.

Photo 31. View facing north of the Lamb borrow pit. No potentially jurisdictional WOTUS were observed here.

Photo 32. View facing northwest of where the Tait borrow pit could be expanded to. No potentially jurisdictional WOTUS were observed here.

Photo 33. View facing northeast of the Tait borrow pit.

Photo 34. View of Stream 6 facing southeast, downstream.

Photo 35. View of Stream 6 facing southeast, downstream.

Photo 36. View of Stream 7 facing southeast, downstream.

Photo 37. View of Stream 8 looking upstream. Note the irrigation pipe to be abandoned.

Photo 38. View of Stream 9 facing downstream.

Photo 39. View of Stream 10 looking downstream. Note the irrigation pipe to be abandoned.

Photo 40. View of EFVR looking downstream near the head of the proposed Glendale Pipeline.

Photo 41. View of the East Fork Virgin River looking upstream at the Pinyon Pine Drive bridge crossing.

Photo 42. View of the soil pit sample for W1 redox depressions and some gleyed matrix.

Photo 43. View of the soil pit for W1.

Photo 44: View of paired upland soil pit investigated for the delineation of W1.

Photo 45. View of soil pit investigated for W2.

Photo 46. View of soil sample for W2 showing redox depressions.

Photo 47: View of paired upland soil pit investigated for the delineation of W2.

APPENDIX D

Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Arid West Region

Project Site: Cove Reservor | City/County: Orderville/Kane | Sampling Date: 10/8/18

Applicant/Owner: Kane County Water Conservancy District | State: UT | Sampling Point: W1

Investigator(s): Brian Parker | Section, Township, Range: S5 T41S R7W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 1

Subregion (LRR): D | Lat: 37.269568 | Long: -112.65711 | Datum: Nad 83 Zone 12N

Soil Map Unit Name: 55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes | NWI classification: lFreshwater Pond

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐		
Hydric Soil Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes ☒ No ☐**
Wetland Hydrology Present?	Yes ☒	No ☐		

Remarks: Wetland is the product of a man-made pond. The pond has not natural outlet and is artificially fed through underground and above ground irrigation. Isolated. No surface water appeared to be present at the time of survey and it appears that the pond is no longer used regularly.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:1000 sq.ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *N/A*			
2.			
3.			
4.			
50% = ____, 20% = ____	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:1000 sq.ft.)			
1. *N/A*			
2.			
3.			
4.			
5.			
50% = ____, 20% = ____	0	= Total Cover	
Herb Stratum (Plot size:1000 sq.ft.)			
1. *Typha latifolia*	99	yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50% = ____, 20% = ____	99	= Total Cover	
Woody Vine Stratum (Plot size:1000 sq.ft.)			
1. *N/A*			
2.			
50% = ____, 20% = ____	0	= Total Cover	
% Bare Ground in Herb Stratum 0	% Cover of Biotic Crust 0		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of :		Multiply by:	
OBL species	____	x1 =	____
FACW species	____	x2 =	____
FAC species	____	x3 =	____
FACU species	____	x4 =	____
UPL species	____	x5 =	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks: Vegetaton is almost completely cattail w/ some unknown grasses around the edge of the pond.

Project Site: Cove Reservoir

SOIL Sampling Point: W1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (Moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	6/10BG Gley2	80	6/4 10YR	20			clay	
0-4	Plant material	20						
4-20	6/10BG Gley2	99	6/4 10YR	20			clay	Plant material mostly absent

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☒ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR C)**
- ☐ 2 cm Muck (A10) **(LRR B)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (Inches):

Hydric Soils Present? **Yes** ☒ **No** ☐

Remarks: Redox features present throughout sample pit and around roots.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) **(Nonriverine)**
- ☐ Sediment Deposits (B2) **(Nonriverine)**
- ☐ Drift Deposits (B3) **(Nonriverine)**
- ☐ Surface Soil Cracks (B6)
- ☒ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) **(Riverine)**
- ☐ Sediment Deposits (B2) **(Riverine)**
- ☐ Drift Deposits (B3) **(Riverine)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches):

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Aerial imagery and evidence of periodic artificial fed indundation (irrigation hoses/lines around pond) indicate that the pond occasionally has surface water.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project Site: Cove Reservor | City/County: Orderville/Kane | Sampling Date: 10/8/18

Applicant/Owner: Kane County Water Conservancy District | State: UT | Sampling Point: UPL1

Investigator(s): Brian Parker | Section, Township, Range: S5 T41S R7W

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): none | Slope (%): 1

Subregion (LRR): D | Lat: 37.269568 | Long: -112.65711 | Datum: Nad 83 Zone 12N

Soil Map Unit Name: 55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒		
Hydric Soil Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	**Yes ☐ No ☒**
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: **Location is adjacent and slightly upslope of the man made pond/wetland feature.**

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:200 sq. ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *N/A*			
2.			
3.			
4.			
50% = ____, 20% = ____	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:200 sq..ft.)			
1. *N/A*			
2.			
3.			
4.			
5.			
50% = ____, 20% = ____	0	= Total Cover	
Herb Stratum (Plot size:200 sq. ft.)			
1. *Atriplex confertifolia*	5	no	FAC
2. *Pascopyrum smithii*	5	no	FAC
3. *Hesperotstipa comata*	35	yes	NL (UPL)
4. *Symphyotrichum spathulatum*	10	no	UPL
5.			
6.			
7.			
8.			
50% = ____, 20% = ____	55	= Total Cover	
Woody Vine Stratum (Plot size:200 sq. ft.)			
1. *N/A*			
2.			
50% = ____, 20% = ____	0	= Total Cover	
% Bare Ground in Herb Stratum 45	% Cover of Biotic Crust 0		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of :	Multiply by:
OBL species ____	x1 = ____
FACW species ____	x2 = ____
FAC species ____	x3 = ____
FACU species ____	x4 = ____
UPL species ____	x5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☐ No ☒**

Remarks: Vegetaton is almost completely cattail w/ some unknown grasses around the edge of the pond.

Project Site: Cove Reservoir

SOIL Sampling Point: UPL1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (Moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	4/3 2.5 YR	100	N/A					

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR C)**
- ☐ 2 cm Muck (A10) **(LRR B)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (Inches):

Hydric Soils Present? **Yes** ☐ **No** ☒

Remarks: Soil slightly moist; likely due to heavy rain a few days prior to field survey (massive sheet flow, flash flooding in area)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) **(Nonriverine)**
- ☐ Sediment Deposits (B2) **(Nonriverine)**
- ☐ Drift Deposits (B3) **(Nonriverine)**
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) **(Riverine)**
- ☐ Sediment Deposits (B2) **(Riverine)**
- ☐ Drift Deposits (B3) **(Riverine)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches):

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Hillside above pond

WETLAND DETERMINATION DATA FORM – Arid West Region

Project Site: Glendale Pipeline | City/County: Orderville/Kane | Sampling Date: 10/9/18

Applicant/Owner: Kane County Water Conservancy District | State: UT | Sampling Point: W2

Investigator(s): Brian Parker | Section, Township, Range: S27 T40S R7W

Landform (hillslope, terrace, etc.): pond basin | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): D | Lat: 37.303818 | Long: -112.61412 | Datum: Nad 83 Zone 12N

Soil Map Unit Name: 55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐		
Hydric Soil Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes ☒ No ☐**
Wetland Hydrology Present?	Yes ☒	No ☐		

Remarks: **Location is within the basin of a man-made pond**

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 1000 sq. ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *N/A*			
2.			
3.			
4.			
50% = , 20% =	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 1000 sq..ft.)			
1. *Salix exigua*	70	yes	FACW
2.			
3.			
4.			
5.			
50% = , 20% =	0	= Total Cover	
Herb Stratum (Plot size: 1000 sq. ft.)			
1. *Unknown grass*	40	yes	NO
2. *Symphyotrichum spathulatum*	20	yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
50% = , 20% =	45	= Total Cover	
Woody Vine Stratum (Plot size: 1000 sq. ft.)			
1. *N/A*			
2.			
50% = , 20% =	0	= Total Cover	

% Bare Ground in Herb Stratum 20 | % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of :		Multiply by:	
OBL species		x1 =	
FACW species		x2 =	
FAC species		x3 =	
FACU species		x4 =	
UPL species		x5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks: Unable to identify grass species outside of flowering/seeding season. Assumed to be OBL, FACW, or FAC..

Project Site: Glendale Pipeline

SOIL Sampling Point: W2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (Moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	6/2 5YR	100	5/6 7.5YR	10			clay	redox throughout entire sample

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR C)**
- ☐ 2 cm Muck (A10) **(LRR B)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (Inches): _____

Hydric Soils Present? **Yes** ☒ **No** ☐

Remarks: Soil slightly moist

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) **(Nonriverine)**
- ☐ Sediment Deposits (B2) **(Nonriverine)**
- ☐ Drift Deposits (B3) **(Nonriverine)**
- ☒ Surface Soil Cracks (B6)
- ☒ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) **(Riverine)**
- ☐ Sediment Deposits (B2) **(Riverine)**
- ☐ Drift Deposits (B3) **(Riverine)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	☐	No	☒	Depth (inches):	
Water Table Present?	Yes	☐	No	☒	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes	☐	No	☒	Depth (inches):	

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Likely seasonal inundation during periods of irrigation and/or heavy precipitation

WETLAND DETERMINATION DATA FORM – Arid West Region

Project Site: Glendale Pipeline | City/County: Orderville/Kane | Sampling Date: 10/9/18

Applicant/Owner: Kane County Water Conservancy District | State: UT | Sampling Point: UPL2

Investigator(s): Brian Parker | Section, Township, Range: S27 T40S R7W

Landform (hillslope, terrace, etc.): pond basin | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): D | Lat: 37.303818 | Long: -112.61412 | Datum: Nad 83 Zone 12N

Soil Map Unit Name: 55—Naplene-Teromote-Arboles-Oxyaquic Ustifluvents complex, 2 to 8 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	**Yes ☐ No ☒**
Hydric Soil Present?	Yes ☒	No ☐		
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: **Location is above pond on relatively flat terrace**

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:100 sq.ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *N/A*			
2.			
3.			
4.			
50% = ____, 20% = ____	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:100 sq..ft.)			
1. *Chrysothamnus viscidiflorus*	20	yes	NL (UPL)
2. *Purshia tridentata*	20	yes	NL (UPL)
3.			
4.			
5.			
50% = ____, 20% = ____	40	= Total Cover	
Herb Stratum (Plot size:100 sq. ft.)			
1. *Sphaeralcea sp.*	10	no	NL (UPL)
2. *Salsola tragus*	5	no	FACU
3. *Erodium cicutarium*	10	no	NL (UPL)
4.			
5.			
6.			
7.			
8.			
50% = ____, 20% = ____	25	= Total Cover	
Woody Vine Stratum (Plot size:100 sq. ft.)			
1. *N/A*			
2.			
50% = ____, 20% = ____	0	= Total Cover	

% Bare Ground in Herb Stratum 20 | % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0	(A/B)

Prevalence Index worksheet:

Total % Cover of :		Multiply by:	
OBL species	____	x1 =	____
FACW species	____	x2 =	____
FAC species	____	x3 =	____
FACU species	____	x4 =	____
UPL species	____	x5 =	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☐ No ☒**

Remarks: Edge of man-made pond structure

Project Site: Glendale Pipeline

SOIL Sampling Point: UPL2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (Moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	5/4 2.5YR	100	N/A				Sandy	
8-20	8/3 5Y	100	6/6 7.5YR	5			Sandy	hard soil area

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR C)**
- ☐ 2 cm Muck (A10) **(LRR B)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (Inches):

Hydric Soils Present? **Yes** ☒ **No** ☐

Remarks: Redox feature present below 8 inches may have existed prior to human disturbance as there is evidence of sandy soil above hard layer indicating that the soil has probably been turned over or disturbed above. Lacks hydrology and wetland veg.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) **(Nonriverine)**
- ☐ Sediment Deposits (B2) **(Nonriverine)**
- ☐ Drift Deposits (B3) **(Nonriverine)**
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) **(Riverine)**
- ☐ Sediment Deposits (B2) **(Riverine)**
- ☐ Drift Deposits (B3) **(Riverine)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches):

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

US Army Corps of Engineers Arid West – Version 2.0

APPENDIX E

Ordinary High-Water Mark Data Sheets

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PJD 1
Investigator(s): Brian Parker

Date: 10/8/18 **Time:** 11:20
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details:
PJD1 ~ North of Reservoir + access road

Projection: UTM NAD 83 **Datum:**
Coordinates: 12S 0353659; 4126944

Potential anthropogenic influences on the channel system:
Retention Pond, (2) downstream

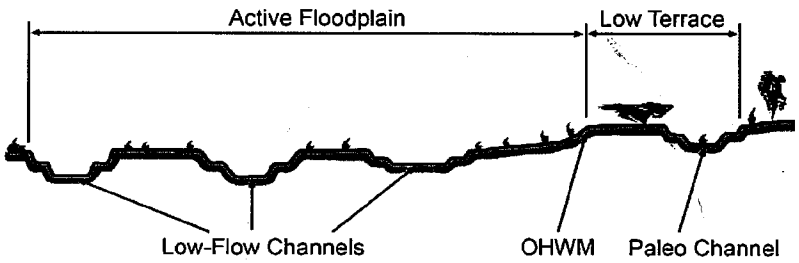
Brief site description:
Steep walled intermittent stream draining adjacent hillsides and leading to retention ponds downstream. Little to no surficial connectivity downstream of ponds

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [ ] Topographic maps
- [X] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies

- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

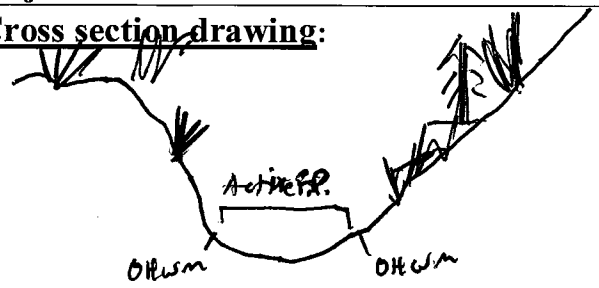


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Cove **Cross section ID:** XSD 1 **Date:** 10/8/14 **Time:** 11:20

Cross section drawing:



OHWM

GPS point: 12S 0353490 ; 4126985

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Steep walled banks. Channel void of vegetation.

Floodplain unit: [x] Low-Flow Channel [ ] Active Floodplain [ ] Low Terrace

GPS point: 12S 0353490 ; 4127009

Characteristics of the floodplain unit:

Average sediment texture: fine silt

Total veg cover: 0 % Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Recent flow due to heavy rainfall in the days prior to survey

Project ID: Cove **Cross section ID:** PSD 1 **Date:** 10/8/18 **Time:** 11:20

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12S 0353490; 4136985

Characteristics of the floodplain unit:

Average sediment texture: clay

Total veg cover: 5 % Tree: 0 % Shrub: 2 % Herb: 3 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Steep walled bank @ floodplain edge

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ ~~Low Terrace~~ N/A

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

No Low terrace here.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir	**Date:** 10/8/18	**Time:** 1300
Project Number:	**Town:** Orderville	**State:** UT
Stream: PJD 1a	**Photo begin file#:**	**Photo end file#:**
Investigator(s):		

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: Tributary to PJD 1

Projection: UTM **Datum:** NAD 83

Coordinates: 12S 352531; 4132 6665

Potential anthropogenic influences on the channel system:

None

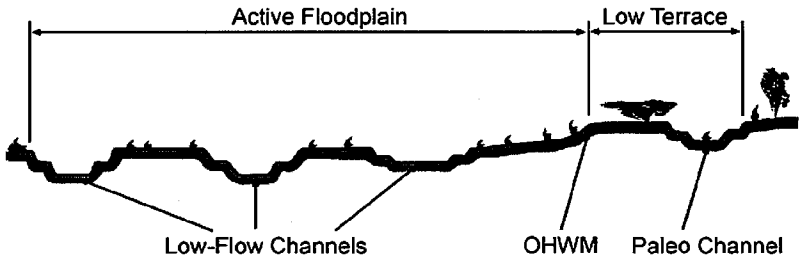
Brief site description:

Small tributary w/ approx 2-3 ft wide channel. Medium sloped banks; clear channel w/ OHWM

Checklist of resources (if available):

- [X] Aerial photography
  - Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  - Gage number:
  - Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

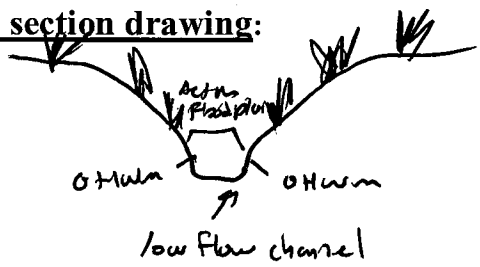


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Love **Cross section ID:** PJD 19 **Date:** 10/9/18 **Time:** 1300

Cross section drawing:



OHWM

GPS point: 125 352531; 4126613

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Clear channel. No veg. Evidence of recent flow

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: 125 352530; 4126663

Characteristics of the floodplain unit:

Average sediment texture: Medium sand

Total veg cover: 0 % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

No vegetation in channel

Project ID: Cove **Cross section ID:** PJD 1a **Date:** 10/9/18 **Time:** 1300

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12S 352581; 4126663

Characteristics of the floodplain unit:

Average sediment texture: medium sand

Total veg cover: 15 % Tree: 0 % Shrub: 10 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Narrow floodplain due to deep bank steep bank

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: N/A

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

No terracing

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PJD 2
Investigator(s): Brian Parker

Date: 10/8/18 **Time:** 13:45
Town: Orderville **State:** UT
Photo begin file#: [redacted] **Photo end file#:** [redacted]

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: Cove Reservoir footprint

Projection: utm **Datum:** NAD 83

Coordinates: 12S 6352969 ; 412 6425

Potential anthropogenic influences on the channel system:

Irrigation downstream ; grazing

Brief site description:

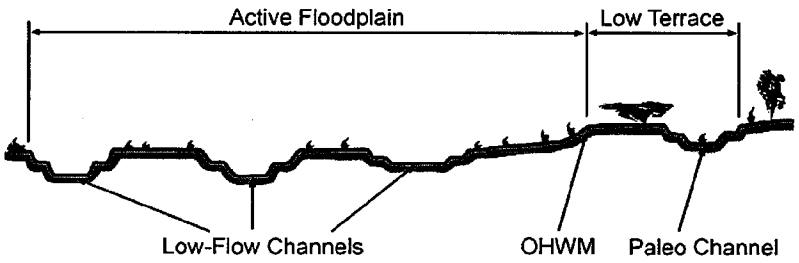
Intermittent stream running ~~West~~ East. ~~from~~ Looks to drain large watershed beyond the footprint of the project.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☐ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

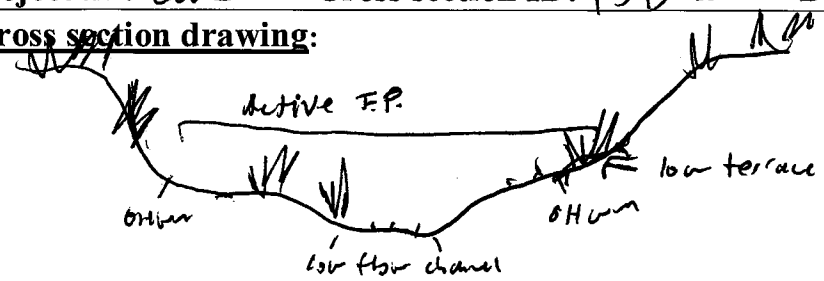


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☒ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☐ GPS
   - ☐ Other:

Project ID: Cove **Cross section ID:** PJD 2 **Date:** 10/8/18 **Time:** 1345

Cross section drawing:



OHWM

GPS point: 125 0352970; 4126430

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Medium to steep walled banks above OHWM funnel flow fairly consistently with little ability to meander.

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: 125 0352968; 4126432

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 30 % Tree: 0 % Shrub: 20 % Herb: 10 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [x] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Recent flow. Channel has some herbaceous ~~cover~~ seedlings and grasses

Project ID: Cora **Cross section ID:** PSD 2 **Date:** 10/8/18 **Time:** 1345

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 125 0352970; 4126428

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 41 % Tree: 1 % Shrub: 20 % Herb: 20 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Terraces only in some areas, Mostly on ~~[illegible]~~ / near beds. Evidence of grazing throughout edges of stream and surrounding valley

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 125 0352965; 4126431

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 50 % Tree: 0 % Shrub: 40 % Herb: 10 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain is more prominent in areas along the inside of bends in the stream

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PJD 2 (upstream)
Investigator(s): Brian Parker

Date: 10/8/18 **Time:** 1630
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: upstream portion of PJD 2

Projection: NAD 83 **Datum:** UTM
Coordinates: 12S 0353122; 4126795

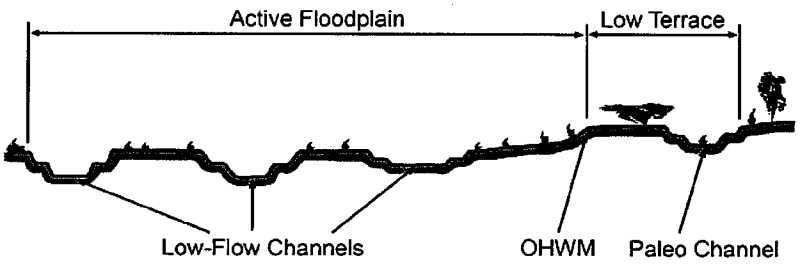
Potential anthropogenic influences on the channel system:
Numerous flood control retention ponds upstream

Brief site description:
steep canyon portion of PJD 2 (upstream). This northern section is very deep with a narrow 'slot' channel at the bottom.

Checklist of resources (if available):

- [X] Aerial photography
  - Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  - Gage number:
  - Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

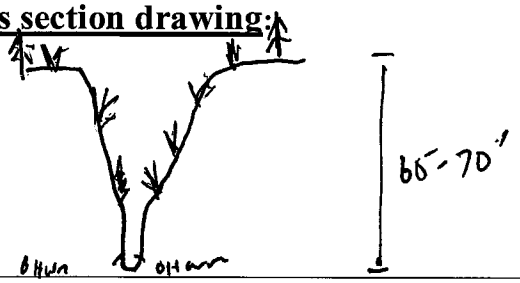


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Cove **Cross section ID:** PJD2 (upstream) **Date:** 8/8/18 **Time:** 1630

Cross section drawing:



OHWM

GPS point: _____

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

slot canyon at bottom, progressively deeper as you go upstream

Floodplain unit: [x] Low-Flow Channel [ ] Active Floodplain [ ] Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: clay

Total veg cover: 10 % Tree: 0 % Shrub: 5 % Herb: 5 %

Community successional stage:

- [x] NA
- [x] Early (herbaceous & seedlings)
- [x] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Some veg. growing in slot channel.

Project ID: COVE **Cross section ID:** PJD2 (upstream) **Date:** 10/8/14 **Time:** 1630

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 20 % Tree: ____ % Shrub: 15 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Some benches where stream meanders. Not a continous floodplain

Mostly just a channel @ the bottom of the canyon

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ ~~Low Terrace~~ N/A

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

No terrace. Only steep canyon walls

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PJD 3 (downstream)
Investigator(s): Brian Carter

Date: 10/8/14 **Time:** 1730
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details:
lower reach of PJD 3

Projection: UTM **Datum:** NAD 83
Coordinates: 12S 0352740 ; 4126424

Potential anthropogenic influences on the channel system:

None @ this reach of PJD 3

Brief site description:

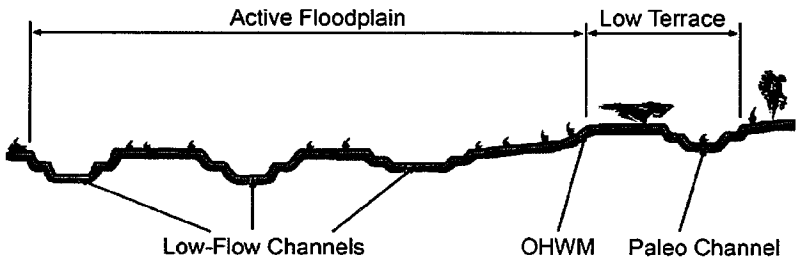
lower reach of intermittent stream before confluence w/ PJD 2. Evidence of heavy flood event last week (large shrubs layed down or uprooted, Debris)

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☒ Soils maps
- ☒ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

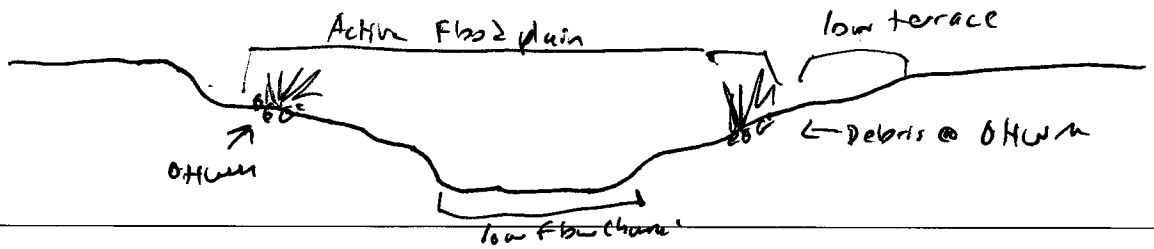


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☒ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: Core **Cross section ID:** PJJ3 downstream **Date:** 10/9/18 **Time:** 1730

Cross section drawing:



OHWM

GPS point: 12S 0352739; 4126426

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Significant debris observed @ OHWM. May be larger than normal flood event that occurred last week/weekend. Approx. width ~~8~~ 20 feet

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: 12S 0352737; 4126422

Characteristics of the floodplain unit:

Average sediment texture: pebble

Total veg cover: 0 % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Mix of sand, cobble and boulders

Project ID: Cove **Cross section ID:** SSD3 downstream **Date:** 10/8/18 **Time:** 1730

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 125 0352735; 4126419

Characteristics of the floodplain unit:

Average sediment texture: Medium sand

Total veg cover: 30 % Tree: X % Shrub: 25 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Large flood event may have widened floodplain as evident by scouring of banks and uprooting/laydown of medium sized shrubs.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 125 0352733; 4126414

Characteristics of the floodplain unit:

Average sediment texture: Fine sand/silt

Total veg cover: 50 % Tree: X % Shrub: 45 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Evidence of sheet flow from recent event.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PJD 3 (upstream)
Investigator(s): Brian Parker

Date: 10/9/18 **Time:** 1230
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details:
Upstream canyon reach of PJD 3

Projection: UTM **Datum:** NAD 83
Coordinates: 12S 0351949; 4127317

Potential anthropogenic influences on the channel system:

None

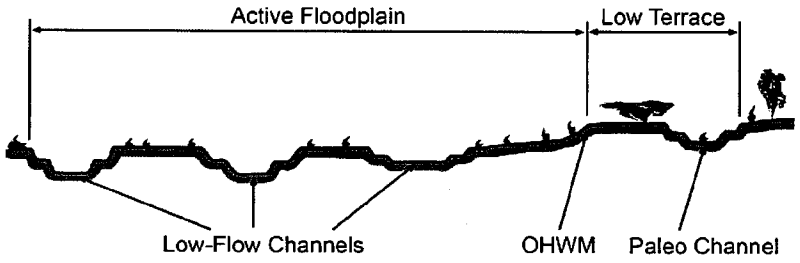
Brief site description:

Deep canyon (~25-30 ft.) in pinyon-juniper habitat

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

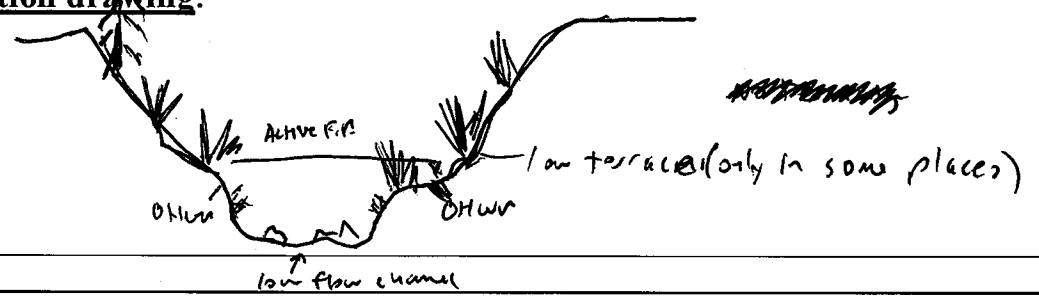


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Cove **Cross section ID:** POD 3 (upstream) **Date:** 10/9/18 **Time:** 1230

Cross section drawing:



OHWM

GPS point: 125 0351948; 4127317

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Well defined. Mix of clay + boulders

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: 125 0351944; 4127314

Characteristics of the floodplain unit:

Average sediment texture: Boulder

Total veg cover: 0 % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Project ID: COVE **Cross section ID:** QSD3upstream **Date:** 10/9/14 **Time:** 1235

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12S 0351944; 4127314

Characteristics of the floodplain unit:

Average sediment texture: Medium sand / cobble

Total veg cover: 20 % Tree: 0 % Shrub: 10 % Herb: 10 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Small, narrow floodplain above low flow due to steep canyon walls

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 12S 0351944; 4127313

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: 50 % Tree: _____ % Shrub: 30 % Herb: 20 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Terracing only in a few places along this stretch

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reruar
Project Number:
Stream: PJD4
Investigator(s): Brian Parker

Date: 10/8/18 **Time:** 1500
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details:
East fork above PJD 2

Projection: ~~UTM~~ UTM **Datum:** ~~NAD83~~ NAD83
Coordinates: 12S 035 3214; 4127015

Potential anthropogenic influences on the channel system:
upstream, 2 retention ponds are found which collect water that would normally flow downstream. water in this small canyon only flows from adjacent sheet flow runoff and during heavy rains where the ponds overflow

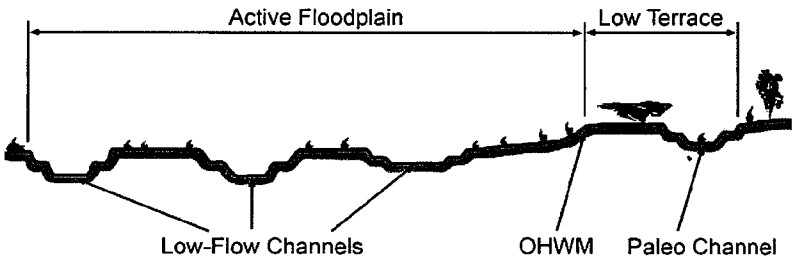
Brief site description:
small tributary canyon (~50 ft. deep) leading to PJD 2

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies

- [ ] Stream gage data
  Gage number:
  Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

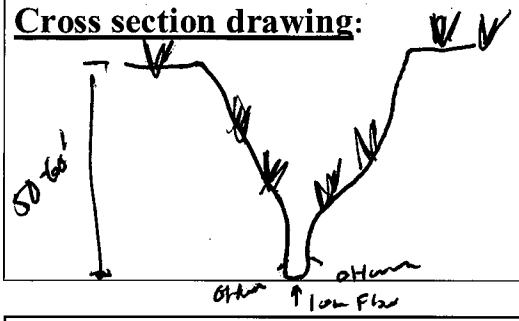


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Cove **Cross section ID:** PJD 4 **Date:** 10/4/19 **Time:** 1500

Cross section drawing:



OHWM

GPS point: 12S 0353212; 4127018

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

50'-60' deep canyon. Not traversible by foot. Observations from above indicated a clear channel ~~[illegible]~~. Approximately 8 ft. wide @ bottom here.

Floodplain unit: [x] Low-Flow Channel [ ] Active Floodplain [ ] Low Terrace

GPS point: 12S 0353212; 4127019

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 0 % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Project ID: Love **Cross section ID:** PJD 4 **Date:** 10/8/18 **Time:** 1500

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12S 0353212; 4127018

Characteristics of the floodplain unit:

Average sediment texture: clay

Total veg cover: 5 % Tree: ____ % Shrub: 3 % Herb: 2 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: ____
- ☐ Other: ____
- ☐ Other: ____

Comments:

Some veg. lining walls of canyon

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 12S 0353214; 4127015 (@ exit of upper canyon) N/A

Characteristics of the floodplain unit:

Average sediment texture: ____

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: ____
- ☐ Other: ____
- ☐ Other: ____

Comments:

No terrace. Steep canyon walls, contain all flow to slot-like canyon.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PSD 5
Investigator(s): Brian Parker

Date: 10/9/18 **Time:** 11:30
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details:
upstream portion of PSD 5

Projection: UTM **Datum:** NAD83
Coordinates: 12S 0352081 ; 4126364

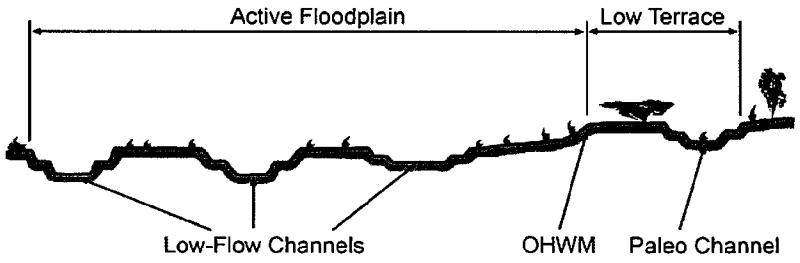
Potential anthropogenic influences on the channel system:
None upstream. Downstream is a dirt road that has been constructed where flow naturally occurs. Recent sheet flow due to flooding in the area appears to have obscured a clearly defined channel

Brief site description:
Gully or deeply eroded channel; moderately deep (2-3 ft.) w/ cut bank

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

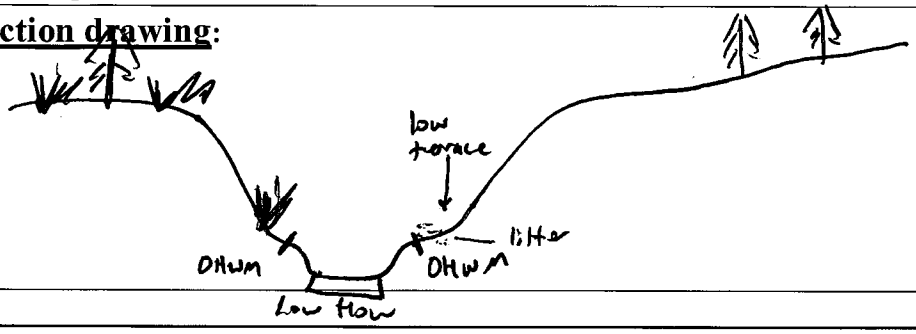


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Cove **Cross section ID:** POD 5 **Date:** 10/9/18 **Time:** 11:30

Cross section drawing:



OHWM

GPS point: 12S 0352080; 4126366

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [ ] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Clear channel. No water observed in channel.

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: 12S 0352080; 4126365

Characteristics of the floodplain unit:

Average sediment texture: Clay

Total veg cover: 0 % Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- [x] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [x] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Project ID: Cove **Cross section ID:** PJD 5 **Date:** 10/9/18 **Time:** 11:30

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 12S 0352081; 4126364

Characteristics of the floodplain unit:

Average sediment texture: clay / fine silt

Total veg cover: 5 % Tree: 0 % Shrub: 5 % Herb: 0 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Narrow floodplain. Floodplain is mostly [illegible] synonomous with the channel in most places

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 12S 0352081; 4126363

Characteristics of the floodplain unit:

Average sediment texture: clay

Total veg cover: 25 % Tree: 0 % Shrub: 20 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Larger shrubs here

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reservoir
Project Number:
Stream: PSD6
Investigator(s): Brian Parker

Date: 10/9/18 **Time:** 1745
Town: Orderville **State:** UT
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details:
Stream above irrigated farmland

Projection: UTM **Datum:** NAD83
Coordinates: DS 0358914 ; 4129955

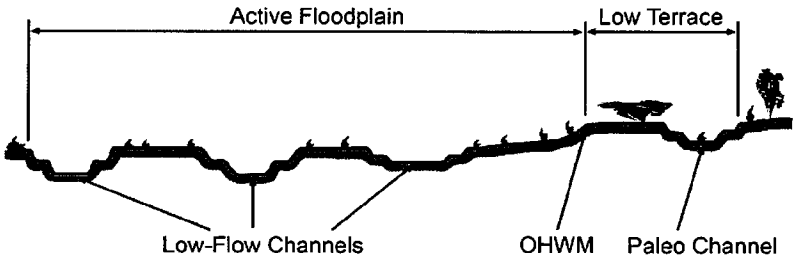
Potential anthropogenic influences on the channel system:
Dirt road, pipelines installed (irrigation)

Brief site description:
Running stream above pastureland. Cottonwood, oaks and pinyon/juniper adjacent to stream

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

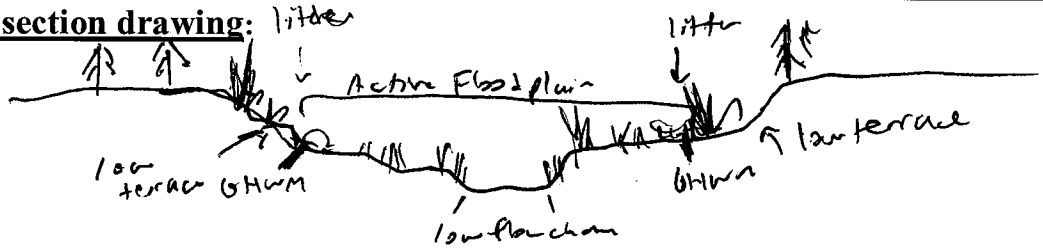


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: COVE **Cross section ID:** **Date:** 10/9/18 **Time:** 1745

Cross section drawing:



OHWM

GPS point: 125 0356914 ; 4129756

Indicators:

- [ ] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Flowing water in channel @ time of survey.

Floodplain unit:

- [ ] Low-Flow Channel
- [ ] Active Floodplain
- [x] Low Terrace

GPS point: 125 0356914 ; 4129746

Characteristics of the floodplain unit:

Average sediment texture: Medium Sand

Total veg cover: 60 % Tree: 25 % Shrub: 25 % Herb: 10 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [x] Mid (herbaceous, shrubs, saplings)
- [x] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [x] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Project ID: COVE **Cross section ID:** PSD 6 **Date:** 10/9/18 **Time:** 1745

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12 S 0356908 ; 4129750

Characteristics of the floodplain unit:

Average sediment texture: Medium silt

Total veg cover: 40 % Tree: 0 % Shrub: 5 % Herb: 35 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Vegetation layed down due to recent flow

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 12S 0356909 ; 4129751

Characteristics of the floodplain unit:

Average sediment texture: cobble

Total veg cover: 0 % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☒ Mudcracks
- ☒ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Flowing water. 3 ft wide channel.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Cove Reroir
Project Number:
Stream: JD 7
Investigator(s): Brian Parker

Date: 10/9/18 **Time:** 1800
Town: Glendale **State:** UT
Photo begin file#: **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details:
Stream adjacent to farmland

Projection: UTM **Datum:** NAD83
Coordinates: 12S 0356736 ; 4129546

Potential anthropogenic influences on the channel system:
Irrigated farmland adjacent to stream. Northern bank has been built up likely for flood control of farmland

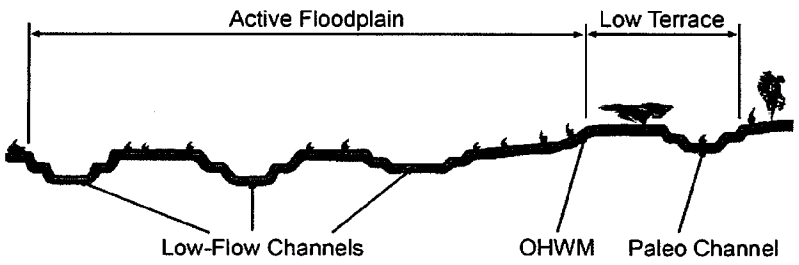
Brief site description:
Running stream south of irrigated farmland towards southern end of Glendale Pipeline. Wooded (Oak, Cottonwood, Sycamore)

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

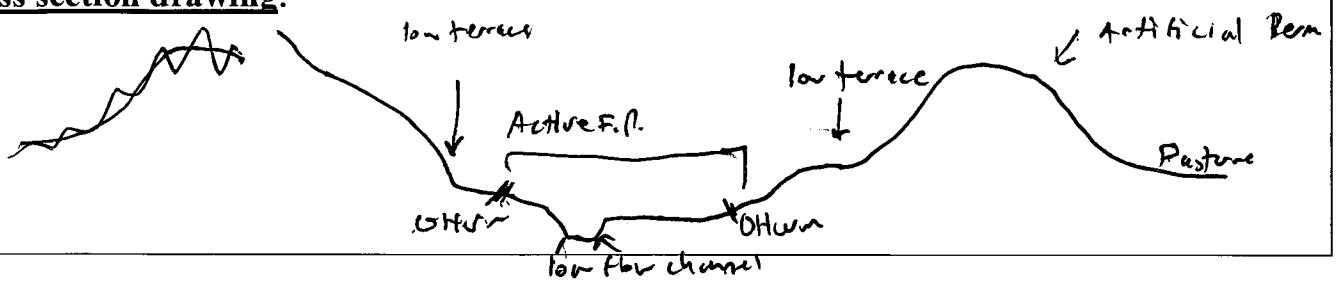


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☒ Mapping on aerial photograph
   - ☒ GPS
   - ☒ Digitized on computer
   - ☐ Other:

Project ID: Cove **Cross section ID:** POD 7 **Date:** 10/9/18 **Time:** 1800

Cross section drawing:



OHWM

GPS point: 12S 0356735; 4129559

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Veg. layed down and litter/debris present

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 12S 0356735; 4129559

Characteristics of the floodplain unit:

Average sediment texture: ~~boggy~~ medium sand

Total veg cover: 25 % Tree: 0 % Shrub: 2 % Herb: 23 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☒ Ripples
- ☒ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Project ID: Cow **Cross section ID:** 307 **Date:** 10/9/18 **Time:** 1800

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 125 0356731; 4129555

Characteristics of the floodplain unit:

Average sediment texture: Coarse sand

Total veg cover: 10 % Tree: 0 % Shrub: 0 % Herb: 10 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☒ Mudcracks
- ☒ Ripples
- ☒ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 125 0356733; 4129555

Characteristics of the floodplain unit:

Average sediment texture: Coarse silt

Total veg cover: 50 % Tree: 15 % Shrub: 15 % Herb: 20 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☒ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Zion National Park

Water Rights Settlement Agreement

This Agreement is made and entered into by and among the United States of America (United States), the State of Utah (Utah), the Washington County Water Conservancy District (Washington District), and the Kane County Water Conservancy District (Kane District).

RECITALS

A. Utah, pursuant to Chapter 4, Title 73, Utah Code Ann. 1953, as amended, initiated a statutory adjudication of water rights on July 21, 1980, in the Fifth Judicial District Court of the State of Utah in and for Washington County, Civil No. 800507596, which encompasses all the rights to the use of water, both surface and underground, within the drainage area of the Virgin River and its tributaries in Utah.
B. The United States has been joined as a party to this statutory adjudication pursuant to the provisions of 43 U.S.C. § 666. A "Statement of Water User's Claims on behalf of the United States of America on Lands Administered by the Department of the Interior, National Park Service, for Division No. 3," was filed on May 18, 1987.
C. In order to remove causes of present and future controversy over the waters of the Virgin River system without further litigation, the United States, Utah and the Washington and Kane Districts have conducted extensive negotiations regarding
the settlement of reserved water right claims filed by the United States for Zion National Park (or Park).
D. These negotiations have resulted in the recognition of the reserved water rights of the United States for Zion National Park and also the agreement of the United States to subordinate its reserved water rights to existing State water rights, and to allow for some potential future development of water above Zion National Park, as set forth herein.
E. Pursuant to the terms of this Agreement, the Washington District has agreed to abandon two major reservoir sites above Zion National Park, the Bullock site on the Upper North Fork Virgin River and a site in the Barracks area of Parunuweap Canyon on the East Fork Virgin River (East Fork). Steps have also been taken which have resulted in the elimination of a proposal to divert water out of the Virgin River Basin from points above the Park. The Washington District has identified potential projects below the Park, which include: (1) the Sand Hollow Reservoir Project; (2) a collection system and pipeline to divert the flows of Pah Tempe (La Verkin) Springs; (3) securing a reduction in the minimum flows required in the Virgin River from 86 to 50 cubic feet per second (cfs) during the period of November 1 to March 31; and (4) the Ash Creek Project. A more detailed description of each of these four projects is set forth in the draft Virgin River Management Plan dated May 2, 1996.
F. The terms and provisions of the Zion National Park Settlement Agreement are set forth below.
NOW, THEREFORE, based on the mutual promises contained herein, the parties agree as follows:

AGREEMENT

Article 1: Federal Reserved Water Rights for Zion National Park
A. To fulfill the purposes for which lands now comprising Zion National Park were reserved from the public domain, the United States has water rights for all federal lands within the present boundaries of Zion National Park that were reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States. This federal reserved water right originates and is defined in federal law. The aliquot part descriptions of these reserved lands are set forth in the applicable proclamations, executive orders, and legislation identified below and in Appendix A. The United States has a reserved right to all water underlying, originating within or flowing through Zion National Park, including perennial, intermittent, and ephemeral streams, springs, seeps,

lakes, ponds, ground water, and other natural sources of water, pertaining or belonging to the reserved lands, that was unappropriated as of the dates of reservation of the lands now within the boundaries of the park, which waters are to remain in a free flowing condition, subject to present and future administrative uses necessary to fulfill reservation purposes. The date of priority for either in-stream or administrative uses of the United States' federal reserved water rights for Zion National Park will be the date on which the place of use was first reserved from the public domain.

B. By virtue of mesne conveyances and appropriations, the United States also holds state appropriative rights in wells, springs and surface diversions on streams, at the locations, in the amounts, and for the uses indicated in the table attached as Appendix B. Water diverted and used for present and future administrative purposes necessary to fulfill reservation purposes will first be satisfied from existing state appropriative rights held by the United States for Zion National Park. In addition to the water provided by the state appropriative rights listed in Appendix B, at least 466 acre-feet per year (AFY) may be diverted and used from those waters reserved for Park purposes, in order to satisfy the administrative needs of the Park. At least 180 days prior to placing any increment of this federal reserved water right for administrative purposes to use or changing the use thereof, the United States agrees to provide notice to the State Engineer concerning the location and means of diversion, the source, quantity, and diversion rate of water, depth and diameter of well (if applicable), the nature of use, the anticipated effective date, and a map depicting the existing system and proposed modifications. This information will be publicly available. The total amount of water available for Park administrative purposes under state and federal reserved rights combined shall not exceed 1295 AFY. The state appropriative rights identified in this paragraph and in Appendix B, and the federal reserved water rights for administrative purposes identified in this paragraph, are not subject to the subordination set forth in Article 11.

C. The purposes for which Zion National Park was established and priority dates to water reserved therefor are as identified in Presidential Proclamation No. 877, 36 Stat. 2498, dated July 31, 1909; Presidential Proclamation No. 1435, 40 Stat. 760, dated March 18, 1918; the Act of November 19, 1919, 41 Stat. 356; Executive Order No. 418 1, dated March 24, 1925; Executive Order No. 5037, dated January 28, 1929; the Act of June 13, 1930; 46 Stat. 582; Presidential Proclamation No. 2221, 50 Stat. 1809, dated January 22, 1937; the Act of July 11, 1956, 70 Stat. 527; the Act of February 20, 1960, 74 Stat. 4; the Antiquities Act of June 8, 1906, 59 Stat. 225, 16 U.S.C. § 431; the Act of October 21, 1976, 90 Stat. 2732; and the National Park Service Establishment Act, 64 Stat. 225, 16 U.S.C. § 1. The purposes and uses of the reserved water rights include the preservation of extraordinary examples of canyon erosion, preservation of the area for scientific research, protection of objects of historic and scientific interest and, pursuant to the National Park Service Establishment Act, conservation of "the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." 16 U.S.C. § 1 . Accordingly, for enforcement purposes, the federal reserved water right for Zion National Park shall be deemed to comprise those waters in the Virgin River Basin as set forth in Article I.A. and I.B., less those quantities subject to the subordinations set forth below. The federal reserved water rights recognized hereby include all water rights of every nature and description derived from the reserved water rights doctrine, from all sources of water, both surface and underground, and includes all types and kinds of uses whatsoever, and encompasses all claims asserted by or through the United States for Zion National Park as now constituted.

Article 11. Subordination of Federal Reserved Water Rights

A. The United States subordinates the non-administrative federal reserved water rights described in Article LA., subject to the limitations contained herein, to all valid existing perfected water rights and approved applications with priority dates prior to January 1, 1996, and to certain new diversions and depletions, as set forth more specifically below.

B. Generally

1. No reservoir shall be located upstream of Zion National Park on the main stems of the East Fork, the North Fork of the Virgin River (North Fork), La Verkin Creek, Deep Creek, Crystal Creek, or on any tributary of the North Fork or East Fork, except as specifically provided herein.

2. Any flood control structure constructed upstream of the Park shall be designed only to attenuate high flows which are dangerous to life or property. The parties agree to consult on flood control proposals and will develop operational guidelines by mutual consent which are consistent with this Agreement and which will protect the resources of Zion National Park.

3. A ground water protection zone shall be established as shown in Appendix C for the drainage basins of the

East and North Forks, located up gradient and within 2 miles of the park boundary. Development of ground water within this zone shall be limited to a diversion rate of 35 gallons per minute (gpm) or less per well, shall withdraw no more than 15 AFY per well, and is subject to the overall limitations on depletions contained in Articles II.C.1. and ILDA., respectively.

C. North Fork of the Virgin River and Certain Other Streams

1. Subject to the limitations contained herein, the United States' subordination extends to new diversions and depletions from surface and ground water sources of up to but not to exceed a total depletion of 6,000 AFY, with no more than 2,500 AFY occurring from surface water, within the composite comprising the drainage basin of the North Fork above the southern boundary of Zion National Park near Springdale, Utah, and the portions of the drainage basins of Ash Creek, La Verkin Creek, North Creek, and Shunes Creek located upstream of Zion National Park (see Appendix D), distributed as described below.

a) There may be up to 3,750 AFY of new depletion in the drainage basin of the Upper North Fork (North Fork Virgin River above the confluence with Deep Creek), Crystal Creek, Deep Creek, and Kolob Creek, with no more than 1,000 AFY occurring in each the Upper North Fork and Crystal Creek, no more than 2,000 AFY in Kollob Creek, and no more than 750 AFY in Deep Creek (excluding Crystal Creek) with a maximum of 250 AFY being taken from surface water in Deep Creek, resulting from the new development of water resources, except that

i) if the Washington District develops a project which diverts Crystal Creek flows to Kolob Reservoir (Water Right Number 81-355, A29398 or other subsequent application filed to cover this project) and such diversions exceed 1,000 AFY, then no other new depletions within the Crystal Creek drainage are allowed. All depletion of water attributable to the Crystal Creek/Kolob Reservoir project shall be charged against the overall depletion limit of 6,000 AFY for the drainage basin of the North Fork Virgin River and other streams set forth in Article 11.C. 1.,

ii) the maximum diversion rate from Crystal Creek to Kolob Reservoir shall not exceed 50 cfs,

iii) the average annual diversion from Crystal Creek to Kolob Reservoir shall not exceed 4,000 acre-feet (AF) less any amounts exchanged to ground water development, based on a 5-year moving average,

iv) the maximum annual diversion from Crystal Creek shall not
exceed 6,000 AF, less any amounts exchanged to ground water development,

v) the active storage capacity of Kolob Reservoir shall not be increased beyond its present capacity by more than 4,000 AF,

vi) the flow of Crystal Creek immediately below its confluence with Spanish Hollow shall be maintained at no less than 0.5 cfs when diversions are being made from Crystal Creek,

vii) new surface water diversions from Deep Creek and its tributaries downstream of the confluence of Deep Creek and Crystal Creek shall not cumulatively exceed 1 cfs,

viii) new surface water diversions on the Upper North Fork shall not exceed the lesser of a) one-half of the existing flow, measured immediately upstream of the diversion, or b) that rate of diversion which maintains a flow of 2 cfs in the channel immediately below the diversion,

ix) the regulated discharge from Kolob Reservoir shall not exceed 35 cfs, except for matters involving dam safety.

b) There may be up to 750 AFY of new depletion per drainage, with no more than 250 AFY per drainage from surface water, from La Verkin Creek, North Creek, and Orderville Canyon, and up to 250 AFY of new depletion per drainage from surface and groundwater combined, from Camp Creek, Clear Creek, Goose Creek, Echo Canyon, Shunes Creek, and Taylor Creek.

c) No new reservoirs upstream of the Park with individual total storage capacities of more than 20 AF shall be constructed in any of the drainages covered by Article II.C., with the exception of the proposed enlargement of Kolob Reservoir.

d) New reservoirs upstream of the Park with individual total storage capacities which are less than or equal to 20 AF and located in any of the drainages covered by Article II.C. shall not be limited as to number but shall be subject to the overall limitation upon depletion contained in Article II.C.1.

D. East Fork of the Virgin River

1. Subject to the limitations contained herein, the United States' subordination also extends to new diversions and depletions from surface and ground water sources in the East Fork upstream or up gradient of the eastern boundary of Zion National Park, of up to but not to exceed a total depletion of 5,000 AFY (see Appendix D), with no more than 3,250 AFY occurring from surface water, as set forth more specifically below.

a) One or more new reservoirs with cumulative active storage capacity of up to but not to exceed 6,750 AF may be constructed on Stout Creek, Lydia's Canyon, Muddy Creek or Cove Canyon (not both), East Fork above Stout Canyon, and on other tributaries of the East Fork upstream of Glendale (see Appendix E).
b) The number of new reservoirs at the locations described in Article II.D.l.a) above, having individual total storage capacities greater than 20 AF, shall not exceed 10.
c) New reservoirs with individual total storage capacities which are less than or equal to 20 AF shall not be limited as to number but shall be subject to the overall limitation upon depletion in Article II.D.1.
2. New surface water diversions on the East Fork or its tributaries shall not cumulatively exceed 60 cfs.
3. The existing flow or 2 cfs, whichever is less, shall be maintained immediately below any new surface water diversion to reservoirs constructed on streams defined in Article II.D.l.a).
4. The existing flow or 1 cfs (including seepage), which ever is less, shall be maintained immediately below any new reservoir constructed on streams defined in 11.D.1.a).
5. Cumulative releases from new reservoirs constructed on streams defined in II.D.l.a) above, shall not increase the flow measured at the U.S. Geological Survey (USGS) gage on the East Fork Virgin River near Springdale (USGS No. 09404900), by more than 25 cfs during any 7-day period and shall not exceed the long-term monthly average at the Springdale gage by more than 15 cfs. As measured at said gage, the maximum instantaneous flow attributable to releases from such reservoirs shall not exceed 50 cfs, except for matters involving dam safety.
6. Surface water diversions to new reservoirs described in II.D.l.a) above shall not occur except during the period from November 1 to May 31, subject to the by-pass flow requirements described above.

Article III: Other Provisions
A. During the month of March each year, a meeting will be scheduled between Zion National Park and the Washington District to discuss forecasted runoff, water levels in Kolob Reservoir and the anticipated schedule and duration for that year's reservoir releases. Other details concerning Kolob Reservoir releases will be worked out by separate agreement, if necessary.
B. This Agreement shall be effective immediately upon the completion of a land exchange between the U.S. Bureau of Land Management (BLM) and the Washington District, whereby the Washington District acquires title to BLM public lands at the site of the proposed Sand Hollow Reservoir.
C. If any federal legislative or administrative action hereafter prevents the State of Utah from permitting development and use of water in any drainage or subdrainage subject to the subordination of the United States' federal reserved water right for Zion National Park herein contained, the undeveloped remainder of the water herein listed as available for future development in such drainage or subdrainage shall be made available in one or more other drainages covered by this Agreement. In the event of such federal legislative or administrative action, the parties hereto shall attempt to agree as to the drainage or drainages in which any such relocated quantity may be developed and how the limitations of the United States' subordination will be modified to facilitate the transfer of such water, provided that such development must occur within the drainages herein identified, and that no party will unreasonably withhold consent to such relocation.
D. The subordination to listed quantities and locations of future water development shall not be effective to the extent and upon proof that specific wells have caused, are causing, or may cause specific and significant adverse impacts to an identifiable resource or resources of Zion National Park. This notwithstanding, the provisions of this paragraph shall not apply to any groundwater rights presently perfected or approved under State law, with priority dates prior to January 1, 1996.
E. If any provision of this Agreement is found to be unlawful and of no effect, the remaining provisions shall remain in effect and fully binding on the parties, and if necessary, the parties hereto shall resume negotiations to revise any such unlawful provision.
F. Upon a proper showing of necessity, the provisions of this Agreement may be modified, with proper notice and concurrence of the Court, only upon the mutual consent of the parties to this Agreement, which consent shall not be unreasonably withheld.
G. Because of the unique nature of Zion National Park, nothing in this Agreement shall constitute an admission, waiver or precedent as to any party for any other federal reserved water right claim in the State of Utah.
H. Nothing in this Agreement shall be construed or interpreted to:
1. in any way affect the water rights of the United States in the Virgin River Basin for agencies and interests other than Zion National Park;

2. establish any standard to be used for the quantification of federal reserved water rights in any other judicial or administrative proceeding;
3. limit in any way the rights of the parties or any person to litigate any issue or question not resolved by this Agreement;
4. restrict the power of the United States to reserve water in the future, or to acquire additional rights to the use of water under the laws of the State of Utah; or
5. restrict the power of the State of Utah or the State Engineer in allocating, administering or distributing the waters of the State.

I. Upon becoming effective, this Agreement will be the subject of a separate proposed determination of water rights issued by the State Engineer specifically covering the portion of the Virgin River Basin encompassing Zion National Park, and the parties hereto will cooperate to obtain an interlocutory decree covering same. If the parties hereto are not successful in securing such interlocutory decree, this Agreement shall nevertheless remain binding as among the parties hereto until a final decree issues covering these water rights. The water rights of the United States, as set forth and quantified herein, shall be protected under State law in the same manner as any water right originating under State law, without losing its character as or the attributes of a federal reserved water right as provided under federal law.

J. The provisions of this Agreement, and particularly the provisions of Article 11 hereof, shall be taken into consideration by the State Engineer in acting upon applications, under State law, for new appropriations or change applications upstream or up gradient of Zion National Park and shall be afforded the same consideration in such proceedings as state appropriative rights; however, the United States shall have the primary responsibility for protecting its own rights and for filing appropriate protests in any proceedings before the State Engineer.

K. Upon entry of a decree covering the water rights of the United States for Zion National Park, the East Entrance Well and the Taylor Creek Well, described in Appendix F, will be administered with priority dates of June 13, 1930, and January 22, 1937, respectively, pursuant to the terms of Article I.A., and the State appropriative water rights thereon will be withdrawn.

L. Upon written request from the United States, the State Engineer will provide information regarding new diversions and total depletions of water in the respective drainages above the Park pursuant to Article 11 of this Agreement.

M. Depletion amounts attributable to specific diversions, as well as to usage and storage patterns, shall be determined by procedures approved by the parties hereto.

N. This Agreement is executed in quintuplicate. Each of the five copies bearing original signatures shall be deemed an original.

Article IV: Definitions

Acre-foot - The amount of water necessary to cover one acre of land to a depth of one foot, equivalent to 43,560 cubic feet or 325,851 gallons.

Active Storage Capacity - The volume of water available for release from a reservoir between the bottom of the outlet and the bottom of the spillway. This shall not include any storage designated as dead storage or a conservation pool.

Annual - Period of time which begins on October 1 and ends on September 30 (water year).

Depletion - The amount of water which is consumptively used by any action or process or otherwise removed from a drainage basin and not returned thereto.

Diversion - The removal of water from its natural source by means of a dam, ditch, canal, flume, bypass, pipeline, conduit, well, pump, or other act of man, that results in a decrease in the amount of water in the source at the point of such removal.

Existing Flow - Annual, monthly and daily flows which exist as of the effective date of this Agreement, which reflect historical diversions and depletions associated with existing perfected water rights and approved applications (except for Water Right No. 81-355, A29398 on Crystal Creek), as determined from available stream gage records and accepted hydrologic methods.

Ground Water - Water beneath the surface of the earth in pores, crevices, and space s in rock and soil, under saturated conditions and in sufficient quantities to supply water to wells, springs, seeps, rivers, streams, creeks, and natural lakes. New - After January 1, 1996.

Reservoir - A man-made impoundment for storing water from which water may be withdrawn for beneficial purposes. Impoundments constructed solely for flood control or sediment retention are specifically excluded.

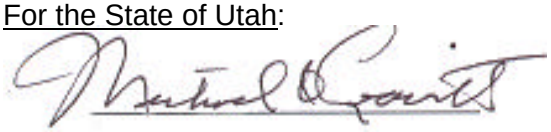
Surface Water - Water on the surface of the earth in rivers, streams, creeks, channels, lakes, reservoirs and other water bodies. Wells within the 500-year floodplain of the East and North Forks of the Virgin River, Camp Creek, Clear Creek, Crystal Creek, Deep Creek, Echo Canyon, Goose Creek, Kolob Creek, La Verkin Creek, Orderville Canyon, Shunes Creek, or Taylor Creek, which are less than 100 feet in depth, shall be considered to draw from surface water.

Year - A calendar year commencing January 1 and ending December 31. It being resolved and agreed to as delineated above, the undersigned parties express their mutual agreement hereto this 4th day of December, 1996.

Home **Back** **Appendicies** **Signature Page**

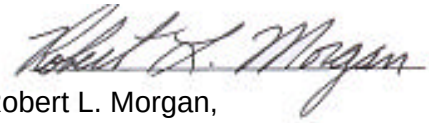
It being resolved and agreed to as delineated above, the undersigned parties express their mutual agreement hereto this 4th day of December, 1996.

For the State of Utah:

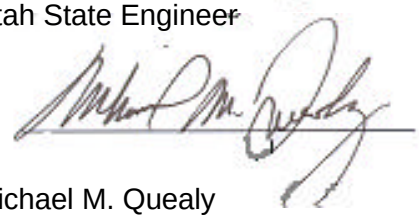


Michael O. Leavitt
Governor, State of Utah

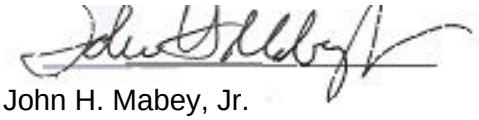
Ted Stewart
Director, Utah Department of Natural Resources



Robert L. Morgan,
Utah State Engineer

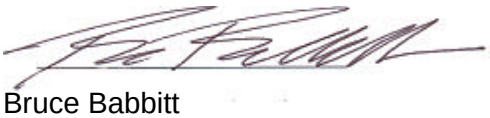


Michael M. Quealy
Chief, Natural Resources
Attorney General's Office



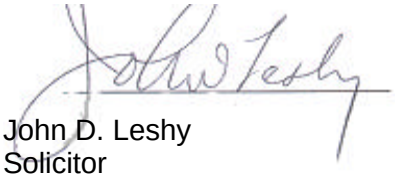
John H. Mabey, Jr.
Assistant Attorney General

For the United States:

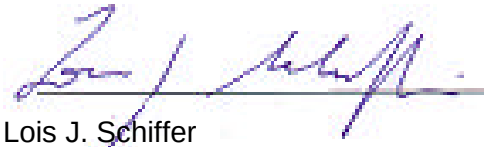


Bruce Babbitt
Secretary of the Interior

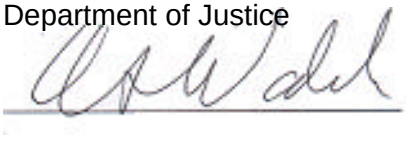
Donald Flavey
Superintendent, Zion National Park



John D. Leshy
Solicitor
Department of Interior

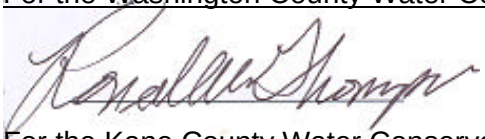


Lois J. Schiffer
Assistant Attorney General
Department of Justice



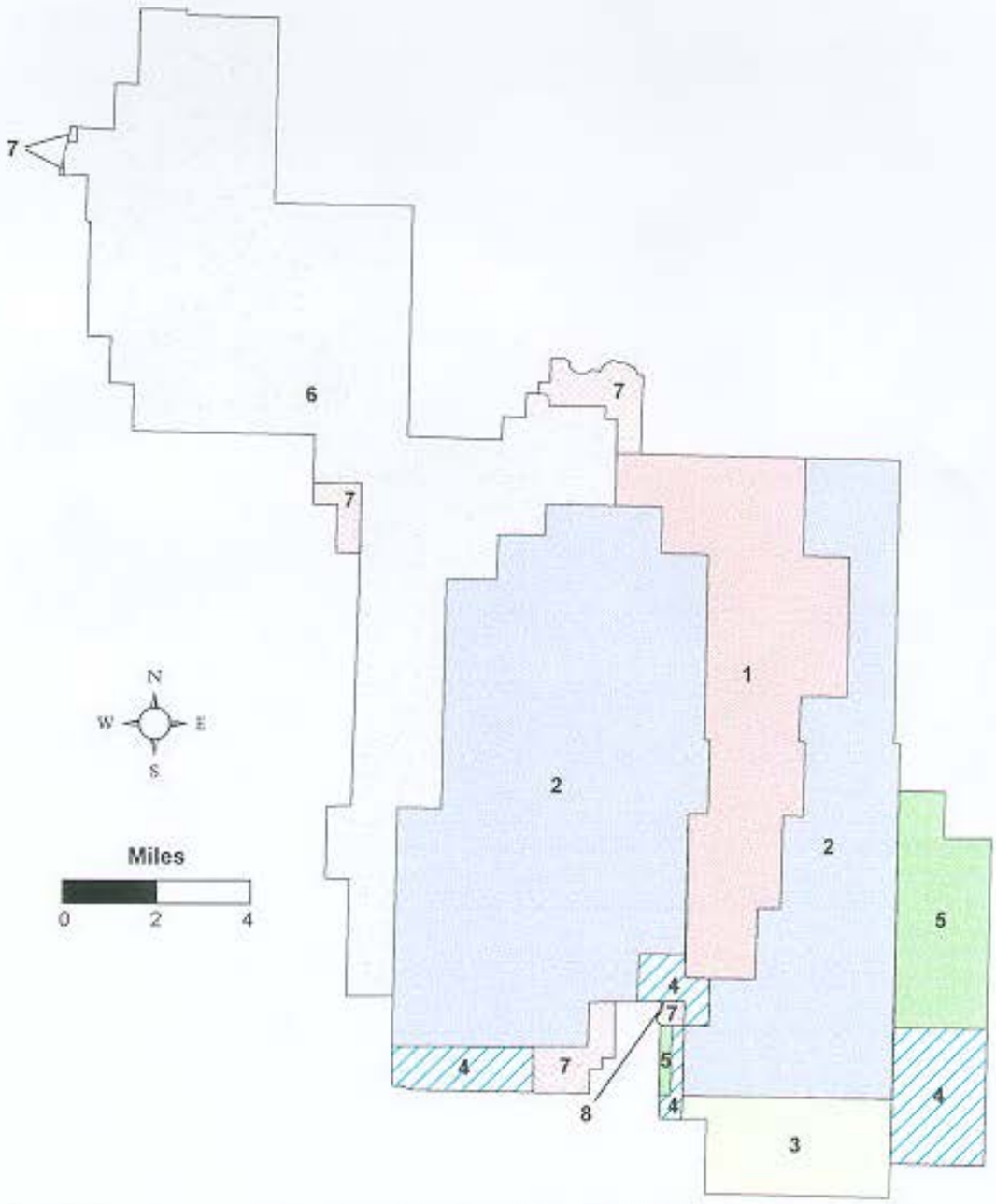
Andrew F. Walch
Department of Justice

For the Washington County Water Conservancy District:



For the Kane County Water Conservancy District:

APPENDIX A
DATES OF LAND RESERVATIONS
ZION NATIONAL PARK



LEGEND: Lands Reserved from the Public Domain

1	National Monument withdrawal by Presidential Proc. 877, dated July 31, 1909 (36 Stat. 2498). Designated a National Park by the Act of November 19, 1919 (41 Stat. 356).
2	National Monument withdrawal by Presidential Proc. 1435, dated March 18, 1918 (40 Stat. 1760). Designated a National Park by the Act of November 19, 1919 (41 Stat. 356).
3	National Monument withdrawal by Executive Order 4181, dated March 24, 1925. Designated a National Park by the Act of June 13, 1930 (46 Stat. 582).
4	National Monument withdrawal by Executive Order 5037, dated January 28, 1929. Designated a National Park by the Act of June 13, 1930. (46 Stat. 582)
5	Withdrawal for National Park by the Act of June 13, 1930 (46 Stat. 582).
6	National Monument withdrawal by Presidential Proc. 2221, dated January 22, 1937 (50 Stat. 1809). Designated a National Park by Act of July 11, 1956 (70 Stat. 527).
7	Added to and made part of the National Park by the Act of February 20, 1960 (74 Stat. 4).
8	Added to and made part of the National Park by the Act of October 21, 1976 (90 Stat. 2732).

APPENDIX B
STATE APPROPRIATIVE WATER RIGHTS
ZION NATIONAL PARK

WUC No.	Right Evidenced BY:	Priority Date	Diversion Works	Water Source	Legal Location (Salt Lake Basin & Meridian)	Type of Use	Period of Use	Diversion Rate (cfs)	Irrigated Acres in Original Decree	Volume of Use-(acre-feet)
81-1128	CERT. a222, Award No. 66 of the Virgin River Decree	1877	[Zion Canyon Water System]* CRAWFORD DITCH GIFFORD DITCH OAK CK. SPG. AREA BIRCH CK. SPG. AREA SINAWAVA SPRINGS SCOUT LKOUT PIPELINE UPPER GROTTO SPG. A. LOWER GROTTO SPG. WYLIE RETRT. SPG. A.	North Fk. Virgin R. North Fk. Virgin R. Oak Ck. Springs Birch Ck. Springs Sinawava Spg. Scout Lookout Spg. Upper Grotto Spg. Lower Grotto Spg. Wylie Retreat Spg.	N.50 deg. 29'E. 1998 ft. from NE Cor., See. 21, T41S, R10W N.41deg.28'45" E. 4233.80 ft. from NE Comer, Sec.21, T41S, R1OW S.86deg.23'W. 8633.70 ft. from NE Comer, Sec. 21, T41 S, R10W N.21deg.56'E. 9151.95 ft. from NE Comer, Sec. 21, T41S, R10W N.18deg.43'E. 27901.20 ft. from NE Comer, Sec. 21, T41 S, R10W N.16deg.59'E. 25095.34 ft. from NE Comer, Sec. 21, T41S, R10W N.29deg.47'E. 17059.55 ft. from NE Comer, Sec. 21, T41S, R10W N.31deg.39'E. 18223.11 ft. from NE Comer, Sec. 21, T41S, R10W N.32deg.25'25" E. 13167.50 ft. from NE Comer, Sec. 21, T41S, R10W	MUNICIPAL	01/01-12/31	1.21	66.7	266.8
81-1124	CERT. a224, Award No. 63 of the Virgin River Decree	1881	[Zion Canyon Water SystLm]* Same As Cert. a222	Same As Cert. a222	Same As Cert. a222	MUNICIPAL	01/01-12/31	0.53	29.4	117.6
81-1129	CERT. a223, Award No. 65 of the Virgin River Decree	1894	[Zion Canyon Water System]* Same As Cert. a222	Same As Cert. a222	Same As Cert. a222	MUNICIPAL	01/01-12/31	0.53	29.0	116
81-117	A10618 a1657 CERT. a221	05/31/29	[Zion Canyon Water System]* Same As Cert. a222	Same As Cert. a222	Same As Cert. a222	MUNICIPAL	01/01-12/31	0.01	—	3.15
81-3608	Award No. 67 of the Virgin River Decree	1880	FLANIGAN DITCH	North Fk. Virgin R.	S. 550 ft. and E. 950 ft. from the NW Comer, Sec. 22, T41N, R10W	IRRIGATION	01/01-12/31	1.38	75.9	303.6

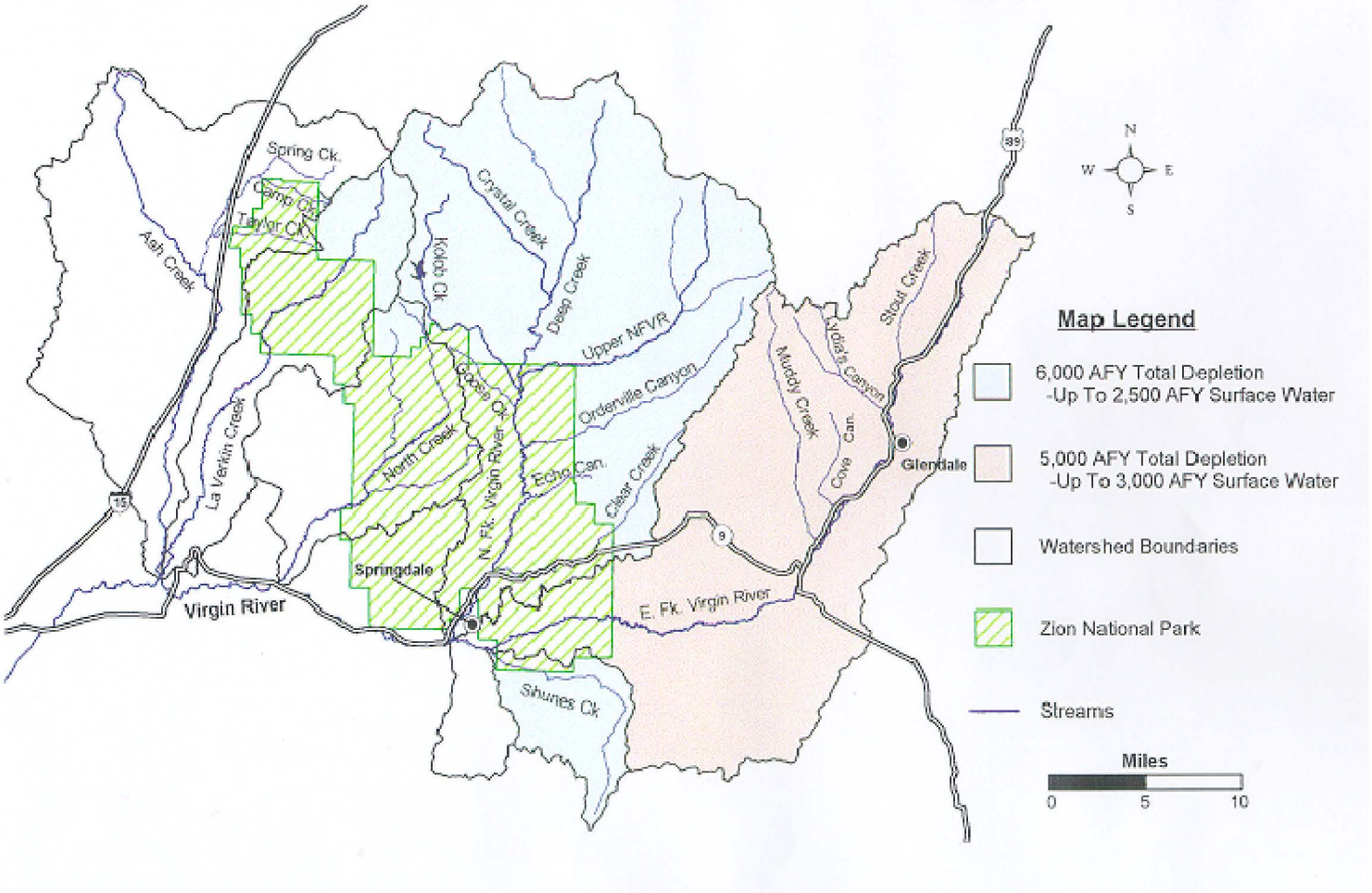
81-728	DILIGENCE CLAIM No. 1031	1900		EARL SPRING	S. 340 ft. and E. 900 ft. from NW Comer, Sec. 9, T40S, R1 I W	DOMESTIC & STOCK WATER	03/01-11/30	0.092	—	1.73
81-113	A8113 CERT. 1197	05/24/19		UNNAMED SPRING	S. 957 ft. and W. 841.5 ft. from NE Comer, Sec. 5, T40S, R1 1W	DOMESTIC	01/01-12/31	0.0002	—	0.14
81-327	A28355 NPR	07/18/56	10 INCH DIAMETER WELL 68 FEET DEEP	SPENDLOVE WELL	N. 1700 ft. and W. 600 ft. from SE Comer, Sec. 8, T40S, R1 1W	DOMESTIC	03/01-11/30	0.015	—	0.34
81-514	A34269 a10851 Cert. 10754	05/03/62	8 INCH DIAMETER WELL 925 FEET DEEP	EAST ENTRANCE WELL	S.75 deg.54'20" W., 6382 ft. from N 1/4 cor Sec. 21 T41 S, R9W	IRRIGATION, STOCKWATER, DOMESTIC & OTHER	01/01-12/31	0.0223	—	10
81-1373	A36328a a7522 Cert. 9697	08113164	7 INCH DIAMETER WELL 367 FEET DEEP	HAMILTON WELL	S.2810.7 ft. and E. 1857.4 ft. from E 1/4 cor Sec. 8, T40S, R1 1W	IRRIGATION & DOMESTIC	01/01-12/31	—	0.25	1.73
	A36782 Approved Proof filed 10/14/92	02/23165	6 IN H DIAMETER WELL 206 FEET DEEP	TAYLOR CREEK WELL	N. 3348 ft. and E. 2873 ft. from SW Comer, Sec. 29, T38S, R 1 2W	DOMESTIC & OTHER	01/01-12/31	0.0688	—	7.94

Total Volume: 829 acre-fee

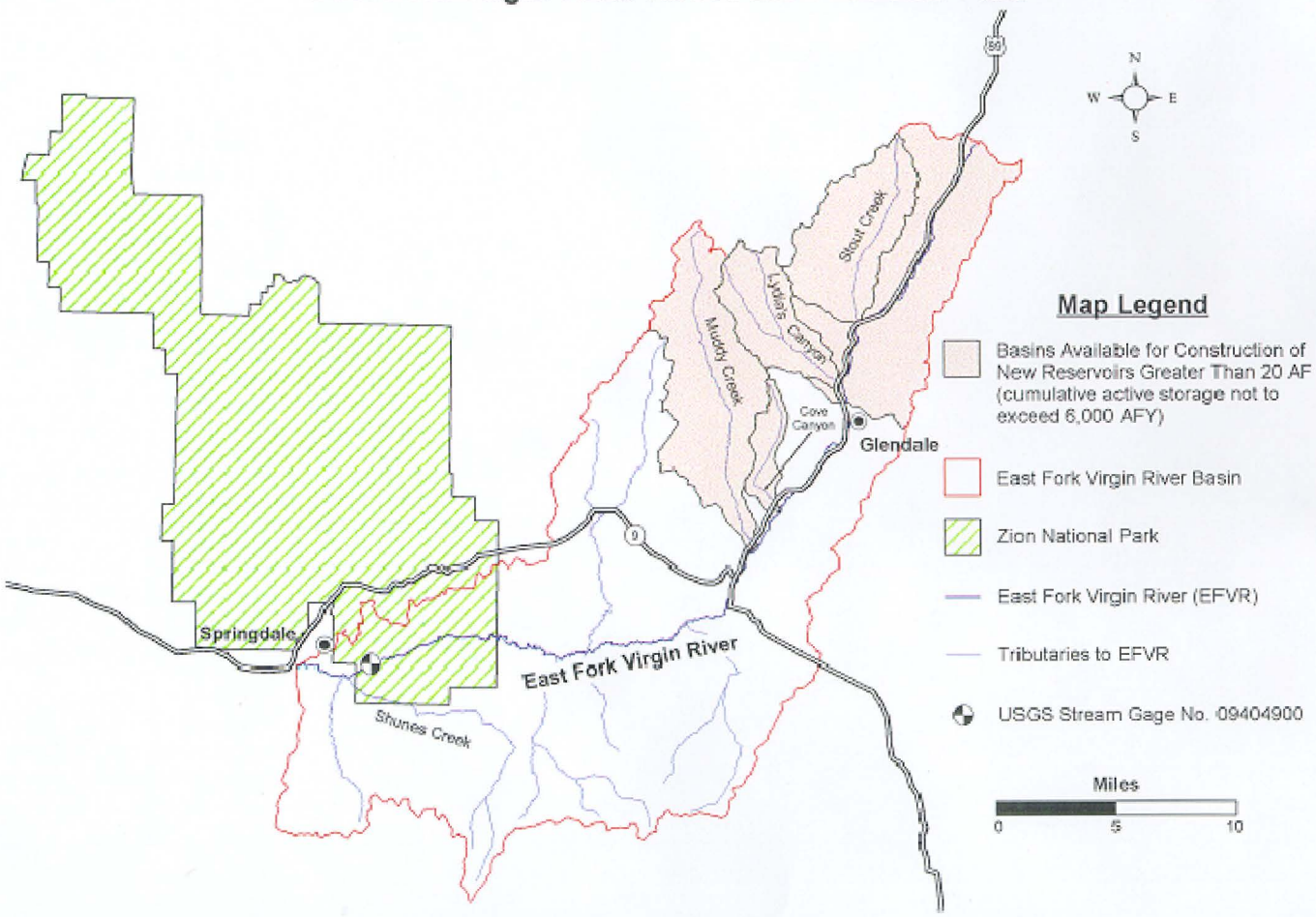
Water is diverted from various sources and comingled in the ZION CANYON WATER SYSTEM. The water rights, as described in each of the individual certificates, entities the United States to "...divert the water at any, each, or all of the... described points of diversion..."
Water Right Volumes are calculated using the following assumptions: -a water duty of 4 ac-ft per acre is used for irrigable land -a value of 0.45 ac-ft per year per family of four is used for domestic use -a value of 10 gallons per visitor is used for use by park visitors (EPA -570-9-82-004) -a value of 2.8 ac-ft per one-hundred head of livestock is used for stockwater use

APPENDIX D

Allowable Depletion Levels for the East and North Forks of the Virgin River, and North, La Verkin and Ash Creeks, Draining Above, and Through, Zion National Park



APPENDIX E
Basins Available for Construction of New Reservoirs (Greater Than 20 Acre-Feet)
East Fork Virgin River Above Zion National Park



APPENDIX F DIVERSION WORKS ASSOCIATED WITH FEDERAL RESERVED WATER RIGHTS
ZION NATIONAL PARK

Water Source	Diversion Works	Priority Date	Legal Location Type of Use (Salt Lake Basin & Meridian)	Period of Use	Diversion Rate (cfs)
EAST ENTRANCE WELL	8 INCH DIAMETER WELL 925 FEET DEEP	06/13/30	S.75 deg.54'20"W 63 ft. from N 1/4 cor Sec. 21 T41S, R9W IRRIGATION, STOCKWATER, DOMESTIC & OTHER	01/01-12/31	0.0223
TAYLOR CREEK WELL	6 INCH DIAMETER WELL 206 FEET DEEP	01122/37	N. 3348 ft. and E. 2873 ft. from SW Corner, Sec. 29, T38S, R12V\ IRRIGATION, DOMESTIC & OTHER	01/01-12/31	0.0688

Colorado River Compact, 1922

The States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, having resolved to enter into a compact under the Act of the Congress of the United States of America approved August 19, 1921 (42 Statutes at Large, page 171), and the Acts of the Legislatures of the said States, have through their Governors appointed as their Commissioners:

W.S. Norviel for the State of Arizona,
W.F. McClure for the State of California,
Delph E. Carpenter for the State of Colorado,
J.G. Scrugham for the State of Nevada,
Stephen B. Davis, Jr., for the State of New Mexico,
R.E. Caldwell for the State of Utah,
Frank C. Emerson for the State of Wyoming,

who, after negotiations participated in by Herbert Hoover appointed by The President as the representative of the United States of America, have agreed upon the following articles:

ARTICLE I

The major purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River System; to establish the relative importance of different beneficial uses of water, to promote interstate comity; to remove causes of present and future controversies; and to secure the expeditious agricultural and industrial development of the Colorado River Basin, the storage of its waters, and the protection of life and property from floods. To these ends the Colorado River Basin is divided into two Basins, and an apportionment of the use of part of the water of the Colorado River System is made to each of them with the provision that further equitable apportionments may be made.

ARTICLE II

As used in this compact-

(a) The term "Colorado River System" means that portion of the Colorado River and its tributaries within the United States of America.

(b) the term "Colorado River Basin" means all of the drainage area of the Colorado River System and all other territory within the United States of America to which the waters of the Colorado River System shall be beneficially applied.

(c) The term "States of the Upper Division" means the States of Colorado, New Mexico, Utah, and Wyoming.

(d) The term "States of the Lower Division" means the States of Arizona, California, and Nevada.

(e) The term "Lee Ferry" means a point in the main stream of the Colorado River one mile below the mouth of the Paria River.

(f) The term "Upper Basin" means those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming within and from which waters naturally drain into the Colorado River System above Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River System which are now or shall hereafter be beneficially served by waters diverted from the System above Lee Ferry.

(g) The term "Lower Basin" means those parts of the States of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River System below Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River System which are now or shall hereafter be beneficially served by waters diverted from the System below Lee Ferry.

(h) The term "domestic use" shall include the use of water for household, stock, municipal, mining, milling, industrial, and other like purposes, but shall exclude the generation of electrical power.

ARTICLE III

(a) There is hereby apportioned from the Colorado River System in perpetuity to the Upper Basin and to the Lower Basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a), the Lower Basin is hereby given the right to increase its beneficial consumptive use of such waters by one million acre-feet per annum.

(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River System, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then, the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

(d) The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification of this compact.

(e) The States of the Upper Division shall not withhold water, and the States of the Lower Division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River System unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October first, 1963, if and when either Basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for a further apportionment as provided in paragraph (f) any two signatory States, acting through their Governors, may give joint notice of such desire to the Governors of the other signatory States and to The President of the United States of America, and it shall be the duty of the Governors of the signatory States and of The President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the Upper Basin and Lower Basin the beneficial use of the unapportioned water of the Colorado River System as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

ARTICLE IV

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for navigation would seriously limit the development of its Basin, the use of its waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nevertheless remain binding.

(b) Subject to the provisions of this compact, water of the Colorado River System may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(c) The provisions of this article shall not apply to or interfere with the regulation and control by any State within its boundaries of the appropriation, use, and distribution of water.

ARTICLE V

The chief official of each signatory State charged with the administration of water rights, together with the Director of the United States Reclamation Service and the Director of the United States Geological Survey shall cooperate, ex-officio:

(a) To promote the systematic determination and coordination of the facts as to flow, appropriation, consumption, and use of water in the Colorado River Basin, and the interchange of available information in such matters.

(b) To secure the ascertainment and publication of the annual flow of the Colorado River at Lee Ferry.

(c) To perform such other duties as may be assigned by mutual consent of the signatories from time to time.

ARTICLE VI

Should any claim or controversy arise between any two or more of the signatory States: (a) with respect to the waters of the Colorado River System not covered by the terms of this compact; (b) over the meaning or performance of any of the terms of this compact; (c) as to the allocation of the burdens incident to the performance of any article of this compact or the delivery of waters as herein provided; (d) as to the construction or operation of works within the Colorado River Basin to be situated in two or more States, or to be constructed in one State for the benefit of another State; or (e) as to the diversion of water in one State for the benefit of another State; the Governors of the States affected, upon the request of one of them, shall forthwith appoint Commissioners with power to consider and adjust such claim or controversy, subject to ratification by the Legislatures of the States so affected.

Nothing herein contained shall prevent the adjustment of any such claim or controversy by any present method or by direct future legislative action of the interested States.

ARTICLE VII

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.

ARTICLE VIII

Present perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact. Whenever storage capacity of 5,000,000 acre-feet shall have been provided on the main Colorado River within or for the benefit of the Lower Basin, then claims of such rights, if any, by appropriators or users of water in the Lower Basin against appropriators or users of water in the Upper Basin shall attach to and be satisfied from water that may be stored not in conflict with Article III.

All other rights to beneficial use of waters of the Colorado River System shall be satisfied solely from the water apportioned to that Basin in which they are situate.

ARTICLE IX

Nothing in this compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under this compact or the enforcement of any of its provisions.

ARTICLE X

This compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination all rights established under it shall continue unimpaired.

ARTICLE XI

This compact shall become binding and obligatory when it shall have been approved by the Legislatures of each of the signatory States and by the Congress of the United States. Notice of approval by the Legislatures shall be given by the Governor of each signatory State to the Governors of the other signatory States and to the President of the United States, and the President of the United States is requested to give notice to the Governors of the signatory States of approval by the Congress of the United States.

IN WITNESS WHEREOF, the Commissioners have signed this compact in a single original, which shall be deposited in the archives of the Department of State of the United States of America and of which a duly certified copy shall be forwarded to the Governor of each of the signatory States.

DONE at the City of Santa Fe, New Mexico, this twenty-fourth day of November, A.D. One Thousand Nine Hundred and Twenty-two.

W. S. NORVIEL
W. F. McCLURE
DELPH E. CARPENTER
J. G. SCRUGHAM
STEPHEN G. DAVIS, JR.
R. E. CALDWELL
FRANK C. EMERSON

Approved:
HERBERT HOOVER

BIOLOGICAL ASSESSMENT

Cove-East Fork Virgin River Watershed Plan

Kane and Washington Counties, Utah

Prepared for:

Natural Resources Conservation Service

125 South State Street

Salt Lake City, Utah 84138

Prepared by:

Ron Bolander

Eocene Environmental Group, Inc.

579 West Galena Park Place, Unit 102

Draper, Utah 84020

August 2026

TABLE OF CONTENTS

1.0 Introduction 1

2.0 Proposed Action 2

2.1 Project Location 2

2.2 Project Description 2

2.2.1 Project Measures (Construction) 3

2.2.2 Operation 4

2.2.3 Maintenance and Replacement 5

2.3 Applicant-Committed Conservation Measures 5

2.3.1 General Measures 5

2.3.2 USFWS Threatened, Endangered, and Proposed Animal Species 6

2.3.3 Plants and Animals 6

2.3.4 Migratory Birds/Bald and Golden Eagles 8

3.0 Action Area 9

3.1 Long Valley 9

3.2 Parunuweap Canyon and Washington County 9

3.3 Action Area Buffers 9

3.4 Habitat Characteristics of the Action Area 10

3.4.1 Community Types 10

3.4.2 Aquatic and Surface Water Resources 10

3.4.3 Vegetation 11

3.4.4 Recreation 12

3.4.5 Wildlife 12

3.4.6 Migratory Bird Species and Bald and Golden Eagles 14

4.0 Federally Listed and Proposed Species and Designated Critical Habitat Considered 16

4.1 California Condor 22
4.1.1 Status 22
4.1.2 Habitat Characteristics 22
4.1.3 Environmental Baseline 23
4.1.4 Survey Methods/Results 23
4.1.5 Designated Critical Habitat 23
4.2 Mexican Spotted Owl 23
4.2.1 Status 23
4.2.2 Habitat Characteristics 23
4.2.3 Environmental Baseline 24
4.2.4 Survey Methods/Results 24
4.2.5 Designated Critical Habitat 24
4.3 Southwestern Willow Flycatcher 25
4.3.1 Status 25
4.3.2 Habitat Characteristics 25
4.3.3 Environmental Baseline 25
4.3.4 Survey Methods/Results 25
4.3.5 Designated Critical Habitat 25
4.4 Virgin River Chub 25
4.4.1 Status 25
4.4.2 Habitat Characteristics 26
4.4.3 Environmental Baseline 26
4.4.4 Survey Methods/Results 26
4.4.5 Designated Critical Habitat 26
4.5 Woundfin 27
4.5.1 Status 27

4.5.2 Habitat Characteristics 27
4.5.3 Environmental Baseline 27
4.5.4 Survey Methods/Results 28
4.5.5 Designated Critical Habitat 28
4.6 Monarch Butterfly 28
4.6.1 Status 28
4.6.2 Habitat characteristics 28
4.6.3 Environmental Baseline 28
4.6.4 Survey Methods/Results 29
4.6.5 Designated Critical Habitat 29
5.0 Water Model Results 30
5.1 Water Diversions 30
5.2 Water Releases 30
5.3 Water Modeling Results 30
5.3.1 Annual Changes 30
5.3.2 Monthly Changes 32
5.4 Impacts on Riparian Vegetation and Habitat 34
5.5 Water Model Summary 34
6.0 Effects Analysis 35
6.1 California Condor 35
6.1.1 Construction Impacts 35
6.1.2 Operational Impacts 35
6.1.3 Maintenance Impacts 36
6.2 Mexican Spotted Owl 37
6.2.1 Construction Impacts 37
6.2.2 Operational Impacts 38

6.2.3 Maintenance Impacts 38
6.3 Southwestern Willow Flycatcher 39
6.3.1 Construction Impacts 39
6.3.2 Operational Impacts 40
6.3.3 Maintenance Impacts 40
6.4 Virgin River Chub/Woundfin 41
6.4.1 Construction Impacts 41
6.4.2 Operational Impacts 42
6.4.3 Maintenance Impacts 43
6.5 Monarch Butterfly 43
6.5.1 Construction Impacts 43
6.5.2 Operational Impacts 44
6.5.3 Maintenance Impacts 45
7.0 Conclusion and Determination of Effects 45
7.1 California Condor 46
7.2 Mexican Spotted Owl 47
7.3 Southwestern Willow Flycatcher 48
7.4 Virgin River Chub/Woundfin 48
7.5 Monarch Butterfly 49
8.0 References 50

LIST OF TABLES

Table 1. Common Vegetation* 11

Table 2. Noxious and Invasive Species 12

Table 3. Wildlife 13

Table 4. Invasive Animal Species* 14

Table 5. Migratory Birds and Bald and Golden Eagles* 15

Table 6. ESA–Listed and Proposed Species Summary 17

Table 7. Projected Annual Changes to EFVR Flow 31

Table 8. Projected Annual Changes to EFVR Depth 31

Table 9. Projected Annual Changes to EFVR Width 31

Table 10. Projected Monthly Changes in Flow at the Mt. Carmel Gauge (09404700) 32

Table 11. Projected Monthly Changes in Flow at the Springdale Gauge (09405500) 33

Table 12. Summary of Effects 45

LIST OF APPENDICES

Appendix A Figures

Appendix B United States Fish and Wildlife Service Information for Planning and Consultation and Utah Department of Wildlife Resources Natural Heritage Program Documents

Appendix C Action Area Photos

1.0 INTRODUCTION

The Natural Resources Conservation Service (NRCS), in association with the Kane County Water Conservancy District (KCWCD) and Washington County Water Conservancy District (WCWCD) as project sponsors, is preparing a Watershed Plan-Environmental Impact Statement (Plan-EIS) for proposed improvements in the East Fork Virgin River (EFVR) Watershed.

The NRCS, KCWCD, and Alpha Engineering (Alpha) contracted Eocene Environmental Group, Inc. (Eocene; formerly Transcon Environmental, Inc.) to prepare the Plan-EIS and analyze the project for anticipated impacts to natural and human resources. This includes an analysis of potential impacts to federally listed threatened, endangered, and proposed species protected under the Endangered Species Act (ESA) as well as avian species protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). In accordance with Section 7 of the ESA, this Biological Assessment (BA) was prepared to evaluate the potential impacts that implementing this Proposed Action may have on federally listed threatened, endangered, and proposed species, their habitat, and any designated critical habitat that may be present.

The purpose of this Proposed Action is to provide the Glendale, Mt. Carmel, and Orderville irrigation companies additional water storage capacity to meet present and future agricultural water demands during dry summer months; add a new, local, water-based recreational opportunity; and provide additional water to the WCWCD for agricultural and municipal and industrial (M&I) use.

2.0 PROPOSED ACTION

2.1 Project Location

The Proposed Action is in Kane County and Washington County, Utah, as shown in Figure 1 (Vicinity Map) in Appendix A.

2.2 Project Description

The NRCS, KCWCD, and WCWCD are proposing to construct a new reservoir and associated facilities to provide irrigation and agricultural water to local users in the Orderville, Glendale, Mt. Carmel, and Hurricane, Utah, areas during the summer months. Water from the reservoir would also be used for undetermined M&I use in Washington County year-round.

The reservoir would be constructed in compliance with Article II Section D of the Zion National Park (ZNP) Water Rights Settlement Agreement of 1996 (ZNP Agreement; Agreement 1996), as summarized below:

- One or more new reservoirs with cumulative active storage capacity of up to but not exceeding 6,750 acre-feet may be constructed in certain tributaries as outline in Article II Section D of the ZNP Agreement

- New surface water diversions on the EFVR or its tributaries shall not cumulatively exceed 60 cubic feet per second (cfs)

- The existing flow or 2 cfs, whichever is less, shall be maintained immediately below any new surface water diversion constructed on streams defined in section 11.D.1a) of the ZNP Agreement

- The existing flow or 1 cfs (including seepage), whichever is less, shall be maintained immediately below any new reservoir constructed on streams defined in section 11.D.1a) of the ZNP Agreement

- Cumulative releases from new reservoirs constructed on streams identified above shall not increase the flow measured at the USGS gauge on the EFVR near Springdale (USGS No. 09404900) by more than 25 cfs during any 7-day period and shall not exceed the long-term monthly average at Springdale gauge by more than 15 cfs; as measured at said gauge, the maximum instantaneous flow attributable to releases from such reservoirs shall not exceed 50 cfs except for matters involving dam safety

- Surface water diversions to new reservoirs described above shall not occur except during the period from November 1 and May 31, subject to the bypass flow requirements described above

Additionally, water would be used for unspecified M&I uses in Washington County. No facility construction or new surface disturbance would occur in Washington County resulting from this Proposed Action. Sections 2.2.1, 2.2.2, and 2.2.3 of this BA describe the project measures, operation, and maintenance and replacement needs.

2.2.1 Project Measures (Construction)

Project construction would include the following components, also shown in Figure 2 (Reservoir Detail Plan), Figure 3 (Glendale Irrigation Pipeline Replacement), Figure 4 (Mt. Carmel Pipeline Construction), and Figure 5 (Recreation Area) in Appendix A:

- A single 6,055-acre-foot capacity reservoir, with principal and auxiliary spillways; approximately 700 feet of a concrete encased steel pipeline would extend from the reservoir to connect to the existing Orderville irrigation pipeline
- Homogeneous earth-fill dam (90 feet by 1,900 feet) with an internal filter/drain
    - The proposed dam would be designed to meet current NRCS and Utah Dam Safety regulations (Utah Code Chapter 73-5a) and engineering standards
- Replacement of approximately 1.7 miles of pipeline in the Glendale irrigation system
- Approximately 4.55 miles of new pipeline in the Mt. Carmel field irrigation area
- A booster pump station to provide pressurized water for the Mt. Carmel irrigation Company (MCIC)
- Approximately 3.2 miles of gravel road to access the reservoir and surrounding properties
- A 4.1-acre outdoor recreational site including a boat ramp, two pit toilets, a pavilion, and 20 recreational vehicle site facilities (including a barbecue grill, table, and fire pit); no utilities would be extended to the recreation facilities
- Construction would require staging large, earth-moving machinery, a portable gravel pit operation, water, and multiple personnel
    - Staging areas for dam construction would be located within the footprint of the reservoir. An additional 200- to 300-foot buffer downstream of the dam would be used for instrumentation and additional staging
- Construction would begin after all necessary permits are obtained and plans are finalized. Construction of the reservoir, pipelines, associated recreation facilities, and access roads is estimated to take up to 15 months to complete. Three borrow sites would be used (Esplin, Lamb, Tait) to provide material (gravel and riprap) for dam construction
- A fish screen at the proposed reservoir intake with a 1-inch maximum pore opening would prevent fish and debris from entering the pipeline to the Orderville hydroelectric power plant.

Approximately 259 acres of permanent ground disturbance would occur where the proposed reservoir, dam, primary and auxiliary spillways, access roads, pipelines, and recreational features would be constructed. Approximately 5.7 acres of this disturbance would be from using the borrow pit sites. Approximately 64 acres of temporary ground disturbance would occur during replacement of the existing pipeline, installation of new pipelines, and contingency disturbance area for construction equipment siting. Three existing borrow sites would be used to provide

material for construction. The Tait and Lamb pits would provide gravel, while the Esplin pit would provide riprap. The Tait and Lamb pits are located on private land near Mt. Carmel and Mt. Carmel Junction, and the Esplin pit is located near the Glendale Bench Road on private land. These borrow sites are shown on Figure 1 (Vicinity Map) in Appendix A and Photos 2, 3, and 4 in Appendix C.

The Washington County portion of the project would include the following actions:

- The increased water yield in the river system provided by the proposed Cove Reservoir would be used to supplement water supply to the Hurricane Canal Company (HCC) service area and for undetermined M&I demand. Water would be diverted to the reservoir in compliance with the ZNP agreement during the non-irrigation season, November 1 - May 31. Water could be released from the reservoir at any time but would most likely occur in the summer for agricultural use, and in the winter for M&I use.

- Water flows to Washington County from the Proposed Action would comply with the ZNP Agreement (Agreement 1996)

- No surface disturbance would result from implementation of the Proposed Action in the Washington County portion of the Proposed Action

- The additional water would be provided to existing agricultural fields; no new lands would be converted to agricultural use

2.2.2 Operation

Operation activities are the activities performed to achieve the goals of the project. Water from the reservoir would provide irrigation and agricultural water for the Orderville, Glendale, Mt. Carmel, and Hurricane areas, as well as provide M&I water for Washington County for approximately 100 years after project construction. The project is anticipated to have a 100-year life before major pipeline repair would be required.

Routine maintenance and replacement actions would be required for the life of the proposed project. O&M measures that would be implemented include regular inspection and maintenance of the dam and associated components; grading of the spillways, as necessary, to maintain access and functionality; annual inspection of the pipeline air valves to ensure that they are functioning properly; annual cleaning of the pipelines; regular inspection and maintenance of the recreation area and boat ramp to ensure hard surfaces and erosional protection and to keep the site free of debris; and regular operation and maintenance of reservoir levels by agreement between the WCWCD and the KCWCD.

Water would be diverted from the EFVR at the Orderville Diversion and conveyed by pipeline to the proposed reservoir (See Appendix A, Figure 2 [Reservoir Plan]). A channel maintenance flow regime of 70 percent of existing bankfull flows (approximately 33 cfs) would be maintained in the 3.2-mile reach between the Orderville Irrigation Company (OIC) diversion and the Mt. Carmel Irrigation Company (MCIC) Diversion for a 10-day period each spring (between March and June). If stream flows are less than 33 cfs, all flows would be allowed to pass through the reach for the 10-day period. Only the OID agricultural water right of 4.7 cfs would be diverted. The MCIC would continue to divert 6.58 cfs for agricultural purposes. Water for Long Valley agricultural

purposes would be diverted from the reservoir during the summer months. Water committed to Washington County for agricultural and M&I purposes would generally be released during the summer months, and water for M&I purposes would generally be released during the winter months, based on demand. Releases to Washington County would comply with the ZNP Agreement (Agreement 1996).

Water would be released from the proposed reservoir back into the EFVR through the existing Orderville hydroelectric power plant. A fish screen installed at the proposed reservoir intake with a 1-inch maximum pore opening would prevent fish and debris from entering the pipeline to the Orderville hydroelectric power plant. The hydroelectric facility utilizes two Turgo Impulse turbines, which focus the water through small nozzles at high pressure and velocity into the turbine. The combination of the small nozzle size, high velocity, and sudden pressure drop would make it highly unlikely that any fish that would survive.

2.2.3 Maintenance and Replacement

Maintenance and replacement actions would include the performance of actions needed to keep the proposed reservoir and associated facilities safe and functioning as planned. This would include preventing deterioration and repairing damage or replacement of structures if one or more of the components fail. Damage to any of the completed structures caused by normal deterioration, droughts, flooding, or vandalism is considered maintenance.

The structures would be inspected by the KCWCD on a regularly scheduled basis as well as during, or immediately following, major storms, earthquakes, or other occurrences that may adversely affect the structures and appurtenant works. It is anticipated that routine maintenance would include maintaining water levels, grading the spillway as necessary, annual cleaning of the pipeline system, erosional protection, and excessive vegetation cleanup.

2.3 Applicant-Committed Conservation Measures

The following applicant-committed conservation measures will be implemented as part of the Proposed Action. These measures have been summarized from the Cove-EFVR Watershed Plan-EIS and apply to the management and protection of the listed and proposed species as well as migratory birds and bald and golden eagles that may be impacted by project development. The full set of committed measures is found in the Plan-EIS. These measures have been taken from and are similar to those implemented for other NRCS–funded Utah projects. The impact analysis and effects determinations made in this BA assume that all these measures will be fully implemented as part of project development.

2.3.1 General Measures

- Implementation of the Proposed Action would comply with all applicable federal and state laws and regulations as well as local zoning and building ordinances during all phases of the project

- Construction activities would be limited to the smallest extent possible within the Action Area

- During construction activities, vehicle parking and material stockpiles would be located within designated staging areas

- Construction personnel would adhere to state and NRCS fire prevention and suppression requirements; construction personnel will always have fire tools and extinguishers available

- Disturbed areas not used as part of the reservoir dam, recreation site, road or dam infrastructure would be restored to preconstruction conditions after construction was completed

- Borrow sites would be cleaned, recontoured, and any debris removed, per instructions of the owner

- An Emergency Action Plan would be developed prior to construction of the Proposed Action

- Additional measuring devices would be installed to record flows into and out of the Cove Reservoir. Metering devices would be installed to record flows through the existing Orderville hydroelectric power plant that will release water rights owned by the WCWCD back into the EFVR as well as water-right shortages being delivered from the reservoir to the Mt. Carmel and Orderville irrigation companies. These meter records would also be filed annually with the Utah State Division of Water Rights

2.3.2 USFWS Threatened, Endangered, and Proposed Animal Species

- Any unexpected encounters with a protected species would be immediately reported to the Utah Division of Wildlife Resources (UDWR), United States Fish and Wildlife Service (USFWS), and NRCS

- All trash at the construction site will be cleaned up daily to minimize any interest in the area by the California condor during construction
- Coordination would be maintained with WCWCD regarding construction activities and potential impacts to downstream Virgin River habitat

- Native milkweed (*Asclepias spp.*) and other monarch butterfly (*Danaus plexippus*) pollinator-friendly native plant species would be included in reclamation seed mixes per NRCS and USFWS guidance

- Disturbance of any encountered milkweed habitat would be avoided to the extent possible

2.3.3 Plants and Animals

- The minimum vegetation necessary would be removed for construction or maintenance activities.

- Areas disturbed during construction activities would be restored to preconstruction conditions. This would be accomplished by grading to match natural contours and

stabilizing through establishment of ground cover. These areas would be reestablished by seeding with an herbaceous plant seed mixture and revegetation with NRCS-approved plant species to match the surrounding native plant community.

- An NRCS-approved, weed-free, native seed mix would be used where seeding is required.
- Established cottonwood trees in riparian areas would be left in place for fish and wildlife habitat.
- A detailed weed control plan would be provided by the NRCS for approval before construction.
- All equipment would be cleaned of soil, seeds, vegetation matter, and other debris prior to entering or reentering the project area to avoid any introduction of non-native plants or weeds.
- Vegetation would be monitored periodically for the potential establishment of noxious weeds.
- Use of herbicides would comply with NRCS requirements.
- A post-construction period weed control plan would be developed by KCWCD.
- Any use of herbicides would comply with all federal and state requirements.
- Prior to stocking the proposed reservoir with fish, a management plan will be developed to ensure that non-native fish species do not escape from the reservoir into the EFVR. The management plan would meet nonnative stocking and control requirements. Cooperating Agencies would have an opportunity to review this plan prior to its implementation.
- Any fish stocking in the reservoir would adhere to state and federal regulations and would be under the responsibility of the Utah Division of Wildlife Resources
- Any unexpected encounters with a protected species would be immediately reported to UDWR, USFWS, and NRCS.
- Coordination with WCWCD regarding construction activities and potential impacts to downstream Virgin River habitat would be maintained
- All open pits or trenches would be monitored throughout construction to prevent entrapment of wildlife
- Excavated holes more than 2 feet deep would be covered at the close of each day or provided with one or more escape ramps. Alternatively, fencing may be erected around open pits or trenches.
- Before pits or trenches are filled, they would be inspected for trapped animals. If found, they would be moved by a qualified biologist approved by the UDWR and NRCS.

- No rodenticides would be used on the project site.

- No mature riparian trees would be removed during construction activities unless approved by the Utah Division of Wildlife Resources and NRCS.

- No machinery would be permitted in the EFVR except for along existing roadways.

- Refuse and trash, including stakes and flags, would be removed and properly disposed of on a regular basis.

2.3.4 Migratory Birds/Bald and Golden Eagles

- Where possible, construction activities, including habitat alteration and noise, would be conducted outside of Utah's migratory bird primary nesting season (April 1–July 15). In Utah, the migratory bird nesting season can extend from January 1 to August 31 (especially for raptors). Therefore, a preconstruction survey for nesting birds would be conducted by a qualified biologist approved by the UDWR and NRCS no more than 5 days prior to the beginning of on-site work. If an active nest is identified, a no-activity buffer, as approved by the UDWR and NRCS, would be established around the nest site and would remain in place until the young have fledged and/or the nest becomes non-active (USFWS 2002a). Follow-up surveys to confirm that all young have successfully fledged would be conducted by a qualified biologist prior to construction in that area.

- After such surveys are performed and disturbance occurs, no additional disturbance during the avian breeding season would occur without first conducting an additional avian survey.

- If the existing topography limits line-of-sight between an active nest and construction activities, spatial and seasonal buffers may be reduced.

- Should an active migratory bird nest be discovered, the appropriate UDWR and NRCS agency biologist would be notified, and an appropriate buffer would be established around the nest until the migratory bird nesting period is over or young have fledged.

3.0 ACTION AREA

The Action Area is defined as the area that could be directly or indirectly affected by a federal action (50 CFR 402.02). It includes sites where all permanent and temporary areas of ground disturbance would occur as well as species-specific buffers, as described in Section 3.3. The Action Area analyzed in this BA includes the areas where permanent disturbance would occur (Long Valley) and the downstream areas, (Parunuweap Canyon and Washington County). The length of the Action Area is approximately 50 river miles along the EFVR and the mainstem Virgin River, where water would be diverted at the Quail Creek Reservoir diversion for agricultural and M&I uses. See Figure 6 (Action Area in Long Valley) and Figure 7 (Action Area in Washington County) in Appendix A for maps of the Action Area.

3.1 Long Valley

The Action Area in Long Valley begins near Glendale, Utah, and extends along the EFVR, past Orderville (the proposed reservoir site) to Mt. Carmel Junction. The two gravel borrow sites (Lamb and Tait pits) are located immediately east of the EFVR near Mt. Carmel. The rip rap borrow site (Esplin pit) is located approximately 7 miles east of Glendale near Glendale Road.

3.2 Parunuweap Canyon and Washington County

Parunuweap Canyon is located between the Long Valley and the Washington County portions of the Action Area. It primarily consists of the BLM administered Parunuweap Canyon Wilderness Study Area (WSA) and the ZNP managed designated wilderness. The 30,800-acre Parunuweap Canyon WSA is located immediately east of and adjoins ZNP. The Zion Wilderness was designated by congress in 2009 and comprises approximately 83 percent of ZNP. A ribbon of green marks the EFVR's approximately 10-mile course through the WSA (BLM 2025) and 7 miles through the arid southernmost portion of the Zion Wilderness (ZNP 2025a).

The remaining portion of the Action Area extends approximately 50 miles downstream via the EFVR and mainstem Virgin River to the Quail Creek Reservoir diversion. At this site, water from the reservoir would be diverted to existing agricultural fields serviced by the HCC. Water would also be used for unspecified Washington County M&I uses.

3.3 Action Area Buffers

For the analysis of listed and proposed species, the Action Area includes species-specific buffers. These buffer distances are determined based on activities proposed to occur within the project footprint (i.e., the immediately impacted area) that may cause impacts extending beyond the footprint (e.g., noise, vibration, dust, etc.). These buffers were determined based on anticipated levels of construction-related disturbance, including noise, dust, and ground vibrations produced by vehicles and heavy equipment. In the Long Valley portion of the Action Area, species-specific buffers include:

- Bird Species: 0.5 miles
- Fish Species: 0.25 miles

- Other species: 300 feet

In the Parunuweap Canyon and Washington County portions of the Action Area, no surface disturbance would occur. There would be negligible changes to water depth and width (discussed in Section 5.0), and therefore, the Action Area extends to a 100-foot buffer of the EFVR to account for the riparian area surrounding the river. No impact would occur outside of this area.

3.4 Habitat Characteristics of the Action Area

Characteristics of the Action Area are summarized below. A detailed discussion is found in the Plan-EIS. The Action Area includes a mix of developed residential land, disturbed grasslands, grazing pastures, and native vegetation communities as described below.

3.4.1 Community Types

Dominant ecological systems in the survey area include inter-mountain basins big sagebrush, Colorado plateau pinyon-juniper woodland, introduced upland vegetation-shrub, shrub land, inter-mountain basins greasewood flat, rocky mountain lower montane riparian woodland and shrub land, Mogollon chaparral, disturbed/successional–shrub regeneration, and pasture/hay (USGS 2018). Species observed within or adjacent to the survey area were characteristic of these ecosystems and included a mix of native and non-native trees, shrubs, forbs, and grasses.

3.4.2 Aquatic and Surface Water Resources

All areas where ground or surface disturbance would occur from project implementation were surveyed in 2018, 2019, and 2021. Surveys identified two small artificial wetlands, 10 intermittent or perennial streams, and five ephemeral streams (Eocene 2025).

The EFVR intersects the Action Area but is outside of any surface disturbance areas. It is located approximately 0.24 miles west of the Tait borrow pit site, 0.16 miles west of the Lamb borrow pit site, and would be approximately 0.67 miles east of the proposed reservoir site. The EFVR flows downstream from Mt. Carmel Junction through Parunuweap Canyon WSA managed by the Bureau of Land Management (BLM) and Zion National Park where it meets with the North Fork of the Virgin River near Rockville, Utah. The river, now known as the Virgin River, continues downstream through Washington County. A mature riparian area that is adaptable to significant changes to river flow habitat is located adjacent to the stream. The riparian area of the Virgin River supports cottonwood trees and a diversity of herbaceous plants and grasses. Nearby, saturated wetlands make nice habitat for cattails, willows, aquatic plants, and rushes (ZNP 2025d). See Figure 1 (Vicinity Map), Figure 6 (Action Area in Long Valley), and Figure 7 (Action Area in Washington County) in Appendix A.

EFVR surface flows vary throughout the year, primarily in response to spring runoff or intense storm events, during which the river carries high sediment loads. From 1967 to 2020, the average monthly discharge of the river, measured at the 09404450 Glendale USGS Gauge, ranged from a high of 33.8 cfs in April to a low of 9.9 cfs in August (Alpha 2026).

Kanab Creek runs near the Esplin borrow pit site but would not be affected by borrow pit activities. Photo 5 in Appendix C shows the Esplin borrow pit site and its relation to Kanab Creek.

3.4.3 Vegetation

Vegetation found at the proposed reservoir/pipeline site consists of a greasewood-salt scrub association that transitions into sagebrush-perennial grassland habitat and, eventually, into a pinyon-juniper woodland on slopes. Agricultural land is also present. Much of the project area is in a disturbed condition with several roads and trails present, and the existing vegetation reflects a sub-climax ecological state.

A mature, generally sparse, riparian area accompanies the EFVR where it traverses the Long Valley portion of the Action Area. Dominant riparian vegetation in this area consists of tamarisk (*Tamarix chinensis*), Russian olive (*Elaeagnus angustifolia*), and cottonwood trees (*Populus spp.*). Understory consists of various shrubs, forbs, and grasses.

In Parunuweap Canyon and Washington County, riparian species along the EFVR and Virgin River include a dense layer of willow (*Salix spp.*), cane (*Phragmites spp.*), cottonwood trees, rushes (*Juncus spp.*), and a diversity of other herbaceous plants and grasses. Invasive species, such as tamarisk and Russian olive, are present (ZNP 2025d). As with the Long Valley portion of the Action Area, this riparian zone is adapted to large changes in flows resulting from flooding, spring runoff, etc. (Lisa Church, personal communication May 2025).

Common vegetation species located in the Action Area are identified in Table 1. Additionally, species listed under the Utah Noxious Weed Act along with other invasive species have been observed within, or likely occur within, the Action Area. These are identified in Table 2. These invasive species usually occur on disturbed areas where native vegetation has been significantly or totally removed (e.g., roadsides, livestock trails, and flood-damaged areas). Noxious weeds and invasive plant species often exclude other vegetation, reducing species diversity and ecosystem stability.

Table 1. Common Vegetation*

Common Name	**Scientific Name**
rabbitbrush	*Chrysothamnus spp.*
blackbrush	*Coleogyne ramosissima*
bluebunch wheatgrass	*Pseudoroegneria spicata*
bottlebrush squirreltail	*Elymus elimoides*
cattail	*Typha latifolia*
cottonwood	*Populus spp.*
Great Basin sagebrush	*Artemisia tridentata*
Indian ricegrass	*Achnatherum hymenoides*
Mormon tea	*Ephedra viridis*
narrowleaf willow	*Salix exigua*
needle-and-thread grass	*Hesperostipa comata*

Common Name	Scientific Name
purple three-awn	*Aristida purpurea*
saltbush	*Atriplex spp.*
two-needle pinyon pine	*Pinus edulis*
Utah juniper	*Juniperus osteosperma*
**Joanna's thistle	*Cirsium joannae*

*The Utah Natural Heritage Program (UNHP) Online Species Search Report did not identify any plant species of greatest conservation within a 2-mile radius of the Action Area (UDWR 2024; UDWR 2025a)

**A State of Utah species of greatest conservation need, identified by the NPS.

Table 2. Noxious and Invasive Species

Common Name	Scientific Name
cheatgrass	*Bromus tectorum*
Russian olive	*Elaeagnus angustifolia*
Russian thistle	*Salsola spp.*
tamarisk	*Tamarix spp.*
cane	*Phragmites spp.*
tall whitetop	*Lepidium latifolium*
Scotch thistle	*Onopordum acanthium*
Canada thistle	*Cirsium arvense*
Spotted knapweed	*Centaurea stoebe*

3.4.4 Recreation

The Action Area contains recreation opportunities such as hiking, wildlife viewing, and landmark sight-seeing. Stunning canyon vistas and unique hiking opportunities are present. Landmarks in the Parunuweap Canyon WSA include Harris Mountain and Elephant Butte. Wildlife, including mule deer, mountain lions, rattlesnakes, and birds are common. The EFVR flows through the WSA. By following the EFVR, hikers can traverse over ten miles through the canyon to the east side of ZNP (BLM 2008; BLM 2025).

3.4.5 Wildlife

Common wildlife species located in the Action Area are identified in Table 3. In addition to these species, several additional species of small mammals, including voles, squirrels, chipmunks, mice, birds, and bats, are also likely present.

Table 3. Wildlife

Common Name	Scientific Name
*Arizona toad	*Bufo microscaphus*
badger	*Taxidea taxus*
*bald eagle	*Haliaeetus leucocephalus*
*band-tailed pigeon	*Patagioenas fasciata*
bobcat	*Lynx rufus*
*burrowing owl	*Athene cunicularia*
chuckar	*Alectoris chukar*
cottontail rabbit	*Sylvilagus ssp.*
coyote	*Canis latrans*
*desert sucker	*Pantosteus clarkii*
*ferruginous hawk	*Buteo regalis*
*flammulated owl	*Psiloscops flammeolus*
*flannelmouth sucker	*Catosomus latipinnis*
gartersnake	*Thamnophis elegans*
*Gila monster	*Heloderma suspectum*
*golden eagle	*Aquila chrysaetos*
gopher snake	*Pituophis catenifer*
jack rabbit	*Lepus californicus*
*kit fox	*Vulpes marotis*
*Lewis's woodpecker	*Melanerpes lewis*
mitered vertigo	*Vertigo modesta concinnula*
mourning dove	*Zenaida macroura*
mule deer	*Odocoileus hemionus*
*northern leopard frog	*Lithobates pipiens*
*peregrine falcon	*Falcon perefrinus*
raccoon	*Procyon lotor*
*Virgin spinedace	*Lepidomeda mollispinis*
weasel	*Mustela frenata*
western toad	*Anaxyrus boreas*
*Yuma myotis	*Myotis yumanensis*

Common Name	Scientific Name
*speckled dace	*Rhinichthys osculus*

*Species of Greatest Conservation Need identified in the UNHP Online Species Search Report (2024). These species are also identified in the Utah Wildlife Action Plan (UDWR 2025a).

Invasive animal species also inhabit the Action Area and are shown in Table 4 (NRCS 2012). Administrative Rule R657-60 identifies regulations and procedures designed to prevent and control the spread of aquatic invasive species in Utah. No surveys have been conducted for invasive animal species within the project area, but it can be assumed that some of these species are present.

Table 4. Invasive Animal Species*

Common Name	Scientific Name
Bullfrog	*Rana catesbeiana*
European starling	*Sturnus vulgaris*
fathead/rosy red minnow	*Pimephales promelas*
mosquitofish	*Gambusia affinis*
muskrat	*Ondatra zibethicus*
New Zealand mudsnail	*Potamopyrgus antipodarum*
Nutria	*Myocastor coypus*
quagga mussel	*Dreissena rostiformis bugensis*
Red fox	*Vulpes vulpes*
raccoon	*Procyon lotor*
red shiner	*Cyprinella lutrensis*
red swamp crayfish	*Procambrus clarkia*
white-tailed deer	*Odocoileus virginianus*
Zebra mussel	*Dreissena polymorpha*
non-native non-sport fish	N/A

(NRCS 2012) *This is a general list taken from the NRCS website, and it is unlikely that several of these species are present.

3.4.6 Migratory Bird Species and Bald and Golden Eagles

The USFWS IPaC site identified 16 MBTA and BGEPA species as potentially occurring within the Action Area, identified in Table 5 (USFWS 2025). These species are included in this BA for

informational purposes only, and no impact analysis is included. The IPaC and UNHP documents are included in Appendix B.

Table 5. Migratory Birds and Bald and Golden Eagles*

Common Name	Scientific Name
*bald eagle	*Haliaeetus leucocephalus*
black-shinned sparrow	*Spizella atrogularis*
broad-tailed hummingbird	*Selasphorus platycercus*
California gull	*Larus californicus*
Cassins's finch	*Haemorhous cassinii*
Clark's nutcracker	*Nucifraga columbiana*
evening grosbeak	*Coccothraustes vespertinus*
*golden eagle	*Aquila chrysaetos*
Grace's warbler	*Setophaga graciae*
lesser yellowlegs	*Tringa flavipes*
*Lewis's woodpecker	*Melanerpes lewis*
long-eared owl	*Asio otus*
olive-sided flycatcher	*Contopus cooperi*
pinyon jay	*Gymnorhinus cyanocephalus*
Virginia's warbler	*Vermivora virginiae*
western grebe	*Aechmophorus occidentalis*

*Identified in the IPaC and UNHP Online Species Search Report (2024)

4.0 FEDERALLY LISTED AND PROPOSED SPECIES AND DESIGNATED CRITICAL HABITAT CONSIDERED

This BA addresses the potential effects that could result from implementation of the Proposed Action on species and their habitat (including designated critical habitat) listed as threatened, endangered, or as proposed for listing under the ESA. The USFWS IPaC site (Section 7 consultation) identified 13 ESA–listed or proposed for listing species that may occur within the Action Area or otherwise be affected by the development of the Proposed Action (USFWS 2025). These species are discussed in Table 6. The USFWS IPaC website, USFWS Environmental Conservation Online System website, and the UNHP Database were also reviewed to obtain information on listed and proposed species that may occur within 2 miles of the Action Area (USFWS 2024b; USFWS 2025; UNHP 2024).

The UNHP database identified the records of two species (southwestern willow flycatcher [SWFL] and Mojave desert tortoise) with known occurrences within 2 miles of the Action Area (UNHP 2024). The IPaC and UNHP documents are included in Appendix B. To date, informal consultation and conferencing with the USFWS has been conducted via in-person meetings, video conferences, telephone calls, and email.

Eocene biologists conducted field visits during October 2018 and October 2023 (Esplin Pit site) to verify desktop review findings and assess potential habitat for listed, proposed, MBTA, and BGEPA species within the Action Area (Transcon 2019; Eocene 2025). Only those species with habitat within the Action Area or those that may be affected by Proposed Action have been carried forward in this BA for further analysis. All temporary and permanent areas of disturbance associated with development of the Proposed Action would be contained within the Long Valley portion of the Action Area, as depicted in Figure 6 (Action Area in Long Valley) in Appendix A.

Table 6. ESA–Listed and Proposed Species Summary

Species	Status	Species Info and Potential to Affect	Designated Critical Habitat within Action Area?
Bird Species California condor (*Gymnogyps californianus*)	Experimental Non-Essential (Threatened in ZNP)	The California condor utilizes a variety of habitats for foraging and nesting, including caves and ledges of steep rocky terrain (USFWS 2013a). The Action Area is located within the experimental non-essential range of the California condor (FR 1996). Experimental non-essential species are treated as threatened within ZNP. The species is present in ZNP and may visit other parts of the Action Area (ZNP 2025b). However, no surface disturbance would occur within known occupied California condor habitat. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. None present within the Action Area.
Bird Species Mexican spotted owl (*Strix occidentalis lucida*)	Threatened	In Utah, the Mexican spotted owl (MSO) inhabits isolated mountain ranges and narrow canyons (USFWS 2013b; ZNP 2025c). Occupied designated critical habitat is present within the Action Area in the Parunuweap Canyon WSA and ZNP (FR 2004). Protected Activity Centers (PACs) for the MSO are also present in the ZNP portion of the Action Area (ZNP 2025c). No surface disturbance would occur within MSO habitat, and minor streamflow changes would not affect riparian habitat. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	Yes
Bird Species Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	The SWFL breeds in riparian vegetation and nests where willows or tamarisk are present. Occupied habitat exists downstream in the Parunuweap Canyon WSA, and ZNP, within the Action Area (USFWS 2002b). However, no surface disturbance would occur within SWFL habitat, and minor streamflow changes would not affect riparian habitat. UNHP data identified the presence of the SWFL within 2 miles of the Action Area (UNHP 2024).	No. None present within the Action Area.

Species	Status	Species Info and Potential to Affect	Designated Critical Habitat within Action Area?
Bird Species Western yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	The western yellow-billed cuckoo (WYBC) breeds in riparian habitat with wide floodplains and dense willow-cottonwood or mesquite forests. They rarely occupy areas less than 325 feet wide. No suitable breeding habitat is present in the Parunuweap Canyon WSA and ZNP areas within the Action Area (FR 2014). Potential suitable stop-over habitat for migrating WYBC may be present in these areas. No surface disturbance would occur within WYBC habitat, and minor streamflow changes would not affect riparian habitat. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. None present within the Action Area.
Reptile Species Desert tortoise (*Gopherus agassizii*)	Threatened	The desert tortoise inhabits deserts, grasslands, and rocky hillsides, typically in desert shrub areas below 5,500 feet. The Upper Virgin River Recovery Unit extends from the Quail Creek Reservoir diversion to Springdale, Utah, outside of the Action Area (USFWS 2011). UNHP data identified the presence of the desert tortoise within 2 miles of the Action Area (UNHP 2024).	No. None present within the Action Area.
Fish Species Virgin River chub (*Gila seminuda*)	Endangered	The Virgin River chub is found below 4,500 feet in deep runs or pools with low to medium velocities, and in-stream cover over sandy substrate (USFWS 1995a). In Utah, the Virgin River supports Virgin River chub populations from the Arizona state line to the La Verkin Creek confluence. Virgin River chub has also colonized habitat upstream of Pah Tempe Springs following the establishment of population maintenance flows below Quail Creek Diversion. Virgin River chub distribution currently extends upstream to the old diversion structure in Timpoweap Canyon (2 miles upstream from Pah Tempe Springs, and 4 miles upstream from the La Verkin Creek confluence (PLPCO 2025). UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. None present within the Action Area.

Species	Status	Species Info and Potential to Affect	Designated Critical Habitat within Action Area?
Fish Species Woundfin (*Plagopterus argentissimus*)	Endangered	The woundfin is found in swift, turbid, warm streams over sand. Adult woundfin prefer depths of 8–18 inches and avoid quieter pools (USFWS 1995a). Occupied habitat exists below the Quail Creek Reservoir Diversion. In Utah, designated critical habitat exists approximately 4.8 river miles downstream from the Diversion beginning at the confluence of La Verkin Creek to the Utah-Arizona state line (FR 2000) (PLPCO 2025). UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. None present within the Action Area.
Insect Species Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened	Adult monarch butterflies feed on various flowers but only breed where milkweed is present. Monarch caterpillars have been observed within portions of the proposed Action Area, primarily in ZNP; however, breeding is unlikely within the Long Valley portion of the Action Area due to a lack of milkweed presence. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024). The Cove Reservoir area is likely a flyover area for migrating monarch butterflies but is not a known overwintering site.	No. No Critical Habitat has been designated.
Insect Species Suckley's cuckoo bumble bee (*Bombus suckleyi*)	Proposed Endangered	Suckley's cuckoo bumble bee is an obligate social parasite, dependent on host bumble bees for much of its life cycle. The species has a broad historical distribution across North America, and it has been found in various habitat types including prairies, grasslands, meadows, and woodlands. Occurrence records were found at elevations ranging from approximately 6,000 to 10,500 feet. In the western portion of the range, Suckley's cuckoo bumble bee observations extend from the Yukon, to Arizona, and east to Minnesota. However, the species has not been observed within the western United States since 2016 (USFWS 2024a). It is unlikely that the species is found within the Action Area. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. No Critical Habitat has been designated

Species	Status	Species Info and Potential to Affect	Designated Critical Habitat within Action Area?
Plant Species Jones cycladenia (*Cycladenia humilis var. jonesii*)	Threatened	Jones cycladenia is found in sparsely vegetated desert scrub between 4,000–6,660 feet, typically on steep slopes with gypsiferous, saline soils of the Wasatch, Cutler, Summerville, and Chinle formations (USFWS 2021). No suitable habitat exists in the Action Area. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. No Critical Habitat has been designated.
Plant Species Shivwits milk-vetch (*Astragalus ampullarioides*)	Endangered	Shivwits milk-vetch grows at elevations of 3,018–4,367 feet on soft clay soils linked to the Petrified Forest member of the Chinle Formation. Occupied habitat is restricted to six isolated populations in Washington County, none of which are near the Action Area (USFWS 2006). UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. None present within the Action Area
Plant Species Siler's pincushion cactus (*Pediocactus sileri*)	Threatened	Siler pincushion is endemic to the Arizona/Utah border in Kane and Washington County, Utah, and grows in gypsiferous and calcareous soils from the Moenkopi, Chinle, and Kaibab Formations (USFWS 2008). No occupied habitat exists in the Action Area. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024).	No. No Critical Habitat has been designated.

Species	Status	Species Info and Potential to Affect	Designated Critical Habitat within Action Area?
Plant Species Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	The Ute ladies-tresses is found in wet meadows near springs, lakes, or streams at elevations of 4,300–7,000 feet (USFWS 1995b). While the Action Area is in a Ute ladies'-tresses Analytical Unit, habitat as described above is not present (USFWS 2023). Further, no surface disturbance would occur within any riparian habitat. UNHP data did not identify any known occurrences of the species in the Action Area (UNHP 2024). A general habitat assessment was conducted in the vicinity of the proposed reservoir and borrow pits. No Ute ladies'-tresses suitable habitat was located. The proposed reservoir site is located in dry, terrestrial habitat. Nearby riparian areas along the EFVR are generally woody, lack understory, and are often dry during summer low flow and do not meet Ute ladies'-tresses habitat requirements.	No. No Critical Habitat has been designated.

Based on the analysis in Table 4, it has been determined that the Proposed Action would have **No Effect** on the following species or their designated critical habitat:

- Western yellow-billed cuckoo
- Desert tortoise
- Suckley's cuckoo bumble bee
- Jones cycladenia
- Shivwits milk-vetch
- Siler's pincushion cactus
- Ute ladies'-tresses

The Action Area is located within the monarch butterfly's migrating fly zone, and native flowering plants are present in the area. Therefore, it is possible that the species could be found migrating through the area. The potential for effect is negligible due to the considerable size of the monarch butterfly habitat and the limited duration of construction activities. Therefore, a determination of Not Likely to Jeopardize has been made for this species due to insignificant effects. Because the potential for effect is so low, the monarch butterfly is not discussed further in this document.

The California condor, MSO, SWFL, Virgin River chub, and woundfin are carried forward for detailed analysis in this BA due to the presence of designated critical habitat within the Action Area (for MSO), the possibility of minor streamflow changes (California condor, SWFL), or their presence in the Virgin River (for Virgin River chub and woundfin).

4.1 California Condor

4.1.1 Status

The Action Area is generally located within the experimental non-essential range of the condor (USFWS 2024c). However, the species is listed as Threatened within ZNP (FR 1996). The Washington County Portion of the Action Area, which includes the EFVR and 100-foot buffer, runs through the ZNP.

4.1.2 Habitat Characteristics

California condors use a variety of habitats for foraging, roosting, and nesting. The birds roost on large trees or snags or on rocky outcrops and cliffs. Nests are located in caves and ledges of steep rocky terrain or in cavities and broken tops of old-growth conifers created by fire or wind. This habitat is not present in the portion of the Action Area where the reservoir would be located, near Orderville. It is present in the Action Area where no surface disturbance would occur, at Parunuweap Canyon, Mineral Gulch, and ZNP. Foraging habitat includes more open areas such as grassland and savannah vegetation types. Use of various foraging locations tends to be seasonal and extensive, as feeding opportunities are often widely distributed across the condor's range (USFWS 2013a). California condors do not kill for food but are obligate scavengers, depending

primarily on large mammalian carcasses such as deer and cattle. The proximity to water sources for drinking and bathing is an important component of condor habitat, as condors regularly drink from and bathe in freshwater pools. Suitable pools must provide easy access and takeoff and be situated within a convenient distance to foraging areas (USDA 2026a; Frixione, et. al. 2026).

4.1.3 Environmental Baseline

The California condor was reintroduced to the Vermillion Cliffs area in Northern Arizona in 1996. Releases in the area still occur. The condor has expanded its range into southern Utah and flies back and forth between Utah and Arizona on a regular basis (UDWR 2025b). The California condor is found in ZNP and Mineral Gulch due to the presence of favorable habitat (ZNP 2025a).

Due to the variety of habitats that condors utilize and their large home range, individual condors regularly move through the Action Area. The condor is known to nest within ZNP and would be expected to continue to nest in the area. Sightings are rare, but approximately 70 condors live wild in Utah and Arizona and are commonly sighted in the ZNP area (ZNP 2025b). They have also been seen above the Vermillion Cliffs of Grand Staircase Escalante National Monument (Bryce Canyon Country 2026). Condors have been known to roost and nest in Mineral Gulch. Mineral Gulch is located approximately 6 miles east of ZNP and drains into Parunuweap Canyon (part of the Action Area), near the Barracks. However, no condors are known to occur where surface disturbance would occur in the Long Valley portion of the Action Area.

4.1.4 Survey Methods/Results

California condor surveys were not conducted for this BA. However, condors in the area are tracked via GPS so locations can be verified. Because no project-specific surveys were conducted, occupancy is assumed for the Parunuweap Canyon and Mineral Gulch portions of the Action Area (including ZNP). The remainder of the Action Area does not contain the habitat requirements necessary for the California condor.

4.1.5 Designated Critical Habitat

No critical habitat has been designated for the California condor in Utah.

4.2 Mexican Spotted Owl

4.2.1 Status

The MSO was listed as a federally threatened species in 1993 (FR 1993). In Utah, populations are disjunct and located in isolated mountain ranges or steep rocky canyon systems, such as Parunuweap Canyon in Kane and Washington Counties (UDWR 2025a).

4.2.2 Habitat Characteristics

Nesting and roosting occur in both forested and rocky canyon habitats. The MSO occupies a variety of habitats in various parts of its range. In Utah, nesting habitat is primarily steep, rocky canyons where nests are found in caves or on cliff ledges in steep-walled canyons, as found in Parunuweap Canyon (UDWR 2025a). Mexican spotted owls appear to use a wider variety of cover types for foraging than for roosting or nesting. MSOs forage in a variety of habitats:

managed and unmanaged forests, pinyon-juniper woodlands, mixed-conifer and ponderosa pine forests, cliff faces and terraces between cliffs, and riparian zones (USFWS 2012).

MSO's forage primarily at night, starting at sunset and continuing until just before sunrise. MSO's feed on a variety of prey, including small mammals, particularly mice, voles, and woodrats, and will also take birds, bats, reptiles and arthropods (USFWS 2012).

4.2.3 Environmental Baseline

The MSO occurs in disjunct habitats, including forested mountains and canyonlands throughout the United States and Mexico. In Utah (Colorado Plateau Ecological Management Unit [EMU]), it is primarily found in the southern and eastern parts of the state on the Colorado Plateau, where it is a rare permanent resident (UDWR 2025a).

Recreation is a primary land use within the Colorado Plateau EMU. Activities such as hiking, camping, hunting, rock climbing, mountain biking, and off-road vehicle use occur in MSO habitat within the EMU. Forest and fire management are also important land activities. In the BLM-ZNP Parunuweap Canyon area, the potential for non-motorized recreation to affect owl presence and recovery is compounded by the terrain, with owls established in narrow canyons having less opportunity to move away from human activity. Other land uses, such as timber cutting and energy development, do not occur within Parunuweap Canyon WSA and Zion National Park portion of the Action Area (USFWS 2004).

4.2.4 Survey Methods/Results

MSO surveys were not conducted for this BA. Therefore, occupancy is assumed for the Parunuweap Canyon portion of the Action Area. The remainder of the Action Area does not contain the habitat requirements necessary for the MSO.

4.2.5 Designated Critical Habitat

The USFWS designated critical habitat for the MSO in 2004 (FR 2004). Designated Critical Habitat Unit CP-11 is in Iron, Washington, and Kane Counties. A portion of this habitat unit includes BLM and ZNP–administered lands in Parunuweap Canyon. The portion of Designated Critical Habitat Unit CP-11 located adjacent to the EFVR in the canyon lies within the Action Area.

MSO designated critical habitat primary constituent elements (PCEs) related to canyon habitat consist of one or more of the following: presence of water (often providing cooler and often higher humidity than the surrounding areas); clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; canyon walls containing crevices, ledges, or caves; a prey base; and a high percent of ground litter and woody debris (USFWS 2013b). These PCEs are present in Parunuweap Canyon. ZNP data shows that suitable MSO habitat extends beyond the designated critical habitat. Additionally, within the Action Area, the MSO-Designated Critical Habitat contains at least two PACs, as defined in the MSO Recovery Plan (USFWS 2012). These PACs are located along the EFVR in Parunuweap Canyon (Appendix A, Figure 8). A PAC is a minimum of 600 acres surrounding a 100-acre core area that includes a nest or roosting site. PACs are established for the purpose of protecting nest and roosting areas (USFWS 2012). The most protective MSO management prescriptions occur within PACs.

4.3 Southwestern Willow Flycatcher

4.3.1 Status

The SWFL was listed as a federally threatened species in 1995 (FR 1995). In Utah, the SWFL is found only in riparian areas in the southernmost portion of the State (Washington, Kane, and San Juan Counties) (UDWR 2025a).

4.3.2 Habitat Characteristics

Nesting sites are found in riparian habitat including dense stands of willows and cottonwood trees. In some areas, nonnative tamarisk and Russian olive trees are interspersed with native willows. The SWFL rarely nests in dense stands of these species (UDWR 2025a) and rarely occupies habitat areas less than 325 feet wide. SWFL have only been documented nesting in stands with a width of 10 meters or more, although they will use narrower, linear habitat, such as that found in Parunuweap Canyon, during migration. Hydrological conditions play an important role in where SWFL choose to nest; they will nest along lentic water such as slow-moving stream reaches, at river backwaters, in swampy abandoned channels, and in oxbows and margins of impounded water (USFWS 2002b).

4.3.3 Environmental Baseline

Habitat required for nesting (as described above) is not found within the Parunuweap Canyon portion of the Action Area. However, it is likely used during migration. Riparian habitat in the Long Valley portion of the Action Area is sparse and would not likely meet SWFL habitat requirements.

4.3.4 Survey Methods/Results

No SWFL surveys were conducted for this project.

4.3.5 Designated Critical Habitat

In Utah, designated critical habitat extends along the Virgin River from the Utah-Arizona state line to immediately below the Quail Creek Reservoir. Designated critical habitat does not extend into the Action Area.

4.4 Virgin River Chub

4.4.1 Status

The Virgin River chub was listed as endangered by the USFWS on August 24, 1989 (FR 1989). The Virgin River, upstream of the La Verkin Creek confluence, supports abundant Virgin River chub populations. Virgin River chub has also colonized habitat upstream of Pah Tempe Springs since the establishment of population maintenance flows below Quail Creek Reservoir Diversion and currently occupies habitat between Pah Tempe Springs and the Quail Creek Diversion. Virgin River chub distribution currently extends upstream to the old diversion structure in Timpoweap Canyon (2 miles upstream from Pah Tempe Springs, and 4 miles upstream from the La Verkin

Creek confluence) (PLPCO 2025). Currently, only the Virgin River population is listed as endangered (FR 2000).

4.4.2 Habitat Characteristics

The Virgin River chub is found in aquatic habitat below 4,500 feet above sea level in deep runs or pools with low to medium velocities containing boulders, undercut banks, root snags, or other instream cover over sandy substrate (FR 2000). This rare, medium-sized minnow grows to an average length of 8 inches but can grow up to 18 inches (USFWS 1995). They are opportunistic, omnivorous feeders; juveniles will primarily feed on animal macro invertebrates, transitioning to algae and debris as they reach adulthood (NatureServe 2024). These fish rely on the mainstem channel maintaining water throughout the year as well as uplands that are seasonally inundated during spring flow (FR 2000). Maintaining this floodplain is crucial to the bio productivity of the river system and nutrient supply available to the species. Seasonal flooding also provides areas of warmer, less turbulent waters and cover from predators (FR 2000).

4.4.3 Environmental Baseline

The Virgin River chub is an extremely rare minnow, occurring only in the Virgin River system of southwestern Utah, southern Nevada, and northwestern Arizona. In Utah, the species is restricted to limited areas of the main-stem Virgin River from the Arizona state line upstream to the confluence with La Verkin Creek. Virgin River chub has also colonized habitat upstream of the La Verkin Creek confluence following the establishment of population maintenance flows below Quail Creek Diversion. Virgin River chub distribution currently extends upstream to the old diversion structure in Timpoweap Canyon (2 miles upstream from Pah Tempe Springs, and 4 miles upstream from the La Verkin Creek confluence (PLPCO, 2025). Refer to Figure 1 (Vicinity Map) in Appendix A for a map of Pah Tempe Springs in relation to the Action Area The Virgin River chub is threatened by habitat loss and the introduction of nonnative fish, particularly red shiner. Dams, reservoirs, water diversions, and stream dewatering have also damaged or destroyed its habitat (USFWS 1995a; UDWR 2025a).

4.4.4 Survey Methods/Results

Virgin River chub surveys were not conducted for this BA.

4.4.5 Designated Critical Habitat

The area designated as critical habitat for the Virgin River chub is the mainstem Virgin River and its 100-year floodplain, extending from the confluence with La Verkin Creek, Utah to Halfway Wash, Nevada (USFWS 1995). No designated critical habitat is present within the Action Area, as it does not extend upstream past the Virgin River-La Verkin Creek confluence approximately 4.8 river miles downstream from the Action Area. See Figure 8 (Listed Species Designated Critical Habitat) in Appendix A for a figure of Virgin River chub–designated critical habitat in the Action Area.

Virgin River chub–designated critical habitat PCEs include a sufficient quantity and quality of water, river channels, side channels, secondary channels, backwaters, springs, and other areas that provide access to these habitats; areas with slow to moderate velocities and deep runs or pools that are predominately sand substrates, particularly habitats which contain boulders or

other instream cover; an adequate food supply; and a balanced predation and competition component (FR 2000).

4.5 Woundfin

4.5.1 Status

The woundfin was listed as endangered by the USFWS on October 13, 1970 (FR 1970). This is a small (less than 4 inches long) species of minnow of the American Cyprinidae family and is the only species in the genus Plagopterus. The woundfin was once found throughout much of the lower Colorado and Gila River basins, including the Colorado River from Yuma, Arizona up to the Virgin River in Nevada and Utah, and in the Gila River from Yuma to the Salt River confluence (USFWS 1995a). Currently, this highly specialized species is believed to have been extirpated from its historical range and is restricted to the Virgin River from Pah Tempe Springs near La Verkin, Utah downstream to Lake Mead, Nevada. Recent studies have expanded woundfin occupied habitat in Utah. The woundfin is now known to regularly occupy habitat upstream from the La Verkin Creek confluence approximately 1.6 miles to the Hurricane Hydro Electric Plant inflow (PLPCO, 2025).

4.5.2 Habitat Characteristics

Woundfin are found in warm, swift, flowing, highly mineralized, and turbid waters with constantly shifting sandy or gravelly substrate (USFWS 1995a). Adults' frequent depths of 8–18 inches (deeper if turbidity levels are low) and are rarely found in quieter pools. Juveniles inhabit slow, deep backwaters with sandy substrates. Woundfin are omnivores, utilizing a variety of food sources, including algae, detritus, tamarisk seeds, and insects (USFWS 1995a). They rely on the mainstem channel maintaining water during the year as well as uplands that are seasonally inundated during spring flow (FR 2000). Maintaining this floodplain is crucial to the bio productivity of the river system and nutrient supply available to the species. Seasonal flooding also provides areas of warmer, less turbulent waters and cover from predators (FR 2000).

4.5.3 Environmental Baseline

The biggest threats to this species include the introduction of fish barriers (e.g., dams and diversions), decline in water quality within designated critical habitat, reduction of base flows due to drought and water withdrawal, and competition from the invasive red shiner (USFWS 2009). Building dams and associated reservoirs, water diversion structures, canals, laterals, aqueducts, and the dewatering streams cause loss or degradation of habitat. The decline in both species' range and population numbers is due to the physical reduction in available habitats within the various river systems caused by these water projects (USFWS 1995a; UDWR 2025a).

Occupied habitat was thought not to extend upstream from the Virgin River—La Verkin Creek confluence due to the presence of the Pah Tempe Springs, which acts as a barrier to any potential upstream movement. However, recent woundfin studies found that the species regularly occupies habitat upstream of the La Verkin Creek confluence, and its distribution now extends upstream to the Hurricane Hydro Electric Plant inflow approximately 1.6 miles upstream from the La Verkin Creek confluence.

4.5.4 Survey Methods/Results

Woundfin surveys were not conducted for this BA.

4.5.5 Designated Critical Habitat

The area designated as critical habitat for the woundfin is the mainstem Virgin River and its 100-year floodplain, extending from the confluence with La Verkin Creek, Utah to Halfway Wash, Nevada. No designated critical habitat is present within the Action Area, as it does not extend upstream past the Virgin River-La Verkin Creek confluence approximately 4.8 river miles downstream from the Action Area (FR 2000).

Woundfin designated critical habitat PCEs include a sufficient quantity and quality of water; presence of river channels, side channels, and secondary channels; backwaters, springs, and other areas that provide access to these habitats; runs and pools adjacent to riffles that have sand and sand/gravel substrates; deeper and slower water movement for young of the year; and shoreline margins and backwater habitats with growths of filamentous algae (FR 2000).

4.6 Monarch Butterfly

4.6.1 Status

The monarch butterfly has been proposed for listing as a threatened species. In December 2020, the USFWS published results of a 12-month finding, stating that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority actions (FR 2020). In 2024, the USFWS issued a FR notice proposing to list the monarch butterfly as threatened and designate critical habitat for the species (FR 2024)

4.6.2 Habitat characteristics

Adult monarch butterflies feed on various flowers but only breed where milkweed is present. Monarch caterpillars have been observed within portions of the proposed study area, primarily in ZNP; however, breeding is unlikely within the Long Valley portion of the study area due to a lack of milkweed presence. UNHP data did not identify any known occurrences of the species in the study area (UNHP 2024). The Cove Reservoir area is likely a flyover area for migrating monarch butterflies but is not an over-wintering site.

4.6.3 Environmental Baseline

The primary drivers affecting the health of the two monarch butterfly migratory populations are loss and degradation of habitat (from conversion of grasslands to agriculture, widespread use of herbicides, senescence and incompatible management of overwintering sites in California, urban development, and drought), continued exposure to insecticides, and effects of climate variations (USFWS, 2024). Monarch adults arrive in Utah where they are most abundant from July through October. An adult monarch can lay up to 500 eggs, but they prefer to lay only one egg per plant. The eggs hatch in 3 to 12 days, revealing the distinctive black-, white-, and yellow-banded caterpillars. The caterpillars then go through five instars of development before building a chrysalis in which they change into an adult monarch butterfly. In late summer and early fall, most adults in Utah fly south or west, heading to California to overwinter (NRCS 2019).

4.6.4 Survey Methods/Results

No surveys were conducted for the monarch butterfly as part of this proposed action.

4.6.5 Designated Critical Habitat

No designated critical habitat has been proposed for the monarch butterfly in Utah (FR 2024).

5.0 WATER MODEL RESULTS

This chapter summarizes water-modeling results used to evaluate whether the proposed reservoir diversions and releases would alter EFVR flow, channel conditions, riparian habitat, or listed species habitat within the action area.

The proposed reservoir would store excess water during high-flow periods and release it during low-flow periods to meet irrigation and water conservancy demands. Although the timing of flows would change, modeled flow alterations would be small compared to natural seasonal variability of EFVR flows (Alpha 2026). Yearly monitoring would continue to be required to regulate water flows in the EFVR.

5.1 Water Diversions

Per the ZNP Agreement, water would be diverted from the EFVR at the Orderville Diversion and delivered by pipeline to the proposed reservoir between November 1 and May 31. No diversions are allowed outside of this period. During the summer months, up to 4.7 cfs would be diverted for OIC agricultural use, while MCIC would continue to divert up to 6.58 cfs (Agreement 1996).

The use of EFVR water by the GIC, OIC, and the MCIC is monitored on a regular basis. The three companies divert water from the EFVR at different locations. A weir is present at each diversion site with gages to read water elevation. Additionally, each weir is equipped with an electronic flow meter that sends information to a website to provide remote monitoring. The data collected from these flow meters are used to determine the total amount of water diverted. Additionally, the Utah State Water engineer collects money from the GIC, OIC, and the MCIC to fund a water commissioner. The commissioner is responsible for monitoring the diversions and making certain that companies are using the correct amount of water according to their water right.

5.2 Water Releases

Releases from the reservoir would be timed to supplement low, natural flows. Water for Long Valley agricultural purposes would be released into the EFVR during the summer months, when natural flows are lowest. Water committed to Washington County for agricultural and M&I purposes could be released any time during the year to meet demand but would most likely be during the summer months for agricultural needs and during the fall and winter months for M&I needs.

The ZNP Agreement allows releases of up to 25 cfs for a 1-week period or 15 cfs continually (Agreement 1996). Releases would be managed to optimize irrigation efficiency and to meet M&I demands.

5.3 Water Modeling Results

5.3.1 Annual Changes

Modeling shows that reservoir operations would cause minor changes to EFVR flows. On an annual basis, modeled changes in EFVR flows were small, ranging from a decrease of 1.8 cfs under low-flow conditions to an increase of 0.9 cfs under high-flow conditions (Table 7). Larger

short-term operational changes may occur during specific release or diversion periods, as discussed in section 5.3.2.

Current seasonal EFVR flows can vary from less than 40 cfs to more than 2,000 cfs, representing a range of more than 1,960 cfs or approximately a 4,900 percent increase from 40 cfs. By comparison, modeled project-related annual average changes are less than 2 cfs (Alpha 2026).

Tables 7 through 9 summarize the modeled changes in flow, depth, and width (Alpha 2026).

Table 7. Projected Annual Changes to EFVR Flow

Scenario	Low-Flow Condition	High-Flow Condition
Pre-Project Flow	34.8 cfs	82.2 cfs
Post-Project Flow	33.0 cfs	83.1 cfs
Change	-1.8 cfs	+0.9 cfs
Percent Change	5.17% decrease	1.09% increase

Table 8. Projected Annual Changes to EFVR Depth

Scenario	Low-Flow Condition	High-Flow Condition
Pre-Project Depth	1.13 ft	1.71 ft
Post-Project Depth	1.10 ft	1.72 ft
Change	-0.03 ft	+0.01 ft
Percent Change	2.65% decrease	0.58% increase

Table 9. Projected Annual Changes to EFVR Width

Scenario	Low-Flow Condition	High-Flow Condition
Pre-Project Width	19.32 ft	22.31 ft
Post-Project Width	19.37 ft	22.36 ft
Change	+0.05 ft	+0.05 ft
Percent Change	0.25% increase	0.22% increase

These results show that changes in flow (-5.17% to +1.09%), depth (-2.65% to +0.5%), and width (+0.25% to +0.22%) would be minor. Downstream tributaries such as Meadow Creek in Mineral Gulch would not be affected, because they are hydrologically independent of EFVR baseflow and the project would not alter tributary inflow, sediment supply, or confluence hydraulics (UDWRe 2000). Because the project would not include construction, diversion, or flow modifications within the Meadow Creek watershed, and because modeled changes are limited to EFVR

mainstream flows, no effect to Meadow Creek inflow, sediment supply, or confluence hydraulics is anticipated.

5.3.2 Monthly Changes

An analysis was completed by Alpha to evaluate anticipated changes in river flow on a monthly basis associated with the Project. The analysis evaluated river flows at the Mount Carmel and Springdale gauges during average, driest, and wettest hydrologic conditions for each month of the year. Detailed results of the analysis are provided in the Water Model Report. A summary of findings at each gauge is provided below.

At the Mount Carmel Gauge, average monthly changes typically range from approximately -57 percent to +59 percent corresponding to a change in flow ranging from -11 cfs to +2.5 cfs in the months of November and July, respectively.

During driest conditions, the project produces the largest relative changes. Without WCWCD delivery, reductions of approximately -70 percent to well over +3,400 percent occur, corresponding to a change in flow ranging from -11.9 cfs to +3.4 cfs in the months of December and August, respectively.

Under wettest conditions, river flows generally remain similar to existing conditions, with changes ranging from approximately -16 percent to increases of +149 percent, corresponding to a change in flow ranging from -4.2 cfs to +97 cfs in the months of November and May, respectively.

When the assumed 15 cfs WCWCD delivery is included, average monthly flows increase substantially. Average conditions show increases ranging from approximately +22 percent to well above +471 percent. Driest conditions exhibit the largest relative increases, with December exceeding +18 percent and August exceeding 18,400 percent due to the relatively small existing flows.

Table 10. Projected Monthly Changes in Flow at the Mt. Carmel Gauge (09404700)

Scenario	Without WCWCD Delivery	With WCWCD Delivery
Average Conditions Percent Change	-57% to +59%	+22% to +471%
Average Conditions Change in Flow	-11 cfs to +2.5 cfs	+4.1 cfs to +16.5 cfs
Driest Conditions Percent Change	-70% to +3,400%	+18% to +18,400%
Driest Conditions Change in Flow	-11.9 cfs to +3.4 cfs	+3.1 cfs to +18.5 cfs
Wettest Conditions Percent Change	-16% to +149%	+7%t to +292%

Scenario	Without WCWCD Delivery	With WCWCD Delivery
Wettest Conditions Change in Flow	-4.2 cfs to +97 cfs	+6.8 cfs to +27.7 cfs

Because of additional watershed inflows between Mount Carmel and Springdale, the relative changes at the Springdale gauge are generally smaller.

Without WCWCD delivery, average monthly flows at the Springdale gauge range from approximately -20 percent to +16 percent. Driest conditions range from -27 percent to +13 percent. Wettest conditions range from approximately -6 percent to +68 percent.

With the assumed 15 cfs WCWCD delivery, average monthly flows at Springdale increase approximately +7 percent to +41 percent. Driest conditions increase approximately +7 percent to +60 percent, while wettest conditions increase approximately +4 percent to +78 percent.

Table 11. Projected Monthly Changes in Flow at the Springdale Gauge (09405500)

Scenarios	Without WCWCD Delivery	With WCWCD Delivery
Average Conditions Percent Change	-20% to +16%	+7% to + 41%
Average Conditions Change in Flow	-10.9 cfs to +12.2 cfs	+4.1 cfs to +17 cfs
Driest Conditions Percent Change	-27% to +13%	+17% to + 60%
Driest Conditions Change in Flow	-11.9 cfs to +4.8 cfs	+3.1 cfs to +17.7 cfs
Wettest Conditions Percent Change	-6% to +68%	+4% to +78%
Wettest Conditions Change in Flow	-4.2 cfs to +97 cfs	+6.8 cfs to +112 cfs

Modeled decreases occur primarily during the authorized diversion season, when flows are generally higher and ecological water stress is lower. Modeled increases occur primarily during summer low-flow periods, when surface water availability and riparian vegetation stress are more limiting. This seasonal redistribution is the basis for concluding that the project would have only minor impacts on downstream flows.

The percent change in flows is higher when looking at the monthly change compared to the annual change because the Project would shift water timing from naturally low-demand seasons

to periods when ecological needs are higher. Although some monthly percent changes appear large, particularly during dry low-flow periods, these percentages reflect small baseline flows; the absolute change in cfs remains within the modeled operational range and does not exceed authorized release limits.

5.4 Impacts on Riparian Vegetation and Habitat

The EFVR riparian corridor is adapted to substantial natural variation in streamflow, including episodic flood events, spring runoff, and seasonal low flow periods. As described in Section 5.3, modeled project-related changes in flow, depth, and width would remain small relative to the river's existing natural variability, and no downstream reach of the EFVR would be dewatered as a result of the proposed project.

Reservoir operations would primarily change the timing of water availability rather than altering overall flow magnitude. Water would generally be diverted when flows are higher and released during lower-flow periods when irrigation demand and ecological water stress are greatest. Although modeled predictions in flow show a reduction in winter baseflows during some scenarios, these reductions would occur when evapotranspiration rates and plant water demands are low and riparian vegetation is dormant or less physiologically active. Winter flows would remain sufficient to maintain hydrologic connectivity and would not eliminate the seasonal high-flow events needed to recharge shallow alluvial groundwater, redistribute sediment, and support riparian recruitment. Consequently, the anticipated reductions would not be expected to cause a sustained decline in soil moisture or groundwater availability within the riparian corridor. Modeled summer releases would increase baseflows during the period when riparian vegetation is most vulnerable to drought stress and high evapotranspiration demand. Research indicates that increasing summer flows can support riparian vegetation (Höller et. al. 2025). Even small increases in summer flow can disproportionately improve riparian conditions by extending soil moisture availability and reducing drought stress (Stromberg et al. 2007; Rood et al. 2005).

Mature overstory species, such as cottonwood and Russian olive, are generally supported by alluvial groundwater rather than direct uptake from short-term surface flows. Their deep root systems would not be affected by the minor changes in streamflow (Zimmerman et al. 2023). Because the project would not dewater the EFVR and modeled changes in surface flow would be minor, the project is not expected to alter groundwater conditions supporting mature riparian vegetation. As a result, the project is not expected to adversely affect existing riparian overstory structure or associated habitat functions.

No new agricultural development is proposed as part of the project, and the project would not involve direct disturbance or vegetation removal within existing EFVR riparian habitat. Project effects would be limited to modeled changes in EFVR flow timing and magnitude. Because those changes would remain within the natural range of variability, would not cause dewatering, and would not decrease summer baseflows during low-flow conditions, adverse effects to riparian vegetation and riparian habitat are not anticipated.

5.5 Water Model Summary

Modeled annual changes in EFVR flow, depth, and width are small relative to existing seasonal variability. The project would not dewater downstream reaches, would not eliminate riparian recruitment areas, and would generally increase summer baseflows during the period of greatest

vegetation water stress. Therefore, reservoir operations are not expected to adversely affect riparian vegetation structure, aquatic-riparian habitat connectivity, or listed-species habitat associated with EFVR flow conditions. Species-specific analyses are provided in

6.0 Effects Analysis

6.1 California Condor

6.1.1 Construction Impacts

6.1.1.1 Species

California condors are known to inhabit Parunuweap Canyon and surrounding area in ZNP. Construction activities and related surface disturbance would only occur at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area. No condors have been observed in this portion of the Action Area. However, at least two nesting sites are located within 8 miles of the town of Orderville. No surface disturbance would occur in the EFVR, and no changes in EFVR downstream flows would occur during construction. Construction activities would be short term (15 months) and would not occur where California condors are found in Parunuweap Canyon, Mineral Gulch, and ZNP. Implementation of committed conservation measures such as regular daily site cleaning would further reduce any potential effect. Therefore, project construction activities are not likely to jeopardize the continued existence of the California condor outside of ZNP and would have **No Effect** on the condor inside ZNP boundaries.

6.1.1.2 Habitat

Known California occupied condor habitat in the Action Area is restricted to Parunuweap Canyon and surrounding area in ZNP. Construction activities would only occur at the proposed reservoir site near Orderville. No surface disturbance or changes in EFVR streamflow would occur in Parunuweap Canyon; accordingly, construction activities are not likely to jeopardize the continued existence of the California condor as a result of habitat effects outside of ZNP and would have **No Effect** on the condor inside ZNP boundaries.

6.1.1.3 Designated Critical Habitat

No critical habitat has been designated for the California condor in Utah. Therefore, construction-related activities are not likely to jeopardize the continued existence of California condor designated critical habitat outside of ZNP and would have **No Effect** on condor-designated critical habitat inside ZNP boundaries.

6.1.2 Operational Impacts

6.1.2.1 Species

The EFVR corridor provides habitat for California condors, including roosting areas and water sources used for bathing and drinking. Operational activities would result in minor changes in streamflow, as described in Chapter 5.0. The proposed Project would not remove trees or alter riparian structure, would not reduce summer flows, would not eliminate existing water access

points, and would cause only minor changes in flow compared to the natural variation. Therefore, minor impacts would occur to prey availability and water quality, and the Proposed Action is not likely to jeopardize the continued existence of the condor outside of ZNP and **May Affect, but is Not Likely to Adversely Affect** California condors or their habitat due to insignificant or discountable impacts inside ZNP boundaries.

6.1.2.2 Habitat

The EFVR flows through occupied California condor habitat in Parunuweap Canyon (ZNP 2025b). Although no surveys were conducted for the condor, occupancy is assumed. The proposed Project would have no ground disturbance in Parunuweap Canyon and would not alter riparian vegetation. Additionally, operational activities would result in minor changes in streamflow, as described above in Chapter 5.0, which is also not anticipated to alter the surrounding riparian vegetation. Because no effects to the riparian zone are anticipated and because condors utilize a large area beyond the immediate riparian zone, it has been determined that the Proposed Action is not likely to jeopardize the continued existence of the condor outside of ZNP and **May Affect, but is Not Likely to Adversely Affect** the California condor as a result of insignificant or discountable impacts on its habitat inside ZNP boundaries.

6.1.2.3 Designated Critical habitat

No critical habitat has been designated for the California condor in Utah. Therefore, operational related activities are not likely to jeopardize the continued existence of California condor-designated critical habitat outside of ZNP and would result in **No Effect** to the condor designated critical inside ZNP boundaries.

6.1.3 Maintenance Impacts

6.1.3.1 Species

California condors are known to inhabit and nest in Parunuweap Canyon and the surrounding area in ZNP but are not known to occur at the proposed reservoir site near Orderville where routine maintenance activities would occur. No new surface disturbance or construction related activities would be associated with routine maintenance. Any unanticipated changes in streamflow during maintenance would be temporary and minor, and no impacts on downstream riparian vegetation would be anticipated. As a result, no harm or harassment would occur to the condor as a result of maintenance activities. Therefore, it has been determined that routine maintenance activities associated with the Proposed Action are not likely to jeopardize the continued existence of the California condor outside of ZNP and would result in **No Effect to** California condor inside ZNP boundaries.

6.1.3.2 Habitat

California condor habitat in the Action Area is not present at the proposed reservoir site. However, at least two nesting sites are located within 8 miles of the town of Orderville. These nests are located outside of the Project Area. No surface disturbance resulting from maintenance actions would occur downstream from the reservoir where condors are known to occur. Any unanticipated changes in streamflow during maintenance would be temporary and minor, and no impacts to downstream riparian vegetation or other habitat would be anticipated. No effects

would occur beyond the EFVR 100-foot buffer or immediate riparian zone (See Section 3.3). Therefore, it has been determined that the maintenance actions resulting from implementation of the Proposed Action are not likely to jeopardize the continued existence of the condor outside of ZNP and **May Affect, but is Not Likely to Adversely Affect** the California condor as a result of insignificant or discountable impacts on its habitat inside ZNP boundaries.

6.1.3.3 Designated Critical Habitat

No critical habitat has been designated for the California condor in Utah. Therefore, routine maintenance related activities are not likely to jeopardize the continued existence of California condor-designated critical habitat outside of ZNP and would result in **No Effect** to condor-designated critical habitat inside ZNP boundaries.

6.2 Mexican Spotted Owl

6.2.1 Construction Impacts

6.2.1.1 Species

MSOs in the Action Area are restricted to Parunuweap Canyon and the surrounding area. Construction activities would only occur at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area. No MSOs occur in this portion of the Action Area. No surface disturbance would occur in the EFVR, and no changes in EFVR downstream flows would occur during construction. Construction activities would be short term (15 months) and would not occur where MSOs are found. Therefore, construction activities would have **No Effect** on the MSO.

6.2.1.2 Habitat

MSO habitat in the Action Area is restricted to Parunuweap Canyon and the surrounding area. No surface disturbance or changes in streamflow would occur in the canyon; accordingly, construction activities would have **No Effect** on MSO habitat.

6.2.1.3 Designated Critical Habitat

MSO–designated critical habitat is located on BLM– and ZNP–administered lands in the Parunuweap Canyon portion of the Action Area (See Appendix A; Figure 8[Listed Species Designated Critical habitat]). PCEs, including the presence of water (often providing cooler and often higher humidity than the surrounding areas); clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; canyon walls containing crevices, ledges, or caves; and a high percent of ground litter and woody debris (USFWS 2013) associated with MSO-designated critical habitat would not be affected during construction, because there would be no surface disturbance or changes in streamflow within any designated critical habitat. Additionally, two PACs, as described in Section 4.2, are located within MSO-designated critical habitat in Parunuweap Canyon. These PACs would not be affected by construction activities at the proposed reservoir site, as no surface disturbance or changes in streamflow would occur within or near the PACs. No conflicts with USFWS-recommended management measures for PACs or PAC core areas would occur. Therefore, construction activities would have **No Effect** on MSO–designated critical habitat including the PACs.

6.2.2 Operational Impacts

6.2.2.1 Species

The EFVR corridor provides habitat for MSOs, including roosting areas and water sources used for bathing and drinking. Operation activities would result in minor changes in stream flow, as described in Chapter 5.0. The proposed Project would not remove trees or alter riparian structure, would not reduce summer flows, would not eliminate existing water access points, and would cause only minor changes in flow compared to the natural variation. Therefore, minor impacts would occur to prey availability and water quality, and no harm or harassment would occur to MSOs. Accordingly, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** MSO due to insignificant or discountable impacts.

6.2.2.2 Habitat

The EFVR flows through MSO occupied habitat in Parunuweap Canyon (FR 2004). Although no surveys were conducted for the MSO, occupancy is assumed. The proposed Project would have no ground disturbance in Parunuweap Canyon and would not alter riparian vegetation. Additionally, operational activities would result in minor changes in streamflow, as described in Chapter 5.0, which is also not anticipated to alter the surrounding riparian vegetation. Because no effects to the riparian zone are anticipated and because MSOs utilize a large area beyond the immediate riparian zone, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** MSOs as a result of insignificant or discountable impacts on MSO habitat.

6.2.2.3 Designated Critical Habitat

MSO designated critical habitat is located on BLM and ZNP administered lands in the Parunuweap Canyon portion of the Action Area (See Appendix A; Figure 8). No surface disturbance would occur in designated critical habitat. It is anticipated that impacts to designated MSO critical habitat PCEs (including the presence of water [often providing cooler and often higher humidity than the surrounding areas]); clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; canyon walls containing crevices, ledges, or caves; and a high percent of ground litter and woody debris (USFWS 2013) would be negligible based on minor changes in streamflow as discussed in Section 6.2.2.1. Additionally, no conflicts with USFWS-recommended management measures for PACs or PAC core areas, such as deferring activities during the MSO breeding season or planned fire management, would occur. Therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** designated critical habitat and PACs based on insignificant or discountable impacts.

6.2.3 Maintenance Impacts

6.2.3.1 Species

No MSOs occur where the proposed reservoir would be sited near Orderville in Long Valley where maintenance activities would occur. Therefore, no harm or harassment would occur to MSOs as a result of maintenance activities. No maintenance activities would occur where MSOs are known to occur in Parunuweap Canyon or other areas in ZNP within the Action Area, and no downstream effects from maintenance activities are anticipated. Any unplanned changes in

streamflow would be temporary and minor, and no effects to riparian vegetation are anticipated. No effects would occur beyond the EFVR 100-foot buffer or riparian zone. Because no MSOs are present where maintenance activities would occur and no effects are anticipated in downstream MSO habitat, it has been determined that maintenance activities associated with the Proposed Action would have **No Effect** on the species.

6.2.3.2 Habitat

MSO habitat in the Action Area is restricted to Parunuweap Canyon. Any unplanned changes in streamflow would be temporary and minor, and no effects on riparian vegetation are anticipated. No effects would occur beyond the EFVR 100-foot buffer or riparian zone (See Section 3.3). Therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** MSOs based on insignificant or discountable impacts on habitat during maintenance activities.

6.2.3.3 Designated Critical Habitat

MSO–designated critical habitat is found in the Parunuweap Canyon portion of the Action Area. Maintenance actions would be confined to the proposed reservoir site and adjacent irrigation pipelines and would not result in any surface disturbance in the canyon. It is anticipated that impacts to PCEs (specifically, presence of water and riparian vegetation) would be negligible based on unanticipated temporary and minor changes in streamflow during maintenance activities. Additionally, two PACs, as described in Section 4.2, are located within MSO-designated critical habitat in Parunuweap Canyon. These PACs would also not be affected by maintenance activities at the proposed reservoir site, as no downstream surface disturbance would occur. Additionally, no conflicts with USFWS-recommended management measures for PACs or PAC core areas would occur. USFWS PAC or PAC core area management recommendations, such as deferring activities during the MSO breeding season or planned fire management, would not be affected maintenance activities. Therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** critical habitat, including PACs, based on insignificant or discountable impacts associated with maintenance activities.

6.3 Southwestern Willow Flycatcher

6.3.1 Construction Impacts

6.3.1.1 Species

SWFL presence in the Action Area are restricted to Parunuweap Canyon. Construction activities would only occur at the proposed reservoir site near Orderville in Long Valley. No SWWLs occur in this portion of the Action Area due to a lack of habitat. No surface disturbance would occur in the EFVR that would affect any riparian habitat, and no changes in EFVR downstream flows would occur during construction. Construction activities would be short term (15 months) and would not occur where SWFLs are found. Therefore, construction activities would have **No Effect** on the SWFL.

6.3.1.2 Habitat

SWFL habitat in the Action Area is restricted to Parunuweap Canyon. Surface disturbing activities would only occur at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area. No riparian area would be disturbed during construction. No changes in streamflow would occur in the EFVR in Parunuweap Canyon; Therefore, no changes to SWFL habitat resulting from construction activities would occur. As a result, construction activities would have **No Effect** on the SWFL as a result of habitat impacts.

6.3.1.3 Designated Critical Habitat

No designated critical habitat is located within the Action Area.

6.3.2 Operational Impacts

6.3.2.1 Species

The minor change in streamflow resulting from project development would not result in a significant adverse effect on or loss of SWFL habitat. Water from the reservoir would result in only minor changes in flow amounts and would not alter riparian vegetation beyond that which has been occurring for several years, as discussed in Chapter 5. No effects would occur beyond the EFVR 100-foot buffer (See Section 3.3). Therefore, no harm or harassment would occur to SWFLs as a result of reservoir related streamflow changes; accordingly, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** SWFLs or their habitat due to insignificant or discountable impacts.

6.3.2.2 Habitat

The EFVR flows through SWFL suitable migration habitat in Parunuweap Canyon. Since no surveys were conducted for the SWFL, migration occupancy is assumed. Operational activities would result in minor changes in streamflow as described in Chapter 5.0, and it is anticipated that impacts to riparian vegetation resulting from reservoir operations would be negligible; therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** SWFL habitat as a result of insignificant or discountable impacts on habitat.

6.3.2.3 Designated Critical Habitat

No SWFL designated critical habitat is located within the Action Area.

6.3.3 Maintenance Impacts

6.3.3.1 Species

No SWFL habitat occurs at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area where maintenance activities would occur. No harm or harassment would occur to SWFLs as a result of maintenance activities as none would occur near any riparian habitat. Therefore, it has been determined that maintenance activities associated with the Proposed Action would have **No Effect** on SWFL.

6.3.3.2 Habitat

SWFL habitat in the Action Area is restricted to Parunuweap Canyon. Any changes in streamflow resulting from maintenance activities would be temporary and minor, and impacts on riparian vegetation are anticipated to be negligible. Therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** SWFL habitat based on insignificant or discountable impacts on habitat during maintenance activities.

6.3.3.3 Designated Critical Habitat

No SWFL designated critical habitat is located within the Action Area.

6.4 Virgin River Chub/Woundfin

6.4.1 Construction Impacts

6.4.1.1 Species

Surface disturbance associated with the reservoir, pipelines, and recreation facilities development would last approximately 15 months. Virgin River chub and woundfin habitat is located approximately 55 river miles downstream from the construction site in Long Valley. No surface disturbance would occur in the EFVR, and there would be no changes in streamflow or water quality; therefore, no harm or harassment would occur to the Virgin River chub or woundfin as a result of construction activities. Therefore, it has been determined that construction activities associated with the Proposed Action would have **No Effect** to the Virgin River chub or woundfin.

6.4.1.2 Habitat

Virgin River chub and woundfin habitat is located approximately 55 river miles downstream from the construction site in Long Valley. Habitat does not occur upstream from the Quail Creek Reservoir Diversion in Washington County. No surface disturbance associated with construction activities would occur in the EFVR, and no changes in streamflow levels would occur during construction. Therefore, it has been determined that construction activities associated with the Proposed Action would have **No Effect** on Virgin River chub and woundfin habitat.

6.4.1.3 Designated Critical Habitat

Virgin River chub and woundfin–designated critical habitat is located approximately 4.8 miles downstream from the Action Area in Washington County. No surface disturbance associated with construction activities would occur in the EFVR, and no changes in streamflow levels would occur during construction. No PCEs associated with Virgin River chub or woundfin–designated critical habitat would be affected. Therefore, it has been determined that construction activities associated with the Proposed Action would have **No Effect** on Virgin River chub and woundfin–designated critical habitat.

6.4.2 Operational Impacts

6.4.2.1 Species

No surface disturbance would result from operational activities. Operations associated with the Proposed Action would result in minor changes in downstream streamflow as discussed in Chapter 5.0. Since there is no Virgin River chub or woundfin habitat upstream from the diversion, no harm or harassment would occur to the Virgin River chub or woundfin as a result of operational activities. Should an unanticipated reduction event occur, it would be short term in duration, and the streamflow reduction amount would be negligible. The ZNP Agreement ensures water quality would benefit from the Proposed Action by maintaining controlled flow rates that prevent excessive sedimentation, nutrient loading, or changes in water temperature that could degrade the river's water quality and aquatic habitats. The change in water flow is not expected to introduce pollutants or alter the river's chemistry in a way that would impact the Virgin River chub or woundfin. Based on these factors, it has been determined that operational activities associated with the Proposed Action **May Affect, but is Not Likely To Adversely Affect** the Virgin River chub and woundfin due to insignificant or discountable effects.

6.4.2.2 Habitat

Habitat for the Virgin River chub and woundfin is located immediately downstream from Quail Creek Reservoir diversion in Washington County. While operational activities would result in minor changes in streamflow levels above the diversion, the amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir. Should an unanticipated streamflow reduction event occur, it would be short term in duration, and the reduction would be negligible. Therefore, no harm or harassment would occur to Virgin River chub or woundfin habitat as a result of operational activities. Based on these factors, it has been determined that operational activities associated with the Proposed Action **May Affect, but is Not Likely To Adversely Affect** the Virgin River chub/woundfin or their occupied habitats due to insignificant or discountable effects.

6.4.2.3 Designated Critical Habitat

Designated critical habitat for the Virgin River chub and woundfin begins approximately 4.8 miles downstream from the Quail Creek Reservoir diversion (FR 2000). While operation activities associated with the Proposed Action would result in minor changes in downstream streamflow above the diversion (Alpha 2026), the amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir. Should an unanticipated streamflow reduction occur, it would be short term in duration, and the reduction would be negligible. None of the Virgin River chub- or woundfin-designated critical habitat PCEs (FR 2000) would be affected. Based on these factors, it has been determined that the Proposed Action operation activities **May Affect, but are Not Likely To Adversely Affect** Virgin River chub-/woundfin-designated critical habitat due to insignificant or discountable effects.

6.4.3 Maintenance Impacts

6.4.3.1 Species

Maintenance actions would not result in any surface disturbance to the Virgin River chub or woundfin. It is not anticipated that any impacts to PCEs (e.g., water quality and quantity) would occur as the amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir. Should an unanticipated streamflow reduction occur, it would be short term in duration, and the reduction would be negligible. Therefore, it has been determined that the Proposed Action **May Affect, but is Not Likely to Adversely Affect** either species based on insignificant or discountable impacts associated with maintenance.

6.4.3.2 Habitat

Habitat for the Virgin River chub and woundfin is located immediately downstream from the Quail Creek Reservoir diversion in Washington County. While maintenance activities would result in minor changes in streamflow levels above the diversion, the amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir. Should an unanticipated streamflow reduction event occur, it would be short term in duration, and the reduction would be negligible. Therefore, no harm or harassment would occur to Virgin River chub or woundfin habitat as a result of maintenance activities. Based on these factors, it has been determined that operational activities associated with the Proposed Action **May Affect, but is Not Likely To Adversely Affect** the Virgin River chub/woundfin or their occupied habitats due to insignificant or discountable effects.

6.4.3.3 Designated Critical Habitat

Designated critical habitat for the Virgin River chub and woundfin begins approximately 4.8 miles downstream from the Quail Creek Reservoir diversion (FR 2000). While maintenance activities associated with the Proposed Action would result in minor changes in downstream streamflow above the diversion (Alpha 2026), the amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir. Should an unanticipated streamflow reduction occur, it would be short term in duration, and the reduction would be negligible. None of the Virgin River chub- or woundfin-designated critical habitat PCEs (FR 2000) would be affected. Based on these factors, it has been determined that the Proposed Action maintenance activities **May Affect, but are Not Likely To Adversely Affect** Virgin River chub-/woundfin-designated critical habitat due to insignificant or discountable effects.

6.5 Monarch Butterfly

6.5.1 Construction Impacts

6.5.1.1 Species

Monarch butterflies likely migrate through the Action Area. They are known to inhabit Parunuweap Canyon and the surrounding area in ZNP. Construction activities and related surface disturbance would only occur at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area where monarch butterfly presence is limited. No surface disturbance would occur in the EFVR, and no changes in EFVR downstream flows where milkweed plants are

mostly found would occur during construction. Construction activities would be short term (15 months) and surface disturbance would be limited in size. Implementation of committed conservation measures would further reduce any potential effect to the monarchs. Therefore, project construction activities are not likely to jeopardize the continued existence of the monarch butterfly.

6.5.1.2 Habitat

Adult monarch butterflies feed on various flowers but only breed where milkweed is present. Monarch caterpillars have been observed within portions of the proposed study area, primarily in ZNP; however, breeding is unlikely within the Long Valley portion of the study area due to a lack of milkweed presence, although monarch butterflies likely migrate through the area. No surface disturbance would occur within the EFVR or downstream from the proposed reservoir site. UNHP data did not identify any known occurrences of the species in the study area (UNHP 2024). The Cove Reservoir area is likely a flyover area for migrating monarch butterflies but is not an over-wintering site. Construction of the reservoir would likely provide a small amount of habitat. Therefore, project construction activities are not likely to jeopardize the continued existence of the monarch butterfly based on habitat impacts discussed above.

6.5.1.3 Designated Critical Habitat

No monarch butterfly proposed designated critical habitat is located within the Action Area.

6.5.2 Operational Impacts

6.5.2.1 Species

Minor changes in streamflow resulting from project operations would not result in an adverse effect on or loss of monarch butterfly habitat. Water from the reservoir would result in only minor changes in flow amounts and would not alter riparian vegetation beyond that which has been occurring for several years, as discussed in Chapter 5. No effects would occur beyond the EFVR 100-foot buffer (See Section 3.3). A minor amount of habitat would be created as riparian habitat becomes established around the reservoir. Because no monarch butterfly habitat would be lost, it has been determined that the Proposed Action is not likely to jeopardize the continued existence of the monarch butterfly due to insignificant or discountable impacts.

6.5.2.2 Habitat

As previously discussed, potential monarch butterfly habitat occurs in much of the Action Area but is mostly concentrated in Parunuweap Canyon and ZNP where various flowers, including milkweed, are present. Breeding is unlikely within the Long Valley portion of the study area due to a lack of milkweed presence. Any changes in streamflow would be minor, and no effects on riparian vegetation are anticipated. No effects would occur beyond the EFVR 100-foot buffer or riparian zone (See Section 3.3). Therefore, project construction activities are not likely to jeopardize the continued existence of monarch butterfly habitat due to insignificant or discountable impacts on habitat during operational activities.

6.5.2.3 Designated Critical Habitat

No monarch butterfly proposed designated critical habitat is located within the Action Area.

6.5.3 Maintenance Impacts

6.5.3.1 Species

Monarch butterfly habitat is limited at the proposed reservoir site near Orderville in the Long Valley portion of the Action Area where maintenance activities would occur. No harm or harassment would occur to monarchs as a result of maintenance activities as none would occur near any riparian habitat where milkweed plants are most likely to occur. Therefore, it has been determined that maintenance activities associated with the Proposed Action are not likely to jeopardize the continued existence of monarch butterfly habitat due to insignificant or discountable impacts during maintenance activities.

6.5.3.2 Habitat

Monarch butterfly habitat in the Action Area is focused on Parunuweap Canyon ZNP. Any changes in streamflow resulting from maintenance activities would be temporary and minor, and impacts on riparian vegetation would be negligible. Therefore, it has been determined that maintenance activities associated with the Proposed Action are not likely to jeopardize the continued existence of monarch butterfly habitat due to insignificant or discountable impacts during maintenance activities.

6.5.3.3 Designated Critical Habitat

No monarch butterfly proposed designated critical habitat is located within the Action Area.

7.0 CONCLUSION AND DETERMINATION OF EFFECTS

Table 12 summarizes the determinations of effect for the Proposed Action.

Table 12. Summary of Effects

Species	Status	Species Effects Determination	Critical Habitat Effects Determination
California condor	Experimental Non-Essential	Not Likely to Jeopardize the Continued Existence outside of ZNP; May Affect, but is Not Likely to Adversely Affect within ZNP	Not designated
Desert tortoise	Threatened	No Effect	Designated critical habitat is not located in the Action Area
Jones cycladenia	Threatened	No Effect	Not designated
Monarch Butterfly	Proposed Threatened	Not Likely to Jeopardize the Continued Existence	Not designated

Species	Status	Species Effects Determination	Critical Habitat Effects Determination
Suckley's cuckoo bumble bee	Proposed Endangered	No Effect	Not designated
Mexican spotted owl	Threatened	May Affect, but is Not Likely to Adversely Affect	May Affect, but is Not Likely to Adversely Affect
Shivwits milk-vetch	Endangered	No Effect	Designated critical habitat is not located in the Action Area
Siler's pincushion cactus	Threatened	No Effect	Not designated
Southwestern willow flycatcher	Endangered	May Affect, but is Not Likely to Adversely Affect	Designated critical habitat is not located in the Action Area
Ute ladies'-tresses	Threatened	No Effect	Not designated
Virgin River chub	Endangered	May Affect, but is Not Likely to Adversely Affect	May Affect, but is Not Likely to Adversely Affect
Woundfin	Endangered	May Affect, but is Not Likely to Adversely Affect	May Affect, but is Not Likely to Adversely Affect
Western yellow-billed cuckoo	Threatened	No Effect	No Effect

7.1 California Condor

In summary, an overall determination of No Jeopardy outside of ZNP and **May Affect, but is Not Likely to Adversely Affect** within ZNP has been determined for the California condor for the following reasons:

- A portion of Parunuweap Canyon and surrounding contains California condor habitat and is within the Action Area. Since no condor surveys have been conducted for this project, occupancy is assumed, and condors are known to be present within ZNP and the surrounding area. However, condors are not known to occur at the proposed Cove Reservoir site.

- No surface disturbance resulting from Cove Reservoir construction, operational, and maintenance activities would occur in occupied condor habitat.

- Changes in summer and winter stream flows in the EFVR resulting from Cove Reservoir operations would be minor, and adverse impacts to the surrounding riparian vegetation

are not anticipated. No effects would occur beyond the EFVR or surrounding riparian vegetation.

- No riparian vegetation overstory, such as cottonwood trees, would be lost due to Cove Reservoir construction, operational, or maintenance activities.

- No condor bathing or drinking sites would be lost. The proposed reservoir may provide a new bathing or drinking site for condors.

- No effects to California condor habitat would occur when diversions to the proposed reservoir are not occurring.

- No diversions would occur during the summer months when riparian vegetation is most stressed.

- No new dry periods in the EFVR would result from diversions or proposed reservoir operations.

7.2 Mexican Spotted Owl

In summary, an overall determination of **May Affect, but is Not Likely to Adversely Affect** has been determined for the MSO and designated critical habitat for the following reasons:

- A portion of Parunuweap Canyon is located within MSO–designated critical habitat and is within the Action Area. Additionally, two PACs are present. Since no MSO surveys have been conducted for this project, occupancy is assumed.

- No surface disturbance resulting from Cove Reservoir construction, operation, or maintenance activities would occur in MSO habitat, including designated critical habitat.

- Changes in summer and winter flows in the EFVR resulting from Cove Reservoir operations would be minor and would not affect riparian or other habitat within occupied MSO habitat in Parunuweap Canyon. The current natural EFVR flow variations would be 100 times the range of effect from reservoir releases. No effects would occur beyond the 100-foot buffer or riparian zone.

- Impacts to designated critical habitat PECs (specifically presence of water, prey base, and riparian vegetation) would not be affected. The two PACs would also not be affected, as no conflicts with USFWS-recommended management measures for PACs or PAC core areas would occur.

- No effects to MSO habitat would occur when diversions to the proposed reservoir are not occurring.

- No diversions would occur during the summer months when riparian vegetation is most stressed.

- No new dry periods in the EFVR would result from diversions or proposed reservoir operations.

7.3 Southwestern Willow Flycatcher

In summary, an overall determination of **May Affect, but is Not Likely to Adversely Affect** has been determined for the SWFL for the following reasons:

- A portion of Parunuweap Canyon contains SWFL migratory habitat and is within the Action Area. Since no SWFL surveys have been conducted for this project, migratory occupancy is assumed.
- No surface disturbance resulting from construction and maintenance activities would occur in SWFL habitat.
- Changes in summer and winter stream flows in the EFVR resulting from Cove Reservoir operations would be minor and not affect riparian or other habitat within SWFL habitat in Parunuweap Canyon.
- No effect to SWFL–designated critical habitat would occur as none is located within the Action area.
- No diversions would occur during the summer months when riparian vegetation is most stressed.
- No new dry periods in the EFVR would result from diversions or proposed reservoir operations.

7.4 Virgin River Chub/Woundfin

In summary, an overall determination of **May Affect, but is Not Likely to Adversely Affect** has been determined for the Virgin River chub and woundfin and designated critical habitat. The following reasons were used for these determinations:

- Occupied habitat is not located within the Action Area as habitat does not extend above the Quail Creek Reservoir Diversion.
- Designated critical habitat for both species is not located in the Action Area.
- Studies demonstrate that the effect of an additional 15 to 25 cfs flow from the proposed reservoir during flood stage or during normal streamflow conditions would be minor and that the natural variation of the river is approximately 100 times the range of effect from reservoir releases. The amount of water diverted for use by the Hurricane Canal Company would not exceed that released from the proposed reservoir.
- Should an unplanned lapse occur, the difference in water amounts downstream from the diversion would be negligible and short term.
- No impacts to water quality are anticipated.

7.5 **Monarch Butterfly**

In summary, an overall determination of **Not Likely to Jeopardize** has been made for the monarch butterfly for the following reasons:

- Large size of monarch butterfly habitat outside of the Action Area
- Limited duration of construction activities
- Limited amount of surface disturbance
- Creation of a small amount of habitat created by the reservoir

8.0 REFERENCES

Agreement. 1996. Zion National Park Water Rights Settlement Agreement. Agreement between the U.S. of America, State of Utah, Washington Water Conservancy District, and Kane County Water Conservancy District.

Alpha Engineering (Alpha). 2026. Water Model Report Cove Reservoir. July 2026. Attached to the Water Model Report is a draft memorandum from Alpha Engineering further summarizing the negligible changes in water depth and width in the Virgin River at the USGS river gauge near Springdale, Utah.

_____. 2025. Memorandum. River Changes-Cove Reservoir Project. February 8, 2025.

Bryce Canyon Country. 2026. Utah's California Condor. https://www.brycecanyoncountry.com/utahs-california-condors/#:~:text=Sightings%20are%20rare%2C%20but%20the,Grand%20Staircase%20Escalante%20National%20Monument, accessed January 2026.

Bureau of Land Management (BLM). 2008. Kanab Field Office. Proposed Resource Management Plan & Final Environmental Impact Statement. BLM-UT-PL-08-002-1610. UT-110-2007-022. FES 08-24. July 2008.

_____. Parunuweap Canyon WSA Website. https://www.blm.gov/visit/parunuweap-canyon-wsa. Website accessed May 2025

Eocene. 2024. Biological Evaluation. Esplin Glendale Bench Borrow Pit. Cove-East Fork Virgin River-EIS Project. Prepared for: Kane County Water Conservancy District. June 2024

_____. 2025. Preliminary Aquatic Resource Delineation Report. Cove Reservoir Project. Kane County, Utah. Prepared by Transcon Environmental, Inc. Prepared for Kane County Water Conservancy District and U.S. Department of Agriculture Natural Resources Conservation Service. May 2025.

Federal Register (FR). 1970. Federal Register. Vol. 35, No. 199/Tuesday, October 13, 1970/Title 50 Wildlife and Fisheries. Chapter 1 – Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Department of the Interior. Part 17-Conservation of Endangered Species and other Fish and Wildlife. Pages 16047--16048.

_____. 1989. Federal Register. Vol. 54, No. 163/Thursday, August 24, 1989/Rules and Regulations. Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the Virgin River Chub. Final Rule. 50 CFR Part 17. Pages 35305--35311.

_____. 1992. Federal Register. Vol. 57, No. 12/Friday, January 17, 1992/Rules and Regulations. Endangered and Threatened Wildlife and Plants: Final Rule To List the Plant Spiranthes Diluvialis (Ute Ladies'-Tresses) as a Threatened Species. Pages 2048--2054.

_____. 1993. Federal Register. Vol. 58, No. 49/Tuesday, March 16, 1993/ Rules and Regulations. Endangered and Threatened Wildlife and Plants: Final Rule to List the Mexican Spotted Owl as a Threatened Species. Pages 14248-14271.

_____. 1995. Federal Register. Vol. 60, No. 38/Monday, February 27, 1995/ Rules and Regulations. Endangered and Threatened Wildlife and Plants: Final Rule Determining Endangered Status for the Southwestern Willow Flycatcher. Pages 10694-10715.

_____. 1996. Federal Register. Vol. 61, No. 201/Wednesday, October 16, 1996/ Rules and Regulations. Endangered and Threatened Wildlife and Plants: Establishment of a Nonessential Experimental Population of California Condors in Northern Arizona. Pages 54044-54060.

_____. 2000. Federal Register. Vol 65, No. 17/Wednesday, January 26, 2000 / Rules and Regulations. Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Woundfin and Virgin River Chub. Final Rule. Pages 4140-4156.

_____. 2004. Federal Register. Vol. 69, No. 168/Tuesday, August 31, 2004/Rules and Regulations. Endangered and Threatened Wildlife and Plants: Final Designation of Critical Habitat for Mexican Spotted Owl. Final Rule. 50 CFR Part 17. Pages 53182–53298.

_____. 2014. Federal Register. Vol. 79, No. 192/Friday 3, 2014. Rules and Regulations. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Final Rule. Pages 59991-60038.

_____. 2020. Federal Register/Vol. 85, No. 243/Thursday, December 17, 2020/Rules and Regulations. Endangered and Threatened Wildlife and Plants; 12-Month Finding for the Monarch Butterfly. Department of the Interior. 50 CFR Part 17. Pages 81813-81822.

_____. 2024. Federal Register/Vol. 89, No.239/Thursday, December 12, 2024/Proposed Rules. Department of the Interior, Fish and Wildlife Service; Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for Monarch Butterfly and Designation of Critical habitat. 50 CFR Pat 17. Pages 100662-100716.

Frixione, et. al. 2026. Use of Natural Springs by Raptors: Insights from Camera Traps in the Baja California Peninsula, Mexico Martín G. Frixione, Israel Guerrero-Cárdenas, Rafael Ramírez-Orduña, Enrique de Jesús Ruiz-Mondragón, Ivonne Tovar-Zamora, Gustavo A. Arnaud-Franco, Joaquín Rivera-Rosas and Fernando I. Gastelum-Mendoza. Diversity 2026 Volume 18 Issue 1. https://www.mdpi.com/1424-2818/18/1/28

Höller, et. al. 2025. J. Bastian Höller, Roland Jansson, Britta Malm-Renöfält, Asa Widén, J. Gunnar I. Hellström and Anders G. Anderson. Ecological benefits of reintroducing seasonal flow variation for riparian vegetation. Journal of Ecohydraulics. Accepted 28 October 2025. https://www.tandfonline.com/doi/full/10.1080/24705357.2025.2584774

NatureServe. 2024. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version 7.1. Arlington, Virginia. URL: http://explorer.natureserve.org