

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

441 - IRRIGATION SYSTEM, MICROIRRIGATION

I. SCOPE

The work will consist of furnishing and installing materials as required to provide for a complete microirrigation system for the tract of land as shown on the drawings.

Only operate system when needed to furnish water for plant growth, the soil may also be used to store moisture within the rooting depth of the plant.

Operate the system according to the parameters for the area.

II. SOURCE OF WATER

The source of water shall be as shown on the drawings, and as previously determined by the landowner. Water rights for the use of the water are the responsibility of the landowner. The source shall provide the full capacity as may be needed for the system being installed.

Check to make sure that all connections are watertight and all valves are working properly.

Make sure that the filter system is working, even if it is automatic it needs constant monitoring, make adjustments if needed.

Periodically examine each emitter for proper operation and replace if defective.

III. INSTALLATION

The materials shall be fabricated in accordance with the manufacturer's instructions. The system shall be tested to determine if the system is in proper working order, and will deliver the required capacity to meet the crop consumptive use, and the specified uniformity distribution rate.

Exclude all livestock from the equipment or irrigated areas.

Monitor the crop noting areas of moisture stress and repair or adjust system operation.

During non-seasonal use place the system in an area where it will not be damaged but secure, if necessary.

IV. BASIS OF ACCEPTANCE

The basis of acceptance shall be the ability of the system to deliver the required amount of water to meet the peak consumptive use of the crop, with a distribution uniformity rate of 80 percent or greater.

Maintain all pumps, agitators, piping, valves and other electrical and mechanical equipment in good condition following the manufacturers' recommendations.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

OPERATION AND MAINTENANCE ITEMS

A properly operated and maintained microirrigation system is an asset to your farm. This irrigation system was designed and installed to apply irrigation water to meet the needs of the crops without causing excessive erosion or runoff. The estimated life span of this installation is at least 10 years. The life of this system can be assured and usually increased by developing and carrying out a good operation and maintenance program.

Immediately repair any vandalism, vehicular or livestock damage.

Other items specific to your project are listed on the "Practice Requirements" sheet.

This practice will require you to perform periodic maintenance and may also require operational items to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program.

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

441 – IRRIGATION SYSTEM - MICROIRRIGATION

OPERATION AND MAINTENANCE

Sponsor/Land user: _____ Date: _____

Address: _____

Location GPS Coordinates Map Datum: _____ E _____ N _____

Quad Sheet Name _____ SEC _____ T _____ R _____

A properly operated and maintained microirrigation system is an asset to the farm. This irrigation system was designed and installed to efficiently apply irrigation water directly to the root zone of the plants to maintain soil moisture without excessive water loss, erosion, reduction in water quality or salt accumulation. The estimated life span of this installation is at least 10 years. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program:

GENERAL RECOMMENDATIONS

- Only operate the system when needed to furnish water for plant growth, salt management or to store moisture within the rooting depth of the plant. Monitor crops regularly noting areas of moisture stress and repair or adjust system operation as needed.
- Operate the system at the pressure, discharge rate, speed, duration and frequency as designed.
- Periodically examine each sprinkler and spray head, etc., for proper operation. Clean plugged nozzles, and replace if defective and worn. Use shank end of steel drill bits to check diameters.
- Check to make sure that all connections are watertight and all valves are working properly.
- Promptly repair all leaks in delivery facilities, by replacing valves, fittings, gaskets, worn or damaged parts.
- During non-seasonal use, place appurtenances in an area where they will not be damaged but are secure, if necessary.
- Promptly repair all leaks, by replacing gaskets or worn parts.

- Maintain all pumps, agitators, piping, valves and other electrical and mechanical equipment in good operating condition following the manufacturer's recommendations.
- Maintain all screens, filters, valves, timers and other electrical and mechanical equipment in good operating condition following manufacturer's recommendations. Drain and protect from freezing, as necessary.
- Inspect for damage from rodents or burrowing animals. Repair any damage. Take appropriate corrective actions to alleviate further damage.
- Immediately repair any vandalism, vehicular or livestock damage. Do not allow livestock near equipment during operation.

SPECIFIC RECOMMENDATIONS FOR YOUR MICROIRRIGATION SYSTEM

CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR MICROIRRIGATION SYSTEM.

STATEMENT OF WORK
IRRIGATION SYSTEM, MICROIRRIGATION (441)

These deliverables apply to this individual practice. For other planned practice deliverables refer to those specific Statements of Work.

DESIGN

Deliverables:

1. Design documentation that will demonstrate that the criteria in NRCS practice standard have been met and are compatible with other planned and applied practices.
 - a. Practice purpose(s) as identified in the conservation plan
 - b. List of required permits to be obtained by the client
 - c. Compliance with NRCS national and state utility safety policy (NEM Part 503-Safety, Subpart A - Engineering Activities Affecting Utilities 503.00 through 503.06)
 - d. List of facilitating/component practices
 - e. Practice standard criteria related computations and analyses to develop plans and specifications including but not limited to:
 - i. System Capacity
 - ii. Depth of Application, Rate, Frequency, Pressure and Uniformity
 - iii. Hydraulics
 - iv. Filters and chemical injection
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describes the requirements to install the practice and obtain necessary permits.
3. Operation and Maintenance Plan
4. Certification that the design meets practice standard criteria and comply with applicable laws and regulations (NEM Subpart A, 505.03 (a) (3)).
5. Design modifications during installation as required.

INSTALLATION

Deliverables

1. Pre Installation conference with client and contractor.
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Installation inspection (according to inspection plan as appropriate).
 - a. Actual materials used (Part 512, Subpart D Quality Assurance Activities, 512.33)
 - b. Inspection records
5. Facilitate and implement required design modifications with client and original designer
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the installation process and materials meets design and permit requirements.

CHECK OUT

Deliverables

1. As-Built documentation.
 - a. Extent of practice units applied
 - b. Drawings
 - c. Final quantities
2. Certification that the installation meets NRCS standards and specifications and is in compliance with permits (NEM Subpart A, 505.03 (c) (1)).
3. Progress reporting.

STATEMENT OF WORK
IRRIGATION SYSTEM, MICROIRRIGATION (441)

REFERENCES

- NRCS Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard - Irrigation System, Microirrigation, 441
- NRCS National Engineering Manual (NEM).
- NRCS National Environmental Compliance Handbook
- NRCS Cultural Resources Handbook

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

**430EE - IRRIGATION WATER CONVEYANCE
LOW-PRESSURE, UNDERGROUND, PLASTIC PIPELINE**

I. SCOPE

The work shall consist of furnishing and installing low-pressure plastic pipe and fittings to the lines and grades as shown on the drawings and/or as staked in the field.

II. MINIMUM DEPTH OF COVER

Pipe shall be installed at sufficient depth below the ground surface to provide protection from hazards imposed by traffic crossings, farming operations, freezing temperatures, or soil cracking. The minimum depth of the cover shall be 30 inches. The maximum depth of cover for all pipe sizes shall be 4 feet.

When depths of cover are otherwise specified, they will be noted on the "Practice Requirement" sheet.

At low places on the ground surface, extra fill may be placed over the pipeline to provide the minimum depth of cover. The top width of the fill shall be no less than 10 feet and the side slopes no steeper than 6 horizontal and 1 vertical. The fill material shall be placed and compacted before the trench is excavated. If extra protection is needed at vehicular crossings, encasement pipe or other approved methods may be used.

III. TRENCH CONSTRUCTION

The trench width shall be as shown in Table 1 (page 430-EE-5 of this specification.)

The trench at any point below the top of the pipe shall only be wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be uniformly placed under the haunches and along the sides of the pipe. If the trench is precision excavated and has a semicircular bottom that closely fits the pipe, the width shall not exceed the outside diameter of the pipe by more than 10 percent.

The trench bottom shall be uniform so that the pipe lays on the bottom without bridging. Clods, rocks, and uneven spots that can damage the pipe or cause non-uniform support shall be removed.

If there are rocks, boulders, or any other material that might damage the pipe, the trench bottom shall be undercut a minimum of 4 inches below final grade and filled with bedding material consisting of sand or compacted fine-grained soils.

Provisions shall be made to insure safe working conditions where unstable soil, trench depth, or other conditions exist that can be hazardous to personnel working in the trench.

IV. PLACEMENT

Care shall be taken to prevent permanent distortion and damage when handling the pipe during unusually warm or cold weather. To minimize stresses of expansion and contraction, pipe shall be allowed to come within a few degrees of the temperature it will have after it is completely covered before placing the backfill, other than that needed for shading, or before connecting the pipe to other facilities.

The pipe shall be uniformly and continuously supported over its entire length on firm stable material. Blocking or mounding shall not be used to bring the pipe to final grade.

For pipe with belled ends, bell holes shall be excavated in the bedding material, as needed, to allow for unobstructed assembly of the joint and to permit the body of the pipe to be in contact with the bedding material throughout its length.

The pipe shall be centered and anchored in the trench to allow proper backfill placement.

V. JOINTS AND CONNECTIONS

All joints and connections shall be capable of withstanding the design maximum working pressure for the pipeline without leakage and shall leave the inside of the line free of any obstruction that can reduce its capacity below design requirements.

All fittings, such as couplings, reducers, bends, tees, and crosses, shall be installed according to the recommendations of the pipe manufacturer.

Fittings and appurtenances made of steel or other metals susceptible to corrosion shall be adequately protected by wrapping them with plastic tape or applying a coating having high corrosion preventative qualities. If plastic tape is used, all surfaces shall be thoroughly cleaned and then coated with a primer compatible with the tape before wrapping them.

VI. THRUST BLOCKS

Thrust blocks must be formed against a solid hand-excavated earth trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and the trench wall shall be filled to the height of the outside diameter of the pipe or as specified by the manufacturer.

VII. TESTING

The pipeline shall be thoroughly and completely tested at the design pressure for pressure strength and leakage while uncovered or only partly backfilled. If it is necessary to partly backfill the line before testing to hold the pipeline in place, backfilling shall be according to the specifications under "Initial Backfill." All joints and connections shall be left uncovered for inspection; only the body of the pipe sections shall be covered.

The line shall be slowly filled with water. Adequate provision shall be made for air release during filling operations, taking care to bleed all entrapped air. The pressure shall be slowly built up to the maximum design working pressure of the system. While this pressure is maintained, all exposed pipe, fittings, valves, hydrants, joints, appurtenances, and covered parts of the line shall be examined for leaks. Any leaks shall be repaired and the system retested.

It shall be demonstrated by testing that the pipeline will function properly at design capacity. At or below design capacity there shall be no objectionable flow conditions, such as water hammer, continuing unsteady delivery of water, damage to the pipeline, or detrimental discharge from control valves, vents or stands.

VIII. BACKFILL

A. Initial Backfill. (for 18 inch or less). Hand, or water packing methods may be used. The pipeline

shall be filled with water and maintained at the design working pressure during backfilling operations.

The initial backfill material shall be selected soil or sand free from rocks or stones larger than 1 inch in diameter and earth clods greater than about 2 inches in diameter. The material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged.

Water packing shall be used when possible to consolidate the initial backfill around the pipe. The initial backfill, before wetting, shall be of sufficient depth to insure complete coverage of the pipe after consolidation takes place. Water packing is accomplished by adding water to diked reaches of the trench in sufficient quantity to thoroughly saturate the initial backfill without excessive pooling of water. After the initial fill is saturated, the pipeline shall remain full until after final back filling. The waterpacked backfill shall be allowed to dry until firm enough to walk on before final backfill is begun.

If conditions do not permit water packing, the initial backfill shall be placed in layers and compacted around and about 6 inches above the pipe by hand or mechanical methods to the soil density required to provide adequate lateral support to the pipe.

An exception to water packing or to completely compacting the initial backfill is permitted if the trench is precision excavated and has a semicircular bottom that closely fits the pipe and the width does not exceed the outside diameter of the pipe by more than 10 percent. With this type of trench construction, all other initial and final backfill requirements shall apply, including having the pipe under water pressure during backfilling.

B. Initial Backfill (for 20-inch and greater). Hand, or water packing methods may be used. The pipeline shall be filled with water and maintained at the design working pressure during backfilling operations.

The initial backfill material shall be select material as shown in Figure 1 (page 430-EE-5 of this specification), placed from the bottom of the trench to a depth of 0.7 the pipe diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. The initial backfill material shall be placed so that the pipe will not be displaced, excessively deformed, or damaged.

If backfilling is done by hand or mechanical means, the initial fill shall be compacted firmly in 4 to 6 inch lifts around the pipe as required in Figure 1 (to provide adequate lateral support to the pipe.)

If the water packing method is used, the pipeline first shall be filled with water. The initial backfill before wetting, shall be of sufficient depth to insure a final depth of 0.7 of the pipe diameter after consolidation. Water packing is accomplished by adding water to diked reaches of the trench in sufficient quantity to thoroughly saturate the initial backfill. The backfill shall then be vibrated sufficiently to fill all voids under the pipe. The amount of water used for consolidation shall be controlled to insure no pooling of excess water. After the backfill is saturated, the pipeline shall remain full until after the final backfill is made. The wetted fill shall be allowed to dry until firm before beginning the final backfill.

C. Final Backfill. Final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 inches in diameter. The material shall be placed and spread in approximately uniform layers so that there will be no unfilled spaces in the backfill and the backfill will be level with the natural ground or at the design grade required to provide the minimum depth of cover after settlement takes place. Rolling equipment shall not be used to consolidate the final backfill.

All special backfilling recommendations of the pipe manufacturer shall be met.

IX. MATERIALS

A. The plastic pipe shall conform to the requirements of the Material Specifications and pressure rating as listed on the "Practice Requirements" sheet. Prior to purchase of the pipe, the owner should provide the Engineer with the name of the pipe manufacturer and the markings on the pipe for the Engineer's determination of acceptance.

B. All fittings and couplers shall meet or exceed the same strength requirements as those of the pipe.

Such fittings and joints shall be capable of withstanding a working pressure equal to or greater than that for the pipe.

C. Joints can be either rubber gasket or solvent cemented joints. When solvent cement joints are used, they shall be constructed and cemented according to the recommendations of the pipe manufacturer.

D. Use of low head plastic irrigation pipe is limited to projects installed by a licensed contractor.

X. BASIS OF ACCEPTANCE

The acceptability of the pipeline shall be determined by inspection to check compliance with all the provision of this specification with respect to the drawings, pipe, pipe markings, the appurtenances, and the minimum installation requirements.

The installing constructor shall certify that his installation complies with the requirements of the specification. A written guarantee shall be furnished that protects the owner against defective workmanship and materials for not less than 1 year, and that identifies the manufacturer and markings of the pipe used.

XI. VEGETATIVE COVER

When specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

XII. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical that enhance fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food and den trees.

XIII. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The completed job shall be workmanlike and present a good appearance.

OPERATION AND MAINTENANCE ITEMS

A properly operated and maintained irrigation pipeline is an asset to your farm. This irrigation pipeline was designed and installed to transmit water to where it may be utilized. The estimated life span of this installation is at least 10 years. The life of this pipeline can be assured and usually increased by developing

and carrying out a good operation and maintenance program.

This practice will require you to perform periodic maintenance and may also require operational items to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program.

Check to make sure all valves and air vents are set at the proper operating condition so they may provide protection to the pipeline.

Maintain the design depth of cover over the pipeline.

Limit traffic over the pipeline to designated section that were designed for traffic loads.

Avoid travel over pipelines by tillage equipment when the soil is saturated.

Avoid any subsoiling operation that may disturb the pipeline.

Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization and application of herbicides when necessary. Periodic mowing may also be needed to control height.

Remove all foreign debris that hinders system operation.

Drain the system and components in areas that are subject to freezing. If parts of the system cannot be drained, an anti-freeze solution may be added.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Other items specific to your project are listed on the "Practice Requirements" sheet.

FIGURE 1.

* IF NEEDED FOR ROCKY CONDITIONS

TW = TRENCH WIDTH, SEE TABLE 1.

B1 = FINAL BACKFILL, AND INITIAL BACKFILL FOR PIPE SIZES 18 OR LESS;
SOIL EXCAVATION FROM TRENCH, AND COMPACTED TO SAME DENSITY AS ADJACENT
SOIL IN TRENCH BANKS.

B2 = INTERMEDIATE BACKFILL, SOIL MATERIAL THIS IS SAND, LOAMY SAND, OR SANDY
LOAM FREE FROM CLOUDS AND ROCKS GREATER THAN 1 INCH.

B3 = INITIAL BACKFILL, MATERIAL OF SOIL TYPES SW (WELL GRADED CLEAN SAND) OR SP
(POORLY GRADED SAND), WITH LESS THAN 12% PASSING 200 SIEVE.

TABLE 1.
MINIMUM AND MAXIMUM TRENCH WIDTHS FOR UNDERGROUND
PLASTIC PIPELINES

Pipe Size (in)	Minimum Trench Width (in)		Maximum Trench Width (in)
	Water Packed	Mechanical Compaction	
4	10	16	30
5	11	17	30
6	12	18	30
8	14	20	30
10	16	22	30
12	18	24	36
14	22	32	36
15	23	33	36
18	26	36	42
20	28	38	42
24	32	42	46
27	35	45	46

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

LAND RECLAMATION, ABANDONED MINED LAND

(Ac.)

CODE 543

DEFINITION

Reclamation of land and water areas adversely affected by past mining activities

PURPOSE

- Stabilize abandoned mined areas to decrease erosion and sedimentation, support desirable vegetation and improve offsite water quality and or quantity
- Maintain or improve landscape visual and functional quality
- Protect public health, safety and general welfare

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to abandoned mined land that degrades the quality of the environment and prevents or interferes with the beneficial uses of soil, water, air, plant or animal resources, or endangers human health and safety.

CRITERIA

General Criteria Applicable to All Purposes

Develop a reclamation plan that is consistent with the site capability, the planned land use and the landowner's conservation objectives. Include practices necessary to reclaim and stabilize the mined areas to prevent further degradation of soil, water, air, plant and animal resources.

Dust Control

Control the generation of particulate matter and fugitive dust during removal and replacement of soil and other materials. Detail the practices and activities necessary for dust control in the plans and specifications.

Site Preparation

Properly identify areas for preservation including those containing desirable trees, shrubs, grasses, stream corridors, natural springs, historic structures or other important features.

Remove trees, logs, brush, rubbish and other debris from construction areas that can interfere with reclamation operations. Dispose of these materials so they will not create a resource problem or interfere with reclamation activities and the planned land use.

Remove or bury soil materials that will adversely affect water quality or plant growth. Bury materials containing heavy metals below the root zone, or add suitable soil amendments to minimize the negative effect of this material.

Slope overhanging rocks walls to ½ horizontal to one vertical slope or flatter before placing backfill against the wall. In the plans and specifications, identify the thickness and density of lifts for fill material to limit the deep infiltration of precipitation and to limit settlement of the completed fill to acceptable levels, based on the planned land use.

Removal and Placement of Material for Final Cover

Salvage, stockpile and protect soil materials from the site that are suitable for use as final cover material. Control prohibited noxious and/or invasive plant species in the stockpile area. Use Conservation Practice Standard 595, Pest Management for guidance to control noxious and invasive plants..

Reconstructed soils must meet the requirements for the specified land use on at least 80 percent of the area. Soils in the remaining areas must be suitable for stabilization and revegetation.

Spread the final cover material over the graded areas to the depth specified in the reclamation plan. The final slope must permit application of needed conservation and management practices to keep soil losses within planned levels. Final grading must compensate for any settlement expected to interfere with the planned land use, surface drainage or water disposal.

Erosion and Sediment Control During Construction

Plan and implement conservation practices that will decrease erosion and trap sediment onsite during construction to limit offsite damages from sedimentation to acceptable levels.

Runoff Control

Plan and implement runoff control practices to control erosion for final stabilization of the site. The practices selected must be compatible with the final planned land use of the site.

Establishment of Vegetation

Do site preparation, planting and seeding at a time and in a manner to ensure survival and growth of the selected species. In the plans and specifications, identify the criteria for successful establishment of vegetation such as minimum percent ground/canopy cover, percent survival or stand density.

Apply soil amendments and or plant nutrients as appropriate, according to the requirements of Conservation Practice Standard 590, Nutrient Management. If the recommended fertilizer rate exceeds the criteria in Conservation Practice Standard (590) Nutrient Management, use appropriate mitigating practices to reduce the risk of nutrient losses from the site.

Select plant materials suitable for the specified end land use according to local climate potential, site conditions and local NRCS criteria. Identify in the plans and specifications the species, rates of seeding or planting, minimum quality of planting stock, such as PLS or stem caliper, and method of establishment. Use only viable, high quality seed or planting stock.

Use local NRCS criteria for seedbed preparation, seeding rates, planting dates, depths and methods.

Restoration of Borrow Area

If cover or fill material is taken from areas outside the reclamation site, grade and shape the borrow area for proper drainage, and revegetate as appropriate to control erosion.

If the cover material is taken from adjacent land, the topsoil from the borrow area must be stockpiled separately and replaced after the borrow area is restored for its intended purpose.

If the borrow area is prime farmland, remove and stockpile the A and B soil horizons separately by horizon (or the B and C soil horizons if applicable). Replace the soil horizons on the borrow area in the natural sequence to a thickness that will restore the original soil productivity. Treat the borrow area to meet the requirements of the Conservation Practice Standard 544, Land Reconstruction, Currently Mined Land.

Additional Criteria to Maintain or Improve Landscape Visual and Functional Quality

Reclaim the site to maintain or improve visual quality based on the scenic quality of the reclaimed site, as well as the function of the site for the end land use. Plan the reclamation to be compatible with the topography and land cover of the adjacent landscape. Focus on areas of high public visibility and those offering direct or indirect human and wildlife benefits.

Grade and shape spoil piles and borrow areas to blend with the adjacent landscape topography to the extent practicable.

Develop a planting plan that mimics the species, arrangement, spacing and density of plants growing on adjacent landscapes. Choose native species of erosion control vegetation and other plant materials where practical. Arrange plantings to screen views, delineate open space, act as windbreaks, serve as parkland, provide wildlife habitat or protect stream corridors.

Additional Criteria to Protect Public Health, Safety and General Welfare

Reclamation plans must eliminate the safety hazards to the public from, erosion and water pollution, high walls, pools of water with steep side slopes that are difficult to escape from, landslide potential, and underground mine openings.

Design treatment alternatives that meet or exceed the requirements of the following conservation practices based upon the site hazards: Land Reclamation, Landslide Treatment, 453; Land Reclamation, Highwall Treatment, 456, and/or; Mine Shaft and Adit Closing, 457.

CONSIDERATIONS

In California, the Surface Mining and Reclamation Act of 1975 (SMARA) regulates surface mining operations, in part to assure that: 1) adverse environmental effects are prevented; 2) mined lands are reclaimed to a usable condition which is readily adaptable for alternative uses; and 3) residual hazards to the public health and safe and safety are eliminated.

The key to a successful restoration is often dependent upon the proper placement of soils that will best support vegetation. One means to do this is to develop a detailed soil survey for the project and proposed borrow areas. Use the soil survey to identify the types and extent of soil materials and those that will best support vegetation.

Soil permeability is often a problem on reclaimed soils. Where appropriate, improve soil permeability after placing backfill material by using tillage or deep ripping to decrease compaction and promote infiltration and root development. Do not plan practices that promote infiltration if seepage through cover materials has the potential to increase acid mine drainage or otherwise negatively impact groundwater quality, or where soil has been compacted to meet strength or stability criteria for engineered measures.

Reclaimed soils are often low in organic matter. The use of organic soil amendments such as manure, compost, mulch or sewage sludge can contribute to the success of vegetative establishment by increasing soil organic matter.

Reclaimed mine areas can provide important wildlife habitat. Improve the potential for wildlife habitat by establishing diverse vegetation types, including water in the reclaimed landscape, and/or increasing edge effect and landform diversity as appropriate. Avoid monocultures of vegetation.

Every effort should be made to utilize native, non-invasive vegetative species and control the spread of invasive undesirable species. Where appropriate, wash all equipment utilized in the project activities before leaving the site.

The reclamation of abandoned mine lands provides an opportunity to increase carbon sequestration. Choose species such as deep rooted perennial grasses and trees to increase the carbon sequestration potential of the reclaimed site.

Unless an extensive program is undertaken to change the chemistry of a serpentine site, the site indigenous species are the best choice for rehabilitation of that site. These plants are adapted to the stressful soil environment, but tend to be very slow growing. Consider the need for additional erosion control measures in these situations (Newton and Claassen, 2003.)

Monitoring and maintenance will need to be done on a regular basis after the initial reclamation to ensure success. The construction of stabilized access roads will allow access to the site for maintenance without causing erosion problems.

Cultural Resources Considerations

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

<http://www.nrcs.usda.gov/technical/cultural.html> is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

Endangered Species Considerations

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each treatment unit according to the Criteria, Considerations, and Operation and Maintenance sections of this standard.

As a minimum, include the following information in the plans and specification for the reclamation area:

- Location of the reclamation area
- Plans showing the final grading to take place on the reclamation area
- The location of topsoil stockpiles
- The location of erosion and sediment control practices
- Detailed information for the installation of erosion and sediment control practices
- Detailed information on the soil amendments to be applied to the site
- Detailed information on the species and arrangement of plant materials to be planted on the site

OPERATION AND MAINTENANCE

Prepare an Operation and Maintenance plan that provides specific details concerning conservation practices identified in the reclamation plan. As a minimum, include the following items in the operation and maintenance plan:

- Periodic checking of the site for areas where settlement may adversely affect drainage and land use.
- Periodic checking of the site for bare spots, eroded areas, areas of excessive settlement and other areas where initial attempts to establish vegetation were not successful.
- Periodic soil testing and checking of vegetation to determine if additional soil amendments are needed.
- Maintenance of access roads.
- Maintenance of drainage structures and channels.
- Periodic checking of the site for noxious weeds and invasive species.
- Control of vehicular traffic to minimize disturbance to reclaimed areas.

REFERENCES

- Soil Survey Division Staff. 1993. Soil Survey Manual. Pp. 90-92. Soil Conservation Service. U.S. Department of Agriculture Handbook 18,
<http://soils.usda.gov/technical/manual/>
- National Cultural Resources Procedures Handbook. 2003. USDA, Natural Resources Conservation Service, Washington D.C.
http://policy.nrcs.usda.gov/media/pdf/H_190_601_a.pdf
- National Agronomy Manual, Part 501, Water Erosion and Part 502, Wind Erosion . 2002. USDA Natural Resources Conservation Service, Washington D.C
http://policy.nrcs.usda.gov/media/pdf/M_190_NAM.pdf
- Revised Universal Soil Loss Equation, Ver. 2 (Rusle 2). 2004. USDA Natural Resources Conservation Service, Washington D.
http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm
- Wind Erosion Equation (WEQ) Guidance Document. 2003. USDA Natural Resources Conservation Service, Washington D.C.,
<http://www.nrcs.usda.gov/technical/ECS/agronomy/WEQGuidance.doc>
- Landscape Design in Mined Land Reclamation, LAN-1, 1983, National Technical Information Service, USDA NRCS Conservation Engineering Division, Washington, D.C.
- Procedures to Establish Priorities in Landscape Architecture, TR-65, 1978, National Technical Information Service, USDA NRCS Conservation Engineering Division, Washington, D.C.,
<http://www.info.usda.gov/CED/ftp/CED/tr65.pdf>
- Surface Mining and Reclamation Act of 1975 and Associated Regulations. Revised January 2007. California Department of Conservation, Office of Mine Reclamation, Sacramento, CA.
<http://www.consrv.ca.gov/OMR/smara/>
- Rehabilitation of Disturbed Lands in California: A Manual for Decision-Making. 2003. California Geological Survey Special Publication 123 by G.A. Newton and V.P. Claassen, Sacramento, CA.,
http://www.consrv.ca.gov/OMR/qh_publications.htm

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

543 – LAND RECLAMATION, ABANDONED MINED LAND

OPERATION AND MAINTENANCE

Sponsor/Land user: _____ Date: _____

Address: _____

Location GPS Coordinates Map Datum: _____ E _____ N _____

Quad Sheet Name _____ SEC _____ T _____ R _____

Properly operated and maintained abandoned mined land project is an asset to your farm. This project was designed and installed to stabilize abandoned mined areas so that they can be used to support desirable vegetation, reduce erosion and sedimentation, enhance water quality or quantity, maintain and improve the visual quality of the landscape, and protect public health, safety, and general welfare. The estimated life span of this installation is at least 10 years. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program.

GENERAL RECOMMENDATIONS

- Maintain appropriate warning signs.
- All fences, railings, and/or warning signs shall be maintained to prevent unauthorized human, vehicle or livestock entry.
- Inspect project site yearly and fill areas where settlement is adversely affecting drainage and land use.
- Add soil amendments to soils that cannot support adequate vegetation or replace them with suitable soil material.
- Inspect haul roads and approaches to and from the project frequently to determine the need for stabilizing materials. Repair as needed.
- Inspect drainage structures and channels. Remove any obstructions to keep structures and channels clean and functional. Take corrective actions to address any erosion that occurs.
- Visually inspect grazed land. Take corrective actions to address any erosion that occurs. Seek the advice of the local NRCS for proper grazing practices to eliminate any future erosion.

- Inspect project area after heavy rains. Promptly repair any damage. Fill rills and gullies that occur and re-vegetate.
- Maintain vigorous growth of vegetative coverings. This includes reseeding, fertilization, and application of herbicides when necessary. Periodic mowing may also be needed to control height.
- Immediately repair any vandalism, vehicular, or livestock damage.
- Inspect for damage from rodents or burrowing animals. Repair any damage. Take appropriate corrective actions to alleviate further damage.
- Avoid excessive travel on any portion of the system that will harm or destroy the vegetative cover.

SPECIFIC RECOMMENDATIONS FOR YOUR PROJECT

CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR ABANDONED MINED LAND RECLAMATION PROJECT.

STATEMENT OF WORK
Land Reclamation, Abandoned Mined Land (543)

These deliverables apply to this individual practice. For other planned practice deliverables refer to those specific Statements of Work.

DESIGN**Deliverables:**

1. Design documents that demonstrate criteria in NRCS practice standard have been met and are compatible with planned and applied practices.
 - a. Practice purpose(s) as identified in the conservation plan
 - b. List of required permits to be obtained by the client
 - c. List of facilitating practices
 - d. Compliance with NRCS national and state utility safety policy (NEM part 503-Safety, Section 503.00 through 503.22)
 - e. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to:
 - i. Site preparation requirements
 - ii. Requirements for final cover
 - iii. Water disposal requirements
 - iv. Vegetation requirements
 - v. Provisions for restoration of borrow area
 - vi. Additional provisions, as required, to maintain or improve visual quality, protect public health and general welfare.
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describes the requirements to install the practice and obtain necessary permits.
3. Operation and maintenance plan.
4. Certification that the design meets practice standard criteria and comply with applicable laws and regulations.
5. Design modifications during installation as required.

INSTALLATION**Deliverables**

1. Pre-installation conference with client.
2. Verification that client has obtained required permits.
3. Staking and layout of measures according to plans and specifications including applicable layout notes.
4. Installation guidance as needed.
5. Facilitate and implement required design modifications with client and original designer.
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the installation process and materials meet design and permit requirements.

CHECK OUT**Deliverables**

1. Records of installation.
 - a. Extent of practice units applied
 - b. Actual measures and materials used and applied
 - c. Drawings
 - d. Final quantities
2. Certification that the application meets NRCS standards and specifications and is in compliance with permits.
3. Progress reporting.

STATEMENT OF WORK
Land Reclamation, Abandoned Mined Land (543)

REFERENCES

- [NRCS Field Office Technical Guide \(eFOTG\)](#), Section IV, Conservation Practice Standard – Land Reclamation, Abandoned Mined Land, 543
- [National Engineering Manual](#), Utility Safety Policy
- [NRCS National Environmental Compliance](#) Handbook
- [NRCS Cultural Resources](#) Handbook
- [Surface Mining and Reclamation Act of 1975 and Associated Regulations](#). Revised January 2007. California Department of Conservation, Office of Mine Reclamation, Sacramento, CA.
- [Rehabilitation of Disturbed Lands in California: A Manual for Decision-Making](#). 2003. California Geological Survey Special Publication 123 by G.A. Newton and V.P. Claassen, Sacramento, CA.