

# Mountain View Academy Stormwater Management Plan

**Prepared For:**

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January 17, 2020

MERRICK PROJECT NO. 65120399

**Item 1. Add Qualified Stormwater Manager and Contractor information to cover/title sheet. If unknown, add a placeholder to be updated prior to the pre-construction meeting:**

**STORMWATER MANAGER**  
Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_

**CONTRACTOR**  
Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_

PCD Project Number:  
EGP-20-002

Item 2. update

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## **INTRODUCTION**

### **PROJECT AND SITE DESCRIPTION**

This project encompasses the grading of the property located at 2103 Meadowbrook Pkwy, Tract H, Claremont Ranch Filing 4 in the Northeast Quarter of Section 4, Township 14 South, Range 65 West of the Sixth Principal Meridian in El Paso County, CO. Tract H consists of 7.88 acres of currently vacant land covered with low lying native plants and weeds. This property was previously graded during construction activities related to Claremont Ranch Filing 4 construction, sometime around 2003. It is expected that the entirety of the property will be disturbed during the lifetime of the project. Since more than 1 acre of disturbed land will be associated with this project, a Colorado Stormwater Discharge Permit will be required.

This purpose of this project is to prepare the property for the eventual construction of a charter school to be run by National Heritage Academies as sanctioned by El Paso School District 49. The scope of work for this project will consist only of the grading of the property. No construction other than earthwork will be preformed during the lifetime of this project.

Access to the project site will be off of Pinyon Jay Drive, a paved road running generally north-south, in the southeastern corner of the City of Colorado Springs, though the property itself is unincorporated. No building materials will be used during this phase of construction however a stabilized staging area will be constructed in the southern portion of the property in order to provide for the storage of vehicles and equipment. The staging area will eventually be used for material storage during subsequent phases of construction.

The southeast portion of the property is relatively flat and is at a higher elevation than surrounding properties. From this high point the ground slopes gently and generally to the north and west.

Stormwater on the site flows in several different directions. The southern portion of the site drains towards Hames Drive to the south and enters a storm inlet located at roughly the midpoint of the southern property boundary where a low point exists in Hames Drive. The western portion of the site drains to the west and into a neighboring undeveloped property owned by Cherokee Metropolitan District. The northern portion of the site drains generally north towards Meadowbrook Parkway. Some stormwater in the north portion of the property will enter the storm inlet located at the corner of Pinyon Jay Drive and Meadowbrook Parkway. The majority will flow west along Meadowbrook Parkway where it eventually enters a storm inlet on Meadowbrook Parkway roughly 200 ft south of the intersection with Killdeer Ct. This storm line eventually outfalls to East Fork Sand Creek through a 54" storm outlet approximately 500 ft due west of the

property. The storm system connected to the inlet on Hames Drive runs south and then west of the site where it eventually outfalls into the East Fork Sand Creek through a 36" storm outlet approximately 750 ft due west of the southwest corner of the property.

Upon completion of this project the high point of the property will be located in the center of the property and stormwater will drain in all directions from this high point. The southern portion of the site will be sloped gently towards Hames Road at a grade of approximately 2%. A nearly flat area will exist on the north side of the property where an AstroTurf field is planned during the next phase of construction. Grade along the north and much of the west property lines will be quite steep approaching 3:1 in many places. Along the eastern and southern boundaries slopes will be milder ranging between 2% and 10%.

## PROPOSED PROJECT SEQUENCING

The expected duration of construction is 2 months with an anticipated start date of March 1, 2020 (or as soon as possible thereafter pending required reviews, permitting, and approvals) and completion date of May 1, 2020. Final stabilization is projected to be complete by August 2022. Stormwater BMP's will be inspected biweekly during active construction activities and monthly upon completion of initial stabilization efforts. Post-storm event inspections are required to be performed within 24 hours of any storm event resulting in run-off during active construction.

Pre-construction activities will include the installation of stormwater control measures. It is expected that pre-construction activities will take approximately one week.

Construction will begin immediately upon completion of pre-construction activities and is expected to take approximately 6 weeks. Planned activities include clearing and grubbing of the property, the stripping and stockpiling of topsoil, and performing preliminary site grading.

Initial stabilization of the project area will begin immediately upon completion of earth disturbing activities and is expected to take one week.

## SOILS

On-site soils consist entirely of Blakeland loamy sands (National map unit symbol 369v) with slopes ranging from 1-9%. According to the Geotechnical report by Terracon, subsurface soils consist of sand and silty sand to a depth of at least 5 feet and possibly as deep as 30 feet (several borings were only 5 feet in depth). The hydrologic soil

group of these soils is group A, soils with high infiltration rate and low runoff potential. USDA's soil report for this property and Terracon's Geotechnical Report are included as Appendix E.

## EXISTING VEGETATION

Vegetation at the site consists entirely of low-lying species of native grasses and weeds. Existing vegetative cover is somewhat patchy and large nearly bare spots are present in the central and southeast corner of the property. Relative vegetative cover is approximately 70%, this figure was estimated by direct visual observation of the property.

## EARTH MOVING ACTIVITIES

The project site is approximately 7.88 acres in size and it is expected that the entirety of the property will be disturbed during construction activities. No soil will be imported or exported during this project. The purpose of this project is preliminary grading only with the objective being to prepare the site for vertical construction and supporting civil infrastructure (which will be the subject of an additional project and applied for separately). With this goal in mind, the contractor will grade the area where the foundation is planned to be constructed to final grade. The remainder of the site will be graded as close as possible to the proposed grade using existing soils on-site only. No soil will be imported or exported with this project.

## **GEC PLANS**

GEC Plans are included as Appendix B.

## SWMP / GEC CONTACTS

<p><u>Owner/Operator</u> National Heritage Academies Jacques Soumis Construction Project Manager 3850 Broadmoor SE Grand Rapids, MI 49512 616-285-1589 jsoumis@nhaschools.com</p>	<p><u>Client Representative</u> Bill Torres Gilbane Superintendent 720-633-1268 wtorres@gilbaneco.com</p>
<p><u>SWMP / GEC Developer</u> Merrick &amp; Company Tom Habberfield, PE Engineer 5970 Greenwood Plaza Blvd Greenwood Village, CO 80111 303-353-3927 Tom.habberfield@merrick.com</p>	<p><u>Qualified Stormwater Manager</u> TBD</p>
<p><u>BMP Contractor</u> TBD</p>	<p><u>Stormwater Inspector</u> TBD</p>

## POTENTIAL POLLUTANT SOURCES

As required by the CDPS General Permit (COR-400000), the following sources and activities were evaluated for their potential to contribute pollutants to stormwater discharges.

<b>Potential Pollutant Source</b>	<b>Expected on this Project</b>	<b>Processes, Storage Areas, or Activities Associated with this Pollutant and Mitigation Practices</b>
Disturbed/Stockpiled Soils	yes	<p>Disturbed soils will be created wherever clearing, grubbing, grading, excavating, or heavy vehicle traffic operations are performed. Stockpiled soils created by any of these soil disturbing activities will be located in the SSA.</p> <p>Mitigation of disturbed soils will be achieved mainly through the use of silt fence, sediment control logs, inlet protection, and surface roughening to increase infiltration. Soils present on site have a high hydraulic conductivity so surface roughening will greatly reduce runoff.</p>
Vehicle Tracking on to Public Roadways	yes	<p>Vehicle tracking occurs when vehicles contact disturbed soil areas and move off the site on to paved roadways.</p> <p>The main technique that will be used to mitigate this pollutant source is through the use of a VTC at the properties access point, the use of a stabilized staging area (SSA) and controlling site access. Vehicles not directly involved in construction activities should remain in the SSA whenever possible. If these mitigation techniques are insufficient, street sweeping or scraping of vehicle tires prior to exiting the property may also be required.</p>
Management of Contaminated Soils	no	<p>Contaminated soils are not known to be present on this site. If soils suspected to be contaminated are encountered during construction, all work in the area will halt until a proper assessment has been performed.</p>



		Soils contaminated with non-hazardous materials during construction activity (i.e. from minor spills or leaky equipment) will be dug up and moved to the on-site dumpster immediately.
Loading and Unloading Operations	yes	<p>Loading and unloading operations will occur only within the SSA.</p> <p>Since this project consists of preliminary grading operations only, no loading/unloading operations are expected other than the delivery of heavy equipment.</p>
Outdoor Storage Activities	yes	Any chemicals, liquids, powders, etc. stored in small containers should be placed indoors by the end of the workday. Larger containers such as drums, totes or tanks are required to be double-walled or stored in sufficiently sized secondary containment. All materials stored on site should be kept within the SSA.
Vehicle and Equipment Maintenance and Fueling	yes	<p>Any leaking equipment should be removed from service and placed in the SSA until repairs are complete. On-site refueling tanks need to be double-walled or placed within secondary containment. A spill kit will be available nearby during all refueling or vehicle maintenance activities.</p> <p>Vehicle maintenance/refueling areas must be located away from any surface water, drainages, or stormwater outfalls. Any soils contaminated during refueling/maintenance operations must be cleaned up ASAP and moved to the dumpster.</p>
Dust and/or particulate generating processes	yes	<p>Site soils consist almost entirely of sand. Sand particles are relatively large compared with most other soils and are less likely to create significant dust. However smaller particles do exist in the soil and coupled with the semi-arid climate of the region the potential for dust generation does exist.</p> <p>Should dust generation become an issue, the main technique to mitigate this hazard will be through suppression (usually by wetting the materials).</p>

		No particulate generating processes are expected on this site.
Routine Maintenance	no	N/A
Waste Management	yes	Dumpsters will be located in the SSA.  Non-hazardous solid wastes will be stored in the dumpster located in the stabilized staging area. Whenever the dumpster becomes full it should be removed and replaced ASAP. Liquid wastes will be stored in closed containers either indoors or within secondary containment until they can be disposed of properly.
Concrete Truck/Equipment Washing	no	No concrete work will be preformed during this project. However, a CWA is planned to be installed in the SSA in preparation for future construction activities.
Dedicated Asphalt and Concrete Batch Plants	no	N/A
Non-industrial Waste Sources	yes	Non-industrial waste such as worker trash will be disposed of in trash cans located throughout the property. Larger trash such as scrap building materials and their packaging will be disposed of in larger dumpsters located in the SSA. Portable toilets will be used for sanitary waste and will be located in the SSA and regularly serviced by a licensed sanitation contractor.  Good housekeeping will be the main BMP for small refuse such as litter or worker trash. Worker trash and litter will be picked up as necessary, placed into small bins, and properly disposed of offsite. Larger refuse will be stored in dumpsters and managed as described under the "Waste Management" section. Portable toilets will be secured in place to avoid tipping over and cleaned out regularly by a subcontractor. Portable toilets will not be located adjacent to surface water or storm drains.
Other Potential Pollutants	no	No other potential pollutants or processes or procedures that could result in a spill were identified for this project.

## **EROSION AND SEDIMENT CONTROL MEASURES**

Structural Best Management Practices (BMP's) utilized on site and their exact locations are noted in the GEC Plans located in Appendix B. BMP's expected or likely to be utilized on site include: silt fence (SF), a VTC, a SSA, sediment control logs (SCL's), inlet protection (IP), surface roughening (SR), erosion control blankets (ECB), diversion ditches (DD), temporary sediment basins (SB), and seeding and mulching (SM).

### Site Control

El Paso

Construction Fence (CF) consists of orange plastic fencing material, or other Douglas County approved material, attached to support posts and used to limit access to the construction site.

A Concrete Washout Area (CWA) is a shallow excavation with a small perimeter berm to isolate concrete truck washout operations. The washout area shall be combined with a vehicle tracking control pad to control tracking of mud. A CWA will be installed in the SSA.

### Sediment Control BMP's

Silt Fence (SF) is a temporary sediment barrier constructed of woven fabric stretched across supporting posts. The bottom edge of the fabric is placed in an anchor trench that is backfilled with compacted soil. Silt fence will be installed along the entire perimeter of the site except at the site access point.

Vehicle Tracking Control (VTC) consists of a pad of 3" to 6" rock at all entrance/exit points for a site that is intended to help strip mud from tires prior to vehicles leaving the construction site. A VTC will be installed at the access point to the property.

A Reinforced Rock Berm (RRB) consists of a linear mass of gravel enclosed in wire mesh to form a porous filter, able to withstand overtopping. The berm is heavy and stable and promotes sediment deposition on its upstream side.

A Sediment Control Log (SCL) consists of a cylindrical bundle of wood, coconut, compost, excelsior, or straw fiber designed to form a semi-porous filter, able to withstand overtopping. The log can be staked into the ground and promotes sediment deposition on its upstream side. SCL's will be installed along the majority of the northern property line in conjunction with the SF.

Check Dams (CD) are small rock dams designed to withstand overtopping, that are placed in a stream or drainageway. The purpose of the check dam is to trap water-borne sediment in the backwater zone upstream of the check.

Inlet Protection (IP) consists of a reinforced rock berm placed in front of (but not blocking) a curb opening inlet or around an area inlet to reduce sediment in runoff approaching the inlet. Inlet protection will be installed at all inlets in vicinity of the site and along some gutters.

A Sediment Basin (SB) is an impoundment that captures sediment laden runoff and releases it slowly, providing prolonged settling times to capture coarse and fine-grained soil particles. Three sediment basins are planned for this site. One to be located in the southern portion of the property that will capture runoff from approximately 3.7 acres of the site. The second in the northern portion of the property that will capture runoff from approximately 3 acres of the site. The last along the central portion of the western property boundary that will capture runoff from approximately 0.9 acres of the site.

A Sediment Trap (ST) consists of a riprap berm with a small upstream basin that acts to trap coarse sediment particles.

Erosion Control BMP's only list the BMPs planned for the site

A Stabilized Staging Area (SSA) consists of stripping topsoil and spreading a layer of granular material in the area to be used for a trailer, parking, storage, unloading and loading. A stabilized staging area reduces the likelihood that the vehicles most frequently entering a site are going to come in contact with mud. A stabilized staging area will be constructed in the southern portion of the property.

Temporary Stream Crossings (TSC) consists of rock layer placed temporarily in a stream to allow construction equipment to cross. A stream crossing may include culverts or provide a low water crossing or ford.

A Diversion Ditch (DD) is a small earth channel used to divert and convey runoff. Depending on slope, the diversion swale may need to be lined with erosion control matting, plastic (for temporary installations only), or riprap. Diversion ditches will be constructed in several areas in order to convey water to the planned sediment basins.

A Temporary Slope Drain (TSD) is a small culvert or plastic liner to convey runoff down a slope or channel bank to reduce the occurrence of rill and gully erosion.

Terracing (TER) consists of creating one or more flat benches in high, steep cut or fill slopes to interrupt runoff and reduce the formation of rill and gully erosion.

Surface Roughening (SR) consists of creating a series of grooves or furrows on the contour in all disturbed, graded areas to trap rainfall and reduce the formation of rill and gully erosion. Surface roughening will be used throughout the property in all temporarily inactive areas prior to seeding and mulching.

Seeding and Mulching (SM) consists of drill seeding disturbed areas with grasses and crimping in straw mulch to provide immediate protection against raindrop and wind erosion and, as the grass cover becomes established, to provide long-term stabilization of exposed soils. Seeding and mulching will be used across the entire site upon completion of grading activities with the exception of the SSA and VTC areas which will remain in place for future project work. If the operator chooses to remove the SSA or VTC, that remaining area will also be seeded and mulched.

Erosion Control Blankets (ECB) are a fibrous blanket of straw, jute, coconut or excelsior material trenched in and staked down over prepared, seeded soil. The blanket reduces both wind and water erosion and helps to establish vegetation. Erosion control blankets will be installed upon completion of grading activities in all areas where grade exceeds 4:1.

Compost Blankets (CB) consist of a layer of Class I Compost spread over prepared, seeded topsoil in non-concentrated flow areas to protect exposed soil against raindrop and wind erosion and to provide an organic soil amendment to promote the establishment of vegetation.

## STORMWATER MANAGEMENT PRACTICES

The major mechanism for reducing runoff and erosion on site will be through SR, DD's, and SB's. Combined with the high hydraulic conductivity of site soil these methods alone should nearly eliminate all runoff from the site. Maintaining SB's and DD's and making sure SR is implemented properly are the most important aspect of managing stormwater on site.

VTC's must always be used when exiting the property and vehicles not used for construction should remain in the SSA whenever possible. Likewise, vehicles used in construction activities should refrain from exiting the property whenever possible.

General worker training is an important aspect of stormwater management. Workers who are trained to notice and report damaged or ineffective control measures assist greatly in maintaining an effective stormwater management strategy outside of the scheduled weekly inspections.

Good housekeeping, and proper waste management and storage techniques are important in keeping a clean and orderly project site. Messy sites not only look bad, but spills are more likely, damage to vehicles or building materials are more common, and there are generally higher incidences of worker injury.

## BMP INSPECTION AND MAINTENANCE PROCEDURES

During active construction, an inspection of the project site to assess whether BMP's are performing adequately, if any BMP's require maintenance, or if additional BMP's are necessary will occur biweekly. Additional inspections will be required to be conducted within 24 hours following any storm event that results in stormwater runoff conditions. Inspections may be suspended if snow cover exists across the entirety of the project site and construction has been temporarily halted. As soon as construction resumes, or snowmelt conditions exist inspections of the project site will resume.

Any BMP's found to be damaged or no longer functioning properly will be repaired, maintained, or replaced as necessary. If a BMP is found to be inadequate the stormwater manager will assess the situation and make changes to the plans as necessary to comply with the stormwater permit. The stormwater manager is free to add additional BMP's as they deem necessary to comply with the stormwater permit as long as the changes are noted in the plans. Any of the aforementioned conditions should be addressed as soon as possible.

Upon completion of construction and initial stabilization of the disturbed areas, inspections will be conducted monthly until relative vegetative cover has rebounded to at least 70% of pre-construction levels. During this phase of the project post-storm event inspections are not required.

This report is to be stored on site for the lifetime of this project including the post-construction phase prior to achieving final stabilization. The report will be stored in the job trailer during active construction and at a yet-to-be-determined location after initial stabilization efforts have concluded when the trailer has been scheduled for removal.

Item 21. Discuss how the SWMP will be revised in the field. EPC should be notified of any changes to the SWMP

Item 25. Note that all inspection forms will be signed and kept onsite.

## **MATERIALS HANDLING, SPILL PREVENTION, AND WASTE MANAGEMENT AND DISPOSAL**

### **MATERIALS HANDLING AND SPILL PREVENTION**

All materials used during construction with the potential to impact stormwater quality are required to have a procedure in place designed to minimize potential impacts to stormwater. Procedures or significant materials required to have these procedures in place include (but are not limited to) the following:

- The storage of exposed building materials
- Concrete (including concrete mix, spoils, and washout)
- Any hydrocarbon containing liquids
- Paints, solvents, and detergents
- Fertilizers or chemicals
- Waste materials
- Equipment maintenance or fueling procedures
- Plastic pellets/wrapping
- Metallic products
- Ashes, slag, and sludge
- Any hazardous substance (CERCLA section 101(14))

Any of these materials must be stored, used and managed in such a way that any stormwater contacting them does not contribute pollutants to runoff. Any of these processes or procedures that have the potential to cause a spill must have a spill prevention and response procedure in place.

All liquids that may contribute pollutants to stormwater runoff will be stored in secondary containment or indoors. Containers used to store these liquids should be checked frequently for signs of leaks or flaws and any issues shall be addressed immediately. Any equipment found to be leaking fluids will be put out of service immediately, a drip pan will be placed beneath the leak, and the equipment will not be allowed to return to service until proper maintenance/repairs are complete.

All procedures that involve the use of these chemicals (such as fueling or spray-on application of paints/chemicals) must have spill kits on hand in the event that a release occurs. Any soils that come in contact with spilled liquids shall be removed and disposed of in accordance with state, local, and/or national laws and regulations.

All spills or releases that enter surface water or sanitary sewers must be reported to CDPHE immediately and written notification must be provided to CDPHE within 5 days of the discovery of the release. Any spill/release of hazardous substances or

spill/release of more than 25 gallons of fuel must also be reported regardless of whether or not the substance comes into contact with water.

## WASTE MANAGEMENT AND DISPOSAL INCLUDING CONCRETE WASHOUT

Solid wastes generated from construction activity will be moved off-site as soon as is practical. If temporary storage of solid waste materials on-site is necessary, all waste materials will be placed into a dumpster. As soon as dumpsters are full, they will be removed from the project site and sent to a recycling center or waste processing facility as applicable. If any waste materials are found outside of their designated areas project personnel will move them to the proper location as soon as possible.

Portable restroom facilities will be located away from high traffic areas, any areas where surface water exists all or part of the time, storm drain locations, areas where concentrated flow of stormwater runoff is likely, and if possible, paved surfaces.

Portable sanitary facilities will be anchored in such a way as to prevent tipping over and cleaned and maintained by a licensed contractor.

Excess concrete and/or washout water may only be discharged to the ground surface if a formal designated Concrete Washout Area (CWA) has been installed on site (See Appendix D for design details and requirements for a CWA) and must never be discharged to surface waters, drainages, or storm sewer systems. CWA's consist of a shallow excavation with bermed areas on 3 sides and a small ramp leading down to the washout area. CWA's must also be equipped with a Vehicle Tracking Control (VTC) on the ramp side and proper signage. As with other BMP's, proper inspection and maintenance of a CWA is required. Concrete waste must be removed from the CWA by an approved disposal contractor whenever the excavated area reaches 2/3 of its maximum capacity.

In lieu of a designated concrete washout area, the contractor may use rigid, watertight receptacles (such as eco-pans, plastic tubs, or dumpsters) to temporarily store washout water or waste concrete. These receptacles should either be removed by the end of the workday or covered in a manner so as not to be exposed to stormwater.

A concrete washout may be installed as part of the SSA, but concrete work will not be performed with this phase of the project.

remove this  
paragraph



## ALLOWABLE NON-STORMWATER DISCHARGES

Allowable non-stormwater discharges include:

- Emergency fire-fighting activities
- Landscape irrigation return flow
- Uncontaminated natural springs
- Concrete washout water
- Construction dewatering activities

Item 14. discuss each type of discharge listed or remove from the list

Though not anticipated, the discharge of water associated with emergency fire-fighting activities is always a possibility. Likewise, the point of discharge cannot be determined as there is no way to predict the location of any fire-fighting activity.

## PROJECT PHASING

list the BMPs to be installed

Project Phase	BMPs to be implemented during each phase*
Pre-construction – 1 week	<ul style="list-style-type: none"> <li>• Install initial BMP's, perimeter controls, and access points.</li> </ul>
Pre-construction Inspection	<ul style="list-style-type: none"> <li>• Meet with the City Engineering Inspector prior to the start of construction</li> <li>• Install and/or alter BMP's as instructed by the Engineering Inspector</li> </ul>
Construction – Initial Grading – 6 weeks	<ul style="list-style-type: none"> <li>• Begin grading operations, use surface roughening on all idled disturbed surfaces</li> </ul>
Construction – Initial Stabilization Preparation – 1 week	<ul style="list-style-type: none"> <li>• Surface roughen all exposed soil on site</li> <li>• Apply seed and mulch to exposed soils</li> <li>• SSA to remain in place for subsequent construction activity</li> </ul>
Post-construction – 2 years (or until additional construction phases have been approved)	<ul style="list-style-type: none"> <li>• Perform monthly inspections to monitor vegetation growth</li> <li>• Perform BMP maintenance/repairs and reseed where necessary</li> <li>• Apply noxious weed control measures as necessary</li> <li>• Continue to monitor until 70% vegetative cover is achieved</li> </ul>
Final Inspection	<ul style="list-style-type: none"> <li>• Meet with the City Engineering Inspector</li> <li>• Make changes or repairs as instructed by the inspector.</li> <li>• If requirements have been met, receive approval from the inspector that requirements have been met.</li> </ul>
Permit Closure	<ul style="list-style-type: none"> <li>• Submit a termination application to the CDPHE WQCD notifying them that the required vegetative cover has been achieved and request a Notice of Termination</li> <li>• The stormwater permit is considered closed as soon as the Notice of Termination from CDPHE WQCD is received.</li> </ul>

## **FINAL STABILIZATION**

### **FINAL STABILIZATION METHODS**

Final stabilization is the process that is undertaken at the completion of construction activities in order to provide of means of mitigating stormwater pollutants, particularly erosion and sedimentation, on a permanent basis. Several different methods are commonly used achieve permanent stabilization of disturbed areas including:

- Hardscaping – includes the use of concrete, asphalt, gravel, or other impervious surfaces
- Landscaping – gardens are an acceptable method of final stabilization and do not need to meet the 80% revegetation criteria
- Soil preparation – includes addition of fertilizer, soil buffers to control pH, and/or tilling of the soil to provide an adequate seed bed
- Stabilizing the soil – includes the use of crimp mulch and erosion control blankets to prevent soils from mobilizing
- Selection of an appropriate seed mix – this depends largely on the region in which the project is located and the future use of the property.
- Maintenance of any structural BMP's necessary to prevent erosion and sedimentation prior to achieving final stabilization
- Removal of BMP's once final stabilization is achieved

### **PLAN TO ACHIEVE FINAL STABILIZATION**

Upon completion of construction activities, remaining disturbed areas will undergo initial stabilization. Initial stabilization will consist seeding and mulching of the entirety of the site using a native grasses seed mix. See plan drawings located in Appendix B.

### **COMPLETION OF FINAL STABILIZATION**

Final stabilization is reached 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% of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. Upon attaining the required vegetation coverage, all temporary BMP's must be removed prior to terminating the permit.

## LONG-TERM STORMWATER MANAGEMENT

No long-term control measures will exist on site at the completion of this project. Eventually a detention pond will be constructed along the south property boundary but not during this phase of the project.

## **INSPECTION REQUIREMENTS**

Inspection requirements are detailed in the permits located in Appendix A. The City of Colorado Springs inspection form, as adopted by El Paso County is included as Appendix D.

## **APPENDIX A**

### **PERMITS**

CDPS Permit Certification COR [#####]

CDPS General Permit

El Paso Erosion and Stormwater Quality Control Permit (ESQCP)



# 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)

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 1st day of November 2018.

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Ellen Howard Kutzer, Permits Section Manager  
Water Quality Control Division

**Permit History**

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

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## 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 (i.e. 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.
- iii. Discharges of landscape irrigation return flow.

**c. Emergency Fire Fighting**

Discharges resulting from emergency firefighting activities 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 sites that will disturb one acre or more; or
    - ii. Construction sites that are 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. Applicants must use the paper form provided by the division or the electronic form provided on the division's web-based application platform when applying for coverage under this permit.
    - iv. 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.

- v. The applicant(s) must submit a complete, accurate, and signed permit application electronically, by mail or hand delivery to the division at least 10 days prior to the commencement of construction activity except that construction activities that are in response to a [public emergency related site](#) 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.
  - vi. The application must be signed in accordance with the requirements of Part IA. Applications submitted by mail or hand delivered should be directed 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
  - vii. 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 Alternate 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. In this case, the Division will notify the applicant or permittee that an individual permit application is required.
  - ii. Permittee Request for alternate 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 must make 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.”

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, reassignments, and terminations, shall be conducted following 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 activities that may contribute pollutants to stormwater discharges. 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 non-structural control measures must meet the requirements listed below.

Specific control measures must meet the requirements listed below.

- (a) Vehicle tracking controls shall either be implemented to minimize vehicle tracking of sediment from disturbed areas, or the areas where vehicle tracking occurs shall meet subsection Part I.B.1.a.i(b);
- (b) Stormwater runoff from all disturbed areas and soil storage areas for which permanent or temporary stabilization is not implemented, must flow to at least one control measure to minimize sediment in the discharge. This may be accomplished through filtering, settling, or straining. The control measure must be selected, designed, installed and adequately sized in accordance with good engineering, hydrologic and pollution control practices. 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 (i.e., sheet or concentrated flow);
- (c) Outlets that withdraw water from or near the surface shall be installed when discharging from basins and impoundments, unless **infeasible**.
- (d) Maintain pre-existing vegetation or equivalent control measures for areas within 50 horizontal feet of receiving waters as defined by this permit, unless **infeasible**.
- (e) Soil compaction must be minimized for areas where infiltration control measures will occur or where **final stabilization** will be achieved through vegetative cover.
- (f) Unless **infeasible**, topsoil shall be preserved for those areas of a site that will utilize vegetative final stabilization.
- (g) Minimize the amount of soil exposed during construction activity, including the disturbance of steep slopes.

ii. Practices for Other Common Pollutants

- (a) Bulk storage, 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 shall 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.

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.
- (b) Final stabilization must be implemented for all construction sites. Final stabilization is reached when all ground surface disturbing activities at the construction site are complete; and, for all areas of ground surface disturbing activities, either a uniform vegetative cover with an individual plant density of at least 70 percent of pre-disturbance levels is established, or equivalent permanent alternative stabilization methods are implemented. The division may approve alternative final stabilization criteria for specific operations.
- (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 (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;
  - (6) Other alternative stabilization practices as applicable;

(d) The permittee(s) 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).

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, 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 of control measure immediately after discovering the deficiency, the following must be documented 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 (e.g., discharge of non-stormwater, spill, or leak not authorized by this permit.) The permittee must also clean up any contaminated surfaces to minimize discharges of the material in subsequent storm events.

2. Discharges to an Impaired Waterbody

a. Total Maximum Daily Load (TMDL)

If the permittee's discharge 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 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 the site's qualified stormwater manager(s) responsible for implementing the SWMP in its entirety. 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. Materials Handling. The SWMP must describe and locate 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.
  - iv. 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 shall 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;
    - (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.
- v. Implementation of Control Measures. The SWMP must include design specifications that contain information on the implementation of the control measure 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.

- vi. 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 used in the development of the construction site plans or SWMP that describe the soil or existing potential for soil erosion;

- (e) a description of the percent of existing vegetative ground cover relative to the entire site and the method for determining the percentage;
  - (f) a description of any allowable non-stormwater discharges at the site, including those being discharged under a division low risk discharge guidance policy;
  - (g) a description of areas receiving discharge from the site. Including a description of the immediate source receiving the discharge. If the stormwater discharge is to a municipal separate storm sewer system, the name of the entity owning that system, the location of the storm sewer discharge, and the ultimate receiving water(s); and
  - (h) a description of all stream crossings located within the construction site boundary.
- vii. 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;
  - (i) 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 in accordance with Part I.B.1.a.i.(d).; and
  - (j) locations of all stream crossings located within the construction site boundary.
- viii. Final Stabilization and Long Term Stormwater Management. The SWMP must describe the practices used to achieve final stabilization of all disturbed areas at the site and any planned practices 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.
- ix. Inspection Reports. The SWMP must include documented inspection reports in accordance with Part ID.

### 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.

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. 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 is a qualified stormwater manager.

##### 2. Inspection Frequency

Permittees must conduct site inspections in accordance with one of the following minimum frequencies, unless the site meets the requirements of Part ID.3

- 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 may 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 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.

#### 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 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 II:

- 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. designated haul routes;
- iv. material and waste storage areas exposed to precipitation;
- v. locations where stormwater has the potential to discharge offsite; and
- vi. 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 in accordance with Part IB.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. Inspection records must be retained in accordance with Part II.O. and signed in accordance with Part I.A.3.f. 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) of discharges of sediment or other pollutants from the site;
- vii. location(s) of control measures needing maintenance;
- viii. location(s) and identification of inadequate control measures;
- ix. location(s) and identification of additional control measures are needed that were not in place at the time of inspection;
- x. description of the minimum inspection frequency (either in accordance with Part I.D.2., I.D.3. or I.D.4.) utilized when conducting each inspection.
- xi. deviations from the minimum inspection schedule as required in Part I.D.2.;
- xii. after adequate corrective action(s) and maintenance have been taken, or where a report does not identify any incidents requiring corrective action or maintenance, 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  $\frac{1}{4}$  mile of, a construction site and that provide materials only to that specific construction site.
- (7) Final Stabilization - The condition reached when all ground surface disturbing activities at the site have been completed, and for all areas of ground surface disturbing activities where a uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed.
- (8) 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.
- (9) 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.
- (10) Infeasible - Not technologically possible, or not economically practicable and achievable in light of best industry practices.
- (11) 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.
- (12) 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).
- (13) 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).
- (14) Municipal Stormwater Management Program - A stormwater program operated by a municipality, typically to meet the requirements of the municipalities MS4 discharge certification.

- (15) 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.(e.g. the general contractor)
- (16) 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 with ownership of, a long term lease of, or easements on the property on which the construction activity is occurring (e.g., the developer).
- (17) Permittee(s) - The owner and operator named in the discharge certification issued under this permit for the construction site specified in the certification.
- (18) 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).
- (19) 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).
- (20) 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.
- (21) 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.
- (22) 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.
- (23) 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.
- (24) 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.
- (25) 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.
- (26) 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).

- (27) 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.
- (28) 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.
- (29) Spill - An unintentional release of solid or liquid material which may pollute state waters.
- (30) 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.
- (31) 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.
- (32) Stormwater - Precipitation runoff, snow melt runoff, and surface runoff and drainage. See 5 CCR 1002-61.2(103).
- (33) 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.
- (34) 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:

- a. enforcement action;
- b. permit termination, revocation and reissuance, or modification; or
- c. 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. (i) the chief executive officer of the agency, or

- ii. (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(l) 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(l)(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. ee 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:

- i. the bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

- ii. 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
- iii. 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 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



## EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) EL PASO COUNTY APPLICATION AND PERMIT

### APPLICANT INFORMATION

### PERMIT NUMBER

Owner Information	
Owner	Charter Development Company, LLC c/o National Heritage Academies
Name (person of responsibility)	Joe Sprys
Company/Agency	
Position of Applicant	
Address (physical address, not PO Box)	3850 Broadmoor SE
City	Grand Rapids
State	Michigan
Zip Code	49512
Mailing address, if different from above	
Telephone	(616) 929-1290
FAX number	N/A
Email Address	jsprys@nhaschools.com
Cellular Phone number	(734) 474-8029
Contractor/Operator Information	
Name (person of responsibility)	William "Bill" Torres as General Contractor, however we will subcontract this scope of work to a firm specializing in it.
Company	Gilbane Building Company
Address (physical address, not PO Box)	304 Inverness Way S #200
City	Engelwood
State	CO
Zip Code	80112
Mailing address, if different from above	
Telephone	720-633-1268
FAX number	
Email Address	<a href="mailto:wtorres@gilbaneco.com">wtorres@gilbaneco.com</a>
Cellular Phone number	720-633-1268
Erosion Control Supervisor (ECS)*	TBD
ECS Phone number*	TBD
ECS Cellular Phone number*	TBD

\*Required for all applicants. May be provided at later date pending securing a contract when applicable.

**PROJECT INFORMATION**

Project Information	
Project Name	Mountain View Academy
Legal Description	Tract H, Claremont Ranch Filing No. 4 as recorded under Reception No. 204062712 of the records of the El Paso County Clerk and Recorder, County of El Paso, State of Colorado, containing 7.884 Acres or 343,420 Square Feet, more or less.
Address (or nearest major cross streets)	2103 Meadowbrook Parkway, Colorado Springs, CO 80951
Acreage (total and disturbed)	Total: 7.88 acres Disturbed: 7.88 acres
Schedule	Start of Construction: March 01, 2020 Completion of Construction: May 01, 2020 Final Stabilization: August 2022
Project Purpose	This application's purpose is to allow for early site grading to get the site prepped for civil and building construction.
Description of Project	Ultimately, a Charter school authorized by District 49 will be constructed on the site. This first stand-alone Phase of the project is to allow for earthwork and site preparation / grooming only.
Tax Schedule Number	5404121002

**FOR OFFICE USE ONLY**

The following signature from the ECM Administrator signifies the approval of this ESQCP. All work shall be performed in accordance with the permit, the El Paso County Engineering Criteria Manual (ECM) Standards, City of Colorado Springs Drainage Criteria Manual, Volume 2 (DCM2) as adopted by El Paso County Addendum, approved plans, and any attached conditions. The approved plans are an enforceable part of the ESQCP. Construction activity, except for the installation of initial construction BMPs is not permitted until issuance of a Construction permit and Notice to Proceed.

Signature of ECM Administrator: \_\_\_\_\_

Date \_\_\_\_\_

## 1.1 REQUIRED SUBMISSIONS

In addition to this completed and signed application, the following items must be submitted to obtain an ESQCP:

- Permit fees
- Stormwater Management Plan (SWMP) meeting the requirements of DCM2 and ECM either as part of the plan set or as a separate document;
- Cost estimates of construction and maintenance of construction and permanent stormwater control measures (Cost estimates shall be provided on a unit cost basis for all stormwater BMPs);
- Financial surety in an amount agreeable to the ECM Administrator based on the cost estimates of the stormwater quality protection measures provided. The financial surety shall be provided in the form of a Letter of Credit, Surety with a Bonding Company, or other forms acceptable to El Paso County;
- Operation and Maintenance Plan for any proposed permanent stormwater control measures; and
- Signed Private Detention Basin/Stormwater Quality Best Management Practice Maintenance Agreement and Easement, if any permanent stormwater control measures are to be located on site.

## 1.2 RESPONSIBILITY FOR DAMAGE

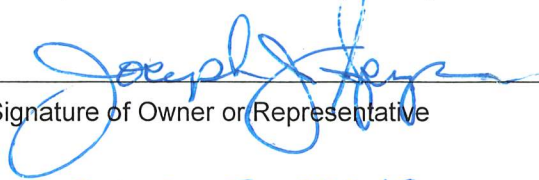
The County and its officers and employees, including but not limited to the ECM Administrator, shall not be answerable or accountable in any manner, for injury to or death of any person, including but not limited to a permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder, or for damage to property resulting from any activities undertaken by a permit holder or under the direction of a permit holder. The permit holder shall be responsible for any liability imposed by law and for injuries to or death of any person, including but not limited to the permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder, or damage to property arising out of work or other activity permitted and done by the permit holder under a permit, or arising out of the failure on the permit holder's part to perform the obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity, or at any subsequent time work or other activity is being performed under the obligations provided by and contemplated by the permit.

To the extent allowed by law, the permit holder shall indemnify, save, and hold harmless the County and its officers and employees, including but not limited to the BOCC and ECM Administrator, from all claims, suits or actions of every name, kind and description brought for or on account of injuries to or death of any person, including but not limited to the permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder and the public, or damage to property resulting from the performance of work or other activity under the permit, or arising out of the failure on the permit holder's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time work or other activity is being performed under the obligations provided by and contemplated by the permit, except as otherwise provided by state law. The permit holder waives any and all rights to any type of expressed or implied indemnity against the County, its officers or employees.

**1.3 APPLICATION CERTIFICATION**

We, as the Applicants or the representative of the Applicants, hereby certify that this application is correct and complete as per the requirements presented in this application and the El Paso County Engineering Criteria Manual and Drainage Criteria Manual, Volume 2 and El Paso County Addendum.

We, as the Applicants or the representatives of the Applicants, have read and will comply with all of the requirements of the specified Stormwater Management Plan and any other documents specifying stormwater best management practices to be used on the site including permit conditions that may be required by the ECM Administrator. We understand that the stormwater control measures are to be maintained on the site and revised as necessary to protect stormwater quality as the project progresses. We further understand that a Construction Permit must be obtained and all necessary stormwater quality control measures are to be installed in accordance with the SWMP, the El Paso County Engineering Criteria Manual, Drainage Criteria Manual, Volume 2 and El Paso County Addendum before land disturbance begins and that failure to comply will result in a Stop Work Order and may result in other penalties as allowed by law. We further understand and agree to indemnify, save, and hold harmless the County and its officers and employees, including but not limited to the BOCC and ECM Administrator, from all claims, suits or actions of every name, kind and description as outlined in Section 1.2 Responsibility for Damage.

  
\_\_\_\_\_  
Signature of Owner or Representative  
JOSEPH J. SPRYS  
\_\_\_\_\_  
Print Name of Owner or Representative

Date: 1/17/20

\_\_\_\_\_  
Signature of Operator or Representative  
  
\_\_\_\_\_  
Print Name of Operator or Representative

Date: \_\_\_\_\_

Permit Fee           \$ \_\_\_\_\_  
Surcharge           \$ \_\_\_\_\_  
Financial Surety   \$ \_\_\_\_\_  
  
Total                 \$ \_\_\_\_\_

Type of Surety \_\_\_\_\_

## **APPENDIX B**

### **GEC PLANS**

**APPENDIX C**  
**BMP DETAILS/SPECIFICATIONS**

# Guidelines for Implementing Construction Best Management Practices

## For Any Construction Site:

1. **Provide Perimeter Controls** on downgradient site boundaries.

Use one of the following BMPs:

See **Silt Fence** Fact Sheet  
See **Straw Bale Barrier** Fact Sheet  
See **Temporary Swale** Fact Sheet

2. **Provide Sediment Basin or Check Dam** at locations where concentrated flow exits site.

Provide **Sediment Basin** for upstream drainage areas greater than 1 acre.

See **Sediment Basin** Fact Sheet

Provide **Check Dam** for upstream drainage areas between 1 and 10 acres.

See **Check Dam** Fact Sheet

3. **Provide Vehicle Tracking Controls** for stabilized access to site.

See **Vehicle Tracking Control** Fact Sheet

4. **Stabilize Disturbed Ground** within specified time limits.

Use one of the following BMPs:

See **Erosion Control Blankets** Fact Sheet  
See **Mulching** Fact Sheet  
See **Temporary Seeding** Fact Sheet

## For Slopes:

1. **Provide Surface Roughening.**

See **Surface Roughening** Fact Sheet

2. **Provide Drainage Controls.**

Use one of the Following BMPs:

See **Slope Drain** Fact Sheet  
See **Silt Fence** Fact Sheet  
See **Straw Bale Barrier** Fact Sheet  
See **Temporary Swale** Fact Sheet

## For Storm Drain Inlets:

1. **Provide Inlet Protection.**

See **Inlet Protection** Fact Sheet

# Check Dam

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## What it is

Check dams are small, temporary or permanent dams constructed across a drainage ditch, swale or channel to reduce the velocity of concentrated flows and to trap sediment eroded from upstream. Check dams can be constructed out of rocks, gravel-filled sandbags or straw bales.



## When and Where to use it

- In open channels that receive flow from drainage between 1 and 10 acres.
- In steeply sloped swales.
- In swales that need protection during the establishment of grasses or prior to installation of a non-erodible lining.

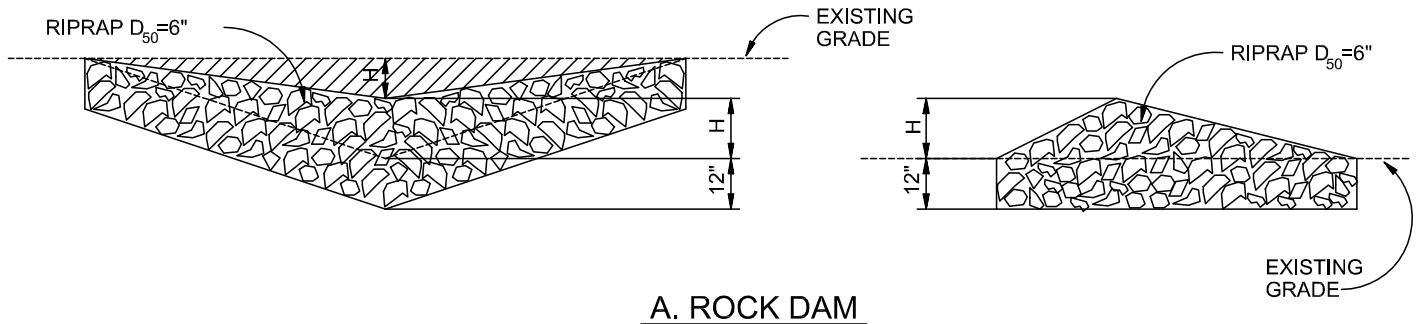
## When and Where NOT to use it

- In live streams.
- In channels that receive flow from drainage areas greater than 10 acres.
- In channels that will be overtopped by flow once the dams are constructed.

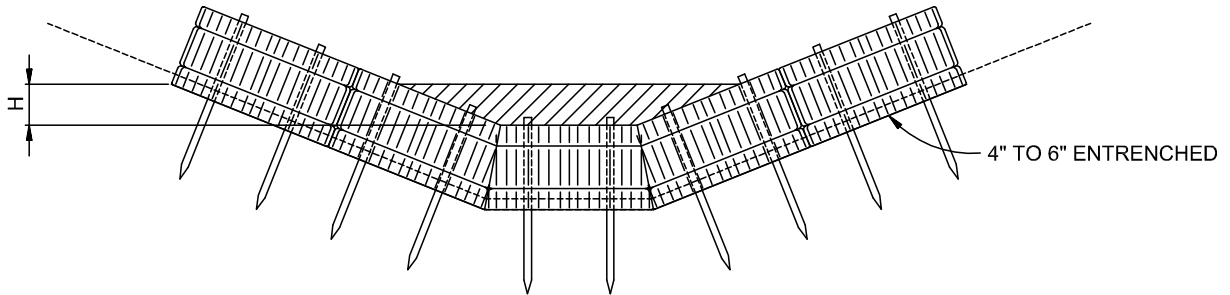
## Construction Detail and Maintenance Requirements

Figure CD-1 provides a construction detail and maintenance requirements for a check dam.



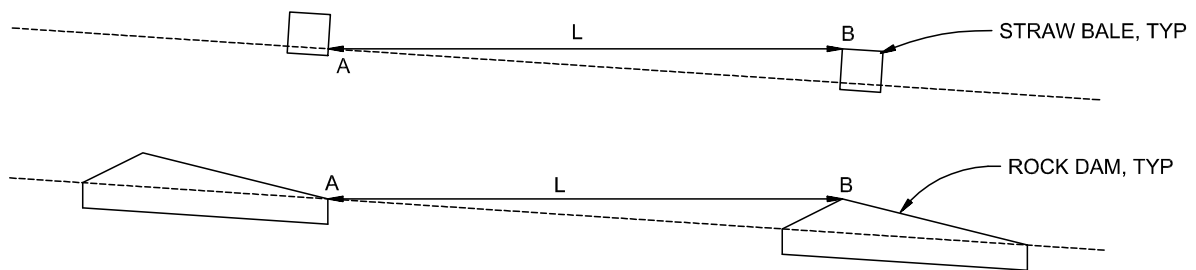


**A. ROCK DAM**



**B. STRAW BALE CHECK DAM**

(SEE STRAW BALE BARRIER INSTALATION)



L= THE DISTANCE SUCH THAT POINTS A AND B ARE AT THE SAME ELEVATION.

**C. SPACING CHECK DAMS**

**CHECK DAM**

NTS

**CHECK DAM NOTES**

**INSTALLATION REQUIREMENTS**

1. STRAW BALES USED AS CHECK DAMS ARE TO MEET THE REQUIREMENTS STATED IN FIGURE SBB-2.
2. THE "H" DIMENSION SHALL BE SELECTED TO PROVIDE WEIR FLOW CONVEYANCE FOR 2-YEAR FLOW OR GREATER.

**MAINTENANCE REQUIREMENTS**

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL CHECK DAMS, ESPECIALLY AFTER STORM EVENTS.
2. REPLACE STONE AS NECESSARY TO MAINTAIN THE CORRECT HEIGHT OF THE DAM.
3. ACCUMULATED SEDIMENT AND DEBRIS IS TO BE REMOVED FROM BEHIND THE DAMS AFTER EACH STORM OR WHEN 1/2 OF THE ORIGINAL HEIGHT OF THE DAM IS REACHED.
3. CHECK DAMS ARE TO REMAIN IN PLACE AND OPERATIONAL UNTIL THE DRAINAGE AREA AND CHANNEL ARE PERMANENTLY STABILIZED.
4. WHEN CHECK DAMS ARE REMOVED THE CHANNEL LINING OR VEGETATION IS TO BE RESTORED.

# Erosion Control Blankets

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## What it is

Erosion control blankets are geotextiles or filter fabrics that are used to stabilize soils, steep slopes and drainage channels.

### TYPES OF EROSION CONTROL BLANKETS

- WOVEN OR BONDED SYNTHETIC MATERIALS SUCH AS POLYPROPYLENE, POLYESTER, POLYETHYLENE, NYLON, POLYVINYL CHLORIDE, GLASS AND VARIOUS MIXTURES OF THESE.
- MULCH MATTING MADE FROM JUTE OR OTHER WOOD FIBER THAT HAS BEEN FORMED INTO SHEETS.
- NETTING MADE FROM JUTE OR OTHER WOOD FIBER, PLASTIC, PAPER, OR COTTON USED TO HOLD MULCH AND MATTING TO THE GROUND.
- BLANKETS OF WOVEN STRAW MULCH WITH A SYNTHETIC LAYER OR NET.



## When and Where to use it

- In temporary and permanent swales.
- To protect recently seeded slopes.
- In drainageway channels.

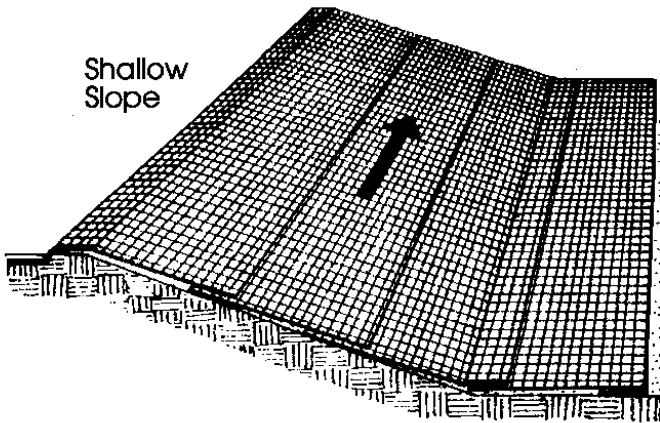
## When and Where NOT to use it

- In swales with slopes greater than 5 percent or with stormwater velocities > 8 feet per second.

## Installation and Maintenance Requirements

Installation requirements are provided in Figures ECB-1 and ECB-2.

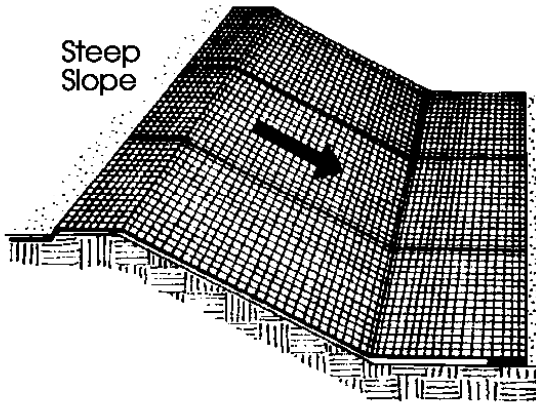
Maintenance requirements include regular inspections to determine if fabric is damaged or has come loose, and appropriate repairs or replacement of damaged materials.



Shallow Slope

On shallow slopes, strips of netting may be applied across the slope.

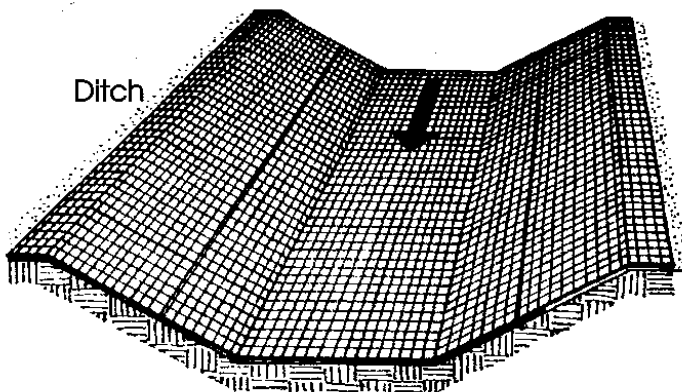
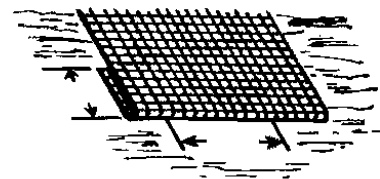
Where there is a berm at the top of the slope, bring the netting over the berm and anchor it behind the berm.



Steep Slope

On steep slopes, apply strips of netting parallel to the direction of flow and anchor securely.

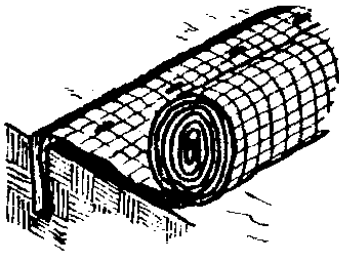
Bring netting down to a level area before terminating the installation. Turn the end under 6" and staple at 12" intervals.



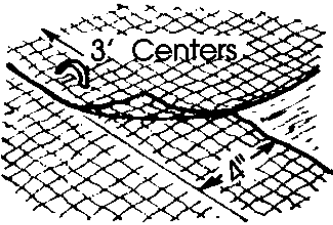
Ditch

In ditches, apply netting parallel to the direction of flow. Use check slots every 15 feet. Do not join strips in the center of the ditch.

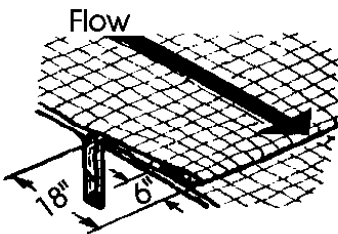
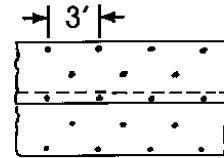
From: Virginia Soil and Water Conservation Commission, 1985



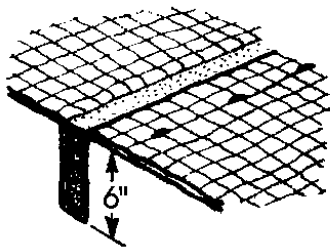
**Anchor Slot:** Bury the up-channel end of the net in a 6" deep trench. Tamp the soil firmly. Staple at 12" intervals across the net.



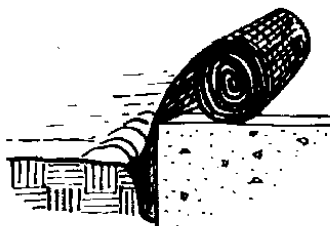
**Overlap:** Overlap edges of the strips at least 4". Staple every 3 feet down the center of the strip.



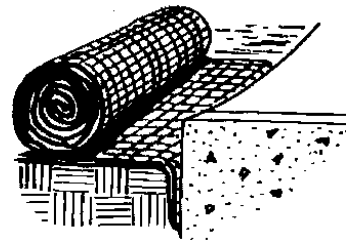
**Joining Strips:** Insert the new roll of net in a trench, as with the Anchor Slot. Overlap the up-channel end of the previous roll 18" and turn the end under 6". Staple the end of the previous roll just below the anchor slot and at the end at 12" intervals.



**Check Slots:** On erodible soils or steep slopes, check slots should be made every 15 feet. Insert a fold of the net into a 6" trench and tamp firmly. Staple at 12" intervals across the net. Lay the net smoothly on the surface of the soil - do not stretch the net, and do not allow wrinkles.



**Anchoring Ends At Structures:** Place the end of the net in a 6" slot on the up-channel side of the structure. Fill the trench and tamp firmly. Roll the net up the channel. Place staples at 12" intervals along the anchor end of the net.



From: Virginia Soil and Water Conservation Commission, 1985

City of Colorado Springs  
Storm Water Quality

Figure ECB-2  
Erosion Control Blanket  
Installation Requirements

# Inlet Protection

## What it is

Inlet protection is a sediment control barrier formed around a storm drain inlet. A number of alternative inlet protection designs are available, including:

- Silt Fence Inlet Protection.
- Straw Bale Barrier Inlet Protection.
- Block and Gravel Bag Inlet Protection.
- Curb Socks Inlet Protection.



## When and Where to use it

Application of inlet protection differs by design.

- Filter fabric and straw bale inlet protection are used for area inlets (not located within streets).
- Block and gravel bag curb inlet protection is used for street inlets in sumps.
- Curb sock protection is used for street inlets in sumps or on continuous grade.

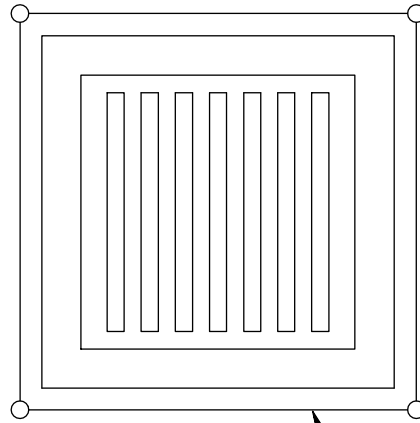


## When and Where NOT to use it

- Filter fabric and straw bale inlet protection cannot be used for drain inlets that are paved because these designs require excavation and/or staking of materials.
- Block and gravel bag inlet protection is not recommended for continuous grade inlets due to concerns about damage from bypassed flow.

## Construction Detail and Maintenance Requirements

Figures IP-1 through IP-4 provide a construction detail and maintenance requirements for each inlet protection design alternative.



FILTER FABRIC  
(SEE FIG. SF-2 FOR  
INSTALLATION  
REQUIREMENTS)

## FILTER FABRIC INLET PROTECTION

NTS

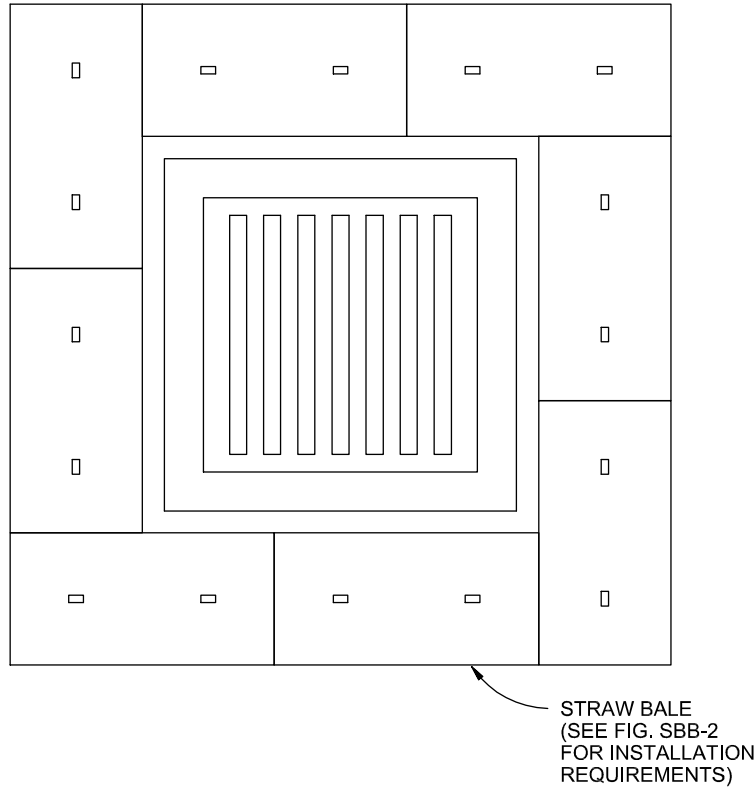
### FILTER FABRIC INLET PROTECTION NOTES

#### INSTALLATION REQUIREMENTS

1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER CONSTRUCTION OF INLET.
2. SEE SILT FENCE FIGURE SF-2 FOR INSTALLATION REQUIREMENTS.
3. POSTS ARE TO BE PLACED AT EACH CORNER OF THE INLET AND AROUND THE EDGES AT A MAXIMUM SPACING OF 3 FEET.

#### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT INLET PROTECTION IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.
2. DAMAGED, COLLAPSED, UNENTRENCHED OR INEFFECTIVE INLET PROTECTION SHALL BE PROMPTLY REPAIRED OR REPLACED.
3. SEDIMENT SHALL BE REMOVED FROM BEHIND FILTER FABRIC WHEN IT ACCUMULATES TO HALF THE EXPOSED GEOTEXTILE HEIGHT.
4. FILTER FABRIC PROTECTION SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED IN THE DRAINAGE AREA AS APPROVED BY THE CITY.



## STRAW BALE INLET PROTECTION

NTS

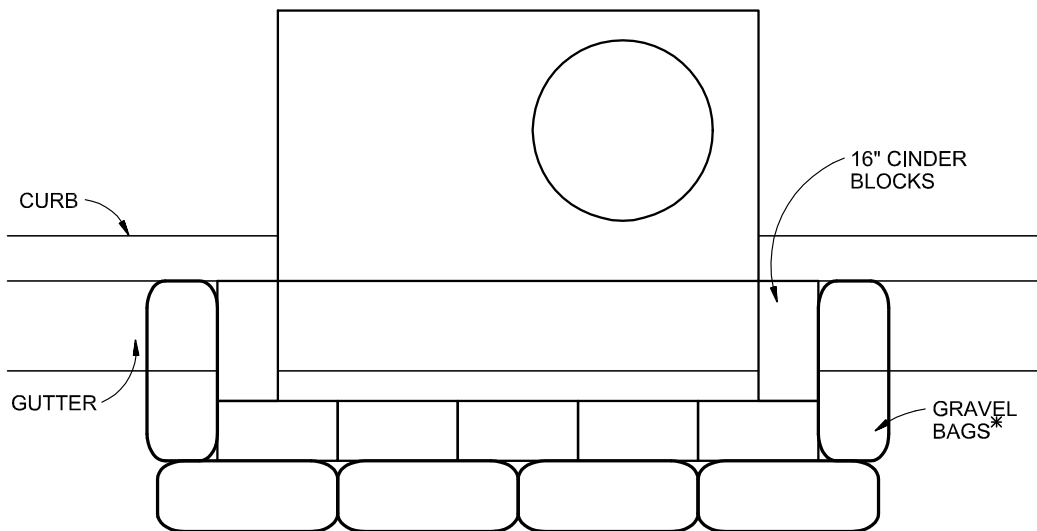
### STRAW BALE INLET PROTECTION NOTES

#### INSTALLATION REQUIREMENTS

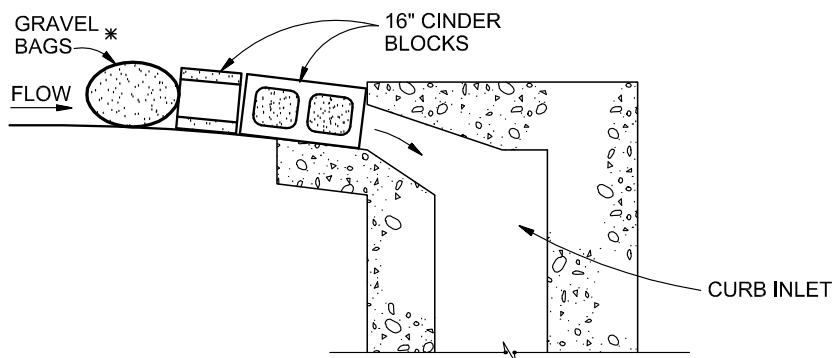
1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER CONSTRUCTION OF INLET.
2. BALES ARE TO BE PLACED IN A SINGLE ROW AROUND THE INLET WITH THE END OF THE BALES TIGHTLY ABUTTING ONE ANOTHER.
3. SEE STRAW BALE BARRIER FIGURE SBB-2 FOR INSTALLATION REQUIREMENTS.

#### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT STRAW BALE INLET PROTECTION IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.
2. DAMAGED OR INEFFECTIVE INLET PROTECTION SHALL PROMPTLY BE REPAIRED, REPLACING BALES IF NECESSARY, AND UNENTRENCHED BALES NEED TO BE REPAIRED WITH COMPACTED BACKFILL MATERIAL.
3. SEDIMENT SHALL BE REMOVED FROM BEHIND STRAW BALES WHEN IT ACCUMULATES TO APPROXIMATELY 1/3 THE HEIGHT OF THE BARRIER.
4. INLET PROTECTION SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED WITHIN THE DRAINAGE AREA AS APPROVED BY THE CITY.



**PLAN**



**SECTION**

## BLOCK AND GRAVEL BAG\* CURB INLET PROTECTION

NTS

### BLOCK AND GRAVEL BAG\* CURB INLET PROTECTION NOTES

#### INSTALLATION REQUIREMENTS

1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER CONSTRUCTION OF INLET.
2. CONCRETE BLOCKS ARE TO BE LAID AROUND THE INLET IN A SINGLE ROW ON THEIR SIDES, ABUTTING ONE ANOTHER WITH THE OPEN ENDS OF THE BLOCK FACING OUTWARD.
3. GRAVEL BAGS ARE TO BE PLACED AROUND THE CONCRETE BLOCKS CLOSELY ABUTTING ONE ANOTHER SO THERE ARE NO GAPS.
4. GRAVEL BAGS ARE TO CONTAIN WASHED SAND OR GRAVEL APPROXIMATELY 3/4 INCH IN DIAMETER.
5. BAGS ARE TO BE MADE OF 1/4" INCH WIRE MESH (USED WITH GRAVEL ONLY) OR GEOTEXTILE.

\* AN ALTERNATE 3/4" TO 1" GRAVEL FILTER OVER A WIRE SCREEN MAY BE USED IN PLACE OF GRAVEL BAGS. THE WIRE MESH SHALL EXTEND ABOVE THE TOP OF THE CONCRETE BLOCKS AND THE GRAVEL PLACED OVER THE WIRE SCREEN TO THE TOP OF THE CONCRETE BLOCKS.

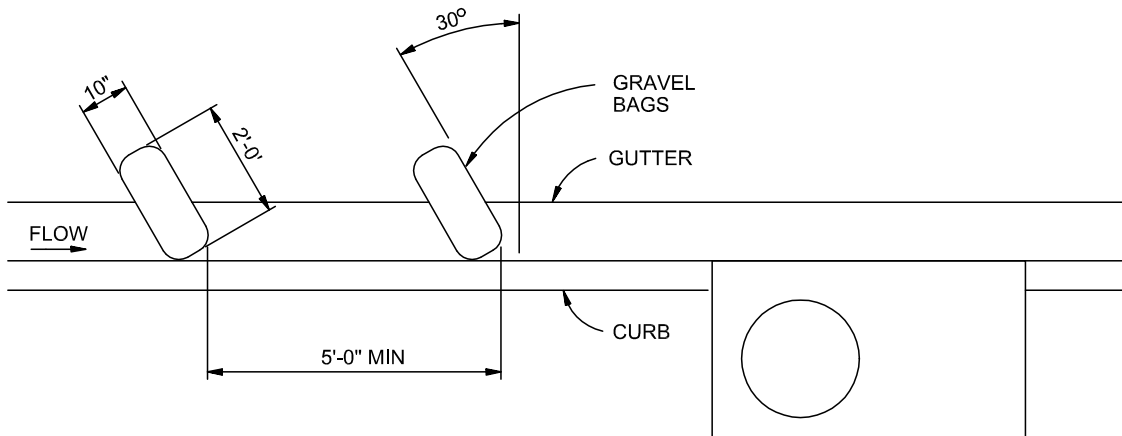
#### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT INLET PROTECTION IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.
2. DAMAGED OR INEFFECTIVE INLET PROTECTION SHALL PROMPTLY BE REPAIRED OR REPLACED.
3. SEDIMENT SHALL BE REMOVED WHEN SEDIMENT HAS ACCUMULATED TO APPROXIMATELY 1/2 THE DESIGN DEPTH OF THE TRAP.
4. INLET PROTECTION SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED WITHIN THE DRAINAGE AREA AS APPROVED BY THE CITY.

City of Colorado Springs  
Stormwater Quality

Figure IP-3  
Block & Gravel Bag Curb Inlet Protection  
Construction Detail and Maintenance  
Requirements





## CURB SOCK INLET PROTECTION

NTS

### CURB SOCK INLET PROTECTION NOTES

#### INSTALLATION REQUIREMENTS

1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER CONSTRUCTION OF INLET.
2. SOCK IS TO BE MADE OF 1/4 INCH WIRE MESH (USED WITH GRAVEL ONLY) OR GEOTEXTILE.
3. WASHED SAND OR GRAVEL 3/4 INCH TO 4 INCHES IN DIAMETER IS PLACED INSIDE THE SOCK.
4. PLACEMENT OF THE SOCK IS TO BE 30 DEGREES FROM PERPENDICULAR IN THE OPPOSITE DIRECTION OF FLOW.
5. SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED AT A MINIMUM 5 FEET APART.
6. AT LEAST 2 CURB SOCKS IN SERIES IS REQUIRED.

#### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT INLET PROTECTION IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL AND WEEKLY DURING PERIODS NO RAINFALL.
2. DAMAGED OR INEFFECTIVE INLET PROTECTION SHALL PROMPTLY BE REPAIRED OR REPLACED.
3. SEDIMENT SHALL BE REMOVED FROM BEHIND THE SOCK WHEN GUTTER WIDTH IS FILLED.
4. INLET PROTECTION SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED WITHIN THE DRAINAGE AREA AS APPROVED BY THE CITY.

# Mulching

---

## What it is

Mulching is used to temporarily stabilize soils by securely applying materials such as grass, hay, woodchips or wood fibers to the soil's surface.

Mulching protects the soil from raindrop impact and reduces the velocity of overland runoff. Mulch also aids in the growth of temporary seeding by holding seeds and topsoil in place, retaining moisture, and insulating against extreme temperatures.



## When and Where to use it

- All disturbed areas and stockpiles shall be mulched within 21 days after final grade is reached.
- Disturbed areas and stockpiles which are not at final grade but will remain dormant for longer than 30 days shall also be mulched within 21 days after interim grading.
- An area that is going to remain in an interim state for more than 60 days shall also be seeded.
- Mulching is always to be used when applying temporary or permanent seeding.
- Mulching is often used when temporary seeding cannot be used due to the season or climate.

## When and Where NOT to use it

- In areas that will involve paving, building, or utility construction within 21 days after final grade is reached.

## Application Techniques and Maintenance Requirements

Figure MU-1 provides application techniques and maintenance requirements for mulching.

## MULCHING NOTES

### INSTALLATION REQUIREMENTS

1. ALL DISTURBED AREAS MUST BE MULCHED WITHIN 21 DAYS AFTER FINAL GRADE AND SEEDED AREAS ARE TO BE MULCHED WITHIN 24 HOURS AFTER SEEDING.
2. MATERIAL USED FOR MULCH CAN BE CERTIFIED CLEAN, WEED- AND SEED-FREE LONG STEMMED FIELD OR MARSH HAY, OR STRAW OF OATS, BARLEY, WHEAT, RYE, OR TRITICALE CERTIFIED BY THE COLORADO DEPARTMENT OF AGRICULTURE WEED FREE FORAGE CERTIFICATION PROGRAM.
3. HYDRAULIC MULCHING MATERIAL SHALL CONSIST OF VIRGIN WOOD FIBER MANUFACTURED FROM CLEAN WHOLE WOOD CHIPS. WOOD CHIPS CANNOT CONTAIN ANY GROWTH OR GERMINATION INHIBITORS OR BE PRODUCED FROM RECYCLED MATERIAL. GRAVEL CAN ALSO BE USED.
4. MULCH IS TO BE APPLIED EVENLY AT A RATE OF 2 TONS PER ACRE.
5. MULCH IS TO BE ANCHORED EITHER BY CRIMPING (TUCKING MULCH FIBERS 4 INCHES INTO THE SOIL), USING NETTING (USED ON SMALL AREAS WITH STEEP SLOPES), OR WITH A TACKIFIER.
6. HYDRAULIC MULCHING AND TACKIFIERS ARE NOT TO BE USED IN THE PRESENCE OF FREE SURFACE WATER.

### MAINTENANCE REQUIREMENTS

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL MULCHED AREAS.
2. MULCH IS TO BE REPLACED IMMEDIATELY IN THOSE AREAS IT HAS BEEN REMOVED, AND IF NECESSARY THE AREA SHOULD BE RESEDED.

# Sediment Basin

## What it is

A temporary sediment basin detains sediment-laden runoff long enough to allow much of the sediment to settle out. Sediment basins are constructed by excavation and/or by placing an earthen embankment across a low area or drainage swale. Basins can be designed to maintain a permanent pool or to drain completely dry through a controlled outlet structure.



## When and Where to use it

- Required in disturbed areas draining more than one acre.
- Where there is sufficient space and appropriate topography.
- In areas that allow access for maintenance and sediment removal.
- Positioned so that it captures sediment from the entire upstream disturbed area.
- Where a permanent detention basin is planned for the site.

## When and Where NOT to use it

- Sediment basins are not to be installed in active streams.

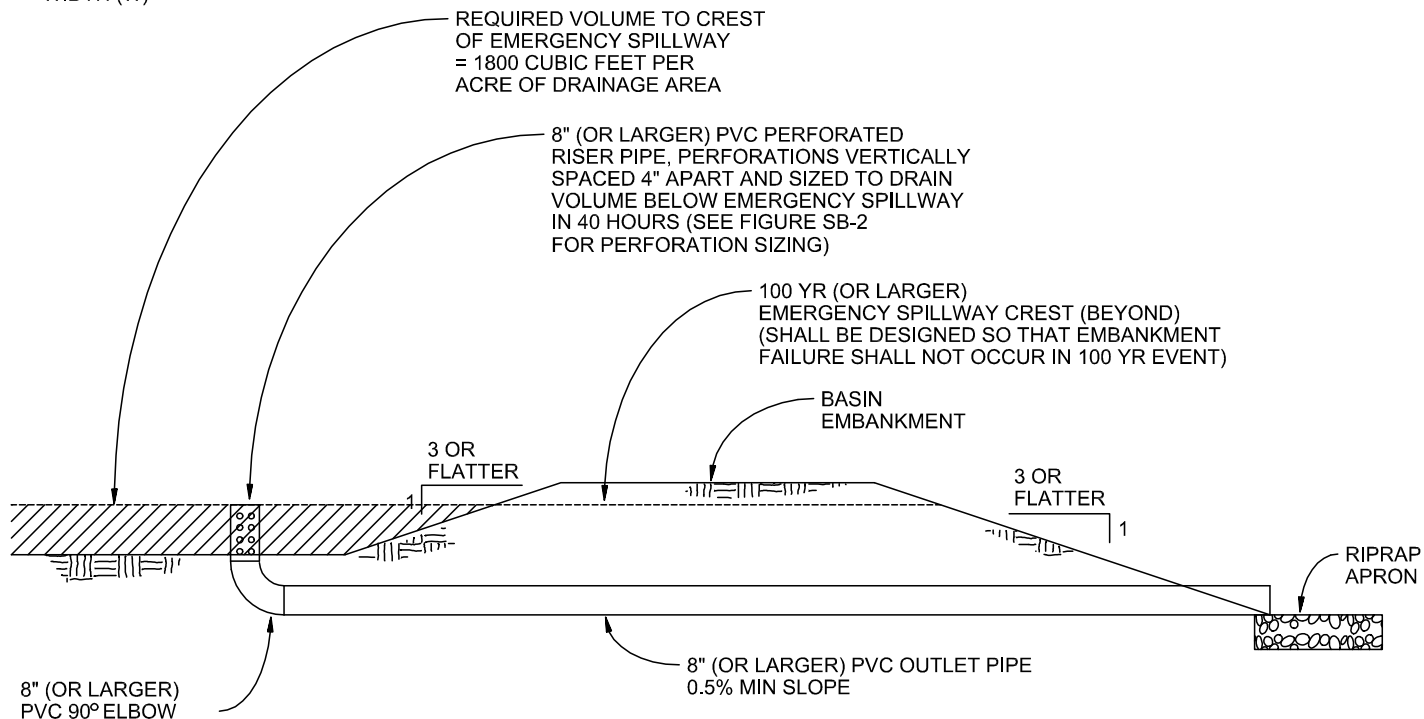


This low area will provide for some removal of sediment; however, it lacks a designed outlet structure.

## Construction Detail and Maintenance Requirements

Figure SB-1 provides a construction detail and maintenance requirements for a sediment basin.

BASIN GEOMETRY:  
 $\frac{\text{LENGTH (L)}}{\text{WIDTH (W)}} \geq 2$



## SEDIMENT BASIN

NTS

## SEDIMENT BASIN NOTES

### INSTALLATION REQUIREMENTS

1. SEDIMENT BASINS SHALL BE INSTALLED BEFORE ANY CLEARING AND/OR GRADING IS UNDERTAKEN.
2. THE AREA UNDER WHICH THE EMBANKMENT IS TO BE INSTALLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ALL VEGETATION AND ROOT MAT.
3. THE OUTLET OF THE BASIN SHALL BE DESIGNED TO DRAIN ITS VOLUME IN 40 HOURS.
4. THE OUTLET IS TO BE LOCATED AT THE FURTHEST DISTANCE FROM THE INLET OF THE BASIN. BAFFLES MAY BE NEEDED TO INCREASE THE FLOW LENGTH AND SETTLING TIME.
5. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL WITH A MINIMUM OF 15% PASSING A #200 SIEVE. EXCAVATED SOIL CAN BE USED IF IT MEETS THIS REQUIREMENT.
6. EMBANKMENT IS TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D 698.
7. WHEN A BASIN IS INSTALLED NEAR A RESIDENTIAL AREA, FOR SAFETY REASONS, A SIGN SHALL BE POSTED AND THE AREA SECURED WITH A FENCE.

### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT SEDIMENT BASINS AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.
2. SEDIMENT BASINS SHALL BE CLEANED OUT BEFORE SEDIMENT HAS FILLED HALF THE VOLUME OF THE BASIN.
3. SEDIMENT BASINS SHALL REMAIN OPERATIONAL AND PROPERLY MAINTAINED UNTIL THE SITE AREA IS PERMANENTLY STABILIZED WITH ADEQUATE VEGETATIVE COVER AND/OR OTHER PERMANENT STRUCTURE AS APPROVED BY THE CITY.

City of Colorado Springs  
 Stormwater Quality

Figure SB-1  
 Sediment Basin  
 Construction Detail and Maintenance  
 Requirements

Required Area per Row (in<sup>2</sup>)

		Depth at Outlet (ft)							
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Design Volume (acre-ft)	2	15.04	7.71	5.10	3.76	2.95	2.41	2.02	1.73
	1	7.52	3.86	2.55	1.88	1.48	1.21	1.01	0.87
	0.6	4.51	2.31	1.53	1.13	0.89	0.72	0.61	0.52
	0.4	3.01	1.54	1.02	0.75	0.59	0.48	0.40	0.35
	0.2	1.50	0.77	0.51	0.38	0.30	0.24	0.20	0.17
	0.1	0.75	0.39	0.26	0.19	0.15	0.12	0.10	0.09
	0.06	0.45	0.23	0.15	0.11	0.09	0.07	0.06	0.05
	0.04	0.30	0.15	0.10	0.08	0.06	0.05	0.04	0.03
	0.02	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.02
	0.01	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01

**TABLE SB-1**

Circular Perforation Sizing

Hole Diameter (in)	Hole Diameter (in)	Area per Row (in <sup>2</sup> )		
		n = 1	n = 2	n = 3
1/4	0.250	0.05	0.10	0.15
5/16	0.313	0.08	0.15	0.23
3/8	0.375	0.11	0.22	0.33
7/16	0.438	0.15	0.30	0.45
1/2	0.500	0.20	0.39	0.59
9/16	0.563	0.25	0.50	0.75
5/8	0.625	0.31	0.61	0.92
11/16	0.688	0.37	0.74	1.11
3/4	0.750	0.44	0.88	1.33
7/8	0.875	0.60	1.20	1.80
1	1.000	0.79	1.57	2.36
1 1/8	1.125	0.99	1.99	2.98
1 1/4	1.250	1.23	2.45	3.68
1 3/8	1.375	1.48	2.97	4.45
1 1/2	1.500	1.77	3.53	5.30
1 5/8	1.625	2.07	4.15	6.22
1 3/4	1.750	2.41	4.81	7.22
1 7/8	1.875	2.76	5.52	8.28
2	2.000	3.14	6.28	9.42
n = Number of columns of perforations				
Minimum steel plate thickness		1/4"	5/16"	3/8"

**TABLE SB-2**

# Silt Fence

## What it is

A silt fence is a temporary sediment barrier constructed of filter fabric stretched across supporting posts. The bottom edge of the fabric is entrenched and covered with backfill.



## When and Where to use it

- On the down gradient perimeters of a construction site.
- On a contour to control overland sheet flow.
- At the top or toe of a steep slope.
- As a form of inlet protection (see inlet protection factsheet).

Figure SF-1 depicts five cases where the use of silt fence is appropriate.

## When and Where NOT to use it

- In areas of concentrated flows such as in ditches, swales or channels that drain areas greater than 1.0 acre.
- At the top of a slope or at high points which do not receive any drainage flows.



This photo reveals a silt fence that has become unentrenched because it was not securely installed.



This photo illustrates what will happen to a silt fence if it is installed in an area of concentrated flow.

## Construction Detail and Maintenance Requirements

Figure SF-2 provides a construction detail and maintenance requirements for a silt fence.

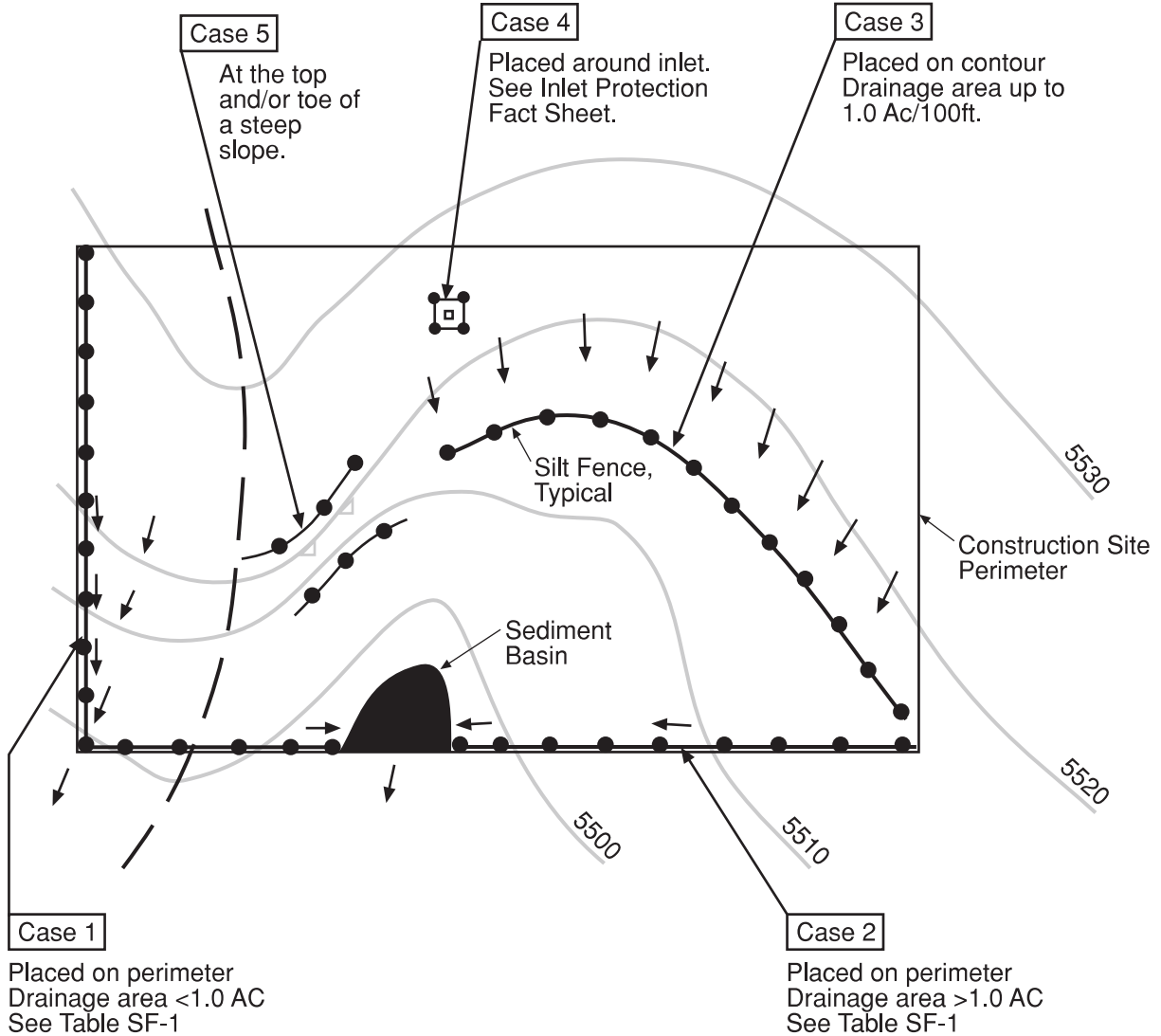


Table SF-1

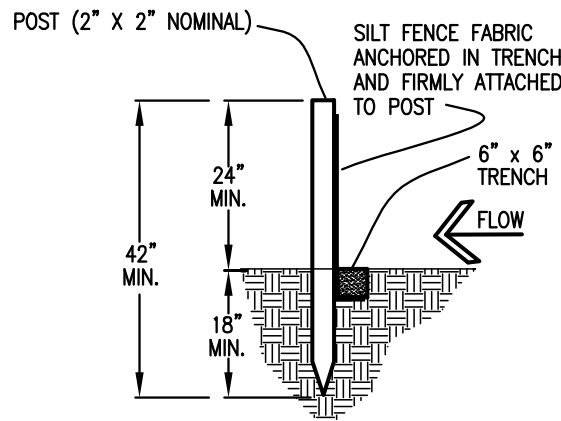
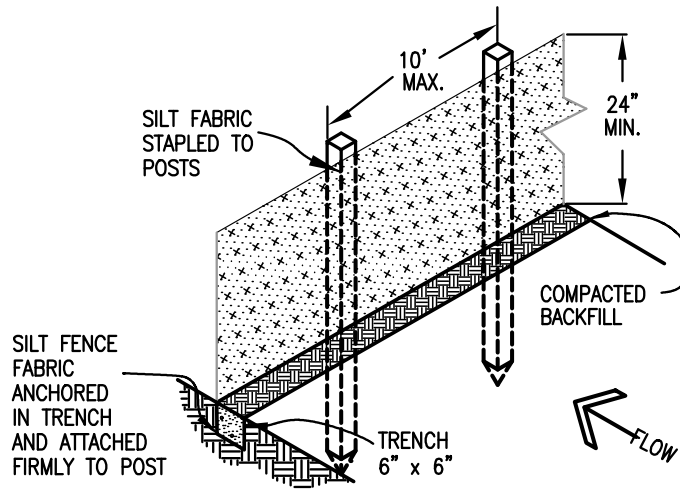
Silt Fence Used as Perimeter Control	Case 1		Case 2 DA > 1.0 AC
	DA < 0.25 AC	0.25 < DA < 1 AC	
Continuous Grade	OK <sup>(1)</sup>	OK <sup>(1)</sup>	OK <sup>(1)</sup>
Area of Concentrated Flow	OK	NO <sup>(2)</sup>	NO <sup>(3)</sup>

(1) Temporary Swale or Straw Bale Barrier may be used as alternative to a Silt Fence.

(2) Check Dam may also be used as alternative to Silt Fence at low point.

(3) Sediment Basin is required for concentrated flow from drainage areas > 1.0 AC.





SILT FENCE

## SILT FENCE NOTES

### INSTALLATION REQUIREMENTS

1. SILT FENCES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
2. WHEN JOINTS ARE NECESSARY, SILT FENCE GEOTEXTILE SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POST AND SECURELY SEALED.
3. METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.
4. THE FILTER MATERIAL SHALL BE FASTENED SECURELY TO METAL OR WOOD POSTS USING WIRE TIES, OR TO WOOD POSTS WITH 3/4" LONG #9 HEAVY-DUTY STAPLES. THE SILT FENCE GEOTEXTILE SHALL NOT BE STAPLED TO EXISTING TREES.
5. WHILE NOT REQUIRED, WIRE MESH FENCE MAY BE USED TO SUPPORT THE GEOTEXTILE. WIRE FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 3/4" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 6" AND SHALL NOT EXTEND MORE THAN 3' ABOVE THE ORIGINAL GROUND SURFACE.

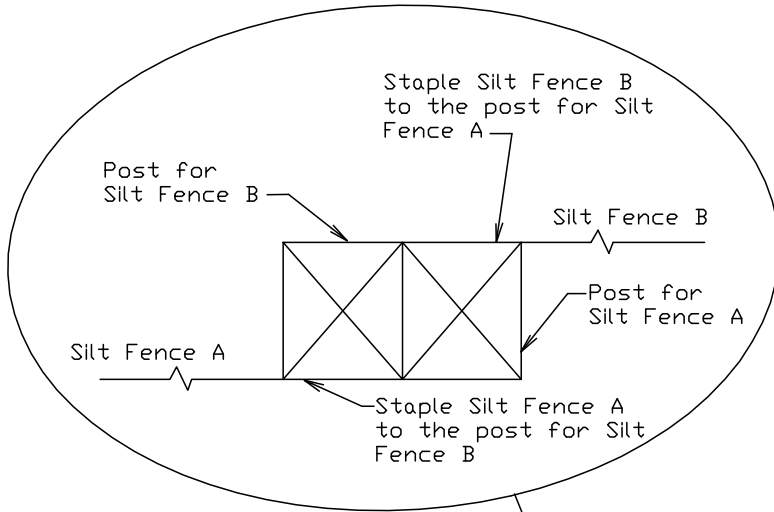
6. ALONG THE TOE OF FILLS, INSTALL THE SILT FENCE ALONG A LEVEL CONTOUR AND PROVIDE AN AREA BEHIND THE FENCE FOR RUNOFF TO POND AND SEDIMENT TO SETTLE. A MINIMUM DISTANCE OF 5 FEET FROM THE TOE OF THE FILL IS RECOMMENDED.

7. THE HEIGHT OF THE SILT FENCE FROM THE GROUND SURFACE SHALL BE MINIMUM OF 24 INCHES AND SHALL NOT EXCEED 36 INCHES; HIGHER FENCES MAY INPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.

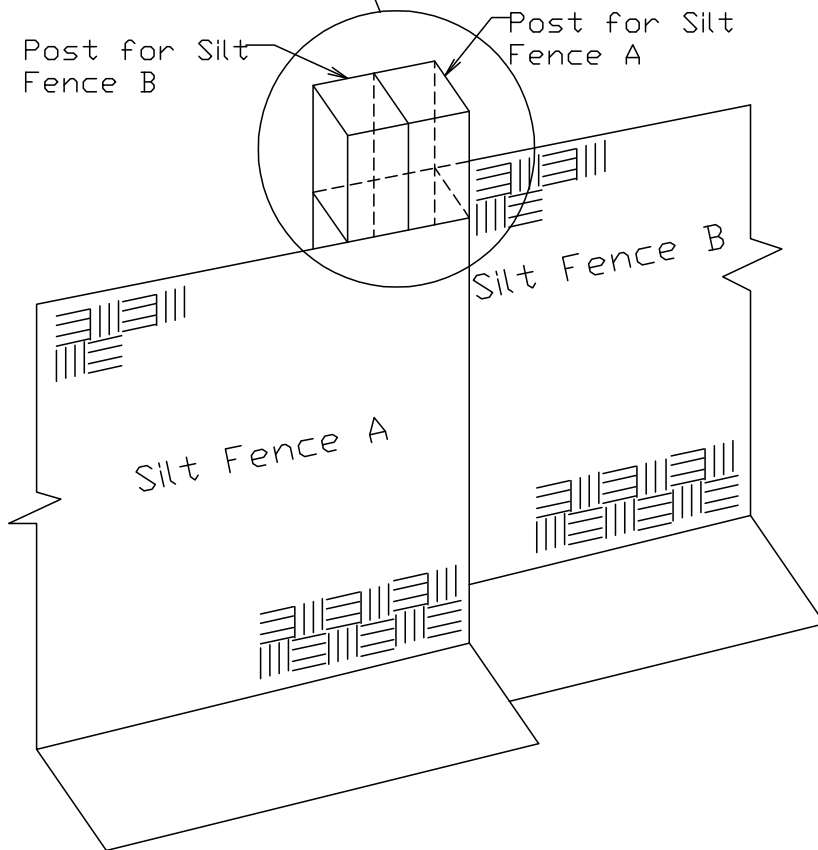
### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT SILT FENCES IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL. DAMAGED, COLLAPSED, UNENTRENCHED OR INEFFECTIVE SILT FENCES SHALL BE PROMPTLY REPAIRED OR REPLACED.
2. SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO HALF THE EXPOSED GEOTEXTILE HEIGHT.
3. SILT FENCES SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED AS APPROVED BY THE CITY.

# Top View of Silt Fence Posts Detail



Refer to "Top View of Silt Fence Posts Detail"



# Slope Drain

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## What it is

Slope drains are either flexible or rigid pipes that convey concentrated runoff from the top of a slope to a stable discharge point at the bottom of the slope. Slope drains can be either temporary or permanent depending on the method of installation and material used.

## When and Where to use it

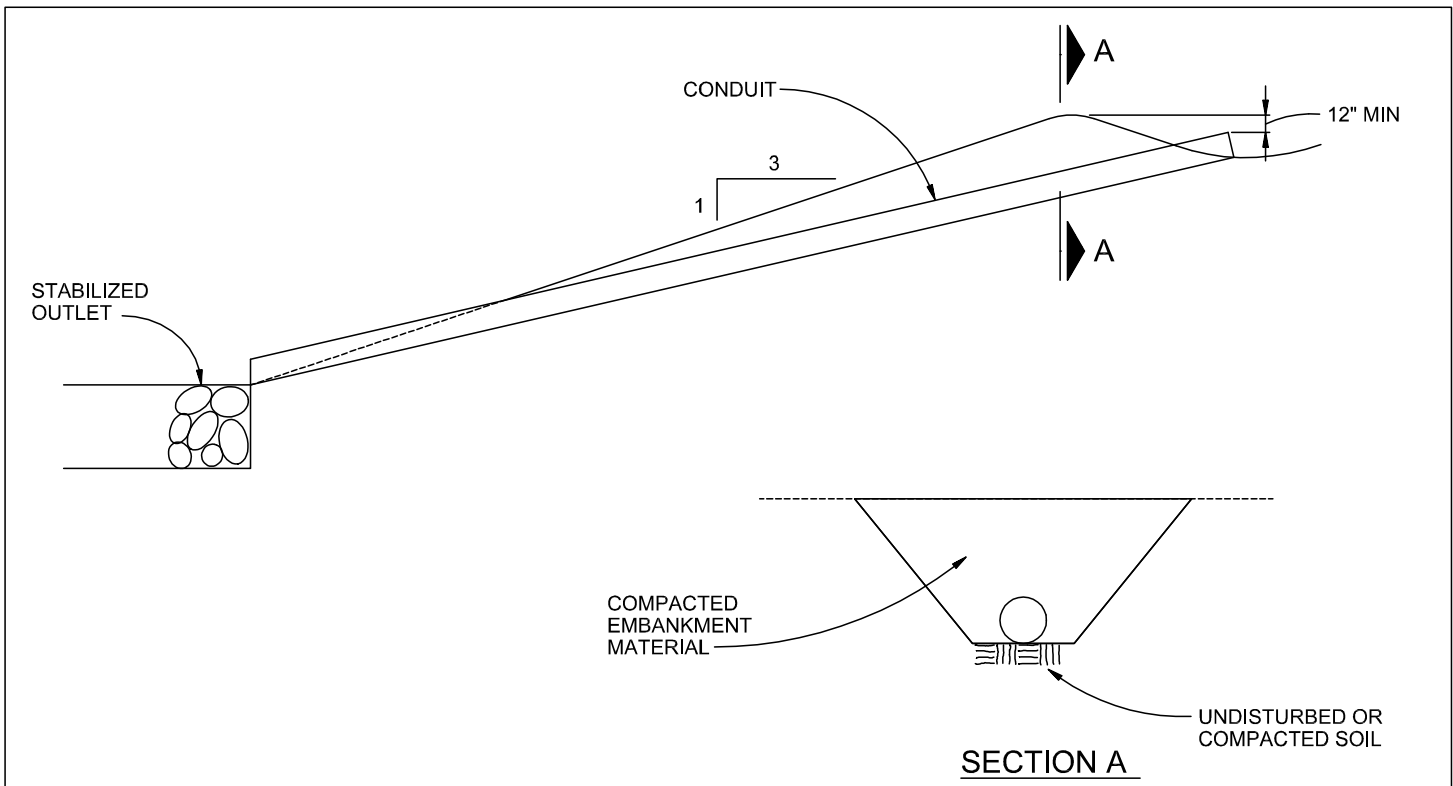
- At the top of cut-and-fill slopes to convey stormwater down the slope.
- Before a slope has been stabilized or before permanent drainage structures are ready for use.
- In combination with other BMPs that have been used to concentrate flows, including temporary swales.

## When and Where NOT to use it

Slope drains should not be used for drainage areas larger than 5 acres.

## Construction Detail and Maintenance Requirements

Figure SD-1 provides a construction detail and maintenance requirements for a slope drain.



**SLOPE DRAIN**  
NTS

**SLOPE DRAIN NOTES**

**INSTALLATION REQUIREMENTS**

1. THE SLOPE DRAIN IS TO BE DESIGNED TO CONVEY THE PEAK RUNOFF FOR THE 2-YEAR STORM.
2. PIPE MATERIAL MAY INCLUDE CORRUGATED METAL, OR RIGID OR FLEXIBLE PLASTIC.
3. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL WITH A MINIMUM OF 15% PASSING A #200 SIEVE. EXCAVATED SOIL CAN BE USED IF IT MEETS THIS REQUIREMENT.
4. EMBANKMENT IS TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D 698.
5. SLOPE DRAIN SECTIONS ARE TO BE SECURELY FASTENED TOGETHER AND HAVE WATERTIGHT FITTINGS.
6. THE OUTLET IS TO BE STABILIZED AND, UNLESS THE DRAIN DISCHARGES DIRECTLY TO A SEDIMENT BASIN, A TEMPORARY SURFACE IS TO BE PROVIDED TO CONVEY FLOWS DOWN STREAM.
7. IMMEDIATELY STABILIZE ALL AREAS DISTURBED BY INSTALLATION OR REMOVAL OF THE PIPE SLOPE DRAIN.

**MAINTENANCE REQUIREMENTS**

1. INLET AND OUTLET POINTS ARE TO BE CHECKED REGULARLY, AND AFTER HEAVY STORMS FOR CLOGGING AND OVERCHARGING. ANY BREAKS IN THE PIPE ARE TO BE PROMPTLY REPAIRED, AND CLOGS REMOVED AS NEEDED.
2. WATER IS NOT TO BYPASS OR UNDERCUT THE INLET OR PIPE. IF THESE PROBLEMS DO EXIST, THE HEADWALL NEEDS TO BE REINFORCED WITH COMPACT EARTH OR SANDBAGS.
3. THE OUTLET POINT IS TO BE FREE OF EROSION, AND, IF NECESSARY, ADDITIONAL OUTLET PROTECTION SHOULD BE INSTALLED.
4. CONSTRUCTION TRAFFIC IS NOT TO CROSS THE SLOPE DRAIN AND MATERIALS ARE NOT TO BE PLACED ON IT.
5. THE SLOPE DRAIN IS TO REMAIN IN PLACE UNTIL THE SLOPE HAS BEEN COMPLETELY STABILIZED OR UP TO 30 DAYS AFTER PERMANENT SLOPE STABILIZATION.

# Straw Bale Barriers

## What it is

A straw bale barrier is a temporary sediment barrier consisting of a row of entrenched and anchored straw bales used to retain sediment from runoff in small drainage areas of disturbed soil.

## When and Where to use it

- At the base of a slope.
- On the down gradient perimeters of a construction site.
- On a contour to control overland sheet flow.
- As a form of check dam (see check dam factsheet).
- As a form of inlet protection (see inlet protection factsheet).



Figure SBB-1 depicts six cases where the use of Straw Bale Barriers is appropriate.

## When and Where NOT to use it

- In areas of concentrated flows such as in ditches, swales, or channels that drain areas greater than 1.0 acre (unless used as a form of check dam).
- At the top of a slope or at high points which do not receive any drainage flows.



This straw bale barrier was not installed properly because runoff is able to flow around the barrier.

## Construction Detail and Maintenance Requirements

Figure SBB-2 provides a construction detail and maintenance requirements for a straw bale barrier.

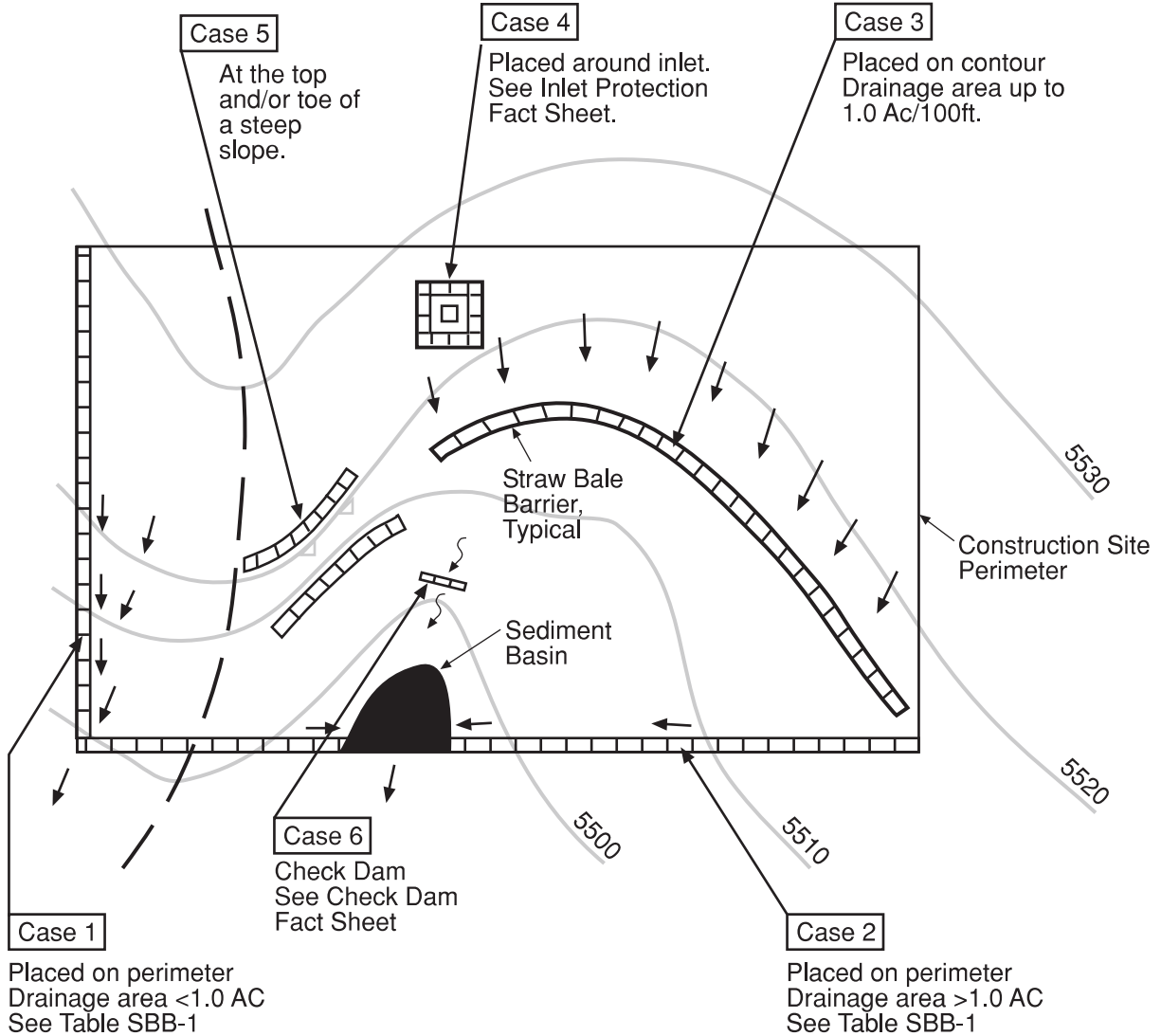


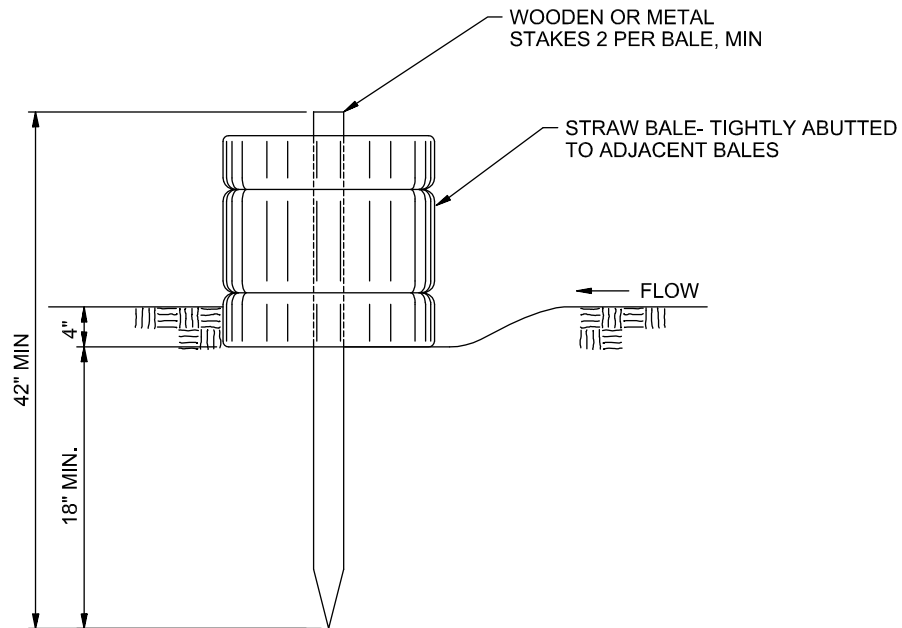
Table SBB-1

Straw Bale Barrier Used as Perimeter Control	Case 1 DA < 1.0 AC	Case 2 DA > 1.0 AC
Continuous Grade	OK <sup>(1)</sup>	OK <sup>(1)</sup>
Area of Concentrated Flow	OK <sup>(2)</sup>	NO <sup>(3)</sup>

(1) Temporary Swale or Silt Fence may be used as alternative to a Straw Bale Barrier.

(2) Straw Bale Check Dam may be used at low points.

(3) Sediment Basin is required for concentrated flow from drainage areas > 1.0 AC.



## STRAW BALE BARRIER

NTS

### STRAW BALE BARRIER NOTES

#### INSTALLATION REQUIREMENTS

1. STRAW BALE BARRIERS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
2. BALES SHALL CONSIST OF APPROXIMATELY 5 CUBIC FEET OF CERTIFIED WEED FREE HAY OR STRAW AND WEIGH NOT LESS THAN 35 POUNDS.
3. BALES ARE TO BE PLACED IN A SINGLE ROW WITH THE END OF THE BALES TIGHTLY ABUTTING ONE ANOTHER.
4. EACH BALE IS TO BE SECURELY ANCHORED WITH AT LEAST TWO STAKES AND THE FIRST STAKE IS TO BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE TO FORCE THE BALES TOGETHER.
5. STAKES ARE TO BE A MINIMUM OF 42 INCHES LONG. METAL STAKES SHALL BE STANDARD "T" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD STAKES SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.
6. BALES ARE TO BE BOUND WITH EITHER WIRE OR STRING AND ORIENTED SUCH THAT THE BINDINGS ARE AROUND THE SIDES AND NOT ALONG THE TOPS AND BOTTOMS OF THE BALE.
7. GAPS BETWEEN BALES ARE TO BE CHINKED (FILLED BY WEDGING) WITH STRAW OR THE SAME MATERIAL OF THE BALE.
8. END BALES ARE TO EXTEND UPSLOPE SO THE TRAPPED RUNOFF CANNOT FLOW AROUND THE ENDS OF THE BARRIER.

#### MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT STRAW BALE BARRIERS IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.
2. DAMAGED OR INEFFECTIVE BARRIERS SHALL PROMPTLY BE REPAIRED, REPLACING BALES IF NECESSARY, AND UNENTRENCHED BALES NEED TO BE REPAIRED WITH COMPACTED BACKFILL MATERIAL.
3. SEDIMENT SHALL BE REMOVED FROM BEHIND STRAW BALE BARRIERS WHEN IT ACCUMULATES TO APPROXIMATELY 1/2 THE HEIGHT OF THE BARRIER.
4. STRAW BALE BARRIERS SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED AS APPROVED BY THE CITY.

City of Colorado Springs  
Stormwater Quality

Figure SBB-2  
Straw Bale Barrier  
Construction Detail and Maintenance  
Requirements

# Street Wash Water Associated with Construction Activities

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The CDPS Municipal Stormwater Discharge Permit for the City of Colorado Springs calls for the development and implementation of best management practices to minimize the impacts from street wash water associated with construction activities. The proposed best management practices (BMPs) are listed below. The permit allows these discharges into State Waters without obtaining a permit providing BMPs are maintained.

## Activity

During construction, it is not uncommon for dirt to accumulate on roadways in the construction site and adjacent to the site. This occurs when BMPs have not been implemented on the site or from the vehicles tracking materials around the site. If the sediment is not removed from the roadways, it will be washed into the storm sewer or other drainage facilities during the next storm event. Therefore, it is necessary to clean the roadways within or adjacent to a construction site on a regular basis. There are several methods for doing this, which include sweeping the streets, scraping the streets and using water to wash down the street. The practice of washing with water, while not encouraged, may be necessary in some cases.

## Areas of Concern

The concern with construction street sweeping is that the water will carry sediment into the storm sewer and then into State Waters. The sediment can have a negative impact on the aquatic life in the stream.

While the water used to clean the street may be potable in some cases, it is believed that the act of spraying the water would dissipate the chlorine.

## BMPs

1. Prior to washing the street with water, efforts will first be made to scrape and sweep the dirt off the roadways. Scraped or swept material will not be deposited in the storm sewer or other drainage facility.
2. Inlet protection or other BMPs will be in place prior to the washing of the streets. Materials collected by the BMP will be removed and will not be disposed of in a manner that would result in it entering the storm sewer or other drainage system.
3. Where practical, high-pressure wash systems will be used on the hard to remove spots. Washing the entire area with a fire hose will be avoided wherever possible. Water will only be used as needed.



# Surface Roughening

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## What it is

Surface roughening is a temporary erosion control practice where the soil surface is roughened by the creation of grooves, depressions, or steps that run parallel to the contour of the land.

## When and Where to use it

- Surface roughening is appropriate for all slopes and should be performed immediately after rough grades have been established in an area.
- Surface roughening can also be used to help establish vegetative cover by reducing runoff velocity and giving seed an opportunity to take hold and grow.
- Surface roughening can be used in combination with other erosion control measures such as mulching and seeding.

## When and Where NOT to use it

- Slopes that are not smooth-graded and are left sufficiently rough after final grading do not need further roughening to control erosion.
- Surface roughening alone is not sufficient to stabilize a slope for long periods of times, further stabilization measures should be implemented within two weeks of grading.
- Extremely sandy or rocky soils are not well suited for surface roughening.

## Application Techniques and Maintenance Requirements

Figure SR-1 provides application techniques and maintenance requirements for surface roughening.

# **SURFACE ROUGHENING NOTES**

## **APPLICATION TECHNIQUES**

1. STAIR STEP GRADING – USED ON SLOPES WITH GRADIENTS BETWEEN 3:1 AND 2:1 AND FOR SOIL CONTAINING A LARGE AMOUNT OF SMALL ROCKS. STAIRS ARE TO BE WIDE ENOUGH TO WORK WITH STANDARD EARTH MOVING EQUIPMENT.
2. GROOVE CUTTING – USED ON SLOPES WITH GRADIENTS BETWEEN 3:1 AND 2:1. GROOVES ARE TO BE AT LEAST 3 INCHES DEEP AND NO MORE THAN 15 INCHES APART.
3. TRACKING – USED ON SOILS WITH HIGHER SAND CONTENT DUE TO COMPACTION BY HEAVY MACHINERY.

## **MAINTENANCE REQUIREMENTS**

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL SURFACE ROUGHENED AREAS.
2. SURFACE ROUGHENING IS TO BE REPEATED AS OFTEN AS NECESSARY.
3. VEHICLES OR EQUIPMENT IS NOT TO BE DRIVEN OVER AREAS THAT HAVE BEEN ROUGHENED.
4. AS SURFACE ROUGHENING IS ONLY A TEMPORARY CONTROL, ADDITIONAL TREATMENTS MAY BE NECESSARY TO MAINTAIN THE SOIL SURFACE IN A ROUGHENED CONDITION.

# Temporary Seeding

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## What it is

Temporary seeding is the use of quickly germinating vegetative cover on disturbed areas to stabilize soils and control erosion.

## When and Where to use it

- On any disturbed areas that are to remain in an interim state for more than 60 days, but less than one year.

## When and Where NOT to use it

- Temporary seeding shall not be used in areas that receive construction traffic; granular material shall be used to stabilize high traffic areas (see Vehicle Tracking Fact Sheet).
- Temporary seeding is not to be used on disturbed areas left in an interim state for more than 1 year. Permanent seeding is then required.



## Application Techniques and Maintenance Requirements

Figure TS-1 provides application techniques and maintenance requirements for temporary seeding.

## RECOMMENDED ANNUAL GRASSES

SPECIES (COMMON NAME)	GROWTH SEASON	SEEDING DATE	POUNDS OF PURE LIVE SEED (PLS) (PLS/ACRE)	PLANTING DEPTH (INCHES)
1. OATS	COOL	MARCH 16 - APRIL 30	35-50	1-2
2. SPRING WHEAT	COOL	MARCH 16 - APRIL 30	25-35	1-2
3. SPRING BARLEY	COOL	MARCH 16 - APRIL 30	25-35	1-2
4. ANNUAL RYEGRASS	COOL	MARCH 16 - JUNE 30	10-15	1/2
5. MILLET	WARM	MAY 16 - JULY 15	3-15	1/2-3/4
6. SUDANGRASS	WARM	MAY 16 - JULY 15	5-10	1/2-3/4
7. SORGHUM	WARM	MAY 16 - JULY 15	5-10	1/2-3/4
8. WINTER WHEAT	COOL	SEPTEMBER 1 - 30	20-35	1-2
9. WINTER BARLEY	COOL	SEPTEMBER 1 - 30	20-35	1-2
10. WINTER RYE	COOL	SEPTEMBER 1 - 30	20-35	1-2
11. TRITICALE	COOL	SEPTEMBER 1 - 30	25-40	1-2

THIS TABLE WAS TAKEN FROM UDFCD FOR RECOMMENDED ANNUAL GRASSES FOR THE DENVER METROPOLITAN AREA. THIS TABLE MAY BE USED UNLESS A SITE-SPECIFIC SEED MIX IS REQUESTED AND APPROVED.

TABLE TS-1

## TEMPORARY SEEDING NOTES

### INSTALLATION REQUIREMENTS

1. DISTURBED AREAS ARE TO BE SEEDED WITHIN 21 DAYS AFTER CONSTRUCTION ACTIVITY OR GRADING ENDS IF SEASON ALLOWS.
2. IF NECESSARY, SOIL IS TO BE CONDITIONED FOR PLANT GROWTH BY APPLYING TOPSOIL, FERTILIZER, OR LIME.
3. SOIL IS TO BE TILLED IMMEDIATELY PRIOR TO APPLYING SEEDS. COMPACT SOILS ESPECIALLY NEED TO BE LOOSENED.
4. SEEDBED DEPTH IS TO BE 4 INCHES FOR SLOPES FLATTER THAN 2:1, AND 1 INCH FOR SLOPES STEEPER THAN 2:1.
5. ANNUAL GRASSES LISTED IN TABLE TS-1 ARE TO BE USED FOR TEMPORARY SEEDING. SEED MIXES ARE NOT TO CONTAIN ANY NOXIOUS WEED SEEDS INCLUDING RUSSIAN OR CANADIAN THISTLE, KNAPWEED, PURPLE LOOSESTRIFE, EUROPEAN BINDWEED, JOHNSON GRASS, AND LEAFY SPURGE.
6. TABLE TS-1 ALSO PROVIDES REQUIREMENTS FOR SEEDING RATES, SEEDING DATES, AND PLANTING DEPTHS FOR THE APPROVED TYPES OF ANNUAL GRASSES.
7. SEEDING IS TO BE APPLIED USING MECHANICAL TYPE DRILLS EXCEPT WHERE SLOPES ARE STEEP OR ACCESS IS LIMITED THEN HYDRAULIC SEEDING MAY BE USED.
8. ALL SEEDED AREAS ARE TO BE MULCHED (SEE FACTSHEET ON MULCHING).
9. IF HYDRAULIC SEEDING IS USED THEN HYDRAULIC MULCHING SHALL BE DONE SEPARATELY TO AVOID SEEDS BECOMING ENCAPSULATED IN THE MULCH.

### MAINTENANCE REQUIREMENTS

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL SEEDED AREAS TO ENSURE GROWTH.
2. AREAS WHERE GROWTH IS NOT OCCURRING QUICKLY OR THE MULCH HAS BEEN REMOVED SHALL BE RE-SEEDED AS SOON AS POSSIBLE AND RE-MULCHED IF NEEDED.
3. SEEDED AREAS ARE NOT TO BE DRIVEN OVER WITH CONSTRUCTION EQUIPMENT OR VEHICLES.

City of Colorado Springs  
Stormwater Quality

Figure TS-1  
Temporary Seeding  
Construction Detail and Maintenance  
Requirements

# Temporary Swale

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## What it is

A temporary swale is an earth channel used to convey runoff. A temporary swale can be excavated or formed upslope from an earthen berm, and may be lined or unlined.



## When and Where to use it

- At the top of a slope to divert upland runoff away from the slope face.
- At the bottom of a slope to convey sediment-laden runoff to a sediment-trapping device such as a sediment basin.
- Along the perimeter of the construction site to keep runoff from leaving the site.

Figure TSW-1 illustrates cases where temporary swales are most effective.

## When and Where NOT to use it

- Where longitudinal slope exceeds 10 percent (lining is required where longitudinal slope exceeds 2 percent).
- In areas where concentrated flow will overtop the swale transversely.

## Construction Detail and Maintenance Requirements

Figure TSW-2 provides a construction detail and maintenance requirements for a temporary swale. Figure TSW-3 provides a construction detail and maintenance requirements for swale linings.

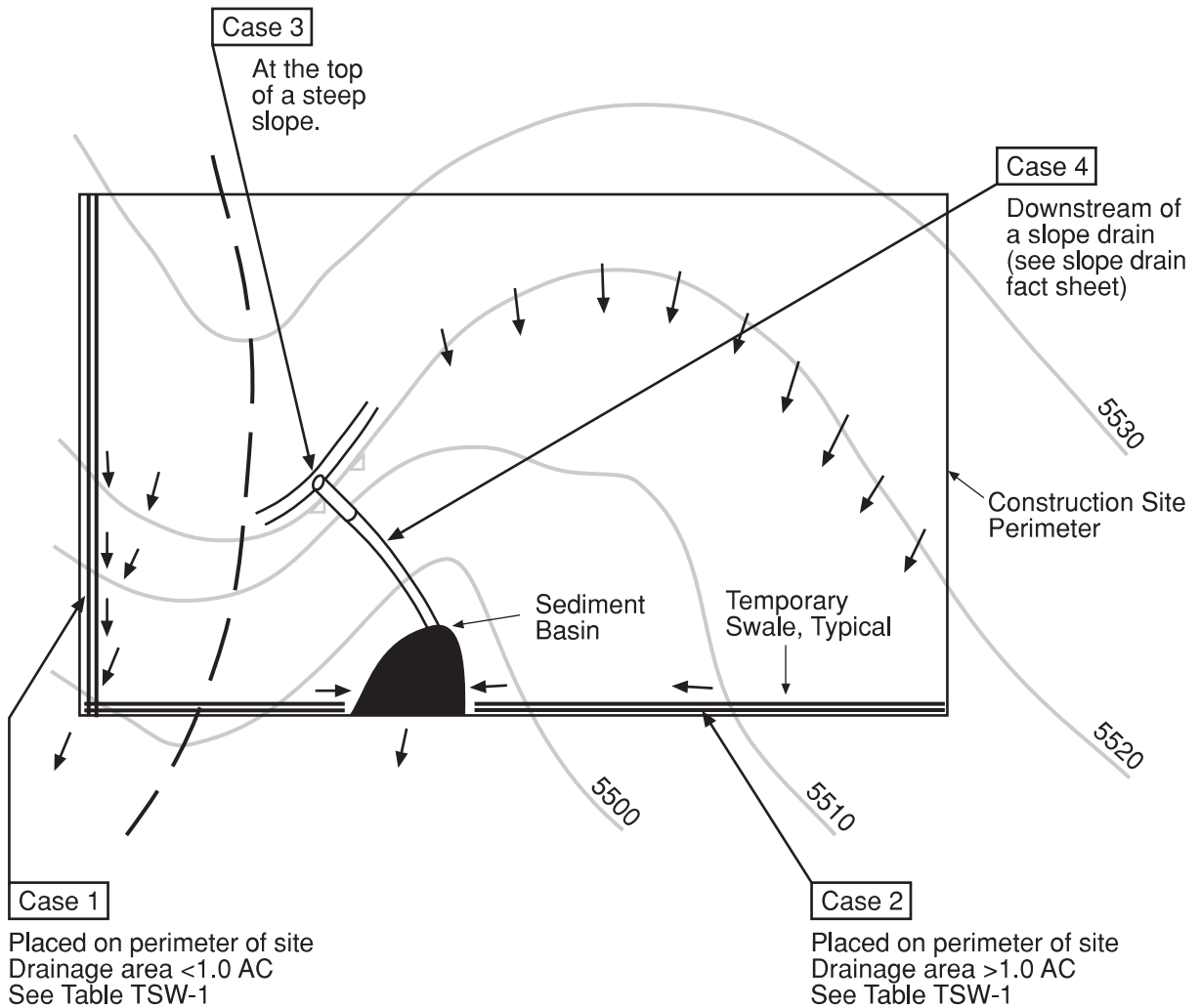


Table TSW-1

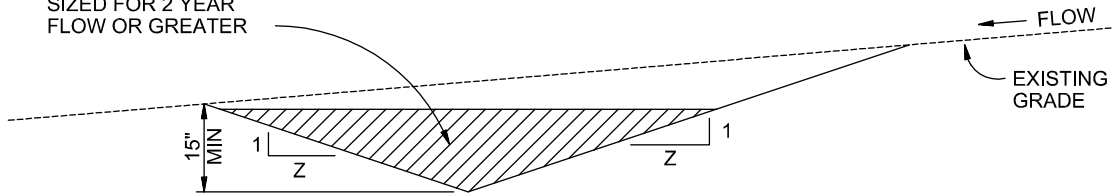
Temporary Swale Used as Perimeter Control	Case 1 DA < 1.0 AC	Case 2 DA > 1.0 AC
Continuous Grade	OK <sup>(1)</sup>	OK <sup>(1)</sup>
Area of Concentrated Flow	NO <sup>(3)</sup>	NO <sup>(2)</sup>

(1) Silt Fence or Straw Bale Barrier may be used as alternative to a Temporary Swale.

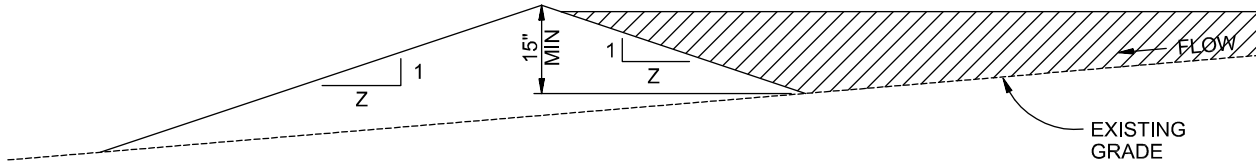
(2) With Temporary Swales Sediment Basin is required for concentrated flow from drainage areas > 1.0 AC.

(3) Check Dam is required at concentrated flow for drainage areas >1.0 acres.

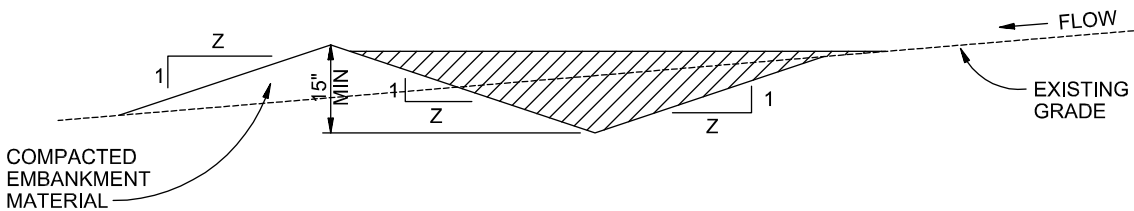
CONVEYANCE  
SIZED FOR 2 YEAR  
FLOW OR GREATER



**A. EXCAVATED SWALE**



**B. SWALE FORMED BY BERM**



**C. SWALE FORMED BY CUT AND FILL**

**TEMPORARY SWALE**

NTS

**TEMPORARY SWALE NOTES**

**INSTALLATION REQUIREMENTS**

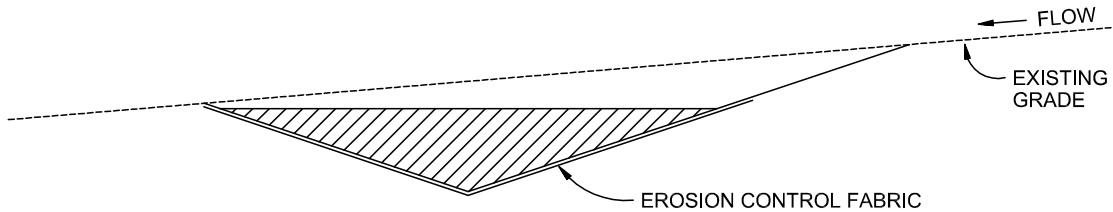
1. TEMPORARY SWALES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
2. THE AREA UNDER WHICH THE EMBANKMENT IS TO BE INSTALLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ALL VEGETATION AND ROOT MAT.
3. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL WITH A MINIMUM OF 15% PASSING A #200 SIEVE. EXCAVATED SOIL CAN BE USED IF IT MEETS THIS REQUIREMENT.
4. EMBANKMENT IS TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT ACCORDING TO ASTM D 698.
5. SWALES WITH SLOPE > 2% SHALL BE LINED, SEE FIGURE TSW-3.
6. SWALES ARE TO DRAIN INTO A SEDIMENT BASIN OR OTHER STABILIZED OUTLET.
7. Z SHALL BE 3 OR GREATER.

**MAINTENANCE REQUIREMENTS**

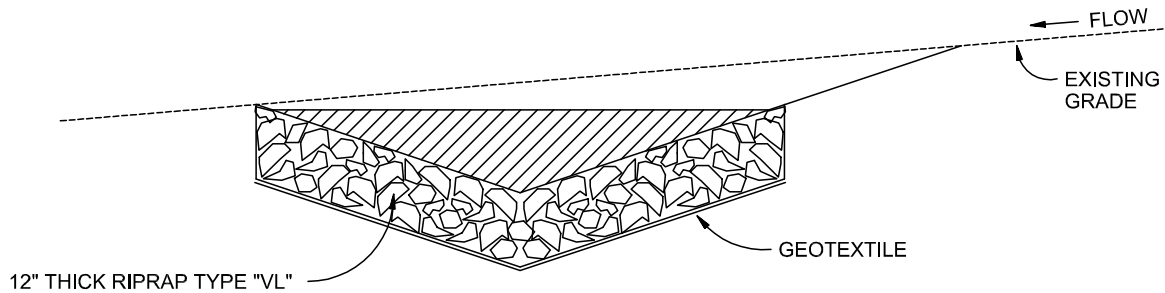
1. CONTRACTOR SHALL INSPECT SWALES AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL.
2. SWALES SHALL BE ROUTINELY CLEARED OF ANY DEBRIS OR ACCUMULATION OF SEDIMENT.
3. ERODED SLOPES OR DAMAGED LININGS SHALL IMMEDIATELY BE REPAIRED.
4. TEMPORARY SWALES SHALL REMAIN OPERATIONAL AND PROPERLY MAINTAINED UNTIL THE SITE AREA IS PERMANENTLY STABILIZED WITH ADEQUATE VEGETATIVE COVER AND/OR OTHER PERMANENT STRUCTURE AS APPROVED BY THE CITY.

City of Colorado Springs  
Stormwater Quality

Figure TSW-2  
Temporary Swale  
Construction Detail and Maintenance  
Requirements



**A. EROSION CONTROL FABRIC**  
 $2\% \leq \text{SLOPE} < 5\%$  AND VELOCITY  $\leq 8$  FPS



**B. RIPRAP**  
 SLOPE  $> 5\%$  OR VELOCITY  $> 8$  FPS

**SWALE LINING**  
 NTS

**SWALE LINING NOTES**

**INSTALLATION REQUIREMENTS**

1. REFER TO THE EROSION CONTROL BLANKETS FACTSHEET FOR PROPER INSTALLATION OF EROSION CONTROL FABRIC LINING.
2. SWALES WITH EASILY EROSIVE SOILS AND SLOPES LESS THAN 2%, SHALL BE LINED WITH EROSION CONTROL FABRIC.
3. VELOCITIES FOR EROSION CONTROL FABRICS SHALL NOT EXCEED 8 FPS. SWALES WITH VELOCITIES GREATER THAN 8 FPS SHALL BE LINED WITH RIP RAP.

**MAINTENANCE REQUIREMENTS**

1. CONTRACTOR SHALL INSPECT SWALE LININGS AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL AND WEEKLY DURING PERIODS OF NO RAINFALL.
2. DAMAGED LININGS SHALL IMMEDIATELY BE REPAIRED.
3. REFER TO THE EROSION CONTROL BLANKETS FACTSHEET FOR PROPER MAINTENANCE.
4. DISPLACED RIPRAP OR COARSE AGGREGATE IS TO BE REPLACED AS SOON AS POSSIBLE.
5. SWALE LININGS ARE TO REMAIN IN PLACE AND BE PROPERLY MAINTAINED UNTIL THE TEMPORARY SWALE IS REMOVED.



# Vehicle Tracking

## What it is

Vehicle tracking refers to the stabilization of construction entrances, roads, parking areas, and staging areas to prevent the tracking of sediment from the construction site.



## When and Where to use it

- All points where vehicles exit the construction site onto a public road.
- Construction entrance/exit should be located at permanent access locations if at all possible.
- Construction roads and parking areas.
- Loading and unloading areas.
- Storage and staging areas.
- Where trailers are parked.
- Any construction area that receives high vehicular traffic.

## When and Where NOT to use it

- The vehicle tracking area should not be located in areas that are wet or where soils erode easily.



This picture shows an unstabilized entrance where dirt is being tracked onto a public road.

## Construction Details and Maintenance Requirements

Figure VT-1 and VT-2 provide construction details and maintenance requirements for vehicle tracking.

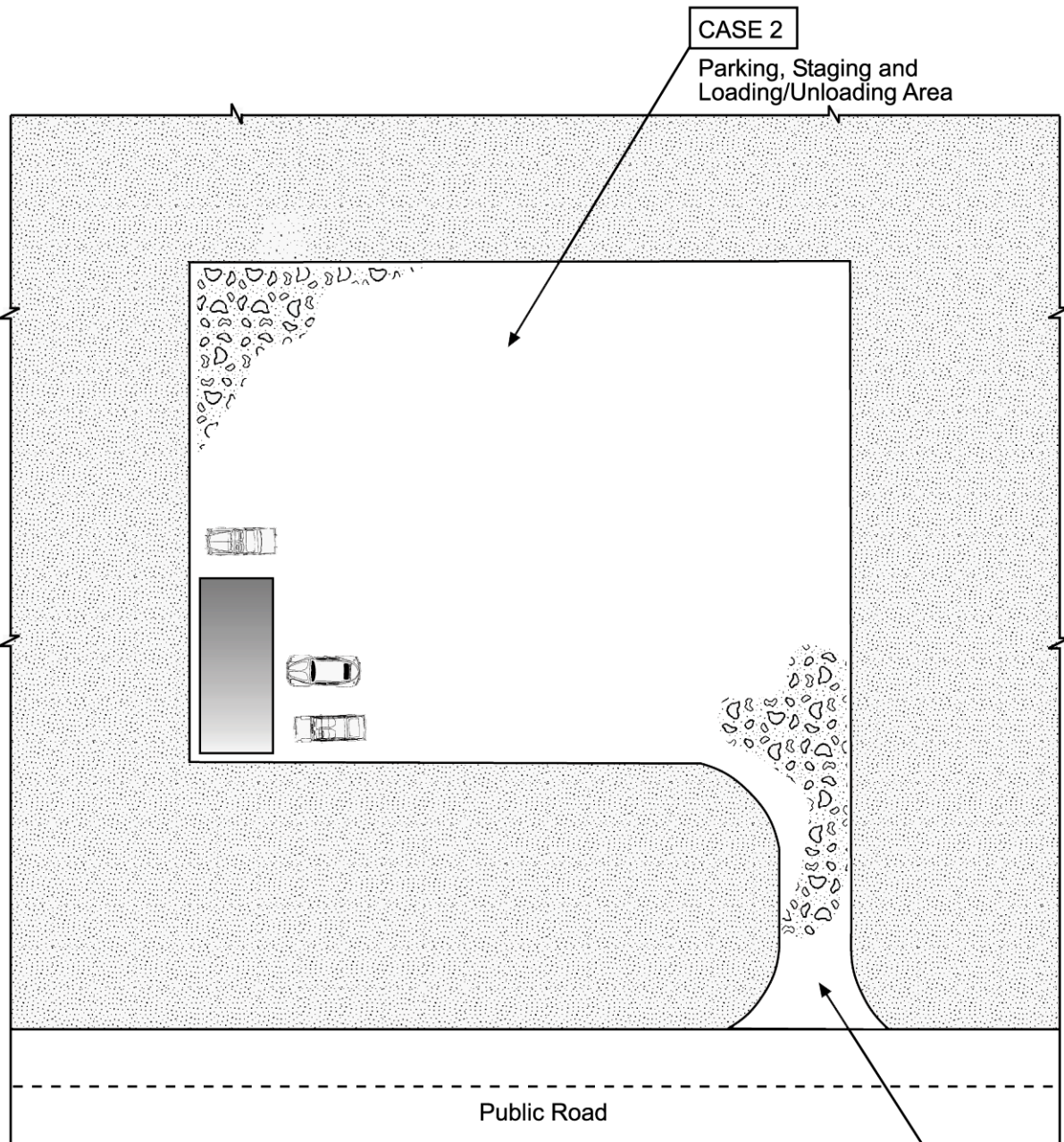
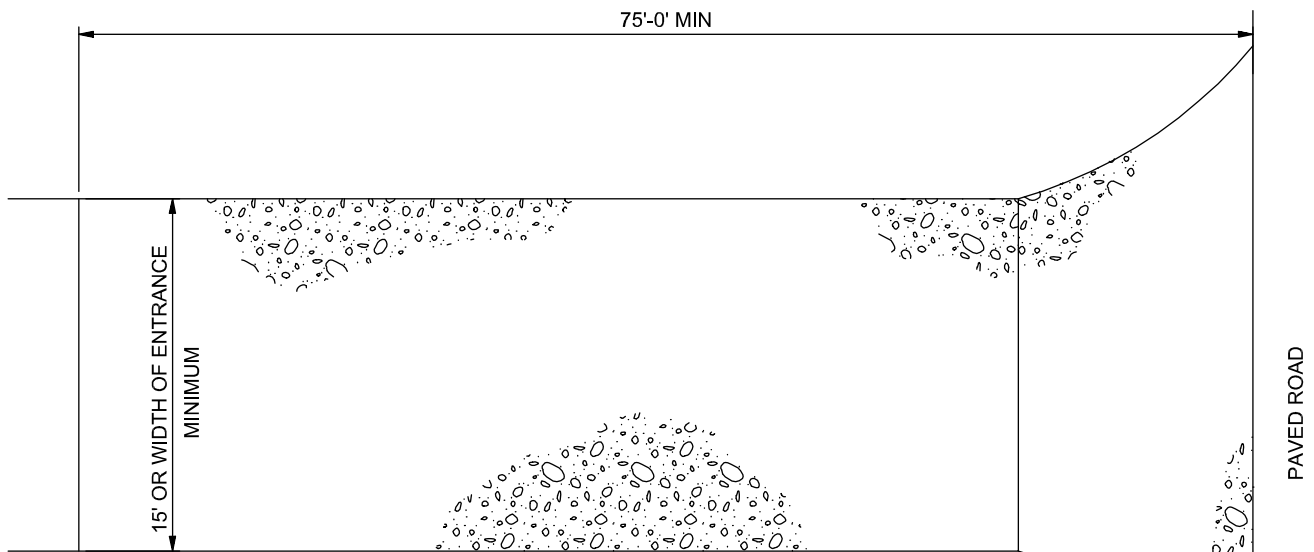


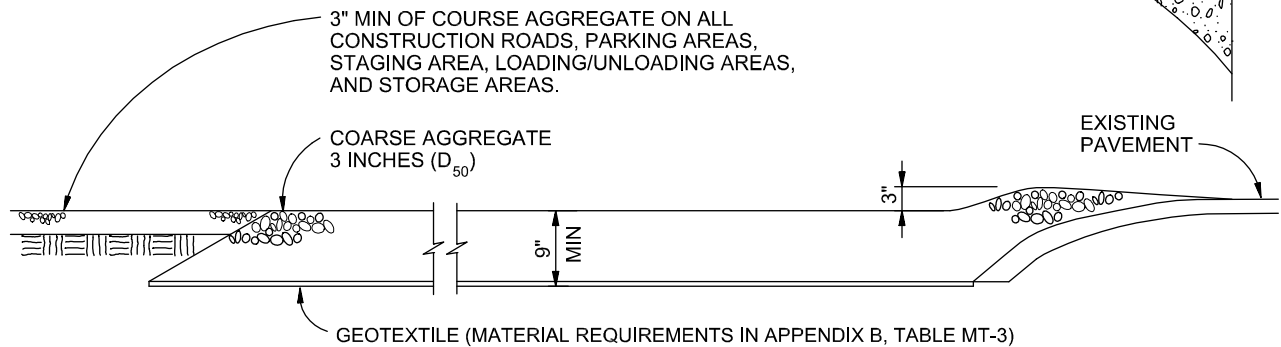
Table VT-1

	Case 1	Case 2
Gravel Thickness	9"	3"
Filter Fabric	YES	NO

CASE 1  
Construction Entrance



**PLAN**



**SECTION**

## **VEHICLE TRACKING**

NTS

### **VEHICLE TRACKING NOTES**

#### **INSTALLATION REQUIREMENTS**

1. ALL ENTRANCES TO THE CONSTRUCTION SITE ARE TO BE STABILIZED PRIOR TO CONSTRUCTION BEGINNING.
2. CONSTRUCTION ENTRANCES ARE TO BE BUILT WITH AN APRON TO ALLOW FOR TURNING TRAFFIC, BUT SHOULD NOT BE BUILT OVER EXISTING PAVEMENT EXCEPT FOR A SLIGHT OVERLAP.
3. AREAS TO BE STABILIZED ARE TO BE PROPERLY GRADED AND COMPACTED PRIOR TO LAYING DOWN GEOTEXTILE AND STONE.
4. CONSTRUCTION ROADS, PARKING AREAS, LOADING/UNLOADING ZONES, STORAGE AREAS, AND STAGING AREAS ARE TO BE STABILIZED.
5. CONSTRUCTION ROADS ARE TO BE BUILT TO CONFORM TO SITE GRADES, BUT SHOULD NOT HAVE SIDE SLOPES OR ROAD GRADES THAT ARE EXCESSIVELY STEEP.

#### **MAINTENANCE REQUIREMENTS**

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL STABILIZED AREAS, ESPECIALLY AFTER STORM EVENTS.
2. STONES ARE TO BE REAPPLIED PERIODICALLY AND WHEN REPAIR IS NECESSARY.
3. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED DAILY BY SHOVELING OR SWEEPING. SEDIMENT IS NOT TO BE WASHED DOWN STORM SEWER DRAINS.
4. STORM SEWER INLET PROTECTION IS TO BE IN PLACE, INSPECTED, AND CLEANED IF NECESSARY.
5. OTHER ASSOCIATED SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED TO ENSURE GOOD WORKING CONDITION.

City of Colorado Springs  
Stormwater Quality

Figure VT-2  
Vehicle Tracking  
Application Examples

**APPENDIX D**  
**INSPECTION REPORTS**

APPENDIX C. - INSPECTION CHECKLIST - GRADING EROSION, AND STORMWATER QUALITY CONTROLS

# CITY OF COLORADO SPRINGS

DATE/TIME:
INSPECTOR:
TYPE OF INSPECTION: Self-Monitoring_____
Initial _____ Compliance_____ Follow-Up_____
Reconnaissance_____ Complaint_____ Final_____

SITE:	DATE OF PERMIT:
ADDRESS:	
CONTRACTOR:	OWNER/OWNER'S REPRESENTATIVE:
CONTACT:	CONTACT:
PHONE:	PHONE:
STAGE OF CONSTRUCTION: Initial BMP Installation/Prior to Construction_____ Clearing & Grubbing_____	
Rough Grading_____ Finish Grading_____ Utility Construction_____ Building Construction_____	
Final Stabilization_____	

OVERALL SITE INSPECTION	YES/NO/N.A.	REMARKS/ACTIONS
Is there any evidence of sediment leaving the construction site? If so, note areas.		
Have any adverse impacts such as flooding, structural damage, erosion, spillage, or accumulation of sediment, debris or litter occurred on or within public or private property, wetlands or surface waters -to include intermittent drainageways and the City's stormwater system (storm sewers, gutters, ditches, etc.)?		
Are the BMPs properly installed and maintained?		
Have the BMPs been placed as shown on approved plans?		
Are the BMPs functioning as intended?		
Is work being done according to approved plans and any phased construction schedule?		
Is the construction schedule on track?		
Are drainage channels and outlets adequately stabilized?		
Is there any evidence of discharges or spills of fuels, lubricants, chemicals, etc.?		

BMP MAINTENANCE CHECKLIST	YES/NO/N.A.	REMARKS/ACTIONS NECESSARY
<p>CHECK DAM</p> <p>Has accumulated sediment and debris been removed per maintenance requirements?</p>		
<p>EROSION CONTROL BLANKET</p> <p>Is fabric damaged, loose or in need of repairs?</p>		
<p>INLET PROTECTION</p> <p>Is the inlet protection damaged, ineffective or in need of repairs?</p> <p>Has sediment been removed per maintenance requirements?</p>		
<p>MULCHING</p> <p>Distributed uniformly on all disturbed areas?</p> <p>Is the application rate adequate?</p> <p>Any evidence of mulch being blown or washed away?</p> <p>Has the mulched area been seeded, if necessary?</p>		
<p>SEDIMENT BASIN</p> <p>Is the sediment basin properly constructed and operational?</p> <p>Has sediment and debris been cleaned out of the basin?</p>		
<p>SILT FENCE</p> <p>Is the fence damaged, collapsed, unentrenched or ineffective?</p> <p>Has sediment been removed per maintenance requirements?</p> <p>Is the silt fence properly located?</p>		
<p>SLOPE DRAIN</p> <p>Is water bypassing or undercutting the inlet or pipe?</p> <p>Is erosion occurring at the outlet of the pipe?</p>		
<p>STRAW BALE BARRIER</p> <p>Are the straw bales damaged, ineffective or unentrenched?</p> <p>Has sediment been removed per maintenance requirements?</p> <p>Are the bales installed and positioned correctly?</p>		

<b>BMP MAINTENANCE CHECKLIST</b>	<b>YES/NO/N.A.</b>	<b>REMARKS/ACTIONS NECESSARY</b>
<p>SURFACE ROUGHENING</p> <p>Is the roughening consistent/uniform on slopes??</p> <p>Any evidence of erosion?</p>		
<p>TEMPORARY SEEDING</p> <p>Are the seedbeds protected by mulch?</p> <p>Has any erosion occurred in the seeded area?</p> <p>Any evidence of vehicle tracking on seeded areas?</p>		
<p>TEMPORARY SWALES</p> <p>Has any sediment or debris been deposited within the swales?</p> <p>Have the slopes of the swale eroded or has damage occurred to the lining?</p> <p>Are the swales properly located?</p>		
<p>VEHICLE TRACKING</p> <p>Is gravel surface clogged with mud or sediment?</p> <p>Is the gravel surface sinking into the ground?</p> <p>Has sediment been tracked onto any roads and has it been cleaned up?</p> <p>Is inlet protection placed around curb inlets near construction entrance?</p>		
<p>OTHER</p>		

<b>FINAL INSPECTION CHECKLIST</b>	<b>YES/NO/N.A.</b>	<b>REMARKS/ACTIONS NECESSARY</b>
<p>Has all grading been completed in compliance with the approved Plan, and all stabilization completed, including vegetation, retaining walls or other approved measures?</p>		
<p>Has final stabilization been achieved - uniform vegetative cover with a density of at least 70 percent of pre-disturbance levels, and cover capable of adequately controlling soil erosion; or permanent, physical erosion methods?</p>		

Have all temporary measures been removed?		
Have all stockpiles, construction materials and construction equipment been removed?		
Are all paved surfaces clean (on-site and off-site)?		
Has sediment and debris been removed from drainage facilities (on-site and off-site) and other off-site property, including proper restoration of any damaged property?		
Have all permanent stormwater quality BMPs been installed and completed?		

ADDITIONAL COMMENTS:
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The items noted as needing action must be remedied no later than \_\_\_\_\_.  
The contractor shall notify the inspector when all the items noted above have been addressed.

By signing this inspection form, the owner/owner's representative and the contractor acknowledge that they have received a copy of the inspection report and are aware it is their responsibility to take corrective actions by the date noted above. Failure to sign does not relieve the contractor and owner/owner's representative of their responsibility to take the necessary corrective action and of their liability for any damages that have occurred or may occur.

INSPECTOR'S SIGNATURE:	DATE:
OWNER/OWNER'S REPRESENTATIVE SIGNATURE:	DATE:
CONTRACTOR'S SIGNATURE:	DATE:



**APPENDIX E**  
**MISCELLANEOUS INFORMATION**

NRCS Soils Report

Terracon Geotechnical Report

FEMA FIRM maps

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services  
 NOAA, NINGS12  
 National Geodetic Survey  
 SSMC-3, #9202  
 1315 East-West Highway  
 Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

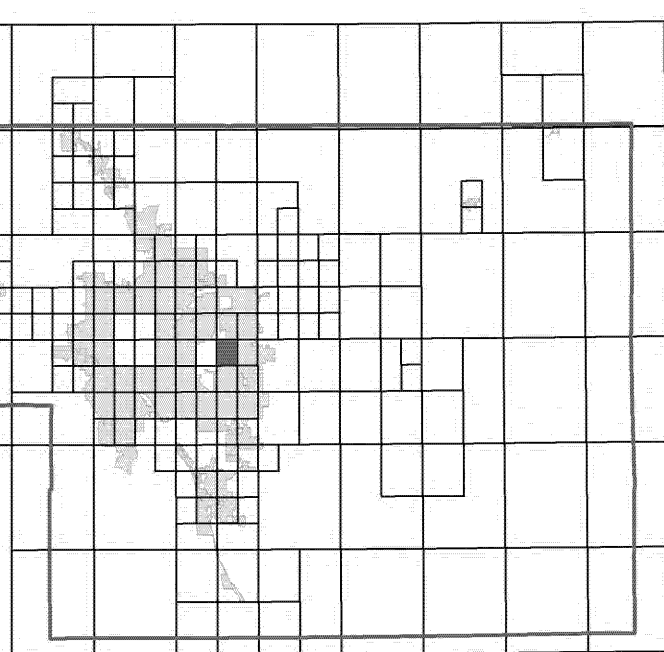
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

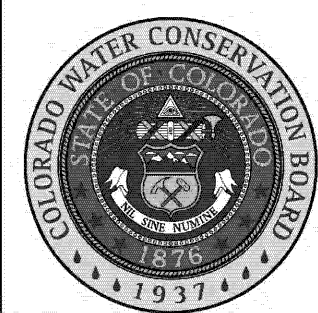
**El Paso County Vertical Datum Offset Table**

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

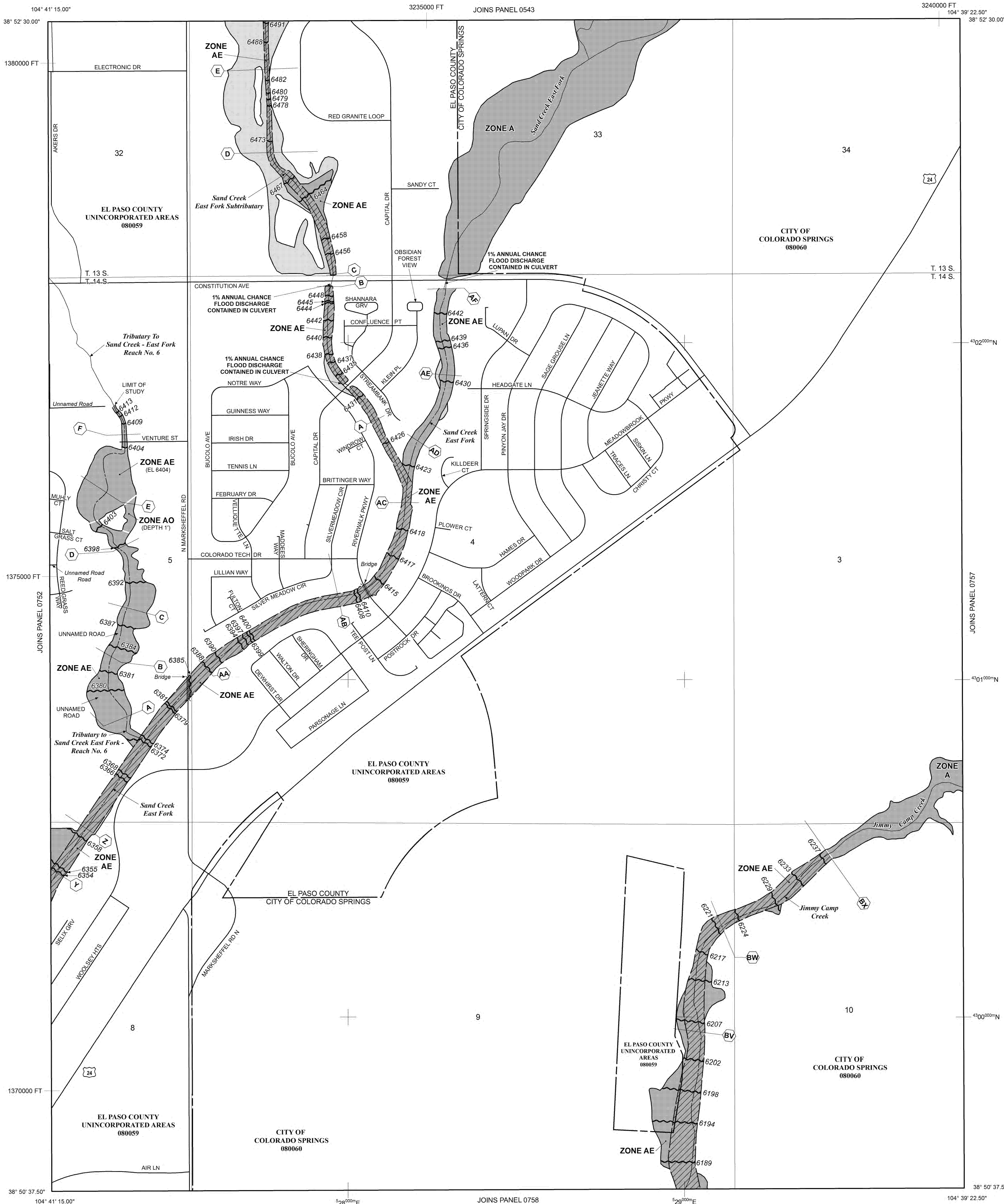
**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.  
**ZONE AE** Base Flood Elevations determined.  
**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decreed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.  
**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
 The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**  
**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**  
**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.  
**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**  
**OTHERWISE PROTECTED AREAS (OPAs)**  
 CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary  
 Floodway boundary  
 Zone D Boundary  
 CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.  
 Base Flood Elevation value where uniform within zone; elevation in feet\*  
 (EL 987)

\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)  
 Cross section line  
 Transsect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)  
 1000-meter Universal Transverse Mercator grid ticks, zone 13

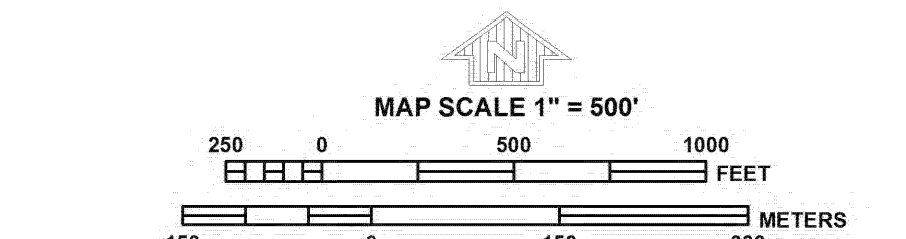
5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)  
 River Mile

MAP REPOSITORIES  
 Refer to Map Repository list on Map Index  
 EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP  
 MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL  
 DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.  
 To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



**NFP**  
**PANEL 0756G**  
**FIRM**  
**FLOOD INSURANCE RATE MAP**  
**EL PASO COUNTY, COLORADO AND INCORPORATED AREAS**  
**PANEL 756 OF 1300**  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)  
 CONTAINS:  

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	08060	0756	G
EL PASO COUNTY	08059	0756	G

  
 Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.  
**MAP NUMBER 08041C0756G**  
**MAP REVISED DECEMBER 7, 2018**  
 Federal Emergency Management Agency



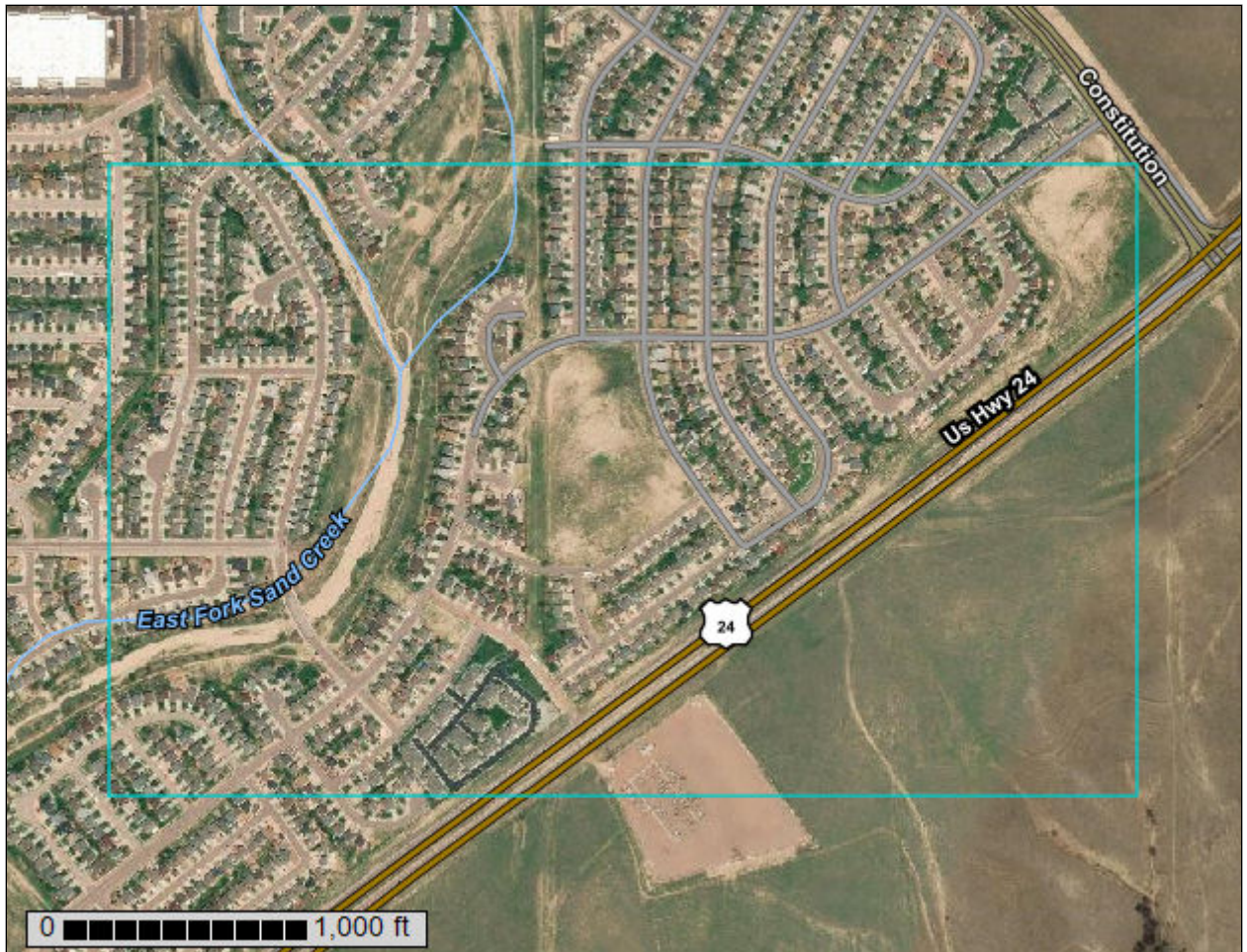
United States  
Department of  
Agriculture

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 El Paso County Area, Colorado



# Preface

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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](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.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and



## Custom Soil Resource Report

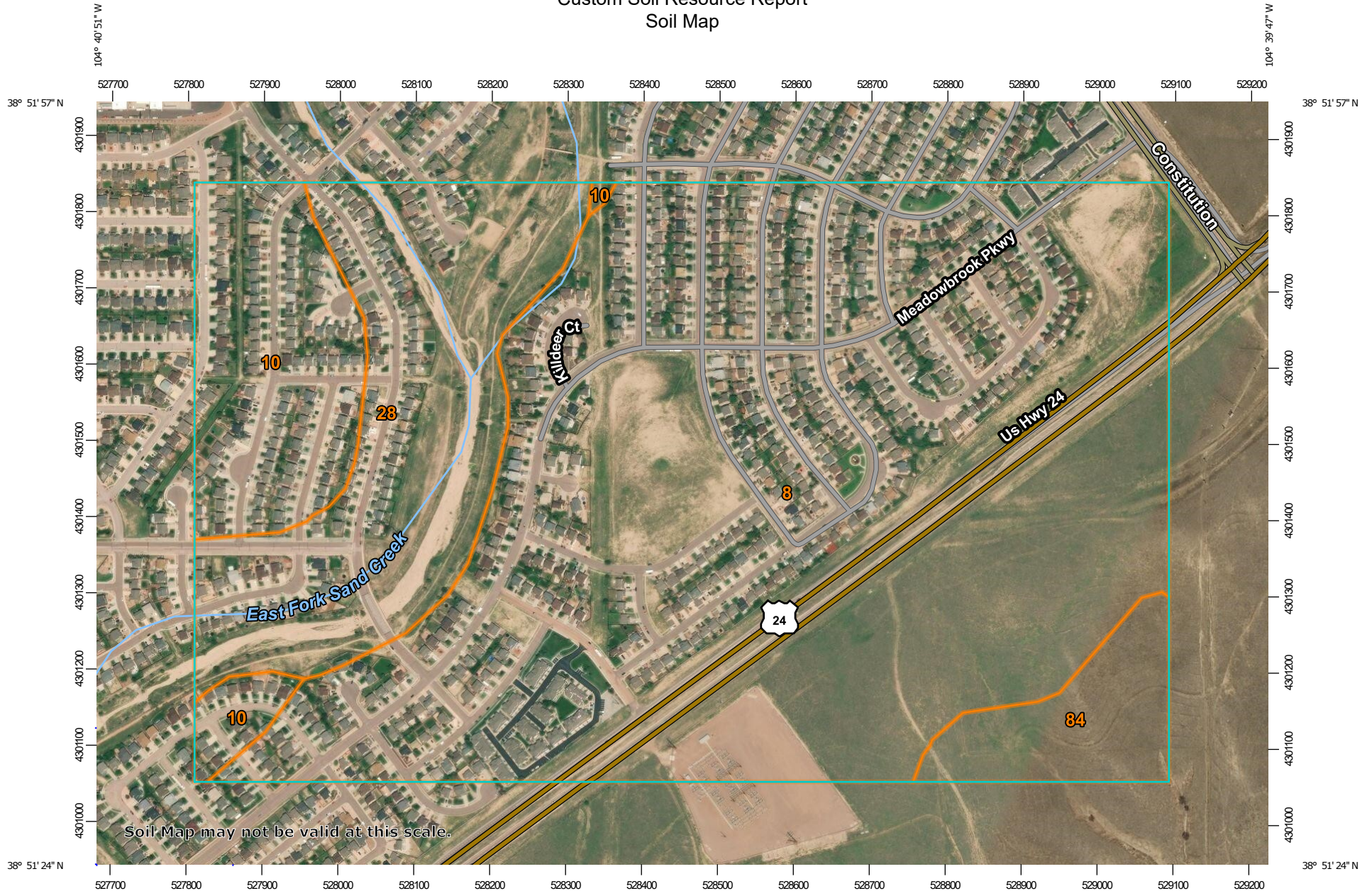
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

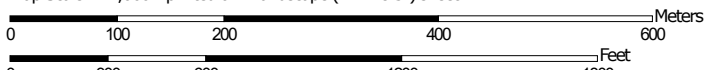
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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map




Map Scale: 1:7,060 if printed on A landscape (11" x 8.5") sheet.







Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

### MAP LEGEND



















**Area of Interest (AOI)**








 Area of Interest (AOI)

**Soils**


 Soil Survey Areas  
 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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: El Paso County Area, Colorado  
 Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Jun 7, 2016—May 26, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	172.2	68.8%
10	Blendon sandy loam, 0 to 3 percent slopes	25.7	10.3%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	41.4	16.5%
84	Stapleton sandy loam, 8 to 15 percent slopes	11.1	4.4%
<b>Totals for Area of Interest</b>		<b>250.4</b>	<b>100.0%</b>

## 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.

## Custom Soil Resource Report

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## El Paso County Area, Colorado

### 8—Blakeland loamy sand, 1 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369v  
*Elevation:* 4,600 to 5,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Blakeland and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blakeland

##### Setting

*Landform:* Hills, flats  
*Landform position (three-dimensional):* Side slope, talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

##### Typical profile

*A - 0 to 11 inches:* loamy sand  
*AC - 11 to 27 inches:* loamy sand  
*C - 27 to 60 inches:* sand

##### Properties and qualities

*Slope:* 1 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 5 percent  
*Available water storage in profile:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

**10—Blendon sandy loam, 0 to 3 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 3671

*Elevation:* 6,000 to 6,800 feet

*Mean annual precipitation:* 14 to 16 inches

*Mean annual air temperature:* 46 to 48 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Blendon and similar soils:* 98 percent

*Minor components:* 2 percent

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

**Description of Blendon**

**Setting**

*Landform:* Terraces, alluvial fans

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

**Typical profile**

*A - 0 to 10 inches:* sandy loam

*Bw - 10 to 36 inches:* sandy loam

*C - 36 to 60 inches:* gravelly sandy loam

**Properties and qualities**

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Natural 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 in profile:* 2 percent

*Available water storage in profile:* Moderate (about 6.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e



## Custom Soil Resource Report

*Hydrologic Soil Group:* B  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

### Minor Components

#### Other soils

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

#### Pleasant

*Percent of map unit:* 1 percent  
*Landform:* Depressions  
*Hydric soil rating:* Yes

## 28—Ellicott loamy coarse sand, 0 to 5 percent slopes

### Map Unit Setting

*National map unit symbol:* 3680  
*Elevation:* 5,500 to 6,500 feet  
*Mean annual precipitation:* 13 to 15 inches  
*Mean annual air temperature:* 47 to 50 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Ellicott and similar soils:* 97 percent  
*Minor components:* 3 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Ellicott

#### Setting

*Landform:* Flood plains, stream terraces  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Sandy alluvium

#### Typical profile

*A - 0 to 4 inches:* loamy coarse sand  
*C - 4 to 60 inches:* stratified coarse sand to sandy loam

#### Properties and qualities

*Slope:* 0 to 5 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches

## Custom Soil Resource Report

*Frequency of flooding:* Frequent

*Frequency of ponding:* None

*Available water storage in profile:* Low (about 4.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7w

*Hydrologic Soil Group:* A

*Ecological site:* Sandy Bottomland LRU's A & B (R069XY031CO)

*Other vegetative classification:* SANDY BOTTOMLAND (069AY031CO)

*Hydric soil rating:* No

### Minor Components

#### Fluvaquentic haplaquoll

*Percent of map unit:* 1 percent

*Landform:* Swales

*Hydric soil rating:* Yes

#### Other soils

*Percent of map unit:* 1 percent

*Hydric soil rating:* No

#### Pleasant

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## 84—Stapleton sandy loam, 8 to 15 percent slopes

### Map Unit Setting

*National map unit symbol:* 36b0

*Elevation:* 6,500 to 7,300 feet

*Mean annual precipitation:* 14 to 16 inches

*Mean annual air temperature:* 46 to 48 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Stapleton and similar soils:* 95 percent

*Minor components:* 5 percent

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

### Description of Stapleton

#### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

## Custom Soil Resource Report

### Typical profile

*A - 0 to 11 inches:* sandy loam  
*Bw - 11 to 17 inches:* gravelly sandy loam  
*C - 17 to 60 inches:* gravelly loamy sand

### Properties and qualities

*Slope:* 8 to 15 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well 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  
*Available water storage in profile:* Low (about 4.7 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B  
*Ecological site:* Gravelly Foothill (R049BY214CO)  
*Hydric soil rating:* No

### Minor Components

#### Other soils

*Percent of map unit:* 4 percent  
*Hydric soil rating:* No

#### Pleasant

*Percent of map unit:* 1 percent  
*Landform:* Depressions  
*Hydric soil rating:* Yes

# Soil Information for All Uses

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## 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 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

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.

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.

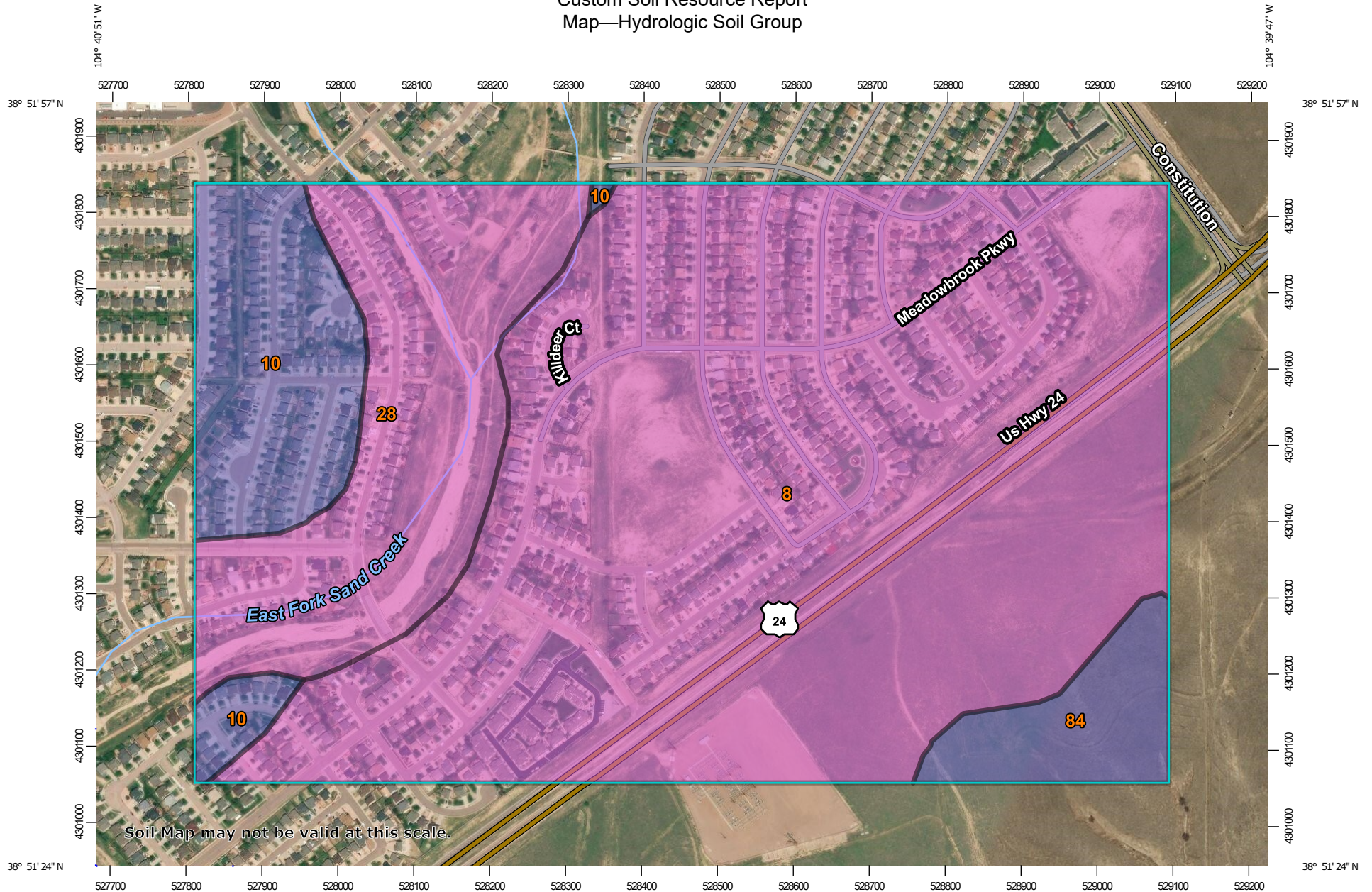
## Custom Soil Resource Report

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.

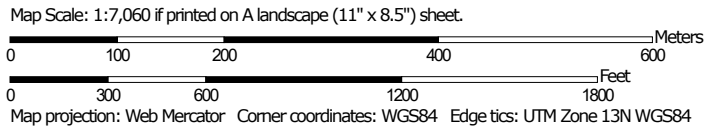
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over 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



Soil Map may not be valid at this scale.



### MAP LEGEND

- Area of Interest (AOI)**
  -  Area of Interest (AOI)
- Soils**
  -  Soil Survey Areas
- 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
- 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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: El Paso County Area, Colorado  
 Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Jun 7, 2016—May 26, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Hydrologic Soil Group**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	172.2	68.8%
10	Blendon sandy loam, 0 to 3 percent slopes	B	25.7	10.3%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	41.4	16.5%
84	Stapleton sandy loam, 8 to 15 percent slopes	B	11.1	4.4%
<b>Totals for Area of Interest</b>			<b>250.4</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group**

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*



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- 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](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

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# Geotechnical Engineering Report

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**Mountain View Academy  
Meadowbrook Parkway and Pinyon Jay Drive  
Colorado Springs, Colorado**

November 8, 2019  
Terracon Project No. 23195115

**Prepared for:**  
National Heritage Academics  
Grand Rapids, Michigan

**Prepared by:**  
Terracon Consultants, Inc.  
Colorado Springs, Colorado



November 8, 2019

National Heritage Academics  
3850 Broadmoor Southeast  
Grand Rapids, Michigan 49512



Attn: Mr. Joseph Sprys – Director of Facilities and Construction  
P: (616) 929-1290  
E: jsprys@nhaschools.com

Re: Geotechnical Engineering Report  
Mountain View Academy  
Meadowbrook Parkway and Pinyon Jay Drive  
Colorado Springs, Colorado  
Terracon Project No. 23195115

Mr. Sprys:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P23195116 dated October 8, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Nick M. Novotny, P.G.  
Senior Staff Geologist

Robert M. Hernandez, P.E.  
Geotechnical Services Manager

Terracon Consultants, Inc. 4172 Center Park Drive Colorado Springs, Colorado 80916  
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## REPORT TOPICS

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**Note:** This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the **GeoReport** logo will bring you back to this page. For more interactive features, please view your project online at [client.terracon.com](http://client.terracon.com).

## ATTACHMENTS

**EXPLORATION AND TESTING PROCEDURES**  
**SITE LOCATION AND EXPLORATION PLANS**  
**EXPLORATION RESULTS**  
**SUPPORTING INFORMATION**

**Note:** Refer to each individual Attachment cover page for a listing of contents.

## **REPORT SUMMARY**

A geotechnical engineering exploration has been performed for the Mountain View Academy to be located at Meadowbrook Parkway and Pinyon Jay Drive in Colorado Springs, Colorado. Based on the information obtained from this subsurface exploration and the laboratory testing completed, the site appears suitable for the proposed construction; however, the following geotechnical conditions will need to be considered:

- Up to about 6 feet of possible fill materials were encountered in the borings drilled for this exploration. We do not possess any information regarding whether the fill was placed under the observation of a geotechnical engineer. It is our opinion the existing fill should not be used to support foundation, interior slab, pavement, or exterior slab construction without complete removal and modification. Support of pavement construction and exterior slab construction on the existing fill materials can be considered, provided a portion of the existing fill materials are over-excavated, processed, moisture conditioned and recompacted, and potential movement beyond 1-inch can be tolerated.
- Based on the results of the laboratory testing and our experience in the area, the sand fill materials and native sand soils have nil expansive potential.
- Test boring data indicate that loose soils may be locally present. Consequently, loose soils could be encountered below foundations or other improvements and these conditions will likely require some corrective work. Corrective work could involve removal and re compaction or replacement, in-place soil densification, or deepening footing excavations to suitable bearing materials.
- Based on the geotechnical engineering analyses, the proposed school may be constructed on a shallow spread footing foundation system bottomed on a zone of new engineered fill.
- Based on the properties of the subsurface materials, the floor system for the proposed structure may consist of a slab-on-grade constructed on a zone of new engineered fill.
- Based on the 2015 International Building Code (IBC) Section 1613.3.2, and the subsurface conditions encountered in the borings, the seismic site classification for this site is D.
- Existing fill materials may be encountered at exterior flatwork and pavement construction elevation in other areas of the site where fill materials were not observed. Construction of exterior flatwork and pavements on a zone of new engineered fill is recommended to improve performance.

## Geotechnical Engineering Report

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- The amount of movement associated with foundations, floor slabs, slabs-on-grade, and other structural elements at this site will be related to the wetting of the underlying soils. Therefore, it is imperative the recommendations outlined in the **Grading and Drainage** subsection of **Earthwork** be followed to reduce potential movement. Moisture conditioning and/or replacement of the on-site fill materials and/or native soils should follow the recommendations outlined in **Earthwork**.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

**Geotechnical Engineering Report**  
**Mountain View Academy**  
**Meadowbrook Parkway and Pinyon Jay Drive**  
**Colorado Springs, Colorado**  
**Terracon Project No. 23195115**  
**November 8, 2019**

## INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Mountain View Academy Project to be located at Meadowbrook Parkway and Pinyon Jay Drive in Colorado Springs, Colorado.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater levels
- Earthwork
- Drainage
- Lateral earth pressures
- Seismic site classification
- Foundation design and construction
- Floor slab design and construction
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of twelve test borings (designated as Boring Nos. B-1 to B-12) to depths ranging from approximately 5 to 30 feet below existing site grades. Plans showing the site and boring locations are shown in the **Site Location and Exploration Plans** section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

## SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
<b>Parcel Information</b>	The project is located a Meadowbrook Parkway and Pinyon Jay Drive in Colorado Springs, Colorado. Latitude: 38.8615° N, Longitude: -104.6722° W (approximate) See <b>Site Location</b>



## Geotechnical Engineering Report

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Item	Description
<b>Existing Improvements</b>	The site of the proposed Mountain View Academy Project appears to be relatively undeveloped. However, based on historical images available through Google Earth, it appears that mass grading associated with previous adjacent development has occurred on the subject parcel. This site is bordered to the north by Meadowbrook Parkway, to the east by Pinyon Jay drive, to the south by Hanes Drive, and to the west by single-family residential homes followed by Meadowbrook parkway.
<b>Current Ground Cover</b>	Sparse to moderate vegetation and exposed soil.
<b>Existing Topography</b>	The site is relatively flat with about 10 feet of elevation change over 300 feet based on the provided ALTA survey. Site topography gently slopes down to the north.
<b>Geology</b>	Based on the geologic map of the area <sup>1</sup> the subsurface materials beneath the site consist of younger eolian sands (Qes <sub>1</sub> ). This geologic unit is Pleistocene to Holocene in age (approximately 2.6 million to 14 thousand years ago), and generally consists of coarse sands deposited in an arid environment.

1. Madole, R.F., and Thorson, J.P., 2003, Geologic Map of the Elsmere 7.5 Minute Quadrangle, El Paso County, Colorado; Colorado Geological Survey, Open-File Report OF02-02, scale 1:24,000

## PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows.

Item	Description
<b>Information Provided</b>	Email correspondence between September 30 and October 1, 2019 Mountain View Charter School Site Layout, undated, received electronically on September 30, 2019. Mountain View Academy ALTA site survey, dated September 20, 2019
<b>Project Description</b>	We understand the project consists of the construction of a new one-to-two-story school building occupying a footprint of approximately 42,500 square feet with associated asphalt paved parking lot and landscaping areas.
<b>Building Construction</b>	We assume the proposed school will be of either brick or CMU construction with slab-on-grade floor system supported on shallow reinforced concrete foundations.
<b>Finished Floor Elevation</b>	Assumed to be within 3 feet of existing site grades.
<b>Maximum Loads (assumed)</b>	<ul style="list-style-type: none"><li>■ Columns: 100 to 200 kips</li><li>■ Walls: 2 to 5 kips per linear foot (klf)</li><li>■ Slabs: 150 to 200 pounds per square foot (psf)</li></ul>

## Geotechnical Engineering Report

Mountain View Academy ■ Colorado Springs, Colorado

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Item	Description
<b>Grading/Slopes</b>	We assume up to 3 feet of cut and 3 feet of fill will be required to develop final grades. Final slope angles as steep as 3H:1V (Horizontal: Vertical) no greater than 5 feet in height are expected.
<b>Below-Grade Structures</b>	None anticipated
<b>Free-Standing Retaining Walls</b>	None anticipated.
<b>Pavements</b>	We understand that paved drive lands and 165 parking stalls will be constructed as part of this project and assume that flexible (asphalt) pavement sections are preferred, but that rigid (Portland cement concrete) pavement sections may be considered. Assumed traffic loading is as follows: <ul style="list-style-type: none"><li>■ Light Duty: 27,000 Equivalent Single Axel Loads (ESALs)</li><li>■ Heavy Duty: 110,000 ESALs</li></ul> The Pavement design period is 20 years.

## GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following sections provide our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options, and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

### Typical Profile

Based on the results of the borings for this exploration, subsurface conditions on the site can be generalized as follows:

Material Description	Approximate Depth to Bottom of Stratum below Existing Site Grade	Relative Density
Existing fill and possible fill materials consisting of poorly graded sand with silt and gravel	About 2 to 6 feet Not encountered in Boring Nos. B-10 and B-12	Loose to dense
Native soil consisting of silty sand to poorly graded sand with silt.	Maximum depth explored	Loose to medium dense

## Geotechnical Engineering Report

Mountain View Academy ■ Colorado Springs, Colorado

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Stratification boundaries on the boring logs represent the approximate location of changes in soil and material types; in situ, the transition between materials may be gradual. Further details of the borings can be found on the boring logs in the **Exploration Results**.

Based on the results of the laboratory testing and our experience in the area, the sand fill materials and native sand soils have nil expansive potential. A summary of laboratory test results is included in the **Exploration Results**.

### Groundwater Conditions

The borings were observed while drilling and upon completion of drilling for the presence and level of groundwater. The water levels encountered in the boreholes can be found on the boring logs in **Exploration Results**, and are summarized below.

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling <sup>1</sup>
B-1	None encountered
B-2	None encountered
B-3	None encountered
B-4	None encountered
B-5	None encountered
B-6	None encountered
B-7	None encountered
B-8	None encountered
B-9	None encountered
B-10	None encountered
B-11	None encountered
B-12	None encountered

<sup>1</sup>. Due to safety concerns, borings were backfilled immediately after completion. Therefore, subsequent groundwater measurements were not obtained.

These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times or at other locations. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

## **GEOTECHNICAL OVERVIEW**

Based on subsurface conditions encountered in the borings, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations outlined in this report are followed. We have identified geotechnical conditions that could impact design and construction of the proposed school building, pavements, and other site improvements.

### **Existing Fill Materials**

Up to about 6 feet of possible fill materials were encountered within the building footprint and in portions of the parking areas at the site. Fill depths presented on the boring logs are approximate and the depth, lateral extents, and composition of fill should be expected to vary. We do not possess any information regarding whether the fill was placed under the observation of a geotechnical engineer. Based on the relatively high blow counts and relatively high in-situ dry unit weights within portions of the fill when compared to the native soils, it appears the fill was placed with some compactive effort. However, without density and water content records indicating how the fill was placed, the consistency of the fill may vary, and it is unclear whether the fill was placed uniformly across the site for support of structural improvements. Because of this uncertainty, it is our opinion the existing fill should not be used to support foundations, interior slabs, exterior slabs-on-grade, or pavement construction without complete removal and modification.

If the owner is willing to accept a higher risk of movement beyond 1-inch for pavements and exterior slabs, consideration could be given to over-excavating a portion of the existing fill materials below these elements, then processing, moisture conditioning and compacting the materials back to subgrade elevation.

There exists the potential for construction debris and/or domestic trash to be encountered within the fill on some portions of the site. Because construction debris and trash was not observed in the borings, the potential for encountering these materials is considered to be low. The fill materials should be observed for the presence of trash and debris during site grading and construction.

We recommend existing fill soils be removed below planned utilities at this site and replaced as compacted, structural fill. Utilities should be designed with restrained joints and designed to accommodate potential differential movement should existing fill soils be left in place.

The existing fill can be reused as engineered fill below foundations, slabs-on-grade, and pavements, provided the material meets the requirements of imported soils in the **Material Types** subsection in **Earthwork**, any deleterious materials are removed, and some movement can be tolerated. Some removal and replacement may be required if unsuitable or soft materials are exposed.

## **Loose Soils**

Test boring data indicate that loose soils may be locally present. Consequently, loose soils could be encountered below foundations or other improvements and these conditions will likely require some corrective work. Corrective work could involve removal and re-compaction or replacement, in-place soil densification, or deepening footing excavations to suitable bearing materials. In any event, Terracon should be contacted to observe foundation excavations to evaluate bearing conditions and to provide guidance concerning corrective work (if needed).

## **EARTHWORK**

The following presents recommendations for site preparation, excavation, subgrade preparation, and placement of engineered fills on the project. All earthwork on the project should be observed and evaluated by Terracon.

### **Site Preparation**

Strip and remove existing vegetation, organics, and other deleterious materials from proposed building and pavement areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

Stripped materials consisting of vegetation, unsuitable fills, and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

Where possible, the site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath the proposed building and improvement areas. All exposed areas that will receive fill, once properly cleared, should be scarified to a minimum depth of 12 inches, conditioned to near optimum moisture content, and compacted. It is imperative the moisture content of prepared materials be protected from moisture loss.

Although evidence of underground facilities such as grease pits, septic tanks, cesspools, and basements was not observed during our exploration, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Depending upon depth of excavation and seasonal conditions, groundwater may be encountered in excavations on the site. Groundwater seeping into excavations at this site could most likely be controlled by shallow trenches leading to a sump pit where the water could be removed by pumping.

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The stability of subgrade soils may be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions are encountered or develop during construction, workability may be improved by over-excavation of wet zones and mixing these soils with crushed gravel. Use of geotextiles could also be considered as a stabilization technique. Lightweight excavation equipment may be required to reduce subgrade pumping.

### Material Types

Fill required to achieve design grades should be classified as structural fill and general fill. Structural fill is material used below or within 10 feet of structures and within 12 inches of drive lane and parking area subgrade. General fill is material used to achieve grade outside of these areas. Earthen materials used for structural and general fill should meet the following material property requirements:

Fill Type <sup>1,2</sup>	USCS Classification	Acceptable location for placement
On-site sand soils	SP-SM, SM	On-site sand soils are considered suitable for reuse as structural fill below foundation, slab, and pavement areas and as general fill for this project.
Imported soils	Varies	Imported soils meeting the gradation outlined herein can be considered acceptable for use as structural fill beneath slabs and pavements.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Care should be taken during the fill placement process to avoid zones of dis-similar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.

Imported soils for use as structural and/or general fill should conform to the following:

Gradation	Percent finer by weight (ASTM C136)
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	0-25

Soil Properties	Value
Liquid Limit	Non-plastic
Plastic Index	

## Compaction Requirements

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.

Structural and general fill should meet the following compaction requirements:

Item	Structural and General Fill
<b>Maximum lift thickness</b>	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack, plate compactor) is used
<b>Minimum compaction requirements</b> 1, 2, 3	95% of the materials maximum dry density for foundations, slabs, and at depths greater than 12 inches below pavements 98% of the materials maximum dry density for the upper 12 inches of pavement subgrade
<b>Water content range</b> 2, 4	Within three percent of optimum water content (granular soils)

1. We recommend that engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Maximum dry density and optimum water content as determined by the Modified Proctor test (D1557).
3. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D4253 and D4254).
4. Water levels should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material becoming unstable under the weight of construction equipment or during proof-rolling. Indications of unstable soil can include pumping or rutting.

## Excavation

Excavations into the subsurface soils will encounter a variety of conditions. The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Soils penetrated by the proposed excavations may vary significantly across the site. The soil classifications are based solely on the materials encountered in the exploratory borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions

should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

## **Grading and Drainage**

All grades must be adjusted to provide positive drainage away from the building during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Landscaped irrigation adjacent to the foundation systems should be minimized or eliminated. Water permitted to pond near or adjacent to the perimeter of the structure (either during or post-construction) can result in significantly higher soil movements than those discussed in this report. As a result, any estimations of potential movement described in this report cannot be relied upon if positive drainage is not obtained and maintained, and water is allowed to infiltrate the fill and/or subgrade.

Permanent grades should be sloped at a minimum of 10 percent grade for at least 10 feet beyond the perimeter of the building. Asphalt pavement or concrete flatwork should be sloped at a minimum of 2 percent beyond the building perimeters for the life of the building. Where Americans with Disabilities Act (ADA) or other requirements or existing site features limit the gradient, slopes on the order of ½ to 1 percent minimum may be necessary to comply with the ADA, but do increase the risk of unanticipated movement. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be compacted in accordance with recommendations in this report and free of all construction debris to reduce the possibility of water infiltration. After building construction and prior to project completion, we recommend that verification of final grading be performed to document that positive drainage, as described above, has been achieved.

Where paving or flatwork abuts the structure, care should be taken that joints are properly sealed and maintained to prevent the infiltration of surface water.

Landscape or xeriscape areas within 10 feet of the foundation systems shall not be hindered by landscape edging, grade variations, or vegetation. In addition, consideration should be given to snow removal practices that will minimize the stockpiling of snow in planter and landscaped areas adjacent to structural improvements.

Planters located adjacent to the structure should be watertight. Sprinkler mains and spray heads should be located a minimum of 10 feet away from the building lines. Where drip line irrigation is located near the building, we recommend that drip line irrigation systems be located at least 5 feet from the outside edge of the foundations. Roof drains should discharge on pavements or be extended away from the structure a minimum of 10 feet through the use of splash blocks or downspout extensions.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the building. Trees and shrubbery should be kept away from the exterior edges of foundations, a distance at least equal to their expected mature height.



## **Earthwork Construction Considerations**

Upon completion of grading operations, care should be taken to maintain the moisture content of the subgrade prior to construction of foundations, slabs-on-grade, pavements, and other structural elements. Construction traffic over prepared subgrade should be minimized and avoided to the extent practical.

The site should also be graded to prevent ponding of surface water on prepared subgrade or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to foundation, floor slab and pavement construction.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during over-excavation operations, excavations, subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of building foundations and floor slabs.

## **SHALLOW FOUNDATIONS**

Based upon the results of the field exploration and laboratory testing program for this exploration, the following foundation systems were evaluated for use in supporting the proposed building:

- Spread footing foundations on new engineered fill.

### **Spread Footing Foundation Recommendations**

Spread footing foundations may be considered for support of the proposed building when constructed on a 3-foot zone of new engineered fill, provided the potential for about 1-inch of movement can be tolerated. New fill materials beneath foundations should be placed and compacted as outlined in the **Earthwork** section of this report.

Design recommendations for spread footing foundation systems are presented in the following table and paragraphs.

<b>Description</b>	<b>Value</b>
<b>Thickness of Zone of New Engineered Fill</b>	Minimum of 3 feet below and beyond bottom of lowest foundation element
<b>Lateral Extent of Zone of New Engineered Fill</b>	10 feet outside building footprint
<b>Supporting Stratum</b>	New engineered fill
<b>Maximum Allowable Bearing Pressure <sup>1,2</sup></b>	2,500 psf

Description	Value
<b>Coefficient of Friction (Sliding)</b>	0.4
<b>Minimum Footing Dimensions</b>	Isolated footings: 24 inches Continuous footings: 18 inches
<b>Maximum Footing Dimensions</b>	Isolated footings: 8 feet Continuous footings: 3½ feet
<b>Minimum Embedment Below Finished Grade for Frost Protection <sup>3</sup></b>	30 inches
<b>Approximate Total Movement <sup>4</sup></b>	About 1 inch
<b>Estimated Differential Movement <sup>4,5</sup></b>	About ½ to ¾ inch

1. The recommended maximum allowable bearing pressure assumes that any existing fill or lower strength soils, if encountered, will be excavated and replaced with engineered fill.
2. The maximum allowable soil bearing pressure can be increased by 1/3 for transient loading conditions.
3. For perimeter footings, footings beneath unheated areas, and footings that will be exposed to freezing conditions during construction. Interior footings may bottom at a minimum depth of 12 inches below finished grade in heated areas.
4. Value provided is based on our project understanding noted in the **Project Description**. Foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill, the quality of the earthwork operations and footing construction, and maintaining uniform soil water content throughout the life of the structure. The estimated movements are based on maintaining uniform soil water content during the life of the structure. Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage and irrigation practices should be incorporated into the design and operation of the facility. Failure to maintain soil water content and positive drainage will nullify the movement estimates provided above.
5. Footings should be proportioned on the basis of equal total dead load pressure to reduce differential movement between adjacent footings.

## Foundation Construction Considerations

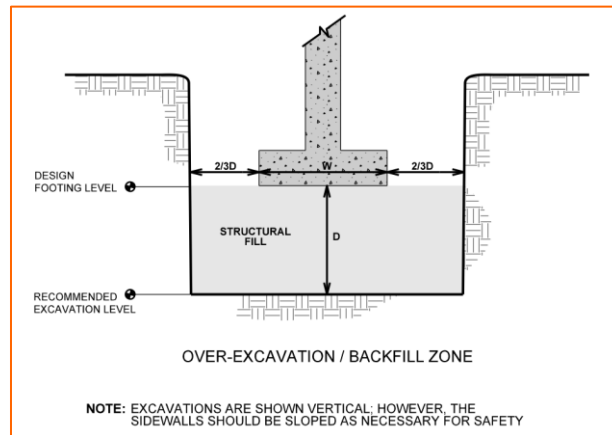
Unstable subgrade conditions should be observed by the geotechnical engineer to assess the subgrade and provide suitable alternatives for stabilization. Stabilized areas should be proofrolled prior to continuing construction to assess the stability of the subgrade.

Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation with structural fill placed as recommended in the **Earthwork** section.

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The base of all foundation excavations should be free of water and loose soil prior to concrete placement. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete.

Footings, foundations, and masonry walls should be detailed and reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

## SEISMIC CONSIDERATIONS

The following table presents the seismic site classification based on the 2015 International Building Code (IBC), and the subsurface conditions encountered within the borings:

Code Used	Site Classification
2015 International Building Code (IBC) <sup>1,2</sup>	D

1. In general accordance with the 2015 International Building Code, Section 1613.3.2.
2. The 2015 International Building Code (IBC) requires a site subsurface profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot subsurface profile determination. The deepest boring of this exploration extended to a maximum depth of about 30½ feet and this seismic site class definition considers that similar subsurface conditions exist below the maximum depth of the subsurface exploration.

## FLOOR SLABS

### Interior Floors

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure.

### Floor Slab Design Parameters

Item	Description
<b>Floor Slab Support</b> <sup>1</sup>	<ul style="list-style-type: none"> <li>■ Minimum 3 feet of compacted structural fill placed on firm, native soil.</li> <li>■ Recommend removal and replacement of existing fill soils below and a minimum of 10 feet beyond edges of floor slabs.</li> </ul>
<b>Estimated Modulus of Subgrade Reaction</b> <sup>2</sup>	100 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns, or utility lines to allow independent movement.
- Control joints should be provided in slabs to control the location and extent of cracking.
- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications described previously.
- The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 for procedures and cautions regarding the use and placement of a vapor retarder.
- Floor slabs should not be constructed on frozen subgrade.
- Other design and construction considerations, as outlined in Section 302.1R of the ACI Design Manual, are recommended.

Movements of slab-on-grades using the above outlined technique will likely be reduced and tend to be more uniform. The estimates outlined previously assume that the other recommendations in this report are followed. Additional movement could occur should the subsurface soils become wetted, which could result in potential excessive movement causing uneven floor slabs and severe cracking. This could be due to over watering of landscaping, poor drainage, improperly functioning drain systems, and/or broken utility lines. Therefore, it is imperative that the

recommendations outlined in this section and in the **Grading and Drainage** subsection of **Earthwork** be followed.

### **Floor Slab Construction Considerations**

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

## **EXTERIOR FLATWORK**

We recommend that existing fill soils be removed and replaced as compacted, structural fill prior to exterior flatwork construction. If the owner is willing to accept an increased risk of movement beyond 1-inch, exterior slabs-on-grade and flatwork can be constructed on at least 2 feet of over-excavated moisture conditioned and compacted structural fill. New fill materials beneath exterior slabs should be placed and compacted as outlined in the **Earthwork** section of this report.

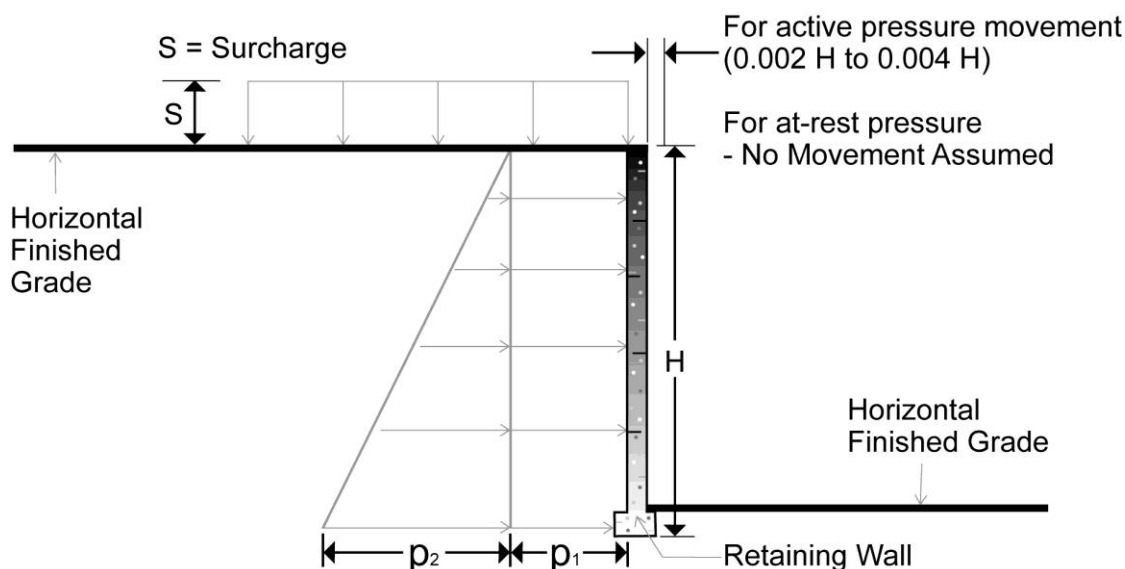
Additional slab design and construction recommendations are as follows:

- Minimizing moisture increases in the backfill.
- Controlling moisture-density during placement of backfill.
- Positive separations and/or isolation joints should be provided between exterior slabs and the building to allow independent movement.
- Control joints should be provided in slabs to control the location and extent of cracking.
- Exterior slabs should not be constructed on frozen subgrade
- Other design and construction considerations, as outlined in Section 302.1R of the ACI Design Manual, are recommended.

Movements of exterior slabs-on-grade using the above technique will likely be reduced and tend to be more uniform. Additional movement could occur should the subsurface soils become wetted, which could result in potential excessive movement causing uneven exterior slabs and severe cracking. This could be due to over watering of landscaping, poor drainage, and/or broken utility lines. Therefore, it is imperative that the recommendations outlined in the **Grading and Drainage** subsection of **Earthwork** be followed.

## LATERAL EARTH PRESSURES

Below-grade walls or free-standing retaining walls are not anticipated for this project; however, we have included lateral earth pressures recommendations in case plans should change. Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Earth Pressure Conditions	Lateral Earth Pressure Coefficient	Equivalent Fluid Density (pcf)	Surcharge Pressure, $p_1$ (psf)	Earth Pressure, $p_2$ (psf)
Active ( $K_a$ )	Sand – 0.33	40	$(0.33)S$	$(40)H$
At-Rest ( $K_o$ )	Sand – 0.50	60	$(0.50)S$	$(60)H$
Passive ( $K_p$ )	Sand – 3.00	360	---	---

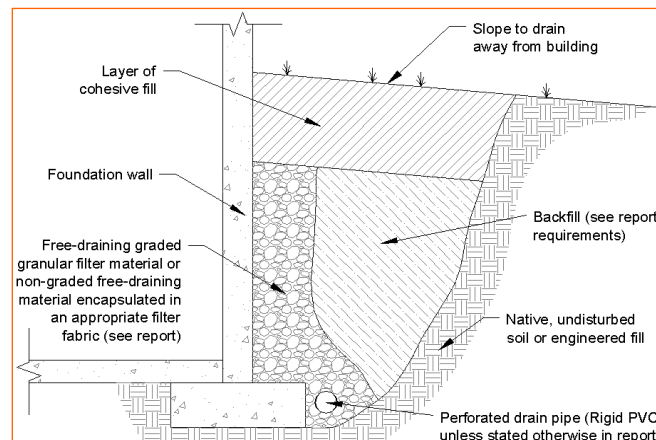
Applicable conditions to the above include:

- For active earth pressure, wall must rotate about base, with top lateral movements of about  $0.002 H$  to  $0.004 H$ , where  $H$  is wall height
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance.
- Uniform surcharge, where  $S$  is surcharge pressure
- In-situ soil backfill weight a maximum of 120 pcf

- Horizontal backfill, compacted to at least 95 percent of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No hydrostatic pressures acting on wall
- No dynamic loading
- No safety factor included in soil parameters

### Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill. The preceding data are applicable only to cast-in-place concrete or modular block walls up to 5 feet in height. **If taller single walls, tiered walls, or Mechanically Stabilized Earth (MSE) walls will be included in the proposed development, additional site-specific studies and laboratory testing will be required.** In addition, the wall designer should perform standard wall design practices including analysis for overturning, sliding, bearing capacity, and global stability, and results of these analyses should be provided for our review. Additional sampling, laboratory testing and document review associated with retaining walls is beyond the original scope of work but can be performed as a separate scope, for a separate fee.

## **PAVEMENTS**

Design of privately maintained pavements for the project has been based on the procedures outlined by the Asphalt Institute (AI) and the American Concrete Institute (ACI).

We recommend that existing fill soils in pavement areas be removed and replaced as compacted, structural fill. If the owner is willing to accept a higher risk of movement beyond 1-inch for pavements, consideration could be given to over-excavating a minimum of 2 feet of the existing fill materials, then processing, moisture conditioning and compacting the materials back to subgrade elevation.

### **Design Traffic**

We assumed the following design parameters for Asphalt Institute flexible pavement thickness design:

- Automobile Parking Areas
  - Parking stalls and parking lots for cars and pick-up trucks, up to 50 stalls
- Main Traffic Corridors
  - Parking lots with a maximum of 5 trucks per day
- Subgrade Soil Characteristics
  - USCS Classification – SP-SM to SM (good subgrade)

We assumed the following design parameters for ACI rigid pavement thickness design based upon the average daily truck traffic (ADTT):

- Automobile Parking Areas
  - ACI Category A-1: Automobile parking with an ADTT of 1 over 20 years
- Main Traffic Corridors
  - ACI Category B: Commercial entrance and service lanes with an ADTT of 25 over 20 years
- Subgrade Soil Characteristics
  - USCS Classification – SP-SM to SM (good support)
- Concrete modulus of rupture value of 600 psi

We should be contacted to confirm and/or modify the recommendations contained herein if actual traffic volumes differ from the assumed values shown above.

### **Subgrade Soils**

Based on subgrade soil Unified Soil Classifications of SP-SM to SM, AI classifies the subgrade soil as good, while ACI classifies the subgrade soil as good support.



## Recommended Minimum Pavement Sections and Materials

Recommended alternatives for flexible and rigid pavements are summarized for each traffic area as follows:

Traffic Area	Alternative	Preliminary Pavement Thickness (Inches)			
		Asphalt Concrete Surface	Aggregate Base Course	Portland Cement Concrete	Total
Automobile Parking (AI Class I and ACI Category A)	A	4	6	--	10
	B	--	--	5	5
Main Traffic Corridors (AI Class III and ACI Category B)	A	5	6	--	11
	B	--	--	6	6

Each alternative should be investigated with respect to current material availability and economic conditions. A minimum 7-inch thickness of rigid reinforced concrete pavement is recommended at the location of dumpsters where trash trucks park and load, and in areas of tight turning radius.

Concrete pavement joint spacing and reinforcement should be in accordance with specifications in ACI 330R-08.

For analysis of pavement costs, the following specifications should be considered for each pavement component:

Pavement Component	Colorado Department of Transportation Criteria
Asphalt Concrete Surface	Grading S or SX
Aggregate Base Course	Class 5 or 6
Portland Cement Concrete	Class P

## Drainage Adjacent to Pavements

To reduce pavement distress due to wetting of the subgrade in areas of water intensive landscaping or other nearby water sources (if aggregate base course is used) located adjacent to pavements, edge drains should be considered.

## Pavement Maintenance

Future performance of pavements constructed at this site will be dependent upon several factors, including:

- Maintaining stable moisture content of the subgrade soils both before and after pavement construction.

- Providing for a planned program of preventative maintenance.

The performance of all pavements can be enhanced by minimizing excess moisture, which can reach the subgrade soils. The following recommendations should be implemented:

- Site grading at a minimum 2 percent grade onto or away from the pavements.
- Water should not be allowed to pond behind curbs.
- Compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade.
- Sealing all landscaped areas in or adjacent to pavements, or providing drains to reduce the risk of moisture migration to subgrade soils.
- Placing compacted backfill against the exterior side of curb and gutter.
- Placing curb, gutter, and/or sidewalk directly on subgrade soils without the use of base course materials.

Preventative maintenance should be planned and provided for an ongoing pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program.

### **Pavement Construction Considerations**

Site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction and corrective action will be required. The subgrade should be carefully evaluated at the time of pavement construction for signs of disturbance or excessive rutting. If disturbance has occurred, pavement subgrade areas should be reworked, moisture conditioned, and properly compacted to the recommendations in this report immediately prior to paving.

We recommend the pavement areas be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and paving. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. All pavement areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to paving.

The placement of a partial pavement thickness for use during construction is not recommended without a detailed pavement analysis incorporating construction traffic. In addition, if the actual

traffic varies from the assumptions outlined above, we should be contacted to confirm and/or modify the pavement thickness recommendations outlined above.

## CORROSIVITY

The following table lists the results of laboratory water-soluble sulfate, pH, and electrical resistivity testing performed on samples obtained during our field exploration. These values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Boring No.	Sample Depth (feet)	Water-Soluble Sulfate <sup>1</sup> (ppm)	pH	Electrical Resistivity (ohm-cm)
B-3	1 – 5	99	8.05	6,063

1. Results of water-soluble sulfate testing indicate that sample of the on-site soils has an exposure class of S0 when classified in accordance with Table 19.3.1.1 of the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I Portland Cement is suitable for project concrete in contact with on-site soils. However, if there is no (or minimal) cost differential, use of ASTM Type II Portland Cement is recommended for additional sulfate resistance of construction concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 19.

## GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is

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November 8, 2019 ■ Terracon Project No. 23195115



solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

## **ATTACHMENTS**

## **EXPLORATION AND TESTING PROCEDURES**

### **Field Exploration**

**Boring Layout and Elevations:** The locations of the borings are presented in the **Site Location and Exploration Plans**. The borings were located in the field by overlaying the site plan on Google Earth, recording the latitude and longitude coordinates, and staking the borings using a handheld, recreational-grade GPS unit. The accuracy of the latitude and longitude values is typically about +/- 25 feet when obtaining the values using this method. The accuracy of the boring locations and elevations should only be assumed to the level implied by the methods used.

**Subsurface Exploration Procedures:** The borings were drilled with a CME-55 truck-mounted rotary drill rig with solid-stem augers. During the drilling operations, lithologic logs of the borings were recorded by the field engineer. Relatively undisturbed samples were obtained at selected intervals utilizing a 2-inch outside diameter standard split spoon sampler and a 3-inch outside diameter modified Dames & Moore barrel sampler. Bulk samples were obtained from auger cuttings. Penetration resistance values were recorded in a manner similar to the standard penetration test (SPT). This test consists of driving the sampler into the ground with a 140-pound hammer free falling through a distance of 30 inches. The number of blows required to advance the barrel sampler 12 inches (18 inches for standard split-spoon samplers, final 12 inches are recorded) or the interval indicated is recorded and can be correlated to the standard penetration resistance value (N-value). The blow count values are indicated on the boring logs at the respective sample depths, barrel sampler blow counts are not considered N-values.

An automatic hammer was used to advance the samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Groundwater measurements were obtained in the borings at the time of drilling. Due to safety concerns, the borings were backfilled with auger cuttings after drilling. Some settlement of the backfill may occur and should be repaired as soon as possible.

### **Laboratory Testing**

Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer, and were classified in general accordance with the Unified Soil Classification System presented in the **Supporting Information**.

## Geotechnical Engineering Report

Mountain View Academy ■ Colorado Springs, Colorado

November 8, 2019 ■ Terracon Project No. 23195115



At this time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and the boring logs were prepared. The boring logs are included in the **Exploration Results**.

Laboratory test results are included in the **Exploration Results**. These results were used for the geotechnical engineering analyses and the development of foundation, earthwork, and pavement recommendations. All laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Grain size distribution
- Atterberg limits
- Consolidation/expansion
- Electrical resistivity
- Water-soluble sulfate content
- pH

## **SITE LOCATION AND EXPLORATION PLANS**

### **Contents:**

Site Location Plan  
Exploration Plan with Project Overlay  
Exploration Plan with ALTA Overlay

Note: All attachments are one page unless noted above.



**SITE LOCATION**

Mountain View Academy ■ Colorado Springs, CO  
November 8, 2019 ■ Terracon Project No. 23195115

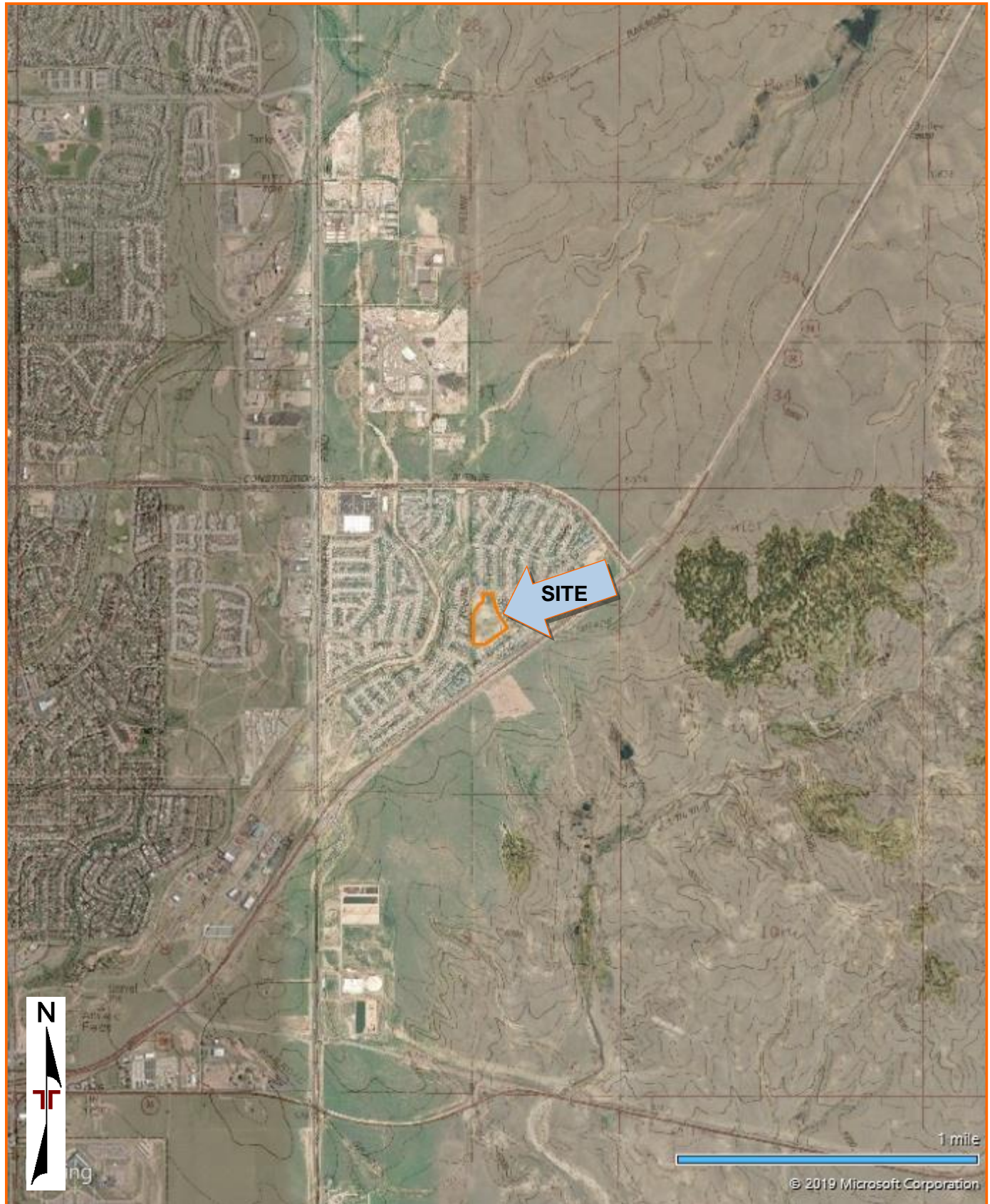


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY  
QUADRANGLES INCLUDE: FALCON NW, CO (1/1/1994) and ELSMERE, CO (1/1/1994).

# EXPLORATION PLAN WITH PROJECT OVERLAY

Mountain View Academy ■ Colorado Springs, CO  
November 8, 2019 ■ Terracon Project No. 23195115

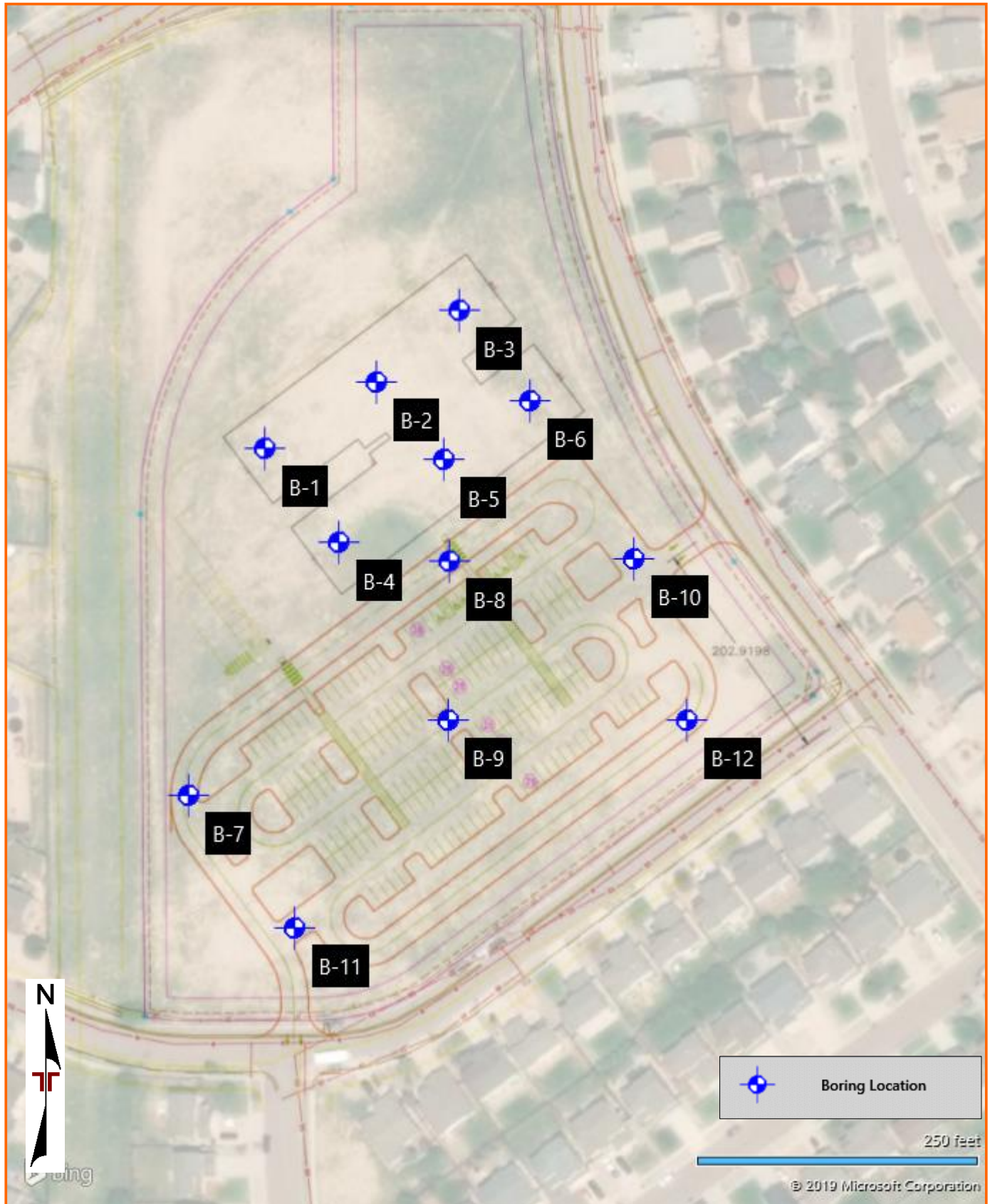


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS



## **EXPLORATION RESULTS**

### **Contents:**

Boring Logs (Boring Nos. B-1 to B-12)

Grain Size Distribution (2 pages)

Consolidation/Expansion (2 Pages)

Results of Corrosion Analysis

Note: All attachments are one page unless noted above.

# BORING LOG NO. B-1

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW.ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 38.8618° Longitude: -104.6728°  Surface Elev.: 6473.5 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH	ELEVATION (Ft.)						LL-PL-PI	
	<b>FILL - POORLY GRADED SAND (SP)</b> , fine grained, brown to dark brown, medium dense	6.0		X	12-14	3	107		
	<b>POORLY GRADED SAND (SP)</b> , fine grained, light brown, loose	17.0		X	5-5	2	100		
	<b>SILTY SAND (SM)</b> , fine grained, light brown, loose to medium dense	30.5		X	4-2-4 N=6	8			
	<b>SILTY SAND (SM)</b> , fine grained, light brown, loose to medium dense	30.5		X	6-5-6 N=11	16			
	<b>SILTY SAND (SM)</b> , fine grained, light brown, loose to medium dense	30.5		X	7-8-9 N=17	11			
<b>Boring Terminated at 30.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

# BORING LOG NO. B-2

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_ 23195115 MOUNTAIN VIEW ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 38.862° Longitude: -104.6724°							LL-PL-PI	
	Surface Elev.: 6477 (Ft.)								
	ELEVATION (Ft.)								
6.0	<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, brown to dark brown, loose to medium dense	5		X	7-8	8	86	NP	9
				X	9-11	7	107		
6.0	<b>SILTY SAND (SM)</b> , fine grained, light brown, very loose to loose	10		X	6-7	4	103		
				X	4-7	5	94		
		15		X	6-10	12	100		
20.5	<b>Boring Terminated at 20.5 Feet</b>	20		X	4-2-1 N=3	10			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

# BORING LOG NO. B-3

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 38.8622° Longitude: -104.6722°							LL-PL-PI	
	Surface Elev.: 6476 (Ft.)								
	ELEVATION (Ft.)								
6.0	<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, dark brown, medium dense	5		10-16	8	115			
6.0		5		13-14	5	111			
12.0	<b>POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, brown, loose  light brown below 9 feet	10		4-5	6	102			
12.0		10		4-4	5	102			
30.5	<b>SILTY SAND (SM)</b> , fine grained, light brown, loose to medium dense	15		6-8	13	103			
30.5		20		6-6-7 N=13	11				
30.5		25		6-6-6 N=12	12				
30.5		30		5-6-7 N=13	14				
<b>Boring Terminated at 30.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

# BORING LOG NO. B-4

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH ELEVATION (Ft.)							LL-PL-PI	
	Latitude: 38.8616° Longitude: -104.6725°  Surface Elev.: 6475 (Ft.)								
6.0	<b>POORLY GRADED SAND (SP-SM)</b> , with gravel, fine grained, brown to dark brown, loose to medium dense	5			9-12	3	104		
					9-7	3	105		
6.0	<b>SILTY SAND (SM)</b> , with gravel, fine to coarse grained, light brown, loose to medium dense	10			4-4	3	99		
					9-6	5	98		
		15			6-6	8	107		
20.5	<b>Boring Terminated at 20.5 Feet</b>	20			7-5-7 N=12	8			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



4172 Center Park Dr  
Colorado Springs, CO

Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115



# BORING LOG NO. B-5

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 38.8618° Longitude: -104.6722°									LL-PL-PI	
	Surface Elev.: 6478 (Ft.)										
6.0	<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, dark brown, medium dense		6472	5			9-10	8	106		
							9-12	11	114		
6.0	<b>SILTY SAND (SM)</b> , fine grained, brown to dark brown, very loose to medium dense						5-4	5	102		
	light brown below 9 feet			10			3-4	5	97		
				15			4-4	7	100		
				20		X	3-1-2 N=3	9			
				25		X	6-6-7 N=13	12			
30.5			6447.5	30		X	6-8-9 N=17	12			
	<b>Boring Terminated at 30.5 Feet</b>										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



4172 Center Park Dr  
Colorado Springs, CO

Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

# BORING LOG NO. B-6

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
	Latitude: 38.862° Longitude: -104.6719°							LL-PL-PI	PERCENT FINES	
	Surface Elev.: 6477 (Ft.)									
	ELEVATION (Ft.)									
6.0	<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, dark brown to gray, medium dense	5			13-14	8	114			
					14-15	6	109			
6.0	<b>SILTY SAND (SM)</b> , fine grained, brown, loose to medium dense				4-7	7	107	NP	20	
	light brown below 9 feet	10			5-4	4	99			
		15			4-6	7	105			
20.5	<b>Boring Terminated at 20.5 Feet</b>	20			5-6-8 N=14	8				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

# BORING LOG NO. B-7

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 38.861° Longitude: -104.673°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
	Surface Elev.: 6474 (Ft.)								
	6.0	6468		X	10-14-16 N=30	2			
				X	8-10-11 N=21	3			
				X	10-10-8 N=18	2			
				X	5-5-5 N=10	2			
	10.5	6463.5	10	X	5-4-5 N=9	2			
<b>Boring Terminated at 10.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON.DATATEMPLATE.GDT 11/8/19

# BORING LOG NO. B-8

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 38.8616° Longitude: -104.6722°							LL-PL-PI	
	Surface Elev.: 6477 (Ft.)								
	ELEVATION (Ft.)								
3.0	6474			X	11-16-14 N=30	2			
<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , with gravel, fine grained, brown, medium dense to dense									
5.5	6471.5	5		X	6-6-5 N=11	5			
<b>SILTY SAND (SM)</b> , with gravel, fine grained, light brown, medium dense blow counts not recorded in the field									
<b>Boring Terminated at 5.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

# BORING LOG NO. B-9

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a>	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	
	Latitude: 38.8612° Longitude: -104.6722°							LL-PL-PI	PERCENT FINES
	Surface Elev.: 6477 (Ft.)								
	ELEVATION (Ft.)								
2.0	6475			X	8-12-12 N=24	2			
<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , with gravel, fine grained, brown, medium dense									
5.5	6471.5	5		X	7-7-7 N=14	2		NP	15
<b>SILTY SAND (SM)</b> , with gravel, light brown, medium dense									
<b>Boring Terminated at 5.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

# BORING LOG NO. B-10

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 38.8616° Longitude: -104.6716°  Surface Elev.: 6478.5 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH	ELEVATION (Ft.)						LL-PL-PI	
	<b>POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, brown to dark brown, loose	6.0	6472.5	5	2-3-5 N=8	2		NP	7
	4-4-4 N=8								
	3-3-3 N=6								
	2-3-4 N=7								
	2-1-2 N=3								
	<b>SILTY SAND (SM)</b> , fine grained, light brown, very loose to loose	10.5	6468	10					
<b>Boring Terminated at 10.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



4172 Center Park Dr  
Colorado Springs, CO

Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

# BORING LOG NO. B-11

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 38.8607° Longitude: -104.6727°  Surface Elev.: 6474.5 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH	ELEVATION (Ft.)						LL-PL-PI	
2.5	<b>FILL - POORLY GRADED SAND WITH SILT (SP-SM)</b> , fine grained, light brown, medium dense	6472		X	7-13-15 N=28	2		NP	12
10.5	<b>SILTY SAND (SM)</b> , fine grained, light brown, very loose to medium dense	6464		X	8-7-7 N=14	5			
				X	5-5-5 N=10	3			
				X	4-2-3 N=5	3			
				X	1-2-1 N=3	1			
<b>Boring Terminated at 10.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

# BORING LOG NO. B-12

**PROJECT:** Mountain View Academy

**CLIENT:** National Heritage Academies  
Grand Rapids, MI

**SITE:** Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

GRAPHIC LOG	LOCATION See <a href="#">Exploration Plan</a> Latitude: 38.8612° Longitude: -104.6715°  Surface Elev.: 6477.5 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	ELEVATION (Ft.)							LL-PL-PI	
2.0	6475.5			X	5-5-7 N=12	2			
5.5	6472	5		X	5-5-7 N=12	4			
5.5	6472			X	5-6-8 N=14				
<b>Boring Terminated at 5.5 Feet</b>									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:  
4" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*



4172 Center Park Dr  
Colorado Springs, CO

Boring Started: 10-14-2019

Boring Completed: 10-14-2019

Drill Rig: CME-45

Driller: Unlimited Access

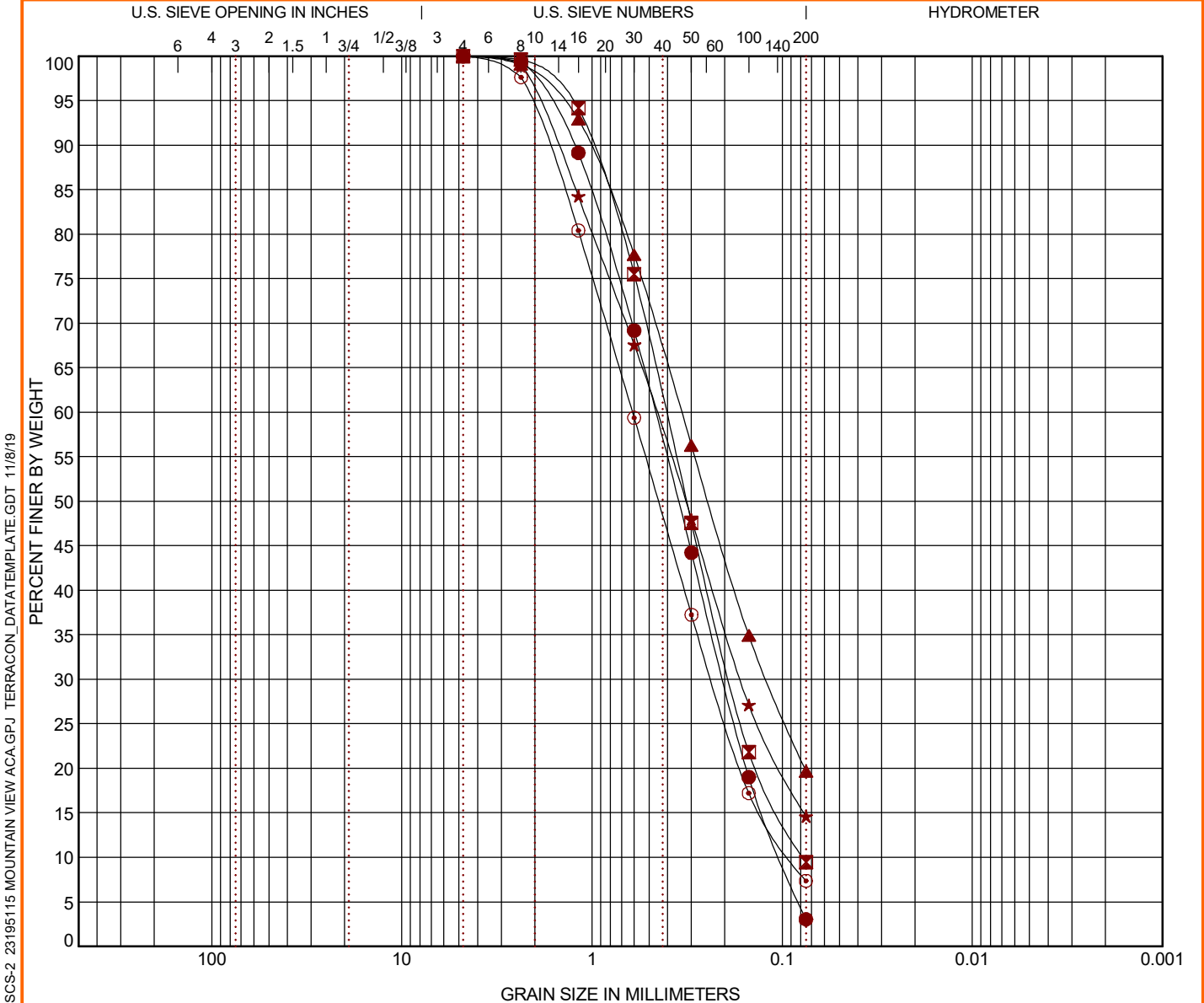
Project No.: 23195115

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL\_23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19



# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification					WC (%)	LL	PL	PI	Cc	Cu
● B-1	4 - 5	POORLY GRADED SAND (SP)					4	NP	NP	NP	0.87	4.58
■ B-2	2 - 3	POORLY GRADED SAND with SILT (SP-SM)					8	NP	NP	NP	1.11	5.28
▲ B-6	7 - 8	SILTY SAND (SM)					7	NP	NP	NP		
★ B-9	2 - 3.5	SILTY SAND (SM)					2	NP	NP	NP		
⊙ B-10	0 - 1.5	POORLY GRADED SAND with SILT (SP-SM)					2	NP	NP	NP	0.99	6.78

Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● B-1	4 - 5	4.75	0.465	0.203	0.101	0.0	0.0	97.0		3.0	
■ B-2	2 - 3	4.75	0.408	0.187	0.077	0.0	0.0	90.5		9.5	
▲ B-6	7 - 8	4.75	0.338	0.12		0.0	0.0	80.3		19.7	
★ B-9	2 - 3.5	4.75	0.459	0.165		0.0	0.0	85.4		14.6	
⊙ B-10	0 - 1.5	4.75	0.612	0.233	0.09	0.0	0.0	92.6		7.4	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 23195115 MOUNTAIN VIEW ACADEMY TERRACON\_DATA TEMPLATE.GDT 11/8/19

PROJECT: Mountain View Academy

SITE: Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO

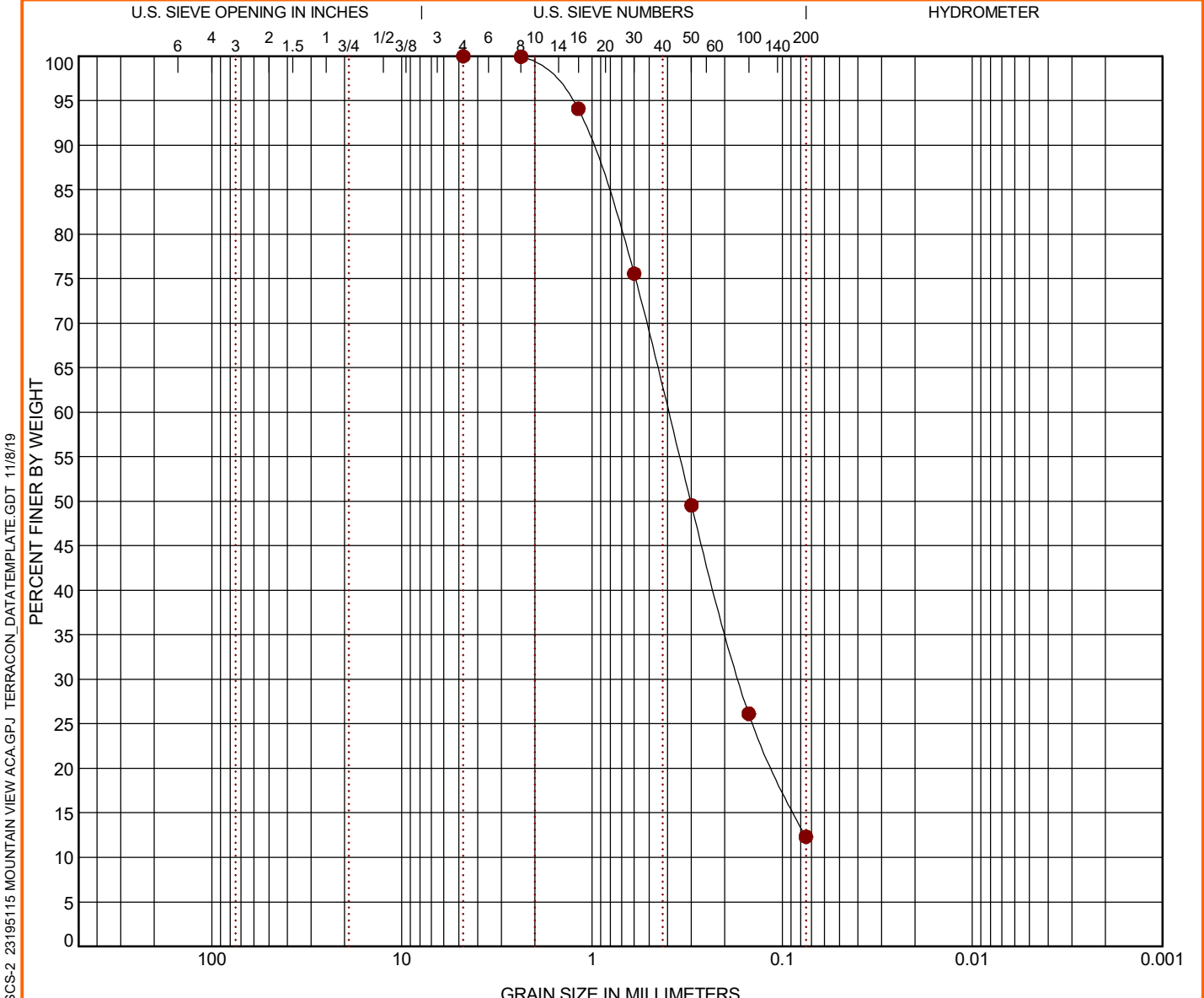


PROJECT NUMBER: 23195115

CLIENT: National Heritage Academies  
Grand Rapids, MI

# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 23195115 MOUNTAIN VIEW ACADEMY TERRACON\_DATA TEMPLATE.GDT 11/8/19

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● B-11	0 - 1.5	SILTY SAND (SM)	2	NP	NP	NP	1.07	5.93

Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● B-11	0 - 1.5	4.75	0.396	0.168	0.075	0.0	0.0	87.7	12.3	12.3	0.0

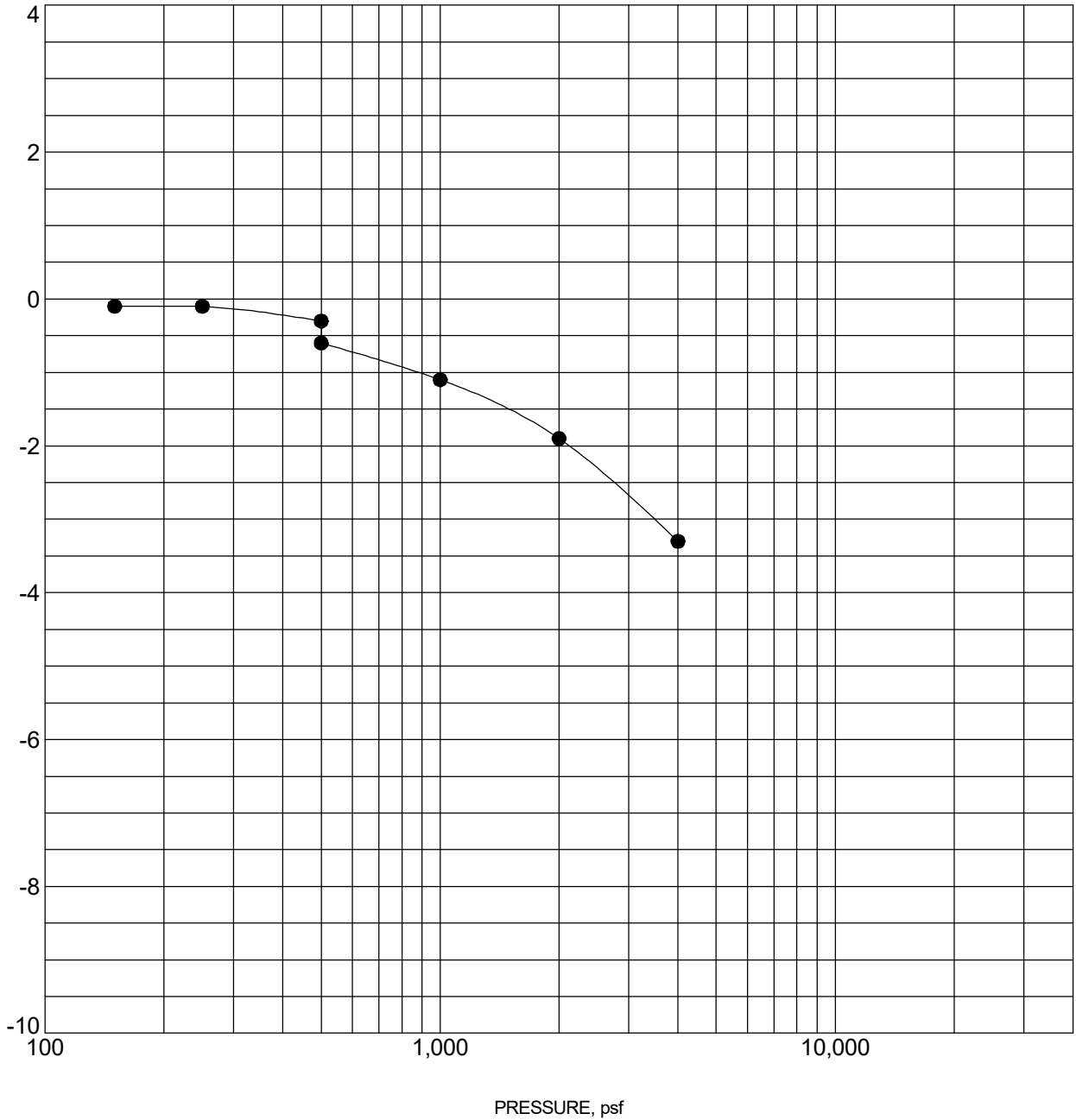
PROJECT: Mountain View Academy	<p style="font-size: small; margin: 0;">4172 Center Park Dr Colorado Springs, CO</p>	PROJECT NUMBER: 23195115
SITE: Hames Drive and Pinyon Jay Drive Colorado Springs, CO		CLIENT: National Heritage Academies Grand Rapids, MI

# SWELL CONSOLIDATION TEST

ASTM D4546

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC\_CONSOL\_STRAIN-USCS 23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

AXIAL STRAIN, %



Specimen Identification		Classification	$\gamma_d$ , pcf	WC, %
●	B-1      4 - 5 ft	POORLY GRADED SAND(SP)	106	4

NOTES:

PROJECT: Mountain View Academy

SITE: Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO



PROJECT NUMBER: 23195115

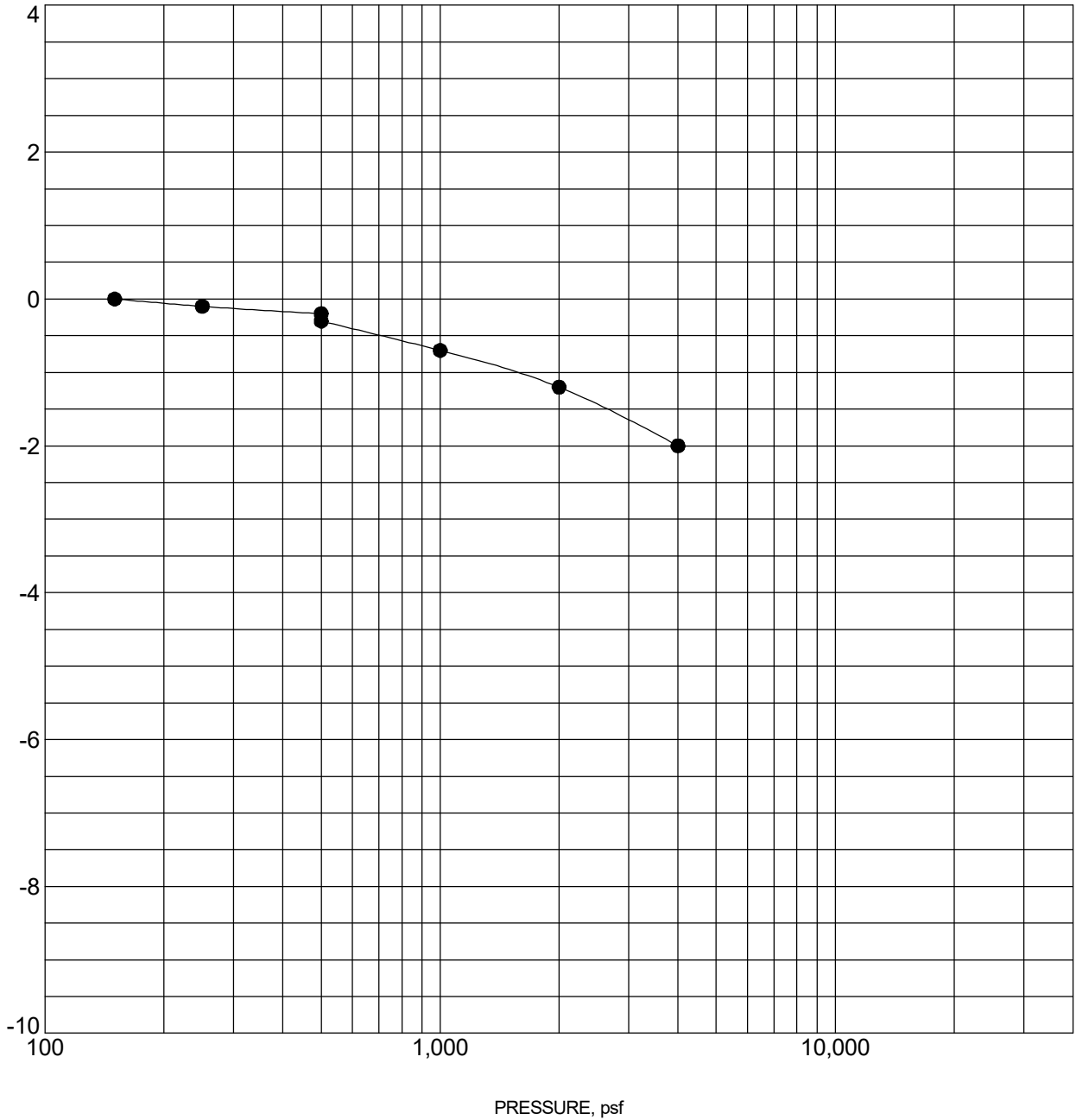
CLIENT: National Heritage Academies  
Grand Rapids, MI

# SWELL CONSOLIDATION TEST

ASTM D4546

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC\_CONSOL\_STRAIN-USCS 23195115 MOUNTAIN VIEW ACA.GPJ TERRACON\_DATATEMPLATE.GDT 11/8/19

AXIAL STRAIN, %



Specimen Identification		Classification	$\gamma_d$ , pcf	WC, %
●	B-6 7 - 8 ft	SILTY SAND(SM)	107	7

NOTES:

PROJECT: Mountain View Academy

SITE: Hames Drive and Pinyon Jay Drive  
Colorado Springs, CO



PROJECT NUMBER: 23195115

CLIENT: National Heritage Academies  
Grand Rapids, MI

# CHEMICAL LABORATORY TEST REPORT

**Project Number:** 23195115  
**Service Date:** 10/28/19  
**Report Date:** 11/04/19  
**Task:**

# Terracon

750 Pilot Road, Suite F  
Las Vegas, Nevada 89119  
(702) 597-9393

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## Client

National Heritage Academies  
Grand Rapids, MI

## Project

Mountain View Academy

**Sample Submitted By:** Terracon (23)

**Date Received:** 10/22/2019

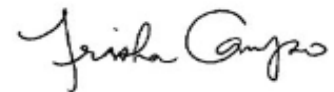
**Lab No.:** 19-1202

## *Results of Corrosion Analysis*

<i>Sample Number</i>	<u>1</u>
<i>Sample Location</i>	<u>B-3</u>
<i>Sample Depth (ft.)</i>	<u>1.0-5.0</u>
pH Analysis, ASTM G 51	<u>8.05</u>
Water Soluble Sulfate (SO <sub>4</sub> ), ASTM C 1580 (mg/kg)	<u>99</u>
Chlorides, ASTM D 512, (mg/kg)	<u>45</u>
Resistivity, ASTM G 57, (ohm-cm)	<u>6063</u>

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**Analyzed By:**



---

Trisha Campo  
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

## **SUPPORTING INFORMATION**

### **Contents:**

General Notes

Unified Soil Classification System







Note: All attachments are one page unless noted above.

# GENERAL NOTES

## DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Mountain View Academy ■ Colorado Springs, CO

Terracon Project No. 23195115

SAMPLING	WATER LEVEL	FIELD TESTS
 Auger Cuttings  Modified Dames & Moore Ring Sampler   Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(N) Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer (UC) Unconfined Compressive Strength (PID) Photo-ionization Detector (OVA) Organic Vapor Analyzer

### DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

### LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

### STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	Particle Size	Term	Plasticity Index
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
<b>Coarse-Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>	
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup>	GP	Poorly graded gravel <sup>F</sup>	
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>F, G, H</sup>	
			Fines classify as CL or CH	GC	Clayey gravel <sup>F, G, H</sup>	
	<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>	SW	Well-graded sand <sup>I</sup>	
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup>	SP	Poorly graded sand <sup>I</sup>	
		<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>	Fines classify as ML or MH	SM	Silty sand <sup>G, H, I</sup>	
			Fines classify as CL or CH	SC	Clayey sand <sup>G, H, I</sup>	
<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line	CL	Lean clay <sup>K, L, M</sup>	
			$PI < 4$ or plots below "A" line <sup>J</sup>	ML	Silt <sup>K, L, M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OL	Organic clay <sup>K, L, M, N</sup>
			Liquid limit - not dried			Organic silt <sup>K, L, M, O</sup>
	<b>Silts and Clays:</b> Liquid limit 50 or more	<b>Inorganic:</b>	$PI$ plots on or above "A" line	CH	Fat clay <sup>K, L, M</sup>	
			$PI$ plots below "A" line	MH	Elastic Silt <sup>K, L, M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K, L, M, P</sup>
			Liquid limit - not dried			Organic silt <sup>K, L, M, Q</sup>
<b>Highly organic soils:</b>	Primarily organic matter, dark in color, and organic odor			PT	Peat	

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

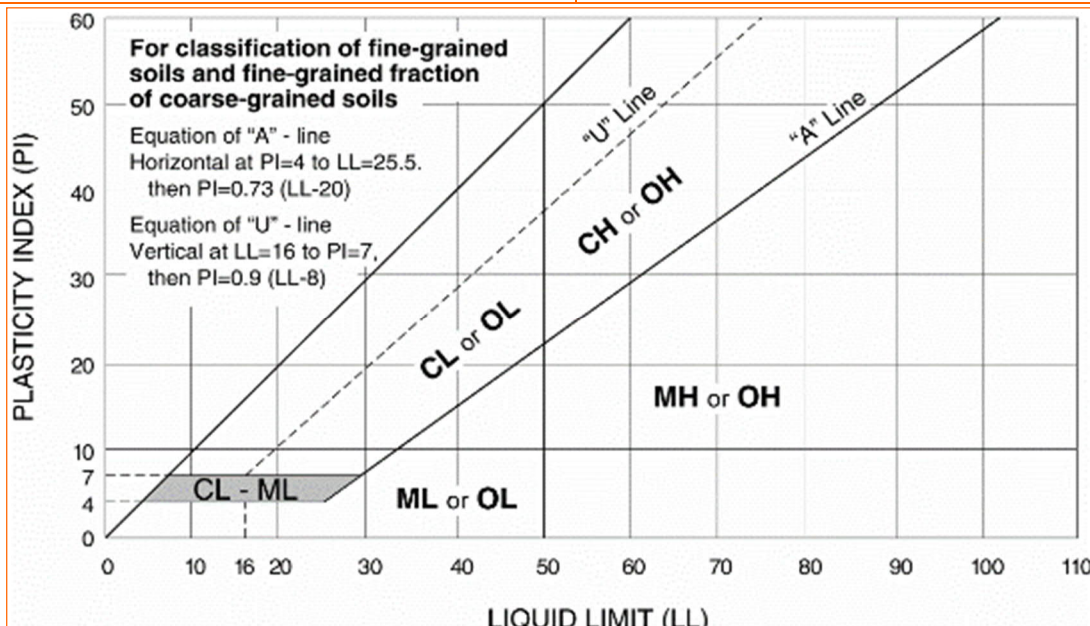
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup>  $PI$  plots on or above "A" line.

<sup>Q</sup>  $PI$  plots below "A" line.





# SWMP Plan\_v1.pdf Markup Summary

CFurchak (11)

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Item Numbers refer to SWMP Checklist

Mou  
Starr

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Item 2. update

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EGP-20-002

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PCD Project Number:  
EGP-20-002

Constructio  
Douglas Co  
limit access

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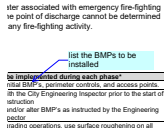
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El Paso



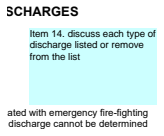
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remove this paragraph



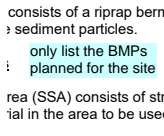
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list the BMPs to be installed



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Item 14. discuss each type of discharge listed or remove from the list



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only list the BMPs planned for the site



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Item 21. Discuss how the SWMP will be revised in the field. EPC should be notified of any changes to the SWMP

Item 25. Note that all inspection forms will be signed and kept onsite.