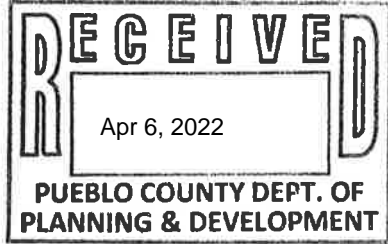


1041 2019-003



Prepared for: Black Hills Energy



105 S Victoria Ave.
Pueblo, Colorado 81003

Transmission Line Canon West Reliability – Desert Cove to North Penrose Rebuild

Construction Stormwater
Management Plan (SWMP)

*Hwy 115 and K St to E Platteville Boulevard
Pueblo County and Fremont County, 81240 - 81007*

March 2022

**SWMP MUST BE
KEPT ON SITE**

Prepared By:



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Table of Contents

General Requirements	4
Qualified Stormwater Manager	4
Permittee / Qualified Stormwater Manager Duties	6
Plan Availability and Retention	6
Reviews and Revisions	6
Inspections	7
Other Required Noncompliance Notifications	7
Spill Prevention and Response Plan	8
Materials Handling	8
Potential Sources of Pollution	9
Control Measure Implementation	15
Structural Control Measures	15
Non-Structural Control Measures	18
Documented Use Agreement	21
Site Description	21
Nature of Construction Activity at the Site	21
Proposed Sequence of Major Construction Activities	21
Area Estimates	22
Existing Soil Information	24
Vegetative Coverage	24
Allowable Non-Stormwater Discharges	24
Receiving Waters	25
Stream Crossings	25
Diversion Structures	26
Alternate Temporary Stabilization Frequencies	26
Site Map	26
Stabilization Requirements	26
Temporary Stabilization	26
Final Stabilization	27
Long Term Stormwater Management	27
Inspection Reports	27
Inspection Frequency	27



Reduced Inspection Frequency	28
Post-Storm Inspections at Temporarily Idle Sites	28
Inspections at Completed Sites/Areas.....	28
Winter Conditions Inspections Exclusion.....	28
Inspection Scope	28
Appendix A: Construction Stormwater Permits	0
Appendix B: Site Maps	0
Appendix C: Control Measure Details	0
Appendix D: Pre-Construction Photos	0
Appendix E: Reference Documents.....	0
Appendix F: Inspection Report	0

No table of figures entries found.



General Requirements

This is a Stormwater Management Plan (SWMP) for the Canon West Reliability – Desert Cove to North Penrose Rebuild project being conducted by Black Hills Energy Corporation (BHE). This document has been developed as defined in the Colorado Discharge Permit System (CDPS) General Permit for Stormwater Discharges Associated With Construction Activity (Permit No. COR-400000, effective April 1, 2019) authorizing stormwater discharges from construction activities that result in a total land disturbance of one acre or greater or if a project is less than an acre but part of a larger common plan of development.

This SWMP was prepared in accordance with good engineering, hydrologic and pollution control practices. Changes or additions may be required to address changes in conditions at the project. If such changes are made, this SWMP will be updated accordingly, and revisions documented in the SWMP.

Qualified Stormwater Manager

This SWMP must identify, at a minimum, one person who meets the following description of a Qualified Stormwater Manager (QSM):

“An individual knowledgeable in the principles and practices of erosion and sediment control and pollution prevention, and with the skills to assess conditions at construction sites that could impact stormwater quality and to assess the effectiveness of stormwater controls implemented to meet the requirements of this permit.”

The QSM is responsible for implementing the SWMP in its entirety. This role may be filled by more than one individual. Update the following table accordingly throughout the life of the project as roles and responsibilities change. Include new rows/additional sheets as necessary.



Qualified Stormwater Manager Contact Information

PROJECT OWNER:			
Name:	Company:	Address:	Email:
Title:	Phone:		QSM (Y/N)
PROJECT OPERATOR:			
Name: Seth Boutilier	Company: Black Hills Energy	Address: 105 S. Victoria Ave Pueblo, Colorado 81003	Email: Seth.Boutilier@blackhillscorp.com
Title: Sr. Transmission Project Manager	Phone: (719)-248-501		QSM (Y/N):
PROJECT MANAGER:			
Name: Seth Boutilier	Company: Black Hills Energy	Address: 105 S. Victoria Ave Pueblo, Colorado 81003	Email: Seth.Boutilier@blackhillscorp.com
Title: Sr. Transmission Project Manager	Phone: (719)-248-501		QSM (Y/N):
SWMP PREPARER:			
Name: Brian Brown	Company: HDR	Address: 416 Canyon Ave, Suite 316 Fort Collins, CO 80521	Email: Brain.Brown@hdrinc.com
Title: PE	Phone: (970)-416-4404		QSM (Y/N): N
CONSTRUCTION FOREMAN/MANAGER:			
Name:	Company:	Address:	Email:
Title:	Phone:		QSM (Y/N)
SWMP INSPECTOR:			
Name: Mike Perry	Company: Apex	Address: 3930 S U.S. Hwy 85-87 Colorado Springs, CO 80911	Email:
Title:	Phone: (719)-930-007		QSM (Y/N)
CONTROL MEASURE INSTALLER:			
Name: Mike Wirth	Company: Apex	Address: 209 Main St Unite A Mead, CO 80542	Email:
Title:	Phone: (610)-217-9604		QSM (Y/N)
OTHER:			
Name: Ally Little	Company: Black Hills Energy	Address: 1301 West 24 th St Cheyenne, WY 82001	Email: Ally.Little@blackhillscorp.com
Title: Qualified Stormwater Manager	Phone: (402)-917-8557		QSM (Y/N) Y
OTHER:			
Name:	Company:	Address:	Email:
Title:	Phone:		QSM (Y/N)



Permittee / Qualified Stormwater Manager Duties

The permittee and qualified stormwater managers defined and identified in Section 1.1 of this report are responsible for maintaining this SWMP per requirements in the general permit. Key responsibilities for management of this SWMP document are defined below.

Plan Availability and Retention

AVAILABILITY

The permittee must provide a copy of the SWMP to the Water Quality Control Division (WQCD), Environmental Protection Agency (EPA), and Pueblo and Fremont County with authority for approving sediment and erosion control plans, grading plans, or local SWMPs upon request. Provide a signed certification (per Part I.A.3.e.), certifying the SWMP is complete and compliant with all terms and conditions of the permit to the requesting agency.

RETENTION

Permittee must retain a copy of the SWMP at the construction site from the date of the initiation of construction activities to the date of expiration or inactivation of permit coverage; unless another location, specified by the permittee, is approved by the WQCD.

Permittee must retain copies of documentation required by the general permit, including records of all data used to complete the application for permit coverage, for at least three years from the date the permit coverage expires or is terminated.

Reviews and Revisions

The qualified stormwater manager should continuously review and update the SWMP, which acts as a living document, as part of the overall process of assessing and managing stormwater quality issues at the site.

Qualified stormwater managers, or other onsite staff, must amend the plan, report narrative or site maps, when any of the following occurs:

- A change in design, construction, operation, or maintenance of the site requiring implementation of new or revised control measures;
- The SWMP proves ineffective in controlling pollutants in stormwater runoff in compliance with the permit conditions;
- Control measures identified in the SWMP are no longer necessary and are removed; and
- Corrective actions are taken onsite that result in a change to the SWMP.

For SWMP revisions made prior to or following changes onsite, including revisions to sections addressing site conditions and control measures, include a notation that identifies:

- Date of the site change, the control measure removed, or modified;
- Locations of those control measures; and
- Changes to the control measures.



The permittee must ensure site changes are reflected in the plan. The permittee is noncompliant with the permit until the SWMP revisions are made.

Inspections

A qualified stormwater manager must conduct regular inspections of the site beginning within seven days of commencement of construction activities at the site and until final stabilization is achieved.

The permittee is responsible for verifying that inspections are conducted by a qualified stormwater manager. Additional inspection requirements are discussed in Section 9.

ROUTINE MAINTENANCE

Maintenance must be in accordance with good engineering, hydrologic, and pollution control practices. Control measures requiring routine maintenance, as observed during an inspection or as a general observation at the site, are not subject to requirements of corrective actions (described below).

CORRECTIVE ACTIONS

Permittee must take all necessary steps to minimize or prevent discharge of pollutants until a control measure is implemented and made operational and/or an inadequate control measure is replaced or returned to effective operating condition.

If it is infeasible to install or repair a control measure immediately after discovering the deficiency, the following information must be documented and kept on record:

- Description of why it is infeasible to initiate the installation or repair immediately; and
- Provide a schedule for installing or repairing the control measure and returning it to an effective operating condition as soon as possible.

The permittee must remove and properly dispose of any unauthorized release or discharge (e.g. discharge of non stormwater, spill, or leak not authorized by the Construction Stormwater Permit). The permittee must also clean up any contaminated surface to minimize discharges of the material in subsequent storm events.

The permittee is noncompliant with the Construction Stormwater Permit until the inadequate control measure is replaced or returned to effective operation condition.

Other Required Noncompliance Notifications

Permittee must notify the WQCD if circumstances allowing any of the following occur:

- Noncompliance which may endanger health or the environment regardless of the cause of the incident;
- Unanticipated bypass which exceeds effluent limitations in the general permit;
 - Bypass: *The intentional diversion of waste streams from any portion of a treatment facility.*
- Upset which causes exceedance of any effluent limitation in the general permit;



- Upset: *Unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. Does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.*
- Daily maximum violations for any pollutants limited by Part I of the general permit, including any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.

Upon discovery, the permittee must provide verbal notification to the WQCD within 24 hours and a written report within five working days.

Spill Prevention and Response Plan

The construction contractor must provide a Spill Prevention and Response Plan (SPRP) containing the following information, at a minimum:

- Notification procedures to be used in the event of an accident. At the very least, notify the Qualified Stormwater Manager (See Section 1). Depending on the nature of the spill and the material involved, the CDPHE 24 hour spill reporting line (**877-518-5608**), downstream water users, or other agencies may also need to be notified;
- Instructions for clean-up procedures and identification of spill kit locations;
- Provisions for absorbents to be made available for use in fuel areas, and for containers to be available for used absorbents; and,
- Procedures for properly washing out concrete truck chutes and other equipment in a manner and location so that the materials and wash water cannot discharge from the site, and never into a storm drain system or stream.

Report to the CDPHE any release of any chemical, oil, petroleum product, sewage, etc., which may enter waters of the State of Colorado (including surface water, groundwater, dry gullies, or storm sewers leading to surface water).

A copy of the contractor's SPRP is included in Appendix E.

Materials Handling

Site maps in Appendix B indicate location of control measures designed to minimize impacts from handling significant materials that could contribute pollutants to runoff. Information on implementation of structural and non-structural control measures associated with such are discussed in Section 5, attached in Appendix C, or included on the site maps in Appendix B.

Significant materials include non-sediment pollutants such as raw materials, petroleum based products, solvents, detergents, plastic pellets, finished raw materials (such as metallic products), raw materials used in food processing, fertilizers, pesticides, sanitary waste



materials, waste from saw cutting, pothole slurry, concrete, mortar and masonry products, and any other hazardous material.

Bulk storage (55 gallons or greater) of any petroleum product or other liquid chemical must have secondary containment, or equivalent protection, in order to prevent spilled material from entering state waters. Concrete washout activities must have associated control measures which are specifically designed for concrete washout waste.

Potential Sources of Pollution

The following potential sources of pollutants and activities have been evaluated for their ability to impact stormwater discharges. If the potential source exists at the site, the control measures used to manage that source are listed in this section and are illustrated in the Site Maps in Appendix B. Details depicting how each control measure is designed to prevent pollution from entering waters are included in Appendix C. Additional information is included in the SPRP.

POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT? YES NO	ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
<i>All disturbed and stored soils:</i> <i>Stockpiled soils (i.e., topsoil, embankments, spoils, etc.)</i> <i>Disturbed soils (exposed areas, staging areas, parking, etc.)</i>	Y	<p>Activities associated with this pollution source are the earth-disturbing activities during all phases of construction activities, including but not limited to excavating, grading, cutting, filling, backfilling, stockpiling, landscaping, etc.</p> <p><u>Control Measures:</u> Sediment control and stockpile containment may include use of: erosion/sediment control logs, silt fence, sweeping, temporary berms, gravel bags, check dams, landforms, vehicle tracking control (VTC), inlet and culvert protection or other proprietary Control Measures (i.e. Big Red Bag, Dandy Recyclers, etc.).</p> <p>Erosion Control may include surface roughening, applying mulch/mulch tackifier, installing erosion control blankets, seeding and mulching, and protecting pre-existing vegetation.</p> <p>For earth disturbing activities that have permanently or temporarily ceased for more than 14 calendar days contractor will implement temporary stabilization. Temporary stabilization methods may include, but are not limited to, tarps, soil tackifier, and hydroseed or mulch and/or surface roughening.</p> <p>Administrative controls may include phasing construction to reduce the amount of open area at any given time and limiting the number of stockpiles.</p>



POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT?		ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
	YES	NO	
<i>Vehicle tracking of sediments:</i>	Y		<p>Activities associated with this pollution source are the movement of vehicles from disturbed areas to paved streets during all phases of construction activities. Personnel may manually remove mud that has adhered to tires and tracks.</p> <p><u>Control Measures:</u> Sediment control may include stabilized construction entrances (rock, geotextiles, mud mats, and/or other proprietary products), street sweeping and inlet and culvert protection.</p> <p>If necessary, use construction fencing to limit entry and exit points and establish perimeter control. If feasible with construction activities and schedule, limit access to areas of site when muddy conditions exist.</p>
<i>Management of contaminated soils</i>		N	<p>No known contaminated soils exist on site. If contaminated soils are encountered, stop all activity until the situation can be assessed. Contact the Project Manager for further direction.</p>
<i>Loading and unloading operations</i>	Y		<p>Activities associated with this pollution source are potential spills during delivery and unloading of materials at the staging area during all phases of construction activity.</p> <p><u>Control Measures:</u> Loading and unloading operations should occur within the disturbance limits at designated material storage and staging areas. For larger, longer duration projects, the staging area may be stabilized with rock or other non-erosive surface.</p> <p>Administrative controls may include following materials management protocols, practicing good housekeeping, training on-site personnel, providing spill kits where needed, and minimizing the number of areas where loading and unloading occur. Contact the Project Manager immediately for all spills.</p>



POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT?		ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
	YES	NO	
<i>Outdoor storage activities (including erodible building materials, fertilizers, chemicals, etc.)</i>	Y		<p>Activities associated with this pollution source are storage of material at the staging areas and the potential for spills and leaks from these materials.</p> <p><u>Control Measures:</u> Containment of the storage or staging area may include installation of silt fence, erosion/sediment control logs, temporary berms, etc. Storage of petroleum products or other liquid chemicals, 55 gallons or greater, must have secondary containment, or equivalent protection.</p> <p>Administrative controls may include following materials management protocols (such as covering chemicals and materials to prevent contact with stormwater where practicable, storing materials in proper containers with appropriate labeling, and only keeping limited supplies onsite), training on-site personnel, and providing spill kits where needed. Contact the Project Manager immediately for all spills.</p> <p>This potential pollutant source is related to the materials handling procedures and controls for the project.</p>



POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT?		ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
	YES	NO	
<i>Vehicle and equipment maintenance and fueling</i>	Y		<p>Potential pollution sources include fuels, oils, antifreeze, and other liquids associated with equipment performance. Fueling of equipment or vehicles and equipment repair may occur during all phases of construction activity. Anticipated fueling methods for the project include: using mobile fueling to refuel equipment, having fuel tanks onsite, fueling offsite or a combination. If fuel tanks are brought on site, the Qualified Stormwater Manager will update the site maps with the location of fuel tanks.</p> <p><u>Control Measures:</u> Limit areas where fueling and equipment maintenance activities occur at the site. Where possible stage fueling /maintenance activities away from storm sewer system inlets/waterways. Provide spill kits where fueling is conducted. Use plastic sheeting, drip pans, dirt berms and other measures to contain fluids. Clean up and dispose of material spilled immediately.</p> <p>Administrative controls may include following materials management protocols, training on-site personnel, and providing spill kits in vehicle maintenance areas. Contact the Project Manager immediately for all spills.</p> <p>This potential pollutant source is related to the materials handling procedures and controls for the project.</p>
<i>Significant dust or particulate generating processes (e.g., saw cutting material, including dust)</i>	Y		<p>Activities associated with this pollution source are the earth-disturbing activities during all phases of construction activities, including but not limited to excavating, grading, cutting, filling, landscaping, etc. There is also the potential for wind to transport dust from disturbed areas including access roads. Additionally, saw cutting can contribute to dust. Saw cutting is not anticipated for this project.</p> <p><u>Control Measures:</u> Limit earth disturbing activities to the extent feasible. Water disturbed areas and dirt roadways as-needed during construction. Other effective means include using palliatives to control dust, temporarily stabilizing areas at the site by surface roughening or mulching, implementing final stabilization linearly as construction progresses, or other effective means.</p>



POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT?		ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
	YES	NO	
<i>Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.</i>	Y		<p>Activities associated with this pollution source are limited due to the short-term nature of utility installation activities. Fueling and maintenance activities involving vehicles and equipment and the potential for use of fuels, oils, solvents, etc., are discussed above. Seeding operations typically occur during the final phase of the project and may involve use of fertilizers and tackifiers, as needed. Fertilizers are typically brought to the site by a seeding contractor during seeding operations and any remaining material is removed from the site by the contractor. Pesticides are not planned for use at this site.</p> <p><u>Control Measures:</u> Liquids should be stored in secondary containment. Administrative controls may include following materials management protocols (such as covering chemicals and materials to prevent contact with stormwater where practicable, storing materials in proper containers with appropriate labeling, and only keeping limited supplies onsite), and training on-site personnel in proper use and storage of materials.</p>
<i>On-site waste management practices (waste piles, liquid wastes, dumpsters, etc.)</i>	Y		<p>Activities associated with this pollution source are generation of waste materials during all phases of construction activities that include but are not limited to debris, waste asphalt or concrete generated during excavating existing transmission pole foundations.</p> <p><u>Control Measures:</u> Use designated waste receptacles and haul off waste. Immediately remove or containerize waste by either covering with a tarp or by using silt fence, sediment/erosion control log, etc. For concrete waste water, use a designated concrete washout area (See next pollutant source in this table). Liquids should be stored in secondary containment. Dumpsters will not typically be used on small projects. However, they will be utilized on larger projects where they will be serviced frequently by a licensed company.</p> <p>This potential pollutant source is related to the materials handling procedures and controls for the project.</p>



POTENTIAL SOURCE OF POLLUTANT	POTENTIAL WITH THIS PROJECT?		ACTIVITIES ASSOCIATED WITH THIS POLLUTION SOURCE AND CONTROL MEASURES SELECTED TO CONTROL THE SOURCE
	YES	NO	
<i>Concrete truck/equipment washing, including the concrete truck chute and associated fixtures and equipment</i>	Y		<p>Activities associated with this pollution source are concrete pours that include but are not limited to pouring transmission pole foundations.</p> <p><u>Control Measures:</u> Dedicated concrete washout areas that are clearly marked and maintained. Where applicable, urban mobile concrete washout structures can be used depending on the amount of concrete used on the project.</p>
<i>Dedicated asphalt, concrete batch plants and masonry mixing stations</i>		N	<p>No dedicated asphalt, concrete batch plants, or masonry mixing stations are planned for this site.</p>
<i>Non-industrial waste sources worker trash and portable toilets</i>	Y		<p>Activities associated with this potential pollutant source include the generation of non-industrial waste such as discarded building materials, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.</p> <p><u>Control Measures:</u> Good housekeeping practices and trash collected in vehicles and disposed of offsite or the use of waste containers. Practice good housekeeping, collect trash in vehicles and dispose of offsite, or the use designated waste containers on-site.</p> <p>Locate portable toilets away from storm sewer system or waterways, when feasible, and properly anchor them to avoid tipping.</p> <p>This potential pollutant source is related to the materials handling procedures and controls for the project.</p>
<i>Other areas or procedures where potential spills can occur</i>	Y		<p>Damaged or broken controls measures can act as a pollutant source. Control measures are inspected and if any are damaged, they are noted as such and repaired or removed. If any materials from the controls have been released, they are properly cleaned up and disposed of.</p> <p>No other potential pollutant sources are identified at this time.</p>



Control Measure Implementation

Selection, design, installation, and maintenance of control measures must be in accordance with good engineering, hydrologic and pollution control practices. Contractors must install control measures prior to commencing activities that may contribute pollutants, including sediment, to stormwater discharges. Control measures must effectively minimize erosion, sediment transport, and the release of other pollutants related to construction activity.

Stormwater runoff from all non-stabilized, disturbed areas and soil storage areas must flow to at least one control measure to minimize (filter, settle, strain) sediment in the discharge.

Erosion control measures prevent or minimize erosion of soil, whereas sediment control measures are designed to remove sediment from stormwater runoff before it leaves the site. Both erosion and sediment control measures will be used at the site.

Information on control measure implementation is included on site maps located in Appendix B. Additional descriptions are included in the following subsections.

When modifying this SWMP to supplement control measures, the QSM must ensure that additional control measure specifications adhere to the requirements of the general permit.

Contractor will phase construction to the extent practical to limit the amount of disturbed area that is exposed at any given time. Control measure phasing is critical to stormwater management. Construction and erosion control contractors will coordinate control measure implementation with the various stages of construction. Erosion control contractor will install control measures that manage erosion and sediment transport from initial site activities prior to earth disturbing activities.

As work progresses and additional areas are disturbed, erosion control contractor will implement control measures targeted for erosion and sediment transport prior to start of earth disturbing activities in those areas. As portions of the site are completed and previously disturbed areas are stabilized or the control measure(s) are no longer needed, contractors may remove them.

Contractors will implement, as soon as practicable after final grading or conclusion of ground disturbing activities, permanent or temporary soil erosion control measures for all slopes, channels, ditches, or any disturbed land area and soil stockpiles. When it is not possible to permanently stabilize a disturbed area after an earth disturbance has been completed or where significant earth disturbance activity ceases, contractor will implement temporary erosion control measures as soon as practicable and no more than 14 days after construction activity has temporarily or permanently ceased.

Structural Control Measures

Structural control measures are physical devices that prevent or minimize stormwater quality impacts.

Check Dam:

Check dams are generally constructed from rock or erosion logs. They are designed to slow water velocity and allow some sediment to settle. Check dams are good for use in areas of concentrated



flows (along drainage swales). Installation includes stacked rock or use of erosion logs so that the center of the check dam is lower than the sides. Install the check dam across the entire width of the drainage swale in order to function properly. Inspect check dams for proper installation and sediment accumulation on the up-gradient side. Remove accumulated sediment and debris from a control measure when the sediment level reaches one-half the height of the control measure or at any time that sediment or debris adversely impacts the functioning of the control measure. Clean and replace materials as needed to maintain function and design.

Temporary Berms:

Temporary berms are typically continuous mounds made of compacted soil. Berms can be used for perimeter control, at the top of a slope to control run-on, at the toe of slopes, around storage areas, or in conjunction with drainage swales/diversion ditch. Berms are typically used to control the flow path of runoff at a construction site by diverting runoff around areas prone to erosion such as steep slopes or areas where significant materials are stored to minimize the potential for the materials to come into contact with stormwater and move off-site. Berms are also used in conjunction with drainage swales to direct surface flows to a sediment trap or basin. Remove temporary berms prior to final grading and permanent seeding. Conduct inspections to verify the continuous, compact nature of the berm. Maintenance includes repairing breaks or low spots.

Inlet/culvert Protection:

Inlet protection consists of a barrier material placed in front of, around, or immediately up-gradient from the inlet. The most common forms of inlet protection are wire or fabric socks filled with rock or other filtering material. If appropriate, install curb check dams in conjunction with inlet protection to reduce storm water velocity and increase the effectiveness of the inlet protection. Inlet protection is designed to slow stormwater flow into the inlet and allow sediment time to settle and accumulate on the up-gradient side to the structure. Install inlet protection prior to earth disturbing activity up-gradient of the inlet. If conditions warrant, provide protection to prevent sediment from entering the inlet from above or behind the opening. Leave inlet protection in place until all up-gradient areas are stabilized. Inlet protection is typically used as the last control measure in a treatment train. Utilize other erosion control measures nearer disturbance limits to the extent feasible to minimize sediment movement.

Inspect inlet protection for damage, structural integrity, proper installation in relationship to the curb, and need for sediment removal. Maintenance includes repairing or replacing as needed, repositioning the inlet protection and/or removing accumulated sediment.

Perimeter Control:

Perimeter control serves as erosion and sediment control and, when appropriate, access control. At down gradient locations, install perimeter controls where overland sheet flow has the potential to leave the site. In up-gradient areas add perimeter control to define project boundaries, limit on-site flows or protect off-site features. Specific controls measures must be suitable to the application. Perimeter control may consist of any number of control measures, including, but not limited to earthen berms, erosion/sediment control logs, silt fence, etc. Use perimeter controls around bore holes, trenches, and other locations where sediment is exposed and may accumulate. Leave perimeter control in place until areas up-gradient of controls are stabilized. Inspect perimeter control for proper installation, structural integrity and accumulated sediment. Maintenance includes repairing or replacing damaged sections and removing accumulated sediment.



Rock Socks/ Curb Socks:

Rock socks or curb socks are wire or geotextile tubes filled with rock or gravel material. Rock socks may be used as inlet protection, outlet protection, swale protection or in any area where concentrated flows need to be fragmented and velocity reduced to prevent erosion. Rock socks serve to reduce water velocity and allow time for sediment to settle out, thus decreasing erosion potential and sediment transport. When used for swale protection rock socks should extend the entire width of the expected flow with the center lower than the sides. For use as inlet or culvert protection, the rock sock should extend beyond the width of the inlet/culvert. Rock socks may be stacked to maximize performance. Install delineators with curb socks for high traffic areas where they may present a potential traffic hazard or where they may be damaged by vehicles or snow plows. Inspect rock socks for proper installation, structural integrity and accumulated sediment. Maintenance includes repairing or replacing damaged sections and removing accumulated sediment.

Silt Fence:

Silt fence consists of geotextile fabric installed with at least six inches of the fabric trenched into the soil; wooden stakes are attached on the down-gradient side. Wire-backed fence or additional stakes or lathe on the up-gradient side of the fence can provide strength to the fence around corners or in high wind conditions. Silt fence provides sediment control by reducing water velocity and ponding water to facilitate the deposition of sediment on the up-gradient side of the fence. Silt fence applications include, but are not limited to: project perimeter control, secondary containment, back of curb protection and containment for disturbed areas or staging areas. Inspect silt fence regularly for sediment accumulation, tear or holes in the fabric, broken stakes, gaps in the fabric, or areas where the fabric needs to be re-attached to the wooden stakes. Maintenance includes repairing the items noted, removing sediment accumulation one-half the height of the fence, or replacing the fence as needed.

Designated Material Staging Area:

A designated and/or stabilized staging area is a specific location on or near the project site for stockpiling/staging materials and equipment for use on-site. A staging area allows for a central location for deliveries and storage of equipment when not in use and reduces disturbance of areas of the site not scheduled for disturbance through construction activities. Staging areas generally consist of a cleared area of the site with vehicle tracking control and perimeter control (e.g., silt fence and/or construction fencing). Utilize staging areas as needed on site. Locate staging areas out of active construction activity and in an area that reduces the need for relocation. Inspect staging areas for adequate vehicle tracking control and perimeter control. Adjust control measures as needed as use of the staging area evolves. Maintain controls measures according to their specific requirements.

Vehicle Tracking Control (VTC):

Implement vehicle tracking control to minimize vehicle tracking of sediment from disturbed areas per (§I.B.1.a.i.a). Physical VTCs may consist of an excavated area with a geotextile liner and gravel, metal grate, asphalt/concrete “rumble strip”, or other proprietary products. Physical VTCs are designed to cause soil to vibrate off equipment and vehicles as they transition from disturbed soils to paved areas. Surface runoff from a physical VTC should drain to a control measure. Leave VTC in place until access to the areas used by the control is no longer needed. Designated points of ingress and egress, where traffic transitions from a stabilized road surface (e.g., gravel or pavement) to disturbed soil, likely require a physical VTC or these areas must drain to a control that meets the requirements of (§I.B.1.a.i.b). VTC may be moved or eliminated (if no longer needed) as on-site conditions and activities change. Inspect VTC for depth of gravel/rock,



presence of excess soil, proper usage, and the overall general condition. The most common maintenance items include the removal of accumulated soil and addition of gravel/rock.

In vegetated areas where access is anticipated to minimal, turf mats or cattle guards, or proprietary products such as mud mats may be installed primarily to protect vegetation and provide a stabilized entrance. Inspect these materials for damage and maintain as needed.

For short duration access during ordinarily dry conditions, manually cleaning vehicles of any mud can replace a physical VTC. Inspect ingress/egress points for evidence of track-out and possible need for physical VTC. Immediately remove, by street sweeping, any mud or dirt that is tracked onto a paved roadway.

Erosion/Sediment Control Log:

An erosion/sediment control log consists of a net or geotextile fabric filled with straw, excelsior, wood mulch or other fillers. Erosion/sediment control log applications include, but are not limited to, slope stabilization, perimeter control, check dams in swales, back of curb protection, and temporary secondary containment for stockpiles, materials storage, or masonry. Erosion/sediment control logs reduce water velocity and allow sediment to accumulate on the up-gradient side of the log. The basic installation for a net wrapped erosion/sediment control log is to prepare a shallow trench and secure the log in the trench using a stake or landscape pin. Install logs should per manufacturer's directions. Inspect logs for proper installation, structural integrity, and sediment accumulation. A log that has been flattened out of round but still remains sufficient to function appropriately on the up-gradient side of the log does not necessarily need to be replaced.

Erosion Control Blankets (ECBs) and Turf Reinforcement Mats (TRMs):

ECBs/TRMs are sheets of straw, excelsior, coconut, manmade fiber, or combination thereof, usually contained between layers of netting to provide structural integrity. ECBs/TRMs function by providing ground cover that reduces erosive action. TRMs can handle higher levels of concentrated flows and are used mainly in channel applications. If needed, use ECBs and TRMs in conjunction with other velocity reducing control measures. ECB/TRM applications include, but are not limited to, slope and swale protection. Inspect ECBs/TRMs for erosion underneath and at the sides of the material, sediment accumulation, rips, tears, and other structural problems. Maintenance includes removing sediment, re-securing material to ground and re-trenching or replacement, as needed.

Additional control measures may be added as site conditions change and will be identified in the SWMP prior to installation.

Non-Structural Control Measures

Non-structural control measures are those practices which, when implemented, will minimize erosion and sediment or other pollutant transport. Practices implemented at this site include interim stabilization practices, permanent stabilization practices (see Appendix E), and site-specific scheduling for implementation of the practices, as well as site management practices, preventative maintenance, and personnel training. The potential non-structural control measures for the project are described below. Specific locations for control measure implementation at the site are indicated on the site plans, provided in Appendix B. Appendix C provides the installation details for each control measure identified.



Crimp Mulch:

Crimp mulching uses hay or straw material that is machine crimped into the soil to provide stability. Use crimp mulch on its own as a temporary soil stabilization method, or in conjunction with seeding for final stabilization. Crimp mulch functions as a soil stabilizer by decreasing the velocity of sheet flow. Mulch may be hay or cereal grain straw. Crimp mulch into the soil, using either a drill seeder or notched disk plow or other suitable method, to the minimum depth of two inches and a maximum depth of four inches. To maximize effectiveness, run crimping equipment parallel to the contours of the land. Crimp mulch may not be appropriate for slopes that are equal to or greater than 3:1 or in areas with hard or rocky soil in which the crimper cannot penetrate. Inspect for areas where mulch is missing or thin and for areas where erosion has occurred. Maintenance items include re-grading as necessary and reapplying as appropriate.

Seed and Stabilization (Temporary and Permanent Ground Cover):

Seeding involves the mechanical or hand application of specific seed mixes appropriate for the site location and soil type. Seeding provides plant growth to stabilize the soil reducing the likelihood of erosion or sediment transport. Properly prepare and seed soil after completion of construction activities in an area, and as soon as practical. The choice of seed mix dictates application rates and methods. Accompany seeding with additional control measures, such as mulching or tackifying, to protect the seed and soil from erosion during the germination and growth process. Inspect seeded areas to ensure that the soil stabilization method (e.g., surface roughening, crimp mulch, etc.) was applied correctly and has not been compromised. Inspect also for erosion and/or sediment deposition. Maintenance items include re-grading and seeding bare or areas of thin vegetative growth and/or adding additional control measures as appropriate. If seeding is impractical or infeasible due to seasonal or other constraints, implement temporary stabilization, such as mulch and mulch tackifier.

Street Sweeping:

Sweep and clean soils deposited on paved surfaces as needed to reduce the potential of sediment transport and tracking. Sweeping operations consist of the scraping large quantities of sediment from pavement and/or sweeping, via hand or mechanical means to remove as much deposited sediment as possible. Clean all streets within and immediately surrounding a construction site of earth material when sediment has been deposited on the roadway and is being tracked off site. Do not deposit scraped or swept material in the storm sewer. Sweeping and vacuuming may not be effective when soil is wet or muddy.

Surface Roughening:

Surface roughening consists of grooves or tracks installed in the soil surface, along the contours (not up and down the slope which promotes erosion). This is a temporary soil stabilization technique that works well in areas that will remain inactive for a short time. Surface roughening works by reducing water velocity and promoting infiltration, thus decreasing the potential for erosion to occur. Any disturbed areas with no construction activity planned for longer than 14 days may be surfaced roughened. This may include areas where scheduling prevents the immediate implementation of final stabilization practices, the sides of stockpiles or other slopes. Surface roughening may be applied by creating a continuous furrow along the contours. This can be done with the teeth on a loader bucket, ripping, disking or plowing equipment. Surface roughening can



also be created by running tracked equipment up and down the slope creating track marks along the contour. Inspection of surface roughened areas would include proper implementation, structural integrity and areas of erosion or sediment accumulation. Maintenance for surface roughening would include re-applying the technique or installation of new or additional control measures.

Protection of Pre-existing Vegetation:

Protection of existing vegetation on a construction site can be accomplished through installation of a construction fence around the area requiring protection. In cases where upgradient areas are disturbed, it may also be necessary to install perimeter controls to minimize sediment loading to sensitive areas such as wetlands. Existing vegetation may be designated for protection to maintain a stable surface cover as part of construction phasing, or vegetation may be protected in areas designated to remain in natural condition under post-development conditions (e.g., wetlands, mature trees, riparian areas, open space). A 50 horizontal foot buffer of pre-existing vegetation or equivalent controls must be maintained between work areas and receiving waters unless infeasible. Maintenance may include removing sediment by hand, replacing construction fence or other plastic fencing used to limit access. If any damage were to occur to a vegetative buffer, a new or additional control measure should be considered and the SWMP will be updated to document why the vegetation could not be left undisturbed.

Vegetation & Topography (VT):

In limited disturbance areas, not installing a control measure (CM) may be the best approach to minimize sediment transport off site. This is based on the concept that shallow overland flow may pick-up and transport sediment that is then dropped out within a vegetative buffer and installation of a down-gradient physical CM is an unnecessary effort, expense, and disturbance that increases the amount of site restoration. VT as a CM was developed using a two-dimensional physically based and spatially distributed computer model with the following inputs and assumptions:

- Input – Site grade slopes. Assumption - Site grade slopes 10% or less allow shallow overland flow.
- Input - Vegetation cover density (surface roughness) represented by Mannings 'n'.
- Input - Rainfall event specific to the project site for ECM design, typically a 5-year 30-minute storm.
- Input - Hydrologic Soil Group (HSG) for the disturbance and buffer area, typically obtained from the National Resource Conservation Service Web Soil Survey, online.
- Assumption - No up-gradient or disturbance area concentrated flow paths through construction site.
- Assumption – 80% sediment removal, typical of sediment reduction targets for physical CMs is acceptable.
- Assumption - No construction traffic or disturbance activity within the vegetation buffer

The inputs above (vegetation cover, slope, soil type, and rainfall) can be conservatively collapsed into a simple table showing that for a given rainfall, the four different soil types (HSG A to D) require four different minimum vegetation buffer lengths for sediment to settle out of the stormwater sheet flow. This vegetation buffer distance table is to be referenced by field crews and



used in combination with the HSG data provided on the SWMP drawings. The rainfall and soil data will be specific to each project.

The VT will have to be inspected to verify that sediment is not being transported beyond the buffer or project control area. In the event that the VT CM is not providing the level of sediment settling necessary, physical CMs may need to be installed or practices up-gradient of the VT buffer modified. It is expected that the thin layer of sediment deposited in the VT buffer should not be removed. All control measure type modifications and movement are to be noted on the SWMP site maps. A comprehensive design guideline, citing good engineering, hydrologic, and pollutant control practices, principles and criteria is contained in the control measures details located in Appendix C.

Wind Erosion Control:

Implement wind erosion and dust control if wind is transporting soil within or off site. Wind erosion control functions to stabilize the soil surface reducing the potential for wind erosion. Wind erosion control consists of applying water and/or other dust palliatives as necessary to prevent or alleviate erosion by the forces of wind. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives. If needed, apply a soil tackifier to control wind erosion. Inspect disturbed areas for obvious signs of wind erosion and implement control measures if needed. Inspect areas with wind erosion controls in place for structural integrity and coverage, and repair or replace CMs as appropriate.

Training:

Train on-site personnel and contractors on good housekeeping, the proper use and storage of materials, and site management practices.

Site Management Practices:

Contractors will implement good housekeeping practices to keep potential areas where pollutants exist clean and orderly. Store containers, drums, and bags away from direct traffic routes to reduce the risk of accidental spills. Stack containers according to manufacturer's instructions to avoid damaging the containers from improper weight distribution. Store containers on pallets or similar devices to prevent corrosion of containers that results from containers coming in contact with moisture on the ground. Store liquids within curbed areas or equip with secondary containment.

Documented Use Agreement

Control measures outside of the permitted area covered by this SWMP are used for CDPS compliance and management of construction stormwater originating from the project area. Copies of documented use agreements with the owners/operators of these control measures are available upon request.

Site Description

Nature of Construction Activity at the Site

This SWMP covers construction activities associated with the rebuild of roughly 30 miles of 115kV transmission line located between North Penrose Substation and Desert Cove Substation. Approximately 7.3 miles of the rebuild will go through Fremont County, and approximately 19.4 miles of the rebuild will run through Pueblo County. The remaining 3.24 miles of transmission line



located north of Desert Cove Substation in Pueblo County will be tensioned; there is no planned ground disturbance as the existing structures will remain in place. The rebuild begins at the West Station transmission corridor in Pueblo West and traverses west through the Pueblo/ Fremont County line and continues traveling westward to North Penrose Substation, located at the intersection of Highway (Hwy) 115 and K Street (St).

New poles will consist of three structure types: steel monopoles, steel H-frames, and three pole structures. A combination of direct imbed wooden poles and steel structures atop concrete foundations. Access to and between structures consists of existing access roads surrounding the project and a 125-foot-wide right-of-way easement throughout the project. Access to STR 8 will require grading work, otherwise there is no anticipated access grading for this project.

Construction contractors will stage equipment and material at the designated 5-acre staging area at the West Station, located approximately 3.5 miles south of Desert Cove Substation. The staging is the primary location for all overnight equipment and material storage.

Contractors will use appropriate control measures to minimize the impact of earth disturbing activities as shown on the Site Maps in Appendix B. Upon completion of earth disturbing activities, BHE and their contractors will restore the site with vegetation in areas that currently have vegetation. The erosion control contractor will maintain and inspect control measures until all areas are stabilized; in some cases, this may require multiple growing seasons to re-establish vegetation. Once areas are stabilized, the erosion control contractor will remove all temporary, non-biodegradable control measures in preparation for permit closeout by BHE.

Proposed Sequence of Major Construction Activities

Estimated Project Start Date:	May 2022
Estimated End of Construction Date:	February 2023
Estimated Final Stabilization Date:	August 2024

Project Phase	Controls implemented during each phase
Site Preparation	<ul style="list-style-type: none">• Develop SWMP based on site visit and anticipated disturbances.• Establish staging area with perimeter controls, vehicle tracking control (VTC). Determine haul routes/areas that will undergo repeated disturbance.• Strip and segregate topsoil at staging yard and stockpile for preservation. Stabilize stockpiles and drive surface as necessary.• Mobilize equipment and materials to staging yard. Locate and install portable toilets, where feasible.• Limit access to areas that are not to be disturbed and protect existing vegetation.



Project Phase	Controls implemented during each phase
Construction	<ul style="list-style-type: none">• Unless infeasible, strip and segregate topsoil (where present) for use in final restoration efforts.• Mobilize control measures to work area.• Excavate pole holes, locate stockpiles in areas with perimeter control or install down-gradient protection.• Pile excess spoils in a conical manner around the base of pole to allow for settling over time and to ensure water sheds from the pole outward• Install new poles. Utilize concrete washout as required for concrete foundations, where planned.• Install conductor wire/move conductor wire from existing poles to new poles. Tension line.• Monitor pulling/tensioning (P/T) sites for disturbances and install control measures (CMs) as necessary. CMs not likely required at P/T sites given limited use.• Remove existing poles to at or below grade per construction specifications.• Protect and repair control measures as necessary.• Perform street sweeping as needed.
Interim Stabilization	<ul style="list-style-type: none">• Leave disturbed areas in surface roughened condition once work in an area is complete. Surface roughen, or otherwise stabilize, within 14 days of area becoming inactive.• Remove temporary control measures where appropriate.• Remove limited stored material and equipment from areas.• Replace topsoil layer, if revegetation is the final form of stabilization, prior to implementing final stabilization.
Final Stabilization	<ul style="list-style-type: none">• Install pavement or other hardscaping where applicable.• Perform seeding and mulching per seed mix and application rates defined in the following sections of this report.• Monitor regrowth of vegetation, irrigate and re-seed if necessary.• Remove all non-biodegradable temporary controls once required vegetative cover is reached.• Close permits as applicable.

The following subsection describes the phasing/sequencing of the project as well as the control measures selected for each phase. Site maps provided in Appendix B indicate specific locations of the control measures. Installation, implementation, and maintenance specifications for each control are included in Appendix C or are shown on the site maps.

Area Estimates

1. Total area of construction site: 332 AC
2. Total area of disturbance: 15 AC
3. Acreage of seeding: 15 AC



Existing Soil Information

The United States Department of Agriculture Natural Resources Conservation Services (NRCS) Web Soil Survey provides information for soil types and properties for the site. Primary soils present include Loveland soils, Niwot soils, and Manvel loam. Hydrologic properties, wind erodibility, and sheet/rill erosion potential are discussed below. Control measures were prescribed based on information made available by the NRCS.

Hydrologic soil groups describe runoff potential and infiltration properties of soils and range from A to D. Group A soils have high infiltration rates and low runoff potential, group D have slow infiltration and high runoff potential. On-site soils are primarily categorized by the NRCS with a hydrologic soil group of either B, C, or D indicating a moderate to high rate of both infiltration and runoff potential.

Susceptibility of soils to sheet and rill erosion by water is rated by a K factor. K factors range from 0.02 to 0.69; with all other factors being equal, higher K values indicate higher susceptibility to sheet and rill erosion. Most soils within the limits of disturbance at the site are rated with a K factor ranging from 0.17-0.43, indicating a low to moderate susceptibility to sheet/rill erosion.

Wind erodibility ratings range from 1 to 8 with 1 being the most susceptible to wind erosion. Most soils within the disturbance limits range from 4-6, indicating a moderate to low susceptibility to wind erosion.

Vegetative Coverage

Typical vegetation within the project area includes woody perennials, native trees, shrubs, and grasses.

Areas of disturbance will be revegetated based on native, background vegetation densities. Areas surrounding planned structures 21, 26, 77, and 117 were used as reference sites to determine native, background vegetative cover. The vegetative cover of the areas planned for ground disturbance are approximately 50%. Higher vegetative densities of 80% were found along the east side of the project, where no ground disturbance will be occurring. Pre-construction photos of the project area are documented in Appendix D.

The US Fish and Wildlife National Wetland Inventory (NWI) Mapper identified Freshwater Emergent Wetlands, Freshwater Forested/Shrub Wetlands, Riverine, and Forested/ Shrub Riparian within the project area. Refer to the Site Map, located in Appendix B for locations of NWI features. Construction is not anticipated to heavily impact the wetlands identified above. No additional monitoring is required.

Allowable Non-Stormwater Discharges

Contractors will manage authorized non-stormwater discharges in conjunction with stormwater discharges at the site. Implemented control measures were designed to handle increased discharges due to the below allowable non-stormwater sources.



- Discharges from uncontaminated springs that do not originate from an area of land disturbance.
- Discharges to the ground of concrete washout water associated with the washing of concrete tools and concrete mixer chutes are allowed under this SWMP, provided that: the washout water is confined in a concrete washout area and does not leave the site as surface runoff or reach receiving waters, and does not contaminate groundwater. Controls for concrete washout water from washing tools and chutes if applicable to the project are illustrated in Site Maps (Appendix B). Concrete on-site waste disposal is not authorized by this permit except in accordance with Part I.B.1.a.ii(b) of COR400000.
- Landscape irrigation return flow.
- Discharges from emergency fire-fighting activities.
- Discharges from diversions of state waters within the permitted site.

All other non-stormwater discharges at the site must be covered by a separate CDPS permit or by the WQCD's Low Risk Discharge Guidance document. Plans have been developed to indicate locations of these discharges, if any, and associated control measures. Low Risk Discharge is not anticipated for this project.

Receiving Waters

1. Names of immediate receiving water(s) on site and the ultimate receiving water. If the stormwater discharge is to a municipal separate storm sewer system, provide the name of the entity owning that system: As the majority of the project is unpaved, dirt and vegetated surfaced, minor storm flows are expected to infiltrate into existing soils. Surface runoff from the site may discharge to immediate receiving waters within the vicinity of the project comprising of Beaver Creek; and Tributaries to the Arkansas River (CORUA14d_C), including but not limited to, Red Creek, Green Gulch, Turkey Creek, Pierce Gulch, Wild Horse Creek, and Williams Creek (COARMA04d_A). All Immediate receiving waters ultimately discharge into the Arkansas River (CORARUA4b_A) and Pueblo Reservoir (COARMA20_A).
2. Is a receiving water within the limits of disturbance?
Stream crossings within the limits of disturbance consists of Tributaries to the Arkansas River (Red Creek, Green Gulch, Turkey Creek, Wild Horse Creek, and Williams Creek). Additional precautions will be taken to protect all stream crossing, which include but are not limited to: installing adequate control measures to protect the streams from potential sediment runoff and encouraging contractors to maintain 50-ft pre-existing vegetation buffers, when feasible.
3. Is the immediate receiving water (classified stream segment or ultimate receiving water) listed as impaired? If yes, does it have an approved TMDL? No
4. Is the immediate receiving water (classified stream segment or ultimate receiving water) listed as an Outstanding Water (website <https://www.colorado.gov/pacific/cdphe/clean-water-gis-maps>) ? No



5. Does the receiving water have any known additional monitoring or sampling requirements: No

Diversion Structures: Diversion structures are not anticipated for this project.

Alternate Temporary Stabilization Frequencies

Constraints that necessitate an alternative temporary stabilization frequency have not been identified at this time. The QSM must update this section as necessary if constraints that necessitate an alternative temporary stabilization schedule arise. Site maps will be updated to indicate locations where alternative temporary stabilization frequencies are required and to show control measures used in the interim.

Site Map

Site maps developed by a qualified stormwater manager are included in Appendix B. Maps must depict:

- Construction site boundaries;
- Flow arrows that depict stormwater flow directions on-site and runoff direction;
- All areas of ground disturbance including areas of borrow and fill;
- Areas used for storage of soil;
- Locations of all waste accumulation areas, including areas for liquid, concrete, masonry, and asphalt;
- Locations of dedicated asphalt and/or concrete batch plants, and masonry mixing stations;
- Locations of all structural control measures;
- Locations of all non-structural control measures;
- Locations of springs, streams, wetlands, and other state waters, including areas that require pre-existing vegetation be maintained within 50 feet of a receiving water, where determined feasible;
- Locations of all stream crossings located within the construction site boundary; and
- Areas where alternate temporary stabilization frequencies are required.

Stabilization Requirements

Temporary Stabilization

Contractors must implement temporary stabilization control measures at any disturbed area within 14 days of cessation of earth disturbing activities at that area. This includes areas that will be re-disturbed outside of the 14-day time frame as well as stockpiles.

Constraints that necessitate an alternative temporary stabilization frequency have not been identified at this time. The Qualified Stormwater Manager must update this section as necessary if constraints that necessitate an alternative temporary stabilization schedule arise. Site maps will be updated to indicate locations where alternative temporary stabilization frequencies are required and to show control measures used in the interim. Temporary stabilization include but



is not limited to: crimp mulch, seed and stabilization (Temporary and Permanent Ground Cover), surface roughening, protection of pre-existing vegetation, and vegetation & topography (VT),

Final Stabilization

Final stabilization is achieved when all ground surface disturbing activities at the site have been completed and uniform vegetative cover has been established with an individual plant density of at least 70 percent of native background vegetative cover, or equivalent permanent, physical erosion reduction methods have been employed. When final stabilization is achieved, temporary erosion and sediment control measures will be removed.

Final stabilization includes those measures taken to control pollutants in stormwater after soil disturbing activities are complete. Practices implemented to achieve final stabilization may include:

- Seed mix selection and application methods;
- Soil preparation and possible amendment of the soil prior to seed application;
- Use of salvaged topsoil preserved during construction;
- Soil stabilization methods (e.g., crimped mulch or rolled erosion control products);
- Maintenance of appropriate erosion and sediment control measures until final stabilization is achieved; and
- Removal of temporary control measures once work is completed and final stabilization achieved.

Seed Mixes and Application Rate:

Seed mix and application rates are included in Appendix E of this report. Alternate seed mixes may be implemented if approved by QSM and the respective land manager. If alternate mixes are used they must be added to this SWMP.

Long Term Stormwater Management

Return of the site to pre-construction conditions, and stabilizing as described above, will act as long term stormwater management for the project. There are no anticipated post-construction water quality control measures that will be installed as part of this project.

Inspection Reports

Inspection Frequency

A qualified stormwater manager will inspect the site at one of the below frequencies unless an alternate schedule, defined by the permittee, has been approved in writing by the CDPHE WQCD. A copy of a blank inspection report can be found in Appendix F.

- At least once every 7 calendar days, or
- At least once every 14 calendar days, if post storm event inspections are conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface



erosion. Post-storm inspections may be used to fulfill the 14-day routine inspection requirement.

Reduced Inspection Frequency

Reduced inspection frequencies may occur when the following conditions exist:

Post-Storm Inspections at Temporarily Idle Sites

For permittees choosing to combine 14-day inspections and post-storm event inspections, if no construction activities will occur following a storm event, post-storm event inspections must be conducted prior to re-commencing construction activities, but no later than 72 hours following the storm event. The delay of any post-storm event inspection must be documented in the inspection record. Routine inspections must still be conducted at least every 14 calendar days.

Inspections at Completed Sites/Areas

When the site, or portions of a site are awaiting establishment of a vegetative ground cover and final stabilization, the permittee must conduct a thorough inspection of the stormwater management system at least once every 30 days. Post-storm event inspections are not required under this schedule. This reduced inspection schedule is allowed if all of the following criteria are met:

- All construction activities resulting in ground disturbance are complete;
- All activities required for final stabilization, in accordance with the SWMP, have been completed, with the exception of the application of seed that has not occurred due to seasonal conditions or the necessity for additional seed application to augment previous efforts; and
- The SWMP has been amended to locate those areas to be inspected in accordance with the reduced schedule allowed for in this paragraph.

Winter Conditions Inspections Exclusion

Inspections are not required for sites that meet all of the following conditions:

- Construction activities are temporarily halted,
- Snow cover exists over the entire site for an extended period, and
- Melting conditions posing a risk of surface erosion do not exist.

When this inspection exclusion is implemented, document and retain the following:

- Dates when snow cover existed;
- Date when construction activities ceased; and
- Date melting conditions began.

Inspection Scope

Qualified stormwater manager must inspect the following areas for evidence of, or potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system, or discharging to state waters:



- Construction site perimeter;
- All disturbed areas;
- Designated haul routes
- Material and waste storage areas exposed to precipitation;
- Locations where stormwater has the potential to discharge offsite; and
- Locations where vehicles exit the site.

During inspections, the qualified stormwater manager must:

- Visually verify whether all implemented control measures are in effective operational condition and are working as designed in their specifications to minimize pollutant discharges;
- Determine if there are new potential sources of pollutants;
- Assess the adequacy of control measures at the site to identify areas requiring new or modified control measures to minimize pollutant discharges; and
- Identify all areas of non-compliance with the general permit requirements and, if necessary, implement corrective action (described in Section 1.3.3.2)

At a minimum the inspection report must include the following information about the site at the time of inspection:

- Inspection date;
- Name/title of personnel conducting inspection;
- Weather conditions;
- Phase of construction;
- Estimated acreage of disturbance;
- Locations of discharges of sediment and other pollutants from the site;
- Locations of control measures requiring maintenance;
- Locations and identification of inadequate control measures;
- Locations and identification of additional control measures needed and not in place;
- Description of the minimum inspection frequency and any deviations from the minimum inspection schedule;
- After adequate corrective actions and maintenance have taken place, or where a report does not identify any incidents requiring such, include the following statement:

“I verify that, to the best of my knowledge and belief, all corrective action and maintenance items identified during the inspection are complete, and the site is currently in compliance with the permit.”

Inspections must differentiate between control measures that require routine maintenance and those that warrant corrective action based on the following definitions:

Control measure requiring routine maintenance: *Any control measure that is still operating in accordance with its design and the requirements of the general permit, but requires maintenance to prevent a breach of the control measure.*



Inadequate control measure: *Any control measure that is not designed or implemented in accordance with the requirements of the general permit and/or any control measure that is not implemented to operate in accordance with its design.*



Appendix A: Construction Stormwater Permits

- CDPS General Permit COR415480



COLORADO

Department of Public
Health & Environment

**CERTIFICATION TO DISCHARGE
UNDER
CDPS GENERAL PERMIT COR400000
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES**

Certification Number: **COR415480**

This Certification to Discharge specifically authorizes:

**Owner Black Hills Colorado Gas, Inc. dba Black Hills Energy
Operator Black Hills Energy
to discharge stormwater from the facility identified as**

Canon West Reliability- North Penrose to Desert Cove

To the waters of the State of Colorado, including, but not limited to:

Beaver Creek, Wildhorse Creek, Turkey Creek, Dry Creek, Arkansas River

Facility Activity : Pipeline and Utilities (including natural gas, electricity, water and communications)
Disturbed Acres: 15 acres
Facility Located at: Hwy 115 and K St., approx 3.5 miles north of Penrose Penrose CO 81240
Fremont County
Latitude 38.463192 Longitude -105.000974

**Specific Information
(if applicable):**

Certification is issued and effective: 2/18/2022
Expiration date of general permit: 3/31/2024

This certification under the permit requires that specific actions be performed at designated times. The certification holder is legally obligated to comply with all terms and conditions of the permit.

This certification was approved by:
Meg Parish, Section Manager
Permits Section
Water Quality Control Division





STATE OF COLORADO

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Division

CDPS GENERAL PERMIT STORMWATER DISCHARGES ASSOCIATED WITH
CONSTRUCTION ACTIVITY AUTHORIZATION TO DISCHARGE UNDER THE COLORADO DISCHARGE PERMIT SYSTEM (CDPS)
COR400000

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), this permit authorizes the discharge of stormwater associated with construction activities (and specific allowable non-stormwater discharges in accordance with Part I.A.1. of the permit) certified under this permit, from those locations specified throughout the State of Colorado to specified waters of the State.

Such discharges shall be in accordance with the conditions of this permit. This permit specifically authorizes the facility listed on the certification to discharge in accordance with permit requirements and conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

This permit becomes effective on April 1, 2019, and shall expire at midnight March 31, 2024.

Issued and signed this 28th day of January, 2021.

Meg Parish

Meg Parish, Permits Section Manager Water Quality Control Division

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Permit History

Minor Modification Issued January 28, 2021 Effective February 1, 2021

Modification Issued December 31, 2020 Effective February 1, 2021

Originally signed and issued October 31, 2018; effective April 1, 2019

Table of Contents

PART I	3
A. COVERAGE UNDER THIS PERMIT	3
1. Authorized Discharges.....	3
2. Limitations on Coverage	3
3. Permit Certification and Submittal Procedures	4
B. EFFLUENT LIMITATIONS	8
1. Requirements for Control Measures Used to Meet Effluent Limitations.....	8
2. Discharges to an Impaired Waterbody.....	11
3. General Requirements	12
C. STORMWATER MANAGEMENT PLAN (SWMP) REQUIREMENTS.....	12
1. SWMP General Requirements	12
2. SWMP Content	13
3. SWMP Review and Revisions.....	15
4. SWMP Availability	16
D. SITE INSPECTIONS	16
1. Person Responsible for Conducting Inspections	16
2. Inspection Frequency.....	16
3. Inspection Frequency for Discharges to Outstanding Waters.....	17
4. Reduced Inspection Frequency	17
5. Inspection Scope	17
E. DEFINITIONS.....	19
F. MONITORING	22
G. OIL AND GAS CONSTRUCTION	22
PART II: STANDARD PERMIT CONDITIONS	24
A. DUTY TO COMPLY	24
B. DUTY TO REAPPLY	24
C. NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE.....	24
D. DUTY TO MITIGATE	24
E. PROPER OPERATION AND MAINTENANCE	24
F. PERMIT ACTIONS.....	24
G. PROPERTY RIGHTS	24
H. DUTY TO PROVIDE INFORMATION	25
I. INSPECTION AND ENTRY	25
J. MONITORING AND RECORDS	25
K. SIGNATORY REQUIREMENTS	26
1. Authorization to Sign:	26
2. Electronic Signatures.....	26

3. Change in Authorization to Sign	26
L. REPORTING REQUIREMENTS	27
1. Planned Changes	27
2. Anticipated Non-Compliance	27
3. Transfer of Ownership or Control	27
4. Monitoring reports	27
5. Compliance Schedules	27
6. Twenty-four Hour Reporting	28
7. Other Non-Compliance	28
8. Other Information	28
M. BYPASS	28
1. Bypass Not Exceeding Limitations	28
2. Notice of Bypass	28
3. Prohibition of Bypass	28
N. UPSET	29
1. Effect of an upset	29
2. Conditions Necessary for Demonstration of an Upset	29
3. Burden of Proof	29
O. RETENTION OF RECORDS	29
1. Post-Expiration or Termination Retention	29
2. On-site Retention	29
P. REOPENER CLAUSE	30
1. Procedures for Modification or Revocation	30
2. Water Quality Protection	30
Q. SEVERABILITY	30
R. NOTIFICATION REQUIREMENTS	30
1. Notification to Parties	30
S. RESPONSIBILITIES	30
1. Reduction, Loss, or Failure of Treatment Facility	30
T. OIL AND HAZARDOUS SUBSTANCE LIABILITY	30
U. EMERGENCY POWERS	31
V. CONFIDENTIALITY	31
W. FEES	31
X. DURATION OF PERMIT	31
Y. SECTION 307 TOXICS	31

Part I

Note: At the first mention of terminology that has a specific connotation for the purposes of this permit, the terminology is electronically linked to the definitions section of the permit in Part I.E.

A. COVERAGE UNDER THIS PERMIT

1. Authorized Discharges

This general permit authorizes permittee(s) to discharge the following to state waters: stormwater associated with construction activity and specified non-stormwater associated with construction activity. The following types of stormwater and non-stormwater discharges are authorized under this permit:

a. Allowable Stormwater Discharges

- i. Stormwater discharges associated with construction activity.
- ii. Stormwater discharges associated with producing earthen materials, such as soils, sand, and gravel dedicated to providing material to a single contiguous site, or within ¼ mile of a construction site (e.g. borrow or fill areas).
- iii. Stormwater discharges associated with [dedicated asphalt](#), [concrete batch plants](#) and [masonry mixing stations](#) (Coverage under this permit is not required if alternative coverage has been obtained.)

b. Allowable Non-Stormwater Discharges

The following non-stormwater discharges are allowable under this permit if the discharges are identified in the stormwater management plan in accordance with [Part I.C](#) and if they have appropriate [control measures](#) in accordance with [Part I.B.1](#).

- i. Discharges from uncontaminated springs that do not originate from an area of land disturbance.
- ii. Discharges to the ground of concrete washout water associated with the washing of concrete tools and concrete mixer chutes. Discharges of concrete washout water must not leave the site as surface runoff or reach [receiving waters](#) as defined by this permit. Concrete on-site waste disposal is not authorized by this permit except in accordance with [Part I.B.1.a.ii\(b\)](#).
- iii. Discharges of landscape irrigation return flow.
- iv. Discharges from [diversions](#) of state waters within the permitted site.

c. Emergency Fire Fighting

Discharges resulting from emergency firefighting activities during the active emergency response are authorized by this permit.

2. Limitations on Coverage

Discharges not authorized by this permit include, but are not limited to, the discharges and activities listed below. Permittees may seek individual or alternate general permit coverage for the discharges, as appropriate and available.

a. Discharges of Non-Stormwater

Discharges of non-stormwater, except the authorized non-stormwater discharges listed in Part

I.A.1.b., are not eligible for coverage under this permit.

- b. Discharges Currently Covered by another Individual or General Permit
- c. Discharges Currently Covered by a Water Quality Control Division (division) Low Risk Guidance Document

3. Permit Certification and Submittal Procedures

a. Duty to Apply

The following activities shall apply for coverage under this permit:

- i. Construction activity that will disturb one acre or more; or
- ii. Construction activity that is part of a [common plan of development or sale](#); or
- iii. Stormwater discharges that are designated by the division as needing a stormwater permit because the discharge:

(a) Contributes to a violation of a water quality standard; or

(b) Is a significant contributor of [pollutants](#) to state waters.

b. Application Requirements

To obtain authorization to discharge under this permit, applicants applying for coverage following the effective date of the renewal permit shall meet the following requirements:

- i. Owners and operators submitting an application for permit coverage will be co-permittees subject to the same benefits, duties, and obligations under this permit.
- ii. Signature requirements: Both the [owner](#) and [operator](#) (permittee) of the construction site, as defined in Part I.E., must agree to the terms and conditions of the permit and submit a completed application that includes the signature of both the owner and the operator. In cases where the duties of the owner and operator are managed by the owner, both application signatures may be completed by the owner. Both the owner and operator are responsible for ensuring compliance with all terms and conditions of the permit, including implementation of the stormwater management plan.
- iii. The applicant(s) must develop a stormwater management plan (SWMP) in accordance with the requirements of Part I.C. The applicant(s) must also certify that the SWMP is complete, or will be complete, prior to commencement of any construction activity.
- iv. In order to apply for certification under this general permit, the applicant(s) must submit a complete, accurate, and signed permit application form as provided by the division by electronic delivery at least 10 days prior to the commencement of construction activity, except those construction activities that are in response to a [public emergency related site](#); [public emergency related sites](#) shall apply for coverage no later than 14 days after the commencement of construction activities. The provisions of this part in no way remove a violation of the Colorado Water Quality Control Act if a [point source](#) discharge occurs prior to the issuance of a CDPS permit.
- v. **The application in its entirety must be submitted via the division's online permitting system** unless a waiver is granted by the division. If a waiver is granted, the application in its entirety, including signatures by both the owner and operator, must be submitted to:

Colorado Department of Public Health and Environment
Water Quality Control Division
Permits Section, WQCD-PS-B2
4300 Cherry Creek Drive South
Denver, CO 80246

- vi. The applicant(s) must receive written notification that the division granted permit coverage prior to conducting construction activities except for construction activities that are in response to a public emergency related site.

c. Division Review of Permit Application

Within 10 days of receipt of the application, and following review of the application, the division may:

- i. Issue a certification of coverage;
- ii. Request additional information necessary to evaluate the discharge;
- iii. Delay the authorization to discharge pending further review;
- iv. Notify the applicant that additional terms and conditions are necessary; or
- v. Deny the authorization to discharge under this general permit.

d. Alternative Permit Coverage

i. Division Required Alternative Permit Coverage:

The division may require an applicant or permittee to apply for an individual permit or an alternative general permit if it determines the discharge does not fall under the scope of this general permit, including if any additional terms and conditions are necessary in order to ensure that discharges authorized by this permit shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any applicable water quality standard, including narrative standards for water quality. In this case, the division will notify the applicant or permittee that an individual permit application is required.

ii. Permittee Request for Alternative Permit Coverage:

A permittee authorized to discharge stormwater under this permit may request to be excluded from coverage under this general permit by applying for an individual permit. In this case, the permittee must submit an individual application, with reasons supporting the request, to the division at least **180 days prior to any discharge. When an individual permit is issued, the permittee's authorization to discharge under this permit is terminated on the effective date of the individual permit.**

e. Submittal Signature Requirements

Documents required for submittal to the division in accordance with this permit, including applications for permit coverage and other documents as requested by the division, must include signatures by both the owner and the operator, except for instances where the duties of the owner and operator are managed by the owner.

Signatures on all documents submitted to the division as required by this permit must meet the Standard Signatory Requirements in [Part II.K](#) of this permit in accordance with 40 C.F.R. 122.41(k).

i. Signature Certification

Any person(s) signing documents required for submittal to the division must make the following

certification:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

f. Compliance Document Signature Requirements

Documents which are required for compliance with the permit, but for which submittal to the division is not required unless specifically requested by the division, must be signed by the individual(s) designated as the [Qualified Stormwater Manager](#), as defined in Part I.E.

- i. Any person(s) signing inspection documents required for compliance with the permit per [Part I.D.5.c.xiii](#) must make the following statement and provide the date of the statement:

“I verify that, to the best of my knowledge and belief, that if any corrective action items were identified during the inspection, those corrective actions are complete, and the site is currently in compliance with the permit.”

g. Field Wide Permit Coverage for Oil and Gas Construction

At the discretion of the division, a single permit certification may be issued to a single oil and gas permittee to cover construction activity related discharges from an oil and gas field at multiple locations that are not necessarily contiguous.

h. Permit Coverage without Application

Qualifying Local Program: When a small construction site is within the jurisdiction of a qualifying local program, the owner and operator of the construction activity are authorized to discharge stormwater associated with [small construction activity](#) under this general permit without the submittal of an application to the division. Sites covered by a qualifying local program are exempt from the following sections of this general permit: Part I.A.3.a.; Part I.A.3.b.; Part I.A.3.c.; Part I.A.3.d.; Part I.A.3.g.; Part I.A.3.i.; Part I.A.3.j.; Part I.A.3.k.

Sites covered by a qualifying local program are subject to the following requirements:

- i. **Local Agency Authority:** This permit does not pre-empt or supersede the authority of local agencies to prohibit, restrict, or control discharges of stormwater to storm drain systems or other water courses within their jurisdiction.
- ii. **Permit Coverage Termination:** When a site under a Qualifying Local Program is finally stabilized, coverage under this permit is automatically terminated.
- iii. **Compliance with Qualifying Local Program:** Qualifying Local Program requirements that are equivalent to the requirements of this permit are incorporated by reference. Permittees authorized to discharge under this permit, must comply with the equivalent requirements of the Qualifying Local Program that has jurisdiction over the site as a condition of this permit.
- iv. **Compliance with Remaining Permit Conditions.** Requirements of this permit that are in addition to or more stringent than the requirements of the Qualifying Local Program apply in addition to the requirements of the Qualifying Local Program.
- v. **Written Authorization of Coverage:** The division or local municipality may require any permittee within the jurisdiction of a Qualifying Local Program covered under this permit to

apply for, and obtain written authorization of coverage under this permit. The permittee must be notified in writing that an application for written authorization of coverage is required.

i. Permittee Initiated Permit Actions

Permittee initiated permit actions, including but not limited to modifications, contact changes, transfers, and terminations, shall be conducted following [Part II.L](#), division guidance and using appropriate division-provided forms.

j. Sale of Residence to Homeowner

Residential construction sites only: The permittee may remove residential lots from permit coverage once the lot meets the following criteria:

- i. The residential lot has been sold to the homeowner(s) for private residential use;
- ii. A certificate of occupancy, or equivalent, is maintained on-site and is available during division inspections;
- iii. The lot is less than one acre of disturbance;
- iv. All construction activity conducted on the lot by the permittee is complete;
- v. The permittee is not responsible for final stabilization of the lot; and
- vi. The SWMP was modified to indicate the lot is no longer part of the construction activity.

If the residential lot meets the criteria listed above then activities occurring on the lot are no longer considered to be construction activities with a duty to apply and maintain permit coverage. Therefore, the permittee is not required to meet the final stabilization requirements and may terminate permit coverage for the lot.

k. Permit Expiration and Continuation of Permit Coverage

Authorization to discharge under this general permit shall expire at midnight on March 31, 2024. While Regulation 61.4 requires a permittee to submit an application for continuing permit coverage 180 days before the permit expires, the division is requiring that permittees desiring continued coverage under this general permit must reapply at least 90 days in advance of this permit expiration. The division will determine if the permittee may continue to discharge stormwater under the terms of the general permit. An individual permit may be required for any facility not reauthorized to discharge under the reissued general permit.

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued and remain in force and effect. For permittees that have applied for continued permit coverage, discharges authorized under this permit prior to the expiration date will automatically remain covered by this permit until the earliest of:

- i. An authorization to discharge under a reissued permit, or a replacement of this permit, following the timely and appropriate submittal of a complete application requesting authorization to discharge under the new permit and compliance with the requirements of the new permit; or
- ii. The issuance and effect of a termination issued by the division; or
- iii. **The issuance or denial of an individual permit for the facility's discharges;** or
- iv. A formal permit decision by the division not to reissue this general permit, at which time the division will identify a reasonable time period for covered dischargers to seek coverage under

an alternative general permit or an individual permit. Coverage under this permit will cease when coverage under another permit is granted/authorized; or

- v. The division has informed the permittee that discharges previously authorized under this permit are no longer covered under this permit.

B. EFFLUENT LIMITATIONS

1. Requirements for Control Measures Used to Meet Effluent Limitations

The permittee must implement control measures to [minimize](#) the discharge of pollutants from all potential pollutant sources at the site. Control measures must be installed prior to commencement of construction activities. Control measures must be selected, designed, installed and maintained in accordance with [good engineering, hydrologic and pollution control practices](#). Control measures implemented at the site must be designed to prevent pollution or degradation of state waters.

a. Stormwater Pollution Prevention

The permittee must implement structural and/or nonstructural control measures that effectively minimize erosion, sediment transport, and the release of other pollutants related to construction activity.

i. Control Measures for Erosion and Sediment Control

Control measures for erosion and sediment control may include, but are not limited to, wattles/sediment control logs, silt fences, earthen dikes, drainage swales, sediment traps, subsurface drains, pipe slope drains, inlet protection, outlet protection, gabions, sediment basins, temporary vegetation, permanent vegetation, mulching, geotextiles, sod stabilization, slope roughening, maintaining existing vegetation, protection of trees, and preservation of mature vegetation.

Specific control measures must meet the requirements listed below.

- (a) Structural and nonstructural vehicle tracking controls shall be implemented to minimize vehicle tracking of sediment from disturbed areas and may include tracking pads, minimizing site access, wash racks, graveled parking areas, maintaining vehicle traffic to paved areas, street sweeping and sediment control measures.
- (b) Stormwater runoff from all disturbed areas and soil storage areas must utilize or flow to one or more control measures to minimize erosion or sediment in the discharge. The control measure(s) must be selected, designed, installed and adequately sized in accordance with good engineering, hydrologic and pollution control practices for the intended application. The control measure(s) must contain or filter flows in order to prevent the [bypass](#) of flows without treatment and must be appropriate for stormwater runoff from disturbed areas and for the expected flow rate, duration, and flow conditions (e.g. sheet or concentrated flow).
- (c) Selection of control measures should prioritize the use of structural and nonstructural control measures that minimize the potential for erosion (i.e. covering materials). Selection should also prioritize phasing construction activities to minimize the amount of soil disturbance at any point in time throughout the duration of construction.
- (d) Outlets that withdraw water from or near the surface shall be installed when discharging from basins and impoundments, unless [infeasible](#).
- (e) Maintain pre-existing vegetation or equivalent control measures for areas within 50 horizontal feet of receiving waters as defined by this permit, unless infeasible.

- (f) Soil compaction must be minimized for areas where infiltration control measures will occur or where [final stabilization](#) will be achieved through vegetative cover.
- (g) Unless infeasible, topsoil shall be preserved for those areas of a site that will utilize vegetative final stabilization.
- (h) Minimize the amount of soil exposed during construction activity, including the disturbance of [steep slopes](#).
- (i) Diversion control measures must minimize soil transport and erosion within the entire diversion, minimize erosion during discharge, and minimize run-on into the diversion. The permittee must minimize the discharge of pollutants throughout the installation, implementation and removal of the diversion. Diversions must meet one or more of the following conditions:
 - (1) Lined or piped structures that result in no erosion in all flow conditions.
 - (2) Diversion channels, berms, and coffer dams must be lined or composed of a material that minimizes potential for soil loss in the entire wetted perimeter during anticipated flow conditions (e.g. vegetated swale, non-erosive soil substrate). The entire length of the diversion channel must be designed with all of the following considerations: maximum flow velocity for the type of material(s) exposed to the anticipated flows to ensure that the calculated maximum shear stress of flows in the channel is not expected to result in physical damage to the channel or liner and result in discharge of pollutants. Additionally, the conditions relied on to minimize soil loss must be maintained for the projected life of the diversion (i.e. a vegetated swale must be limited to a period of time that ensures vegetative growth, minimizes erosion and maintains stable conditions).
 - (3) An alternative diversion criteria, approved by the division prior to implementation. The diversion method must be designed to minimize the discharge of pollutants and to prevent the potential for pollution or degradation to state waters as a result of the diverted flow through the diversion structure. In addition, the alternative diversion method must minimize the discharge of pollutants throughout the installation, implementation and removal of the diversion.

ii. Practices for Other Common Pollutants

- (a) Bulk storage, individual containers of 55 gallons or greater, for petroleum products and other liquid chemicals must have secondary containment, or equivalent protection, in order to contain [spills](#) and to prevent spilled material from entering state waters.
- (b) Control measures designed for concrete washout waste must be implemented. This includes washout waste discharged to the ground as authorized under this permit and washout waste from concrete trucks and masonry operations contained on site. The permittee must ensure the washing activities do not contribute pollutants to stormwater runoff, or receiving waters in accordance [Part I.A.1.b.ii](#). Discharges that may reach groundwater must flow through soil that has buffering capacity prior to reaching groundwater, as necessary to meet the effluent limits in this permit, including [Part I.B.3.a](#). The concrete washout location must not be located in an area where shallow groundwater may be present and would result in buffering capacity not being adequate, such as near natural drainages, springs, or wetlands. This permit authorizes discharges to the ground of concrete washout waste, but does not authorize on-site waste disposal per [Part I.B.3.d](#).
- (c) In the event that water remains onsite and contains pollutants either from the

firefighting activities or picked up from the site (i.e. in a gutter, sediment basin, etc.) after active emergency response is complete, the permittee must ensure the remaining water containing pollutants is properly removed and disposed of in order to minimize pollutants from discharging from the site, unless infeasible.

iii. Stabilization Requirements

The following requirements must be implemented for each site.

- (a) Temporary stabilization must be implemented for earth disturbing activities on any portion of the site where ground disturbing construction activity has permanently ceased, or temporarily ceased for more than 14 calendar days. Temporary stabilization methods may include, but are not limited to, tarps, soil tackifier, and hydroseed. The permittee may exceed the 14-day schedule when either the function of the specific area of the site requires it to remain disturbed or physical characteristics of the terrain and climate prevent stabilization. The SWMP must document the constraints necessitating the alternative schedule, provide the alternate stabilization schedule, and identify all locations where the alternative schedule is applicable on the site map. Minimum inspection frequency and scope, as directed in Part I.D., must be followed for temporarily stabilized areas.
- (b) Final stabilization must be implemented for all construction sites covered under this permit. Final stabilization is reached when (1), (2), and (3) below are complete:
 - (1) All construction activities are complete.
 - (2) Permanent stabilization methods are complete. Permanent stabilization methods include, but are not limited to, permanent pavement or concrete, hardscape, xeriscape, stabilized driving surfaces, vegetative cover, or equivalent permanent alternative stabilization methods. The division may approve alternative final stabilization criteria for specific operations. Vegetative cover must meet the following criteria:
 - a. Evenly distributed perennial vegetation, and
 - b. Coverage, at a minimum, equal to 70 percent of what would have been provided by native vegetation in a local, undisturbed area or adequate reference site, and
 - (3) The permittee must ensure all temporary control measures are removed from the construction site once final stabilization is achieved, except when the control measure specifications allow the control measure to be left in place (i.e. bio-degradable control measures).
- (c) Final stabilization must be designed and installed as a permanent feature. Final stabilization measures for obtaining a vegetative cover or alternative stabilization methods include, but are not limited to, the following as appropriate:
 - (1) Seed mix selection and application methods;
 - (2) Soil preparation and amendments;
 - (3) Soil stabilization methods to provide adequate protection to minimize erosion (e.g. crimped straw, hydro mulch or rolled erosion control products);
 - (4) Appropriate sediment control measures as needed until final stabilization is achieved;

(5) Permanent pavement, hardscape, xeriscape, stabilized driving surfaces;

(d) Other alternative stabilization practices as applicable.

b. Maintenance

The permittee must ensure that all control measures remain in effective operating condition and are protected from activities that would reduce their effectiveness. Control measures must be maintained in accordance with good engineering, hydrologic and pollution control practices. Observations leading to the required maintenance of control measures can be made during a site inspection, or during general observations of site conditions. The necessary repairs or modifications to a [control measure requiring routine maintenance](#), as defined in Part I.E., must be conducted to maintain an effective operating condition. This section is not subject to the requirements in [Part I.B.1.c](#) below.

c. Corrective Actions

The permittee must assess the adequacy of control measures at the site, and the need for changes to those control measures, to ensure continued effective performance.

When an [inadequate control measure](#), as defined in Part I.E., is identified (i.e., new or replacement control measures become necessary), the following corrective action requirements apply. The permittee is in noncompliance with the permit until the inadequate control measure is replaced or corrected and returned to effective operating condition in compliance with [Part I.B.1](#) and the general requirements in [Part I.B.3](#). If the inadequate control measure results in noncompliance that meets the conditions of Part II.L., the permittee must also meet the requirements of that section.

- i. The permittee must take all necessary steps to minimize or prevent the discharge of pollutants from the permitted area and manage any stormwater run-on onto the site until a control measure is implemented and made operational and/or an inadequate control measure is replaced or corrected and returned to effective operating condition. If it is infeasible to install or repair the control measure immediately after discovering the deficiency, the following must be documented in the SWMP in [Part I.D.5.c](#) and kept on record in accordance with the recordkeeping requirements in Part II.

(a) Describe why it is infeasible to initiate the installation or repair immediately; and

(b) Provide a schedule for installing or repairing the control measure and returning it to an effective operating condition as soon as possible.

- ii. If applicable, the permittee must remove and properly dispose of any unauthorized release or discharge within and from the permitted area (e.g., discharge of non-stormwater, untreated stormwater containing pollutants, spill, or leak not authorized by this permit.) The permittee must also clean up any contaminated surfaces, if feasible, to minimize discharges of the material in subsequent storm events, including water remaining from the response that contains pollutants after active emergency firefighting response is complete.

2. Discharges to an Impaired Waterbody

a. [Total Maximum Daily Load](#) (TMDL)

If the discharge from the site of permit coverage flows to or could reasonably be expected to flow to any water body for which a TMDL has been approved, and stormwater discharges associated with construction activity were assigned a pollutant-specific Wasteload Allocation (WLA) under the TMDL, the division may:

- i. Ensure the WLA is implemented properly through alternative local requirements, such as by a

municipal stormwater permit; or

- ii. Notify the permittee of the WLA and amend **the permittee's certification to add specific** effluent limits and other requirements, as appropriate. The permittee may be required to do the following:
 - (a) **Under the permittee's SWMP, implement specific control measures based on** requirements of the WLA, and evaluate whether the requirements are met through implementation of existing stormwater control measures or if additional control measures are necessary. Document the calculations or other evidence demonstrating that the requirements are expected to be met; and
 - (b) If the evaluation shows that additional or modified control measures are necessary, describe the type and schedule for the control measure additions or modifications.
- iii. Discharge monitoring may also be required. The permittee may maintain coverage under the general permit provided they comply with the applicable requirements outlined above. The division reserves the right to require individual or alternate general permit coverage.

3. General Requirements

- a. Discharges authorized by this permit shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any applicable water quality standard, including narrative standards for water quality.
- b. The division may require sampling and testing, on a case-by-case basis, in the event that there is reason to suspect that the SWMP is not adequately minimizing pollutants in stormwater or in order to measure the effectiveness of the control measures in removing pollutants in the effluent. Such monitoring may include Whole Effluent Toxicity testing.
- c. The permittee must comply with the lawful requirements of federal agencies, municipalities, counties, drainage districts and other local agencies including applicable requirements in [Municipal Stormwater Management Programs](#) developed to comply with CDPS permits. The permittee must comply with local stormwater management requirements, policies and guidelines including those for erosion and sediment control.
- d. All construction site wastes must be properly managed to prevent potential pollution of state waters. This permit does not authorize on-site waste disposal.
- e. This permit does not relieve the permittee of the reporting requirements in 40 CFR 110, 40 CFR 117 or 40 CFR 302. Any discharge of hazardous material must be handled in accordance with the division's Noncompliance Notification Requirements (see [Part II.L](#) of the permit).

C. STORMWATER MANAGEMENT PLAN (SWMP) REQUIREMENTS

1. SWMP General Requirements

- a. A SWMP shall be developed for each construction site listed under [Part I.A.3.a](#), including but not limited to, construction activity that will disturb one acre or more and/or are part of a common plan of development or sale covered by this permit. The SWMP must be prepared in accordance with good engineering, hydrologic and pollution control practices.
 - i. For public emergency related sites, a SWMP shall be created no later than 14 days after the commencement of construction activities.
- b. The permittee must implement the provisions of the SWMP as written and updated, from commencement of construction activity until final stabilization is complete. The division may review the SWMP.

- c. A copy of the SWMP must be retained onsite or be onsite when construction activities are occurring at the site unless the permittee specifies another location and obtains approval from the division.

2. SWMP Content

- a. The SWMP, at a minimum, must include the following elements.
 - i. Qualified Stormwater Manager. The SWMP must list individual(s) by title and name who are designated as responsible for implementing the SWMP in its entirety and meet the definition of a Qualified Stormwater Manager. This role may be filled by more than one individual.
 - ii. Spill Prevention and Response Plan. The SWMP must have a spill prevention and response plan. The plan may incorporate by reference any part of a Spill Prevention Control and Countermeasure (SPCC) plan under section 311 of the Clean Water Act (CWA) or a Spill Prevention Plan required by a separate CDPS permit. The relevant sections of any referenced plans must be available as part of the SWMP consistent with Part I.C.4.
 - iii. Other CDPS Permits. The SWMP must list the applicable CDPS permits associated with the permitted site and the activities occurring on the permitted site (e.g. a CDPS Dewatering Permit).
 - iv. Materials Handling. The SWMP must describe handling procedures of all control measures implemented at the site to minimize impacts from handling significant materials that could contribute pollutants to runoff. These handling procedures can include control measures for pollutants and activities such as, exposed storage of building materials, paints and solvents, landscape materials, fertilizers or chemicals, sanitary waste material, trash and equipment maintenance or fueling procedures.
 - v. Potential Sources of Pollution. The SWMP must list all potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges associated with construction activity from the site. This may include, but is not limited to, the following pollutant sources:
 - (a) Disturbed and stored soils;
 - (b) Vehicle tracking of sediments;
 - (c) Management of contaminated soils, if known to be present, or if contaminated soils are found during construction;
 - (d) Loading and unloading operations;
 - (e) Outdoor storage activities (erodible building materials, fertilizers, chemicals, etc.);
 - (f) Vehicle and equipment maintenance and fueling;
 - (g) Significant dust or particulate generating processes (e.g., saw cutting material, including dust);
 - (h) Routine maintenance activities involving fertilizers, pesticides, herbicides, detergents, fuels, solvents, oils, etc.;
 - (i) On-site waste management practices (waste piles, liquid wastes, dumpsters);
 - (j) Concrete truck/equipment washing, including washing of the concrete truck chute and associated fixtures and equipment;
 - (k) Dedicated asphalt, concrete batch plants and masonry mixing stations;

(l) Non-industrial waste sources such as worker trash and portable toilets.

- vi. Implementation of Control Measures. The SWMP must include design specifications that contain information on the implementation of all the structural and nonstructural control measures in use on the site in accordance with good engineering, hydrologic and pollution control practices; including, as applicable, drawings, dimensions, installation information, materials, implementation processes, control measure-specific inspection expectations, and maintenance requirements.

The SWMP must include a documented use agreement between the permittee and the owner or operator of any control measures located outside of the permitted area, that are utilized by the **permittee's construction site for compliance with this permit, but not under the direct** control of the permittee. The permittee is responsible for ensuring that all control measures located outside of their permitted area, that are being utilized by the **permittee's construction** site, are properly maintained and in compliance with all terms and conditions of the permit. The SWMP must include all information required of and relevant to any such control measures located outside the permitted area, including location, installation specifications, design specifications and maintenance requirements.

- vii. Site Description. The SWMP must include a site description which includes, at a minimum, the following:
- (a) The nature of the construction activity at the site;
 - (b) The proposed schedule for the sequence for major construction activities and the planned implementation of control measures for each phase. (e.g. clearing, grading, utilities, vertical, etc.);
 - (c) Estimates of the total acreage of the site, and the acreage expected to be disturbed by clearing, excavation, grading, or any other construction activities;
 - (d) A summary of any existing data and sources used in the development of the construction site plans or SWMP that describe the soil types found in the permitted area and the erodibility of the identified soil types;
 - (e) A description of the percent cover of native vegetation on the site if the site is undisturbed, or the percent cover of native vegetation in a similar, local undisturbed area or adequate reference area if the site is disturbed. Include the source or methodology for determining the percentage. If a percent cover is not appropriate for the site location (i.e. arid), describe the technique and justification for the identified cover of native vegetation;
 - (f) A description of any allowable non-stormwater discharges at the site, including those being discharged under a separate CDPS permit or a division low risk discharge guidance policy, and applicable control measures installed;
 - (g) A description of the drainage patterns from the site, including a description of the immediate source receiving the discharge and the receiving water(s) of the discharge, if different than the immediate source. If the stormwater discharge is to a [municipal separate storm sewer system](#), include the name of the entity owning that system, the location(s) of the stormwater discharge, and the receiving water(s);
 - (h) A description of all stream crossings located within the construction site boundary; and
 - (i) A description of the alternate temporary stabilization schedule, if applicable ([Part I.B.1.a.iii\(a\)](#)).

- (j) A description of the alternative diversion criteria as approved by the division, if applicable ([Part I.B.1.a.i\(i\)\(3\)](#)).

viii. Site Map. The SWMP must include a site map which includes, at a minimum, the following:

- (a) Construction site boundaries;
- (b) Flow arrows that depict stormwater flow directions on-site and runoff direction;
- (c) All areas of ground disturbance including areas of borrow and fill;
- (d) Areas used for storage of soil;
- (e) Locations of all waste accumulation areas, including areas for liquid, concrete, masonry, and asphalt;
- (f) Locations of dedicated asphalt, concrete batch plants and masonry mixing stations;
- (g) Locations of all structural control measures;
- (h) Locations of all non-structural control measures (e.g. temporary stabilization);
- (i) Locations of springs, streams, wetlands, diversions and other state waters, including areas that require pre-existing vegetation be maintained within 50 feet of a receiving water, where determined feasible in accordance with [Part I.B.1.a.i\(e\)](#);
- (j) Locations of all stream crossings located within the construction site boundary; and
- (k) Locations where alternative temporary stabilization schedules apply.

ix. Temporary Stabilization, Final Stabilization and Long Term Stormwater Management.

- (a) The SWMP must document the constraints necessitating an alternative temporary stabilization schedule, as referenced in [Part I.B.1.a.iii\(a\)](#), provide the alternate stabilization schedule, and identify all locations where the alternative schedule is applicable on the site map.
- (b) The SWMP must describe and locate the methods used to achieve final stabilization of all disturbed areas at the site, as listed in [Part I.B.1.a.iii\(b\)](#).
- (c) The SWMP must describe the measures used to establish final stabilization through vegetative cover or alternative stabilization method, as referenced in [Part I.B.1.a.iii\(c\)](#), and describe and locate any temporary control measures in place during the process of final stabilization.
- (d) The SWMP must describe and locate any planned permanent control measures to control pollutants in stormwater discharges that will occur after construction operations are completed, including but not limited to, detention/retention ponds, rain gardens, stormwater vaults, etc.

x. Inspection Reports. The SWMP must include documented inspection reports in accordance with [Part I.D.5.c](#).

3. SWMP Review and Revisions

Permittees must keep a record of SWMP changes made that includes the date and identification of the changes. The SWMP must be amended when the following occurs:

- a. A change in design, construction, operation, or maintenance of the site requiring implementation

of new or revised control measures;

- b. The SWMP proves ineffective in controlling pollutants in stormwater runoff in compliance with the permit conditions;
- c. Control measures identified in the SWMP are no longer necessary and are removed; and
- d. Corrective actions are taken onsite that result in a change to the SWMP.
- e. The site or areas of the site qualifying for reduced frequency inspections under [Part I.D.4](#).

For SWMP revisions made prior to or following a change(s) onsite, including revisions to sections addressing site conditions and control measures, a notation must be included in the SWMP that identifies the date of the site change, the control measure removed, or modified, the location(s) of those control measures, and any changes to the control measure(s). The permittee must ensure the site changes are reflected in the SWMP. The permittee is noncompliant with the permit until the SWMP revisions have been made.

4. SWMP Availability

A copy of the SWMP must be provided upon request to the division, EPA, and any local agency with authority for approving sediment and erosion plans, grading plans or stormwater management plans within the time frame specified in the request. If the SWMP is required to be submitted to any of these entities, the submission must include a signed certification in accordance with [Part I.A.3.e](#), certifying that the SWMP is complete and compliant with all terms and conditions of the permit.

All SWMPs required under this permit are considered reports that must be available to the public under Section 308(b) of the CWA and Section 61.5(4) of the CDPS regulations. The permittee must make plans available to members of the public upon request. However, the permittee may claim any portion of a SWMP as confidential in accordance with 40 CFR Part 2.

D. SITE INSPECTIONS

Site inspections must be conducted in accordance with the following requirements. The required inspection **schedules are a minimum frequency and do not affect the permittee's responsibility to implement control measures in effective operating condition as prescribed in the SWMP, [Part I.C.2.a.vi](#)**, as proper maintenance of control measures may require more frequent inspections. Site inspections shall start within 7 calendar days of the commencement of construction activities on site.

1. Person Responsible for Conducting Inspections

The person(s) inspecting the site may be on the permittee's staff or a third party hired to conduct stormwater inspections under the direction of the permittee(s). The permittee is responsible for ensuring that the inspector meets the definition of a Qualified Stormwater Manager. The inspector may be different than the individual(s) listed in [Part I.C.2.a.i](#).

2. Inspection Frequency

Permittees must conduct site inspections in accordance with on the following minimum frequencies, unless the site meets the requirements of [Part I.D.3](#). All inspections must be recorded per [Part I.D.5.c](#).

- a. At least one inspection every 7 calendar days; or
- b. At least one inspection every 14 calendar days, if post-storm event inspections are conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion. Post-storm inspections may be used to fulfill the 14-day routine inspection requirement.
- c. When site conditions make the schedule required in this section impractical, the permittee may

petition the division to grant an alternate inspection schedule. The alternative inspection schedule must not be implemented prior to written approval by the division and incorporation into the SWMP.

3. Inspection Frequency for Discharges to Outstanding Waters

Permittees must conduct site inspections at least once every 7 calendar days for sites that discharge to a water body designated as an Outstanding Water by the Water Quality Control Commission.

4. Reduced Inspection Frequency

The permittee may perform site inspections at the following reduced frequencies when one of the following conditions exists:

a. Post-Storm Inspections at Temporarily Idle Sites

For permittees choosing an inspection frequency pursuant to [Part I.D.2.b](#) and if no construction activities will occur following a storm event, post-storm event inspections must be conducted prior to re-commencing construction activities, and no later than 72 hours following the storm event. If the post-storm event inspection qualifies under this section, the inspection delay must be documented in the inspection record per [Part I.D.5.c](#). Routine inspections must still be conducted at least every 14 calendar days.

b. Inspections at Completed Sites/Areas

When the site, or portions of a site, are awaiting establishment of a vegetative ground cover and final stabilization, the permittee must conduct a thorough inspection of the stormwater management system at least once every 30 days. Post-storm event inspections are not required under this schedule. This reduced inspection schedule is allowed if all of the following criteria are met:

- i. All construction activities resulting in ground disturbance are complete;
- ii. All activities required for final stabilization, in accordance with [Part I.B.1.a.iii\(b\) & \(c\)](#) and with the SWMP, have been completed, with the exception of the application of seed that has not occurred due to seasonal conditions or the necessity for additional seed application to augment previous efforts; and
- iii. The SWMP has been amended to locate those areas to be inspected in accordance with the reduced schedule allowed for in this paragraph.

c. Winter Conditions Inspections Exclusion

Inspections are not required for sites that meet all of the following conditions: construction activities are temporarily halted, snow cover exists over the entire site for an extended period, and melting conditions posing a risk of surface erosion do not exist. This inspection exception is applicable only during the period where melting conditions do not exist, and applies to the routine 7-day, 14-day and monthly inspections, as well as the post-storm-event inspections. When this inspection exclusion is implemented, the following information must be documented in accordance with the requirements in [Part I.C.3](#) and [Part I.D.5.c](#):

- i. Dates when snow cover existed;
- ii. Date when construction activities ceased; and
- iii. Date melting conditions began.

5. Inspection Scope

a. Areas to Be Inspected

When conducting a site inspection the following areas, if applicable, must be inspected for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system or discharging to state waters:

- i. Construction site perimeter;
- ii. All disturbed areas;
- iii. Locations of installed control measures;
- iv. Designated haul routes;
- v. Material and waste storage areas exposed to precipitation;
- vi. Locations where stormwater has the potential to discharge offsite; and
- vii. Locations where vehicles exit the site.

b. Inspection Requirements

- i. Visually verify whether all implemented control measures are in effective operational condition and are working as designed in their specifications to minimize pollutant discharges.
- ii. Determine if there are new potential sources of pollutants.
- iii. Assess the adequacy of control measures at the site to identify areas requiring new or modified control measures to minimize pollutant discharges.
- iv. Identify all areas of non-compliance with the permit requirements and, if necessary, implement corrective action(s) in accordance with [Part I.B.1.c.](#)

c. Inspection Reports

The permittee must keep a record of all inspections conducted for each permitted site. Inspection reports must identify any incidents of noncompliance with the terms and conditions of this permit. All inspection reports must be signed and dated in accordance with [Part I.A.3.f.](#) Inspection records must be retained in accordance with [Part II.O.](#) At a minimum, the inspection report must include:

- i. The inspection date;
- ii. Name(s) and title(s) of personnel conducting the inspection;
- iii. Weather conditions at the time of inspection;
- iv. Phase of construction at the time of inspection;
- v. Estimated acreage of disturbance at the time of inspection;
- vi. Location(s) and identification of control measures requiring routine maintenance;
- vii. Location(s) and identification of discharges of sediment or other pollutants from the site;
- viii. Location(s) and identification of inadequate control measures;
- ix. Location(s) and identification of additional control measures needed that were not in place at the time of inspection;

- x. Description of corrective action(s) for items vii, viii, ix, above, dates corrective action(s) were completed, including requisite changes to the SWMP, as necessary;
- xi. Description of the minimum inspection frequency (either in accordance with [Part I.D.2](#), [Part I.D.3](#) or [Part I.D.4](#).) utilized when conducting each inspection.
- xii. Deviations from the minimum inspection schedule as required in [Part I.D.2](#). This would include documentation of division approval for an alternate inspection schedule outlined in [Part I.D.2.c](#);
- xiii. After adequate corrective action(s) have been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a statement as required in [Part I.A.3.f](#).

E. DEFINITIONS

For the purposes of this permit:

- (1) Bypass the intentional diversion of waste streams from any portion of a treatment facility in accordance with 40 CFR 122.41(m)(1)(i) and Regulation 61.2(12).
- (2) Common Plan of Development or Sale - A contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related. The **division has determined that “contiguous” means construction activities located in close proximity to each other (within ¼ mile). Construction activities are “considered to be “related” if they share the same development plan, builder or contractor, equipment, storage areas, etc. “Common plan of development or sale” includes construction activities that are associated with the construction of field wide oil and gas permits for facilities that are related.**
- (3) Construction Activity - Ground surface disturbing and associated activities (land disturbance), which include, but are not limited to, clearing, grading, excavation, demolition, installation of new or improved haul roads and access roads, staging areas, stockpiling of fill materials, and borrow areas. Construction does not include routine maintenance to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. Activities to conduct repairs that are not part of routine maintenance or for replacement are construction activities and are not routine maintenance. Repaving activities where underlying and/or surrounding soil is exposed as part of the repaving operation are considered construction activities. Construction activity is from initial ground breaking to final stabilization regardless of ownership of the construction activities.
- (4) Control Measure - Any best management practice or other method used to prevent or reduce the discharge of pollutants to state waters. Control measures include, but are not limited to, best management practices. Control measures can include other methods such as the installation, operation, and maintenance of structural controls and treatment devices.
- (5) Control Measure Requiring Routine Maintenance - Any control measure that is still operating in accordance with its design and the requirements of this permit, but requires maintenance to prevent a breach of the control measure. See also inadequate control measure.
- (6) Dedicated Asphalt, Concrete Batch Plants and Masonry Mixing Stations - Are batch plants or mixing stations located on, or within ¼ mile of, a construction site and that provide materials only to that specific construction site.
- (7) Diversion - Discharges of state waters that are temporarily routed through channels or structures (e.g. in-stream, uncontaminated springs, non-pumped groundwater, temporary rerouting of surface waters).
- (8) Final Stabilization - The condition reached when construction activities at the site have been

- completed, permanent stabilization methods are complete, and temporary control measures are removed. Areas being stabilized with a vegetative cover must have evenly distributed perennial vegetation. The vegetation coverage must be, at a minimum, equal to 70 percent of what would have been provided by native vegetation in a local, undisturbed area or adequate reference site.
- (9) Good Engineering, Hydrologic and Pollution Control Practices: are methods, procedures, and practices that:
- a. Are based on basic scientific fact(s).
 - b. Reflect best industry practices and standards.
 - c. Are appropriate for the conditions and pollutant sources.
 - d. Provide appropriate solutions to meet the associated permit requirements, including practice based effluent limits.
- (10) Inadequate Control Measure - Any control measure that is not designed or implemented in accordance with the requirements of the permit and/or any control measure that is not implemented to operate in accordance with its design. See also Control Measure Requiring Routine Maintenance.
- (11) Infeasible - Not technologically possible, or not economically practicable and achievable in light of best industry practices.
- (12) Minimize - reduce or eliminate to the extent achievable using control measures that are technologically available and economically practicable and achievable in light of best industry practice.
- (13) Municipality - A city, town, county, district, association, or other public body created by, or under, State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or a designated and approved management agency under section 208 of CWA (1987).
- (14) Municipal Separate Storm Sewer System (MS4) - A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):
- a. Owned or operated by a State, city, town, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or a designated and approved management agency under section 208 of the CWA that discharges to state waters;
 - i. Designed or used for collecting or conveying stormwater;
 - ii. Are not a combined sewer; and
 - iii. Are not part of a Publicly Owned Treatment Works (POTW). See 5 CCR 1002-61.2(62).
- (15) Municipal Stormwater Management Program - A stormwater program operated by a municipality, typically to meet the requirements of the municipalities MS4 discharge certification.
- (16) Operator - The party that has operational control over day-to-day activities at a project site which are necessary to ensure compliance with the permit. This party is authorized to direct individuals at a site to carry out activities required by the permit (i.e. the general contractor).

- (17) Outstanding Waters - Waters designated as outstanding waters pursuant to Regulation 31, Section 31.8(2)(a). The highest level of water quality protection applies to certain waters that constitute an outstanding state or national resource.
- (18) Owner - The party that has overall control of the activities and that has funded the implementation of the construction plans and specifications. This is the party that may have ownership of, a long term lease of, or easements on the property on which the construction activity is occurring (e.g. the developer).
- (19) Permittee(s) - The owner and operator named in the discharge certification issued under this permit for the construction site specified in the certification.
- (20) Point Source - Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. Point source does not include irrigation return flow. See 5 CCR 102-61.2(75).
- (21) Pollutant - Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal or agricultural waste. See 5 CCR 1002-61.2(76).
- (22) Presentation of credentials - a government issued form of identification, if in person; or (ii) providing name, position and purpose of inspection if request to enter is made via telephone, email **or other form of electronic communication. A Permittee's non-response** to a request to enter upon presentation of credentials constitutes a denial to such request, and may result in violation of the Permit.
- (23) Process Water - Any water which, during manufacturing or processing, comes into contact with or results from the production of any raw material, intermediate product, finished product, by product or waste product.
- (24) Public Emergency Related Site - a project initiated in response to an unanticipated emergency (e.g., mud slides, earthquake, extreme flooding conditions, disruption in essential public services), for which the related work requires immediate authorization to avoid imminent endangerment to human health or the environment, or to reestablish essential public services.
- (25) Qualified Stormwater Manager - An individual knowledgeable in the principles and practices of erosion and sediment control and pollution prevention, and with the skills to assess conditions at construction sites that could impact stormwater quality and to assess the effectiveness of stormwater controls implemented to meet the requirements of this permit.
- (26) Qualifying Local Program - A municipal program for stormwater discharges associated with small construction activity that was formally approved by the division as a qualifying local program.
- (27) Receiving Water - Any classified or unclassified surface water segment (including tributaries) in the State of Colorado into which stormwater associated with construction activities discharges. This definition includes all water courses, even if they are usually dry, such as borrow ditches, arroyos, and other unnamed waterways.
- (28) Severe Property Damage - substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. See 40 CFR 122.41(m)(1)(ii).
- (29) Significant Materials - Include, but not limited to, raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in

- food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the permittee is required to report under section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA); fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharges.
- (30) Small Construction Activity - The discharge of stormwater from construction activities that result in land disturbance of equal to, or greater than, one acre and less than five acres. Small construction activity also includes the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale, if the larger common plan ultimately disturbs equal to, or greater than, one acre and less than five acres.
- (31) Spill - An unintentional release of solid or liquid material which may pollute state waters.
- (32) State Waters - means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.
- (33) Steep Slopes: where a local government, or industry technical manual (e.g. stormwater BMP manual) **has defined what is to be considered a “steep slope”, this permit’s definition automatically** adopts that definition. Where no such definition exists, steep slopes are automatically defined as those that are 3:1 or greater.
- (34) Stormwater - Precipitation runoff, snow melt runoff, and surface runoff and drainage. See 5 CCR 1002-61.2(103).
- (35) Total Maximum Daily Loads (TMDLs) -The sum of the individual wasteload allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background. For the purposes of this permit, a TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes WLAs, LAs, and must include a margin of safety (MOS), and account for seasonal variations. See section 303(d) of the CWA and 40 C.F.R. 130.2 and 130.7.
- (36) Upset - an exceptional incident in which there is unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation in accordance with 40 CFR 122.41(n) and Regulation 61.2(114).

F. MONITORING

The division may require sampling and testing, on a case-by-case basis. If the division requires sampling and testing, the division will send a notification to the permittee. Reporting procedures for any monitoring data collected will be included in the notification.

If monitoring is required, the following applies:

1. The thirty (30) day average must be determined by the arithmetic mean of all samples collected during a thirty (30) consecutive-day period; and
2. A **grab sample, for monitoring requirements, is a single “dip and take”** sample.

G. OIL AND GAS CONSTRUCTION

Stormwater discharges associated with construction activities directly related to oil and gas exploration, production, processing, and treatment operations or transmission facilities are regulated under the Colorado Discharge Permit System Regulations (5 CCR 1002-61), and require coverage under this permit in accordance with that regulation. However, references in this permit to specific authority under the CWA do not apply to

stormwater discharges associated with these oil and gas related construction activities, to the extent that the references are limited by the federal Energy Policy Act of 2005.

Part II: Standard Permit Conditions

A. DUTY TO COMPLY

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Water Quality Control Act and is grounds for:

1. Enforcement action;
2. Permit termination, revocation and reissuance, or modification; or
3. Denial of a permit renewal application.

B. DUTY TO REAPPLY

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain authorization as required by Part I.A.3.k. of the permit.

C. NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. DUTY TO MITIGATE

A permittee must take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. PROPER OPERATION AND MAINTENANCE

A permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of this permit. This requirement can be met by meeting the requirements for Part I.B., I.C., and I.D. above. See also 40 C.F.R. § 122.41(e).

F. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause. The permittee request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. Any request for modification, revocation, reissuance, or termination under this permit must comply with all terms and conditions of Regulation 61.8(8).

G. PROPERTY RIGHTS

In accordance with 40 CFR 122.41(g) and 5 CCR 1002-61, 61.8(9):

1. The issuance of a permit does not convey any property or water rights in either real or personal property, or stream flows or any exclusive privilege.
2. The issuance of a permit does not authorize any injury to person or property or any invasion of personal rights, nor does it authorize the infringement of federal, state, or local laws or regulations.
3. Except for any toxic effluent standard or prohibition imposed under Section 307 of the Federal act or any standard for sewage sludge use or disposal under Section 405(d) of the Federal act, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301,

302, 306, 318, 403, and 405(a) and (b) of the Federal act. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in Section 61.8(8) of the Colorado Discharge Permit System Regulations.

H. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the division, within a reasonable time, any information which the division may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the division, upon request, copies of records required to be kept by this permit in accordance with 40 CFR 122.41(h) and/or Regulation 61.8(3)(q).

I. INSPECTION AND ENTRY

The permittee shall allow the division and the authorized representative, upon the [presentation of credentials](#) as required by law, to allow for inspections to be conducted in accordance with 40 CFR 122.41(i), Regulation 61.8(3), and Regulation 61.8(4):

1. To enter upon the permittee's premises where a regulated facility or activity is located or in which any records are required to be kept under the terms and conditions of this permit;
2. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit;
3. At reasonable times, inspect any monitoring equipment or monitoring method required in the permit; and
4. To enter upon the permittee's premises in a reasonable manner and at a reasonable time to inspect or investigate, any actual, suspected, or potential source of water pollution, or any violation of the Colorado Water Quality Control Act. The investigation may include: sampling of any discharges, stormwater or [process water](#), taking of photographs, interviewing site staff on alleged violations and other matters related to the permit, and assessing any and all facilities or areas within the site that may affect discharges, the permit, or an alleged violation.

The permittee shall provide access to the division or other authorized representatives upon **presentation of proper credentials. A permittee's non-response** to a request to enter upon presentation of credentials constitutes a denial of such request, and may result in a violation of the permit.

J. MONITORING AND RECORDS

1. Samples and measurements taken for the purpose of monitoring must be representative of the volume and nature of the monitored activity.
2. The permittee must retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date the permit expires or the date the **permittee's authorization is terminated. This period may be extended by request of the division at any time.**
3. Records of monitoring information must include:
 - a. The date, exact place, and time of sampling or measurements;
 - b. The individual(s) who performed the sampling or measurements;
 - c. The date(s) analyses were performed

- d. The individual(s) who performed the analyses;
 - e. The analytical techniques or methods used; and
 - f. The results of such analyses.
4. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in the permit.

K. SIGNATORY REQUIREMENTS

1. Authorization to Sign:

All documents required to be submitted to the division by the permit must be signed in accordance with the following criteria:

- a. For a corporation: by a responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means:
 - i. A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or
 - ii. The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
- c. For a [municipality](#), state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes
 - i. The chief executive officer of the agency, or
 - ii. A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency. (e.g. Regional Administrator of EPA)

2. Electronic Signatures

For persons signing applications for coverage under this permit electronically, in addition to meeting other applicable requirements stated above, such signatures must meet the same signature, authentication, and identity-proofing standards set forth at 40 CFR § 3.2000(b) for electronic reports (including robust second-factor authentication). Compliance with this requirement can be achieved by submitting the application using the Colorado Environmental Online Service (CEOS) system.

3. Change in Authorization to Sign

If an authorization is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to the division, prior to the re-authorization, or together with any reports, information, or applications to be signed by an authorized representative.

L. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall give advance notice to the division, in writing, of any planned physical alterations or additions to the permitted facility in accordance with 40 CFR 122.41(I) and Regulation 61.8(5)(a). Notice is required only when:

- a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or
- b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.41(a)(1).

2. Anticipated Non-Compliance

The permittee shall give advance notice to the division, in writing, of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements. The timing of notification requirements differs based on the type of non-compliance as described in subparagraphs 5, 6, 7, and 8 below.

3. Transfer of Ownership or Control

The permittee shall notify the division, in writing, ten (10) calendar days in advance of a proposed transfer of the permit. This permit is not transferable to any person except after notice is given to the division.

- a. Where a facility wants to change the name of the permittee, the original permittee (the first owner or operators) must submit a Notice of Termination.
- b. The new owner or operator must submit an application. See also signature requirements in Part II.K, above.
- c. A permit may be automatically transferred to a new permittee if:
 - i. The current permittee notifies the division in writing 30 calendar days in advance of the proposed transfer date; and
 - ii. The notice includes a written agreement between the existing and new permittee(s) containing a specific date for transfer of permit responsibility, coverage and liability between them; and
 - iii. The division does not notify the existing permittee and the proposed new permittee of its intent to modify, or revoke and reissue the permit.
 - iv. Fee requirements of the Colorado Discharge Permit System Regulations, Section 61.15, have been met.

4. Monitoring reports

Monitoring results must be reported at the intervals specified in this permit per the requirements of 40 CFR 122.41(I)(4).

5. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule in the permit, shall be submitted on the date listed

in the compliance schedule section. The fourteen (14) calendar day provision in Regulation 61.8(4)(n)(i) has been incorporated into the due date.

6. Twenty-four Hour Reporting

In addition to the reports required elsewhere in this permit, the permittee shall report the following circumstances orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall mail to the division a written report containing the information requested within five (5) working days after becoming aware of the following circumstances:

- a. Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident;
- b. Circumstances leading to any unanticipated bypass which exceeds any effluent limitations in the permit;
- c. Circumstances leading to any upset which causes an exceedance of any effluent limitation in the permit;
- d. Daily maximum violations for any of the pollutants limited by Part I of this permit. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.
- e. The division may waive the written report required under subparagraph 6 of this section if the oral report has been received within 24 hours.

7. Other Non-Compliance

A permittee must report all instances of noncompliance at the time monitoring reports are due. If no monitoring reports are required, these reports are due at least annually in accordance with Regulation 61.8(4)(p). The annual report must contain all instances of non-compliance required under either subparagraph 5 or subparagraph 6 of this subsection.

8. Other Information

Where a permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Permitting Authority, it has a duty to promptly submit such facts or information.

M. BYPASS

1. Bypass Not Exceeding Limitations

The permittees may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part II.M.2 of this permit. See 40 CFR 122.41(m)(2).

2. Notice of Bypass

- a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, the permittee must submit prior notice, if possible at least ten days before the date of the bypass. See 40 CFR §122.41(m)(3)(i) and/or Regulation 61.9(5)(c).
- b. Unanticipated bypass. The permittee must submit notice of an unanticipated bypass in accordance with Part II.L.6. See 40 CFR §122.41(m)(3)(ii).

3. Prohibition of Bypass

Bypasses are prohibited and the division may take enforcement action against the permittee for bypass, unless:

- a. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;
- b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- c. Proper notices were submitted to the division.

N. UPSET

1. Effect of an upset

An upset constitutes an affirmative defense to an action brought for noncompliance with permit effluent limitations if the requirements of Part II.N.2. of this permit are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review in accordance with Regulation 61.8(3)(j).

2. Conditions Necessary for Demonstration of an Upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that:

- a. An upset occurred and the permittee can identify the specific cause(s) of the upset;
- b. The permitted facility was at the time being properly operated and maintained; and
- c. The permittee submitted proper notice of the upset as required in Part II.L.6. (24- hour notice); and
- d. The permittee complied with any remedial measure necessary to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition to the demonstration required above, a permittee who wishes to establish the affirmative defense of upset for a violation of effluent limitations based upon water quality standards shall also demonstrate through monitoring, modeling or other methods that the relevant standards were achieved in the receiving water.

3. Burden of Proof

In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

O. RETENTION OF RECORDS

1. Post-Expiration or Termination Retention

Copies of documentation required by this permit, including records of all data used to complete the application for permit coverage to be covered by this permit, must be retained for at least three years from the date that permit coverage expires or is terminated. This period may be extended by request of EPA at any time.

2. On-site Retention

The permittee must retain an electronic version or hardcopy of the SWMP at the construction site from

the date of the initiation of construction activities to the date of expiration or inactivation of permit coverage; unless another location, specified by the permittee, is approved by the division.

P. REOPENER CLAUSE

1. Procedures for Modification or Revocation

Permit modification or revocation of this permit or coverage under this permit will be conducted according to Regulation 61.8(8).

2. Water Quality Protection

If there is evidence indicating that the stormwater discharges authorized by this permit cause, have the reasonable potential to cause or contribute to an excursion above any applicable water quality standard, the permittee may be required to obtain an individual permit, or the permit may be modified to include different limitations and/or requirements.

Q. SEVERABILITY

The provisions of this permit are severable. If any provisions or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

R. NOTIFICATION REQUIREMENTS

1. Notification to Parties

All notification requirements, excluding information submitted using the CEOS portal, shall be directed as follows:

- a. Oral Notifications, during normal business hours shall be to:
Clean Water Compliance Section
Water Quality Control Division
Telephone: (303) 692-3500
- b. Written notification shall be to:
Clean Water Compliance Section
Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

S. RESPONSIBILITIES

1. Reduction, Loss, or Failure of Treatment Facility

The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the effluent limitations of the permit. It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

T. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 (Oil and Hazardous Substance Liability) of the CWA.

U. EMERGENCY POWERS

Nothing in this permit shall be construed to prevent or limit application of any emergency power of the division.

V. CONFIDENTIALITY

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Water Quality Control Commission or the division, but shall be kept confidential. Any person seeking to invoke the protection of this section shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

W. FEES

The permittee is required to submit payment of an annual fee as set forth in the 2016 amendments to the Water Quality Control Act. Section 25-8-502 (1.1) (b), and the Colorado Discharge Permit System Regulations 5 CCR 1002-61, Section 61.15 as amended. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-601 et. seq., C.R.S.1973 as amended.

X. DURATION OF PERMIT

The duration of a permit shall be for a fixed term and shall not exceed five (5) years. If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least ninety (90) calendar days before this permit expires. Filing of a timely and complete application shall cause the expired permit to continue in force to the effective date of the new permit. The permit's duration may be extended only through administrative extensions and not through interim modifications. If the permittee anticipates there will be no discharge after the expiration date of this permit, the division should be promptly notified so that it can terminate the permit in accordance with Part I.A.3.i.

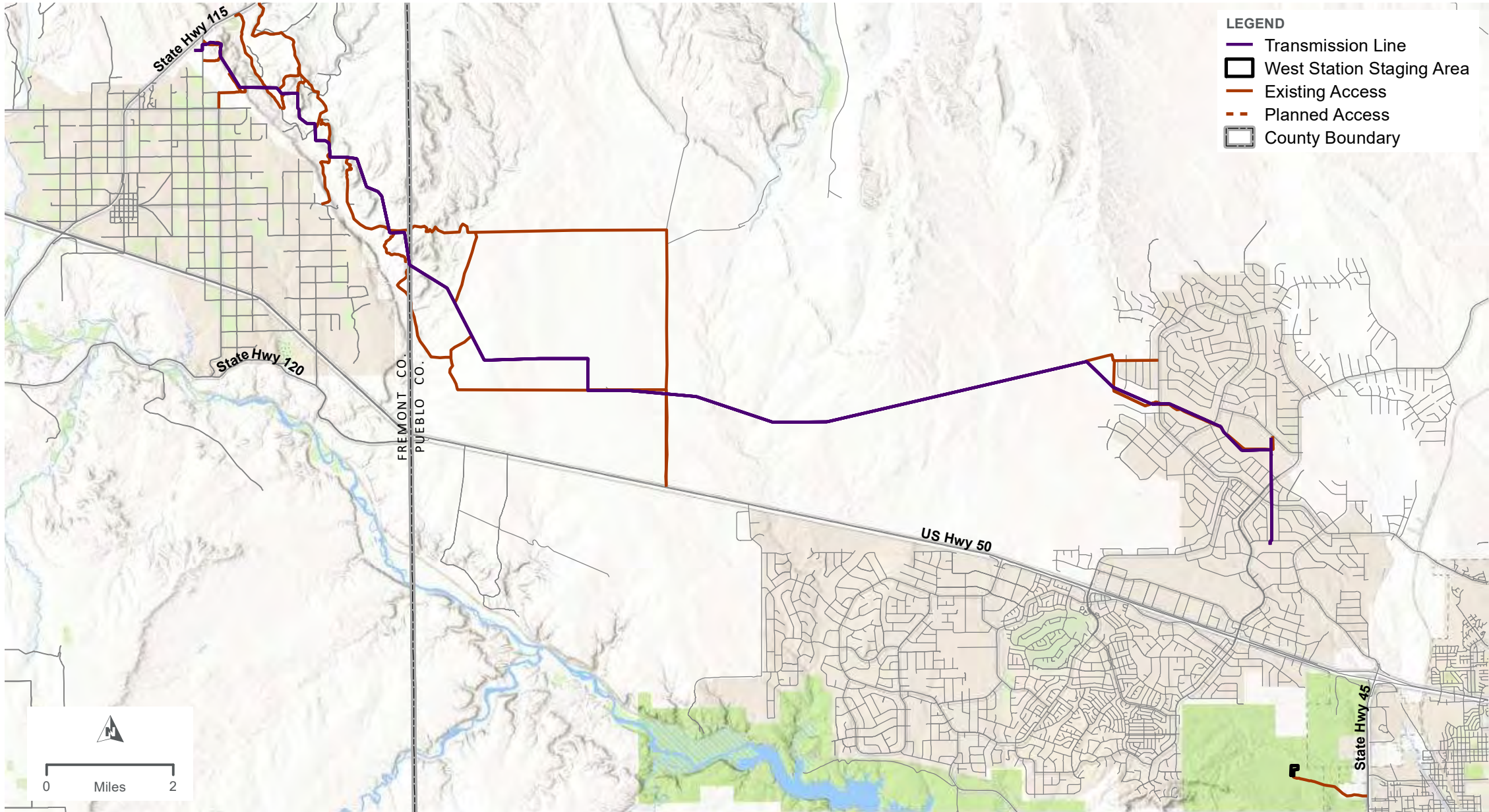
Y. SECTION 307 TOXICS

If a toxic effluent standard or prohibition, including any applicable schedule of compliance specified, is established by regulation pursuant to Section 307 of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in the discharge permit, the division shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition



Appendix B: Site Maps

Black Hills Energy Transmission Line
Canon West Reliability - Desert Cove to North Penrose Rebuild



VICINITY MAP



INDEX OF DRAWINGS

- 1 COVER SHEET
- 2 NOTES & LGEND
- 3 KEY MAP
- 4-37 SWMP DRAWINGS
- 38 SWMP DRAWINGS - STAGING AREA

BLACK HILLS ENERGY
105 S. VICTORIA AVE.
PUEBLO, COLORADO 81003
SR. TRANSMISSION PROJECT MANAGER: SETH BOUTILIER
(719) 248-5101

HDR, INC.
419 CANYON AVE., SUITE 316
FORT COLLINS, CO 800521
PROJECT MANAGER: BRIAN BROWN,
PE
(970) 416-4404



CALL BEFORE YOU DIG
EXISTING UTILITY LOCATIONS AND DEPTHS ARE APPROXIMATE. CONTRACTOR WILL CONTACT THE FOLLOWING AGENCY 72 HOURS PRIOR TO CONSTRUCTION. COLORADO STATE ONE CALL (800) 922-1987



GENERAL NOTES:

1. NON-COMPLIANCE AND ANY NOTICE OF VIOLATION IS THE RESPONSIBILITY OF THE PERMITEE.

2. CONCRETE WASH WATER SHALL NOT BE ALLOWED TO RUNOFF TO STATE WATERS, INCLUDING GROUNDWATER AND ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OF FACILITIES. CONCRETE WASH WATER, AND WASTEWATER USED IN RINSING TOOLS SHALL BE COLLECTED IN AN APPROVED WASH OUT AREA, REMOVED REGULARLY, AND DISPOSED OF APPROPRIATELY. A CONCRETE WASHOUT (CWA) WILL BE LOCATED AT ANY WORK AREAS WHERE CONCRETE WILL BE POURED.

3. SOIL EROSION CONTROL MEASURES (CMs) FOR ALL SLOPES, CHANNELS, DITCHES, OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN FOURTEEN (14) CALENDAR DAYS FOR INACTIVE AREAS OR AFTER FINAL GRADING OR FINAL EARTH DISTURBANCE HAS BEEN COMPLETED.

4. THIS PLAN CONTAINS SOIL EROSION AND SEDIMENT CONTROL METHODS TO BE USED DURING CONSTRUCTION; ADDITIONAL MEASURES MAY BE REQUIRED AS CONDITIONS CHANGE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE COMPLAINE WITH FEDERAL, STATE, AND LOCAL REQUIREMENTS.

5. ALL CMs ARE TO BE MAINTAINED PER THE SPECIFICATIONS NOTED IN THIS PLAN, IF ANY SUBSTANTIAL DEVIATION FROM INSTALLATION/IMPLEMENTATION SPECIFICATIONS MAY BETTER SUIT A PARTICULAR APPLICATION, CONTACT THE COUNTY FOR APPROVAL BEFORE INSTALLATION, OR MAKING A CHANGE TO THE CM OR ITS LOCATION.

6. SOILS EXPOSED BY LAND DISTURBING ACTIVITIES ON SLOPES SHALL BE KEPT IN A ROUGHENED CONDITION BY RIPPING ALONG CONTOUR TO PREVENT EROSION. TECHNIQUES SUCH AS SURFACE ROUGHENING SHALL BE USED TO MINIMIZE WIND EROSION.

7. ALL TEMPORARY CMs MUST BE REMOVED FROM THE CONSTRUCTION SITE AND PROPERLY DISPOSED OF ONCE FINAL STABILIZATION IS ACHIEVED.

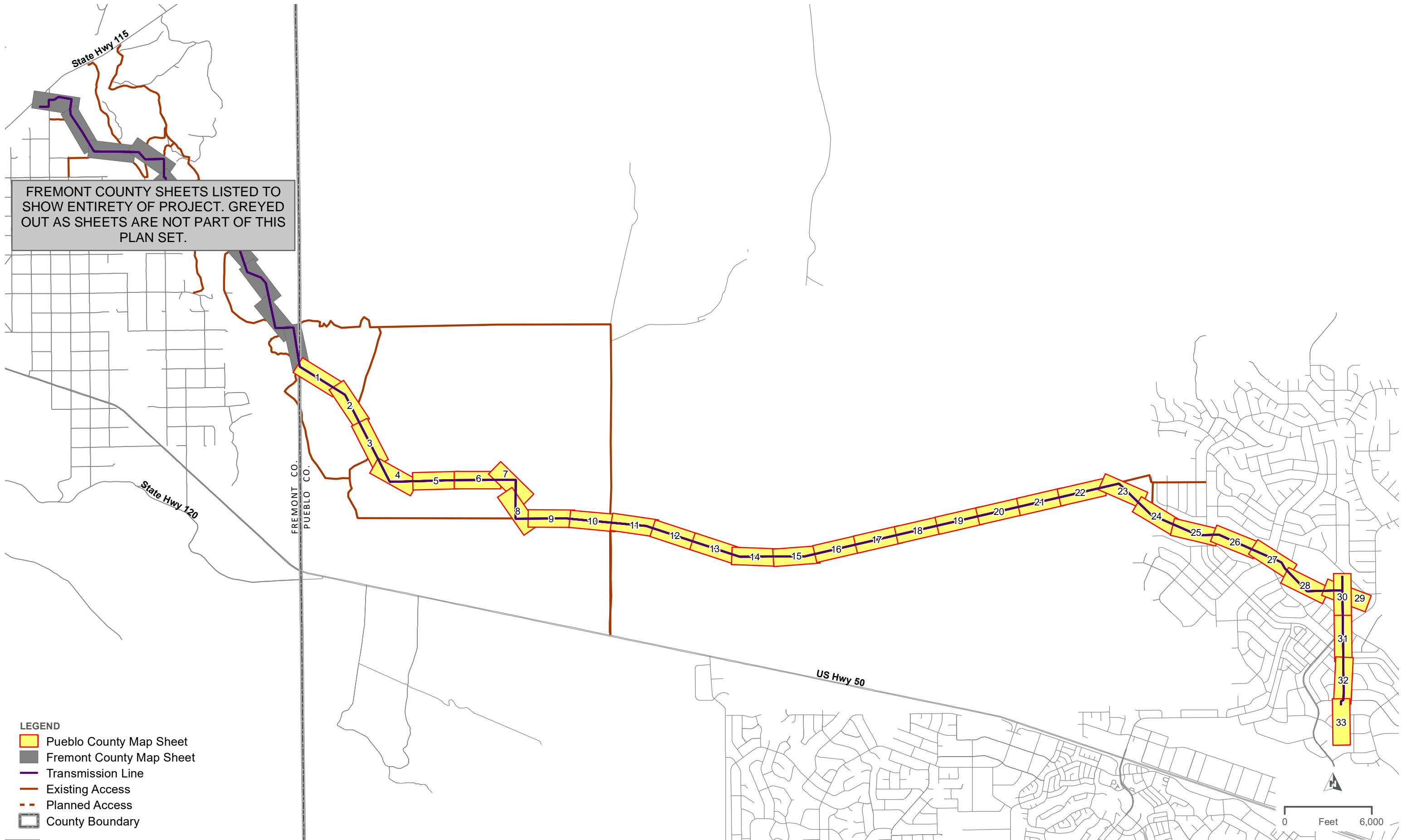
8. STABILIZE ALL DISTURBED AREAS DUE TO REMOVAL OF CMs. ALL AREAS OF DISTURBANCE WILL REQUIRE STABILIZATION BY SEED AND MULCH UNLESS THE FUNCTION OF SUCH AREAS IS TO REMAIN DISTURBED (I.E. ACCESS ROADS). THE SITE WILL BE CONSIDERED FULLY STABILIZED WHEN VEGETATION REACHES A MINIMUM OF 70% OF PRE-DISTRUBANCE DENSITIES, AS DISCUSSED IN THE SWMP REPORT NARRATIVE.

9. LIMITS OF CONSTRUCTION INCLUDE ALL PULL SITES, STAGING YARD, ACCESS ROADS, AND EXISITING AND PROPOSED ALIGNMENTS.

10. ALL STORMWATER INSPECTIONS WILL BE COMPLETED BY A QUALIFIED THIRD-PARTY INSPECTOR AND SENT TO OWNER'S ENVIRONMENTAL PROFESSIONAL FOR ELECTRONIC RECORDKEEPING.

11. PORTABLE SEDIMENT CONTROL LOG (PSCL) AND SEDIMENT CONTROL LOG (SCL) ARE USED INTERCHANGEABLY THROUGHOUT THESE PLANS.





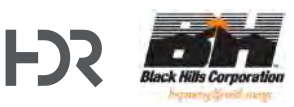
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 4. TOPOGRAPHY BASED ON USGS 10' INTERVALS . TOPOGRAPHIC LINES ARE APPROXIMATE.
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- CONTROL MEASURE LEGEND**
- VT VEGETATION TOPOGRAPHY
 - FLOW DIRECTION
 - PSCL PORTABLE SEDIMENT CONTROL LOG

CONTRACTOR TO USE MATTING IF WET CONDITIONS EXIST OR RUTTING IS OBSERVED.

REFER TO FREMONT COUNTY SWMP MAPS FOR PROJECT AREAS LOCATED IN FREMONT COUNTY.

- LEGEND**
- Stucture
 - Transmission Line
 - - County Boundary
 - Elevation Countour
 - Parcel Boundary
 - NWI Feature
 - CDPHE Stream



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CONTROL MEASURE LEGEND

VT VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

PSCL PORTABLE SEDIMENT CONTROL LOG

LEGEND

● Structure	— Elevation Countour
— Transmission Line	□ Parcel Boundary
— Existing Access	■ NWI Feature
	— CDPHE Stream

CONTRACTOR TO USE MATTING IF WET CONDITIONS EXIST OR RUTTING IS OBSERVED.

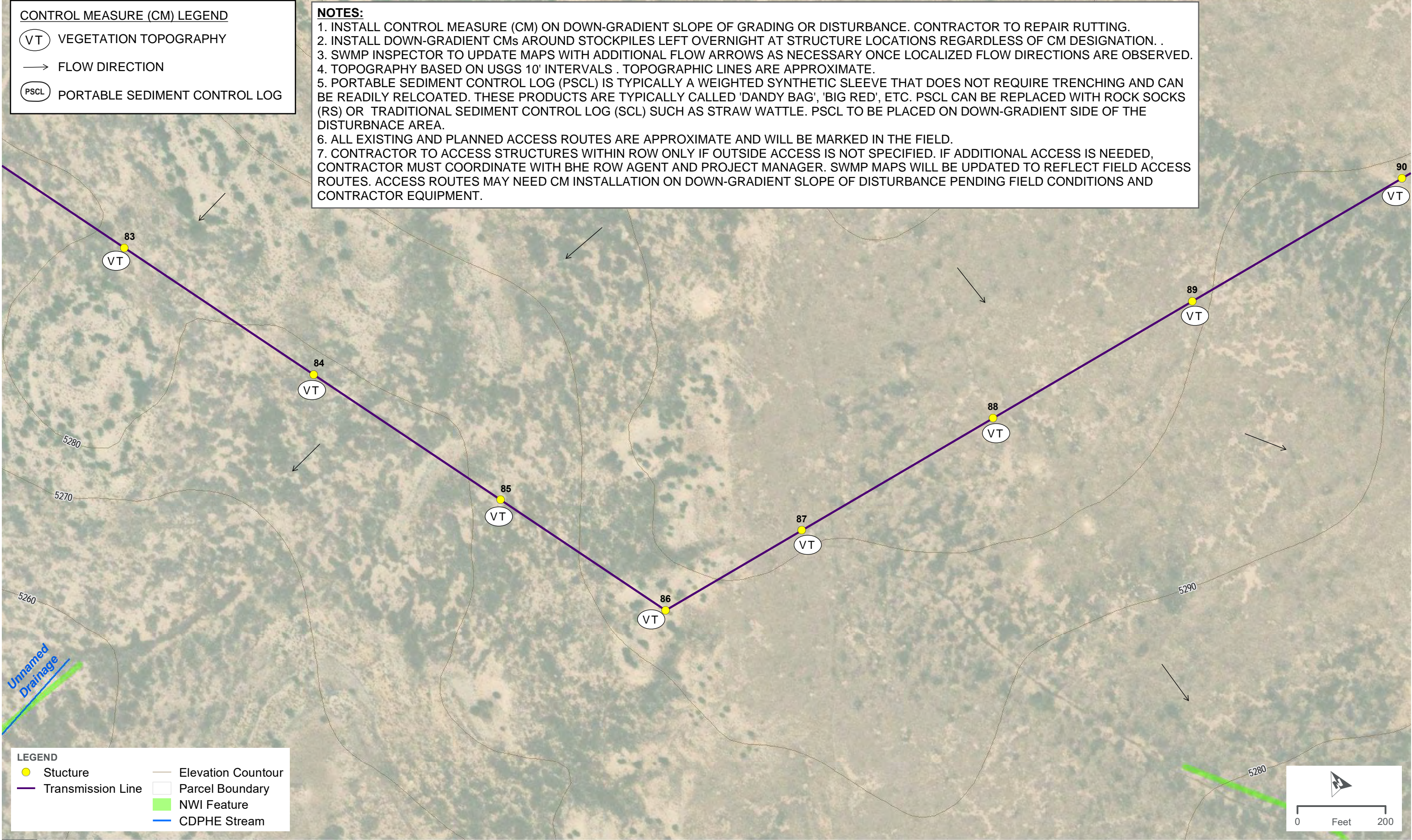
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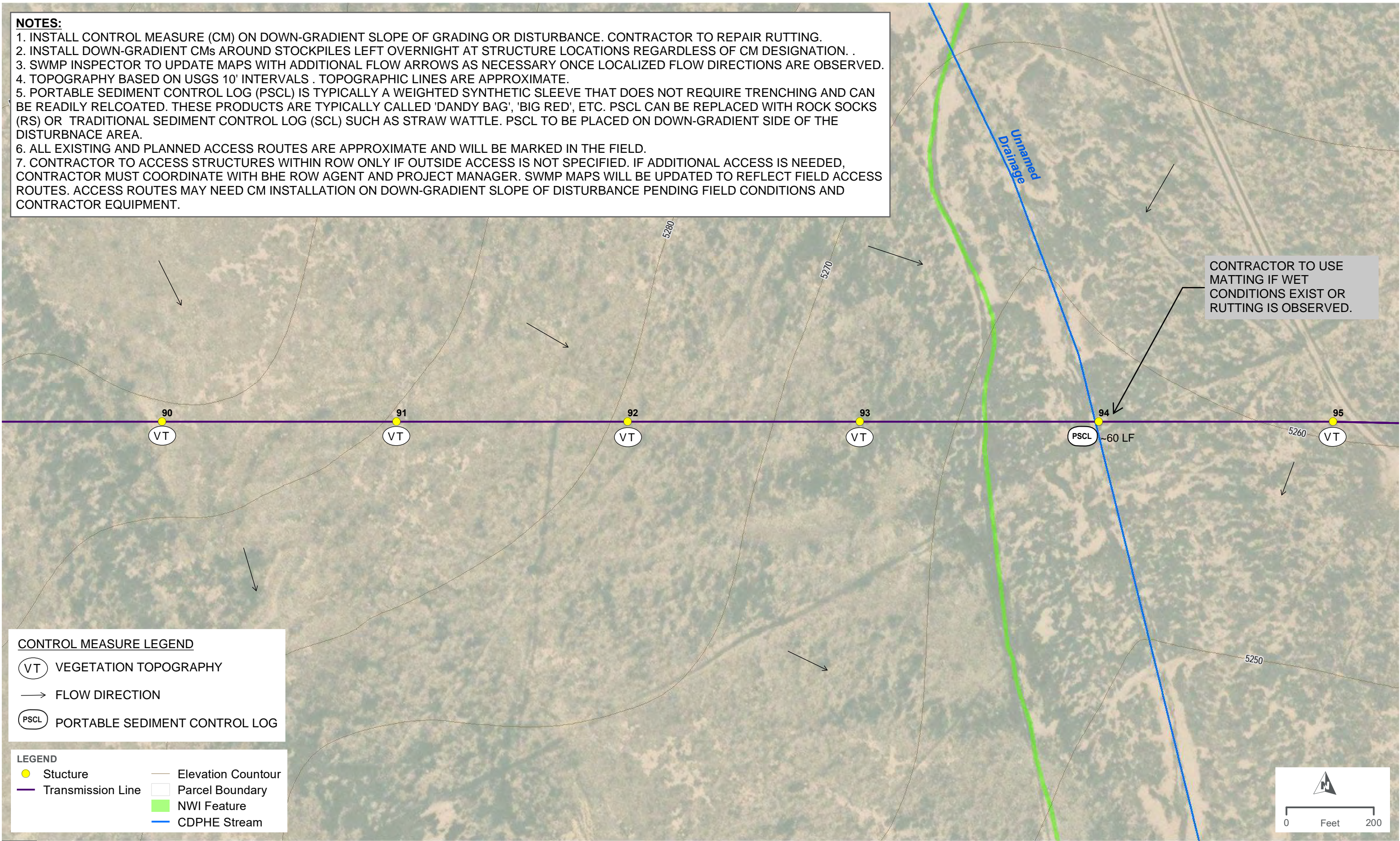
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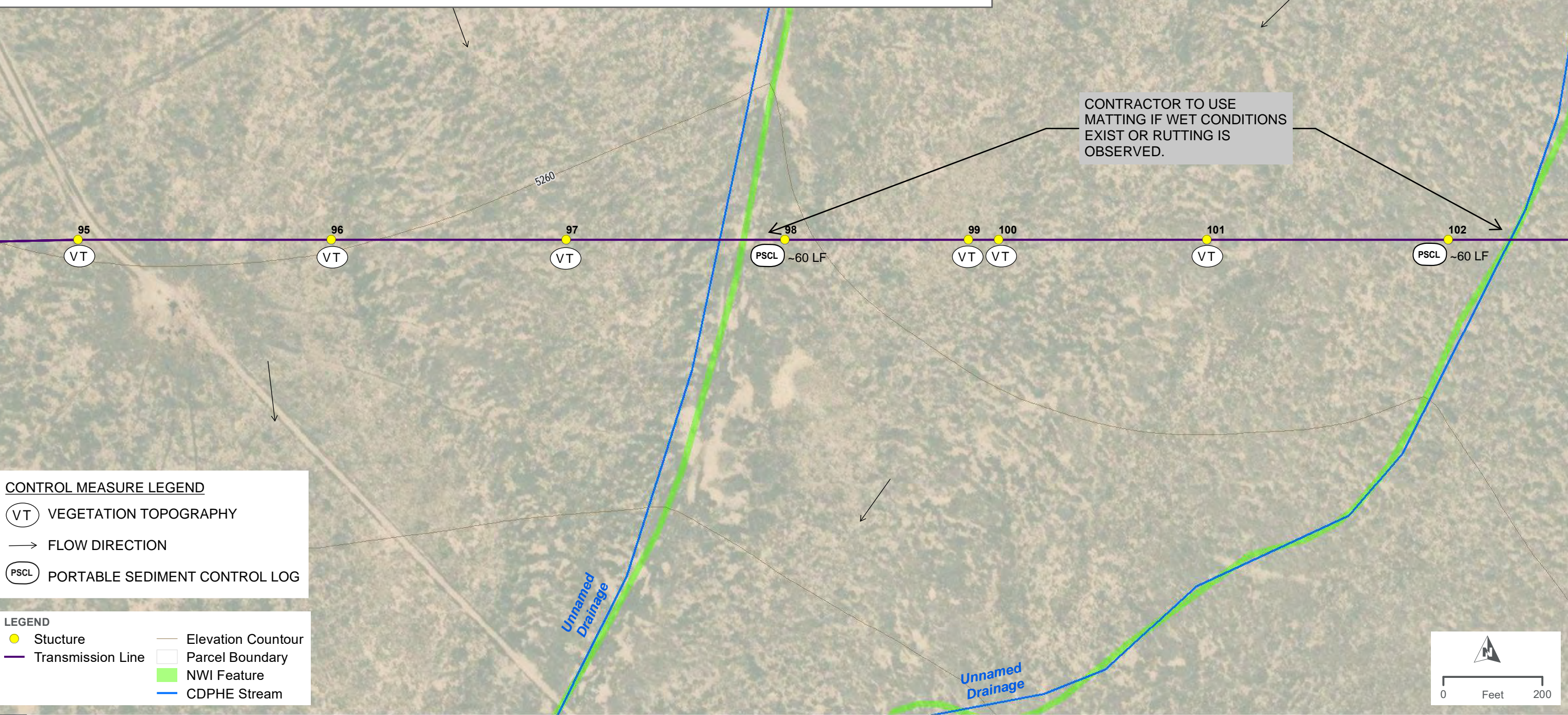




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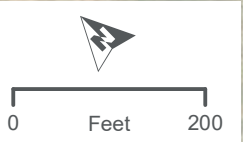
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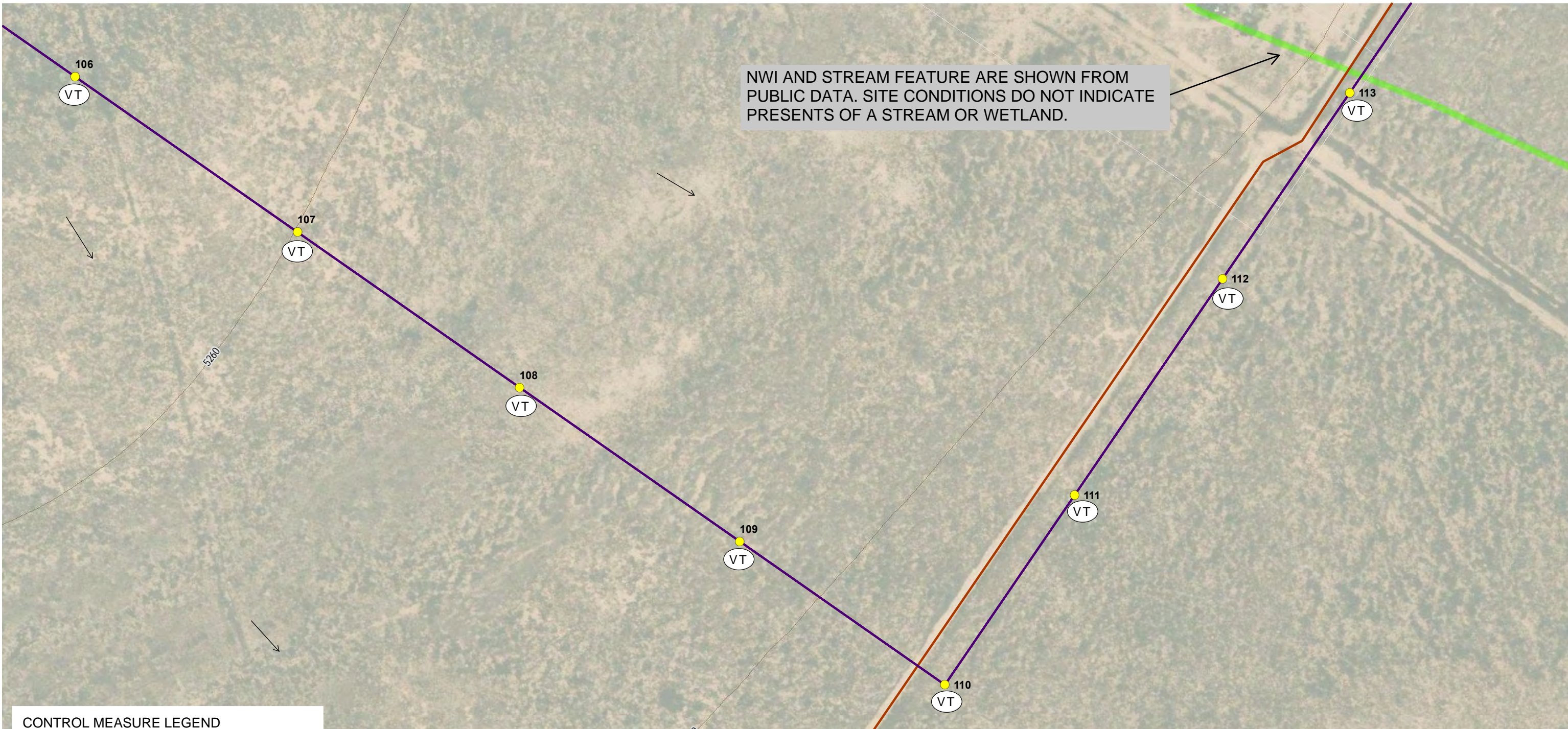
CONTROL MEASURE (CM) LEGEND

- (VT) VEGETATION TOPOGRAPHY
→ FLOW DIRECTION
(PSCL) PORTABLE SEDIMENT CONTROL LOG

NWI AND STREAM
FEATURE ARE SHOWN
FROM PUBLIC DATA. SITE
CONDITIONS DO NOT
INDICATE PRESENTS OF A
STREAM OR WETLAND.

- LEGEND**
- | | |
|---------------------|----------------------|
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| — Transmission Line | □ Parcel Boundary |
| | ■ NWI Feature |
| | — CDPHE Stream |



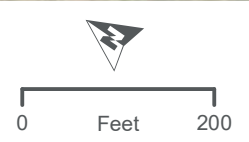


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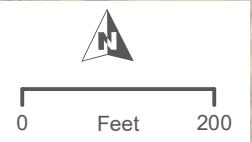
NWI AND STREAM FEATURE ARE SHOWN FROM PUBLIC DATA. SITE CONDITIONS DO NOT INDICATE PRESENCE OF A STREAM OR WETLAND.

Co Rd 3111

CONTROL MEASURE LEGEND

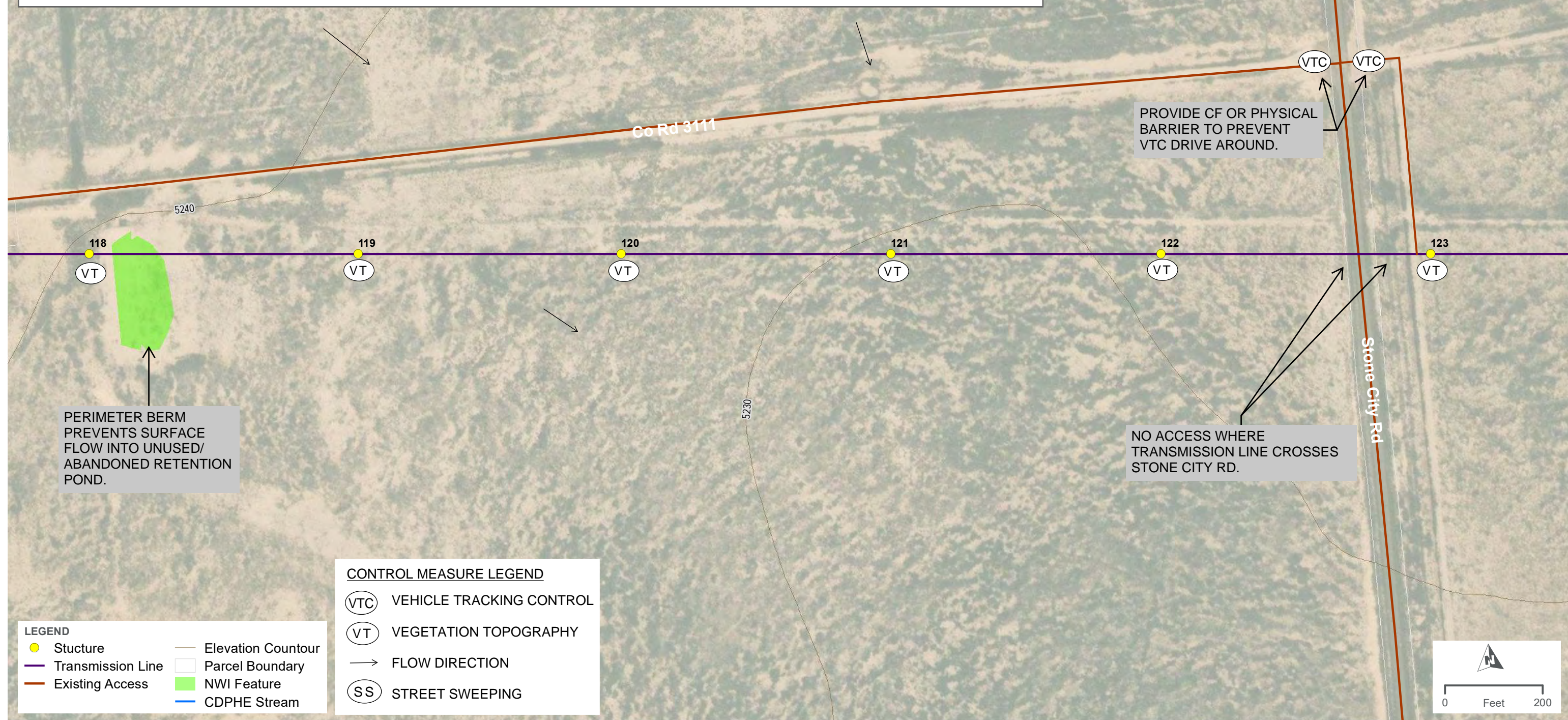
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- FLOW DIRECTION
- PSCL PORTABLE SEDIMENT CONTROL LOG

- LEGEND**
- Structure
 - Transmission Line
 - Existing Access
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 - Parcel Boundary
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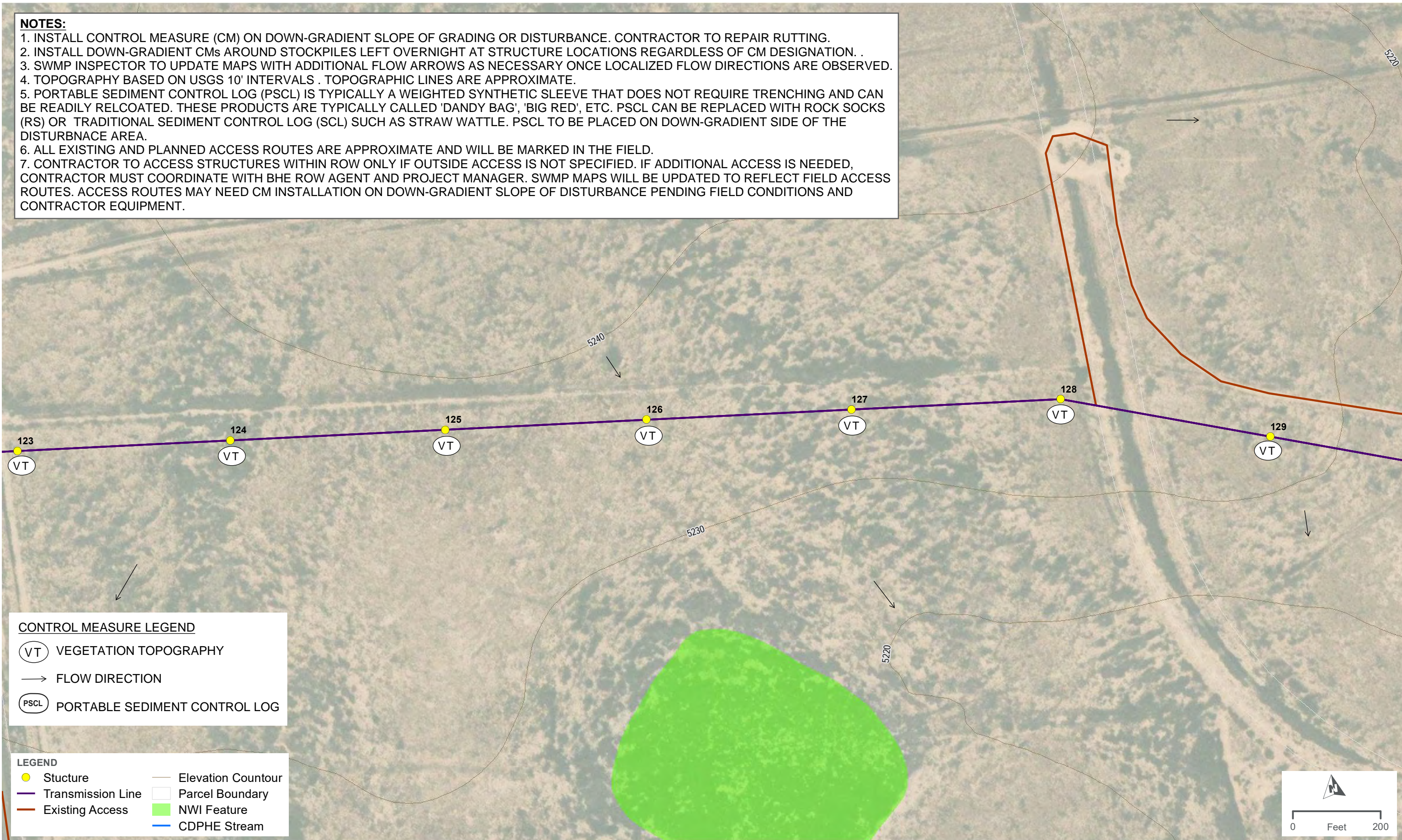


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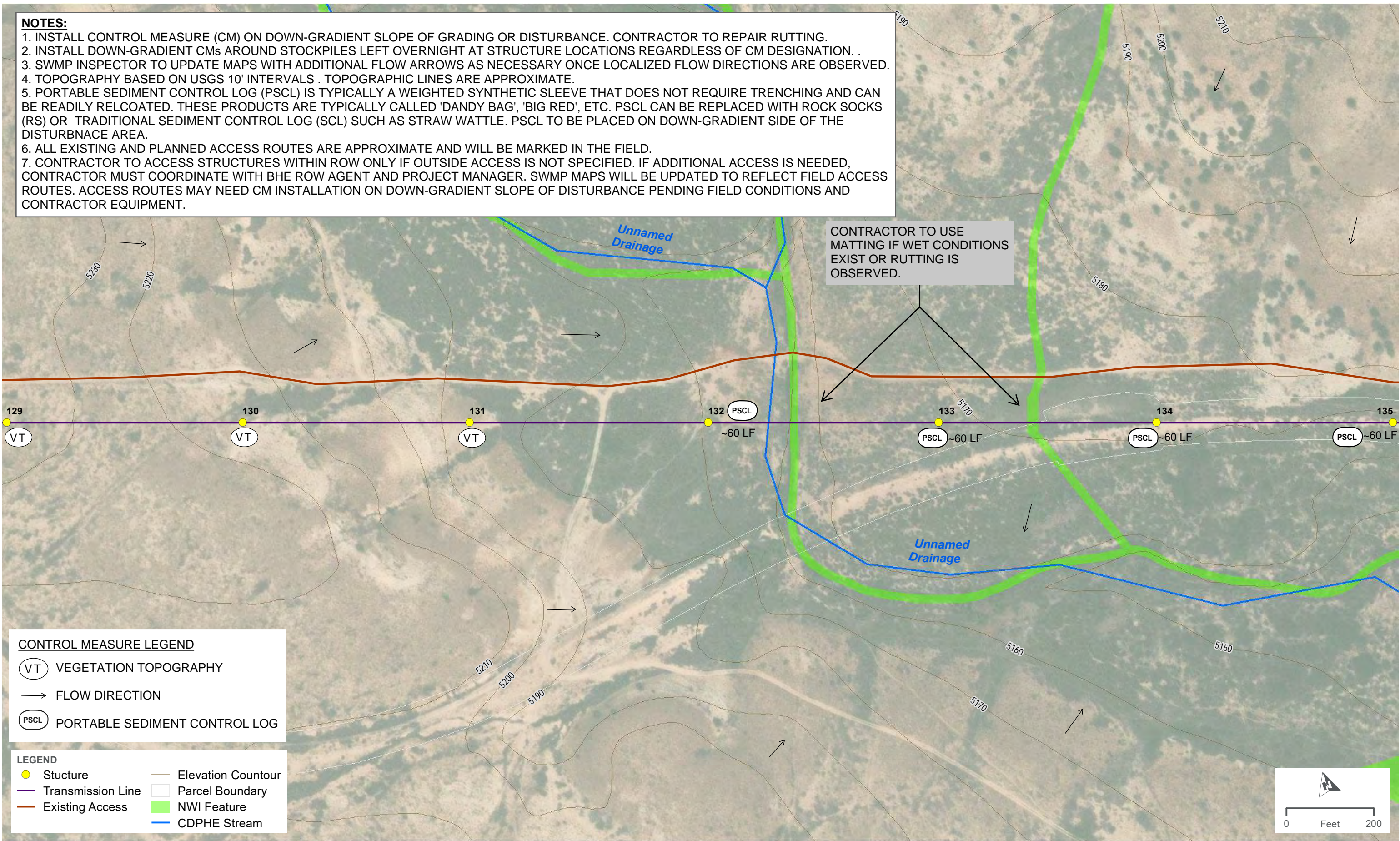
- VEGETATION TOPOGRAPHY
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LEGEND

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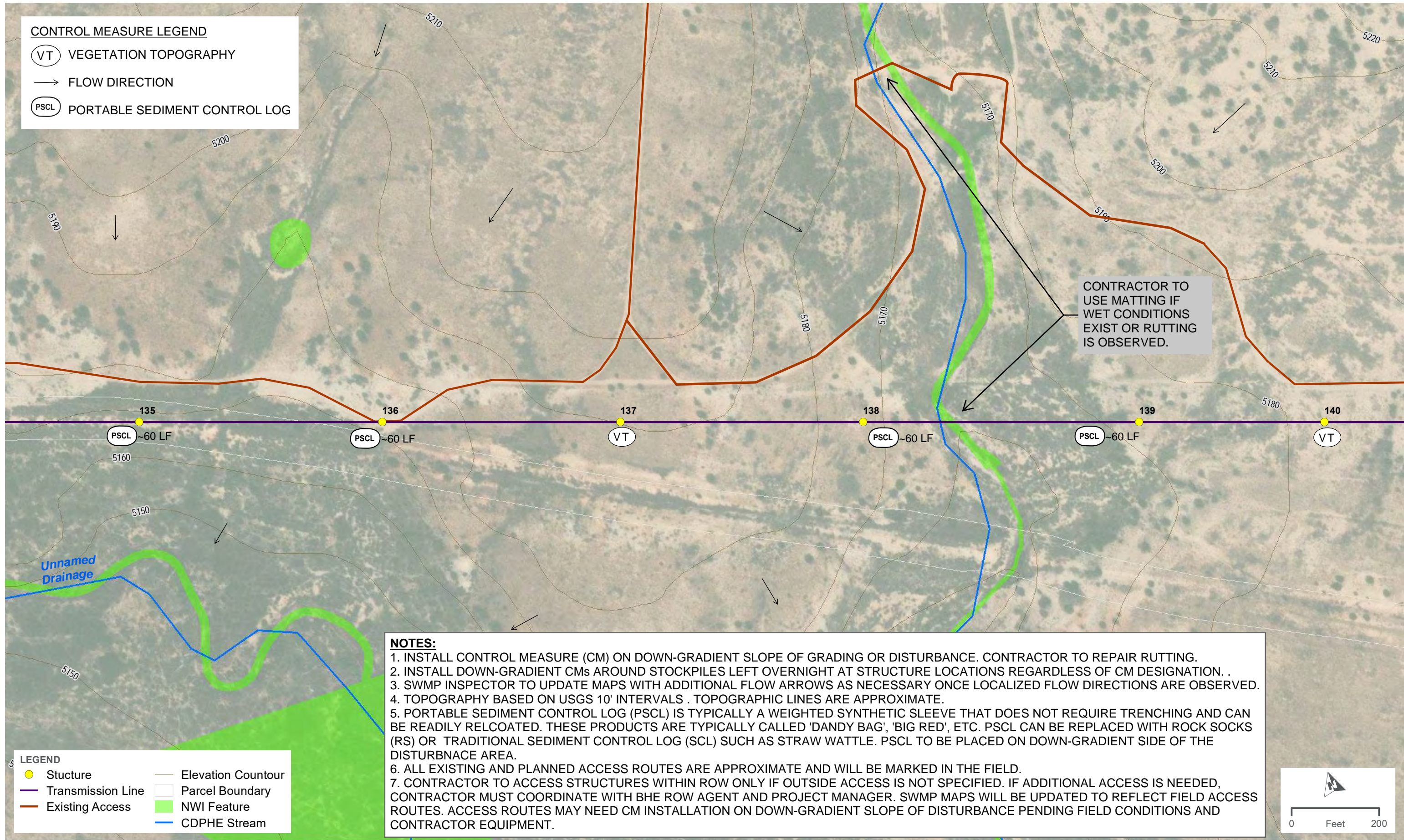


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(VT) VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

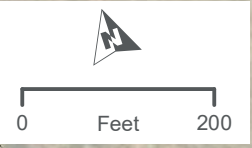
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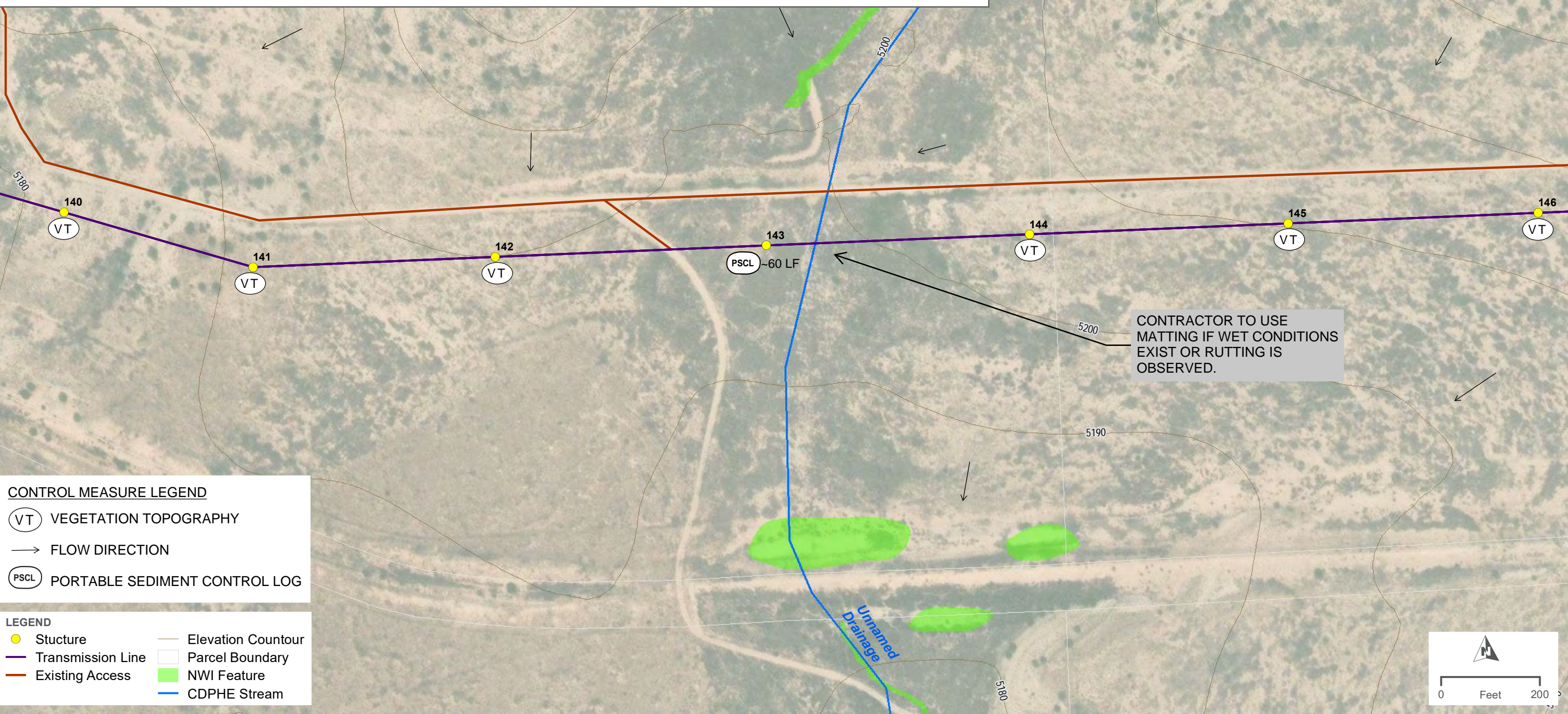
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LEGEND

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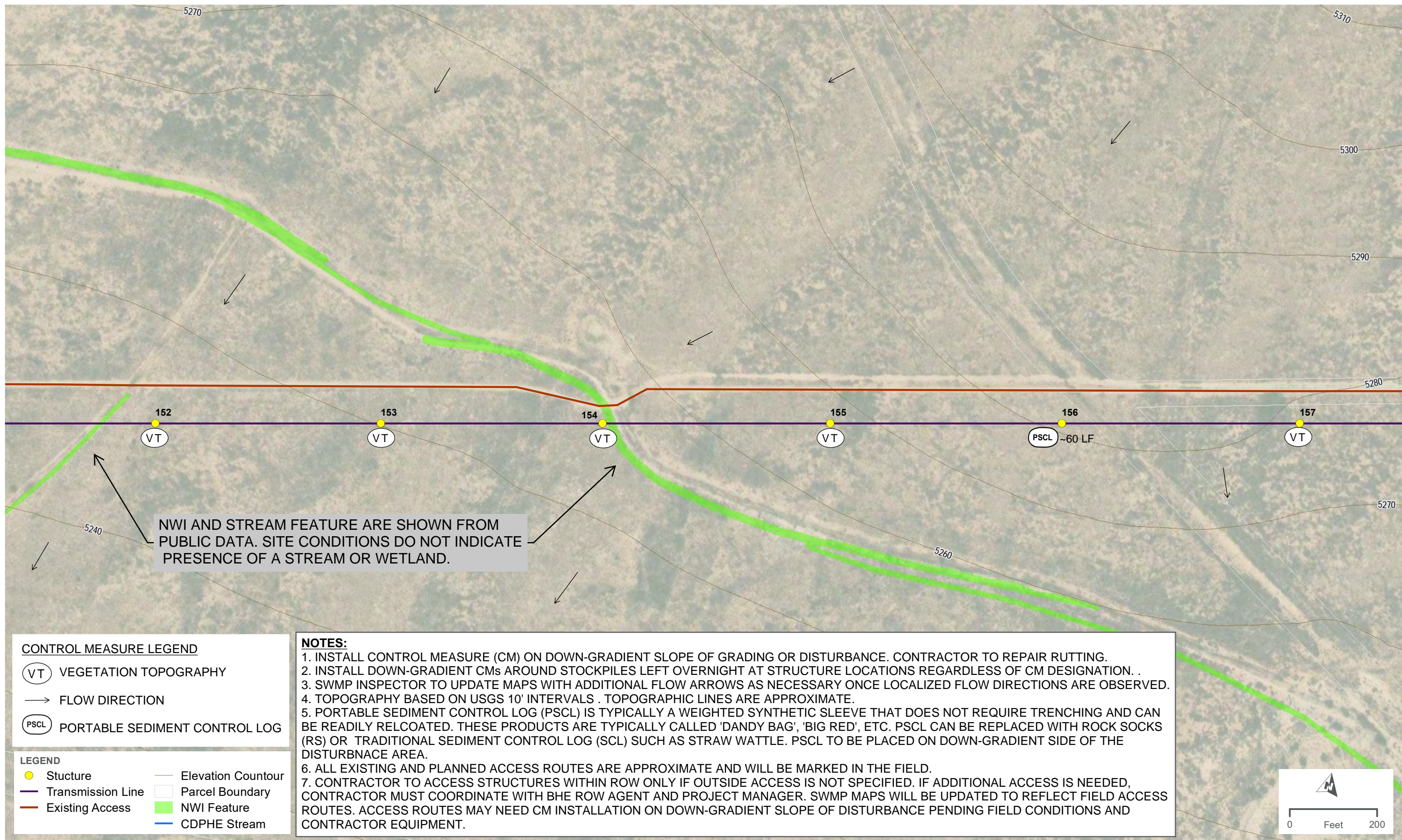


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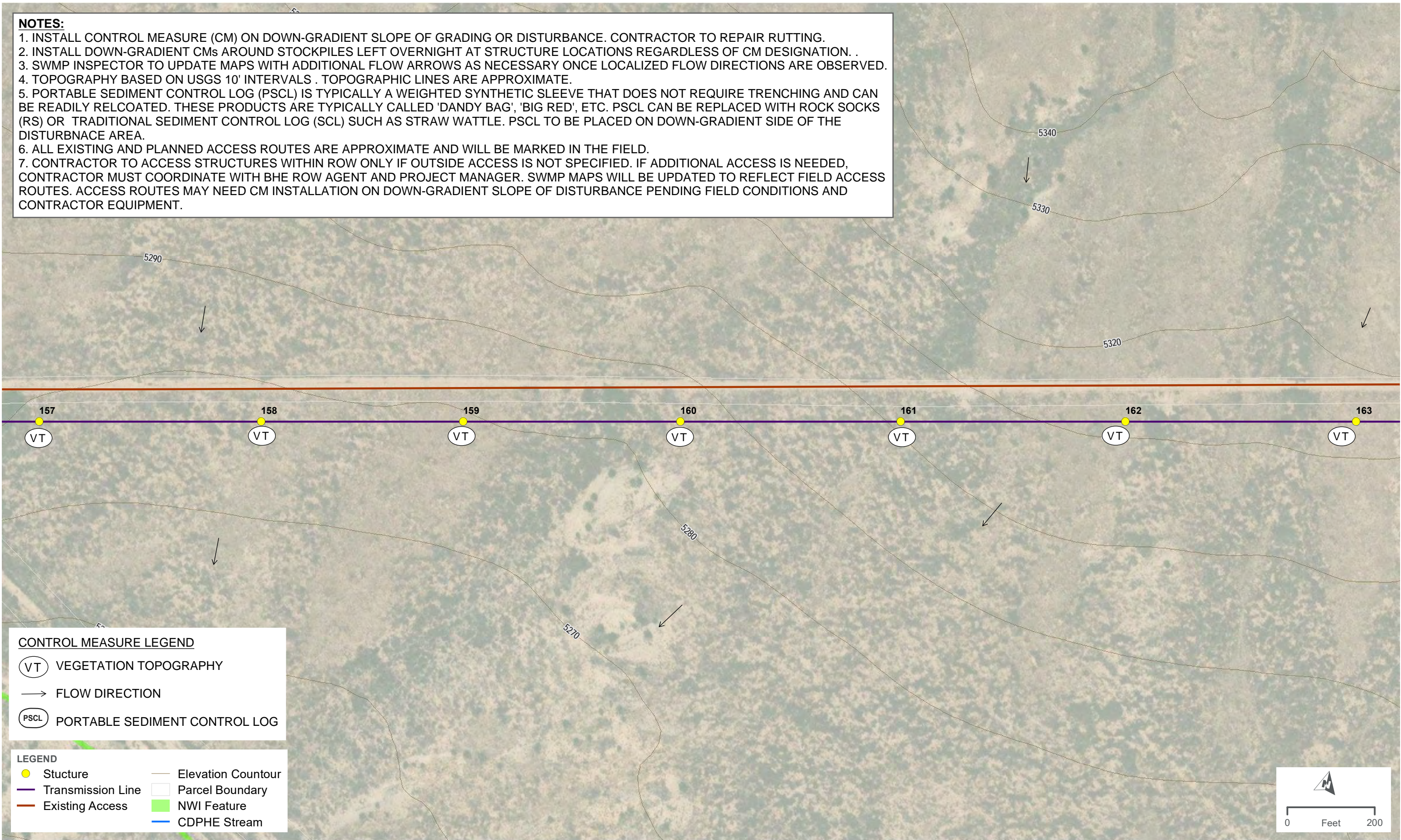


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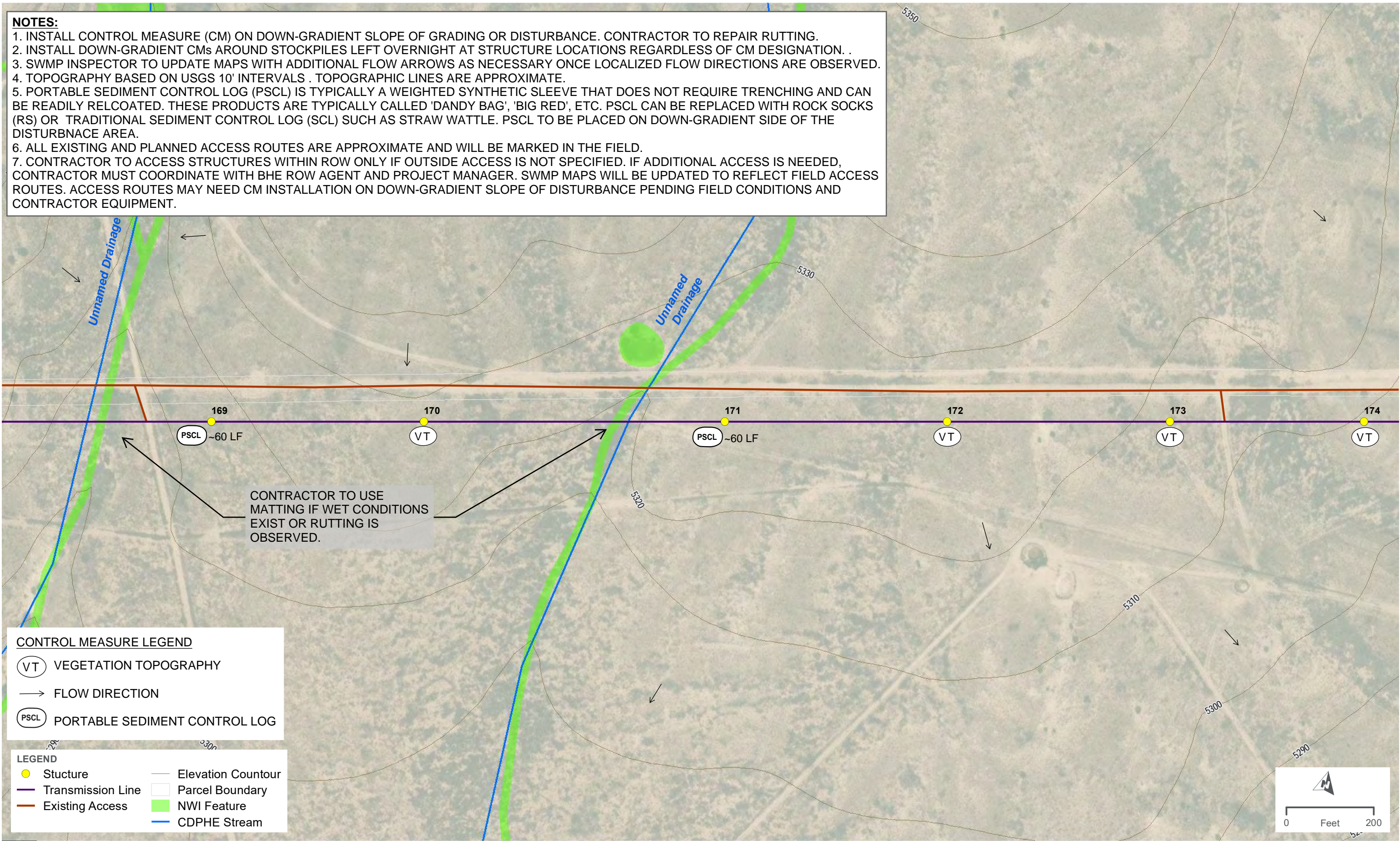
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- LEGEND**
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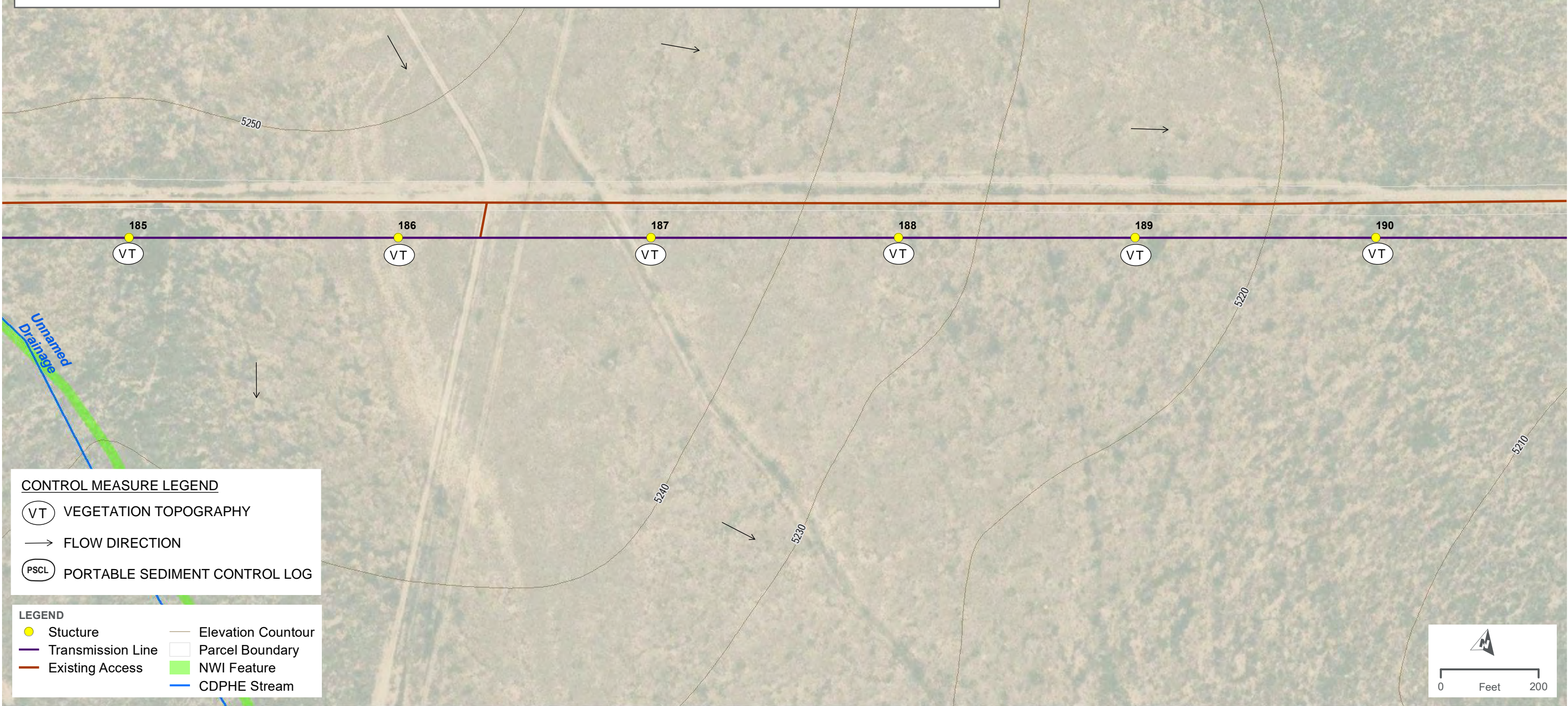
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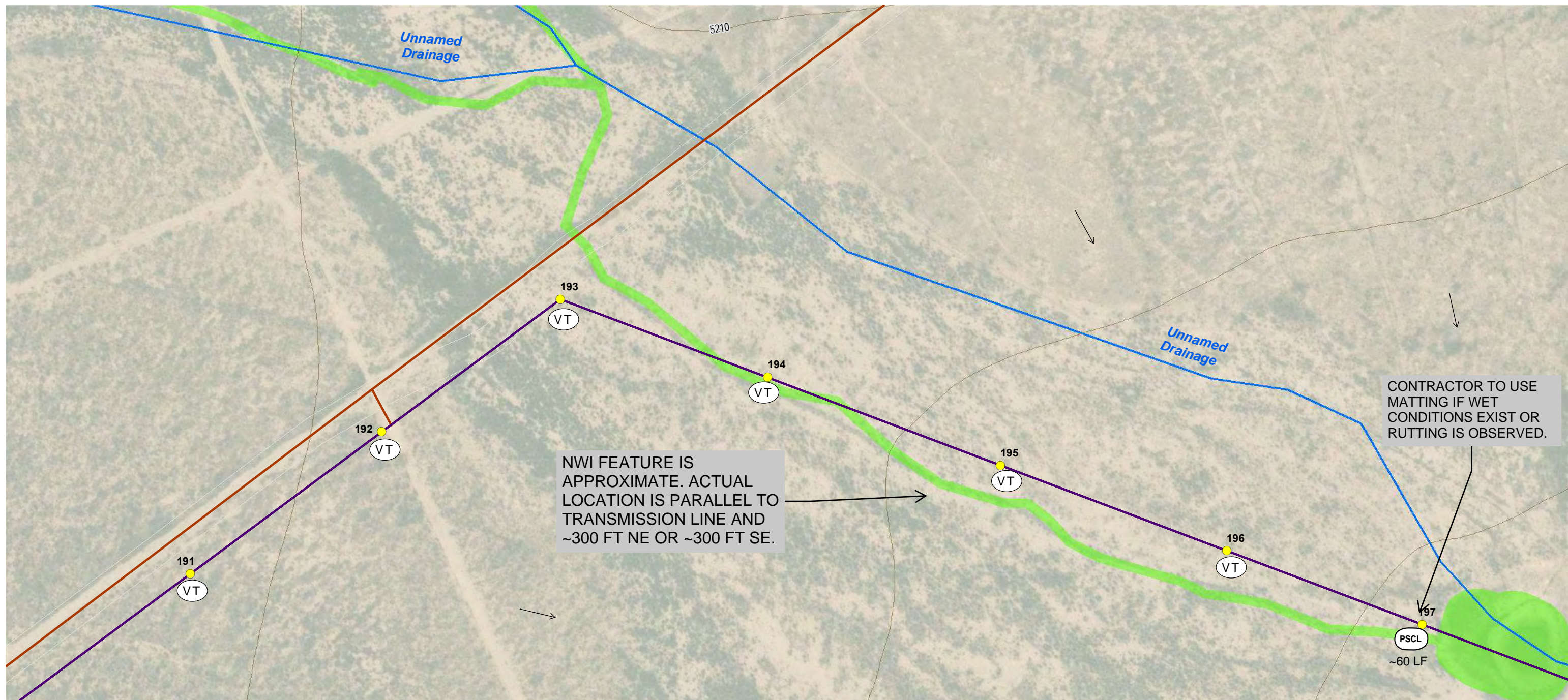
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 - 5. PORTABLE SEDIMENT CONTROL LOG (PSCL) IS TYPICALLY A WEIGHTED SYNTHETIC SLEEVE THAT DOES NOT REQUIRE TRENCHING AND CAN BE READILY RELCOATED. THESE PRODUCTS ARE TYPICALLY CALLED 'DANDY BAG', 'BIG RED', ETC. PSCL CAN BE REPLACED WITH ROCK SOCKS (RS) OR TRADITIONAL SEDIMENT CONTROL LOG (SCL) SUCH AS STRAW WATTLE. PSCL TO BE PLACED ON DOWN-GRADIENT SIDE OF THE DISTURBNACE AREA.
 - 6. ALL EXISTING AND PLANNED ACCESS ROUTES ARE APPROXIMATE AND WILL BE MARKED IN THE FIELD.
 - 7. CONTRACTOR TO ACCESS STRUCTURES WITHIN ROW ONLY IF OUTSIDE ACCESS IS NOT SPECIFIED. IF ADDITIONAL ACCESS IS NEEDED, CONTRACTOR MUST COORDINATE WITH BHE ROW AGENT AND PROJECT MANAGER. SWMP MAPS WILL BE UPDATED TO REFLECT FIELD ACCESS ROUTES. ACCESS ROUTES MAY NEED CM INSTALLATION ON DOWN-GRADIENT SLOPE OF DISTURBANCE PENDING FIELD CONDITIONS AND CONTRACTOR EQUIPMENT.





CONTROL MEASURE LEGEND

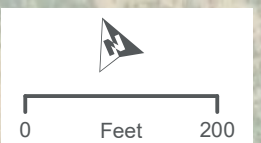
- (VT) VEGETATION TOPOGRAPHY
- FLOW DIRECTION
- (PSCL) PORTABLE SEDIMENT CONTROL LOG

LEGEND

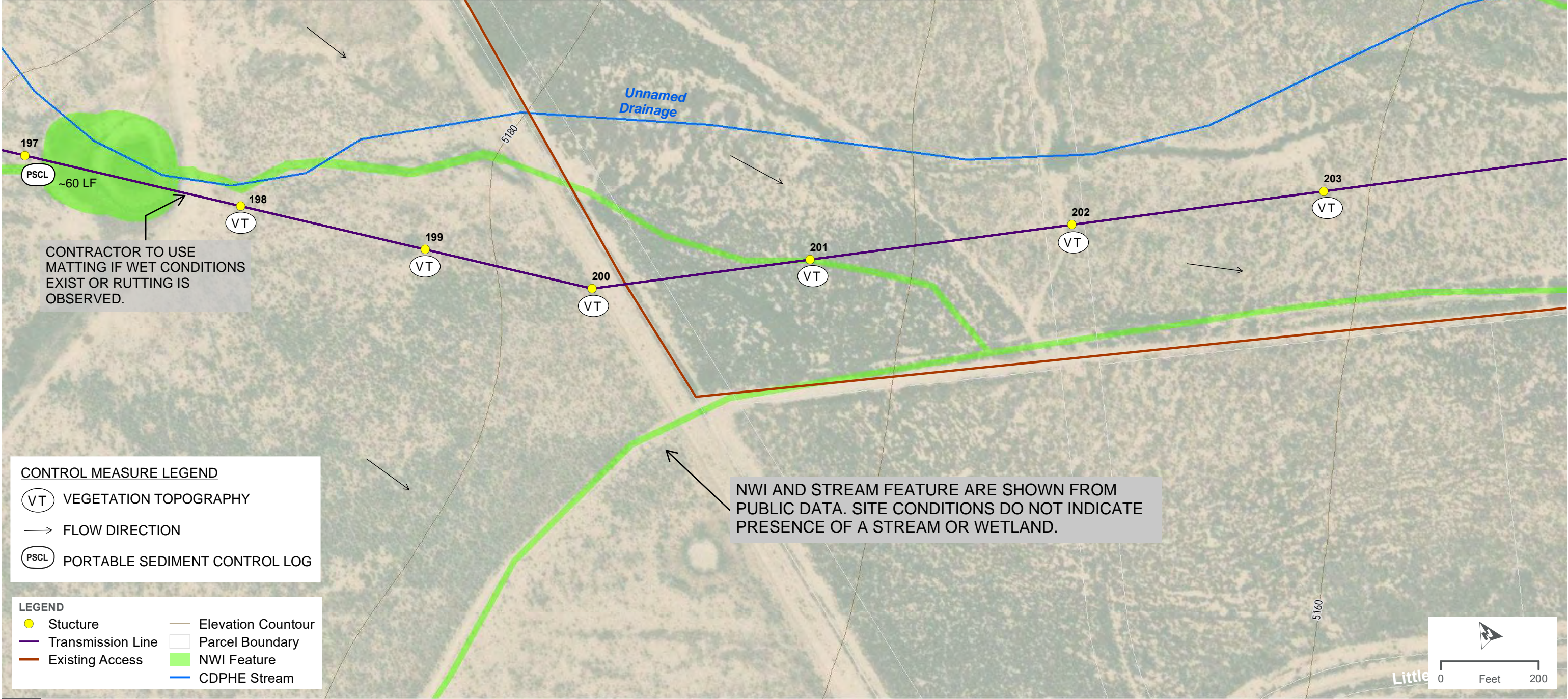
- Structure
- Transmission Line
- Existing Access
- Elevation Countour
- Parcel Boundary
- NWI Feature
- CDPHE Stream

NOTES:

1. INSTALL CONTROL MEASURE (CM) ON DOWN-GRADIENT SLOPE OF GRADING OR DISTURBANCE. CONTRACTOR TO REPAIR RUTTING.
2. INSTALL DOWN-GRADIENT CMs AROUND STOCKPILES LEFT OVERNIGHT AT STRUCTURE LOCATIONS REGARDLESS OF CM DESIGNATION. .
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INSTALL PSCL DURING CONSTRUCTION IF WATER IS PRESENT IN ADJACENT DRAINAGE.

PROVIDE CF OR PHYSICAL BARRIER TO PREVENT VTC DRIVE AROUND.

NWI AND STREAM FEATURE ARE SHOWN FROM PUBLIC DATA. SITE CONDITIONS DO NOT INDICATE PRESENCE OF A STREAM OR WETLAND.

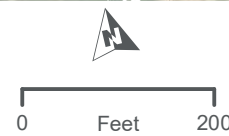
ALTERNATIVE TRACKING CONTROL OPTION, CONTRACTOR TO MANUALLY REMOVE ADHERED MUD FROM EQUIPMENT PRIOR TO DRIVING ON PAVEMENT. IF TRACKOUT OCCURS STREET SWEEPING SHOULD BE PERFORMED IMMEDIATELY FOLLOWING TRACKOUT. IF CONTRACTOR IS UNABLE TO CONTROL TRACKOUT WITH NON-STRUCTURAL PRACTICES, INSTALL VTC.

LEGEND

- | | |
|-----------------------------------|----------------------|
| ● Structure | — Elevation Countour |
| ○ Existing Transmission Structure | □ Parcel Boundary |
| — Existing Alignment | ■ NWI Feature |
| — Transmission Line | — CDPHE Stream |
| — Existing Access | |

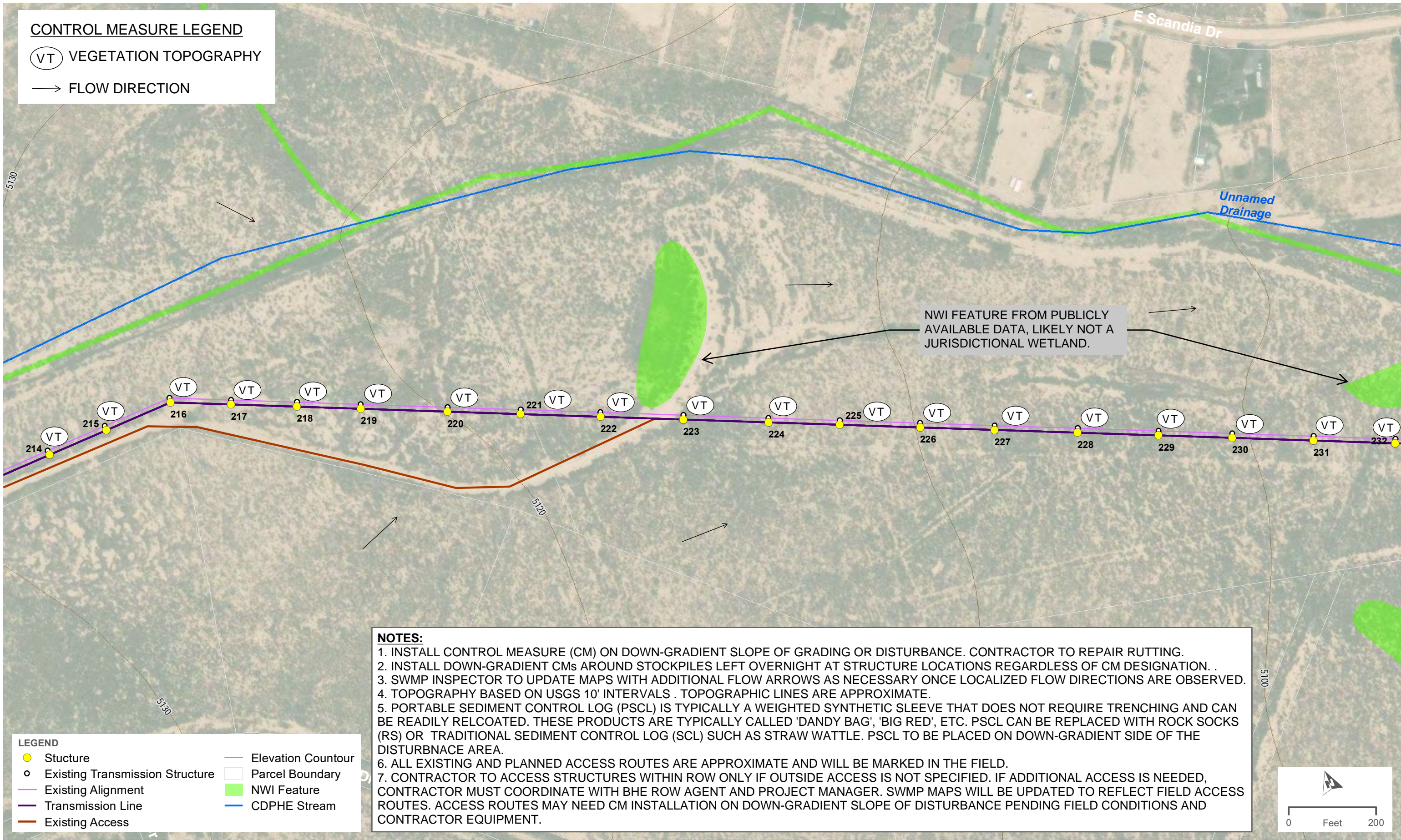
CONTROL MEASURE LEGEND

- | | |
|--|--------------------------------------|
| | (PSCL) PORTABLE SEDIMENT CONTROL LOG |
| | (VTC) VEHICLE TRACKING CONTROL |
| | (VT) VEGETATION TOPOGRAPHY |
| | → FLOW DIRECTION |
| | (SS) STREET SWEEPING |



CONTROL MEASURE LEGEND

- (VT) VEGETATION TOPOGRAPHY
→ FLOW DIRECTION



NOTES:

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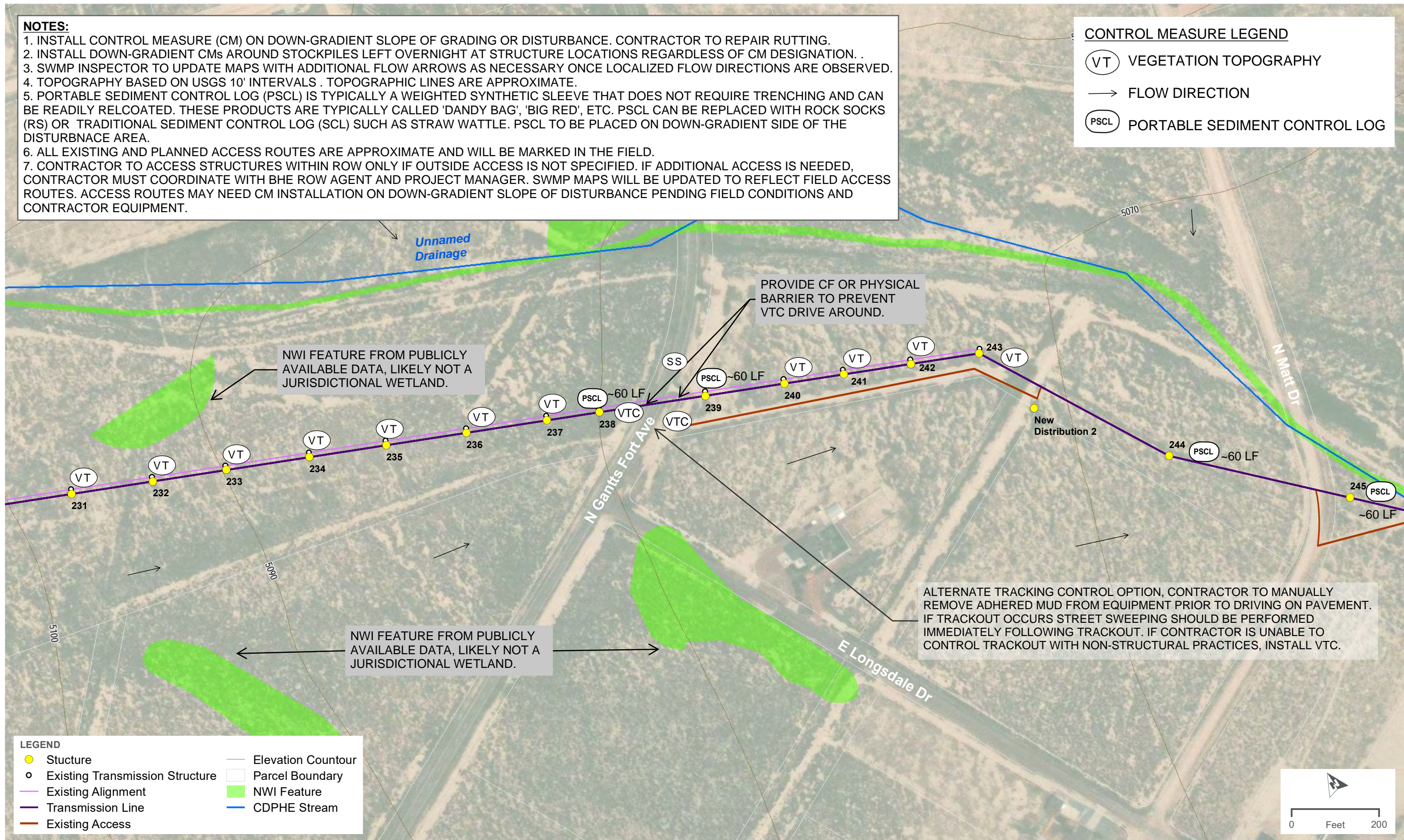
LEGEND

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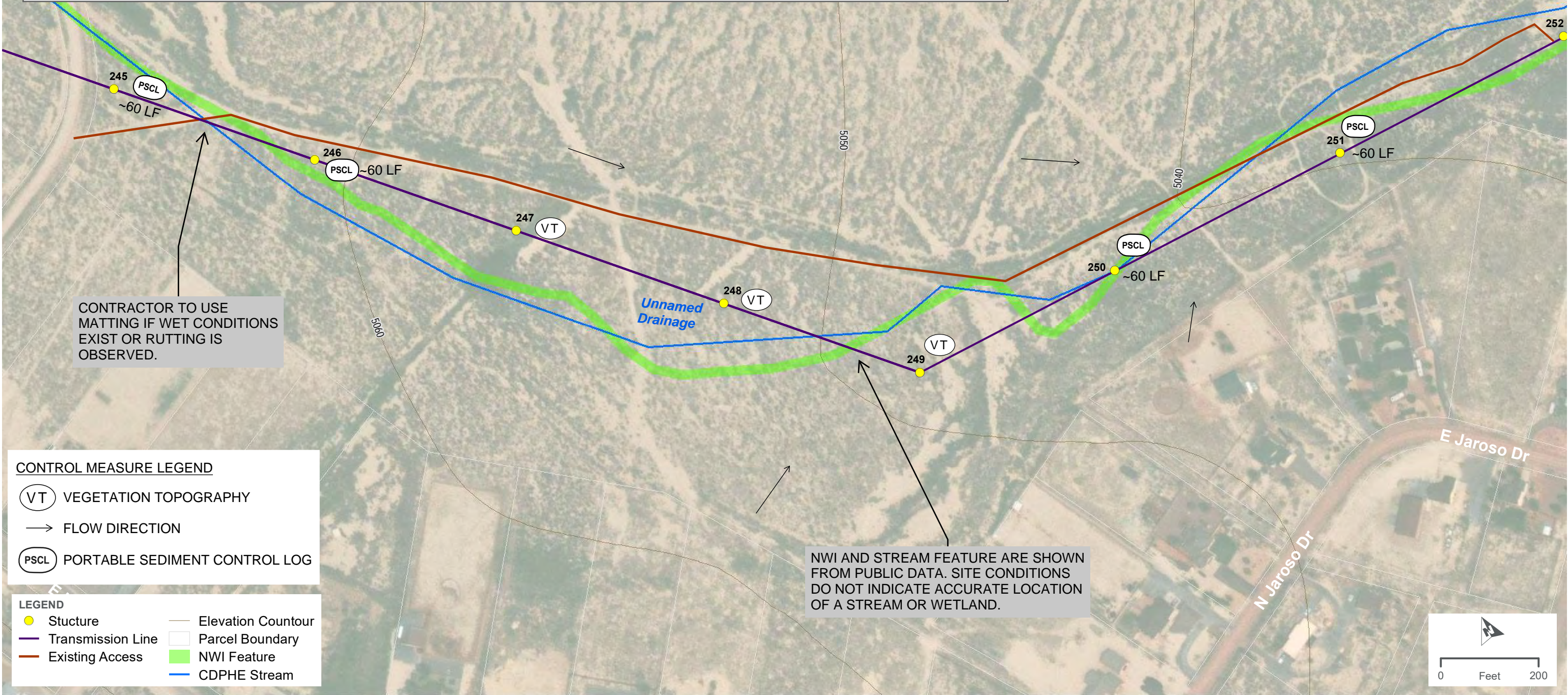


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- CONTROL MEASURE LEGEND**
- VT VEGETATION TOPOGRAPHY
 - FLOW DIRECTION
 - PSCL PORTABLE SEDIMENT CONTROL LOG



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CONTROL MEASURE LEGEND

VT VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

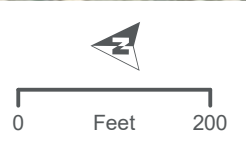
SEE SH. 35-37 FOR CONTINUATION OF TRANSMISSION LINE NORTHWARD.

ACTIVIES AT STRs 12-16 ONLY INVOLVE LINE TENSIONING. NO GRADING FOR LINE TENSIONING. LIMITED ACCESS, DRIVE AND CRUSH ONLY.

GROUND DISTURBING ACTIVITES OCCURRING AT STR 252-254.

CONTRACTOR TO USE MATTING IF WET CONDITIONS EXIST OR RUTTING IS OBSERVED.

CONTRACTOR IS TO INSTALL PSCL IF WATER IS PRESENT IN ADJACENT DRAINAGE.




- LEGEND**
- | | |
|----------------------|----------------------|
| ● Structure | — Elevation Countour |
| ○ Existing Structure | □ Parcel Boundary |
| — Existing Alignment | ■ NWI Feature |
| — Transmission Line | — CDPHE Stream |
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0 Feet 200

CONTROL MEASURE LEGEND

VT VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

SS STREET SWEEPING

LEGEND

● Structure

○ Existing Structure

— Existing Alignment

— Elevation Countour

□ Parcel Boundary

■ NWI Feature

— CDPHE Stream



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POLE REPLACEMENT CONSTRUCTION OCCURRING AT 1A.

DESERT COVE SUBSTATION. SUBSTATION IN TERMINOUS OF TRANSMISSION LINE CONSTRUCTION.

0 Feet 200

CONTROL MEASURE LEGEND

VT VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

LEGEND

● Structure

○ Existing Structure

— Existing Alignment

— Elevation Countour

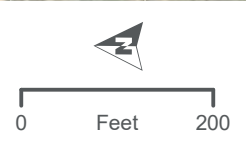
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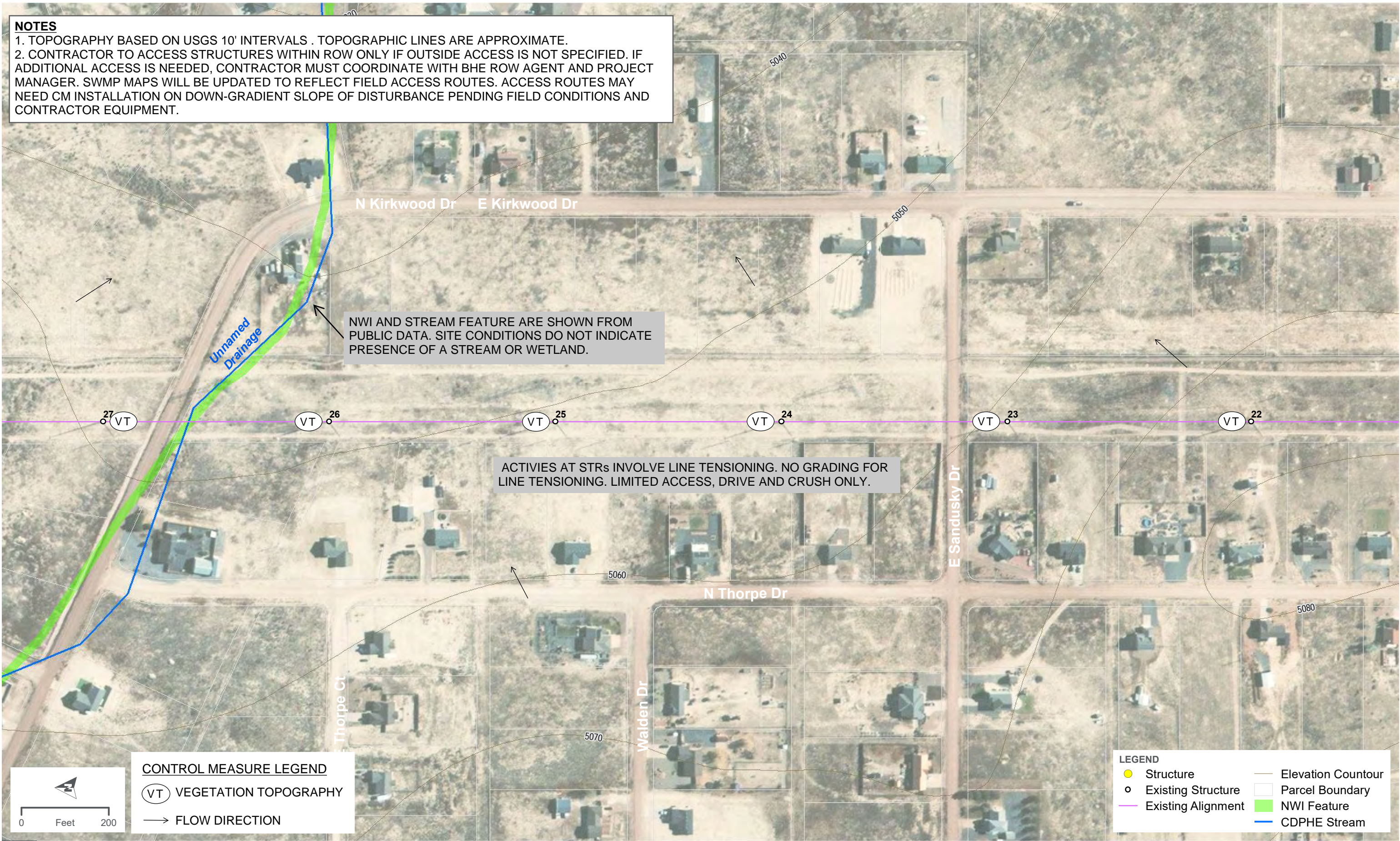
- VT VEGETATION TOPOGRAPHY
- FLOW DIRECTION
- SS STREET SWEEPING


LEGEND

● Structure	— Elevation Countour
○ Existing Structure	□ Parcel Boundary
— Existing Alignment	■ NWI Feature
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0 Feet 200

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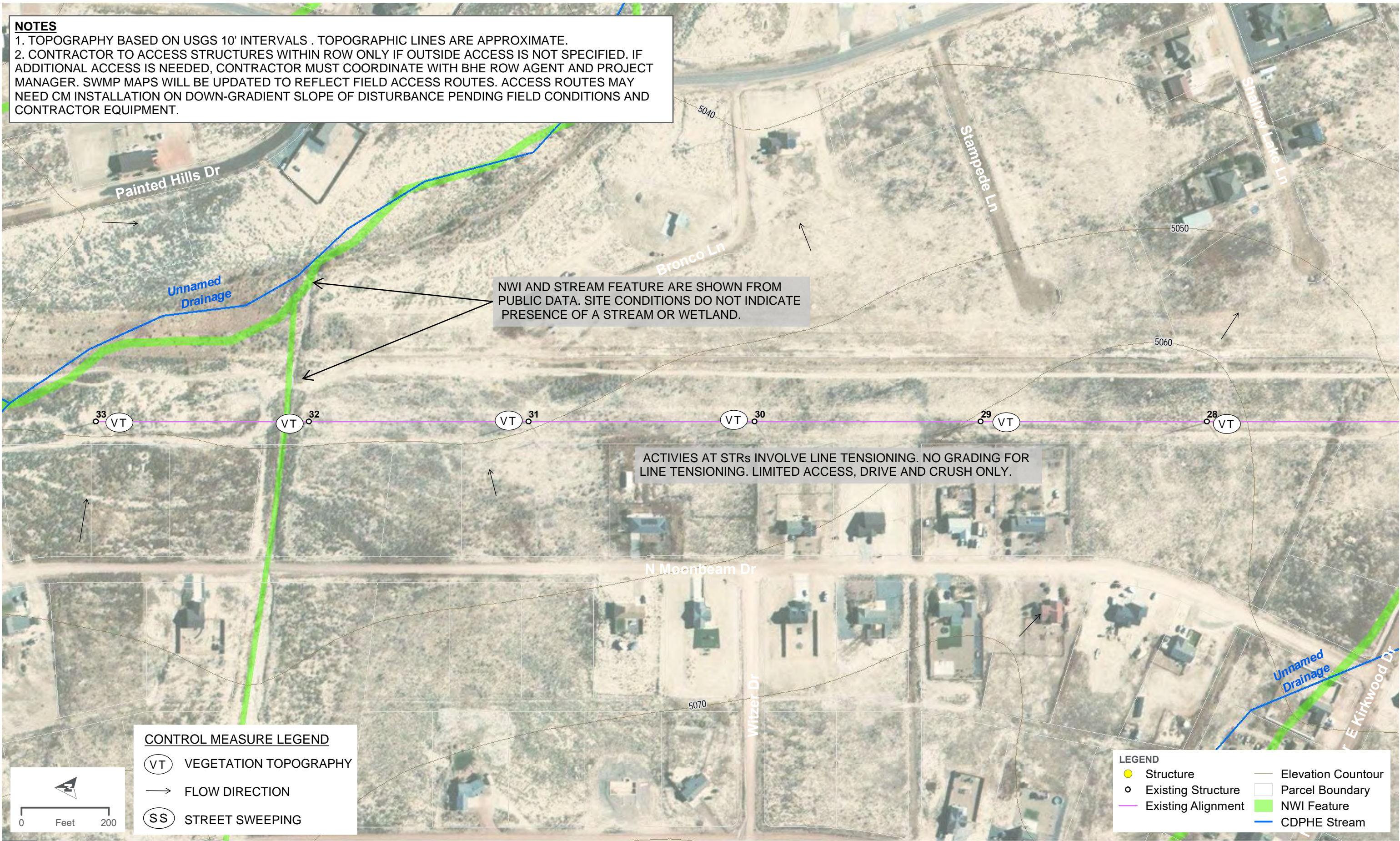
VT VEGETATION TOPOGRAPHY

→ FLOW DIRECTION

LEGEND

● Structure	— Elevation Countour
○ Existing Structure	□ Parcel Boundary
— Existing Alignment	■ NWI Feature
	— CDPHE Stream

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NOTES:

1. SWMP INSPECTOR TO UPDATE MAPS WITH ADDITIONAL FLOW ARROWS AS NECESSARY ONCE LOCALIZED FLOW DIRECTIONS ARE OBSERVED.
2. NO VTC REQUIRED AS ACCESS ONTO DIRT ROAD. INSTALL VTC IF SEDIMENT IS TRANSPORTED OFF SITE.
3. SURFACE FLOWS FROM WEST TO EAST. HOWEVER, NATURAL BERM CREATED FROM PREVIOUS SUBSTATION CONSTRUCTION DIRECTS FLOW SOUTH TO SCL.

IF SEDIMENT IS TRANSPORTED OR EROSION OCCURS AS A RESULT OF EQUIPMENT ACCESS OR STAGING, AREA MUST BE RECLAIMED AND CMS MUST BE INSTALLED ON THE DOWN-GRADIENT SIDE OF DISTURBANCE.

CONTROL MEASURE (CM) LEGEND

- (SCL) SEDIMENT CONTROL LOG
- (VTC) VEHICLE TRACKING CONTROL
- (VT) VEGETATION TOPOGRAPHY
- FLOW DIRECTION
- (PSCL) PORTABLE SEDIMENT CONTROL LOG
- STAGING YARD LIMITS

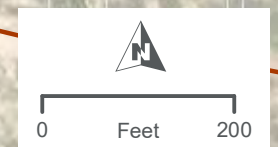
LEGEND

- Existing Access
- Elevation Countour
- Parcel Boundary

ADDITIONAL ACCESS TO STAGING YARD.

(SCL) 60 LF

GRAVEL ACCESS FROM HWY 45





Appendix C: Control Measure Details

(BF) BOUNDARY FENCE

DESCRIPTION

BOUNDARY FENCE IS USED AS A PERIMETER CONTROL TO DESIGNATE PROJECT LIMITS AND PROTECT SENSITIVE NATURAL AREAS SUCH AS OPEN SPACE, WETLANDS, AND RIPARIAN AREAS.

DESIGN AND INSTALLATION

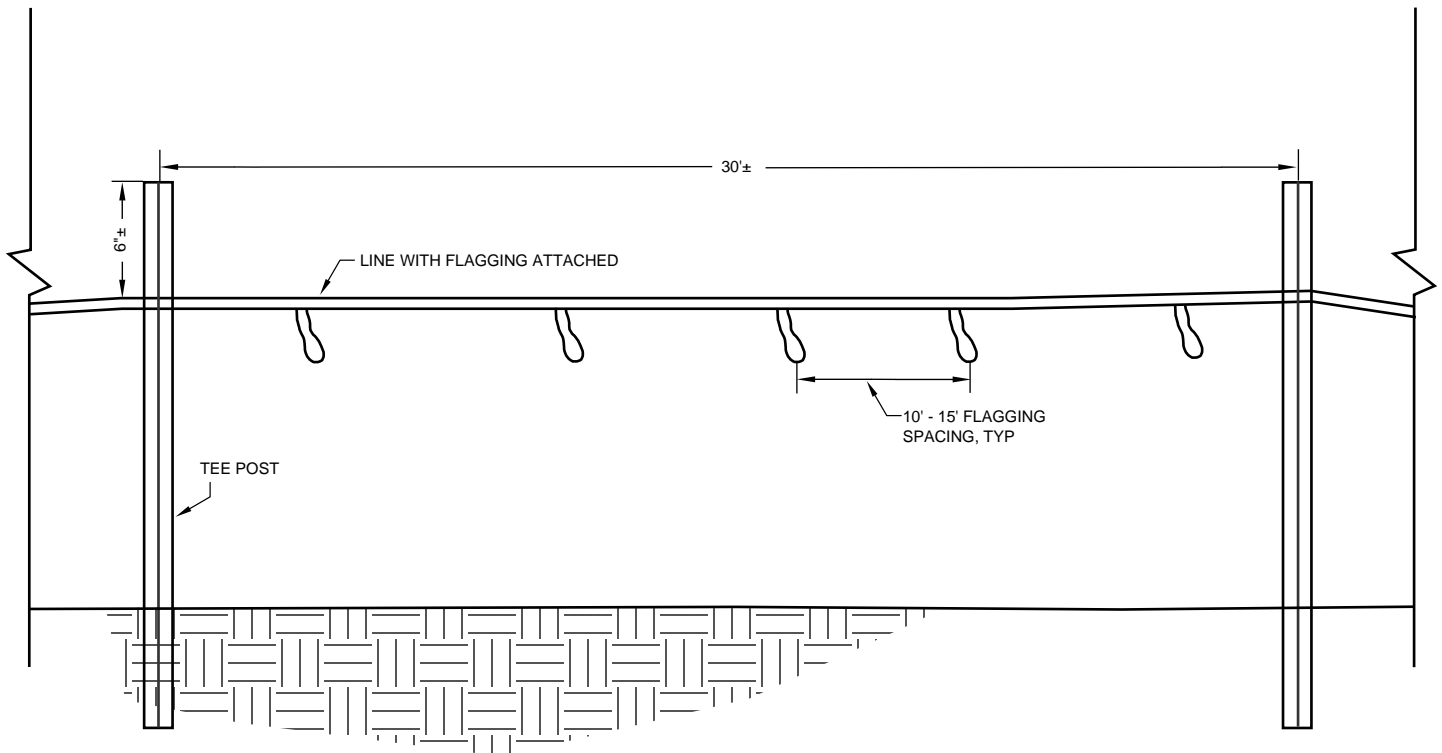
1. TEE POSTS SPACED ~30' SHALL BE USED WITH LINE CONNECTED BETWEEN AND FLAGGING ATTACHED. SEE DETAIL BELOW.
2. EASEMENTS, WETLANDS, AND WILDLIFE AREAS TO BE STAKED OUT BY SURVEYOR BEFORE PLACEMENT OF BOUNDARY FENCE.
3. ALL EQUIPMENT USED TO INSTALL FENCING SHALL BE KEPT ON THE CONSTRUCTION SIDE OF PROJECT.
4. BOUNDARY FENCING SHALL BE REMOVED PRIOR TO FINAL STABILIZATION AND PERMANENT SEEDING.

MAINTENANCE:

MAINTAIN, REPLACE, AND REPAIR AS NEEDED TO ENSURE THERE IS NO DAMAGE TO TEE POSTS, LINE, AND FLAGGING. MAINTAIN LINE TENSION SO LINE SPACE BETWEEN LINE AND GROUND IS AT LEAST 3'.

ADDITIONAL NOTES:

REVIEW LOCAL JURISDICTION REQUIREMENTS FOR CM TYPES AND INSTALLATION METHODS.





CONCRETE WASHOUT AREA

DESCRIPTION:

ECO-PAN IS A PROPRIETARY SELF-CONTAINED, WATER-TIGHT CONCRETE WASHOUT WITH FORK CHANNELS AND EYELETS FOR PORTABILITY. THE PAN CAPTURES AND CONTAINS CONCRETE WASTEWATER AND WASHOUT MATERIAL.

MAINTENANCE:

INSPECT AND CLEAN OUT WHEN 3/4 FULL, NOT ALLOWING THE ECO-PAN TO OVERFLOW. INSPECT WASTEWATER LEVEL, REQUEST SERVICE, AND REPLACE WITH EMPTY ECO-PAN AS NEEDED. INSPECT ECO-PANS TO ENSURE THAT PROPER HOUSEKEEPING PROCEDURES ARE UTILIZED WHEN WASHING OUT EQUIPMENT.

ADDITIONAL NOTES:

1. ECO-PAN IS AN ALTERNATIVE TO AN ON-SITE CONSTRUCTED CONCRETE WASHOUT.
2. CONTRACTOR TO CHOOSE PAN SIZE BASED ON PROJECT NEEDS.
3. ALL WASHOUT WATER AND CONCRETE WILL BE DISPOSED OF PROPERLY.
4. ECO-PAN TO BE USED PER MANUFACTURER'S RECOMMENDATIONS.
5. ALTERNATIVE CONCRETE WASHOUT CONTAINMENT SYSTEM MAY BE USED IF APPROVED BY BLACK HILLS.



2.35 YARD / 5 TON CAPACITY



1.5 YARD / 3 TON CAPACITY

PORTABLE SEDIMENT CONTROL LOG

DESCRIPTION

PORTABLE SEDIMENT CONTROL LOGS (PSCL) ARE SYNTHETIC, REUSABLE, WEIGHTED CONTROL MEASURES THAT CAN ACT AS A SUITABLE ALTERNATIVE TO SEDIMENT CONTROL LOGS (SCL), ROCK LOGS (RL), OR REINFORCED ROCK BERM (RRB). PSCL ARE IDEAL ALTERNATIVES WHERE A TRADITIONAL SCL CANNOT BE TRENCHED INTO THE GROUND SURFACE OR FOR AREAS WHERE CONTRACTORS MAY NEED TO REMOVE AND REPLACE CONTROL MEASURES THROUGHOUT THE WORK DAY TO ACCOMMODATE CONSTRUCTION.

PRIMARY CASES WHERE PSCL ACT AS SUITABLE ALTERNATIVES TO SCL ARE FOR USE ON HARD SURFACED OR PAVED AREAS, FOR STOCKPILE PROTECTION, OR LOCALIZED DISTURBANCE AREAS PRONE TO A SHIFTING CONSTRUCTION FOOTPRINT.

DESIGN AND INSTALLATION

DESIGN AND INSTALLATION OF PSCL SHOULD BE CONDUCTED SIMILARLY TO THAT OF TRADITIONAL SCL, RL, OR RRB.

INSTALL PSCL WITH A MINIMUM OVERLAP OF 12" AND TIGHTLY JOINED IN A MANNER SIMILAR TO TRADITIONAL SCL OR RRB.

ENSURE PSCL HAS CONTINUOUS GROUND CONTACT THAT DOES NOT ALLOW WATER TO FLOW BENEATH THE PSCL. TRENCHING AND STAKING IS NOT REQUIRED DUE TO THE WEIGHT OF THE PSCL.

PLACE PARALLEL TO CONTOUR LINES WHEREVER POSSIBLE AND INSTALL J-HOOKS WHERE RUNNING AT AN ANGLE LESS THAN 45 DEGREES FROM THE SLOPE FLOW LINE.

WHEN USED AS A CURB SOCK OR INLET PROTECTION, FOLLOW CM DETAIL FOR SUCH.

URBAN DRAINAGE FLOOD CONTROL DISTRICT / MILE HIGH FLOOD DISTRICT (UDFCD/MHFD) DESIGN AND SIZING BASED ON 9" DIAMETER STRAW LOGS TRENCHED 3" INTO GROUND. TYPICAL 7" DIAMETER PSCL ARE SUITABLE ALTERNATIVES AS THEY ARE NOT TRENCHED AND OVERALL HEIGHT OF CM REMAINS THE SAME OR GREATER. REFER TO UDFCD DETAIL FOR SCL IF TRIBUTARY SIZING CALCULATIONS ARE REQUIRED.

MAINTENANCE:

INSPECT AT FREQUENCY PER LOCAL JURISDICTION REQUIREMENT OR SITE SWMP.

REPOSITION DISPLACED OR MISALIGNED WATTLES. REPLACE TORN OR DAMAGED PSCL AND REMOVE ANY PSCL MATERIAL DEPOSITED AT THE SITE.

REMOVE SEDIMENT ACCUMULATED ON UPSTREAM SIDE OF PSCL TO ENSURE FUNCTIONALITY. CM IS CONSIDERED NO LONGER FUNCTIONAL WHEN SEDIMENT REACHES ONE HALF THE TOTAL HEIGHT OF THE PSCL.

REMOVE CM WHEN UPGRADIENT AREAS HAVE REACHED FINAL STABILIZATION.

ADDITIONAL NOTES:

REVIEW LOCAL JURISDICTION REQUIREMENTS FOR CM TYPES AND INSTALLATION METHODS. ENSURE APPROVAL FROM JURISDICTION PRIOR TO USE.

Memo

Date: Wednesday, February 9, 2022

Project: Transmission Line Canon West Reliability - Desert Cove to North Penrose Rebuild

To: GESC, Control Measure Details

From: Brian Brown, PE - HDR

Subject: Use of Vegetation & Topography (VT) instead of structural erosion Control Measures (CM)

This memo describes the specific conditions for which the installation of an erosion Control Measure (CM) is not recommended based on site conditions. Under certain conditions, not installing a CM may be the best approach to minimize sediment transport off site. This is based on the concept that shallow overland flow may pick-up and transport sediment that is then dropped out within a vegetative buffer depending on a variety of site conditions. Use of VT instead of a structural CM is dependent on the following factors:

- Rainfall – Rainfall intensity impacts the buffer distance. The rainfall rate across the site has been calculated to be 0.87" in a 5-year, 30-minute storm. A 1.0" 5-year, 30 minute storm was utilized for model inputs. This rainfall depth is incorporated in the Table 1 distances.
- 80% sediment removal – structural CMs target 80% sediment removal. Actual removal rates vary but have been shown to be less than 80% in many studies. The 80% removal rate is one basis for the VT buffer distances reported in Table 1.
- **Disturbance area does not have concentrated flow** – This approach is based on sediment dropping out while suspended in an overland sheet flow condition. If there is concentrated flow prior to or due to construction, i.e. rill erosion across the work/disturbance area that continues down-gradient and off-site, then structural CMs are recommended.
- Low slope – local slope of the site impacts velocity, flow concentration, and other factors. Use **VT should not be considered for slopes exceeding 10%.**
- Soil Type – Soil type impacts likelihood of soil being transported in sheet flow. The larger the soil particles, i.e. sand, the harder to pick-up and transport. The smaller the particle, i.e. clay, the longer the transport distance. The NRCS predominant Hydrologic Soil Group (HSG) soil types for the project area are A and B. The hydrologic soil groups (HSG) are A – D and as follows:
 - A – sand or silty sand, High infiltration rate
 - B – sandy silt, moderately high infiltration rate
 - C – clayey silt, moderate to low infiltration rate
 - D – clay, low infiltration rate
- Vegetation cover – The vegetation cover (surface roughness) was accounted for in the VT model runs and found to provide similar buffer distances, therefore the most conservative vegetation density is reflected in Table 1.

- Vegetation Buffer - The buffer distance measurement is along the flow direction, and measured from the limit of the work zone to the limit of the utility easement/ROW. **Vegetation buffer outside of the ROW may not be utilized for the required buffer distance.** Due to the project area, there is adequate area for sediment settling on-site.
- The use of this VT approach may be applied to linear and larger area disturbances that meet the parameters described in this memo.
- Table 1 results below include a 15% buffer beyond calculated model buffer distances.

Utilize Table 1 below for VT buffer distances:

VT Buffer	
Soil	Buffer Distance (ft)
A	3
B	7
C	30
D	61

Maintenance:

In the same manner that using existing conditions as a CM does not require installation of a CM, there is no maintenance of this CM. VT is either adequate or structural CMs should be installed.

Inspection:

Like structural CMs, the area down gradient of a VT CM should be walked and observed for the following which indicate that VT may not be adequate:

- signs of new rill erosion in work area or immediately down gradient of work area
- signs of sediment deposition well beyond the expected buffer distance or nearing area not controlled by Black Hills property lease
- observations of work area or up gradient areas that are creating concentrated flow through and down gradient of the work area.
- Observe and discuss with contractor potential construction practices that could promote sheet flow and infiltration to minimize stormwater runoff from work area.

In the event that VT is inadequate to keep sediment on site at any local area, that local area must immediately have a structural down gradient CM installed, at a minimum. Sediment Control Log is the expected control measure. Site conditions will dictate actual CM to be used. Note: Sediment Control Logs cannot be used in across swales or drainageways.

Description

A construction fence restricts site access to designated entrances and exits, delineates construction site boundaries, and keeps construction out of sensitive areas such as natural areas to be preserved as open space, wetlands and riparian areas.

Appropriate Uses

A construction fence can be used to delineate the site perimeter and locations within the site where access is restricted to protect natural resources such as wetlands, waterbodies, trees, and other natural areas of the site that should not be disturbed.



Photograph CF-1. A construction fence helps delineate areas where existing vegetation is being protected. Photo courtesy of Douglas County.

If natural resource protection is an objective, then the construction fencing should be used in combination with other perimeter control BMPs such as silt fence, sediment control logs or similar measures.

Design and Installation

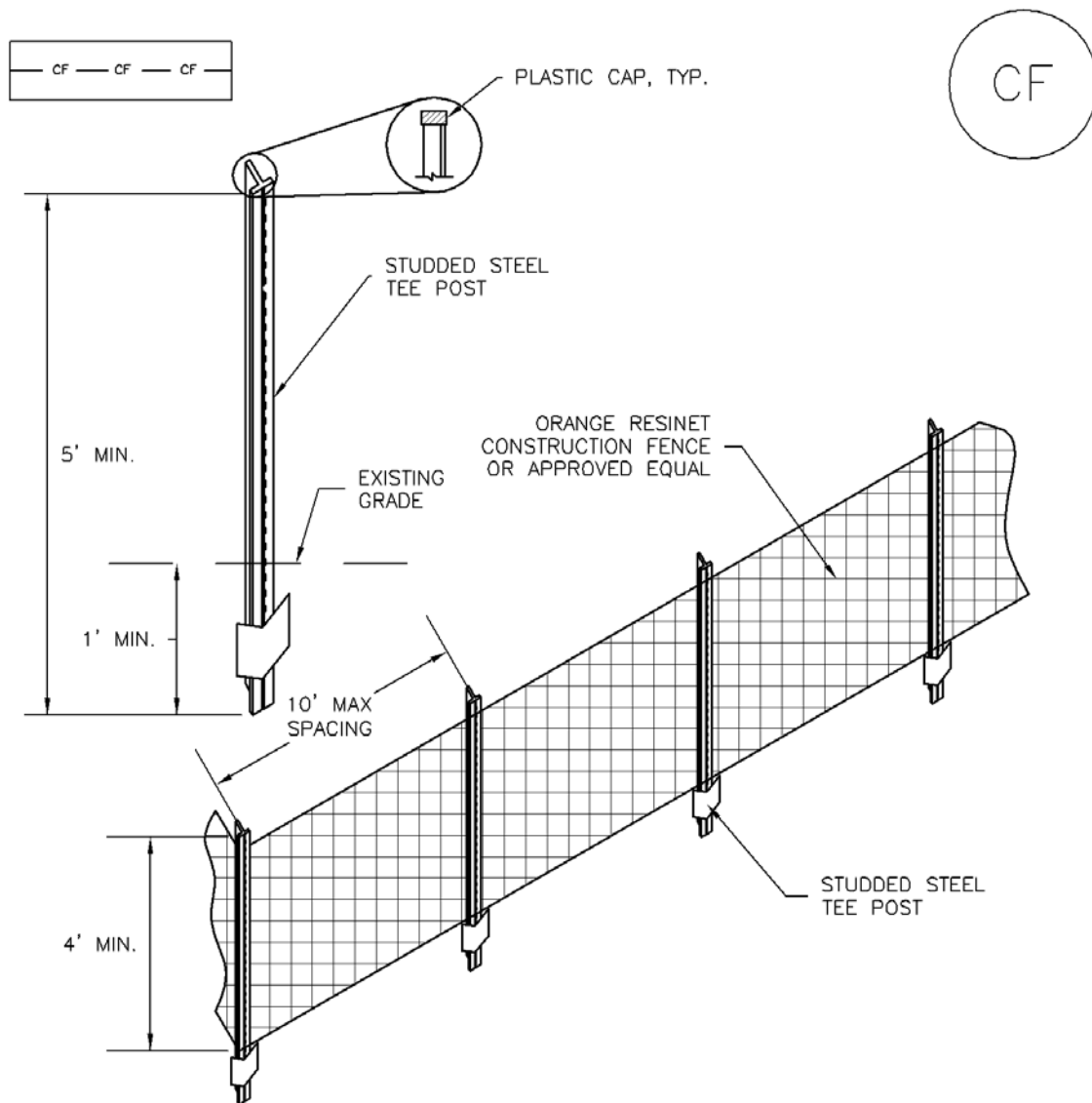
Construction fencing may be chain link or plastic mesh and should be installed following manufacturer's recommendations. See Detail CF-1 for typical installations.

Do not place construction fencing in areas within work limits of machinery.

Maintenance and Removal

- Inspect fences for damage; repair or replace as necessary.
- Fencing should be tight and any areas with slumping or fallen posts should be reinstalled.
- Fencing should be removed once construction is complete.

Construction Fence	
Functions	
Erosion Control	No
Sediment Control	No
Site/Material Management	Yes



CF-1. PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
-LOCATION OF CONSTRUCTION FENCE.
2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR-GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.
4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.
5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CONSTRUCTION FENCE MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

Description

Temporary seeding can be used to stabilize disturbed areas that will be inactive for an extended period.

Permanent seeding should be used to stabilize areas at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextiles, or other appropriate measures.



Photograph TS/PS -1. Equipment used to drill seed. Photo courtesy of Douglas County.

Appropriate Uses

When the soil surface is disturbed and will remain inactive for an extended period (typically 30 days or longer), proactive stabilization measures should be implemented. If the inactive period is short-lived (on the order of two weeks), techniques such as surface roughening may be appropriate. For longer periods of inactivity, temporary seeding and mulching can provide effective erosion control. Permanent seeding should be used on finished areas that have not been otherwise stabilized.

Typically, local governments have their own seed mixes and timelines for seeding. Check jurisdictional requirements for seeding and temporary stabilization.

Design and Installation

Effective seeding requires proper seedbed preparation, selection of an appropriate seed mixture, use of appropriate seeding equipment to ensure proper coverage and density, and protection with mulch or fabric until plants are established.

The USDCM Volume 2 *Revegetation* Chapter contains detailed seed mix, soil preparations, and seeding and mulching recommendations that may be referenced to supplement this Fact Sheet.

Drill seeding is the preferred seeding method. Hydroseeding is not recommended except in areas where steep slopes prevent use of drill seeding equipment, and even in these instances it is preferable to hand seed and mulch. Some jurisdictions do not allow hydroseeding or hydromulching.

Seedbed Preparation

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation. Overlot grading can result in loss of topsoil, resulting in poor quality subsoils at the ground surface that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, it is typically necessary to provide stockpiled topsoil, compost, or other

Temporary and Permanent Seeding	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

EC-2 Temporary and Permanent Seeding (TS/PS)

soil amendments and rototill them into the soil to a depth of 6 inches or more.

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content. The rooting depth of most native grasses in the semi-arid Denver metropolitan area is 6 to 18 inches. At a minimum, the upper 6 inches of topsoil should be stripped, stockpiled, and ultimately respread across areas that will be revegetated.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth. Other treatments can be used to adjust soil pH conditions when needed. Soil testing, which is typically inexpensive, should be completed to determine and optimize the types and amounts of amendments that are required.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary. Surface roughening will assist in placement of a stable topsoil layer on steeper slopes, and allow infiltration and root penetration to greater depth.

Prior to seeding, the soil surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth. Seed-to-soil contact is the key to good germination.

Seed Mix for Temporary Vegetation

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas. Annual grasses suitable for the Denver metropolitan area are listed in Table TS/PS-1. These are to be considered only as general recommendations when specific design guidance for a particular site is not available. Local governments typically specify seed mixes appropriate for their jurisdiction.

Seed Mix for Permanent Revegetation

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade. Each site will have different characteristics and a landscape professional or the local jurisdiction should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific recommendation, one of the perennial grass mixes appropriate for site conditions and growth season listed in Table TS/PS-2 can be used. The pure live seed (PLS) rates of application recommended in these tables are considered to be absolute minimum rates for seed applied using proper drill-seeding equipment.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (*Chrysothamnus nauseosus*), fourwing saltbush (*Atriplex canescens*) and skunkbrush sumac (*Rhus trilobata*) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively. In riparian zones, planting root stock of such species as American plum (*Prunus americana*), woods rose (*Rosa woodsii*), plains cottonwood (*Populus sargentii*), and willow (*Populus spp.*) may be considered. On non-topsoiled upland sites, a legume such as Ladak alfalfa at 1 pound PLS/acre can be included as a source of nitrogen for perennial grasses.

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes. If the area is irrigated, seeding may occur in summer months, as well. See Table TS/PS-3 for appropriate seeding dates.

Table TS/PS-1. Minimum Drill Seeding Rates for Various Temporary Annual Grasses

Species ^a (Common name)	Growth Season ^b	Pounds of Pure Live Seed (PLS)/acre ^c	Planting Depth (inches)
1. Oats	Cool	35 - 50	1 - 2
2. Spring wheat	Cool	25 - 35	1 - 2
3. Spring barley	Cool	25 - 35	1 - 2
4. Annual ryegrass	Cool	10 - 15	½
5. Millet	Warm	3 - 15	½ - ¾
6. Sudangrass	Warm	5-10	½ - ¾
7. Sorghum	Warm	5-10	½ - ¾
8. Winter wheat	Cool	20-35	1 - 2
9. Winter barley	Cool	20-35	1 - 2
10. Winter rye	Cool	20-35	1 - 2
11. Triticale	Cool	25-40	1 - 2
<p>^a Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.</p> <p>Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in the mulch.</p> <p>^b See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.</p> <p>^c Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.</p>			

EC-2 Temporary and Permanent Seeding (TS/PS)

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses

Common ^a Name	Botanical Name	Growth Season ^b	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Alakali Soil Seed Mix					
Alkali sacaton	<i>Sporobolus airoides</i>	Cool	Bunch	1,750,000	0.25
Basin wildrye	<i>Elymus cinereus</i>	Cool	Bunch	165,000	2.5
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Jose tall wheatgrass	<i>Agropyron elongatum 'Jose'</i>	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	5.5
Total					17.75
Fertile Loamy Soil Seed Mix					
Ephriam crested wheatgrass	<i>Agropyron cristatum 'Ephriam'</i>	Cool	Sod	175,000	2.0
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	7.0
Total					15.5
High Water Table Soil Seed Mix					
Meadow foxtail	<i>Alopecurus pratensis</i>	Cool	Sod	900,000	0.5
Redtop	<i>Agrostis alba</i>	Warm	Open sod	5,000,000	0.25
Reed canarygrass	<i>Phalaris arundinacea</i>	Cool	Sod	68,000	0.5
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
Pathfinder switchgrass	<i>Panicum virgatum 'Pathfinder'</i>	Warm	Sod	389,000	1.0
Alkar tall wheatgrass	<i>Agropyron elongatum 'Alkar'</i>	Cool	Bunch	79,000	5.5
Total					10.75
Transition Turf Seed Mix^c					
Ruebens Canadian bluegrass	<i>Poa compressa 'Ruebens'</i>	Cool	Sod	2,500,000	0.5
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	<i>Lolium perenne 'Citation'</i>	Cool	Sod	247,000	3.0
Lincoln smooth brome	<i>Bromus inermis leyss 'Lincoln'</i>	Cool	Sod	130,000	3.0
Total					7.5

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)

Common Name	Botanical Name	Growth Season ^b	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Sandy Soil Seed Mix					
Blue grama	<i>Bouteloua gracilis</i>	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	<i>Schizachyrium scoparium</i> 'Camper'	Warm	Bunch	240,000	1.0
Prairie sandreed	<i>Calamovilfa longifolia</i>	Warm	Open sod	274,000	1.0
Sand dropseed	<i>Sporobolus cryptandrus</i>	Cool	Bunch	5,298,000	0.25
Vaughn sideoats grama	<i>Bouteloua curtipendula</i> 'Vaughn'	Warm	Sod	191,000	2.0
Arriba western wheatgrass	<i>Agropyron smithii</i> 'Arriba'	Cool	Sod	110,000	5.5
Total					10.25
Heavy Clay, Rocky Foothill Seed Mix					
Ephriam crested wheatgrass ^d	<i>Agropyron cristatum</i> 'Ephriam'	Cool	Sod	175,000	1.5
Oahe Intermediate wheatgrass	<i>Agropyron intermedium</i> 'Oahe'	Cool	Sod	115,000	5.5
Vaughn sideoats grama ^e	<i>Bouteloua curtipendula</i> 'Vaughn'	Warm	Sod	191,000	2.0
Lincoln smooth brome	<i>Bromus inermis</i> leyss 'Lincoln'	Cool	Sod	130,000	3.0
Arriba western wheatgrass	<i>Agropyron smithii</i> 'Arriba'	Cool	Sod	110,000	5.5
Total					17.5
^a All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation. ^b See Table TS/PS-3 for seeding dates. ^c If site is to be irrigated, the transition turf seed rates should be doubled. ^d Crested wheatgrass should not be used on slopes steeper than 6H to 1V. ^e Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sideoats grama.					

EC-2 Temporary and Permanent Seeding (TS/PS)

Table TS/PS-3. Seeding Dates for Annual and Perennial Grasses

Seeding Dates	Annual Grasses (Numbers in table reference species in Table TS/PS-1)		Perennial Grasses	
	Warm	Cool	Warm	Cool
January 1–March 15			✓	✓
March 16–April 30	4	1,2,3	✓	✓
May 1–May 15	4		✓	
May 16–June 30	4,5,6,7			
July 1–July 15	5,6,7			
July 16–August 31				
September 1–September 30		8,9,10,11		
October 1–December 31			✓	✓

Mulch

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier. See the Mulching BMP Fact Sheet for additional guidance.

Maintenance and Removal

Monitor and observe seeded areas to identify areas of poor growth or areas that fail to germinate. Reseed and mulch these areas, as needed.

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado. Reseed portions of the site that fail to germinate or remain bare after the first growing season.

Seeded areas may require irrigation, particularly during extended dry periods. Targeted weed control may also be necessary.

Protect seeded areas from construction equipment and vehicle access.

Description

Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Mulching helps reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff. Although often applied in conjunction with temporary or permanent seeding, it can also be used for temporary stabilization of areas that cannot be reseeded due to seasonal constraints.

Mulch can be applied either using standard mechanical dry application methods or using hydromulching equipment that hydraulically applies a slurry of water, wood fiber mulch, and often a tackifier.



Photograph MU-1. An area that was recently seeded, mulched, and crimped.

Appropriate Uses

Use mulch in conjunction with seeding to help protect the seedbed and stabilize the soil. Mulch can also be used as a temporary cover on low to mild slopes to help temporarily stabilize disturbed areas where growing season constraints prevent effective reseeded. Disturbed areas should be properly mulched and tacked, or seeded, mulched and tacked promptly after final grade is reached (typically within no longer than 14 days) on portions of the site not otherwise permanently stabilized.

Standard dry mulching is encouraged in most jurisdictions; however, hydromulching may not be allowed in certain jurisdictions or may not be allowed near waterways.

Do not apply mulch during windy conditions.

Design and Installation

Prior to mulching, surface-roughen areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where other methods are impractical because track walking with heavy equipment typically compacts the soil.

A variety of mulches can be used effectively at construction sites. Consider the following:

Mulch	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No

- Clean, weed-free and seed-free cereal grain straw should be applied evenly at a rate of 2 tons per acre and must be tacked or fastened by a method suitable for the condition of the site. Straw mulch must be anchored (and not merely placed) on the surface. This can be accomplished mechanically by crimping or with the aid of tackifiers or nets. Anchoring with a crimping implement is preferred, and is the recommended method for areas flatter than 3:1. Mechanical crimpers must be capable of tucking the long mulch fibers into the soil to a depth of 3 inches without cutting them. An agricultural disk, while not an ideal substitute, may work if the disk blades are dull or blunted and set vertically; however, the frame may have to be weighted to afford proper soil penetration.
- Grass hay may be used in place of straw; however, because hay is comprised of the entire plant including seed, mulching with hay may seed the site with non-native grass species which might in turn out-compete the native seed. Alternatively, native species of grass hay may be purchased, but can be difficult to find and are more expensive than straw. Purchasing and utilizing a certified weed-free straw is an easier and less costly mulching method. When using grass hay, follow the same guidelines as for straw (provided above).
- On small areas sheltered from the wind and heavy runoff, spraying a tackifier on the mulch is satisfactory for holding it in place. For steep slopes and special situations where greater control is needed, erosion control blankets anchored with stakes should be used instead of mulch.
- Hydraulic mulching consists of wood cellulose fibers mixed with water and a tackifying agent and should be applied at a rate of no less than 1,500 pounds per acre (1,425 lbs of fibers mixed with at least 75 lbs of tackifier) with a hydraulic mulcher. For steeper slopes, up to 2000 pounds per acre may be required for effective hydroseeding. Hydromulch typically requires up to 24 hours to dry; therefore, it should not be applied immediately prior to inclement weather. Application to roads, waterways and existing vegetation should be avoided.
- Erosion control mats, blankets, or nets are recommended to help stabilize steep slopes (generally 3:1 and steeper) and waterways. Depending on the product, these may be used alone or in conjunction with grass or straw mulch. Normally, use of these products will be restricted to relatively small areas. Biodegradable mats made of straw and jute, straw-coconut, coconut fiber, or excelsior can be used instead of mulch. (See the ECM/TRM BMP for more information.)
- Some tackifiers or binders may be used to anchor mulch. Check with the local jurisdiction for allowed tackifiers. Manufacturer's recommendations should be followed at all times. (See the Soil Binder BMP for more information on general types of tackifiers.)
- Rock can also be used as mulch. It provides protection of exposed soils to wind and water erosion and allows infiltration of precipitation. An aggregate base course can be spread on disturbed areas for temporary or permanent stabilization. The rock mulch layer should be thick enough to provide full coverage of exposed soil on the area it is applied.

Maintenance and Removal

After mulching, the bare ground surface should not be more than 10 percent exposed. Reapply mulch, as needed, to cover bare areas.

Description

Implement construction site good housekeeping practices to prevent pollution associated with solid, liquid and hazardous construction-related materials and wastes. Stormwater Management Plans (SWMPs) should clearly specify BMPs including these good housekeeping practices:

- Provide for waste management.
- Establish proper building material staging areas.
- Designate paint and concrete washout areas.
- Establish proper equipment/vehicle fueling and maintenance practices.
- Control equipment/vehicle washing and allowable non-stormwater discharges.
- Develop a spill prevention and response plan.

Acknowledgement: This Fact Sheet is based directly on EPA guidance provided in *Developing Your Stormwater Pollution Prevention Plan* (EPA 2007).

Appropriate Uses

Good housekeeping practices are necessary at all construction sites.

Design and Installation

The following principles and actions should be addressed in SWMPs:

- **Provide for Waste Management.** Implement management procedures and practices to prevent or reduce the exposure and transport of pollutants in stormwater from solid, liquid and sanitary wastes that will be generated at the site. Practices such as trash disposal, recycling, proper material handling, and cleanup measures can reduce the potential for stormwater runoff to pick up construction site wastes and discharge them to surface waters. Implement a comprehensive set of waste-management practices for hazardous or toxic materials, such as paints, solvents, petroleum products, pesticides, wood preservatives, acids, roofing tar, and other materials. Practices should include storage, handling, inventory, and cleanup procedures, in case of spills. Specific practices that should be considered include:

Solid or Construction Waste

- Designate trash and bulk waste-collection areas on-site.



Photographs GH-1 and GH-2. Proper materials storage and secondary containment for fuel tanks are important good housekeeping practices. Photos courtesy of CDOT and City of Aurora.

Good Housekeeping	
Functions	
Erosion Control	No
Sediment Control	No
Site/Material Management	Yes

- Recycle materials whenever possible (e.g., paper, wood, concrete, oil).
- Segregate and provide proper disposal options for hazardous material wastes.
- Clean up litter and debris from the construction site daily.
- Locate waste-collection areas away from streets, gutters, watercourses, and storm drains. Waste-collection areas (dumpsters, and such) are often best located near construction site entrances to minimize traffic on disturbed soils. Consider secondary containment around waste collection areas to minimize the likelihood of contaminated discharges.
- Empty waste containers before they are full and overflowing.

Sanitary and Septic Waste

- Provide convenient, well-maintained, and properly located toilet facilities on-site.
- Locate toilet facilities away from storm drain inlets and waterways to prevent accidental spills and contamination of stormwater.
- Maintain clean restroom facilities and empty portable toilets regularly.
- Where possible, provide secondary containment pans under portable toilets.
- Provide tie-downs or stake-downs for portable toilets.
- Educate employees, subcontractors, and suppliers on locations of facilities.
- Treat or dispose of sanitary and septic waste in accordance with state or local regulations. Do not discharge or bury wastewater at the construction site.
- Inspect facilities for leaks. If found, repair or replace immediately.
- Special care is necessary during maintenance (pump out) to ensure that waste and/or biocide are not spilled on the ground.

Hazardous Materials and Wastes

- Develop and implement employee and subcontractor education, as needed, on hazardous and toxic waste handling, storage, disposal, and cleanup.
- Designate hazardous waste-collection areas on-site.
- Place all hazardous and toxic material wastes in secondary containment.



Photograph GH-3. Locate portable toilet facilities on level surfaces away from waterways and storm drains. Photo courtesy of WWE.

- Hazardous waste containers should be inspected to ensure that all containers are labeled properly and that no leaks are present.
- **Establish Proper Building Material Handling and Staging Areas.** The SWMP should include comprehensive handling and management procedures for building materials, especially those that are hazardous or toxic. Paints, solvents, pesticides, fuels and oils, other hazardous materials or building materials that have the potential to contaminate stormwater should be stored indoors or under cover whenever possible or in areas with secondary containment. Secondary containment measures prevent a spill from spreading across the site and may include dikes, berms, curbing, or other containment methods. Secondary containment techniques should also ensure the protection of groundwater. Designate staging areas for activities such as fueling vehicles, mixing paints, plaster, mortar, and other potential pollutants. Designated staging areas enable easier monitoring of the use of materials and clean up of spills. Training employees and subcontractors is essential to the success of this pollution prevention principle. Consider the following specific materials handling and staging practices:
 - Train employees and subcontractors in proper handling and storage practices.
 - Clearly designate site areas for staging and storage with signs and on construction drawings. Staging areas should be located in areas central to the construction site. Segment the staging area into sub-areas designated for vehicles, equipment, or stockpiles. Construction entrances and exits should be clearly marked so that delivery vehicles enter/exit through stabilized areas with vehicle tracking controls (See Vehicle Tracking Control Fact Sheet).
 - Provide storage in accordance with Spill Protection, Control and Countermeasures (SPCC) requirements and plans and provide cover and impermeable perimeter control, as necessary, for hazardous materials and contaminated soils that must be stored on site.
 - Ensure that storage containers are regularly inspected for leaks, corrosion, support or foundation failure, or other signs of deterioration and tested for soundness.
 - Reuse and recycle construction materials when possible.
- **Designate Concrete Washout Areas.** Concrete contractors should be encouraged to use the washout facilities at their own plants or dispatch facilities when feasible; however, concrete washout commonly occurs on construction sites. If it is necessary to provide for concrete washout areas on-site, designate specific washout areas and design facilities to handle anticipated washout water. Washout areas should also be provided for paint and stucco operations. Because washout areas can be a source of pollutants from leaks or spills, care must be taken with regard to their placement and proper use. See the Concrete Washout Area Fact Sheet for detailed guidance.

Both self-constructed and prefabricated washout containers can fill up quickly when concrete, paint, and stucco work are occurring on large portions of the site. Be sure to check for evidence that contractors are using the washout areas and not dumping materials onto the ground or into drainage facilities. If the washout areas are not being used regularly, consider posting additional signage, relocating the facilities to more convenient locations, or providing training to workers and contractors.

When concrete, paint, or stucco is part of the construction process, consider these practices which will help prevent contamination of stormwater. Include the locations of these areas and the maintenance and inspection procedures in the SWMP.

- Do not washout concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams. Only use designated washout areas.
- Establish washout areas and advertise their locations with signs. Ensure that signage remains in good repair.
- Provide adequate containment for the amount of wash water that will be used.
- Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed.
- Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground in the vicinity of waterbodies. Washwater should not be discharged to a sanitary sewer system without first receiving written permission from the system operator.
- **Establish Proper Equipment/Vehicle Fueling and Maintenance Practices.** Create a clearly designated on-site fueling and maintenance area that is clean and dry. The on-site fueling area should have a spill kit, and staff should know how to use it. If possible, conduct vehicle fueling and maintenance activities in a covered area. Consider the following practices to help prevent the discharge of pollutants to stormwater from equipment/vehicle fueling and maintenance. Include the locations of designated fueling and maintenance areas and inspection and maintenance procedures in the SWMP.
 - Train employees and subcontractors in proper fueling procedures (stay with vehicles during fueling, proper use of pumps, emergency shutoff valves, etc.).
 - Inspect on-site vehicles and equipment regularly for leaks, equipment damage, and other service problems.
 - Clearly designate vehicle/equipment service areas away from drainage facilities and watercourses to prevent stormwater run-on and runoff.
 - Use drip pans, drip cloths, or absorbent pads when replacing spent fluids.
 - Collect all spent fluids, store in appropriate labeled containers in the proper storage areas, and recycle fluids whenever possible.
- **Control Equipment/Vehicle Washing and Allowable Non-Stormwater Discharges.** Implement practices to prevent contamination of surface and groundwater from equipment and vehicle wash water. Representative practices include:
 - Educate employees and subcontractors on proper washing procedures.
 - Use off-site washing facilities, when available.
 - Clearly mark the washing areas and inform workers that all washing must occur in this area.
 - Contain wash water and treat it using BMPs. Infiltrate washwater when possible, but maintain separation from drainage paths and waterbodies.

- Use high-pressure water spray at vehicle washing facilities without detergents. Water alone can remove most dirt adequately.
- Do not conduct other activities, such as vehicle repairs, in the wash area.
- Include the location of the washing facilities and the inspection and maintenance procedures in the SWMP.
- **Develop a Spill Prevention and Response Plan.** Spill prevention and response procedures must be identified in the SWMP. Representative procedures include identifying ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and response. The plan should also specify material handling procedures and storage requirements and ensure that clear and concise spill cleanup procedures are provided and posted for areas in which spills may potentially occur. When developing a spill prevention plan, include the following:
 - Note the locations of chemical storage areas, storm drains, tributary drainage areas, surface waterbodies on or near the site, and measures to stop spills from leaving the site.
 - Provide proper handling and safety procedures for each type of waste. Keep Material Safety Data Sheets (MSDSs) for chemical used on site with the SWMP.
 - Establish an education program for employees and subcontractors on the potential hazards to humans and the environment from spills and leaks.
 - Specify how to notify appropriate authorities, such as police and fire departments, hospitals, or municipal sewage treatment facilities to request assistance. Emergency procedures and contact numbers should be provided in the SWMP and posted at storage locations.
 - Describe the procedures, equipment and materials for immediate cleanup of spills and proper disposal.
 - Identify personnel responsible for implementing the plan in the event of a spill. Update the spill prevention plan and clean up materials as changes occur to the types of chemicals stored and used at the facility.

Spill Prevention, Control, and Countermeasure (SPCC) Plan

Construction sites may be subject to 40 CFR Part 112 regulations that require the preparation and implementation of a SPCC Plan to prevent oil spills from aboveground and underground storage tanks. The facility is subject to this rule if it is a non-transportation-related facility that:

- Has a total storage capacity greater than 1,320 gallons or a completely buried storage capacity greater than 42,000 gallons.
- Could reasonably be expected to discharge oil in quantities that may be harmful to navigable waters of the United States and adjoining shorelines.

Furthermore, if the facility is subject to 40 CFR Part 112, the SWMP should reference the SPCC Plan. To find out more about SPCC Plans, see EPA's website on SPCC at www.epa.gov/oilspill/spcc.htm.

Reporting Oil Spills

In the event of an oil spill, contact the National Response Center toll free at 1-800-424- 8802 for assistance, or for more details, visit their website: www.nrc.uscg.mil.

Maintenance and Removal

Effective implementation of good housekeeping practices is dependent on clear designation of personnel responsible for supervising and implementing good housekeeping programs, such as site cleanup and disposal of trash and debris, hazardous material management and disposal, vehicle and equipment maintenance, and other practices. Emergency response "drills" may aid in emergency preparedness.

Checklists may be helpful in good housekeeping efforts.

Staging and storage areas require permanent stabilization when the areas are no longer being used for construction-related activities.

Construction-related materials, debris and waste must be removed from the construction site once construction is complete.

Design Details

See the following Fact Sheets for related Design Details:

MM-1 Concrete Washout Area

MM-2 Stockpile Management

SM-4 Vehicle Tracking Control

Design details are not necessary for other good housekeeping practices; however, be sure to designate where specific practices will occur on the appropriate construction drawings.

Description

Protection of existing vegetation on a construction site can be accomplished through installation of a construction fence around the area requiring protection. In cases where upgradient areas are disturbed, it may also be necessary to install perimeter controls to minimize sediment loading to sensitive areas such as wetlands. Existing vegetation may be designated for protection to maintain a stable surface cover as part of construction phasing, or vegetation may be protected in areas designated to remain in natural condition under post-development conditions (e.g., wetlands, mature trees, riparian areas, open space).



Photograph PV-1. Protection of existing vegetation and a sensitive area. Photo courtesy of CDOT.

Appropriate Uses

Existing vegetation should be preserved for the maximum practical duration on a construction site through the use of effective construction phasing. Preserving vegetation helps to minimize erosion and can reduce revegetation costs following construction.

Protection of wetland areas is required under the Clean Water Act, unless a permit has been obtained from the U.S. Army Corps of Engineers (USACE) allowing impacts in limited areas.

If trees are to be protected as part of post-development landscaping, care must be taken to avoid several types of damage, some of which may not be apparent at the time of injury. Potential sources of injury include soil compaction during grading or due to construction traffic, direct equipment-related injury such as bark removal, branch breakage, surface grading and trenching, and soil cut and fill. In order to minimize injuries that may lead to immediate or later death of the tree, tree protection zones should be developed during site design, implemented at the beginning of a construction project, as well as continued during active construction.

Design and Installation

General

Once an area has been designated as a preservation area, there should be no construction activity allowed within a set distance of the area. Clearly mark the area with construction fencing. Do not allow stockpiles, equipment, trailers or parking within the protected area. Guidelines to protect various types of existing vegetation follow.

Protection of Existing Vegetation	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	Yes

Surface Cover During Phased Construction

Install construction fencing or other perimeter controls around areas to be protected from clearing and grading as part of construction phasing.

Maintaining surface cover on steep slopes for the maximum practical duration during construction is recommended.

Open Space Preservation

Where natural open space areas will be preserved as part of a development, it is important to install construction fencing around these areas to protect them from compaction. This is particularly important when areas with soils with high infiltration rates are preserved as part of LID designs. Preserved open space areas should not be used for staging and equipment storage.

Wetlands and Riparian Areas

Install a construction fence around the perimeter of the wetland or riparian (streamside vegetation) area to prevent access by equipment. In areas downgradient of disturbed areas, install a perimeter control such as silt fence, sediment control logs, or similar measure to minimize sediment loading to the wetland.

Tree Protection¹

- Before beginning construction operations, establish a tree protection zone around trees to be preserved by installing construction fences. Allow enough space from the trunk to protect the root zone from soil compaction and mechanical damage, and the branches from mechanical damage (see Table PV-1). If low branches will be kept, place the fence outside of the drip line. Where this is not possible, place fencing as far away from the trunk as possible. In order to maintain a healthy tree, be aware that about 60 percent of the tree's root zone extends beyond the drip line.

Table PV-1
Guidelines for Determining the Tree Protection Zone
 (Source: Matheny and Clark, 1998; as cited in GreenCO and WWE 2008)

Species Tolerance to Damage	Distance from Trunk (ft) per inch of DBH		
	<i>Young</i>	<i>Mature</i>	<i>Over mature</i>
<i>Good</i>	0.5'	0.75'	1.0'
<i>Moderate</i>	0.75'	1.0'	1.25'
<i>Poor</i>	1.0'	1.25'	1.5'
Notes: DBH = diameter at breast height (4.5 ft above grade); Young = <20% of life expectancy; Mature = 20%-80% of life expectancy; Over mature =>80% of life expectancy			

- Most tree roots grow within the top 12 to 18 inches of soil. Grade changes within the tree protection zone should be avoided where possible because seemingly minor grade changes can either smother

¹ Tree Protection guidelines adapted from GreenCO and WWE (2008). *Green Industry Best Management Practices (BMPs) for the Conservation and Protection of Water Resources in Colorado: Moving Toward Sustainability, Third Release*. See www.greenco.org for more detailed guidance on tree preservation.

roots (in fill situations) or damage roots (in cut situations). Consider small walls where needed to avoid grade changes in the tree protection zone.

- Place and maintain a layer of mulch 4 to 6-inch thick from the tree trunk to the fencing, keeping a 6-inch space between the mulch and the trunk. Mulch helps to preserve moisture and decrease soil compaction if construction traffic is unavoidable. When planting operations are completed, the mulch may be reused throughout planting areas.
- Limit access, if needed at all, and appoint one route as the main entrance and exit to the tree protection zone. Within the tree protection zone, do not allow any equipment to be stored, chemicals to be dumped, or construction activities to take place except fine grading, irrigation system installation, and planting operations. These activities should be conducted in consultation with a landscaping professional, following Green Industry BMPs.
- Be aware that soil compaction can cause extreme damage to tree health that may appear gradually over a period of years. Soil compaction is easier to prevent than repair.

Maintenance and Removal

Repair or replace damaged or displaced fencing or other protective barriers around the vegetated area.

If damage occurs to a tree, consult an arborist for guidance on how to care for the tree. If a tree in a designated preservation area is damaged beyond repair, remove and replace with a 2-inch diameter tree of the same or similar species.

Construction equipment must not enter a wetland area, except as permitted by the U.S. Army Corps of Engineers (USACE). Inadvertent placement of fill in a wetland is a 404 permit violation and will require notification of the USACE.

If damage to vegetation occurs in a protected area, reseed the area with the same or similar species, following the recommendations in the USDCM *Revegetation* chapter.

Description

Street sweeping uses mechanical pavement cleaning practices to reduce sediment, litter and other debris washed into storm sewers by runoff. This can reduce pollutant loading to receiving waters and in some cases reduce clogging of storm sewers and prolong the life of infiltration oriented BMPs and reduce clogging of outlet structures in detention BMPs.

Different designs are available with typical sweepers categorized as a broom and conveyor belt sweeper, wet or dry vacuum-assisted sweepers, and regenerative-air sweepers. The effectiveness of street sweeping is dependent upon particle loadings in the area being swept, street texture, moisture conditions, parked car management, equipment operating conditions and frequency of cleaning (Pitt et al. 2004).



Photograph SSC-1. Monthly street sweeping from April through November removed nearly 40,690 cubic yards of sediment/debris from Denver streets in 2009. Photo courtesy of Denver Public Works.

Appropriate Uses

Street sweeping is an appropriate technique in urban areas where sediment and litter accumulation on streets is of concern for aesthetic, sanitary, water quality, and air quality reasons. From a pollutant loading perspective, street cleaning equipment can be most effective in areas where the surface to be cleaned is the major source of contaminants. These areas include freeways, large commercial parking lots, and paved storage areas (Pitt et al. 2004). Where significant sediment accumulation occurs on pervious surfaces tributary to infiltration BMPs, street sweeping may help to reduce clogging of infiltration media. In areas where construction activity is occurring, street sweeping should occur as part of construction site stormwater management plans. Vacuuming of permeable pavement systems is also considered a basic routine maintenance practice to maintain the BMP in effective operating condition. See the maintenance chapter for more information on permeable pavement systems. Not all sweepers are appropriate for this application.

Practice Guidelines¹

1. Post street sweeping schedules with signs and on local government websites so that cars are not parked on the street during designated sweeping days.
2. Sweeping frequency is dependent on local government budget, staffing, and equipment availability, but monthly sweeping during non-winter months is a common approach in the metro Denver urban

¹ Practice guidelines adapted from CASQA (2003) *California Stormwater BMP Handbook*, Practice SC-70 Road and Street Maintenance.

area. Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to watercourses, etc. For example:

- Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
 - Conduct street sweeping prior to wetter seasons to remove accumulated sediments.
 - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
3. Perform street cleaning during dry weather if possible.
 4. Avoid wet cleaning the street; instead, utilize dry methods where possible.
 5. Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with more technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
 6. Operate sweepers at manufacturer recommended optimal speed levels to increase effectiveness.
 7. Regularly inspect vehicles and equipment for leaks and repair promptly.
 8. Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
 9. Dispose of street sweeping debris and dirt at a landfill.
 10. Do not store swept material along the side of the street or near a storm drain inlet.

Changes in Street Sweeper Technology (Source: Center for Watershed Protection 2002)

At one time, street sweepers were thought to have great potential to remove stormwater pollutants from urban street surfaces and were widely touted as a stormwater treatment practice in many communities. Street sweeping gradually fell out of favor, largely as a result of performance monitoring conducted as part of the National Urban Runoff Program (NURP). These studies generally concluded that street sweepers were not very effective in reducing pollutant loads (USEPA, 1983). The primary reason for the mediocre performance was that mechanical sweepers of that era were unable to pick up fine-grained sediment particles that carry a substantial portion of the stormwater pollutant load. In addition, the performance of sweepers is constrained by that portion of a street's stormwater pollutant load delivered from outside street pavements (e.g., pollutants that wash onto the street from adjacent areas or are directly deposited on the street by rainfall). Street sweeping technology, however, has evolved considerably since the days of the NURP testing. Today, communities have a choice in three basic sweeping technologies to clean their urban streets: traditional mechanical sweepers that utilize a broom and conveyor belt, vacuum-assisted sweepers, and regenerative-air sweepers (those that blast air onto the pavement to loosen sediment particles and vacuum them into a hopper).

For more information, see

http://www.cwp.org/Resource_Library/Center_Docs/PWP/ELC_PWP121.pdf

Description

A rock sock is constructed of gravel that has been wrapped by wire mesh or a geotextile to form an elongated cylindrical filter. Rock socks are typically used either as a perimeter control or as part of inlet protection. When placed at angles in the curb line, rock socks are typically referred to as curb socks. Rock socks are intended to trap sediment from stormwater runoff that flows onto roadways as a result of construction activities.



Photograph RS-1. Rock socks placed at regular intervals in a curb line can help reduce sediment loading to storm sewer inlets. Rock socks can also be used as perimeter controls.

Appropriate Uses

Rock socks can be used at the perimeter of a disturbed area to control localized sediment loading. A benefit of rock socks as opposed to other perimeter controls is that they do not have to be trenched or staked into the ground; therefore, they are often used on roadway construction projects where paved surfaces are present.

Use rock socks in inlet protection applications when the construction of a roadway is substantially complete and the roadway has been directly connected to a receiving storm system.

Design and Installation

When rock socks are used as perimeter controls, the maximum recommended tributary drainage area per 100 linear feet of rock socks is approximately 0.25 acres with disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. A rock sock design detail and notes are provided in Detail RS-1. Also see the Inlet Protection Fact Sheet for design and installation guidance when rock socks are used for inlet protection and in the curb line.

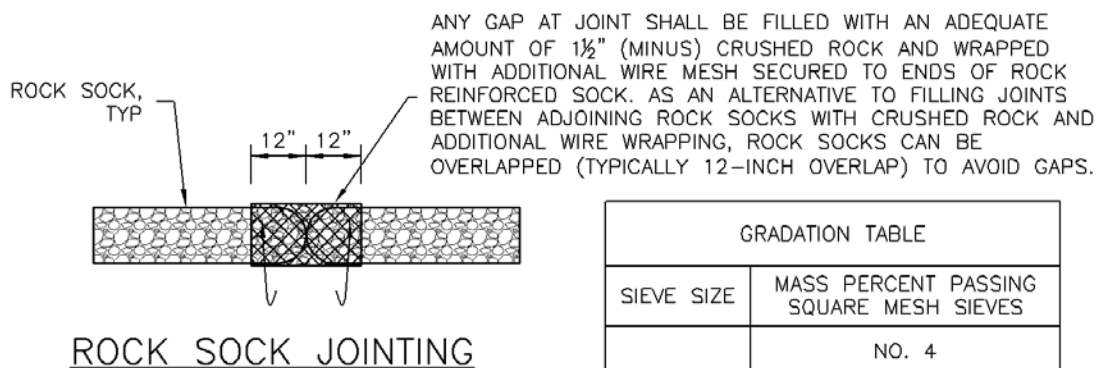
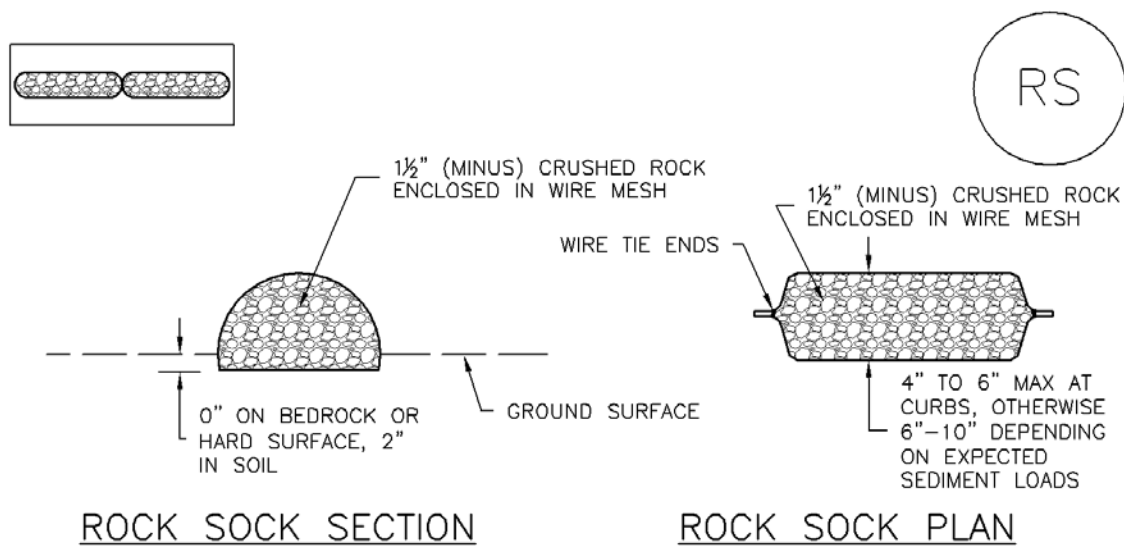
When placed in the gutter adjacent to a curb, rock socks should protrude no more than two feet from the curb in order for traffic to pass safely. If located in a high traffic area, place construction markers to alert drivers and street maintenance workers of their presence.

Maintenance and Removal

Rock socks are susceptible to displacement and breaking due to vehicle traffic. Inspect rock socks for damage and repair or replace as necessary. Remove sediment by sweeping or vacuuming as needed to maintain the functionality of the BMP, typically when sediment has accumulated behind the rock sock to one-half of the sock's height.

Once upstream stabilization is complete, rock socks and accumulated sediment should be removed and properly disposed.

Rock Sock	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

ROCK SOCK INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
-LOCATION(S) OF ROCK SOCKS.
2. CRUSHED ROCK SHALL BE 1½" (MINUS) IN SIZE WITH A FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON THIS SHEET (1½" MINUS).
3. WIRE MESH SHALL BE FABRICATED OF 10 GAGE POULTRY MESH, OR EQUIVALENT, WITH A MAXIMUM OPENING OF ½", RECOMMENDED MINIMUM ROLL WIDTH OF 48"
4. WIRE MESH SHALL BE SECURED USING "HOG RINGS" OR WIRE TIES AT 6" CENTERS ALONG ALL JOINTS AND AT 2" CENTERS ON ENDS OF SOCKS.
5. SOME MUNICIPALITIES MAY ALLOW THE USE OF FILTER FABRIC AS AN ALTERNATIVE TO WIRE MESH FOR THE ROCK ENCLOSURE.

RS-1. ROCK SOCK PERIMETER CONTROL

ROCK SOCK MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SOCKS SHALL BE REPLACED IF THEY BECOME HEAVILY SOILED, OR DAMAGED BEYOND REPAIR.
5. SEDIMENT ACCUMULATED UPSTREAM OF ROCK SOCKS SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY $\frac{1}{2}$ OF THE HEIGHT OF THE ROCK SOCK.
6. ROCK SOCKS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
7. WHEN ROCK SOCKS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

NOTE: THE DETAILS INCLUDED WITH THIS FACT SHEET SHOW COMMONLY USED, CONVENTIONAL METHODS OF ROCK SOCK INSTALLATION IN THE DENVER METROPOLITAN AREA. THERE ARE MANY OTHER SIMILAR PROPRIETARY PRODUCTS ON THE MARKET. UDFCD NEITHER NDORSES NOR DISCOURAGES USE OF PROPRIETARY PROTECTION PRODUCTS; HOWEVER, IN THE EVENT PROPRIETARY METHODS ARE USED, THE APPROPRIATE DETAIL FROM THE MANUFACTURER MUST BE INCLUDED IN THE SWMP AND THE BMP MUST BE INSTALLED AND MAINTAINED AS SHOWN IN THE MANUFACTURER'S DETAILS.

Description

A sediment control log is a linear roll made of natural materials such as straw, coconut fiber, or compost. The most common type of sediment control log has straw filling and is often referred to as a "straw wattle." All sediment control logs are used as a sediment barrier to intercept sheet flow runoff from disturbed areas.



Appropriate Uses

Sediment control logs can be used in the following applications to trap sediment:

- As perimeter control for stockpiles and the site.
- As part of inlet protection designs.
- As check dams in small drainage ditches. (Sediment control logs are not intended for use in channels with high flow velocities.)
- On disturbed slopes to shorten flow lengths (as an erosion control).
- As part of multi-layered perimeter control along a receiving water such as a stream, pond or wetland.



Photographs SCL-1 and SCL-2. Sediment control logs used as 1) a perimeter control around a soil stockpile; and, 2) as a "J-hook" perimeter control at the corner of a construction site.

Sediment control logs work well in combination with other layers of erosion and sediment controls.

Design and Installation

Sediment control logs should be installed along the contour to avoid concentrating flows. The maximum allowable tributary drainage area per 100 lineal feet of sediment control log, installed along the contour, is approximately 0.25 acres with a disturbed slope length of up to 150 feet and a tributary slope gradient no steeper than 3:1. Longer and steeper slopes require additional measures. This recommendation only applies to sediment control logs installed along the contour. When installed for other uses, such as perimeter control, it should be installed in a way that will not produce concentrated flows. For example, a "J-hook" installation may be appropriate to force runoff to pond and evaporate or infiltrate in multiple areas rather than concentrate and cause erosive conditions parallel to the BMP.

Sediment Control Log	
Functions	
Erosion Control	Moderate
Sediment Control	Yes
Site/Material Management	No

Although sediment control logs initially allow runoff to flow through the BMP, they can quickly become a barrier and should be installed as if they are impermeable.

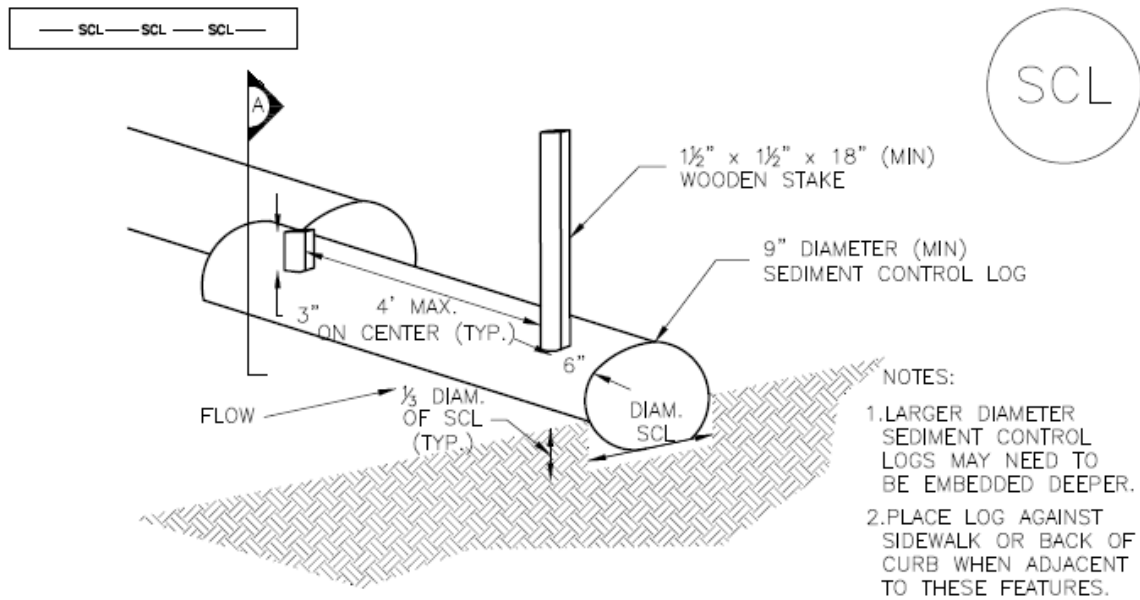
Design details and notes for sediment control logs are provided in the following details. Sediment logs must be properly installed per the detail to prevent undercutting, bypassing and displacement. When installed on slopes, sediment control logs should be installed along the contours (i.e., perpendicular to flow).

Improper installation can lead to poor performance. Be sure that sediment control logs are properly trenched (if lighter than 8 lb/foot), anchored and tightly jointed.

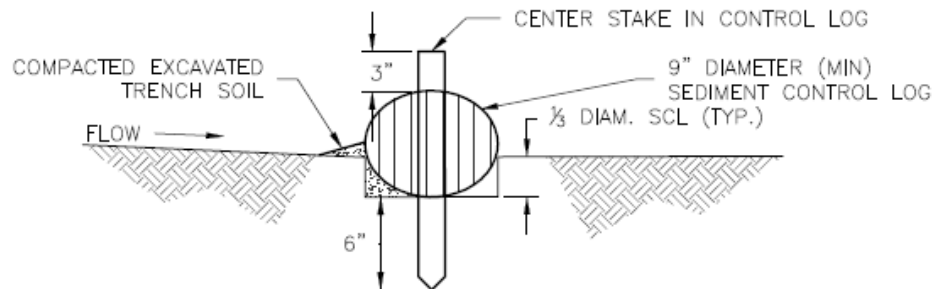
Maintenance and Removal

Be aware that sediment control logs will eventually degrade. Remove accumulated sediment before the depth is one-half the height of the sediment log and repair damage to the sediment log, typically by replacing the damaged section.

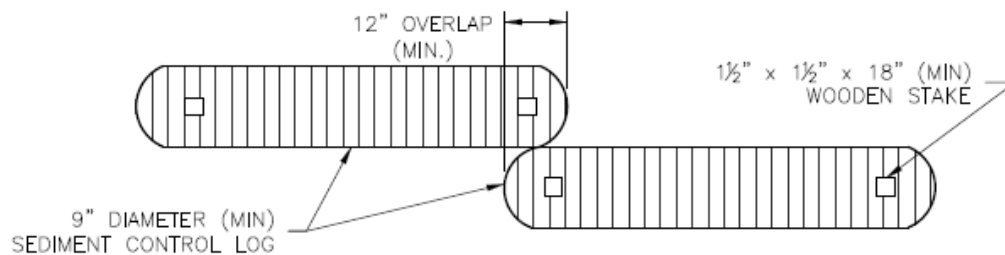
Once the upstream area is stabilized, remove and properly dispose of the logs. Areas disturbed beneath the logs may need to be seeded and mulched. Sediment control logs that are biodegradable may occasionally be left in place (e.g., when logs are used in conjunction with erosion control blankets as permanent slope breaks). However, removal of sediment control logs after final stabilization is typically appropriate when used in perimeter control, inlet protection and check dam applications. Compost from compost sediment control logs may be spread over the area and seeded as long as this does not cover newly established vegetation.



TRENCHED SEDIMENT CONTROL LOG

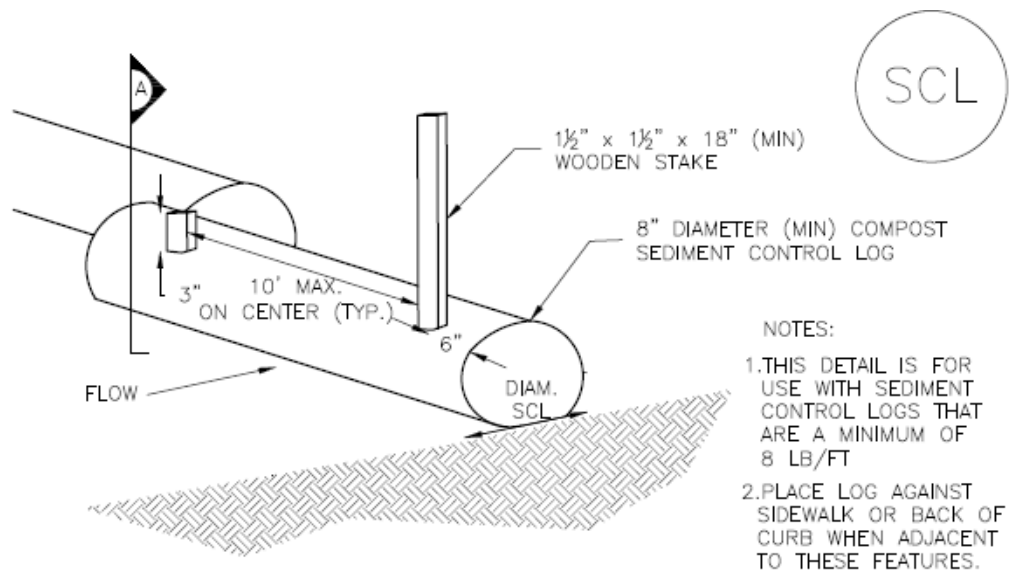


SECTION A TRENCHED SEDIMENT CONTROL LOG

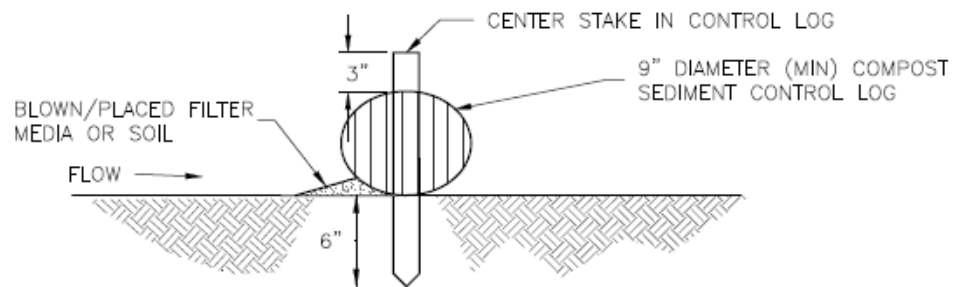
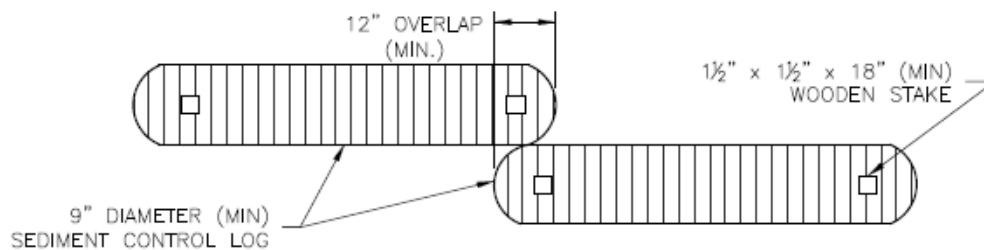


LOG JOINTS

SCL-1. TRENCHED SEDIMENT CONTROL LOG

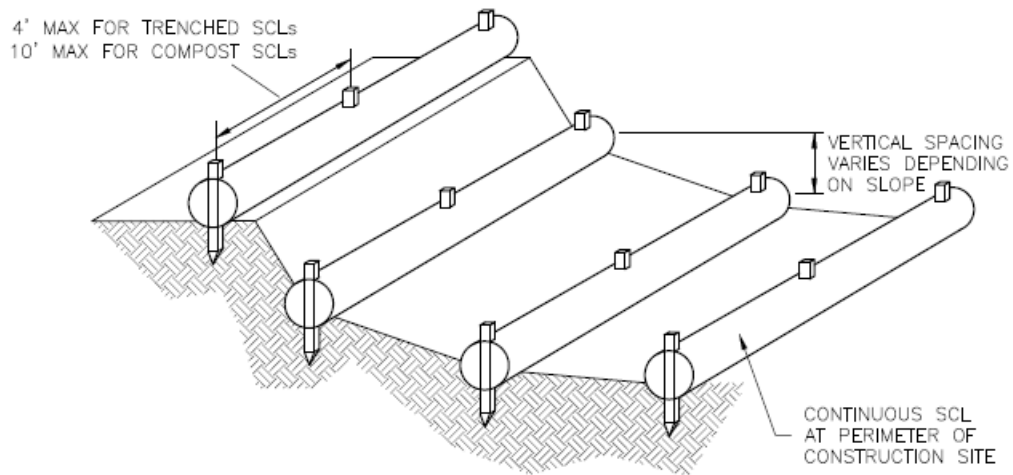


COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

SECTION A
COMPOST SEDIMENT CONTROL LOG

LOG JOINTS

SCL-2. COMPOST SEDIMENT CONTROL LOG (WEIGHTED)



SCL-3. SEDIMENT CONTROL LOGS TO CONTROL
SLOPE LENGTH

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.
2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
4. SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.
5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY $\frac{1}{3}$ OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPE) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING. COMPOST LOGS THAT ARE 8 LB/FT DO NOT NEED TO BE TRENCHED.
6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.
7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED 10' ON CENTER.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY $\frac{1}{2}$ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
5. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION. COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BAGS ARE REMOVED AND THE AREA SEEDED. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Description

Stockpile management includes measures to minimize erosion and sediment transport from soil stockpiles.

Appropriate Uses

Stockpile management should be used when soils or other erodible materials are stored at the construction site. Special attention should be given to stockpiles in close proximity to natural or manmade storm systems.



Photograph SP-1. A topsoil stockpile that has been partially revegetated and is protected by silt fence perimeter control.

Design and Installation

Locate stockpiles away from all drainage system components including storm sewer inlets. Where practical, choose stockpile locations that that will remain undisturbed for the longest period of time as the phases of construction progress. Place sediment control BMPs around the perimeter of the stockpile, such as sediment control logs, rock socks, silt fence, straw bales and sand bags. See Detail SP-1 for guidance on proper establishment of perimeter controls around a stockpile. For stockpiles in active use, provide a stabilized designated access point on the upgradient side of the stockpile.

Stabilize the stockpile surface with surface roughening, temporary seeding and mulching, erosion control blankets, or soil binders. Soils stockpiled for an extended period (typically for more than 60 days) should be seeded and mulched with a temporary grass cover once the stockpile is placed (typically within 14 days). Use of mulch only or a soil binder is acceptable if the stockpile will be in place for a more limited time period (typically 30-60 days). Timeframes for stabilization of stockpiles noted in this fact sheet are "typical" guidelines. Check permit requirements for specific federal, state, and/or local requirements that may be more prescriptive.

Stockpiles should not be placed in streets or paved areas unless no other practical alternative exists. See the Stabilized Staging Area Fact Sheet for guidance when staging in roadways is unavoidable due to space or right-of-way constraints. For paved areas, rock socks must be used for perimeter control and all inlets with the potential to receive sediment from the stockpile (even from vehicle tracking) must be protected.

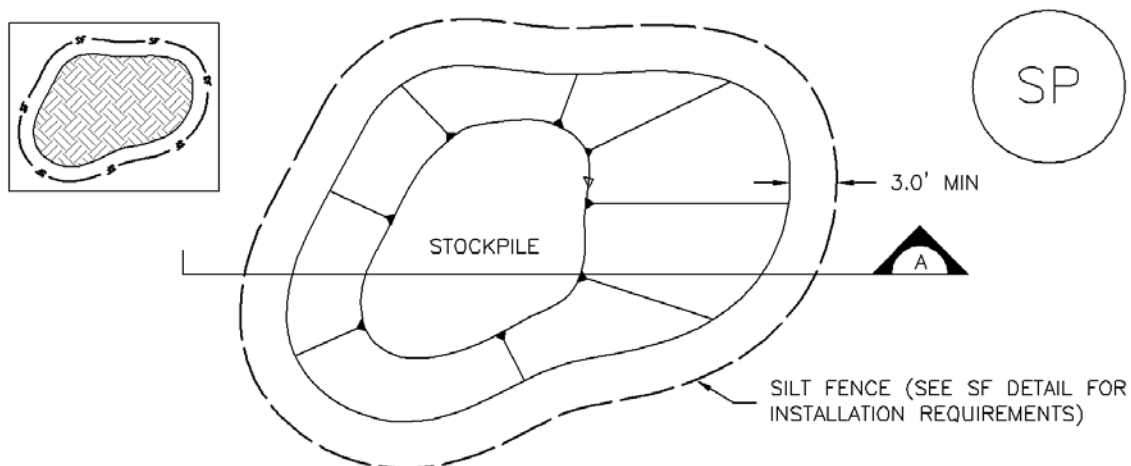
Maintenance and Removal

Inspect perimeter controls and inlet protection in accordance with their respective BMP Fact Sheets. Where seeding, mulch and/or soil binders are used, reseeding or reapplication of soil binder may be necessary.

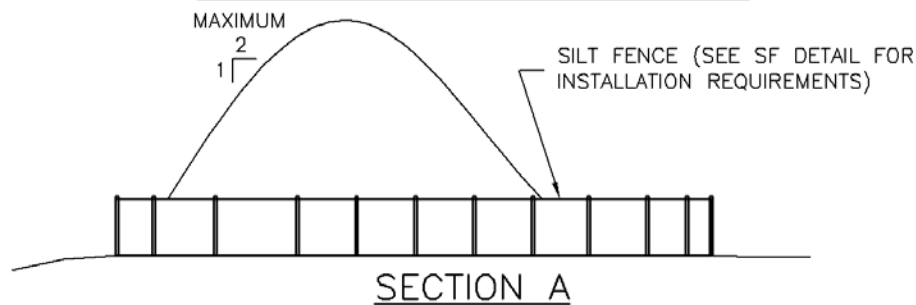
When temporary removal of a perimeter BMP is necessary to access a stockpile, ensure BMPs are reinstalled in accordance with their respective design detail section.

Stockpile Management	
Functions	
Erosion Control	Yes
Sediment Control	Yes
Site/Material Management	Yes

When the stockpile is no longer needed, properly dispose of excess materials and revegetate or otherwise stabilize the ground surface where the stockpile was located.



STOCKPILE PROTECTION PLAN



SP-1. STOCKPILE PROTECTION

STOCKPILE PROTECTION INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
 - LOCATION OF STOCKPILES.
 - TYPE OF STOCKPILE PROTECTION.
2. INSTALL PERIMETER CONTROLS IN ACCORDANCE WITH THEIR RESPECTIVE DESIGN DETAILS. SILT FENCE IS SHOWN IN THE STOCKPILE PROTECTION DETAILS; HOWEVER, OTHER TYPES OF PERIMETER CONTROLS INCLUDING SEDIMENT CONTROL LOGS OR ROCK SOCKS MAY BE SUITABLE IN SOME CIRCUMSTANCES. CONSIDERATIONS FOR DETERMINING THE APPROPRIATE TYPE OF PERIMETER CONTROL FOR A STOCKPILE INCLUDE WHETHER THE STOCKPILE IS LOCATED ON A PERVIOUS OR IMPERVIOUS SURFACE, THE RELATIVE HEIGHTS OF THE PERIMETER CONTROL AND STOCKPILE, THE ABILITY OF THE PERIMETER CONTROL TO CONTAIN THE STOCKPILE WITHOUT FAILING IN THE EVENT THAT MATERIAL FROM THE STOCKPILE SHIFTS OR SLUMPS AGAINST THE PERIMETER, AND OTHER FACTORS.
3. STABILIZE THE STOCKPILE SURFACE WITH SURFACE ROUGHENING, TEMPORARY SEEDING AND MULCHING, EROSION CONTROL BLANKETS, OR SOIL BINDERS. SOILS STOCKPILED FOR AN EXTENDED PERIOD (TYPICALLY FOR MORE THAN 60 DAYS) SHOULD BE SEEDDED AND MULCHED WITH A TEMPORARY GRASS COVER ONCE THE STOCKPILE IS PLACED (TYPICALLY WITHIN 14 DAYS). USE OF MULCH ONLY OR A SOIL BINDER IS ACCEPTABLE IF THE STOCKPILE WILL BE IN PLACE FOR A MORE LIMITED TIME PERIOD (TYPICALLY 30-60 DAYS).
4. FOR TEMPORARY STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS, INCLUDING PERIMETER CONTROL, ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

STOCKPILE PROTECTION MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

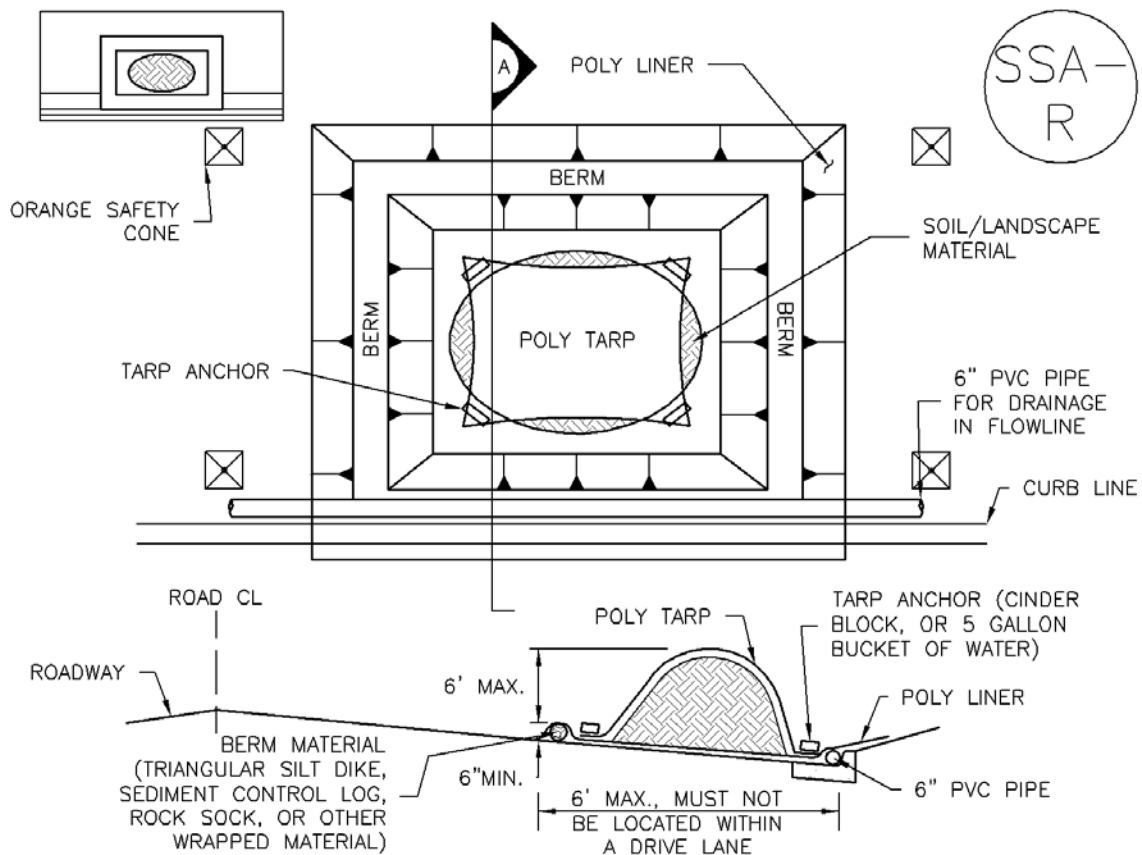
STOCKPILE PROTECTION MAINTENANCE NOTES

4. IF PERIMETER PROTECTION MUST BE MOVED TO ACCESS SOIL STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORKDAY.

5. STOCKPILE PERIMETER CONTROLS CAN BE REMOVED ONCE ALL THE MATERIAL FROM THE STOCKPILE HAS BEEN USED.

(DETAILS ADAPTED FROM PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.



SP-2. MATERIALS STAGING IN ROADWAY

MATERIALS STAGING IN ROADWAYS INSTALLATION NOTES

1. SEE PLAN VIEW FOR
 - LOCATION OF MATERIAL STAGING AREA(S).
 - CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
2. FEATURE MUST BE INSTALLED PRIOR TO EXCAVATION, EARTHWORK OR DELIVERY OF MATERIALS.
3. MATERIALS MUST BE STATIONED ON THE POLY LINER. ANY INCIDENTAL MATERIALS DEPOSITED ON PAVED SECTION OR ALONG CURB LINE MUST BE CLEANED UP PROMPTLY.
4. POLY LINER AND TARP COVER SHOULD BE OF SIGNIFICANT THICKNESS TO PREVENT DAMAGE OR LOSS OF INTEGRITY.
5. SAND BAGS MAY BE SUBSTITUTED TO ANCHOR THE COVER TARP OR PROVIDE BERMING UNDER THE BASE LINER.
6. FEATURE IS NOT INTENDED FOR USE WITH WET MATERIAL THAT WILL BE DRAINING AND/OR SPREADING OUT ON THE POLY LINER OR FOR DEMOLITION MATERIALS.
7. THIS FEATURE CAN BE USED FOR:
 - UTILITY REPAIRS.
 - WHEN OTHER STAGING LOCATIONS AND OPTIONS ARE LIMITED.
 - OTHER LIMITED APPLICATION AND SHORT DURATION STAGING.

MATERIALS STAGING IN ROADWAY MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. INSPECT PVC PIPE ALONG CURB LINE FOR CLOGGING AND DEBRIS. REMOVE OBSTRUCTIONS PROMPTLY.
5. CLEAN MATERIAL FROM PAVED SURFACES BY SWEEPING OR VACUUMING.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM AURORA, COLORADO)

Description

Surface roughening is an erosion control practice that involves tracking, scarifying, imprinting, or tilling a disturbed area to provide temporary stabilization of disturbed areas. Surface roughening creates variations in the soil surface that help to minimize wind and water erosion. Depending on the technique used, surface roughening may also help establish conditions favorable to establishment of vegetation.



Photograph SR-1. Surface roughening via imprinting for temporary stabilization.

Appropriate Uses

Surface roughening can be used to provide temporary stabilization of disturbed areas, such as when revegetation cannot be immediately established due to seasonal planting limitations. Surface roughening is not a stand-alone BMP, and should be used in conjunction with other erosion and sediment controls.

Surface roughening is often implemented in conjunction with grading and is typically performed using heavy construction equipment to track the surface. Be aware that tracking with heavy equipment will also compact soils, which is not desirable in areas that will be revegetated. Scarifying, tilling, or ripping are better surface roughening techniques in locations where revegetation is planned. Roughening is not effective in very sandy soils and cannot be effectively performed in rocky soil.

Design and Installation

Typical design details for surfacing roughening on steep and mild slopes are provided in Details SR-1 and SR-2, respectively.

Surface roughening should be performed either after final grading or to temporarily stabilize an area during active construction that may be inactive for a short time period. Surface roughening should create depressions 2 to 6 inches deep and approximately 6 inches apart. The surface of exposed soil can be roughened by a number of techniques and equipment. Horizontal grooves (running parallel to the contours of the land) can be made using tracks from equipment treads, stair-step grading, ripping, or tilling.

Fill slopes can be constructed with a roughened surface. Cut slopes that have been smooth graded can be roughened as a subsequent operation. Roughening should follow along the contours of the slope. The tracks left by truck mounted equipment working perpendicular to the contour can leave acceptable horizontal depressions; however, the equipment will also compact the soil.

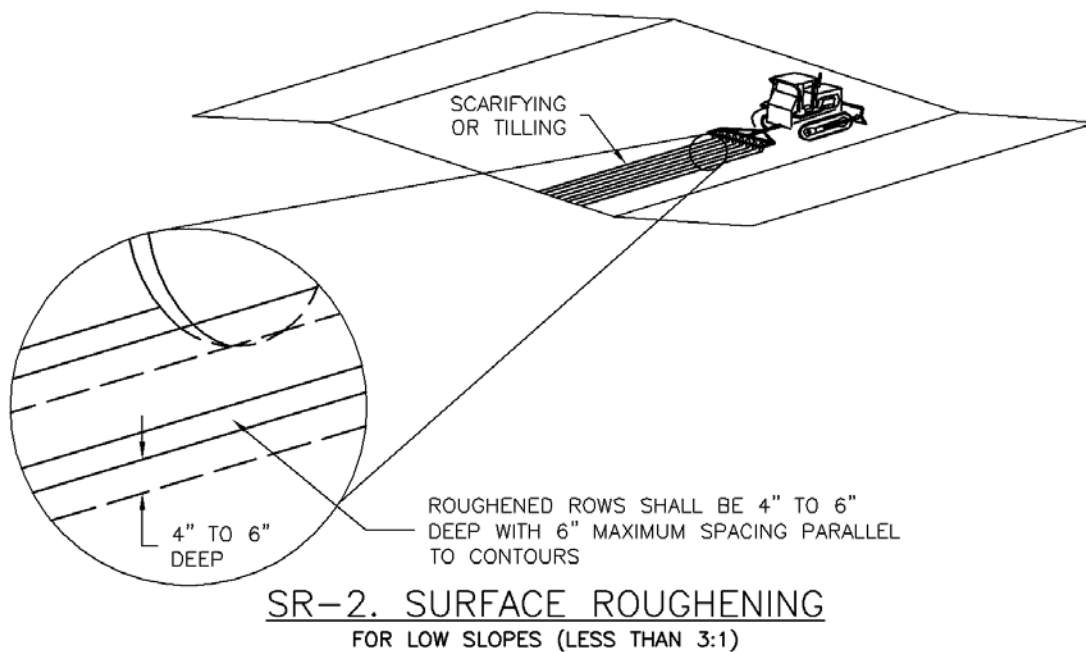
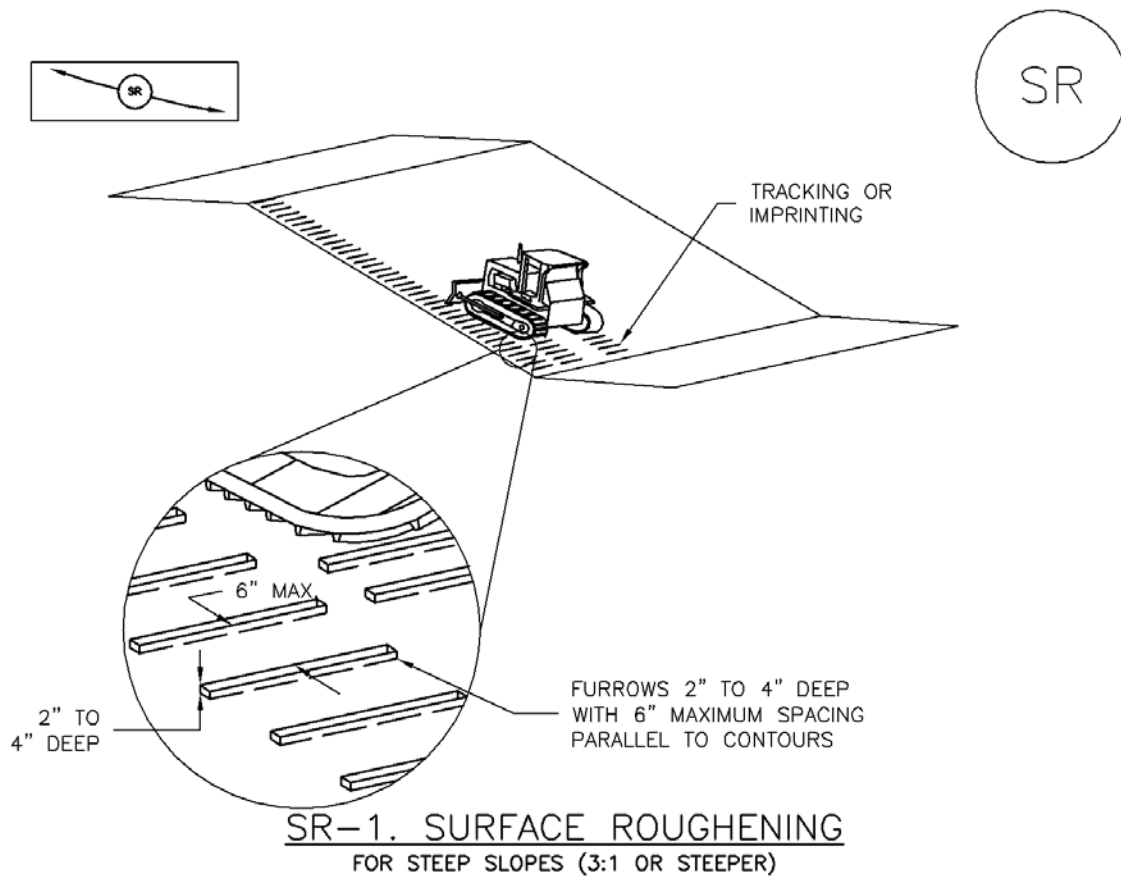
Surface Roughening	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

Maintenance and Removal

Care should be taken not to drive vehicles or equipment over areas that have been surface roughened. Tire tracks will smooth the roughened surface and may cause runoff to collect into rills and gullies.

Because surface roughening is only a temporary control, additional treatments may be necessary to maintain the soil surface in a roughened condition.

Areas should be inspected for signs of erosion. Surface roughening is a temporary measure, and will not provide long-term erosion control.



SURFACE ROUGHENING INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
 –LOCATION(S) OF SURFACE ROUGHENING.
2. SURFACE ROUGHENING SHALL BE PROVIDED PROMPTLY AFTER COMPLETION OF FINISHED GRADING (FOR AREAS NOT RECEIVING TOPSOIL) OR PRIOR TO TOPSOIL PLACEMENT OR ANY FORECASTED RAIN EVENT.
3. AREAS WHERE BUILDING FOUNDATIONS, PAVEMENT, OR SOD WILL BE PLACED WITHOUT DELAY IN THE CONSTRUCTION SEQUENCE, SURFACE ROUGHENING IS NOT REQUIRED.
4. DISTURBED SURFACES SHALL BE ROUGHENED USING RIPPING OR TILLING EQUIPMENT ON THE CONTOUR OR TRACKING UP AND DOWN A SLOPE USING EQUIPMENT TREADS.
5. A FARMING DISK SHALL NOT BE USED FOR SURFACE ROUGHENING.

SURFACE ROUGHENING MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACE UPON DISCOVERY OF THE FAILURE.
4. VEHICLES AND EQUIPMENT SHALL NOT BE DRIVEN OVER AREAS THAT HAVE BEEN SURFACE ROUGHENED.
5. IN NON-TURF GRASS FINISHED AREAS, SEEDING AND MULCHING SHALL TAKE PLACE DIRECTLY OVER SURFACE ROUGHENED AREAS WITHOUT FIRST SMOOTHING OUT THE SURFACE.
6. IN AREAS NOT SEEDED AND MULCHED AFTER SURFACE ROUGHENING, SURFACES SHALL BE RE-ROUGHENED AS NECESSARY TO MAINTAIN GROOVE DEPTH AND SMOOTH OVER RILL EROSION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Description

Vehicle tracking controls provide stabilized construction site access where vehicles exit the site onto paved public roads. An effective vehicle tracking control helps remove sediment (mud or dirt) from vehicles, reducing tracking onto the paved surface.



Photograph VTC-1. A vehicle tracking control pad constructed with properly sized rock reduces off-site sediment tracking.

Appropriate Uses

Implement a stabilized construction entrance or vehicle tracking control where frequent heavy vehicle traffic exits the construction site onto a paved roadway. An effective vehicle tracking control is particularly important during the following conditions:

- Wet weather periods when mud is easily tracked off site.
- During dry weather periods where dust is a concern.
- When poorly drained, clayey soils are present on site.

Although wheel washes are not required in designs of vehicle tracking controls, they may be needed at particularly muddy sites.

Design and Installation

Construct the vehicle tracking control on a level surface. Where feasible, grade the tracking control towards the construction site to reduce off-site runoff. Place signage, as needed, to direct construction vehicles to the designated exit through the vehicle tracking control. There are several different types of stabilized construction entrances including:

VTC-1. Aggregate Vehicle Tracking Control. This is a coarse-aggregate surfaced pad underlain by a geotextile. This is the most common vehicle tracking control, and when properly maintained can be effective at removing sediment from vehicle tires.

VTC-2. Vehicle Tracking Control with Construction Mat or Turf Reinforcement Mat. This type of control may be appropriate for site access at very small construction sites with low traffic volume over vegetated areas. Although this application does not typically remove sediment from vehicles, it helps protect existing vegetation and provides a stabilized entrance.

Vehicle Tracking Control	
Functions	
Erosion Control	Moderate
Sediment Control	Yes
Site/Material Management	Yes

VTC-3. Stabilized Construction Entrance/Exit with Wheel Wash. This is an aggregate pad, similar to VTC-1, but includes equipment for tire washing. The wheel wash equipment may be as simple as hand-held power washing equipment to more advance proprietary systems. When a wheel wash is provided, it is important to direct wash water to a sediment trap prior to discharge from the site.

Vehicle tracking controls are sometimes installed in combination with a sediment trap to treat runoff.

Maintenance and Removal

Inspect the area for degradation and replace aggregate or material used for a stabilized entrance/exit as needed. If the area becomes clogged and ponds water, remove and dispose of excess sediment or replace material with a fresh layer of aggregate as necessary.

With aggregate vehicle tracking controls, ensure rock and debris from this area do not enter the public right-of-way.

Remove sediment that is tracked onto the public right of way daily or more frequently as needed. Excess sediment in the roadway indicates that the stabilized construction entrance needs maintenance.

Ensure that drainage ditches at the entrance/exit area remain clear.

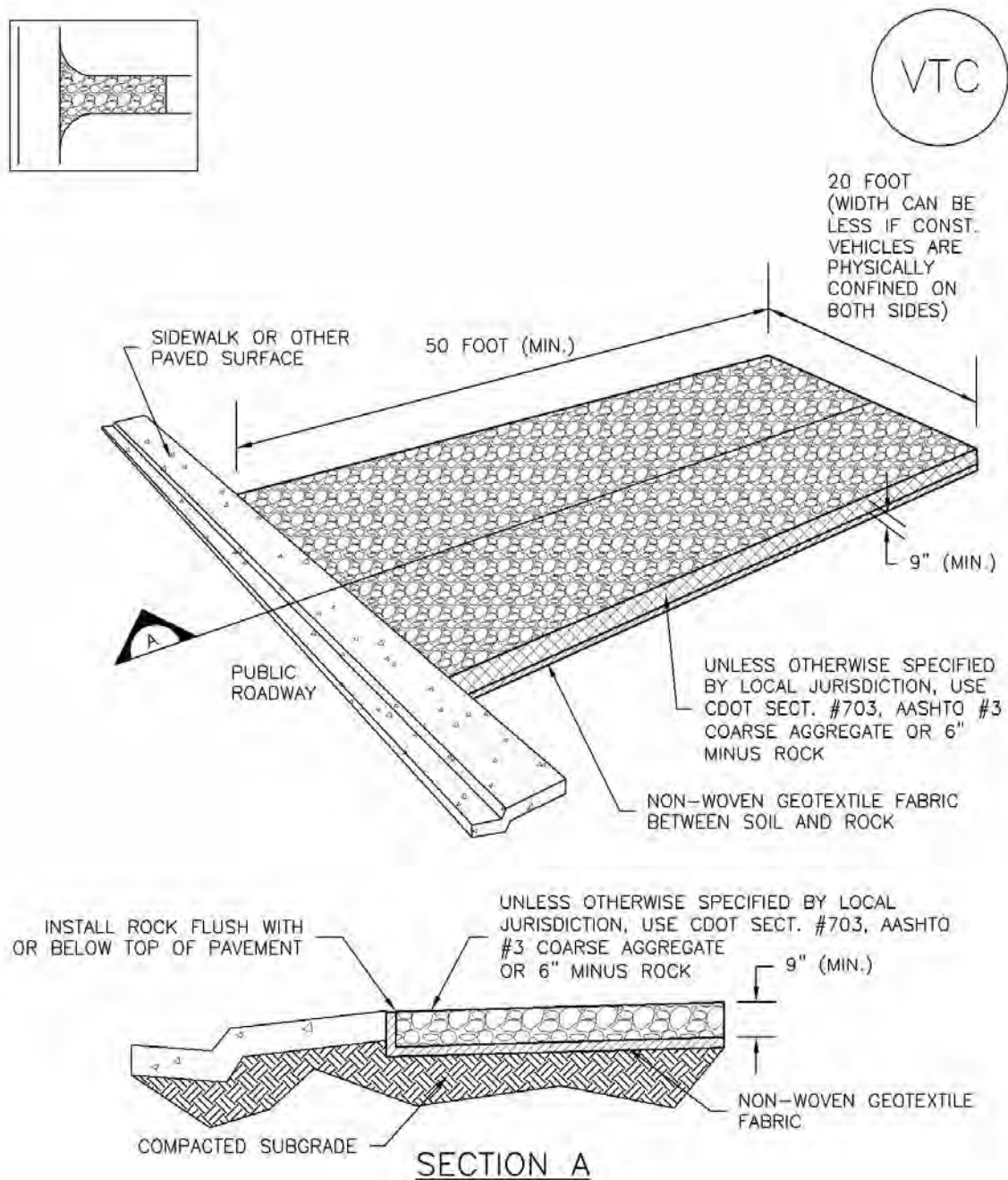
A stabilized entrance should be removed only when there is no longer the potential for vehicle tracking to occur. This is typically after the site has been stabilized.

When wheel wash equipment is used, be sure that the wash water is discharged to a sediment trap prior to discharge. Also inspect channels conveying the water from the wash area to the sediment trap and stabilize areas that may be eroding.

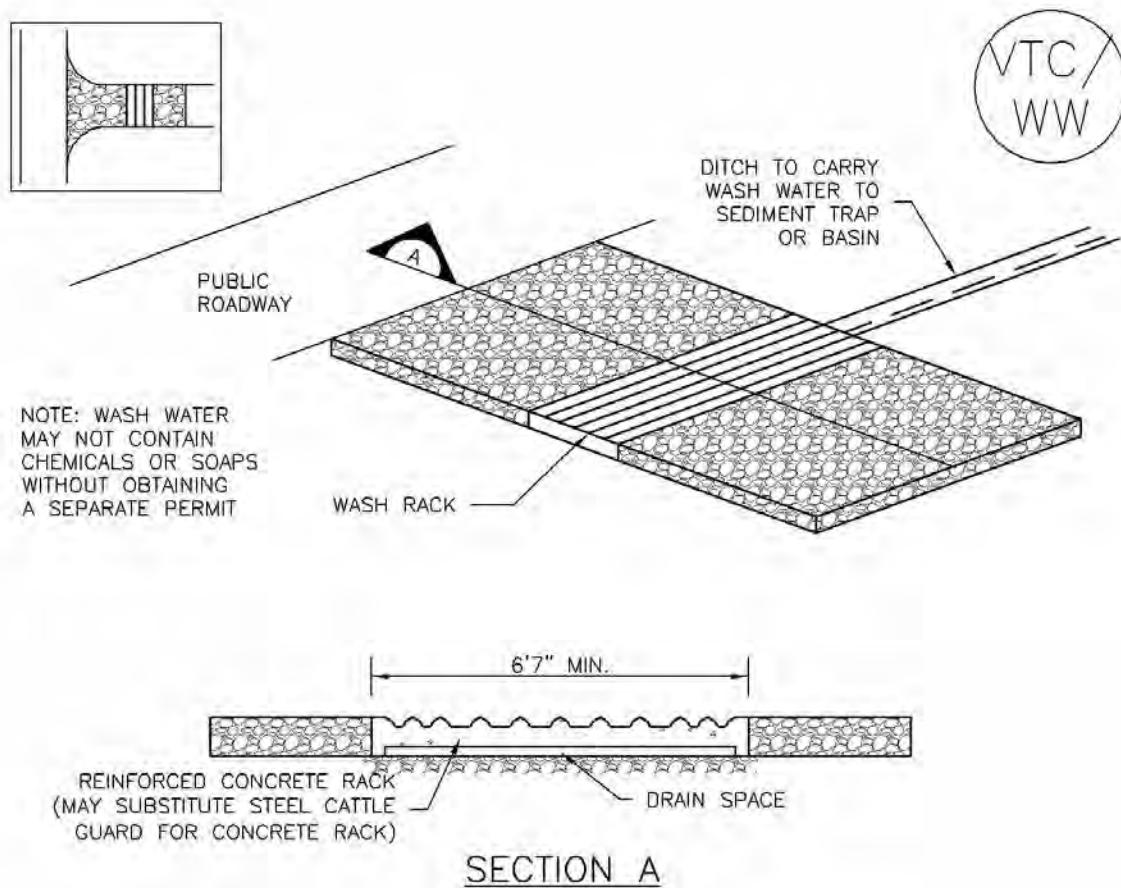
When a construction entrance/exit is removed, excess sediment from the aggregate should be removed and disposed of appropriately. The entrance should be promptly stabilized with a permanent surface following removal, typically by paving.



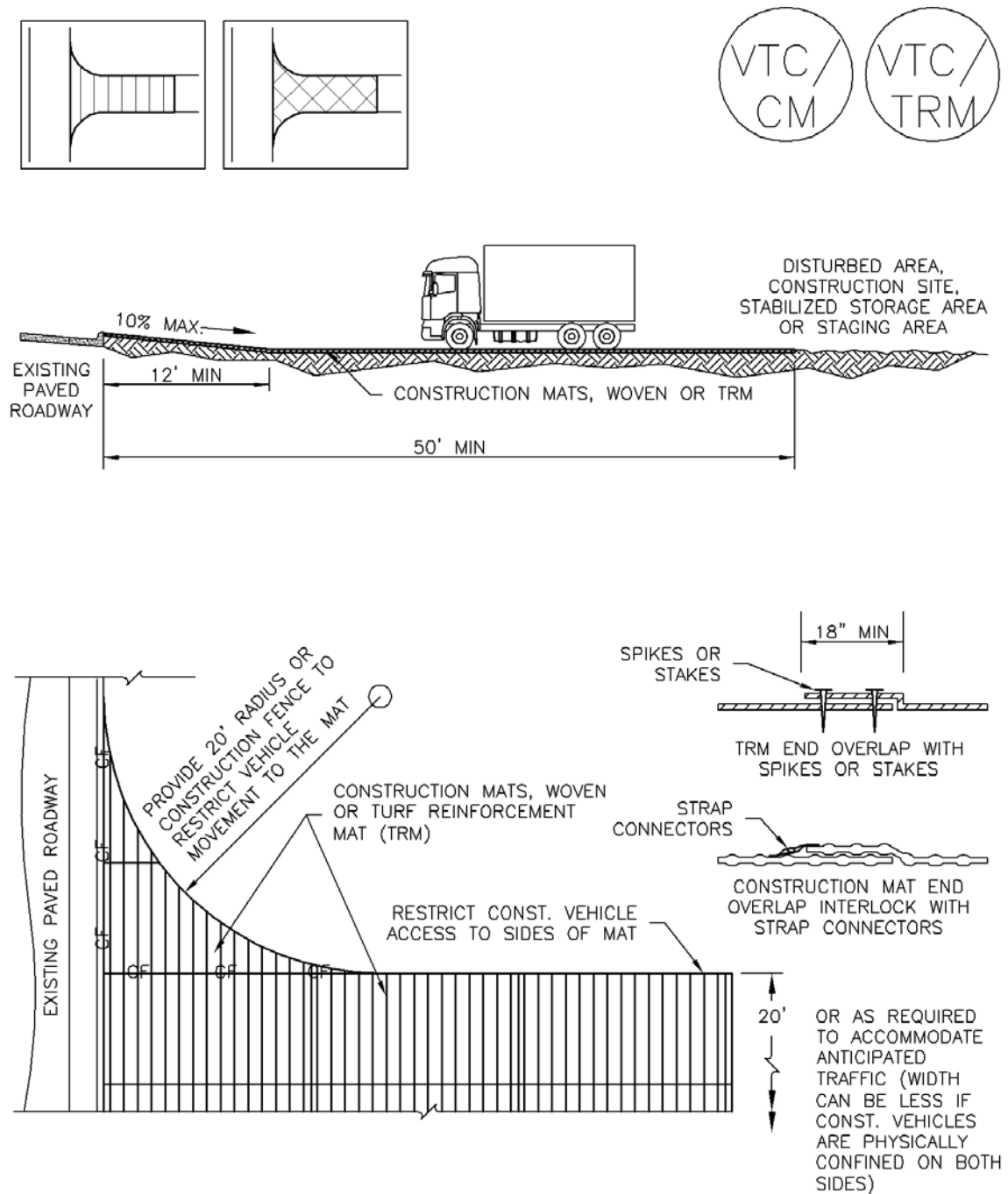
Photograph VTC-2. A vehicle tracking control pad with wheel wash facility. Photo courtesy of Tom Gore.



VTC-1. AGGREGATE VEHICLE TRACKING CONTROL



VTC-2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK



VTC-3. VEHICLE TRACKING CONTROL W/ CONSTRUCTION MAT OR TURF REINFORCEMENT MAT (TRM)

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR
 - LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S).
 - TYPE OF CONSTRUCTION ENTRANCE(S)/EXITS(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM).
2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.
3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.
4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
5. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.
6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.
5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM CITY OF BROOMFIELD, COLORADO, NOT AVAILABLE IN AUTOCAD)

SWP-CI BIG RED Curb Inlet Protector Product Reference



The Midwest's Most Trusted
Site Solutions Provider

GEO SOURCE

Product

The SWP-CI "Big Red" Filter is a REUSABLE inlet protector that keeps out sediment throughout the entire construction project. There are no pockets to fill, no velcro bags, no assembly etc. Simply place in front of the inlet, make sure it lays in the contour, and you are DONE!

"Big Red" CI Protector Advantages:

- Easy to Install
- Versatile for a variety of curb inlets
- Reusable and Extremely easy to clean
- Made from 90% Inert Recycled Materials

Fabric Properties

Property	Test	Units	Value
Weight	ASTM D5261	oz/sq yd	9.3
Grab Tensile Strength	ASTM D4632	lb	warp 250 fill 290
Tear Strength	ASTM D4533	lb	warp 60 fill 50
Burst	ASTM D3786	psi	440

Installation

Simple installation also translates into simple removal, cleanup and re-use at the next project or phase. Maintenance is simple as well by lifting the unit from the inlet, shaking the mud off of it, removing the sediment on the concrete, and placing the unit back. If it is severely filled with sediment, wash it out in a vegetated area and it is as good as new.

All of these features and benefits combine to make the SWP-CI "Big Red" curb inlet protector the perfect choice for all curb inlet applications. It comes in 54" long for single curb inlets and 104" lengths for double curb inlets. Custom sizes are also available depending on quantity.



1 "Big Red" CI protector protecting a concrete swale.

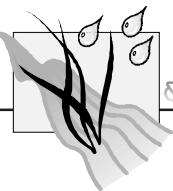


2 This is a 14' custom unit. Big Red is very easy to work with.

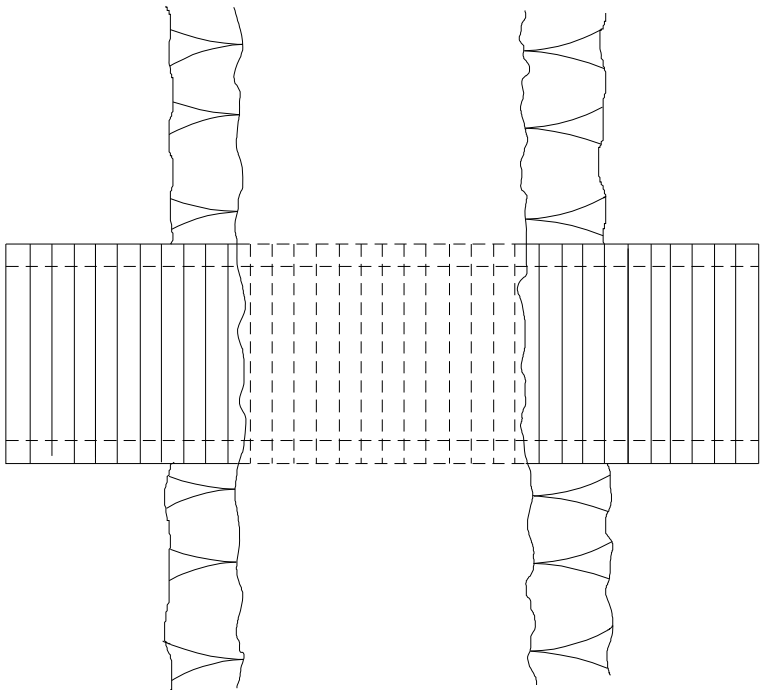


3 Single "Big Red" CI Protector.

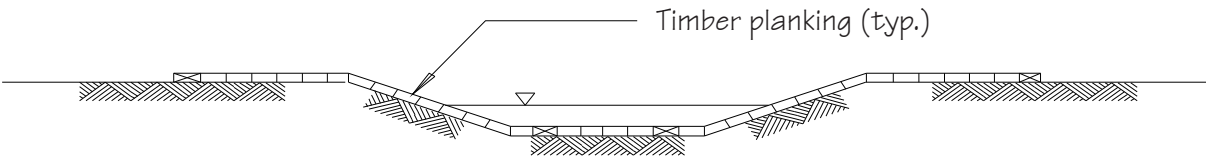
product reference



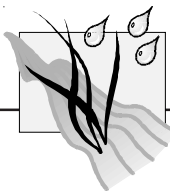
Temp. Crossing - Timber Mat



Plan



Profile



Temp. Crossing - Timber Mat

Construction Notes:

1. **Restrictions** - No installation or removal of a temporary timber mat crossing will be permitted from March 15 through June 15 to minimize interference with fish spawning and migration. Further restrictions may apply in accordance with other State and/or Federal permits.
2. **Installation**
 - a. Placement - Mats shall be placed only in those areas designated on the approved plan.
 - b. Stabilization - All areas disturbed during the installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard and Specifications for Temporary Vegetative Stabilization.
3. **Maintenance**
 - a. Inspection - Periodic inspection shall be performed to ensure that the crossing, stream bed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.
 - b. Maintenance - Maintenance shall be performed as needed, in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway floodplain.
4. **Restoration**
 - a. Removal - It may be necessary to temporarily remove a timber mat crossing in anticipation of unusual storm events. When the crossing has served its purpose, all components shall be removed within 14 calendar days. In all cases, the crossing materials shall be removed within one year of installation.
 - b. Final Clean-up - Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross-section, and protection of the streambanks from erosion. Removed materials shall be stored outside of the waterway floodplain.
 - c. Method - Removal of the structure and clean up of the area shall be accomplished without construction equipment working in the waterway channel.
 - d. Final Stabilization - All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard and Specifications for Permanent Vegetative Stabilization.



Appendix D: Pre-Construction Photos

HDR Site Visit, January 2022



View facing SW. Planned access along STR 8.



View facing NE. Existing access road at L St and 3rd St intersection.



Existing vegetation at planned STR 18. Approximately, 30 % vegetative cover.



View facing NW. Planned STR 18. Approximately, 50 % of vegetative cover.



View facing E. Existing access along Valley Dr, E of STR 21.



View facing NE. Planned STR 21. Approximately, 50% vegetative cover.



View facing SW. Hillside along planned STR 22.



View facing N. Existing access road, W Valley Dr, between planned STR 22-23.



Existing vegetation, down-gradient of planned STR 22-23. Approximately, 60% vegetative cover.



Existing vegetation between planned STR 26-27. Approximately, 20% vegetative cover.



View facing NE. Planned STR 26. Approximately, 50% vegetative cover.



View facing NE. Existing access road to STR 39-41. Approximately, 30% vegetative cover.



Existing Vegetation at planned STR 34. Approximately, 20% vegetative cover.



View facing SW. Planned STR 117. Approximately, 50% vegetative cover.



View facing NW. Adjacent stream crossing, SW of planned STR 67. Approximately 40% vegetative cover.



View facing E. Dry tributary W of planned STR 69. Approximately, 60% vegetative cover.



View W. Dry Beaver Creek drainage to Red Creek.



View facing E to Beaver Creek. Between Top Notch Trail and planned STR 82.



View NW. Planned STR 73. Approximately, 20% vegetative cover.



Existing vegetation at planned STR 73. Approximately, 20 % vegetative cover.



View facing NE. Planned STR 77. Approximately, 50% vegetative cover.



View facing NW. Old cattle pond NE of planned STR 77.



View facing N. Existing access along STR 76-77.



View facing E. Planned STR 82. Approximately, 40% vegetative cover.



View facing E. Existing Access to planned STR 82-86.



View facing S. Planned STR 110. Approximately, 40% vegetative cover.



Existing vegetation at planned STR 110. Approximately, 10 % vegetative cover.



View facing S. Planned STR 117.



Existing vegetation at planned STR 117. Approximately, 5 % vegetative cover.



View facing NW. Existing access road off Stone City Rd onto CR 3111 towards planned STR 122.



View facing W. Area SW of planned STR 193-196. Approximately, 50% vegetative cover.



View facing W. Existing access along E Auburn Ave.



Existing vegetation S of planned STR 193. Approximately, 20% vegetative cover.



View facing E. Wild Horse Creek, NE of planned STR 200. Approximately, 80% vegetative cover.



View facing W. Planned STR 200.



View facing E. Horseshoe Creek along N Platteville Blvd. Approximately, 80% vegetative cover.



View facing N. Existing STR 211.



View facing E. Existing STR 211.



Existing vegetation at planned STR 243. Approximately, 70% vegetative cover.



View facing S. Planned STR 243. Approximately 60% vegetative cover.



View facing E. Existing access road to planned STR 239-243.



View facing NE. Existing access road off E Linda Ave.



View facing NE. No land disturbance will occur S of STR 1A – 254.



View facing S. Planned STR 254.



Appendix E: Reference Documents



2022 Canon City Reliability- Desert Cove to North Penrose

Spill Prevention Plan

Black Hills Environmental Contact:

Ally Little, Senior Environmental Professional

(307) 778-2123 (office)

(402) 917-8557 (cell)

Ally.little@blackhillscorp.com

Spill Prevention Plan Overview

This spill prevention plan has been developed to specifically address preventive measures and practices to reduce the likelihood of an accidental release of a hazardous or regulated liquid, primarily from the use of heavy equipment during construction, and in the event such a release occurs, to expedite the response to and remediation of the release. This plan restricts the location of fuel storage, fueling activities, and construction equipment maintenance in the construction site and provides procedures for these activities. All contractor personnel, subcontractor personnel, and fuel suppliers working on the Canon West Reliability project are responsible for the implementation of the measures and procedures defined in the plan.

Preventive Measures

Preventive measures will be highly emphasized from the beginning of the project. The proper implementation and training of these procedures will greatly reduce the chances of an accidental release, and the associated responses outlined later in this plan.

Training – All contractor employees, subcontractor employees, and fuel suppliers will be required to read the spill prevention plan prior to commencing work on the project. Site training will also be required for all employees in the procedures specific to this project and more importantly working in a river environment. This training will include information regarding the following site specific operations:

- The proper operation and maintenance of fueling equipment.
- The proper handling and storage of hazardous or regulated liquids.
- The location of and allowable practices at delineated fueling and maintenance sites.
- The strategic locations of release response equipment and the requirement of specific crews to have on hand adequate materials to contain and recover spills.
- The proper use and practices regarding response equipment and materials to effectively mitigate a spill.
- To instill in each employee the importance of this plan and to educate each individual the impacts on the environment of a potential spill.

Training is provided annually in-person from the Environmental Services Department or online on the BHYOU training system. Contractors will be trained at a pre-construction tailgate.

Release Response Equipment- The contractor will provide kits to deal with a potential spill at the staging area and on their trucks. These kits will be stocked with a quantity of absorbent, barrier, and containment materials sufficient to contain and recover spills that could occur from the equipment with the largest on board volume of fuel and lubricant. Kits should also include:

- Drip pans, funnels, buckets, absorbent pads, and epoxy resins to deal with fluids at the point of the leak.
- Buckets and drums to transfer contained fluids from the point of the leak to a satisfactory holding container.
- Containment booms, absorbent materials, containment barriers, and skimmer pumps to deal with potential ground spills.

Equipment Inspection-Equipment, including transformers, will be inspected for leaks, cracks, excessive corrosion, or other flaws that may compromise the integrity of its fuel, hydraulic, or cooling system prior to mobilization to the jobsite. Furthermore, equipment will be inspected during daily fueling and maintenance procedures for leaks on these systems, and issues will be addressed immediately.

Regulated Materials Storage and Handling

The following fluids and materials will potentially be present on the jobsite:

- Diesel Fuel
- Gasoline
- Engine Oil
- Transmission/Drive Train Oil
- Hydraulic Oil
- Gear Oil
- Lubricating Grease
- Coolant
- Power Steering Fluid
- Brake Fluid
- Propane
- Transformer oil

Storage for these products should include secondary containment that provides a minimum containment volume equal to 110 percent of the volume of the sum of the storage vessels in the container. In the event of a leak or spill, the liquid will be contained within the structure. Chemical storage will not take place in flood-prone areas or near Waters of the United States

Refueling of storage vessels and containers will be done only by suppliers and supplier personnel who have received training on this spill prevention plan, and who are familiar with the procedures outlined in it. All fuel nozzles shall be equipped with automatic shut off valves. All fueling activities will require the presence of two properly trained personnel, primarily to prevent a potential spill, and also to aid in the treatment of one.

When feasible, all equipment will be fueled in the designated fueling area, to be positioned and protected in a location on the job that provides the least risk to a potential spill to a wetland or waterway. Designated fueling areas should be a minimum of 100 feet

from the river or any creek or drainage. Fueling for immobile equipment outside of the designated fueling area will be from approved storage containers with a volume of less than 300 gallons. Fueling activities will take place only when two qualified personnel are involved. Equipment shall not be overfilled in a manner that does not provide room for the fuel to expand in a reaction to heat or overfilling that restricts operation of the equipment on severe slopes without the spilling of fuel.

Spill Response

In the event of a spill, the event will be contained and remediated as soon as possible. Project Manager and Environmental Professional will be notified immediately, regardless of spill quantity. Environmental Professional will report to local, state, and federal agencies as required and Right-of-Way agent will notify the landowner. The contractor will appoint two spill coordinators for the site. One of the spill coordinators will be required to be on the site at all times while work is in progress. It will be the responsibility of the spill coordinator to assess the incident and provide the best plan to remedy and mitigate the affects of the spill.

All spills regardless of size will be reported to Project Manager and Environmental Professional. The person observing the incident will take the following actions:

- Assess the safety of the situation (including risk to public).
- If safe, remove possible ignition sources, and make every effort to stop the source of the spill.
- Recruit the most available assistance from coworkers.
- Make every effort to contain the spill: drip pans, buckets, absorbent pads, etc.
- Identify the leak source and use all available means to stop the leak.
- Address any fluids that have hit the ground, using absorbent pads, materials, and isolating the leak from spreading or being transferred by groundwater.
- Excavate any contaminated materials and move them to a previously identified off site disposal area.

Contact Information

Spill coordinator contact information is as follows:

Seth Boutilier, Project Manager	(719) 546-6449 (office) (719) 248-5101 (cell)
Ally Little, Senior Environmental Professional	(307) 778-2123 (office) (402) 917-8557 (cell)



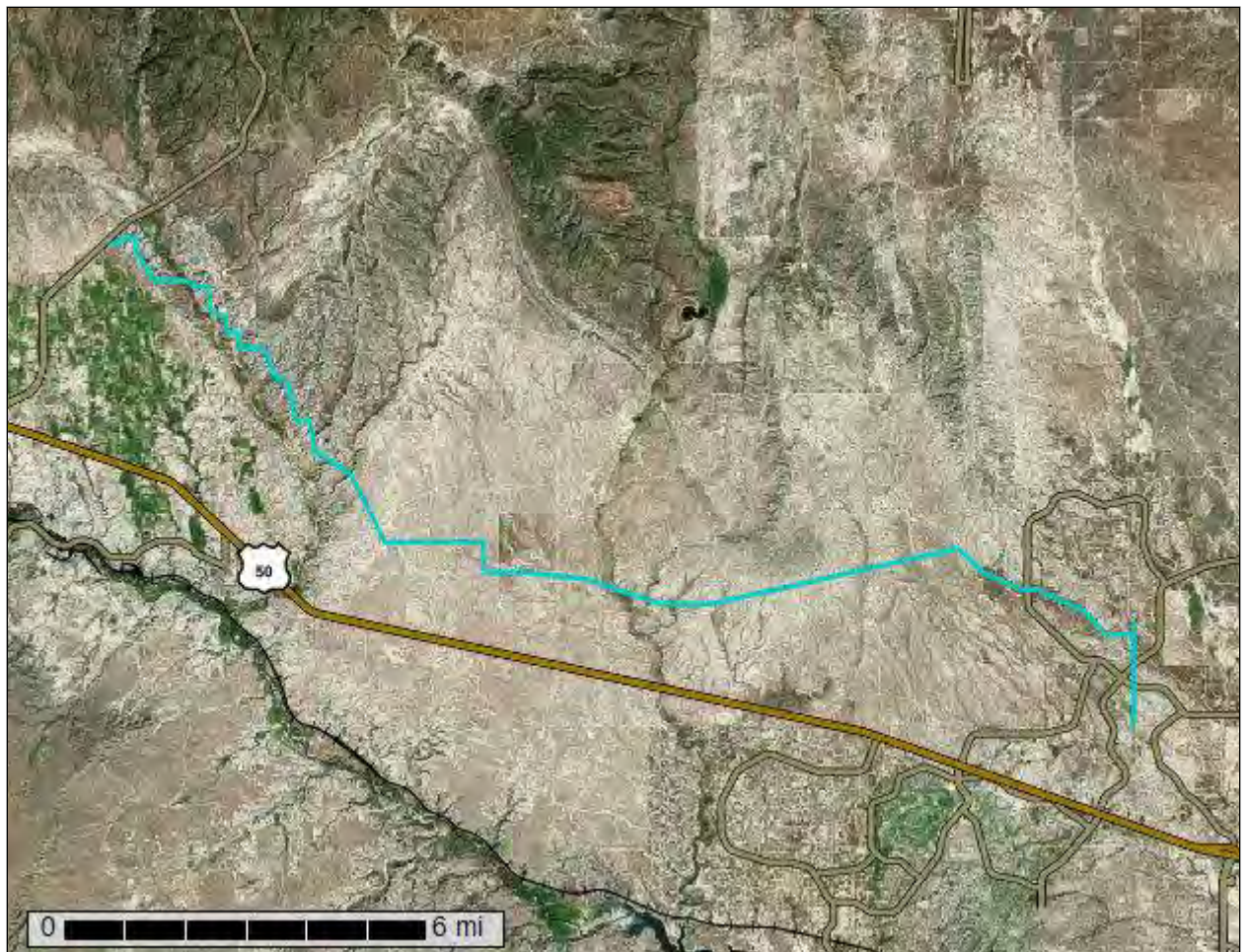
United States
Department of
Agriculture

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 Fremont County Area, Colorado; and Pueblo Area, Colorado, Parts of Pueblo and Custer Counties



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

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Contents

Preface	2
Soil Map	5
Soil Map.....	6
Legend.....	7
Map Unit Legend.....	9
Map Unit Descriptions.....	10
Fremont County Area, Colorado.....	12
3—Aquic Ustifluvents.....	12
52—Kim-Cascajo complex, 2 to 15 percent slopes.....	13
62—Limon-Gaynor silty clay loams, 3 to 12 percent slopes.....	14
66—Manvel silt loam, 2 to 6 percent slopes.....	16
68—Manzanola loam, 1 to 5 percent slopes.....	18
71—Midway clay loam, 3 to 15 percent slopes.....	19
72—Midway-Cascajo complex, 10 to 40 percent slopes.....	20
83—Penrose-Minnequa complex, 1 to 15 percent slopes.....	22
84—Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes.....	24
Pueblo Area, Colorado, Parts of Pueblo and Custer Counties.....	28
Gh—Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded.....	28
Ha—Haversid silt loam, 0 to 2 percent slopes, frequently flooded.....	30
Km—Kim fine sandy loam.....	31
LvB—Limon silty clay, 0 to 5 percent slopes, gullied.....	32
MaB—Manvel silt loam, 2 to 6 percent slopes, dry.....	33
Mv—Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry.....	35
MzA—Manzanola silty clay loam, saline, 0 to 2 percent slopes.....	37
PM—Penrose-Minnequa complex, 1 to 15 percent slopes, dry.....	39
PmE—Penrose-Minnequa complex, 1 to 15 percent slopes.....	41
PrF—Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes.....	43
SgD—Shingle silty clay loam, 1 to 9 percent slopes.....	46
Soil Information for All Uses	48
Soil Properties and Qualities.....	48
Soil Erosion Factors.....	48
K Factor, Whole Soil (Canon West Reliability – Desert Cove to N Penrose).....	48
Wind Erodibility Group (Canon West Reliability – Desert Cove to N Penrose).....	53
Soil Qualities and Features.....	58
Hydrologic Soil Group (Canon West Reliability – Desert Cove to N Penrose).....	58
References	65

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






Custom Soil Resource Report

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 1:24,000.

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: Fremont County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

Soil Survey Area: Pueblo Area, Colorado, Parts of Pueblo and Custer Counties
Survey Area Data: Version 20, Aug 31, 2021

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
3	Aquic Ustifluvents	11.3	2.0%
52	Kim-Cascajo complex, 2 to 15 percent slopes	0.4	0.1%
62	Limon-Gaynor silty clay loams, 3 to 12 percent slopes	14.6	2.6%
66	Manvel silt loam, 2 to 6 percent slopes	2.6	0.5%
68	Manzanola loam, 1 to 5 percent slopes	8.4	1.5%
71	Midway clay loam, 3 to 15 percent slopes	3.0	0.5%
72	Midway-Cascajo complex, 10 to 40 percent slopes	2.9	0.5%
83	Penrose-Minnequa complex, 1 to 15 percent slopes	44.3	7.8%
84	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	62.5	11.0%
Subtotals for Soil Survey Area		150.1	26.4%
Totals for Area of Interest		569.0	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Gh	Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded	6.9	1.2%
Ha	Haversid silt loam, 0 to 2 percent slopes, frequently flooded	86.4	15.2%
Km	Kim fine sandy loam	1.8	0.3%
LvB	Limon silty clay, 0 to 5 percent slopes, gullied	11.1	2.0%
MaB	Manvel silt loam, 2 to 6 percent slopes, dry	89.6	15.7%
Mv	Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry	124.4	21.9%
MzA	Manzanola silty clay loam, saline, 0 to 2 percent slopes	2.1	0.4%
PM	Penrose-Minnequa complex, 1 to 15 percent slopes, dry	71.5	12.6%
PmE	Penrose-Minnequa complex, 1 to 15 percent slopes	1.2	0.2%
PrF	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	1.9	0.3%

Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SgD	Shingle silty clay loam, 1 to 9 percent slopes	21.1	3.7%
Subtotals for Soil Survey Area		418.1	73.5%
Totals for Area of Interest		569.0	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.

Custom Soil Resource Report

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.

Fremont County Area, Colorado

3—Aquic Ustifluvents

Map Unit Setting

National map unit symbol: jqj0
Elevation: 4,950 to 5,100 feet
Mean annual precipitation: 11 to 13 inches
Mean annual air temperature: 51 to 53 degrees F
Frost-free period: 155 to 170 days

Map Unit Composition

Aquic ustifluvents and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aquic Ustifluvents

Setting

Landform: Flood plains, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified alluvium

Typical profile

A - 0 to 13 inches: loam
Cg1 - 13 to 40 inches: stratified fine sandy loam to loam
Cg2 - 40 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)
Depth to water table: About 12 to 48 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R069XY073CO - Riverbottom
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 5 percent
Hydric soil rating: No

52—Kim-Cascajo complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: jqjt
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Kim and similar soils: 55 percent
Cascajo and similar soils: 43 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kim

Setting

Landform: Fan terraces, stream terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium

Typical profile

A - 0 to 4 inches: loam
C - 4 to 60 inches: loam

Properties and qualities

Slope: 2 to 10 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 to high
(0.60 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 slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Hydric soil rating: No

Description of Cascajo

Setting

Landform: Fan terraces, fans, stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: very gravelly sandy loam

Bk - 6 to 21 inches: extremely cobbly sandy loam

C - 21 to 60 inches: extremely cobbly sand

Properties and qualities

Slope: 10 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: 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: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: A

Ecological site: R069XY064CO - Gravel Breaks LRU's A and B

Hydric soil rating: No

Minor Components

Midway

Percent of map unit: 1 percent

Hydric soil rating: No

Shingle

Percent of map unit: 1 percent

Hydric soil rating: No

62—Limon-Gaynor silty clay loams, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: jqk5

Elevation: 5,100 to 5,500 feet

Mean annual precipitation: 11 to 13 inches

Mean annual air temperature: 51 to 53 degrees F

Frost-free period: 150 to 170 days

Custom Soil Resource Report

Farmland classification: Not prime farmland

Map Unit Composition

Limon and similar soils: 60 percent

Gaynor and similar soils: 38 percent

Minor components: 2 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limon

Setting

Landform: Hills

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from shale

Typical profile

A - 0 to 3 inches: silty clay loam

C - 3 to 46 inches: silty clay

Cr - 46 to 50 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent

Depth to restrictive feature: 40 to 60 inches to paralithic bedrock

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

Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Ecological site: R069XY033CO - Salt Flat LRU's A and B

Hydric soil rating: No

Description of Gaynor

Setting

Landform: Hills

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: silty clay loam

C - 4 to 30 inches: silty clay

Cr - 30 to 34 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Hydric soil rating: No

Minor Components

Midway

Percent of map unit: 1 percent
Hydric soil rating: No

Gullies

Percent of map unit: 1 percent
Hydric soil rating: No

66—Manvel silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2rgqk
Elevation: 3,700 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Manvel and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manvel

Setting

Landform: Interfluves, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 5 inches: silt loam
Bk1 - 5 to 32 inches: silt loam
Bk2 - 32 to 48 inches: silt loam
Bky - 48 to 79 inches: silt loam

Properties and qualities

Slope: 2 to 6 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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Hydric soil rating: No

Minor Components

Minnequa

Percent of map unit: 7 percent
Landform: Pediments, ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear, convex
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Hydric soil rating: No

Manzanola

Percent of map unit: 5 percent
Landform: Drainageways, fan remnants
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear

Custom Soil Resource Report

Ecological site: R069XY042CO - Clayey Plains LRU's A and B

Hydric soil rating: No

Penrose

Percent of map unit: 3 percent

Landform: Hillslopes, scarps, cuestras

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Crest

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: R069XY058CO - Limestone Breaks LRU's A and B

Hydric soil rating: No

68—Manzanola loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: jqkc

Elevation: 5,100 to 5,700 feet

Mean annual precipitation: 11 to 13 inches

Mean annual air temperature: 47 to 53 degrees F

Frost-free period: 140 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manzanola and similar soils: 99 percent

Minor components: 1 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzanola

Setting

Landform: Plains, fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 4 inches: loam

Btk - 4 to 17 inches: silty clay loam

Bk - 17 to 60 inches: silty clay loam

Properties and qualities

Slope: 1 to 5 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

Custom Soil Resource Report

Calcium carbonate, maximum content: 5 percent

Gypsum, maximum content: 3 percent

Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum: 15.0

Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Hydric soil rating: No

Minor Components

Gaynor

Percent of map unit: 1 percent

Hydric soil rating: No

71—Midway clay loam, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: jqkh

Elevation: 5,100 to 5,600 feet

Mean annual precipitation: 11 to 13 inches

Mean annual air temperature: 51 to 53 degrees F

Frost-free period: 150 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Midway and similar soils: 97 percent

Minor components: 3 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway

Setting

Landform: Plains, knolls, hills

Landform position (three-dimensional): Crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 3 inches: clay loam

C - 3 to 16 inches: clay

Cr - 16 to 20 inches: weathered bedrock

Properties and qualities

Slope: 3 to 15 percent

Depth to restrictive feature: 6 to 20 inches to paralithic bedrock

Custom Soil Resource Report

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: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Hydric soil rating: No

Minor Components

Gaynor

Percent of map unit: 1 percent
Hydric soil rating: No

Limon

Percent of map unit: 1 percent
Hydric soil rating: No

Shingle

Percent of map unit: 1 percent
Hydric soil rating: No

72—Midway-Cascajo complex, 10 to 40 percent slopes

Map Unit Setting

National map unit symbol: jqkj
Elevation: 5,300 to 6,500 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 150 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Midway and similar soils: 70 percent
Cascajo and similar soils: 28 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway

Setting

Landform: Fan terraces, hills, knobs
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 3 inches: very gravelly clay loam
C - 3 to 15 inches: clay
Cr - 15 to 19 inches: weathered bedrock

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
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
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R069XY064CO - Gravel Breaks LRU's A and B
Hydric soil rating: No

Description of Cascajo

Setting

Landform: Fan terraces, hills, knobs
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: very gravelly sandy loam
Bk - 6 to 21 inches: extremely cobbly sandy loam
C - 21 to 60 inches: extremely cobbly sand

Properties and qualities

Slope: 10 to 40 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 (2.00 to 6.00 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R069XY064CO - Gravel Breaks LRU's A and B
Hydric soil rating: No

Minor Components

Kim

Percent of map unit: 1 percent
Hydric soil rating: No

Shallow and mod. deep soils

Percent of map unit: 1 percent
Hydric soil rating: No

83—Penrose-Minnequa complex, 1 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2rgr8
Elevation: 4,500 to 6,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 125 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Penrose and similar soils: 50 percent
Minnequa and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penrose

Setting

Landform: Scarps, hogbacks, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Slope alluvium over residuum weathered from limestone

Custom Soil Resource Report

Typical profile

A - 0 to 4 inches: channery loam
C - 4 to 15 inches: channery loam
R - 15 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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: 70 percent
Maximum salinity: Nonsaline (0.1 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R069XY058CO - Limestone Breaks LRU's A and B
Other vegetative classification: Limestone Breaks #58 (069XY058CO_2)
Hydric soil rating: No

Description of Minnequa

Setting

Landform: Ridges, interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Slope alluvium over residuum weathered from limestone and shale

Typical profile

A - 0 to 6 inches: silt loam
Bw - 6 to 18 inches: silt loam
Bky - 18 to 32 inches: loam
Cr - 32 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
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: 45 percent

Custom Soil Resource Report

Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.1 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Forage suitability group: Loamy (G069XW017CO)
Other vegetative classification: Loamy (G069XW017CO)
Hydric soil rating: No

Minor Components

Willid

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy (G069XW017CO)
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Shingle

Percent of map unit: 5 percent
Landform: Hills, scree slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Other vegetative classification: Shaly Plains #46 (069XY046CO_2), Needs Field Review (G069XW050CO)
Hydric soil rating: No

84—Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes

Map Unit Setting

National map unit symbol: 2pd2n
Elevation: 3,700 to 6,400 feet
Mean annual precipitation: 10 to 14 inches

Custom Soil Resource Report

Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 130 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Penrose and similar soils: 40 percent

Midway and similar soils: 35 percent

Rock outcrop: 15 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penrose

Setting

Landform: Mesas, cuestras

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 5 inches: loam

AC - 5 to 9 inches: loam

C - 9 to 15 inches: channery loam

R - 15 to 79 inches: bedrock

Properties and qualities

Slope: 10 to 45 percent

Depth to restrictive feature: 14 to 20 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 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 75 percent

Maximum salinity: Very slightly saline (2.0 to 3.9 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 8e

Land capability classification (nonirrigated): 8e

Hydrologic Soil Group: D

Ecological site: R069XY058CO - Limestone Breaks LRU's A and B

Hydric soil rating: No

Description of Midway

Setting

Landform: Hills, mesas, pediments

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear, concave, convex

Across-slope shape: Convex

Parent material: Slope alluvium over residuum weathered from shale

Custom Soil Resource Report

Typical profile

A - 0 to 3 inches: clay
Bw - 3 to 8 inches: clay
Bk - 8 to 14 inches: clay
Cr - 14 to 79 inches: bedrock

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: 12 to 20 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 low (0.00 to 0.03 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: Very slightly saline to slightly saline (2.0 to 7.9 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 8e
Land capability classification (nonirrigated): 8e
Hydrologic Soil Group: D
Ecological site: R069XY048CO - Shale Breaks LRU's A and B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Scarps
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Crest
Parent material: Limestone

Typical profile

R - 0 to 83 inches: bedrock

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Minnequa

Percent of map unit: 5 percent
Landform: Ridges, interfluves
Landform position (two-dimensional): Backslope, summit

Custom Soil Resource Report

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex, linear

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Hydric soil rating: No

Razor

Percent of map unit: 5 percent

Landform: Pediments

Down-slope shape: Linear

Across-slope shape: Convex

Ecological site: R069XY042CO - Clayey Plains LRU's A and B

Hydric soil rating: No

Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

Gh—Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tqyt

Elevation: 4,500 to 5,800 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 130 to 170 days

Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Glenberg, occasionally flooded, and similar soils: 60 percent

Haversid, occasionally flooded, and similar soils: 30 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenberg, Occasionally Flooded

Setting

Landform: Flood plains, flood-plain steps

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

Ap - 0 to 12 inches: fine sandy loam

C1 - 12 to 17 inches: very fine sandy loam

C2 - 17 to 33 inches: fine sandy loam

C3 - 33 to 42 inches: sandy loam

C4 - 42 to 49 inches: loamy sand

C5 - 49 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively 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: Frequent

Frequency of ponding: None

Calcium carbonate, maximum content: 9 percent

Gypsum, maximum content: 1 percent

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Sodium adsorption ratio, maximum: 2.0

Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Custom Soil Resource Report

Hydrologic Soil Group: A

Ecological site: R069XY031CO - Sandy Bottomland LRU's A and B

Hydric soil rating: No

Description of Haversid, Occasionally Flooded

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 6 inches: silt loam

Bw - 6 to 15 inches: silt loam

C - 15 to 79 inches: stratified fine sandy loam to loam to silt loam

Properties and qualities

Slope: 0 to 2 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: 10 percent

Maximum salinity: Slightly saline (4.0 to 7.9 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Ecological site: R069XY037CO - Saline Overflow LRU's A and B

Hydric soil rating: No

Minor Components

Las animas, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains, flood-plain steps

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R069XY030CO - Salt Meadow LRU's A and B

Hydric soil rating: Yes

Ha—Haversid silt loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2tqyn

Elevation: 4,500 to 5,800 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 130 to 170 days

Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Haversid, frequently flooded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haversid, Frequently Flooded

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 6 inches: silt loam

Bw - 6 to 15 inches: silt loam

C - 15 to 79 inches: stratified fine sandy loam to loam to silt loam

Properties and qualities

Slope: 0 to 2 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: 10 percent

Maximum salinity: Slightly saline (4.0 to 7.9 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Ecological site: R069XY037CO - Saline Overflow LRU's A and B

Hydric soil rating: No

Minor Components

Glenberg, frequently flooded

Percent of map unit: 10 percent

Landform: Flood plains, flood-plain steps

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R069XY031CO - Sandy Bottomland LRU's A and B

Hydric soil rating: No

Km—Kim fine sandy loam

Map Unit Setting

National map unit symbol: 36cl

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 11 to 14 inches

Mean annual air temperature: 50 to 54 degrees F

Frost-free period: 145 to 175 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Kim and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kim

Setting

Landform: Stream terraces, fans

Landform position (three-dimensional): Tread, tal

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 5 inches: fine sandy loam

AC - 5 to 15 inches: loam

C1 - 15 to 35 inches: silt loam

C2 - 35 to 60 inches: loam

Properties and qualities

Slope: 0 to 1 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

Custom Soil Resource Report

Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Hydric soil rating: No

Minor Components

Manvel

Percent of map unit: 10 percent
Hydric soil rating: No

Otero

Percent of map unit: 10 percent
Hydric soil rating: No

LvB—Limon silty clay, 0 to 5 percent slopes,gullied

Map Unit Setting

National map unit symbol: 36cv
Elevation: 4,300 to 5,100 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 145 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Limon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limon

Setting

Landform: Fans, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from shale

Typical profile

A - 0 to 4 inches: silty clay
C - 4 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 5 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 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: 2 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R069XY033CO - Salt Flat LRU's A and B
Hydric soil rating: No

Minor Components

Midway

Percent of map unit: 8 percent
Hydric soil rating: No

Shale outcrop

Percent of map unit: 7 percent
Hydric soil rating: No

MaB—Manvel silt loam, 2 to 6 percent slopes, dry

Map Unit Setting

National map unit symbol: 2rgqg
Elevation: 3,600 to 6,000 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Manvel, dry, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manvel, Dry

Setting

Landform: Fans, interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Alluvium derived from limestone and shale

Typical profile

A - 0 to 7 inches: silt loam
Bk1 - 7 to 25 inches: silt loam
Bk2 - 25 to 49 inches: silt loam
Bk3 - 49 to 79 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to moderately saline (1.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Forage suitability group: Loamy, Limy (G069XW022CO)
Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy, Limy (G069XW022CO)
Hydric soil rating: No

Minor Components

Minnequa, dry

Percent of map unit: 7 percent
Landform: Pediments, ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear, convex
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Other vegetative classification: Loamy (G069XW017CO)
Hydric soil rating: No

Wilid, dry

Percent of map unit: 5 percent

Custom Soil Resource Report

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy (G069XW017CO)
Hydric soil rating: No

Penrose, dry

Percent of map unit: 3 percent
Landform: Scarps
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R069XY058CO - Limestone Breaks LRU's A and B
Other vegetative classification: Limestone Breaks #58 (069XY058CO_2)
Hydric soil rating: No

Mv—Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry

Map Unit Setting

National map unit symbol: 2rgqm
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Minnequa, dry, and similar soils: 55 percent
Manvel, dry, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Minnequa, Dry

Setting

Landform: Pediments, ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Slope alluvium and/or residuum weathered from limestone and shale

Typical profile

A - 0 to 6 inches: silt loam

Custom Soil Resource Report

Bw - 6 to 17 inches: silt loam
Bk - 17 to 35 inches: silty clay loam
Cr - 35 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
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: 45 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.1 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Forage suitability group: Loamy (G069XW017CO)
Other vegetative classification: Loamy (G069XW017CO)
Hydric soil rating: No

Description of Manvel, Dry

Setting

Landform: Fans, interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Alluvium derived from limestone and shale

Typical profile

A - 0 to 7 inches: silt loam
Bk1 - 7 to 25 inches: silt loam
Bk2 - 25 to 49 inches: silt loam
Bk3 - 49 to 79 inches: silt loam

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to moderately saline (1.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0

Custom Soil Resource Report

Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Forage suitability group: Loamy, Limy (G069XW022CO)

Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy, Limy (G069XW022CO)

Hydric soil rating: No

Minor Components

Manvel, deep, dry

Percent of map unit: 10 percent

Landform: Fans, interfluves

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy, Limy (G069XW022CO)

Hydric soil rating: No

Penrose

Percent of map unit: 5 percent

Landform: Hills, hogbacks, scarps

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: R069XY058CO - Limestone Breaks LRU's A and B

Other vegetative classification: Limestone Breaks #58 (069XY058CO_2), Not Suited (G069XW000CO)

Hydric soil rating: No

MzA—Manzanola silty clay loam, saline, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rgrg

Elevation: 3,900 to 6,000 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 130 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Manzanola and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzanola

Setting

Landform: Drainageways, fan remnants, interfluves, terraces

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Side slope, tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from shale

Typical profile

A - 0 to 4 inches: silty clay loam

Bt1 - 4 to 11 inches: silty clay loam

Bt2 - 11 to 26 inches: silty clay loam

Bk1 - 26 to 38 inches: silty clay loam

Bk2 - 38 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

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: 14 percent

Gypsum, maximum content: 3 percent

Maximum salinity: Moderately saline (8.0 to 15.0 mmhos/cm)

Sodium adsorption ratio, maximum: 13.0

Available water supply, 0 to 60 inches: Very high (about 12.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: C

Ecological site: R069XY037CO - Saline Overflow LRU's A and B

Other vegetative classification: Saline Overflow (069XY037CO_1)

Hydric soil rating: No

Minor Components

Haversid

Percent of map unit: 5 percent

Landform: Drainageways, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R069XY037CO - Saline Overflow LRU's A and B

Other vegetative classification: Loamy (G069XW017CO)

Hydric soil rating: No

Aguilar

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R069XY033CO - Salt Flat LRU's A and B
Other vegetative classification: Salt Flat #33 (069AY033CO_2), Sodic, Sodic/
Saline (G069XW027CO)
Hydric soil rating: No

PM—Penrose-Minnequa complex, 1 to 15 percent slopes, dry

Map Unit Setting

National map unit symbol: 2rgrb
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Penrose and similar soils: 45 percent
Minnequa, dry, and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penrose

Setting

Landform: Hogbacks, scarps, hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 4 inches: channery loam
C - 4 to 15 inches: channery loam
R - 15 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 70 percent
Maximum salinity: Nonsaline (0.1 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R069XY058CO - Limestone Breaks LRU's A and B
Hydric soil rating: No

Description of Minnequa, Dry

Setting

Landform: Ridges, interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Eolian deposits and/or residuum weathered from limestone and shale

Typical profile

A - 0 to 6 inches: silt loam
Bw - 6 to 17 inches: silt loam
Bk - 17 to 35 inches: silty clay loam
Cr - 35 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
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: 45 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.1 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Forage suitability group: Loamy (G069XW017CO)
Other vegetative classification: Loamy (G069XW017CO)
Hydric soil rating: No

Minor Components

Manvel, dry

Percent of map unit: 10 percent

Landform: Fans, interfluves

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy, Limy (G069XW022CO)

Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent

Hydric soil rating: No

PmE—Penrose-Minnequa complex, 1 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2rgr8

Elevation: 4,500 to 6,500 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 125 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Penrose and similar soils: 50 percent

Minnequa and similar soils: 35 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penrose

Setting

Landform: Scarps, hogbacks, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 4 inches: channery loam

C - 4 to 15 inches: channery loam

R - 15 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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: 70 percent
Maximum salinity: Nonsaline (0.1 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R069XY058CO - Limestone Breaks LRU's A and B
Other vegetative classification: Limestone Breaks #58 (069XY058CO_2)
Hydric soil rating: No

Description of Minnequa

Setting

Landform: Ridges, interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Slope alluvium over residuum weathered from limestone and shale

Typical profile

A - 0 to 6 inches: silt loam
Bw - 6 to 18 inches: silt loam
Bky - 18 to 32 inches: loam
Cr - 32 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
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: 45 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.1 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Forage suitability group: Loamy (G069XW017CO)
Other vegetative classification: Loamy (G069XW017CO)
Hydric soil rating: No

Minor Components

Shingle

Percent of map unit: 5 percent
Landform: Hills, scree slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Other vegetative classification: Shaly Plains #46 (069XY046CO_2), Needs Field Review (G069XW050CO)
Hydric soil rating: No

Wilid

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Other vegetative classification: Loamy Plains #6 (069XY006CO_2), Loamy (G069XW017CO)
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

PrF—Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes

Map Unit Setting

National map unit symbol: 2pd2n
Elevation: 3,700 to 6,400 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Penrose and similar soils: 40 percent

Midway and similar soils: 35 percent

Rock outcrop: 15 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penrose

Setting

Landform: Mesas, cuestas

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 5 inches: loam

AC - 5 to 9 inches: loam

C - 9 to 15 inches: channery loam

R - 15 to 79 inches: bedrock

Properties and qualities

Slope: 10 to 45 percent

Depth to restrictive feature: 14 to 20 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 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 75 percent

Maximum salinity: Very slightly saline (2.0 to 3.9 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 8e

Land capability classification (nonirrigated): 8e

Hydrologic Soil Group: D

Ecological site: R069XY058CO - Limestone Breaks LRU's A and B

Hydric soil rating: No

Description of Midway

Setting

Landform: Hills, mesas, pediments

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear, concave, convex

Across-slope shape: Convex

Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 3 inches: clay

Custom Soil Resource Report

Bw - 3 to 8 inches: clay
Bk - 8 to 14 inches: clay
Cr - 14 to 79 inches: bedrock

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: 12 to 20 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 low (0.00 to 0.03 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: Very slightly saline to slightly saline (2.0 to 7.9 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 8e
Land capability classification (nonirrigated): 8e
Hydrologic Soil Group: D
Ecological site: R069XY048CO - Shale Breaks LRU's A and B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Scarps
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Crest
Parent material: Limestone

Typical profile

R - 0 to 83 inches: bedrock

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Razor

Percent of map unit: 5 percent
Landform: Pediments
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R069XY042CO - Clayey Plains LRU's A and B
Hydric soil rating: No

Minnequa

Percent of map unit: 5 percent

Landform: Ridges, interfluves

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex, linear

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Hydric soil rating: No

SgD—Shingle silty clay loam, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2xzcm

Elevation: 4,260 to 5,900 feet

Mean annual precipitation: 10 to 12 inches

Mean annual air temperature: 50 to 54 degrees F

Frost-free period: 130 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Shingle and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shingle

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from shale

Typical profile

A - 0 to 3 inches: silty clay loam

Bw1 - 3 to 7 inches: silty clay loam

Bw2 - 7 to 13 inches: silty clay loam

Cr - 13 to 79 inches: bedrock

Properties and qualities

Slope: 1 to 9 percent

Depth to restrictive feature: 9 to 17 inches to paralithic bedrock

Drainage class: Well drained

Runoff class: High

Custom Soil Resource Report

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

Gypsum, maximum content: 4 percent

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: R069XY046CO - Shaly Plains LRU's A and B

Hydric soil rating: No

Minor Components

Minnequa

Percent of map unit: 10 percent

Landform: Ridges, hillslopes

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex, linear

Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.

Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

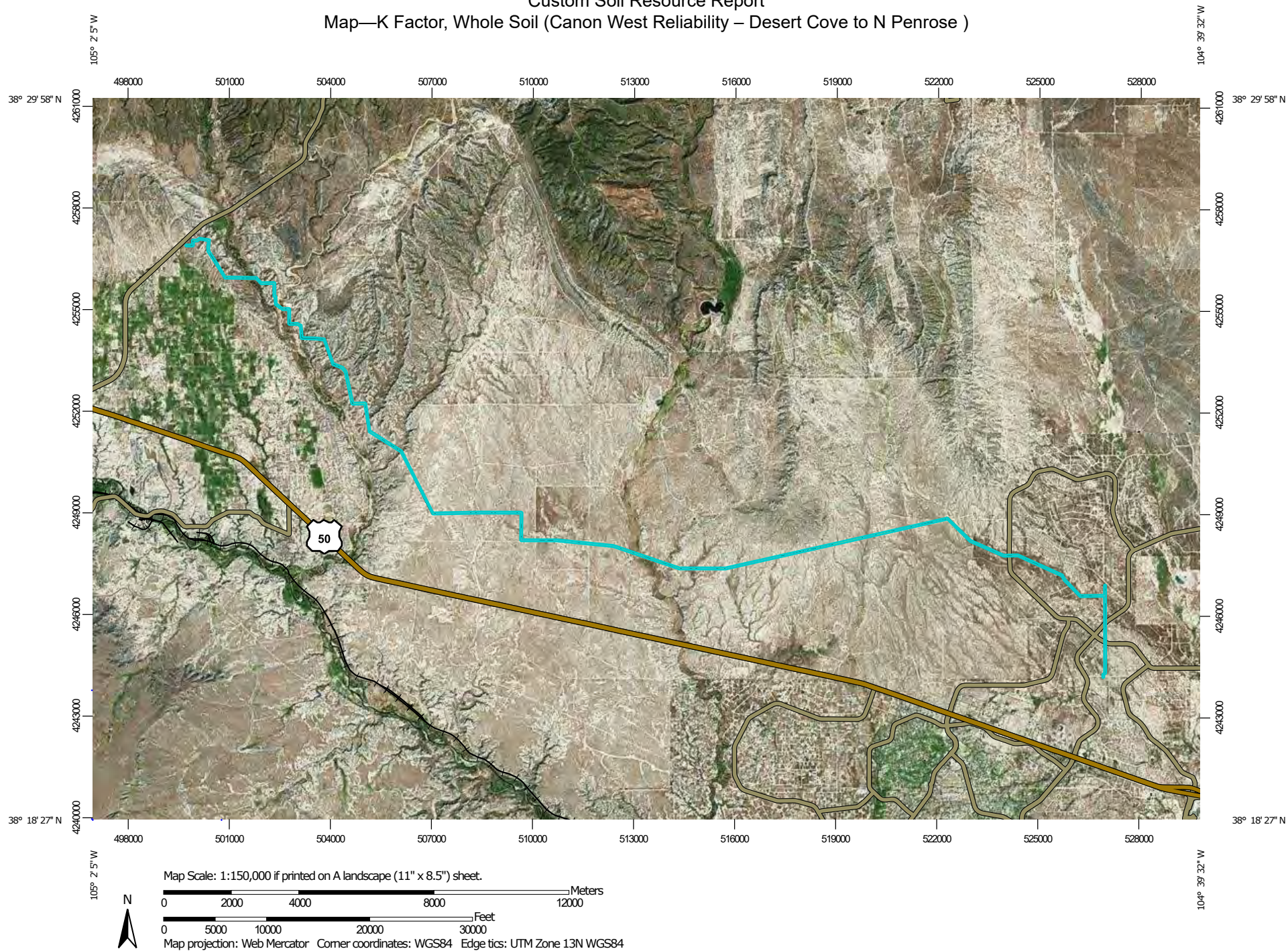
K Factor, Whole Soil (Canon West Reliability – Desert Cove to N Penrose)

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Custom Soil Resource Report Map—K Factor, Whole Soil (Canon West Reliability – Desert Cove to N Penrose)



Custom Soil Resource Report
















MAP LEGEND

Area of Interest (AOI)







Area of Interest (AOI)

Soils

Soil Rating Polygons

	.02
	.05
	.10
	.15
	.17
	.20
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available

Soil Rating Lines

	.02
	.05
	.10
	.15
	.17
	.20

 .24

 .28

 .32

 .37

 .43

 .49

 .55

 .64

 Not rated or not available

Soil Rating Points

 .02

 .05

 .10

 .15

 .17

 .20

 .24

 .28

 .32

 .37

 .43

 .49

 .55

 .64

 Not rated or not available

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 1:24,000.

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: Fremont County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

Soil Survey Area: Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

Survey Area Data: Version 20, Aug 31, 2021

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—K Factor, Whole Soil (Canon West Reliability – Desert Cove to N Penrose)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Aquic Ustifluvents	.28	11.3	2.0%
52	Kim-Cascajo complex, 2 to 15 percent slopes	.28	0.4	0.1%
62	Limon-Gaynor silty clay loams, 3 to 12 percent slopes	.37	14.6	2.6%
66	Manvel silt loam, 2 to 6 percent slopes	.43	2.6	0.5%
68	Manzanola loam, 1 to 5 percent slopes	.37	8.4	1.5%
71	Midway clay loam, 3 to 15 percent slopes	.20	3.0	0.5%
72	Midway-Cascajo complex, 10 to 40 percent slopes	.05	2.9	0.5%
83	Penrose-Minnequa complex, 1 to 15 percent slopes	.17	44.3	7.8%
84	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	.28	62.5	11.0%
Subtotals for Soil Survey Area			150.1	26.4%
Totals for Area of Interest			569.0	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Gh	Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded	.20	6.9	1.2%
Ha	Haversid silt loam, 0 to 2 percent slopes, frequently flooded	.32	86.4	15.2%
Km	Kim fine sandy loam	.28	1.8	0.3%
LvB	Limon silty clay, 0 to 5 percent slopes, gullied	.28	11.1	2.0%
MaB	Manvel silt loam, 2 to 6 percent slopes, dry	.37	89.6	15.7%
Mv	Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry	.43	124.4	21.9%
MzA	Manzanola silty clay loam, saline, 0 to 2 percent slopes	.37	2.1	0.4%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PM	Penrose-Minnequa complex, 1 to 15 percent slopes, dry	.17	71.5	12.6%
PmE	Penrose-Minnequa complex, 1 to 15 percent slopes	.17	1.2	0.2%
PrF	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	.28	1.9	0.3%
SgD	Shingle silty clay loam, 1 to 9 percent slopes	.37	21.1	3.7%
Subtotals for Soil Survey Area			418.1	73.5%
Totals for Area of Interest			569.0	100.0%

Rating Options—K Factor, Whole Soil (Canon West Reliability – Desert Cove to N Penrose)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Wind Erodibility Group (Canon West Reliability – Desert Cove to N Penrose)

A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.

Custom Soil Resource Report
Map—Wind Erodibility Group (Canon West Reliability – Desert Cove to N Penrose)







MAP LEGEND

Area of Interest (AOI)











Area of Interest (AOI)

Soils

Soil Rating Polygons

	1
	2
	3
	4
	4L
	5
	6
	7
	8
	Not rated or not available


Soil Rating Lines

	1
	2
	3
	4
	4L
	5
	6
	7
	8
	Not rated or not available






Soil Rating Points

	1
	2
	3
	4
	4L
	5
	6
	7
	8
	Not rated or not available


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 1:24,000.

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.

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Survey Area Data: Version 19, Aug 31, 2021

Soil Survey Area: Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

Survey Area Data: Version 20, Aug 31, 2021

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Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

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MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Wind Erodibility Group (Canon West Reliability – Desert Cove to N Penrose)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Aquic Ustifluvents	4L	11.3	2.0%
52	Kim-Cascajo complex, 2 to 15 percent slopes	4L	0.4	0.1%
62	Limon-Gaynor silty clay loams, 3 to 12 percent slopes	4L	14.6	2.6%
66	Manvel silt loam, 2 to 6 percent slopes	4L	2.6	0.5%
68	Manzanola loam, 1 to 5 percent slopes	6	8.4	1.5%
71	Midway clay loam, 3 to 15 percent slopes	6	3.0	0.5%
72	Midway-Cascajo complex, 10 to 40 percent slopes	8	2.9	0.5%
83	Penrose-Minnequa complex, 1 to 15 percent slopes	5	44.3	7.8%
84	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	4L	62.5	11.0%
Subtotals for Soil Survey Area			150.1	26.4%
Totals for Area of Interest			569.0	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Gh	Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded	3	6.9	1.2%
Ha	Haversid silt loam, 0 to 2 percent slopes, frequently flooded	6	86.4	15.2%
Km	Kim fine sandy loam	3	1.8	0.3%
LvB	Limon silty clay, 0 to 5 percent slopes, gullied	4	11.1	2.0%
MaB	Manvel silt loam, 2 to 6 percent slopes, dry	4L	89.6	15.7%
Mv	Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry	4L	124.4	21.9%
MzA	Manzanola silty clay loam, saline, 0 to 2 percent slopes	4L	2.1	0.4%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PM	Penrose-Minnequa complex, 1 to 15 percent slopes, dry	4L	71.5	12.6%
PmE	Penrose-Minnequa complex, 1 to 15 percent slopes	5	1.2	0.2%
PrF	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	4L	1.9	0.3%
SgD	Shingle silty clay loam, 1 to 9 percent slopes	6	21.1	3.7%
Subtotals for Soil Survey Area			418.1	73.5%
Totals for Area of Interest			569.0	100.0%

Rating Options—Wind Erodibility Group (Canon West Reliability – Desert Cove to N Penrose)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Canon West Reliability – Desert Cove to N Penrose)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Custom Soil Resource Report

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

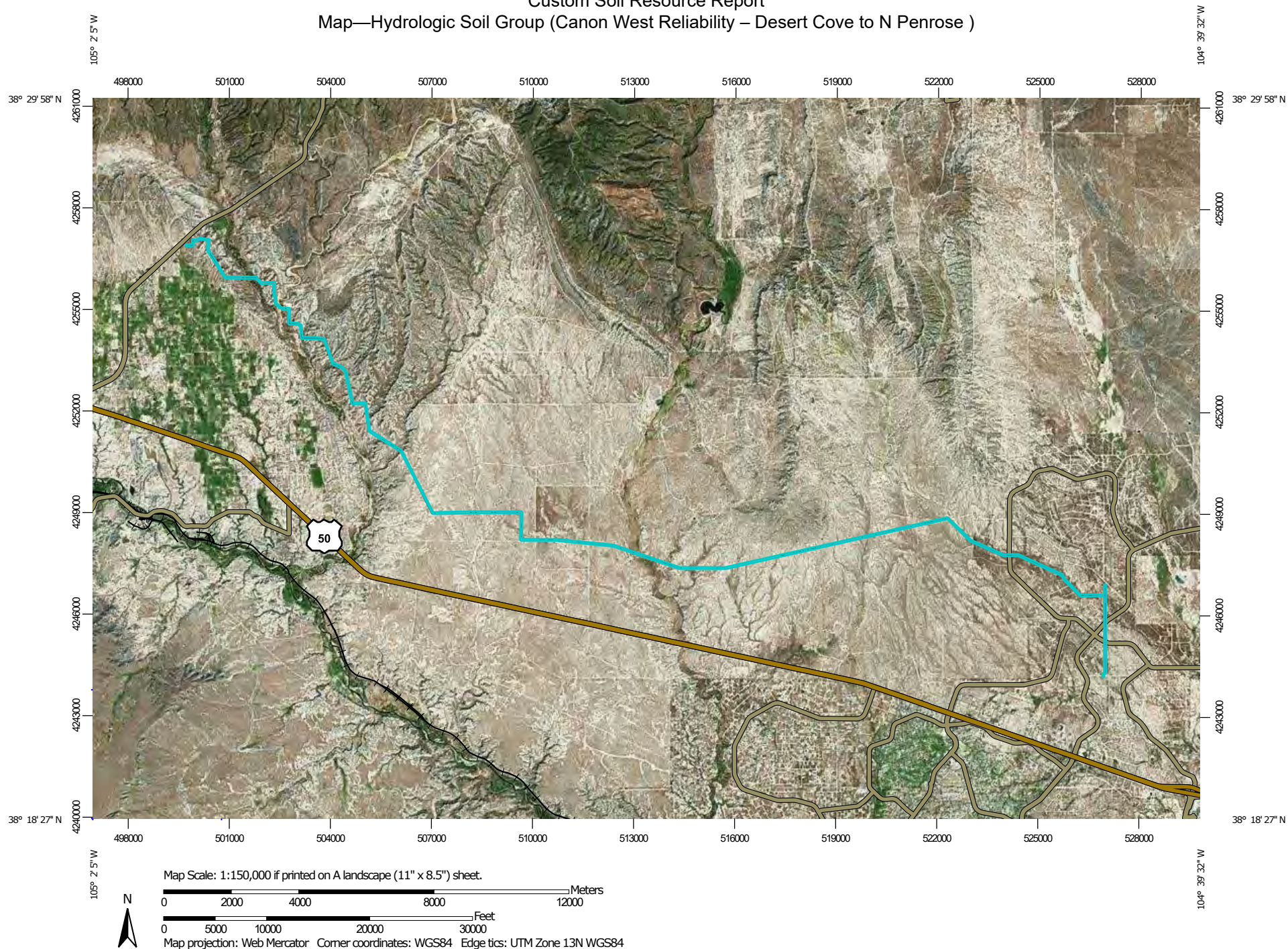
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report

Map—Hydrologic Soil Group (Canon West Reliability – Desert Cove to N Penrose)



Custom Soil Resource Report







MAP LEGEND

Area of Interest (AOI)









Area of Interest (AOI)

Soils

Soil Rating Polygons





	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Lines


	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available

Soil Rating Points






	A
	A/D
	B
	B/D

	C
	C/D
	D
	Not rated or not available


Water Features

	Streams and Canals
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Transportation

	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads

Background

	Aerial Photography
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MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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)

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Soil Survey Area: Pueblo Area, Colorado, Parts of Pueblo and Custer Counties

Survey Area Data: Version 20, Aug 31, 2021

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MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group (Canon West Reliability – Desert Cove to N Penrose)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Aquic Ustifluvents	B	11.3	2.0%
52	Kim-Cascajo complex, 2 to 15 percent slopes	B	0.4	0.1%
62	Limon-Gaynor silty clay loams, 3 to 12 percent slopes	C	14.6	2.6%
66	Manvel silt loam, 2 to 6 percent slopes	B	2.6	0.5%
68	Manzanola loam, 1 to 5 percent slopes	C	8.4	1.5%
71	Midway clay loam, 3 to 15 percent slopes	D	3.0	0.5%
72	Midway-Cascajo complex, 10 to 40 percent slopes	D	2.9	0.5%
83	Penrose-Minnequa complex, 1 to 15 percent slopes	D	44.3	7.8%
84	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	D	62.5	11.0%
Subtotals for Soil Survey Area			150.1	26.4%
Totals for Area of Interest			569.0	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Gh	Glenberg-Haversid complex, 0 to 2 percent slopes, occasionally flooded	A	6.9	1.2%
Ha	Haversid silt loam, 0 to 2 percent slopes, frequently flooded	B	86.4	15.2%
Km	Kim fine sandy loam	B	1.8	0.3%
LvB	Limon silty clay, 0 to 5 percent slopes, gullied	C	11.1	2.0%
MaB	Manvel silt loam, 2 to 6 percent slopes, dry	B	89.6	15.7%
Mv	Minnequa-Manvel silt loams, 1 to 6 percent slopes, dry	C	124.4	21.9%
MzA	Manzanola silty clay loam, saline, 0 to 2 percent slopes	C	2.1	0.4%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PM	Penrose-Minnequa complex, 1 to 15 percent slopes, dry	D	71.5	12.6%
PmE	Penrose-Minnequa complex, 1 to 15 percent slopes	D	1.2	0.2%
PrF	Penrose-Midway-Rock outcrop complex, 10 to 45 percent slopes	D	1.9	0.3%
SgD	Shingle silty clay loam, 1 to 9 percent slopes	D	21.1	3.7%
Subtotals for Soil Survey Area			418.1	73.5%
Totals for Area of Interest			569.0	100.0%

Rating Options—Hydrologic Soil Group (Canon West Reliability – Desert Cove to N Penrose)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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- 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>

Custom Soil Resource Report

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

Fort Carson, CO

Pinon-juniper and pine barren/shale site mix

Blue grama, *Bouteloua gracilis*, 'Alma or Hachita' -- 30% / 1 PLS/acre

Sideoats grama, *Bouteloua curtipendula*, 'El Reno' or 'Vaughn' -- 15% / 1.2 PLS/acre

Indian ricegrass, *Achnatherum hymenoides*, 'Paloma' -- 15% / 1.5 PLS/acre

New Mexico needlegrass, *Hesperostipa neomexicana* -- 20% / 3 PLS/acre

Little bluestem, *Schizachyrium scoparium*, 'Pastura' -- 5% / 0.4 PLS/acre

Bottlebrush squirreltail, *Elymus elymoides*, 'Pueblo' -- 15% / 1.4 PLS/acre

=8.5 PLS/acre (#s for drill seeding, double for broadcast)



Appendix F: Inspection Report

Stormwater Inspection Report Template

Facility Name		Permittee					
Date of Inspection		Weather Conditions					
Permit Certification #		Disturbed Acreage					
Phase of Construction		Inspector Title					
Inspector Name							
Is the above inspector a qualified stormwater manager? (permittee is responsible for ensuring that the inspector is a qualified stormwater manager)			<table border="1"> <tr> <td>YES</td> <td>NO</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	YES	NO	<input type="checkbox"/>	<input type="checkbox"/>
YES	NO						
<input type="checkbox"/>	<input type="checkbox"/>						

INSPECTION FREQUENCY		
Check the box that describes the minimum inspection frequency utilized when conducting each inspection		
At least one inspection every 7 calendar days	<input type="checkbox"/>	
At least one inspection every 14 calendar days, with post-storm event inspections conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosions	<input type="checkbox"/>	
<ul style="list-style-type: none"> This is this a post-storm event inspection. Event Date: _____ 	<input type="checkbox"/>	
Reduced inspection frequency - Include site conditions that warrant reduced inspection frequency	<input type="checkbox"/>	
<ul style="list-style-type: none"> Post-storm inspections at temporarily idle sites 	<input type="checkbox"/>	
<ul style="list-style-type: none"> Inspections at completed sites/area 	<input type="checkbox"/>	
<ul style="list-style-type: none"> Winter conditions exclusion 	<input type="checkbox"/>	
Have there been any deviations from the minimum inspection schedule? If yes, describe below.	YES <input type="checkbox"/>	NO <input type="checkbox"/>

INSPECTION REQUIREMENTS*	
i. Visually verify all implemented control measures are in effective operational condition and are working as designed in the specifications	
ii. Determine if there are new potential sources of pollutants	
iii. Assess the adequacy of control measures at the site to identify areas requiring new or modified control measures to minimize pollutant discharges	
iv. Identify all areas of non-compliance with the permit requirements, and if necessary, implement corrective action	
*Use the attached Control Measures Requiring Routine Maintenance and Inadequate Control Measures Requiring Corrective Action forms to document results of this assessment that trigger either maintenance or corrective actions	

AREAS TO BE INSPECTED			
Is there evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system or discharging to state waters at the following locations?			
	NO	YES	If "YES" describe discharge or potential for discharge below. Document related maintenance, inadequate control measures and corrective actions Inadequate Control Measures Requiring Corrective Action form
Construction site perimeter	<input type="checkbox"/>	<input type="checkbox"/>	
All disturbed areas	<input type="checkbox"/>	<input type="checkbox"/>	
Designated haul routes	<input type="checkbox"/>	<input type="checkbox"/>	
Material and waste storage areas exposed to precipitation	<input type="checkbox"/>	<input type="checkbox"/>	
Locations where stormwater has the potential to discharge offsite	<input type="checkbox"/>	<input type="checkbox"/>	
Locations where vehicles exit the site	<input type="checkbox"/>	<input type="checkbox"/>	
Locations of installed control measures	<input type="checkbox"/>	<input type="checkbox"/>	

CONTROL MEASURES REQUIRING ROUTINE MAINTENANCE

Definition: Any control measure that is still operating in accordance with its design and the requirements of the permit, but requires maintenance to prevent a breach of the control measure. These items are not subject to the corrective action requirements as specified in Part I.B.1.c of the permit.

Are there control measures requiring maintenance?	NO	YES	
	<input type="checkbox"/>	<input type="checkbox"/>	If "YES" document below

[illegible]

INADEQUATE CONTROL MEASURES REQUIRING CORRECTIVE ACTION

Definition: Any control measure that is not designed or implemented in accordance with the requirements of the permit and/or any control measure that is not implemented to operate in accordance with its design. This includes control measures that have not been implemented for pollutant sources. If it is infeasible to install or repair the control measure immediately after discovering the deficiency the reason must be documented and a schedule included to return the control measure to effective operating condition as possible.

Are there inadequate control measures requiring corrective action?	NO	YES	
	<input type="checkbox"/>	<input type="checkbox"/>	If "YES" document below

Are there additional control measures needed that were not in place at the time of inspection?	NO	YES	
	<input type="checkbox"/>	<input type="checkbox"/>	If "YES" document below

[illegible]

REPORTING REQUIREMENTS

The permittee shall report the following circumstances orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall mail to the division a written report containing the information requested within five (5) working days after becoming aware of the following circumstances. The division may waive the written report required if the oral report has been received within 24 hours.

All Noncompliance Requiring 24-Hour Notification per Part II.L.6 of the Permit	
a. Endangerment to Health or the Environment Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident (See Part II.L.6.a of the Permit) <i>This category would primarily result from the discharge of pollutants in violation of the permit</i>	
b. Numeric Effluent Limit Violations <ul style="list-style-type: none"> o Circumstances leading to any unanticipated bypass which exceeds any effluent limitations (See Part II.L.6.b of the Permit) o Circumstances leading to any upset which causes an exceedance of any effluent limitation (See Part II.L.6.c of the Permit) o Daily maximum violations (See Part II.L.6.d of the Permit) <i>Numeric effluent limits are very uncommon in certifications under the COR400000 general permit. This category of noncompliance only applies if numeric effluent limits are included in a permit certification.</i>	

Has there been an incident of noncompliance requiring 24-hour notification?	NO	YES	
	<input type="checkbox"/>	<input type="checkbox"/>	If "YES" document below

Date and Time of Incident	Location	Description of Noncompliance	Description of Corrective Action	Date and Time of 24 Hour Oral Notification	Date of 5 Day Written Notification *

*Attach copy of 5 day written notification to report. Indicate if written notification was waived, including the name of the division personnel who granted waiver.

"I verify that, to the best of my knowledge and belief, all corrective action identified during the inspection are complete, and the site is currently in compliance with the permit."

Name of Qualified Stormwater Manager

Title of Qualified Stormwater Manager

Signature of Qualified Stormwater Manager

Date

Notes/Comments

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