NORTH DAKOTA
ENGINEERING PRACTICE PLANNING GUIDE
LIVESTOCK WATERING SYSTEMS

PRACTICE STANDARDS: 516 (Livestock Pipeline), 614 (Watering Facility), 533 (Pump), 642 (Well), 574 (Spring Development), 378 (Pond)

REFERENCES

In addition to Section IV of the Field Office Technical Guide, the following are recommended technical references for planning Livestock Watering Systems:

- NRCS National Engineering Handbook, Section 18- Ground Water, Chapter 5: Methods and Techniques of Spring Development, Chapter 6: Methods and Techniques of Well Development.
- NRCS Engineering Field Handbook, Part 650, Chapter 3: Hydraulics.
- North Dakota State Water Commission Ground and Surface Water Data: http://www.swc.nd.gov/4dlink2/4dcgi/wellsearchform/Map%20and%20Data%20Resources
- South Dakota NRCS Livestock Water Systems Guide: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/sd/technical/engineering/?cid=nrcs141p2_036576
- Montana NRCS Stockwater Design Manual: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/technical/engineering/?cid=nrcs144p2_056927
- Idaho NRCS Tech Note 17: Above Ground Applications for Polyethylene Pipe: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_044606.pdf
- Manufacturer provided technical data for pipe materials, pumps, valves, tanks, solar panels, and wind turbines.

RESOURCE INVENTORY CONSIDERATIONS

1. How are livestock being watered on the property currently, and can those sources be utilized to facilitate the Prescribed Grazing Plan without modification? If not, why and how were locations for watering facilities chosen?

2. What months will the system need to function, and how many head of what livestock type will need to be watered at a maximum? Will the system need to operate in freezing weather? (Oct-April)

3. How near does the producer live to the location, and how often do they check their livestock? Can livestock be easily moved to another site with water if the system fails?

4. Are there existing water sources already developed on or near to the site, which could be used to supply a new or expanded watering system? If so, collect the following information as applicable:
    a. Water quality and quantity, based on the producer's experience and/or records. For wells, determine static and drawdown water elevations at known flow rates.
    b. Existing pump model and type, if available.
    c. Pressure and flow at existing hydrants. (All ND Area offices have tools available for developing a pressure versus flow curve for existing systems- regardless of whether they are gravity, artesian, or pumped systems those should be measured during planning).
    d. Pressure rating/size of existing pressure tanks, pressure switch settings, locations of existing air or pressure relief valves, and pipe materials currently installed.
    e. If the system is or will service other locations, such as homes or barns, what flow capacity and pressure will be required to service each? Are backflow prevention devices already installed or will we need to incorporate that into the design? Is there a possibility the

watering system will be extended to other areas in the future? Where will the potential critical points on the system be in terms of hydraulics?

5. What constraints on the property exist to govern where pipelines can be economically installed? During field work for range inventory, planners should be looking for areas with shallow or exposed bedrock, wetlands, high water table areas, buried utilities, unstable slopes, cultural resources, etc. that could restrict construction. Particularly when planning frost-free pipelines in shallow bedrock areas, consider doing some field exploration with one of the probe trucks located at each Area Office to verify feasibility of proposed routes.

DEVELOPING AND EVALUATING ALTERNATIVES

1. Determine minimum flow and storage requirements during the period of peak livestock use, based on the 614 Practice Standard. Consider both short term, and potential long term requirements, if the system may be expanded in the future.

2. If no suitable water sources exist, what are the feasible alternatives for developing surface or groundwater sources? What are the conditions of existing surface water bodies, and the potential for developing those into sources? Consideration of spring developments should include flow measurements during the planned season of use, and discussions with producers and their predecessors regarding historic yields. Consideration of ponds should include subsurface exploration to determine water holding capacity, field investigation to ensure the proposed location is not within a wetland, and hydrologic evaluation of watershed yield versus evaporation in an average year. Consideration of wells should include consultation with SWC records and experienced well drillers in the area regarding expected depths, yields, and water quality.

3. Evaluate potential sites for watering tanks (and fence lines), and discuss alternatives for tank types and capacity with the producer. Develop pipeline route alternatives in consideration of factors such as: avoiding undulating topography to minimize air relief vents, siting tanks on well drained soils, crossing streams/riparian corridors at stable locations perpendicular to the stream, avoiding steep or unstable slopes, and property lines.

4. Determine what type of controls would be appropriate for the system: automatic pressure, timer operated pressure, gravity, or artesian pressure. Typically either LIDAR or USGS topographic data is adequate to complete preliminary hydraulic computations to determine feasibility at the planning stage, but in some instances a survey may be necessary. If a pump is necessary at some point in the system, determine options for power sources.

5. Estimate approximate quantities of materials needed to construct the project: pipeline length and pressure class, imported pit run gravel for tank bases, air vents, pump horsepower, pressure tank size/rating, pea gravel for storage tanks or spring developments, earthwork quantities for stock ponds, etc.

6. Prior to sharing engineering alternatives with the producer, determine the engineering job approval authority for the practices involved. If you do not have adequate Planning (I&E) JAA for the practices, have your work reviewed by another individual in the NRCS who does to make sure you have correctly evaluated all of the options and determined feasible and implementable alternatives.

At the point those are presented to a producer, the planner is making a commitment on behalf of the agency that we have provided technically sound, implementable engineering plans.

ASSISTING THE PRODUCER TO MAKE AN INFORMED DECISION

1. Put together some example detail drawings, photos, and/or portions of construction specifications that would be similar to the proposed project. Explaining exactly what following NRCS standards means in relation to construction of a particular project is very important, and anything you can use to communicate those to the producer is very helpful.

2. Estimate actual construction costs for the project, based on your knowledge of similar past projects (consult with other individuals as necessary). Calculate expected cost share, if planning is being done in conjunction with a program application. At this point in the process, it is expected that estimated quantities for cost share will be within 20% of the final design and constructed amount. It should be extremely rare for a situation to arise where significant contract modifications are necessary.

3. Meet with the producer, and go through each of the feasible alternatives discussing factors that will be important to them in their decision: installation requirements, initial investment, operating costs and time requirements, lifespan, and maintenance needs. Encourage them to talk with potential contractors at this point, and offer your assistance, to estimate their potential out of pocket costs more accurately.

4. In the case of a program application, it is important that producers understand exactly how implementation would proceed and what restrictions they will operate under. Ensure that they understand that used materials are not acceptable (with a few exceptions), licensed well drillers and pump installers must be utilized (with some exceptions on tribal lands), no construction may proceed until they have received final design drawings and specifications, and that NRCS will be onsite inspecting during construction to ensure compliance with the design.

5. Provide adequate time for the producer to make an informed decision. If they don't have time to meet to discuss alternatives, they likely haven't had time to adequately complete a good decision making process resulting commitment to implement the plan. Offer and be willing to defer an application, to allow time for a quality planning process and good decision making on the part of the producer.

Provide documentation of above steps in the conservation plan narrative, assistance notes, and/or in separate documentation in Part 5 of the plan folder. Job class for each practice involved, and the approving individual for planning work, needs to be included.