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UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
REGIONAL TECHNICAL SERVICE CENTER

Upper Darby, Pa. 19082  
May 25, 1967

TSC TECHNICAL NOTES WATERSHEDS - UD 5 (Revised)

To: State Conservationists, Northeast Region

From: Head, Engineering and Watershed Planning Unit

Re: WS - Guide Outline for Developing Geologic Data  
on the Effect of Mining at Structure Sites

The attached revised outline provides guidance to State Program Staff and Planning Staff specialists concerned with planning watershed impoundment-type structures over or in the vicinity of mined-out areas or potential and active mine areas.

We recommend that staff geologists use the Guide for developing geologic data: (1) To interpret structure foundation conditions; and (2) to facilitate establishing minimum limits for mineral rights. It also may be helpful in preparing A & E contracts and negotiating with selected consultants.

Attachment

Distribution:

State Cons. N.E. - 10  
Other EWP Units - 3  
C. J. Francis - 4  
Clyde W. Graham - 1  
Hollis Williams - 1  
Selden Lee Tinsley - 1

*Harold M. Kautz*

GUIDE OUTLINE FOR DEVELOPING PRELIMINARY GEOLOGIC DATA  
ON THE EFFECT OF MINING AT STRUCTURE SITES

I. Collect basic geologic data from existing information

A. Geologic maps and reports

1. Areal geology
2. Structural geology
3. Stratigraphy
4. Economic geology - coal and other minerals

B. Maps of existing coal and other types 1/ of mines and workings

Sources:

1. Mine owners and operators
2. U. S. Bureau of Mines
3. State and other local agencies, such as Department of Natural Resources, State Geological Surveys, State University School of Mines, local consultants, and local drillers

C. Logs of drill holes

1. Types

- a. Coal and other solid mineral borings
- b. Oil and gas wells
- c. Exploratory borings for highways, buildings, railroads, tunnels, etc.
- d. Deep water wells
- e. Mine shafts

2. Sources: Same as I B, 1, 2, and 3

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1/ Other types of mined minerals may include: Metallic minerals, salt, stone, sulphur, abrasive minerals, asbestos, clay, feldspar, gypsum, mica, phosphates, potash, slate, talc, and others.

D. Records of mining operations

1. Items

- a. Identify and locate mineable seams
- b. Determine seams mined; amounts, extent, and methods of extraction.
- c. Determine condition, size, and location of remaining coal or rock supports 2/
- d. Collect information on mine leakage, mine pumpage, and water disposal; collect information on quality of disposal water
- e. Collect information on future mining operations and potential
- f. Obtain dates on mine abandonment or closings

2. Sources:

- a. Same as I A, Reports
- b. Same as I B, 1, 2, and 3
- c. Standard texts on coal, mining methods, mineral economics, and mining engineering
- d. Bibliographies related to mining subsidence

E. Base maps

1. USGS standard 7-1/2-minute quadrangle maps
2. Aerial photographs
3. Soil survey maps
4. Others

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2/ "Supports" refers to competent rock or mineral which, because of physical characteristics, can sustain openings without any additional support except pillars and walls. Timber and metal props, and roof bolts are not considered to be adequate structural supports.

II. Prepare geologic map(s) and overlays with complete legends, descriptions, and scale

A. Geologic plan map of watershed

1. a. Make overlay of available geologic maps of adequate scale (1 inch equals 1 or 2 miles)
- b. When geologic map is not available, use 7-1/2-minute topographic maps as a base on which to plot data from Item I
2. Show on geologic plan map:
  - a. Rock outcrop areas of formations
  - b. Outcrop areas of key coal seams, ore, or other economic mineral
  - c. Geologic structure contours based on the elevations of top of major economic coals and mineral deposits
3. Make transparent overlay showing areas of mining and mined out areas scaled to the geologic plan map
4. Show tentative location of structure sites  
Include pool areas

B. Prepare general stratigraphic columns showing:

1. Geologic age
2. Formations
3. Key strata
4. Elevations and thickness
5. Preliminary elevations of flood plain, top of dam, and crest of emergency spillway for each proposed structure.  
Identify elevations by individual structure number

6. Show the entire stratigraphic sequence in the watershed. The column should begin with the formation underlying the lowest economic coal seam or other mine product. The column may be extended to include key coal seams and other formations.

C. Prepare geologic cross section(s) representative of the watershed:

1. Locate section(s) to pass through or close to structure sites
2. Show nonuniform geologic conditions by additional sections

III. Field geology examination

A. Make a field examination of watershed and site geology

1. Check geology plan maps, columns, and sections by confirming locations, elevations, and descriptions of exposed (key) formations and strata
2. Search for, examine, and describe any features which indicate subsidence, or other land movement, has or is occurring

Features may include:

- a. Shattered bedrock
- b. Movement, cracking or shattering of rigid structures, e.g., concrete dams, building walls foundations, bridges, etc.
- c. Landslides, springs at unusual topographic locations
- d. Settlement and/or movement of rail and highway roadbeds
- e. Unusual change in bedrock strike or dip from normal watershed bedrock attitude.

3. Field check areas where logs of exploration boreholes, located within a short distance of each other, show unexplained differences in elevations of key strata or formations
4. Examine surficial geology at sites to evaluate physical conditions of foundation, abutment, emergency spillway, pool and borrow sources for physical adequacy.
5. Determine the intensity of detailed geologic site investigation needed

B. Review and revise geologic maps, columns, and sections based on field findings and data

IV. Prepare detailed geologic maps, overlays, columns and sections for each site complete with details of materials and conditions obtained during the field examination.

V. Use of geologic data (in cooperation with engineers)

A. Relocation of sites to unmined areas

B. Delineation of minimum limit for easements and mineral rights

1. Impoundment area - based on recommendations of Engineering Division or consultant's report, or on State requirements

2. Structure site area - based on recommendations of Engineering Division or consultant's report, or on State requirements

C. Determination of feasibility of permanent impoundment

D. Evaluation of potential damages to any mining operations under or adjacent to site

E. Planning for detailed geologic site investigations and preparing cost estimates

F. Determine need for special studies by qualified consultants.

(Example of engineering services contract specifications attached.)

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VI. Substantiating data - mining studies

- A. Bibliography of reports and data. See Item I
- B. Watershed topographic; geologic maps, columns, and sections;  
overlays
- C. Other records, data, and reports
  - 1. Maps of existing coal and other mines and workings,  
including active and abandoned workings
  - 2. Logs of drill holes used in study
  - 3. Record of mining operations and interviews
  - 4. Field examination notes and records including:
    - a. Hand-auger borings
    - b. Description of rock and mineral outcrops and other  
exposures
    - c. Evidence of subsidence, descriptions, sketches,  
photos, interviews, etc.
    - d. Other

VII. Summarize the information obtained in a concise narrative preliminary report for use in work plan.

- A. Describe mining activities in the watershed
- B. Describe relation of mining activities to sites
- C. Describe investigations and analyses

Attachment

CONTRACT

Engineering Services

PROJECT: Preparation of recommendations concerning methods of preventing subsidence (caused by mining) of structures at Sites Nos. \_\_\_\_\_ of the \_\_\_\_\_

On this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, hereinafter called the Contractor, and the Soil Conservation Service, hereinafter called the Government, do hereby agree as follows:

PART I - SCOPE OF WORK

The Contractor shall furnish all personnel, equipment, and material and perform the services described in Part II hereof in accordance with the terms of the General Provisions, Clauses 1 to 18, inclusive, that are attached hereto and made a part of this contract.

The Contractor shall designate, by a letter to the Contracting Officer, a principal member of the Contractor's firm to supervise the work.

PART II - DESCRIPTION OF WORK

The work shall consist of:

1. Inspecting the structure sites and reservoir sites:
2. Collecting and reviewing all available data concerning:
  - (a) the nature and function of the structures, (b) the geologic stratigraphy and structure of the general area, (c) the geologic profiles of the specific structure sites, and (d) the nature and extent of existing mine workings in the vicinity of the structure sites.
3. Preparing a report containing a summary of data reviewed, a discussion of findings and recommendations concerning:
  - (a) the extent of structural supports apparently required to be installed in existing mine workings to prevent subsidence of the structure sites; (b) the extent of subordination of mineral rights apparently required to control the working of unmined deposits so that the continued stability of the dams and spillways may be assured; and (c) the scope and extent of additional investigations that are required as a basis for firm design recommendations.

In the course of the work, the Government will make available to the Contractor all pertinent data collected in preliminary studies together with such items as the watershed work plan, topographic surveys of the sites, surficial geology reports of sites, and design data.

The Contractor shall furnish ten copies of his report to the Government.

PART III - FEE AND PAYMENT

The Government will pay the Contractor a fixed fee of \$ \_\_\_\_\_ on completion of the work described herein.

PART IV - TIME FOR PERFORMANCE

The Contractor shall complete the work within 60 calendar days after the date of this contract.