STORMWATER MANAGEMENT PLAN

FOR

OUTLOOK POWERS & GRINNELL

May 08, 2023

Revised:

Prepared for:

Evergreen
Development | Services | Investments

1873 South Bellaire St., Suite 1200
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Prepared by:

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Update appendices once the plans and Geotech report are updated.

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SWMP Checklist Item 1: Contacts should include SWMP Preparer and QSM (name) and should be on the cover/title sheet.

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I. Location

The proposed Outlook Powers and Grinnell project (hereinafter referred to as "Site") lies within the County of El Paso and consists of 16.57 acres. The Site is located in the Northwest ¼ of Section 7, Township 15 South, Range 65 West of the 6th P.M., City of Colorado Springs, County of El Paso, State of Colorado. The Site is bounded by Powers Boulevard to the north, Grinnell Boulevard to the west, Goldfield Drive to the south, and Cudahy Drive to the east.

A Vicinity Map is attached in Appendix A.

II. Nature of Construction Activity

The Site is currently vacant with native landscaping. The proposed construction activities for this Site are to construct 16 multifamily buildings of varying size, 4 garages, and 1 clubhouse. An existing drainage ditch runs southwest to northeast through roughly the middle of the site. To account for the demolition of this ditch, a proposed 48" bypass pipe will be constructed that will take flows directly from the outfall under S Powers BLVD, around the Site, to the inlet in Grinnell BLVD. As a part of this proposed development, sections of Grinnell BLVD will be updated to account for new traffic flows.

III. Estimates of Site Area

The Site is approximately 16.57 acres. 16.57 acres on Site will be disturbed by demolition, grading, instillation, permanent control measures, and other construction activities. An additional 6.52 acres offsite will be disturbed as part of construction on Grinnell BLVD. Overall 23.09 acres will be disturbed. The exact limits of disturbance are shown on the Grading and Erosion Control Plan (GESC) located in Appendix E.

IV. Summary of Existing Data

The Site is comprised of undeveloped land. The Site currently consists of vacant land cover with native vegetation.

SWMP Checklist Item 9 - add percent ground cover and method used to determine ground cover (ie visual, aerial, etc.)

The Site slopes down toward the south with an overall grade change of approximately 55 feet.

Discuss large existing erosion on the site and ensure all existing conditions reflect what the current site looks like. Also discuss the soil erosion potential.

According to the Geotechnical evaluation by CTL Thompson Incorporated (Provided in Appendix B), the natural soils within the Site consisted of complexly interbedded natural, silty sand, clayey sand, and sandy clay. The near surface soils are predominantly non-expansive or exhibit low expansion potential. Localized layers of moderately expansive soils are also present. Bedrock was not encountered to the maximum depths explored of up to 30'. Groundwater was not present at the time of drilling.

It is understood that structures on site will consist of post-tensioned slab-on-ground foundations. Post-tensioned slab-on-ground foundation systems structurally integrate the floor slabs and foundations and should exhibit more reliable, long-term performance than conventional slabs-on-grade. In our opinion, a low risk of movement and damage will exist for post-tensioned slabs underlain by the natural, on-site soils.

The Site generally slopes from the high point at the northern edge of the lot to the south with a maximum elevation drop of approximately 55 feet. Grades range from 0.9% - 25%, with the steepest grades seen along the boundaries of the Site.

For more information on existing soil conditions, please refer to the copy of the Geotechnical Report included in Appendix B.

The Site is located within Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) Community Panel Number 08041C0763G, effective as of December 7, 2018. This Site lays in Zone X, area of minimal flood hazard. See Appendix A for FIRMette map.

V. Potential Non-Stormwater Discharges

Non-stormwater components of discharge, such as underground springs and landscape irrigation return flow are not anticipated to occur with this project. However, the contractor shall be responsible to monitor for such discharges and notify the engineer in such an event.

VI. Receiving Water(s)

SWMP Checklist Item 16 - Describe all stream crossings or provide a statement that no streams cross the project area.

The Site discharges to the west under Grinnell BLVD to Windmill Gulch and ultimately into Big Johnson Reservoir. All runoff within the proposed site will continue to follow current drainage patterns. The outfall under Powers that discharges onto the Site will still be routed to the current culvert under Grinnell BLVD but will follow a new alignment designed to mitigate the current issues with erosion. There are no anticipated non-storm water discharges from the development.

Update dates.

VII. Construction Schedule

Construction on this Project is scheduled to commence in Winter of 2023 and the anticipated completion will be in the Spring of 2025. Construction best management practices (BMP's) for the entire Site shall be installed according to the GESC in Appendix E.

VIII. Stormwater Management Considerations

Stormwater management for the Site will be accomplished in the following Phases:

Phase 1 - Prior to earth disturbances

Construction Fence (CF)
Vehicle tracking control (VTC)
Silt Fence (SF) installation
Inlet Protection (IP) at the existing inlets (Refer to Stormwater Management Plan)
Stabilized Staging Area installation

Phase 2 - During and immediately after earth disturbances

Maintenance of the previously installed measures
Roadway inspection and any necessary cleanup each day
Concrete washout (CWA) area installation
Surface roughening where necessary
Temporary Soil Stockpile (SP) area installation
Sediment Basin (SB) installation

Phase 3 - After paving, foundation construction and underground utility construction

Maintenance of the previously installed measures

Removal of concrete washout area

Phase 4 - Final

Maintenance of the previously installed measures

Installation of formal landscaping

Request for final inspection

Upon inspection approval, removal of temporary measures

IX. Erosion and Sediment Control Measures (BMP's)

The following BMP's shall be implemented as indicated, prior to and during construction activities on the Site. This plan indicates the purpose of and estimated timing of implementation of such BMP's. The contractor's representative shall be vigilant in ensuring that additional BMP placement is implemented immediately in the event of deficiencies of any unforeseen erosion conditions.

Silt Fence

Silt fence is to be utilized along the perimeter of the Site. Silt fence shall be placed along the contour, at the base of any disturbed area, as shown on the Stormwater Management Plan. When silt fence is not installed along the contour, a "J-Hook" installation may be appropriate to ensure that the BMP does not create concentrated flow parallel to the silt fence. Rock socks may be substituted for silt fence as perimeter control on hard surface areas.

Inlet Protection

All storm sewer inlets that are made operable during construction or previously exist adjacent to, or located within the Site, must be protected to prevent sediment-laden runoff from entering the storm sewer system. Inlet protection locations are indicated on the GESC. Inlet protection measures may be removed after upstream areas are stabilized.

Vehicle Tracking Control

A vehicle tracking control area will be installed at the location shown on the GESC. All construction traffic will be required to pass through this area in order to limit the amount of sediment transported to public roadways. Whenever sediment is transported onto a public road, the road shall be cleaned immediately. Sediment shall be removed by shoveling, sweeping, or other approved methods. Street washing is not allowed.

Dust Mitigation

The contractor shall have measures on Site during grading to mitigate airborne dust pollutants. Water trucks shall be used to moisten soil access drives to reduce the amount of dust particles created by wind and on Site construction traffic.

Concrete Washout Area

A concrete washout area is identified on the GESC. The concrete washout can be earth built or portable. The concrete washouts shall be maintained in effective operational condition and built to spec per the Urban Drainage and Flood Control District.

Stabilized Staging Area

A Stabilized Staging Area (used for equipment storage, parking, and a loading/unloading zone) is identified on the GESC.

Temporary Soil Stockpile

A temporary soil stockpile is shown on the GESC. The stockpile shall have perimeter protection that shall consist of silt fence (particularly on the downhill side of the stockpile), and rock socks, or sediment control logs (on the upslope side of the stockpile). The stockpile surface shall be stabilized with surface roughening, temporary seeding and mulching, erosion control blankets, or soil binders. Soils that will be stockpiled for more than 60 days should be seeded and mulched with a temporary grass cover once the stockpile is placed (within 14 days). Use of mulch only or a soil binder is acceptable if the stockpile will be in place between 30 to 60 days. If the perimeter protection must be moved to access the soil stockpile, the perimeter controls shall be replaced by the end of the workday.

Seeding and Mulching

All disturbed areas shall be seeded and mulched within 30 days of initial exposure, or 7 days after grading is substantially complete in a given area. All disturbed areas shall be seeded and mulched per Urban Drainage and Flood Control District's criteria or as described in the approved landscape plans.

Surface Roughening

Surface roughening provides temporary stabilization of disturbed areas from water and wind erosion. The soil surface is considered to be roughened if depressions are created two to six inches deep and are spaced approximately six inches apart. Surface roughening shall be performed on all disturbed and graded areas of the Site (except in areas where buildings, pavement, or sod are to be placed within 7 days). Surface Roughening should follow along the contours of the slope. Care should be taken not to allow vehicles on treated slopes, as tire tracks will smooth the roughened surface and encourage runoff to collect into channels.

Temporary Sediment Basin

A temporary sediment basin will be used to capture a large runoff volume from the undeveloped construction site and control the amount of eroded or disturbed soil leaving the site. The Sediment basin shall be designed to release runoff slowly through a control structure, giving the transported sediment time to settle before releasing to off-site receiving waters.

QSM should be a person, if it is to be determined, write TBD.

X. Qualified Stormwater Manager

The Qualified Stormwater Manager (QSM) is Evergreen.

- The QSM is responsible for implementing and maintaining the Stormwater Management Plan.
- The QSM shall contact the engineer of record for development and revisions of the SWMP.
- The QSM shall be responsible for reporting spills.
- The QSM shall conduct Site inspections and shall verify that repairs to the BMPs have been completed and certify corrections.
- The QSM shall conduct BMP training.

XI. Potential Pollution Sources

Disturbed and Stored Soils

Disturbed and stored soils are a potential pollution source for the Site. Implementing dust mitigation, rock socks, silt fence, and sediment control logs will control the disturbed and stored soils.

Vehicle Tracking of Sediments

Vehicle tracking of sediments is a potential pollution source for the Site and will be controlled by vehicle tracking control pads located at the construction entrances.

Management of Contaminated Soil

The contractor shall be responsible to monitor for contaminated soils and notify the engineer and the City of Colorado Springs if discovered.

Any contaminated soil on Site shall be removed and disposed of per the Geotechnical Evaluation. For more information, refer to the Geotechnical Evaluation in Appendix B.

Loading and Unloading Operations

Loading and unloading operations is a potential pollution source for the Site. Loading and unloading operations shall take place within the stabilized staging area.

Outdoor Storage Activities

Outdoor storage activities are a potential pollution source for the Site. Materials sometimes used at a construction site present a potential for contamination of stormwater runoff. These may include, but are not limited to: building materials, fuel, oil, lubricants, paints, solvents, concrete curing compounds, pesticides, fertilizers, chemicals, herbicides, etc. The contractor shall designate an area where these products should be stored in an enclosure, container, or lined earthen dike, constructed to prevent discharge of these materials in runoff from the Site. These barriers will also function to contain spilled materials from contact with surface runoff. Standard Operating Procedures (SOP) for material spill containment and clean-up are provided in Appendix C.

Vehicle and Equipment Maintenance and Fueling

Vehicle and equipment maintenance and fueling is a potential pollution source for the Site. Measures shall also be taken to prevent spills or leaks of fuel, oils, lubricants, antifreeze, and other contaminant fluids from construction vehicles to protect groundwater and stormwater runoff. All equipment maintenance shall be performed in a designated area away from drainage courses, and measures such as drip pans shall be used to contain petroleum products. Dedicated fueling areas shall be protected from stormwater run on and runoff and shall be a minimum of 50 feet away from drainage courses. The area is to be protected with secondary containment such as berms and dikes. Drop cloths or drain pains can be used to catch spills if Spills of construction materials should be cleaned up immediately and disposed of properly. The contractor shall routinely inspect equipment for leaks that could lead to discharge of petroleum products into surface runoff. There will be no bulk storage of fuel onsite.

Dust or Particulate Generating Processes

Significant dust or particulate generating processes are not a potential pollution source for the Site; however minor dust or particulate may be generated during the grading process. Dust mitigation, surface roughening, and seeding and mulching shall be implemented to mitigate airborne dust pollutants.

Routine Maintenance Activities

Routine maintenance activities are a potential pollution source for the Site. The contractor shall designate an area where these practices occur and shall routinely inspect and maintain areas to eliminate the pollution source.

On-Site Waste Management Practices

On-Site waste management practices (waste piles, liquid wastes, dumpsters, etc.) are a potential pollution source for the Site. The contractor shall designate an area where these practices occur and shall routinely inspect and maintain the areas to eliminate the pollution source.

Concrete Truck/Equipment Washing

Concrete truck and equipment washing is a potential pollution source for the Site and should only occur at the designated Concrete Washout Area shown on the GESC.

Masonry Mixing Stations

Masonry mixing activities are a potential pollution source for the Site and should only occur at the designated Masonry Mixing Station Area shown on the GESC.

Dedicated Asphalt and Concrete Batch Plants

Dedicated asphalt and concrete batch plants are not a potential pollution source for the Site. There will not be any dedicated concrete or asphalt batch plants on Site.

Non-Industrial Waste Sources

Non-industrial waste sources such as worker trash and portable toilets are a potential pollution source for the Site. The contractor shall designate an area where these practices occur and shall routinely inspect and maintain the areas to eliminate the pollution source. Portable toilets shall be located in level locations, but not in drainage paths, swales, curb and gutter or on sidewalks or drives and at least 50 feet away from storm sewer inlets. Downstream perimeter controls shall be installed to prevent leaks from entering the storm sewer system. For stabilization purposes, portable toilets shall be provided with tie-downs or stake-downs.

and waters of the state.

Other Areas or Procedures Where Potential Spills Can Occur

- Materials will be handled in accordance with Occupational Safety and Health Administration (OSHA) requirements and manufacturer's instructions.
- Chemicals regulated under the *Comprehensive Environmental Response, Compensations and Liability Act* (CERCLA) will be reported and handled in accordance with relevant regulations.
- Materials stored at the construction site will be covered or otherwise protected from the elements.

- The quantity of fuel and lubricants stored at the construction site will be limited to the amount that is reasonable to support the specific construction or maintenance activity. Offsite storage of fuel, hydraulic oil and form oil are preferable.

- Bulk storage areas for materials not consumed on a daily basis will be enclosed and protected from the elements and contained in a manner to prevent release to the environment.

- Petroleum products and fertilizers will be stored at separate facilities or isolated by impermeable barriers.

- Hypochlorite and other chlorine compounds will be stored separately from other materials and kept dry.

- Areas at the construction site that are used for storage of toxic materials and petroleum products shall be designed with an enclosure, container or dike located around the perimeter of the storage area to prevent discharge of these materials in runoff from the construction site. These barriers will also function to contain spilled materials from contact with surface runoff.

- Measures to prevent spills or leaks of fuel, gear oil, lubricants, antifreeze and other fluid from construction vehicles and heavy equipment shall be considered in order to protect groundwater and runoff quality. All equipment maintenance shall be performed in a designated area and measures, such as drip pans, shall be used to contain petroleum products. Spills of construction-related materials, such as paints, solvents or other fluids and chemicals, shall be cleaned up immediately and disposed of properly.

- Hazardous materials and wastes shall be stored in covered, leak-proof containers.

Training

All contractor's employees and subcontractor's employees shall receive orientation training in "Spill Prevention and Response Procedures". Training will cover responsibilities and procedures to be followed in the event of an on-Site material spill. Periodic training shall be

State that Inspection Form to be provided by contractor/QSM, and/or that the CO State Inspection Form can be used as a go-by for Self-Monitoring Inspections or just use it directly. And if applicable (i.e., the desired form is ready at this stage), provide form as Appendix to SWMP. Otherwise, it can be added in to SWMP at a later date (if this is going to be the case, state so in the SWMP text)

conducted during weekly or monthly safety meetings. All training records shall be maintained in the construction trailer. The contractor is responsible for preparing and training Site personnel for procedures on potential spills.

XII. Final Stabilization and Long-Term Stormwater Management

Final stabilization is reached when all soil-disturbing activities at the Site have been completed, and uniform vegetative cover has been established with a density of at least seventy percent of pre-disturbance levels or equivalent permanent, physical erosion reduction methods have been employed. Upon completion, all portions of the Site outside of the proposed channel will be sodded, seeded and planted per the final stabilization plan to establish vegetation.

SWMP Checklist Item 22: Discuss long-term stormwater quality.
SWMP Checklist Item 26: Add a note stating that this project does not rely on control measures owned or operated by another entity. (WQ Pond)

XIII. Inspection and Maintenance

Inspections will be conducted at least every 7 days. At a minimum, the contractor or his agent shall produce and retain weekly written inspection records for all BMP's and after significant precipitation events. All necessary maintenance and repair shall be completed immediately. However, street sweeping is to be completed by the close of the business day or on an as needed basis. It is the responsibility of the contractor to have all erosion control devices in place and effective, prior to a storm event. The SWMP administrator must maintain a record of the inspection results for a period of three years following expiration or inactivation of permit coverage.

Add "or snowmelt event that causes surface erosion."

Record Keeping and Documenting Inspections

The following items (at a minimum) must be documented as part of the Site inspections:

i. The inspection date;
ii. Name(s) and title(s) of personnel making the inspection;
iii. Location(s) of discharges of sediment or other pollutants from the Site;
iv. Location(s) of BMPs that need to be maintained;
v. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
vi. Location(s) where additional BMPs are needed that were not in place at the time of inspection;

SWMP Checklist Item 21. Add text stating that the SWMP should be viewed as a "living document" that is continuously being reviewed and modified as a part of the overall process of evaluating and managing SW quality issues at the site. The QSM shall amend the SWMP when there is a change in design, construction, O&M of the site which would require the implementation of new or revised BMPs or if the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in SW discharges associated with construction activity or when BMPs are no longer necessary and are removed.

vii. Deviations from the minimum inspection schedule as provided in Section IX above;

viii. Description of corrective action for items iii, iv, v, and vi, above, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the SWMP, as necessary; and

ix. After adequate corrective action(s) has been taken, or where a report does not identify and incidents requiring corrective action, the report shall contain a signed statement indicating the Site is in compliance with the permit to the best of the signer's knowledge and belief.

x. Signed site inspection forms must be kept on-site.

XIV. Conclusion

This Stormwater Management Plan is in conformance with the Urban Drainage and Flood Control District Erosion and Sediment Control Plan Manual and the State of Colorado Stormwater Management Plan Preparation Guidance. Additional grading, erosion and sediment control measures may be required of the owner or his/her agents, due to unforeseen erosion problems or if the submitted plan does not function as intended. The requirements of this plan shall be the obligation of the landowner and/or his successors or heirs; until such time as the plan is properly completed, modified, or voided.

XV. References

1. El Paso County Stormwater Management Plan Standards/Checklists

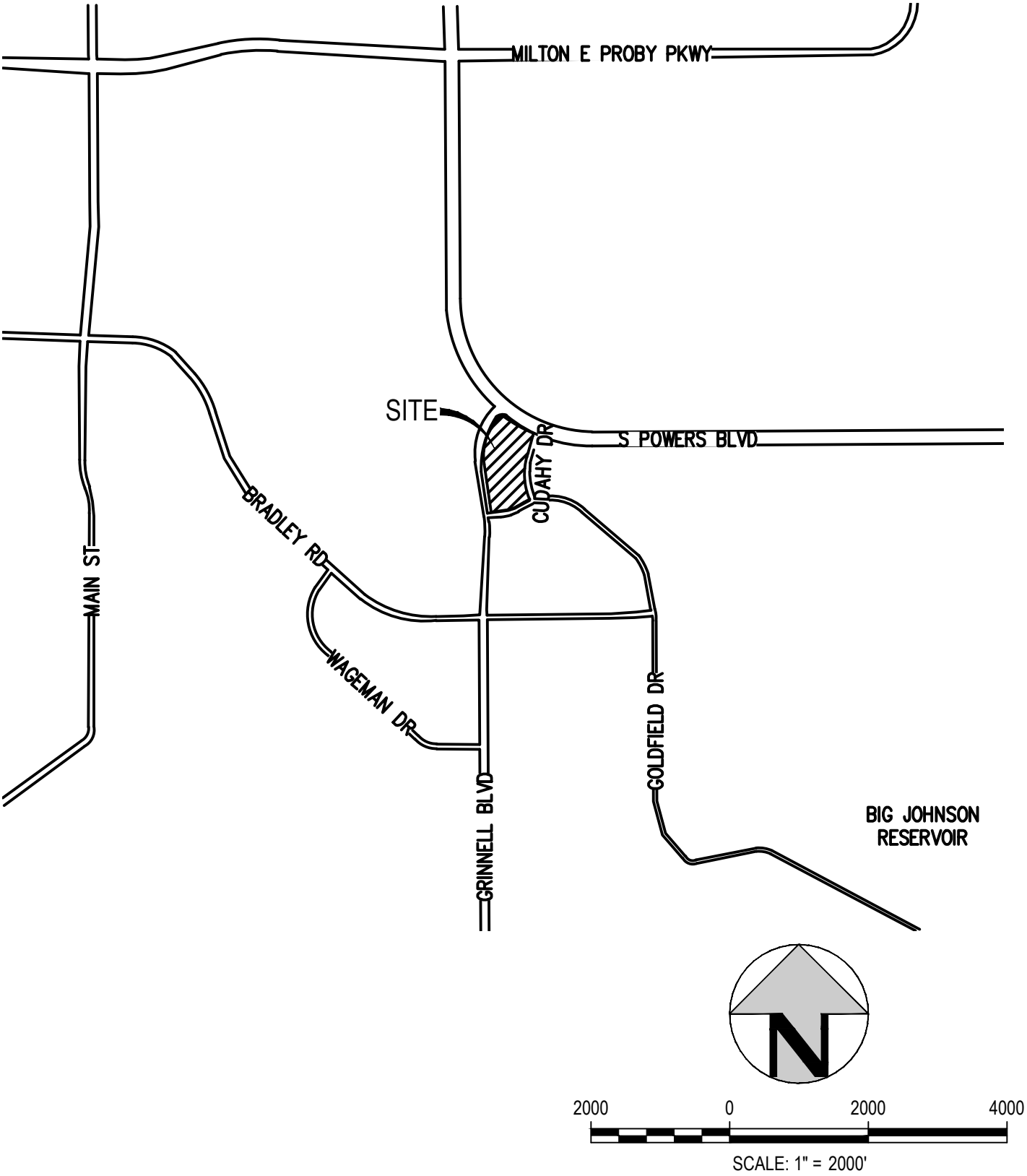
2. Urban Storm Drainage Criteria Manual: Volume 3, Best Management Practices; Urban Drainage and Flood Control District; Update November 2010.

3. Stormwater Management Plan Preparation Guidance; Colorado Department of Public Health and Environment; Revised April, 2011.

4. Geotechnical Engineering Report: Geologic Hazard Evaluation and Geotechnical Investigation Powers and Grinnell Apartments, El Paso County, Colorado. Project No. CS19678-125. May 11, 2023.

APPENDIX A – Vicinity/FIRM Map

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



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EVERGREEN DEVCO

OUTLOOK POWERS & GRINNELL

VICINITY MAP

PROJECT #: 221206

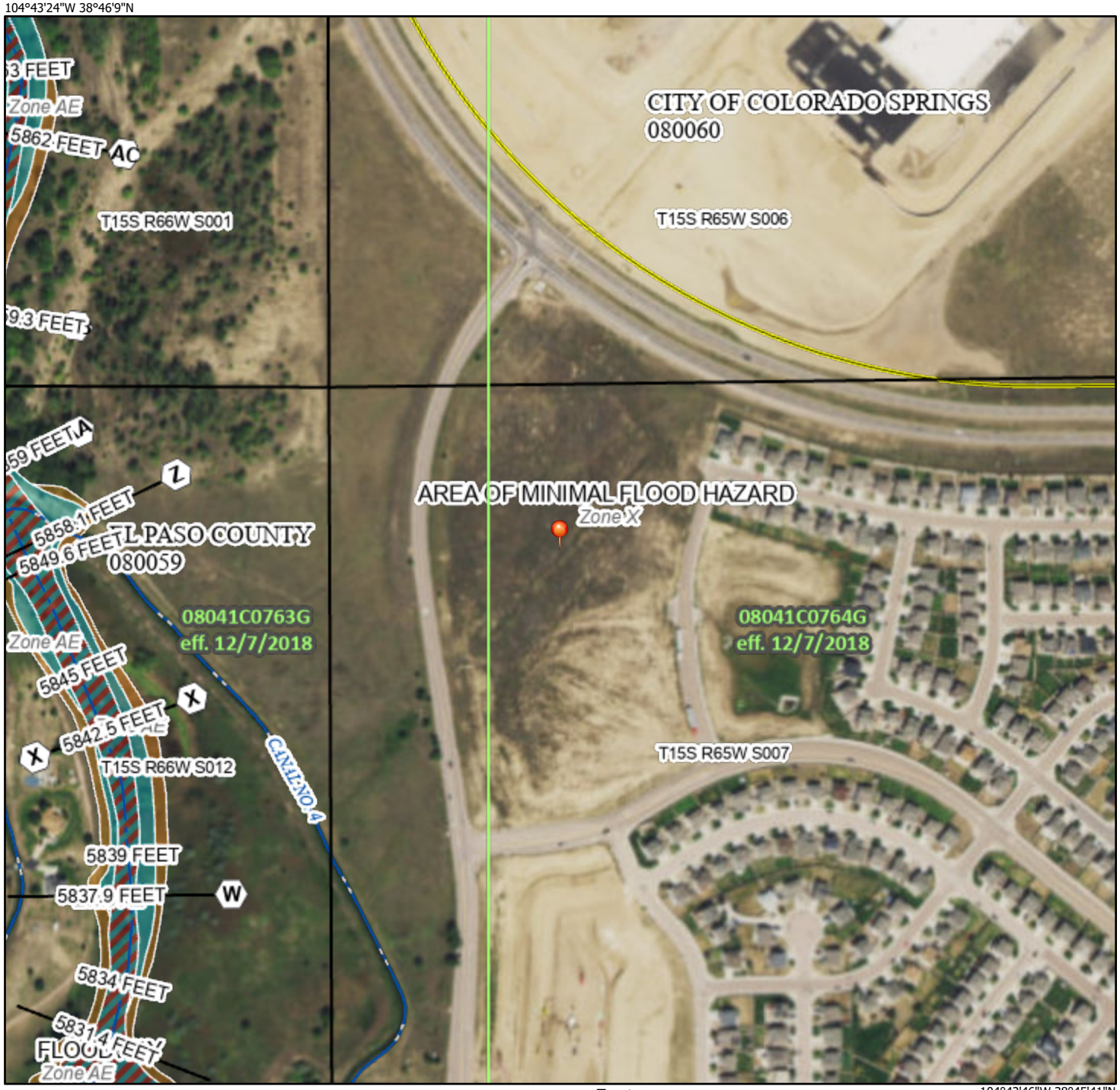
SHEET NUMBER

1

National Flood Hazard Layer FIRMette

FEMA

104°43'24"W 38°46'9"N



104°42'46"W 38°45'41"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/15/2023 at 11:48 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B –Geotechnical Evaluation

CTL | THOMPSON INCORPORATED

GEOLOGIC HAZARD EVALUATION AND GEOTECHNICAL INVESTIGATION POWERS AND GRINNELL APARTMENTS EL PASO COUNTY, COLORADO

Prepared For:

EVERGREEN DEVELOPMENT
1873 South Bellaire Street, Suite 100
Denver, Colorado

Attention: Robert Place

Project No. CS19678-125

May 11, 2023

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FIG. 2 – ENGINEERING GEOLOGIC CONDITIONS

FIG. 3 – SWIMMING POOL DRAIN DETAIL

APPENDIX A – SUMMARY LOGS OF EXPLORATORY BORINGS

APPENDIX B – LABORATORY TEST RESULTS
TABLE B-1: SUMMARY OF LABORATORY TESTING

APPENDIX C – GUIDELINE SITE GRADING SPECIFICATIONS

SCOPE

This report presents the results of our Geologic Hazards Evaluation and Geotechnical Investigation for the proposed Powers and Grinnell Multi-Family Development. The proposed development is located south of Powers Boulevard and east of Grinnell Road within the unincorporated Security-Widefield area of El Paso County, Colorado (Fig. 1). The purpose of our investigation was to evaluate the property for the occurrence of geologic hazards and their potential effect on the proposed development, and to evaluate subsurface conditions at the site to provide geotechnical recommendations and criteria for design and construction of foundations and floor systems, as well as surface drainage precautions. The scope was described in our Proposal (CS-23-0056) dated May 5, 2023. Evaluation of the property for the presence of potentially hazardous materials (Environmental Site Assessment) will be provided under a separate cover.

The report includes descriptions of the subsurface conditions encountered in our exploratory borings, and discussions of construction as influenced by geotechnical considerations. The report was prepared for use by Evergreen Development in design and construction of the planned apartment buildings, clubhouse, stand-alone garages, swimming pool, and the associated site improvements. Other types of construction may require revision of this report and the recommended design criteria. A summary of our conclusions and recommendations follows, with more detailed discussion in the report.

SUMMARY OF CONCLUSIONS

1. Subsurface conditions encountered in our exploratory borings consisted of complexly interbedded natural, silty sand, clayey sand and sandy clay. The near surface soils are predominantly non-expansive or exhibit low expansion potential. Localized layers of moderately expansive soils are also present. Bedrock was not encountered to the maximum depths explored of up to 30 feet.

2. Groundwater was not encountered at the time of drilling. When checked after drilling our borings were found to be dry. Groundwater levels will fluctuate seasonally and rise in response to precipitation and landscaping irrigation.

3. We did not identify geotechnical or geologic constraints at this site that we believe preclude construction of the multi-family development. The primary geotechnical concerns are the sporadic lenses of low to moderately expansive clay, localized layers of collapse-prone soils, and erosion. We believe

these concerns can be mitigated with proper planning, engineering, design, and construction.

4. We understand the proposed apartment buildings, clubhouse building, and stand-alone garage structures are to be constructed with post-tensioned slab-on-ground foundations. Foundation design and construction criteria are presented in the report.

5. Post-tensioned slab-on-ground foundation systems structurally integrate the floor slabs and foundations and should exhibit more reliable, long-term performance than conventional slabs-on-grade. In our opinion, a low risk of movement and damage will exist for post-tensioned slabs underlain by the natural, on-site soils.

6. Full-depth asphalt and concrete pavement section alternatives are presented in the report for the planned automobile parking lots and access driveways.

7. Control of surface drainage will be critical to the performance of foundations and slabs-on-grade. Overall surface drainage should be designed to provide rapid removal of surface runoff away from the proposed residences. Conservative irrigation practices should be followed to avoid excessive wetting.

8. The design and construction criteria for foundations and slabs-on-grade included in this report were compiled with the expectation that all other recommendations presented related to surface drainage, landscaping irrigation, backfill compaction, etc. will be incorporated into the project and that the property manager will maintain the structures, use prudent irrigation practices, and maintain surface drainage. It is critical that all recommendations in this report are followed.

SITE CONDITIONS

The Powers and Grinnell Apartments site consists of approximately 16.5 acres of undeveloped land located east of Grinnell Road and south of South Powers Boulevard within the Security-Widefield area of El Paso County, Colorado. The site location and approximate extents are shown in Fig. 1. The site is bordered to the north by South Powers Boulevard, to the east by Cudahy Drive, the south by Goldfield Drive, and to the west by Grinnell Boulevard. Undeveloped land is present on the

View of site looking northwest

opposite side of the Grinnell Boulevard and single-family residential developments are located to the east and southeast. Amazon facilities are located to the north.

Portions of the site have been previously rough graded. Fill soils appear to be present adjacent to the surrounding roads. The southwest corner of the site contains an asphalt paved driveway. Various underground utilities are located around the perimeter and a “primary underground” electric line approximately bisects the site in a north/south direction. A stockpile of rip rap was present on the northern portion of the site with some placed at the head of a drainage, and as check dams in the erosion channel.

Overall, the site slopes in a general southwest direction at gradients between about 5 and 10 percent with some locally steeper slopes around the perimeter. A drainage channel begins in the northeastern portion of the site, where water has been directed into a concrete culvert beneath the road and onto the site. The channel was actively flowing at the time of our subsurface exploration and flows in a general northeast to southwest direction across the site and into another culvert near Grinnell Road. The drainage channel varies in depth and is up to approximately 10 feet deep with steeply sloping to vertical side walls as a result of erosion. It appears flow within the drainage has significantly increased as a result of recent commercial development across Powers Boulevard.

View looking downstream from where channel enters the site

Corrugated plastic pipes placed within channel

Three corrugated plastic pipes were present in the channel, partially covered with soil. The pipes appeared to be approximately 10 feet in length. We believe this is the location of the electric line crossing. Vegetation on

the site consists of grass and weeds. Numerous prairie dog mounds were observed at the surface throughout the site.

PROPOSED DEVELOPMENT

We understand the proposed development will consist of an apartment complex with 3-story apartment buildings, stand-alone garage structures, and a clubhouse with an out-door swimming pool. No habitable below-grade construction is anticipated. The proposed buildings will be constructed using post-tension, slab-on-ground foundations. Drive under garage units are planned at the ground level of some buildings.

A preliminary grading plan prepared by Harris Kocher Smith (HKS), dated April 11, 2023, indicates several site retaining walls are planned. Additional exterior improvements will include asphalt paved access driveways and parking spaces, areas of concrete flatwork, underground utilities, and a stormwater detention pond. The existing drainage is expected to be rerouted. A cut/fill exhibit also prepared by HKS, dated March 2, 2023, indicates fills of up to 20 feet and cuts of up to 15 feet are planned.

INVESTIGATION

Subsurface conditions at the site were investigated by our firm by drilling a total of forty exploratory borings. The borings were drilled to depths between 15 and 30 feet. The approximate locations of the borings are shown in Fig. 1. Our representative observed the drilling operations, logged the subsurface conditions found in the borings, and obtained samples for laboratory testing. Summary logs of the borings, results of field penetration re-sistance tests, and some laboratory test data are presented in Appendix A.

Soil samples obtained during drilling were returned to our laboratory and visually classified. Laboratory testing was then assigned to representative samples and included moisture content and dry density, gradation analysis, Atterberg limits, swell-consolidation, and water-soluble sulfate concentration. Swell-consolidation and gradation test results are presented in Appendix B. Laboratory test data are summarized in Table B-1.

SUBSURFACE CONDITIONS

Strata encountered in our exploratory borings generally consisted of natural, slightly silty to very silty sand, clayey to very clayey sand, and sandy to very sandy clay extending to the maximum depths explored of 15 to 30 feet. Areas of undocumented fill material may be present around the perimeter of the site as well as where the asphalt driveway and dirt access road are present. Some of the pertinent engineering characteristics of the soil and bedrock are described in the following paragraphs.

Natural Soils

Natural soils were encountered at the surface in each of our borings and extended to the maximum depths explored of 15 to 30 feet. The natural soils consisted of slightly silty to very silty, clayey to very clayey sand, and sandy to very sandy clay.

The sand was loose to dense based on field penetration resistance testing. Thirty samples of the sand contained between 12 and 47 percent silt and clay sized particles. Two samples of the sand exhibited 0.1 and 2.1 percent swell, one sample exhibited no movement, and three samples compressed 0.3 to 2.4 percent when wetted under estimated overburden pressures.

The clay was stiff to very stiff based on field penetration resistance testing. Fourteen samples of the clay tested in our laboratory contained 50 to 81 percent silt and clay-sized particles (passing the No. 200 sieve). Four samples of the clay exhibited 0.3 to 2.5 percent swell and one sample compressed 0.7 percent when wetted under estimated overburden pressures.

Groundwater

Groundwater was not encountered in our borings during drilling. Our borings were checked between one and eight days after drilling and found to be dry. Groundwater may develop and fluctuate seasonally and rise in response to development, precipitation, and landscape irrigation.

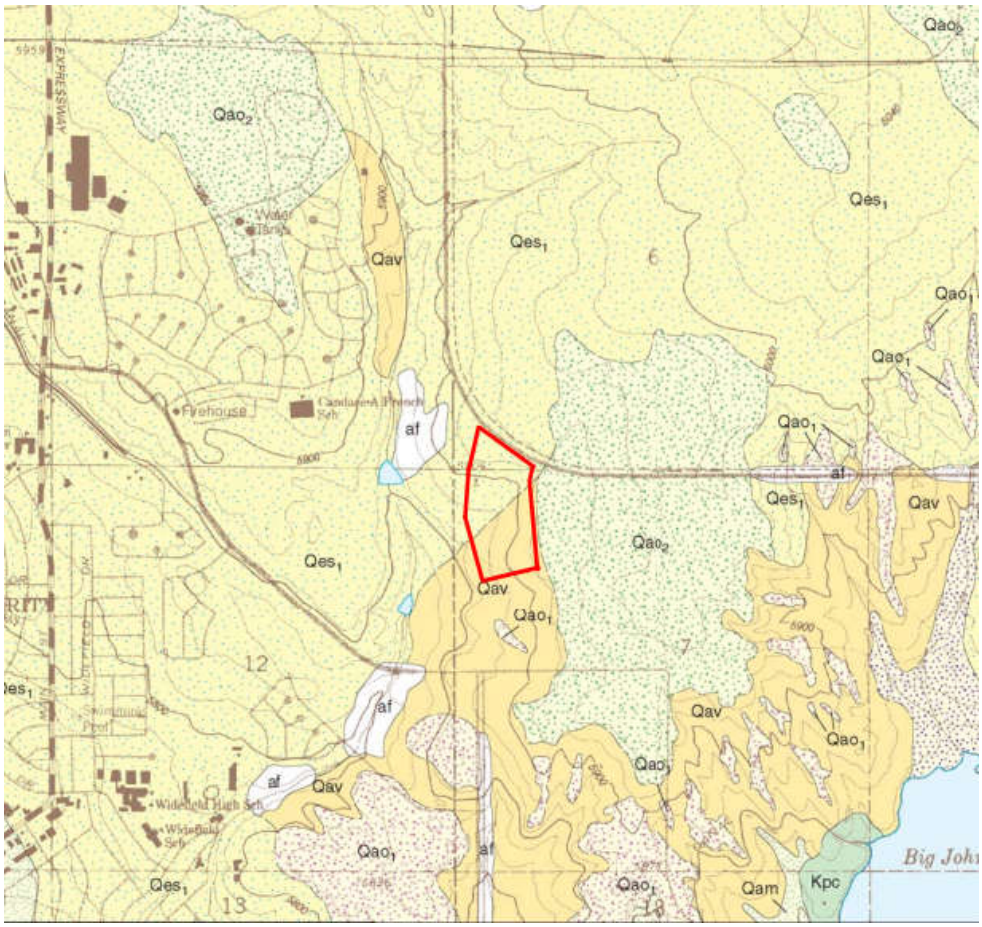
Seismicity

This area, like most of central Colorado, is subject to a degree of seismic activity. We believe the soils on the property classify as Site Class D (stiff soil profile) according to the 2015 International Building Code (2015 IBC).

SITE GEOLOGY

The surficial geology at the site was evaluated by reviewing published geologic maps and our own site reconnaissance. The site lies within the area of the Elsmere Quadrangle Geologic map published by the Colorado Geological Survey (2002).

As shown in the excerpt below, the site is divided among two geologic units consisting of younger eolian sand (Qes_1) within the northwestern portion of the site and Holocene and late Pleistocene Valley-Side Alluvium (Qav) in the southeastern portion of the site. The eolian sand consists of very pale brown, pale-brown, and light-yellowish brown sand. The alluvium consists of brown to light-yellowish-brown, extremely poorly sorted, sand, silty and clayey sand, and minor amounts of mostly pebble size gravel. Conditions at the site were found to be similar to the mapped conditions.



Excerpt from Elsmere Quadrangle Geologic Map, El Paso County, Colorado, 2002.

GEOLOGIC HAZARDS

Geologic hazards we identified at the site include expansive soils, collapse-prone soils, and erosion. No geologic hazards were noted that we believe preclude the proposed development. We believe potential hazards can be mitigated with proper engineering, design, and construction practices, as discussed in this report. Figure 2 shows our interpretation of the engineering geology modified from the system used by Charles Robinson & Associates (1977).

Expansive and Collapse Prone Soils

Colorado is a challenging location to practice geotechnical engineering. The climate is relatively dry and the near-surface soils are typically dry and comparatively stiff. These soils and related sedimentary bedrock formations react to changes in moisture conditions. Some of the soils swell as they increase in moisture and are referred to as expansive soils.

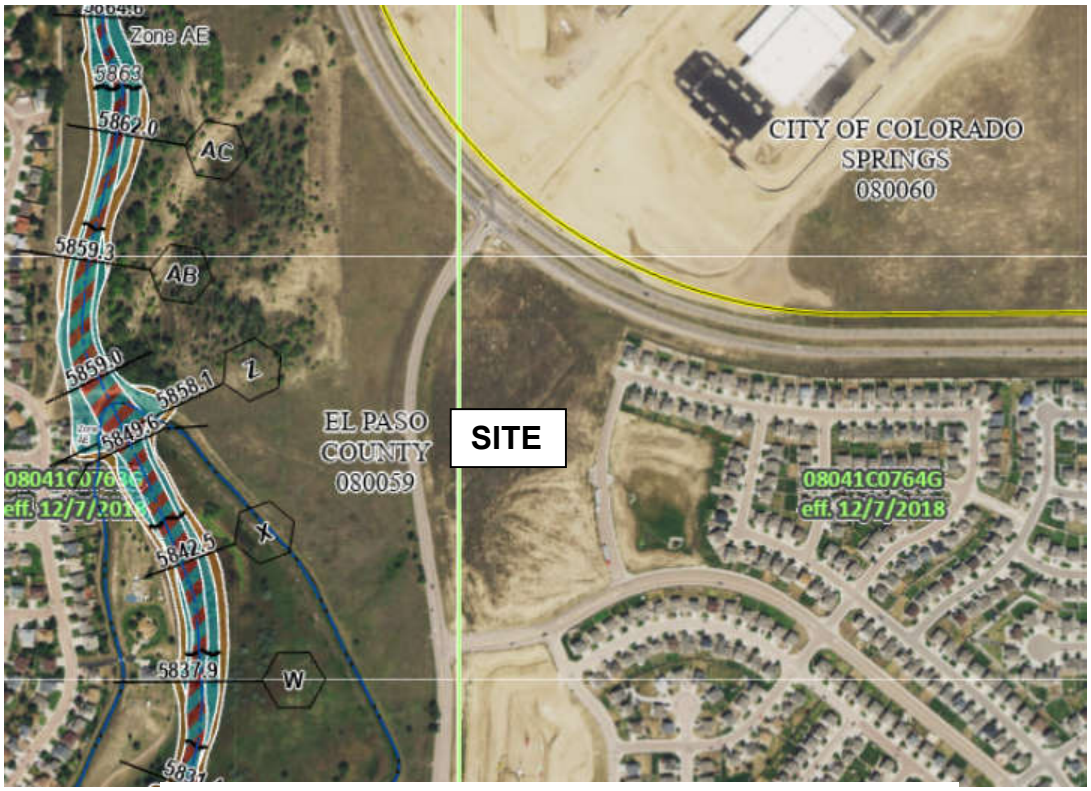
Other soils can compress significantly upon wetting and/or additional loading (from foundations or site grading fill) and are identified as compressible or collapsible soils. Covering the ground with structures, streets, driveways, patios, etc., coupled with lawn irrigation and changing drainage patterns, leads to an increase in subsurface moisture conditions. As a result, some soil movement due to heave or settlement is inevitable.

Low to moderately expansive clay soils are present at this site. There is risk that foundations and slab-on-grade floors will experience heave or settlement and damage. Collapse-prone soils are also present at this site. Collapse-prone soils may be susceptible to hydro-collapse, a phenomenon where soils undergo a decrease in volume (consolidate rapidly) upon an increase in moisture content, with or without an increase in external loads. The presence of collapse-prone soils implies risk that slabs-on-grade and foundations will settle and be damaged. Analysis of moisture contents, dry densities, gradation, and Atterberg limits generally indicate low susceptibility of collapse. The soils are complexly interbedded and the layers of expansive and collapse-prone soils are sporadic. As such, it isn't possible to define areas where these materials should be expected. Expansive and collapse-prone soils may be present in all portions of the site.

Engineered planning, design and construction of grading, pavements, foundations, slabs-on-grade, and drainage can mitigate, but not eliminate, the effects of expansive and collapse-prone soils. We believe the expansive and collapse-prone soils at this site present a low to moderate risk and can be effectively mitigated with the use of post-tension, slab-on-ground foundations. After construction, owners must assume responsibility for maintaining the structures and use appropriate practices regarding drainage and landscaping.

Flooding

The majority of the site lies within Zone D (undetermined flood hazard) as shown below on FIRM Community Map Numbers 08041C0763G and 08041C0764G, revised December 7, 2018. Zone D indicates floods are possible, but not likely.



Excerpt from FEMA National Flood Hazard Layer Viewer

Based on the topography at the site, the potential for a flood to impact the majority of the site area is low; however, a drainage that is directed onto the site from a culvert beneath Powers Boulevard does present a flood risk. We recommend this stormwater flow be re-routed as part of the site development. Development of the site will increase the relative area of impervious surfaces, which can lead to drainage problems and erosion if surface water flow is not adequately designed. Surface drainage design and evaluation of flood potential should be performed by a civil engineer as part of the project design.

Seismicity

This area, like most of Colorado, is subject to a low degree of seismic risk. The soil and bedrock units are not expected to respond unusually to seismic activity. According to the 2015 International Building Code and based upon the results of our investigation, we judge the site classifies as Seismic Site Class C.

Erosion

Erosion in Drainage Channel

The site is susceptible to the effects of wind and water erosion. At the time of our subsurface investigation water was flowing within the drainage channel that crosses the site as shown below. The channel has become incised with steep to vertical side walls as a result of erosion. We expect the drainage will be rerouted as part of the site development. The surficial sandy soils are relatively stable and resistant to wind erosion where vegetation is established. Disturbance of the vegetative cover and long-term exposure of these deposits to the erosive power of wind and water increases the potential for erosion. Maintaining vegetative cover and utilizing surface drainage collection and distribution systems will reduce the potential for erosion from wind and water.

Radon/Radioactivity

We believe no unusual hazard exists from naturally occurring sources of radioactivity on the site. However, the materials found in this area are often associated with the production of radon gas and concentrations in excess of those currently accepted by the EPA can occur. Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after a structure is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, we recommend structures be tested after they are enclosed. The EPA provides guidance on construction of radon resistant structures.

Recoverable Minerals

The project site is included in the Aggregate Resources of Colorado mapping from the Colorado Geological Survey. The mapping does not indicate any commercial sand or

gravel pits near the project site. We observed no evidence of surface or subsurface mining at the site.

SITE DEVELOPMENT

A cut/fill map was provided to our office and indicates fills of up to 20 feet and cuts of up to 15 feet will be required for the proposed development. We recommend grading plans consider long-term cut and fill slopes no steeper than 3:1 (horizontal to vertical). Use of flatter slopes (4:1) is preferable to control erosion from run-off and sheet-flow. Seeding and re-vegetation can also be used to reduce erosion. The heavily eroded drainage channel that bisects the site will need to be rerouted. Concentrated water flows over slopes should be avoided.

Site Grading

Vegetation and organic materials as well as any existing undocumented fill, if encountered, should be removed from the ground surface of areas to be filled. Soft or loose soils, if encountered, should be stabilized or removed to expose stable material prior to placement of fill.

Prairie dog burrow holes were observed throughout the site. The burrow holes typically lead to tunnels that are 3 to 7 feet deep or more with dome shaped mounds present around the burrow entrances. Burrow holes may affect site improvements. Therefore, we recommend removing and/or backfilling the prairie dog holes that are encountered during site grading, as much as practical.

An active drainage channel was present at the site at the time of our site reconnaissance and subsurface exploration. Water flow will need to be rerouted prior to placement of fill within the channel. Standing water, elevated moisture contents, and soft/yielding subgrade conditions should be anticipated at the channel bottom. Soils within the channel bottom will deflect under the load of equipment traffic resulting in heavy rutting. We expect the channel bottom will require stabilization prior to placement of new fill. The depth and extent of soft/yielding conditions will need to be evaluated during construction; however, we expect stabilization can be accomplished by crowding well-graded, 4 to 8-inch size angular rock into the soft/yielding soils.

The onsite materials are generally suitable for use as grading fill, and excavation backfill, provided they are free of debris, vegetation/organics, and other deleterious materials. Based on our laboratory test results the majority of the onsite soils are generally below optimum moisture content and will require significant moisture conditioning to process the soils to near optimum. The silty to very silty sands require close control of moisture content to achieve compaction and can be particularly difficult to compact during cold weather.

If imported fill is necessary, it should ideally consist of granular material with 100 percent passing the 2-inch sieve and less than 35 percent material passing the No. 200 sieve. The import soils should exhibit low plasticity with a liquid limit less than 30 and a plasticity index less than 10. A sample of the import material should be submitted to our office for testing before transporting to the site.

The ground surface in areas to receive fill should be scarified deeply, moisture conditioned and compacted to a high density to establish a stable subgrade for fill placement. The properties of the fill will affect the performance of foundations, slabs-on-grade, and pavements. Detailed recommendations for moisture conditioning, placement, and compaction of grading fill are set forth in Appendix C. Placement and compaction of the grading fill should be periodically observed and tested by our representative during construction.

Buried Utilities

We believe the soils can be excavated with conventional, heavy-duty excavation equipment. Based on our investigation and Occupational Safety and Health Administration (OSHA) standards, we believe the majority of on-site surficial soils classify as Type C materials. OSHA requires Type C materials should be braced or laid back to a maximum slope inclination of 1.5:1 (horizontal to vertical) for dry conditions. If groundwater conditions change and becomes more shallow, the granular materials may “flow” into the excavation. Excavation slopes specified by OSHA are dependent upon the types of soil and groundwater conditions encountered. The contractor’s “competent person” should identify the soils encountered in the excavations and refer to OSHA standards to determine appropriate slopes.

Water and sewer lines are usually constructed beneath paved areas. Compaction of trench backfill will have a significant effect on the life and serviceability of pavements. We recommend trench backfill be moisture conditioned and compacted in accordance with the

recommendations set forth in Appendix C and El Paso County standards. Personnel from our firm should periodically observe and test the placement and compaction of the trench backfill during construction.

FOUNDATIONS

In our opinion the proposed buildings can be constructed with post-tensioned, slab-on-ground foundation systems (PTS). A PTS foundation will help mitigate risk of foundation/slab movement associated with expansive and collapse-prone soils. The following paragraphs present our design and construction recommendations for PTS foundations.

Post-Tensioned, Slabs-On-Ground (PTS)

PTS foundation design is based on a method developed by the Post-Tensioning Institute (PTI) and is outlined in PTI's third edition of *Design of Post-Tensioned Slabs-On-Ground* (2004 with 2008 Supplement). Various climate and relevant soil factors are required to evaluate the PTI design criteria. These include Thornthwaite Moisture Index (I_m), suction compression index (γ_h), unsaturated diffusion coefficient (α), depth of probable moisture variation, initial and final soil suction profiles, and percent clay fraction and predominant clay mineral. In the project area, I_m is about -20.

The PTS foundation design method is based on the potential differential movement of the slab edges (y_m) over a specified edge distance (e_m). Further, the PTI design method, evaluates two mechanisms of soil movement (edge lift and center lift) based on assumptions that wetting and drying of the foundation soils are primarily affected by seasonal climate changes. In the 2004 design manual, PTI recommends evaluating movements for a minimum depth of wetting of 9 feet below the ground surface. This value can be reasonable for a seasonal moisture variation; however, our experience indicates the foundation soils will normally undergo an increase in moisture due to covering the ground surface with buildings and flatwork, coupled with the introduction of landscape irrigation around the buildings. Based on our experience and the subsurface conditions at the site, the depth of wetting can be about 15 to 20 feet or more below the ground surface for the proposed type of development.

The wetting may not penetrate this deep; however, we believe it is a reasonable design assumption when evaluating the edge lift for this site. For the deeper depths of wetting, ground movements can be estimated based on swell or suction profiles, or using a computer program (such as "VOLFLO" by Geostructural Tool Kit, Inc.). The PTI design method does not predict soil movement caused by site conditions such as excessive irrigation or poor surface drainage that may lead to differential foundation movement in excess of the movements estimated by the PTI design method. These conditions may also increase the edge moisture variation distance above the design values provided in the PTI manual.

Considering the limitations of the current PTI design method, we believe a conservative approach with reasonable engineering judgement is merited in PTS foundation design. Design criteria for PTS foundations are presented below. Criteria were developed from analysis of field and laboratory data, the PTS design method outlined in PTI's third edition of *Design and Construction of Post-Tensioned Slabs-On-Ground* (2004 with 2008 Supplement), and our experience.

1. PTS foundations should be constructed on new moisture-conditioned and compacted fill or directly on the natural soils. If soft/loose soils or relatively dry soils are exposed in footing excavations or are the result of the excavation/forming process, these soils should be removed, moisture conditioned as needed, and recompacted.

2. PTS foundations should be designed for a maximum allowable soil pressure of 2,000 psf.

3. For design of uniform thickness PTS foundations or point loads, a modulus of subgrade reaction (K_s) of 100 pci can be used.

4. A differential soil movement (y_m) of 1.46 inches for the edge lift condition and -1.0 inches for the center lift condition can be used.

5. An edge moisture variation distance (e_m) of 8.5 feet for the edge lift condition and 4.4 feet for the center lift condition can be used.

6. We understand the PTI design method assumes the slab is somewhat flexible. The above-grade construction, such as framing, drywall, brick and stucco should be considered when determining the appropriate slab stiffness. We are aware of situations where minor differential slab movement has caused distress to finish materials. One way to enhance performance would be to place reinforcing steel in the bottoms of stiffening beams. The structural engineer should evaluate the merits of this approach, as well as other potential alternatives to reduce damage to finish materials. The slab stiffness should be evaluated per section 6.10 of the PTI 2008 Supplement as it relates to different superstructure materials.

7. Stiffening beams and edge beams may be poured “neat” into excavated trenches. Soil may cave or slough during trench excavation for the stiffening beams. Disturbed soil should be removed from trench bottoms prior to placement of concrete. Formwork or other methods may be required for proper stiffening beam installation.

8. Exterior stiffening beams should be protected from frost action. Normally 30 inches of frost cover is assumed in the area. If exterior patios are incorporated into the PTS, we believe the stiffening beams around the patios should be as deep as those around the building exterior to increase the likelihood they will perform similarly to the rest of the PTS.

9. For slab tensioning design, a coefficient of friction value of 0.75 or 1.0 can be assumed for slabs on polyethylene sheeting or a sand layer, respectively. A coefficient of friction of 2.0 should be used for slabs on clay soils. We believe use of polyethylene is preferable because it serves as a vapor retarder which helps to control moisture migration up through the slabs.

10. A representative of our firm should observe the completed excavations. A representative of the structural engineer or our firm should observe the placement of the reinforcing tendons and any mild reinforcement prior to pouring the slabs and beams, and observe the tendon stressing.

FLOOR SYSTEMS

For the PTS system, the foundations are structurally integrated with the floor slab and should exhibit more reliable long-term performance. In our opinion, a low risk of poor slab performance (movement and damage) will exist for floor slabs underlain by the natural, on-site soils and/or densely compacted, grading fill placed in accordance with the recommendations set forth in Appendix C.

For the slab-on-ground foundation approach, the foundation is structurally integrated with the floor slab and should exhibit more reliable long-term performance, as compared to conventional slab-on-grade floors. Conventional spread footing foundations will settle relative to more lightly loaded slab-on-grade floors.

Underslab utilities such as water and sewer lines should be pressure tested prior to installing slabs. Utilities that penetrate the slab foundations should be provided with sleeves and flexible connections that allow for independent movement of the slab and that reduce the likelihood of damaging buried pipes. We recommend these details allow at least 1-1/2 inches of differential movement between the slabs and pipes.

EXTERIOR FLATWORK

Exterior flatwork, including sidewalks and porch slabs, is normally constructed as a slab-on-grade. Various properties of the soils and environmental conditions influence the magnitude of movement and other performance characteristics of slabs. Exterior flatwork should be designed and constructed to move independently relative to the proposed building foundations.

SITE RETAINING WALLS

Site retaining walls will be incorporated into this project. We assume the walls will be either gravity block, segmental block MSE, or cast-in-place concrete cantilever walls. A detailed scope of services and estimated fee for retaining wall design can be provided upon request.

Site retaining walls may be designed for a maximum allowable bearing pressure of 2,000 psf. Retaining walls will be subject to lateral earth loads which are dependent on the height of the wall, soil type, and backfill configuration. Backfill behind site retaining walls may be sloped in some areas. We expect site retaining walls will be subject to “active” earth pressures where walls are free to rotate, and the soil moves toward the wall away from the soil mass. The active pressures are fully mobilized at horizontal movements of about 0.5 percent of the wall height for cohesionless soils, such as sands and gravels. Passive stresses exist when the wall moves toward the soil mass. Passive resistance requires relatively more movement than active, at-rest, or base friction to generate resistance. The wall designer should carefully evaluate the use of passive pressure where slopes exist in front of the wall. The recommended equivalent fluid densities assume no surcharge loads next to the top of the wall and free-draining, granular backfill, with an angle of internal friction (ϕ) of at least 28 degrees, a unit weight of 125 pounds per cubic foot (pcf), and cohesion of 0 psf. Site retaining walls may be designed for an active equivalent fluid pressure of 45 pcf. For passive resistance to we recommend an equivalent fluid pressure of 250 pcf. Passive pressure should only be used when movement is tolerable, backfill is level, and the soil is well compacted and will not be removed. Gravity walls and mechanically stabilized earth walls may be designed using the soil parameters provided above.

Care must be exercised when compacting backfill against retaining walls. To reduce temporary construction loads on the walls, heavy equipment should not be used for placing and compacting fill within a region as determined by a 0.5H:1V line drawn upward from the bottom of the wall. Granular backfill behind any new site retaining walls should be compacted to 90 percent of the maximum modified Proctor dry density (ASTM D 1557). Thinner lifts should be used when utilizing smaller compaction equipment.

Adequate drainage is essential to the performance of retaining walls. New walls should include installation of a drainpipe that discharges away from the wall. For site retaining walls drainage measures could include free-draining granular backfill and perforated drainpipes leading to a positive gravity outlet or granular backfill with weep holes.

BELOW-GRADE CONSTRUCTION

It is our understanding that no habitable, below-grade construction are planned for the proposed buildings. If plans change and below-grade areas such as a basement level will be included in the structures, our office should be contacted to provide design criteria for lateral earth pressures and subsurface drain systems.

SWIMMING POOL

We understand a swimming pool is planned in association with the proposed clubhouse. No plans were available at the time of this investigation. We anticipate the pool structure may consist of spray-applied gunite against natural soil, or possibly a steel or a fiberglass shell. Because of the granular nature of the on-site soils, vertical excavation of the pool walls required for gunite pool construction may not be possible. A fiberglass or steel shell placed in an enlarged excavation may then be the more feasible options. If gunite methods are used, the cement slurry should be properly reinforced.

We recommend the pool be underlain by a drain system that collects water leakage and provides for discharge of the water to a sump or gravity outfall. The drain system should consist of free-draining gravel covering the bottom of the pool excavation. The excavation should slope to a 3 to 4-inch diameter, perforated or slotted pipe placed within the gravel layer. The drain should lead to a positive gravity outlet, such as a subdrain located beneath the sewer, or to a sump where water can be removed by pumping. A conceptual pool drain

system is presented in Fig. 3. Overall surface drainage patterns should be planned to provide for the rapid removal of storm runoff and water that splashes over the edges of the pool. The precautions described in SURFACE DRAINAGE, IRRIGATION, AND MAINTENANCE should be followed surrounding the swimming pool, as well as for all areas of the site.

The swimming pool structure may settle more than the flatwork surrounding the pool. To avoid damage to the pool structure, a slip joint should be used around the perimeter of the pool structure and adjacent to any other structural elements. Utility lines that penetrate the pool structure should be separated and isolated with joints to allow for free vertical movement. All ducts with connections between the pool structure and surrounding soil should be flexible or “crushable,” to allow some relative movement.

PAVEMENTS

Private paved automobile parking lots and access roads will be constructed throughout the site. Access driveway will extend into the development from one or more of the surrounding streets. Our exploratory borings and understanding of the proposed construction suggest the subgrade soils within the planned access driveways and parking areas will predominantly consist of a mixture of silty to clayey sand and localized areas of sandy clay. Samples of the onsite materials tested in our laboratory classified as A-2-4, A-2-6, A-4, and A-6 materials according to the American Association of State Highway Transportation Officials (AASHTO) classification system. These materials will exhibit variable pavement support characteristics. Based on our laboratory classification testing (Atterberg Limits and gradation analysis), a Hveem Stabilometer (“R”) value of 15 was assigned to the subgrade materials for design purposes.

We anticipate the access driveways could be subjected to occasional heavy vehicle loads such as trash trucks and moving vans. We considered daily traffic numbers (DTN) of 3 for parking stalls and 10 for the access driveways, which correspond to 18-kip Equivalent Single-Axle Loads (ESAL) of 21,900 and 73,000, respectively, for a 20-year pavement design life. Based on the estimated design traffic and pavement design input parameters, we recommend the following flexible pavement sections.

- Standard Duty Asphalt Pavements:
  - Full Depth Asphalt - 5 inches or more of Asphalt
  - Composite Section - 3 inches of Asphalt over 8 inches of Aggregate Base Course
- Heavy Duty Asphalt Pavements:
  - Full Depth Asphalt - 6 inches or more of Asphalt
  - Composite Section - 4 inches of Asphalt over 8 inches of Aggregate Base Course

El Paso County does not allow the use of full depth asphalt pavements. Full depth asphalt pavement use may be limited within county rights-of-way.

We recommend a concrete pad be provided at trash dumpster sites. The pad should be at least 8 inches thick and long enough to support the entire length of the trash truck and dumpster. Joints between concrete and asphalt pavements should be sealed with a flexible compound.

Our design considers pavement construction will be completed in accordance with the El Paso County "Standard Specifications" and the Pikes Peak Region Asphalt Paving Specifications. The specifications contain requirements for the pavement materials (asphalt, base course, and concrete) as well as the construction practices used (compaction, materials sampling, and proof-rolling). Of particular importance are those recommendations directed toward subgrade and base course compaction and proof-rolling. During proof-rolling, attention should be directed toward the areas of confined backfill compaction. Soft or loose subgrade or areas that pump excessively should be stabilized prior to pavement construction. A representative of our office should be present at the site during placement of fill and construction of pavements to perform density testing.

SURFACE DRAINAGE, IRRIGATION AND MAINTENANCE

Proper design, construction, and maintenance of surface drainage are critical to the satisfactory performance of foundations, slabs-on-grade, and other improvements. Landscaping and irrigation practices will also affect performance. Overall surface drainage should be designed, constructed, and maintained to provide rapid removal of surface water runoff away from the proposed buildings and site retaining walls and off pavements and flatwork. Final grading of pavement subgrade should be carefully controlled so that the

designed slopes are maintained and low spots in the subgrade that could trap water are eliminated. We recommend the following precautions be observed during construction and maintained at all times after construction is completed.

1. Wetting or drying of open foundation, utility, and earthwork excavations should be avoided.
2. Positive drainage should be provided away from the buildings. We recommend a minimum slope of at least 5 percent in the first 5 to 10 feet away from the foundations in landscaped areas. In flatwork areas adjacent to the buildings, the slope may be reduced to grades that comply with ADA requirements. Paved surfaces should be sloped to drain away from the buildings. A minimum slope of 2 percent is suggested. More slope is desirable. Concrete curbs and sidewalks may “dam” surface runoff adjacent to the buildings and disrupt proper flow. Use of “chase” drains or weep holes at low points in the curb should be considered to promote proper drainage.
3. Foundation wall backfill should be thoroughly compacted to decrease permeability and reduce the potential for irrigation and stormwater to migrate behind retaining walls or below floor slabs. Areas behind curb and gutter should be backfilled and well compacted to reduce ponding of surface water. Seals should be provided between the curb and pavement to reduce infiltration.
4. Landscaping should be carefully designed to minimize irrigation. Plants placed close to foundation walls should be limited to those with low moisture requirements. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase likelihood of slab and foundation movements and associated damage. Landscaped areas should be adequately sloped to direct flow away from the buildings and improvements. Area drains can be used to drain areas that cannot be provided with adequate slope.
5. Impervious plastic membranes should not be used to cover the ground surface immediately adjacent to the foundations. These membranes tend to trap moisture and prevent normal evaporation from occurring. Geotextile fabrics can be used to control weed growth and allow evaporation.
6. Roof drains should be directed away from the buildings and discharge beyond backfill zones or into an appropriate storm sewer or detention area. Downspout extensions and splash blocks should be provided at all discharge points. Roof drains can also be connected to buried, solid pipe outlets. Roof drains should not be directed below slab-on-grade floors. Roof drain outlets should be maintained.

CONCRETE

Concrete in contact with soil can be subject to sulfate attack. We measured water-soluble sulfate concentrations of less than 0.1 percent in three samples. As indicated in our tests and ACI 318-19, the sulfate exposure class is *Not Applicable* or *S0.*

SULFATE EXPOSURE CLASSES PER ACI 318-19

Exposure Classes		Water-Soluble Sulfate (SO_4) in Soil [A] (%)
Not Applicable	S0	< 0.10
Moderate	S1	0.10 to 0.20
Severe	S2	0.20 to 2.00
Very Severe	S3	> 2.00

A) Percent sulfate by mass in soil determined by ASTM C1580

For this level of sulfate concentration, ACI 318-19 *Code Requirements* indicates there are no special cement type requirements for sulfate resistance as indicated in the table below.

CONCRETE DESIGN REQUIREMENTS FOR SULFATE EXPOSURE PER ACI 318-19

Exposure Class		Maximum Water/ Cement Ratio	Minimum Compressive Strength (psi)	Cementitious Material Types [A]			Calcium Chloride Admixtures
				ASTM C150/ C150M	ASTM C595/ C595M	ASTM C1157/ C1157M	
S0		N/A	2500	No Type Restrictions	No Type Restrictions	No Type Restrictions	No Restrictions
S1		0.50	4000	II[B]	Type with (MS) Designation	MS	No Restrictions
S2		0.45	4500	V [B]	Type with (HS) Designation	HS	Not Permitted
S3	Option 1	0.45	4500	V + Pozzolan or Slag Cement [C]	Type with (HS) Designation plus Pozzolan or Slag Cement [C]	HS + Pozzolan or Slag Cement [C]	Not Permitted
S3	Option 2	0.4	5000	V [D]	Type with (HS) Designation	HS	Not Permitted

A) Alternate combinations of cementitious materials shall be permitted when tested for sulfate resistance meeting the criteria in section 26.4.2.2(c).
B) Other available types of cement such as Type III or Type I are permitted in Exposure Classes S1 or S2 if the C3A contents are less than 8 or 5 percent, respectively.
C) The amount of the specific source of pozzolan or slag to be used shall not be less than the amount that has been determined by service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slab to be used shall not be less than the amount tested in accordance with ASTM C1012 and meeting the criteria in section 26.4.2.2(c) of ACI 318.
D) If Type V cement is used as the sole cementitious material, the optional sulfate resistance requirement of 0.040 percent maximum expansion in ASTM C150 shall be specified.

Superficial damage may occur to the exposed surfaces of highly permeable concrete. To control this risk and to resist freeze-thaw deterioration, the water-to-cementitious materials ratio should not exceed 0.50 for concrete in contact with soils that are likely to stay moist due to surface drainage or high-water tables. Concrete should have a total air content of 6 percent ± 1.5 percent. We advocate damp-proofing of all foundation walls and grade beams in contact with the subsoils.

CONSTRUCTION OBSERVATIONS

We recommend that CTL|Thompson, Inc. provide construction observation services to allow us the opportunity to verify whether soil conditions are consistent with those found during this investigation. If others perform these observations, they must accept responsibility to judge whether the recommendations in this report remain appropriate.

GEOTECHNICAL RISK

The concept of risk is an important aspect with any geotechnical evaluation primarily because the methods used to develop geotechnical recommendations do not comprise an exact science. We never have complete knowledge of subsurface conditions. Our analysis must be tempered with engineering judgment and experience. Therefore, the recommendations presented in any geotechnical evaluation should not be considered risk-free. Our recommendations represent our judgment of those measures that are necessary to increase the chances that the structures will perform satisfactorily. It is critical that all recommendations in this report are followed during construction.

LIMITATIONS

This report has been prepared for the exclusive use by Evergreen Development for the purpose of providing geotechnical design and construction criteria for the proposed project. The information, conclusions, and recommendations presented herein are based on consideration of many factors including, but not limited to, the type of structures proposed, the geologic setting, and the subsurface conditions encountered. The conclusions and recommendations contained in the report are not valid for use by others. Standards of practice continuously evolve in geotechnical engineering. The recommendations provided are

appropriate for about three years. If the proposed structures are not constructed within about three years, we should be contacted to determine if we should update this report.

Our borings were located to obtain a reasonably accurate indication of subsurface foundation conditions. The borings are representative of conditions encountered at the exact boring location only. Variations in subsurface conditions not indicated by the borings are possible. We recommend a representative of our office observe the completed foundation excavations to verify subsurface conditions are as anticipated from our borings. Representatives of our firm should be present during construction to provide construction observation and materials testing services.

We believe this investigation was conducted with that level of skill and care normally used by geotechnical engineers practicing under similar conditions. No warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report or in the analysis of the influence of subsurface conditions on design of the buildings and garages from a geotechnical engineering point-of-view, please call.

CTL|THOMPSON, INC.

COLORADO LICENSED
JEFFREY MARK JONES
47539
5/11/23
PROFESSIONAL ENGINEER

Jeffrey M. Jones, P.E.
Associate Engineer

Reviewed by

Timothy A. Mitchell, P.E.
Principal Engineer

JMJ:TAM:cw
(2 copies sent)

Via e-mail: rplace@evgre.com

REFERENCES

Colorado Geological Survey. (1991). Results of the 1987-88 EPA Supported Radon Study in Colorado, with a Discussion on Geology, Colorado Geological Survey Open File Report 91-4.

Colorado Geological Survey, (2002), Geologic Map of the Elsmere Quadrangle, El Paso County, Colorado, Madole, Richard F., and Thorson, Jon P.

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Harris Kocher Smith, Powers & Grinnell – Cut/Fill Exhibit, dated March 2, 2023.

Harris Kocher Smith, Powers & Grinnell Overall Site Plan, dated April 1, 2023.

International Building Code (2015 IBC).

Kirkham, R.M. & Rogers, W.P. (1981). Earthquake Potential in Colorado. Colorado Geological Survey, Bulletin 43.

Robinson and Associates, Inc. (1977). El Paso County, Colorado - Potential Geologic Hazards and Surficial Deposits, Environmental and Engineering Geologic Maps and Tables for Land Use Maps.

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Location of Exploratory Borings

FIG. 1

ENGINEERING UNITS AND (MODIFIERS)

ENGINEERING CONTACTS

APPROXIMATE LOCATION OF BURIED ELECTRICAL LINES. ARTIFICIAL FILL AND DISTURBED AREAS ARE EXPECTED ALONG THE UTILITY TRENCH.

2-D EOLIAN DEPOSITS GENERALLY ON FLAT TO GENTLE SLOPES OF UPLAND AREAS. EMPHASIS ON WIND EROSION, STABILIZATION DEPTH TO BEDROCK AND POTENTIAL HYDROCOMPACTION

7-A PHYSIOGRAPHIC FLOODPLAIN WHERE EROSION AND DEPOSITION OCCUR AND IS GENERALLY SUBJECT TO RECURRING FLOODING. AREAS MAY HAVE BEEN SUBJECT TO RECENT EROSION CONTROL MEASURES. EMPHASIS ON FREQUENCY, DEPTH AND CONTROL

0 50' 100'

SCALE: 1" = 100'

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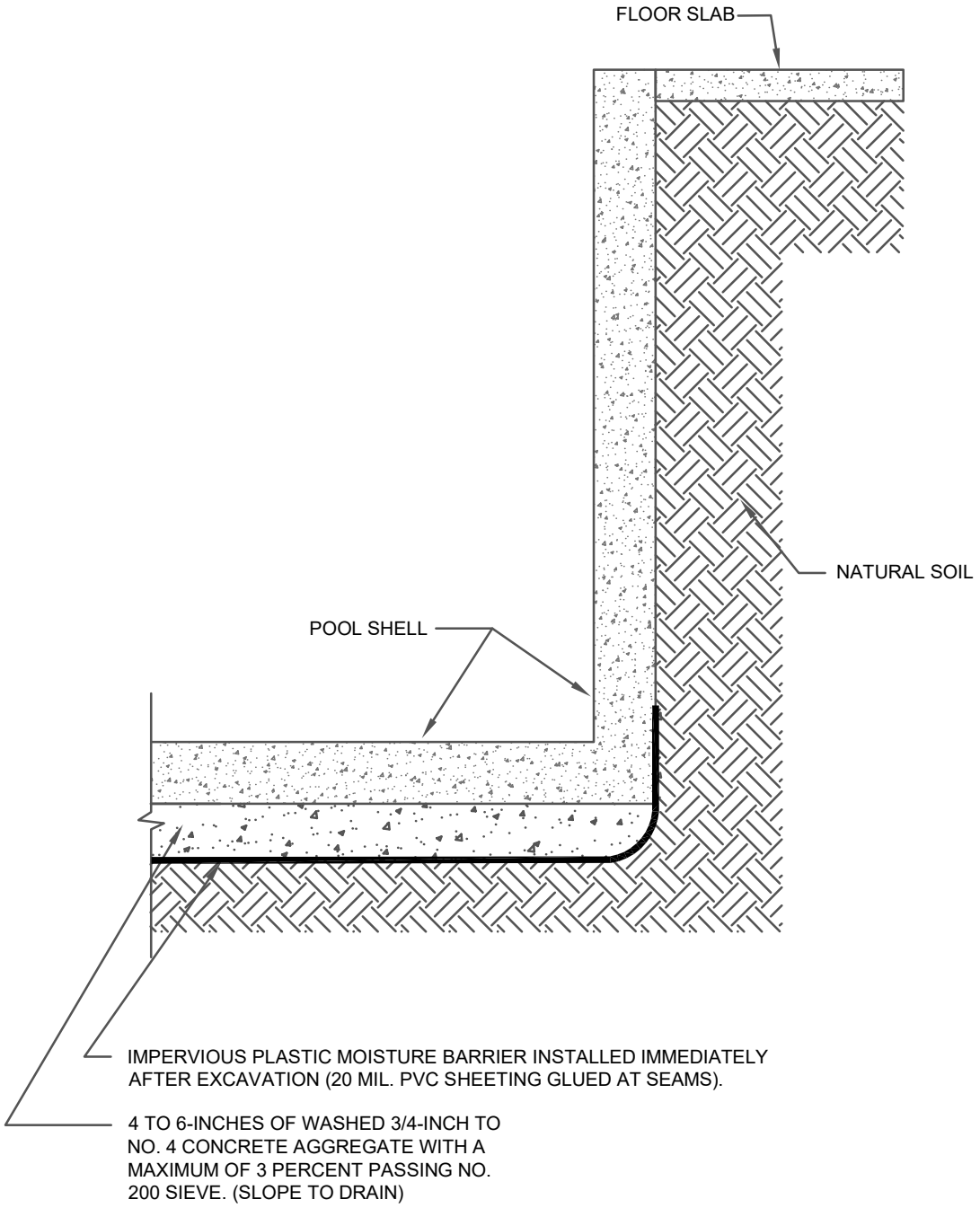
Engineering Geologic Conditions

FIG. 2



NOTE:
DRAIN PIPE SHOULD CONSIST OF A 3 OR 4-INCH DRAIN PIPE WITH A MINIMUM SLOPE OF 1/8 INCH DROP PER FOOT, TO A POSITIVE GRAVITY OUTLET OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING.

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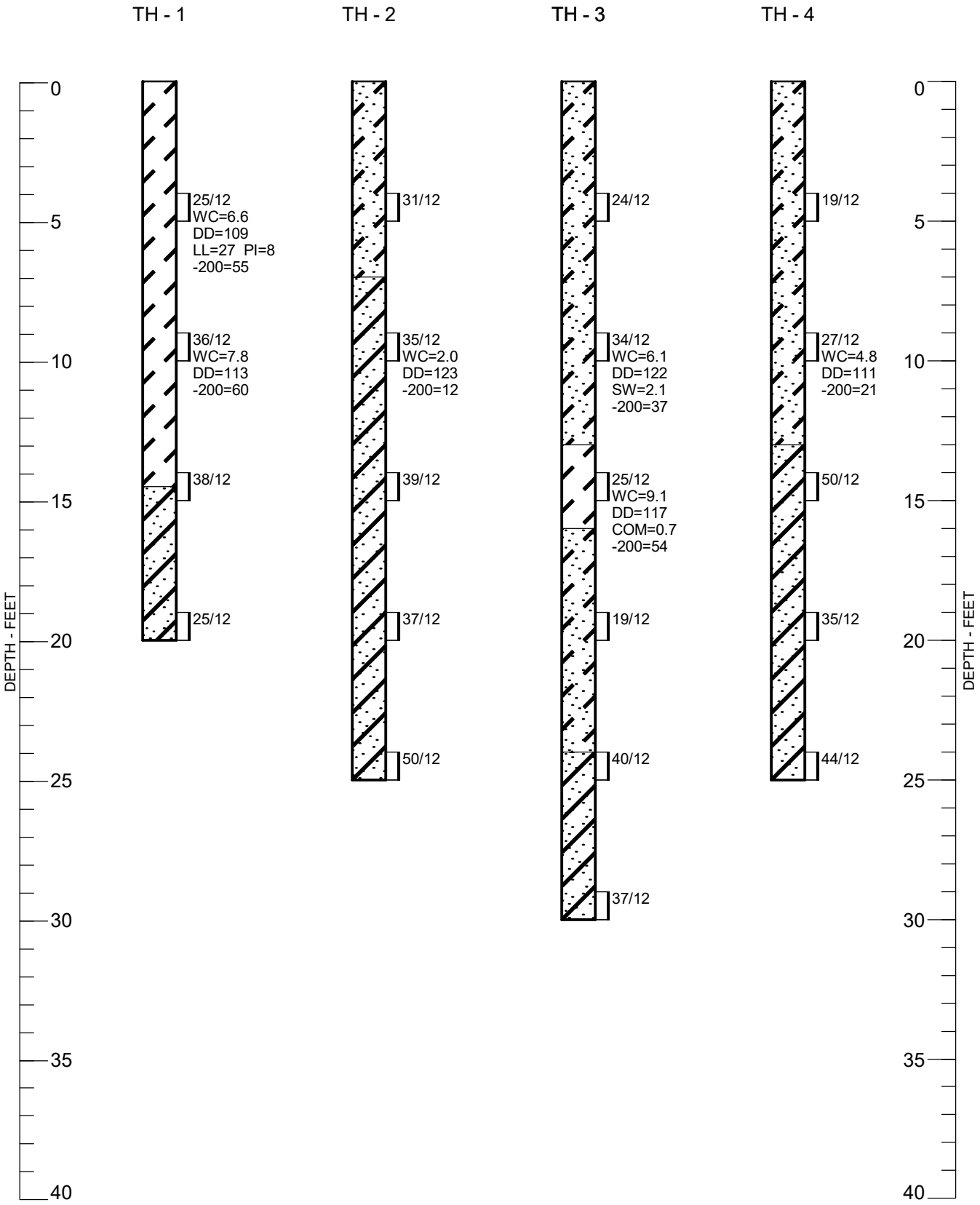
Recommended Pool Drain Detail FIG. 3

APPENDIX A

SUMMARY LOGS OF EXPLORATORY BORINGS



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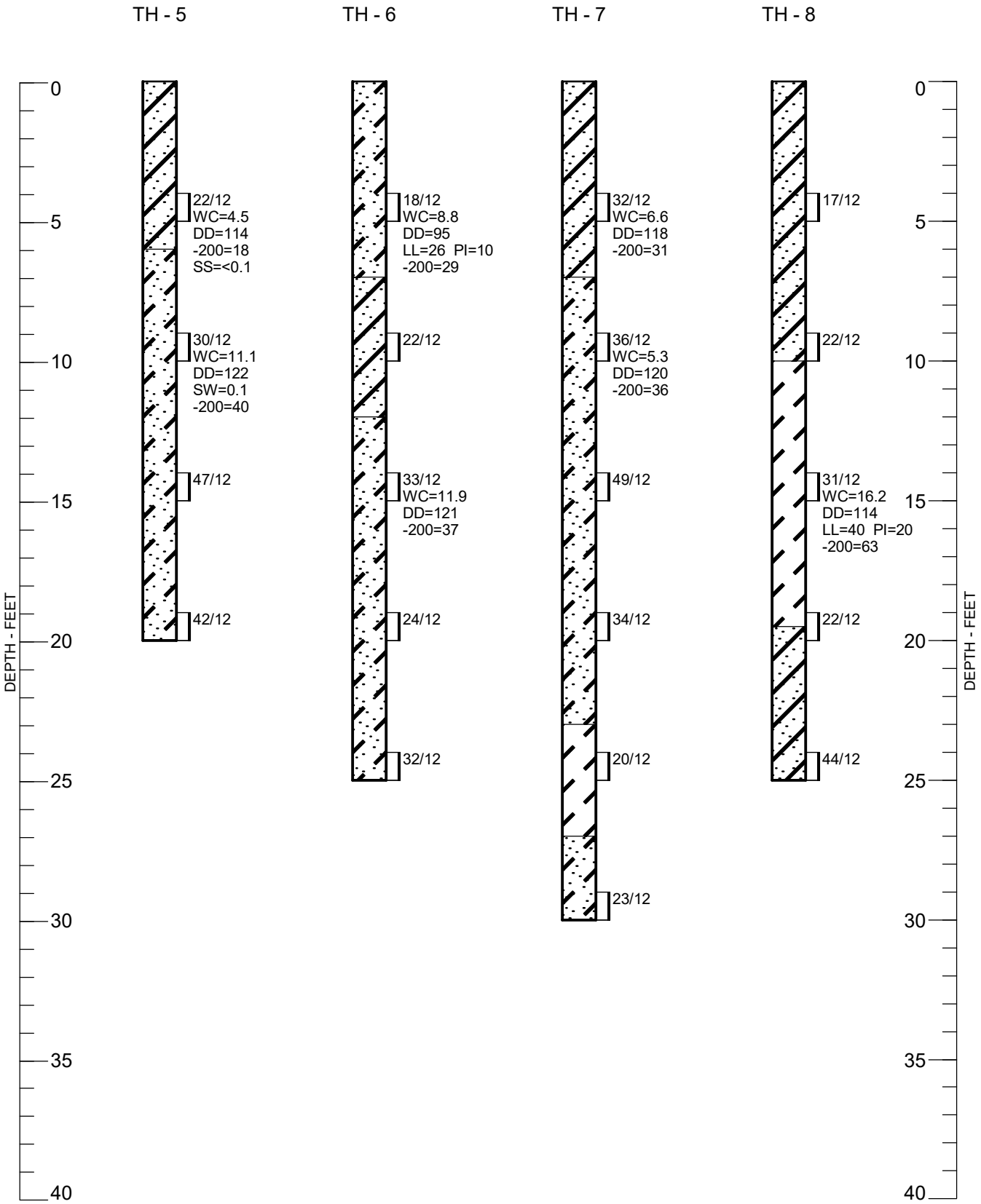
Summary Logs of Exploratory Borings

FIG. A-1



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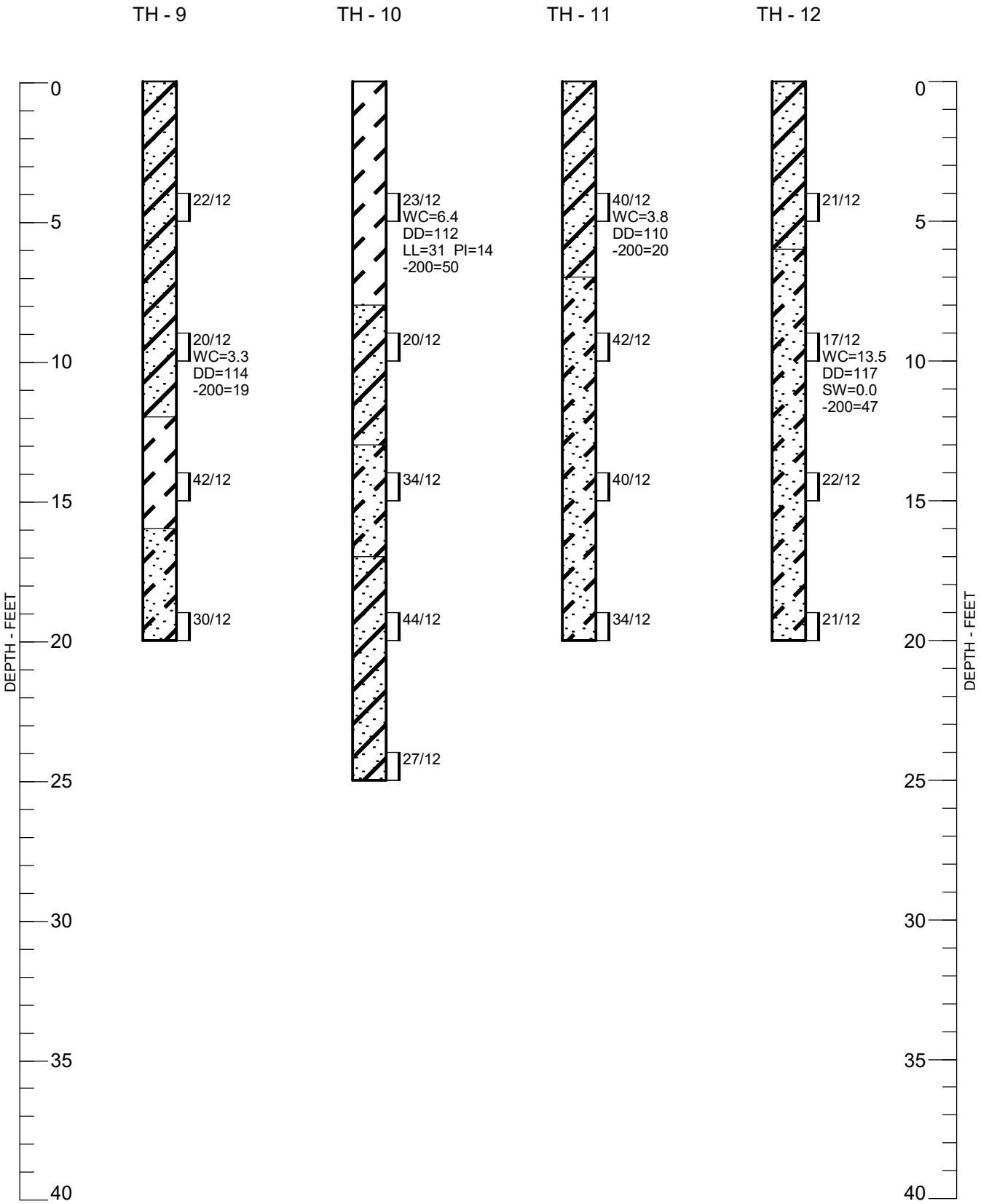
Summary Logs of Exploratory Borings

FIG. A-2



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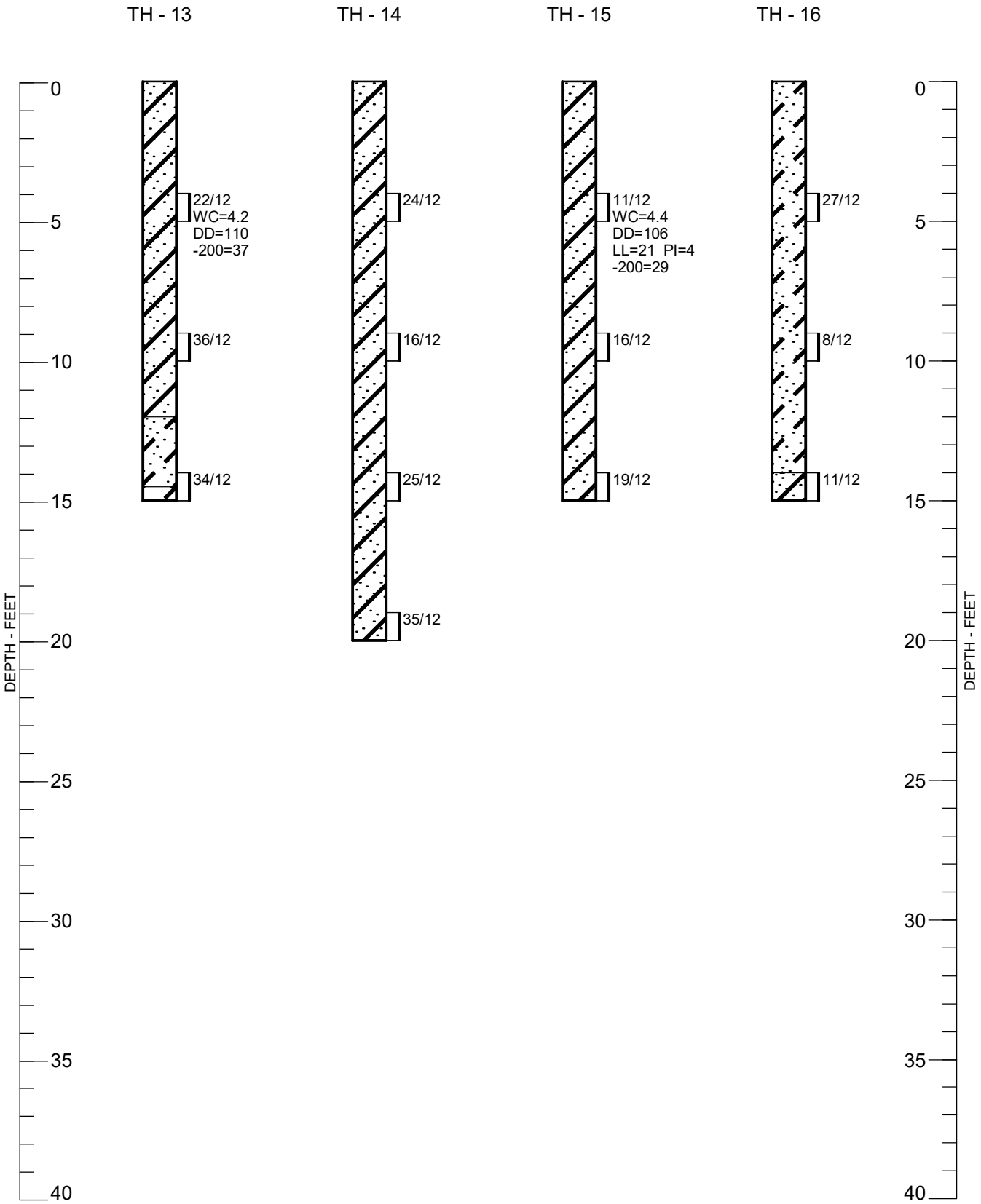
Summary Logs of Exploratory Borings

FIG. A-3



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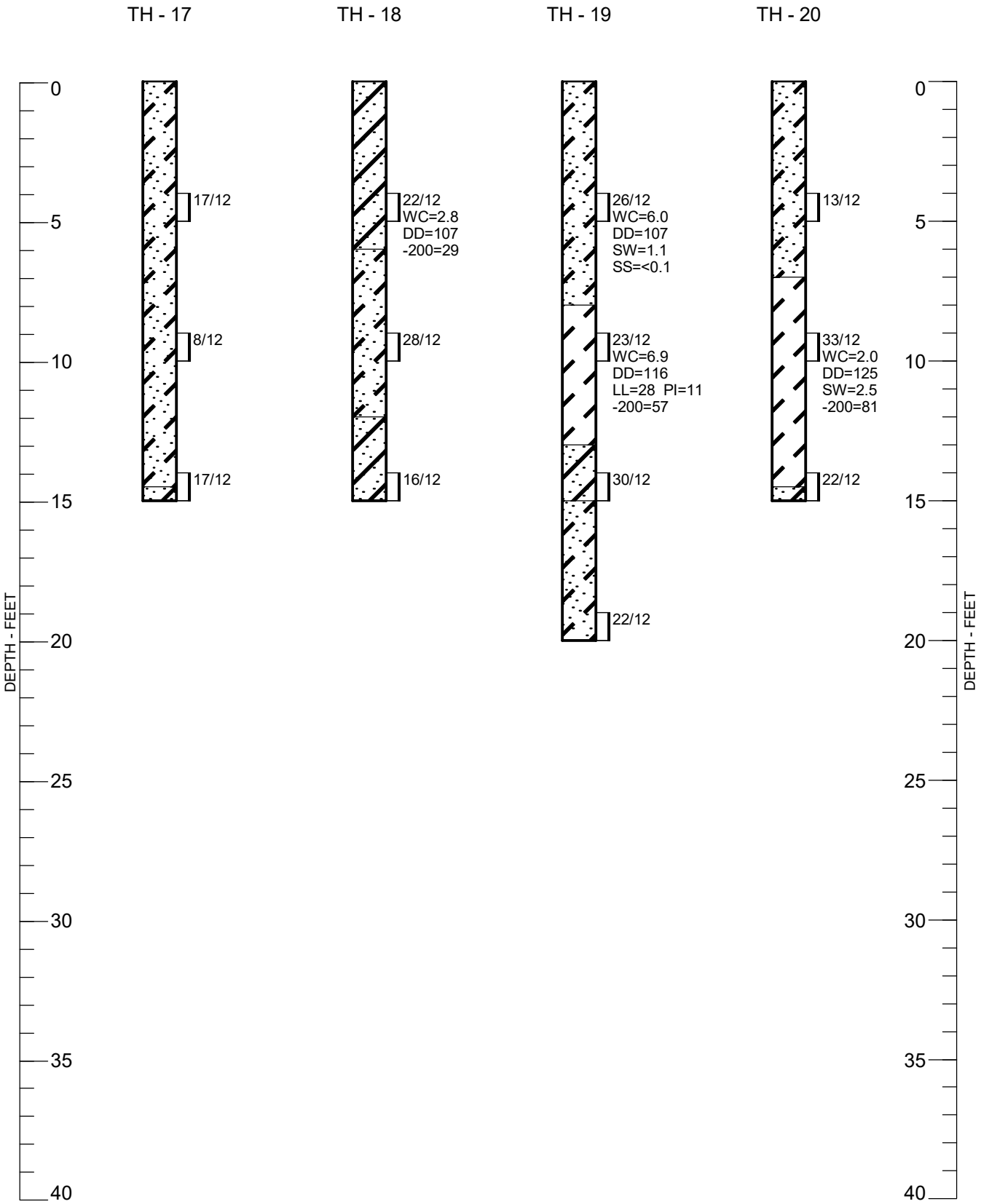
Summary Logs of Exploratory Borings

FIG. A-4



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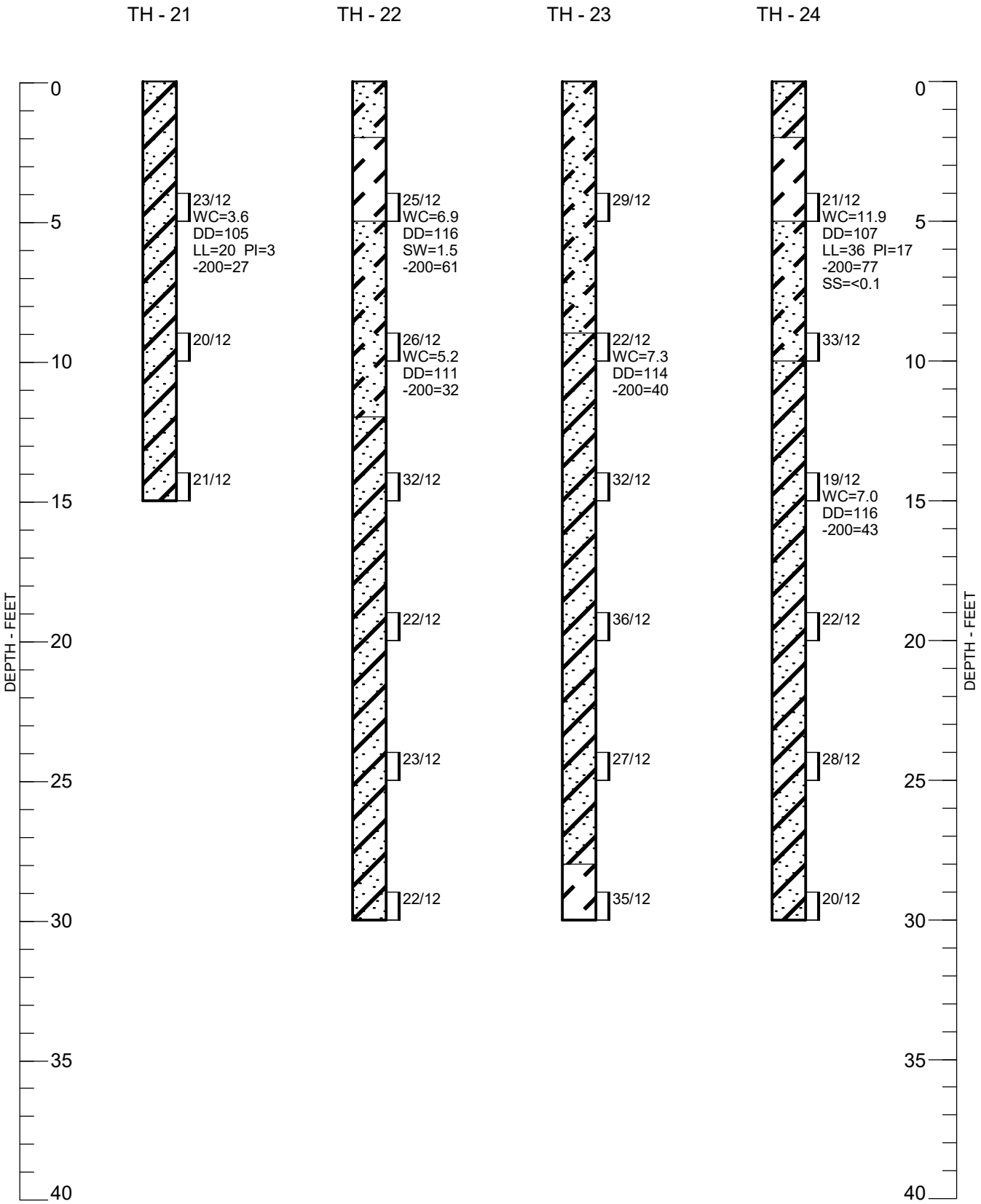
Summary Logs of Exploratory Borings

FIG. A-5



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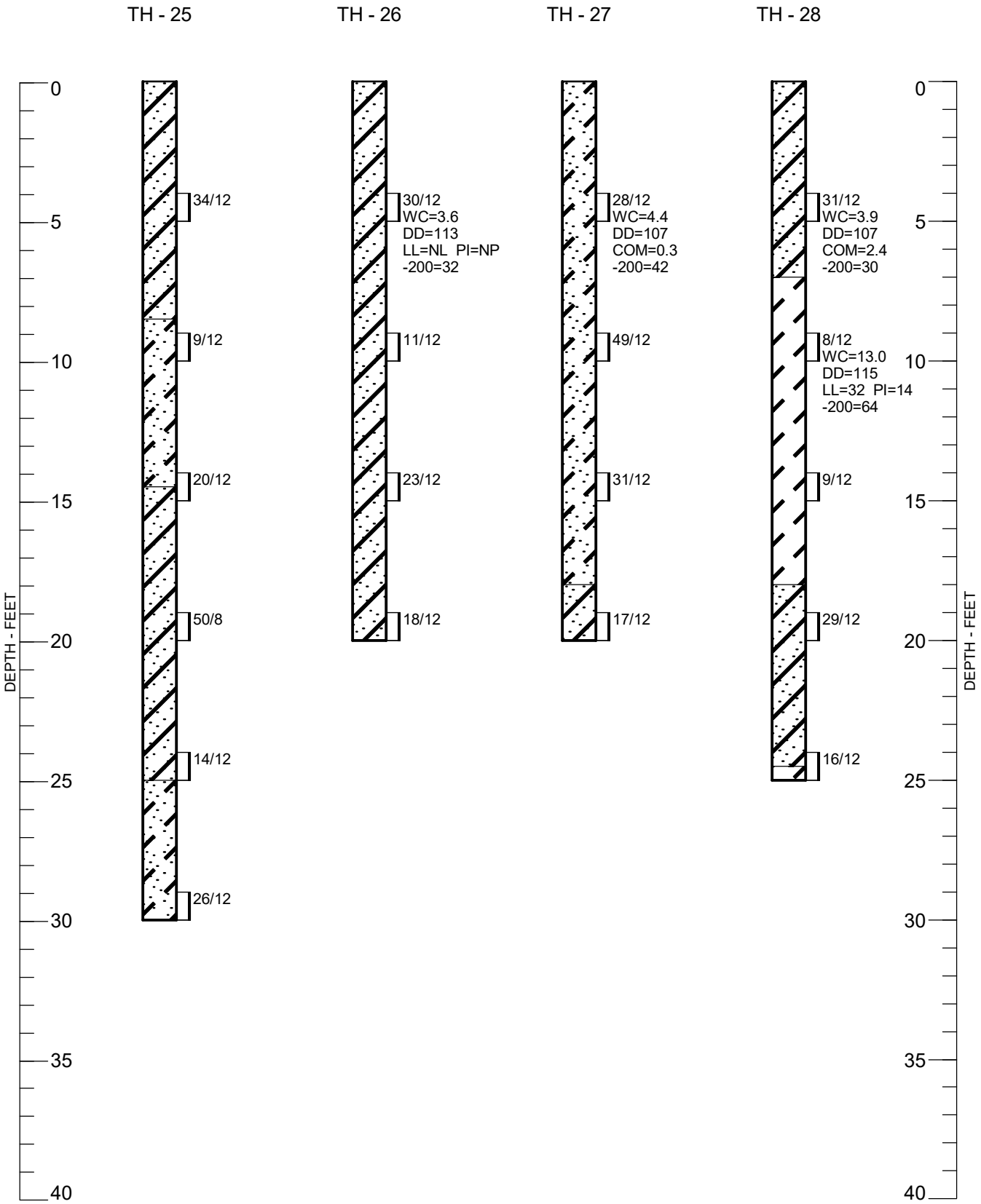
Summary Logs of Exploratory Borings

FIG. A-6



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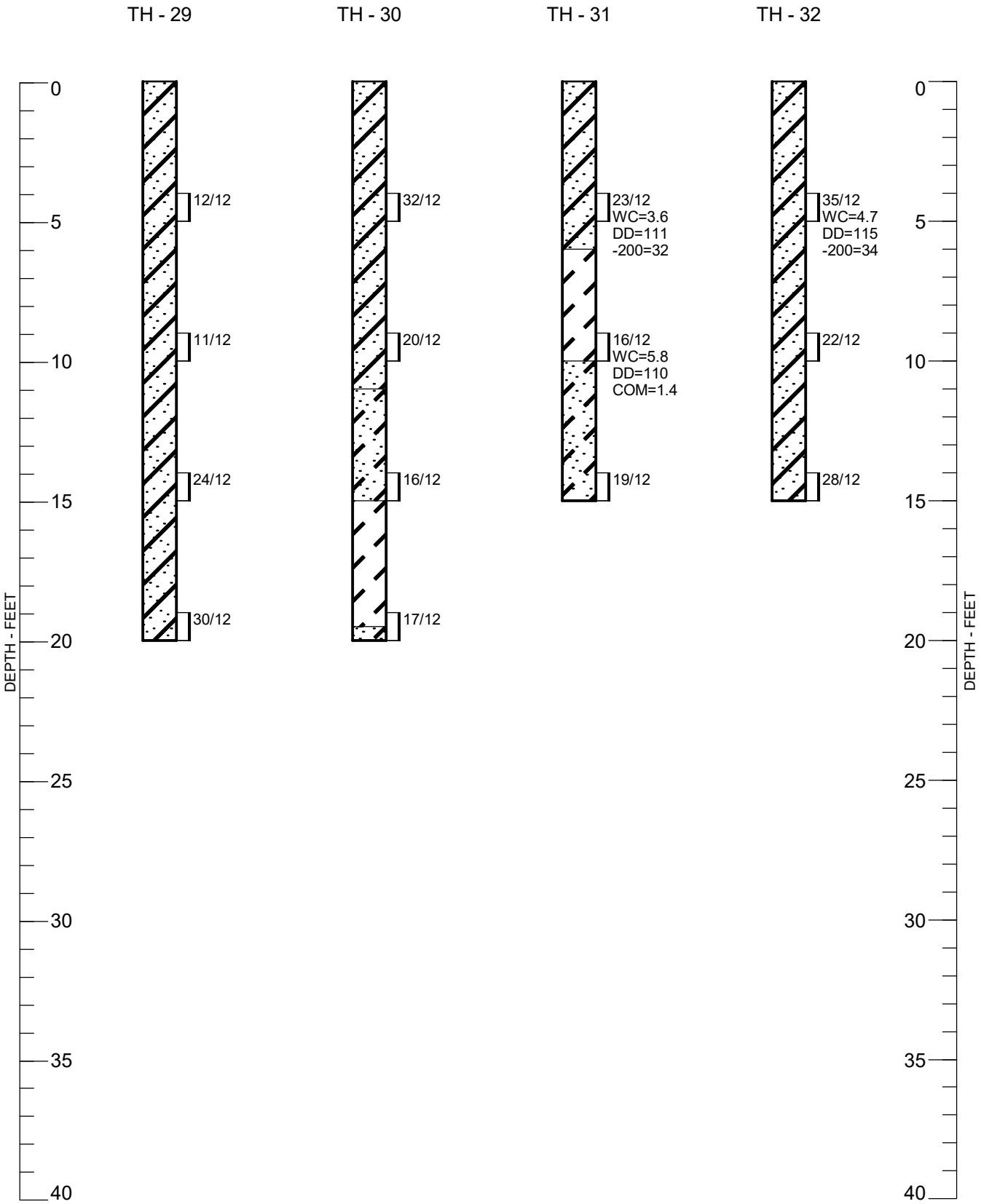
Summary Logs of Exploratory Borings

FIG. A-7



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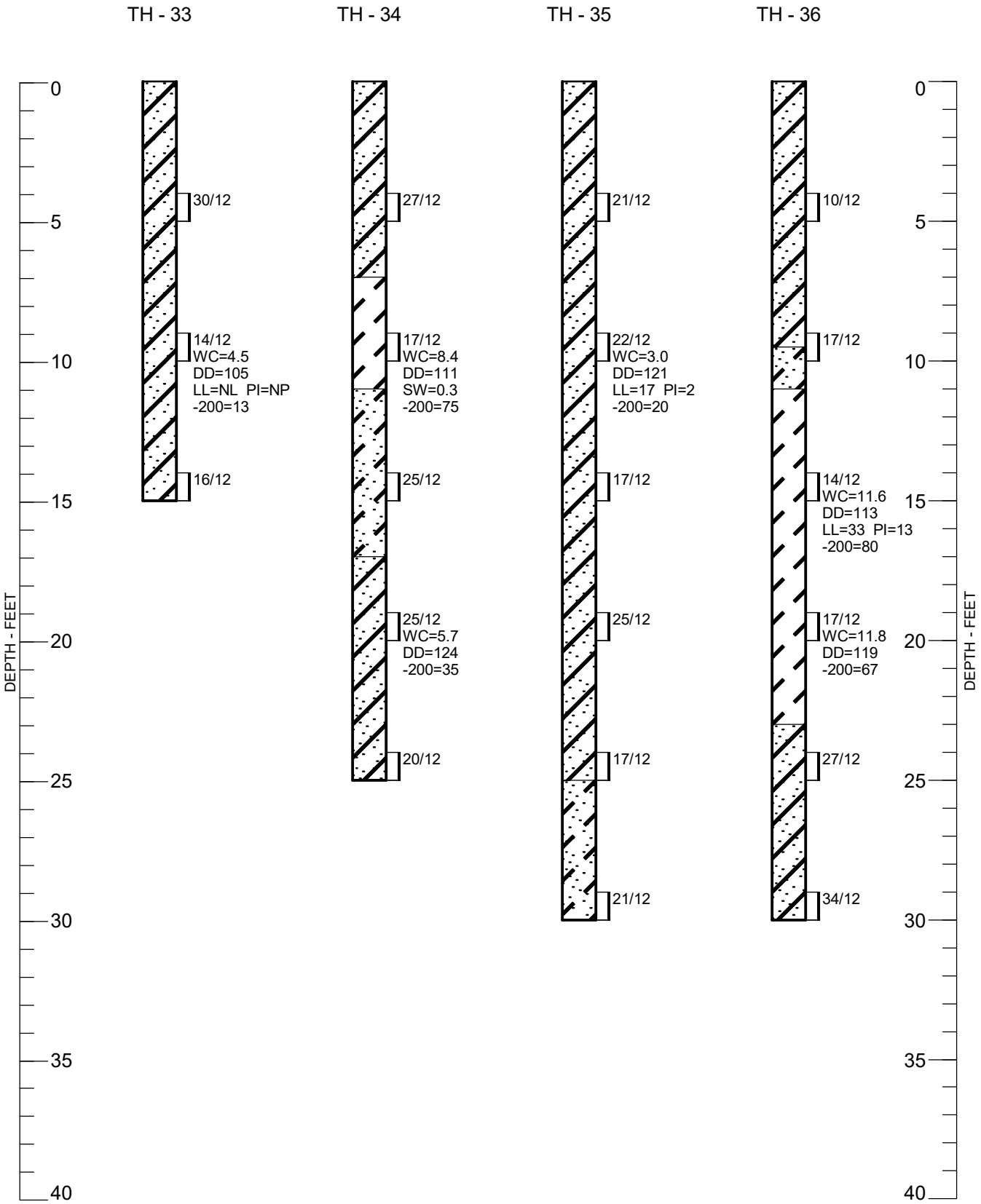
Summary Logs of Exploratory Borings

FIG. A-8



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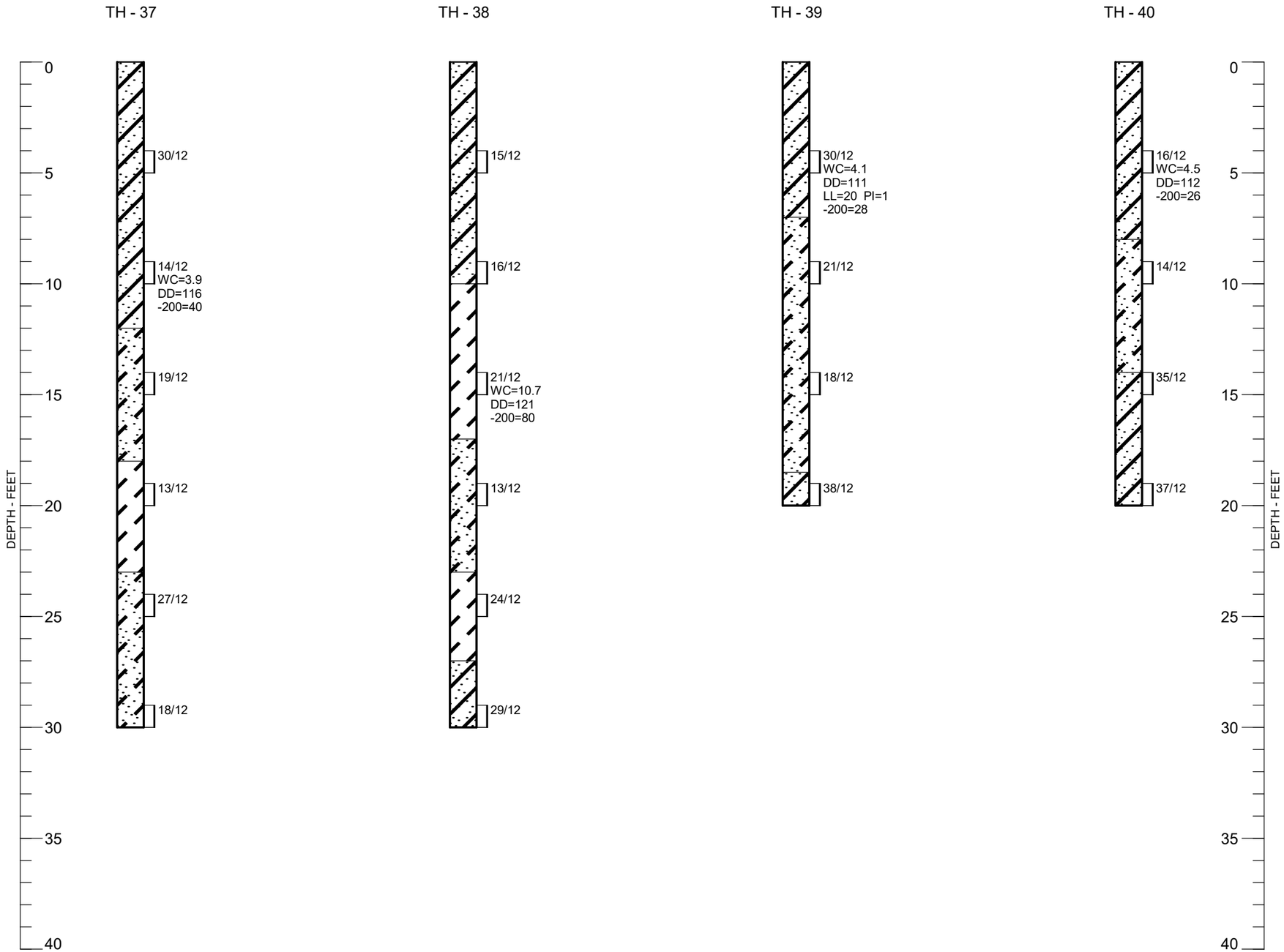
Summary Logs of Exploratory Borings

FIG. A-9



LEGEND:

CLAY, SANDY TO VERY SANDY, STIFF TO VERY STIFF, SLIGHTLY MOIST, BROWN, GRAY (CL).

SAND, CLAYEY, LOOSE TO DENSE, SLIGHTLY MOIST, DARK BROWN, GRAY (SC, SC-SM).

SAND, SLIGHTLY SILTY TO VERY SILTY, MEDIUM DENSE TO DENSE, SLIGHTLY MOIST, BROWN, GRAY (SM, SP-SM).

DRIVE SAMPLE. THE SYMBOL 25/12 INDICATES 25 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

NOTES:

1. THE BORINGS WERE DRILLED BETWEEN APRIL 11 AND 18, 2023 USING A 4-INCH DIAMETER, CONTINUOUS-FLIGHT AUGER AND A CME-45 OR CME-55, TRUCK-MOUNTED DRILL RIG.

2. GROUNDWATER WAS NOT ENCOUNTERED IN THE EXPLORATORY BORINGS DURING THIS INVESTIGATION.

3. WC - INDICATES MOISTURE CONTENT. (%)
   DD - INDICATES DRY DENSITY. (PCF)
   SW - INDICATES SWELL WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE. (%)
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE. (%)
   LL - INDICATES LIQUID LIMIT. (NV : NO VALUE)
   PI - INDICATES PLASTICITY INDEX. (NP : NON-PLASTIC)
   -200 - INDICATES PASSING NO. 200 SIEVE. (%)
   SS - INDICATES WATER-SOLUBLE SULFATE CONTENT. (%)

4. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS, AND CONCLUSIONS AS CONTAINED IN THIS REPORT.

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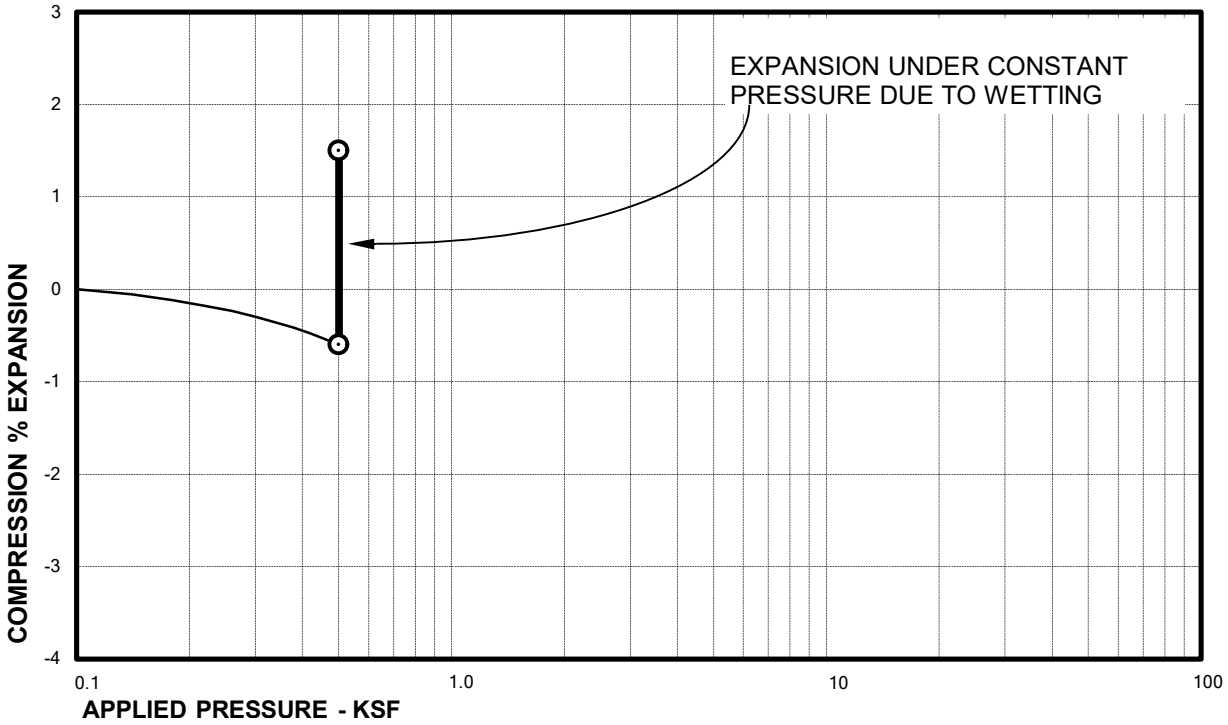
Summary Logs of Exploratory Borings

FIG. A-10

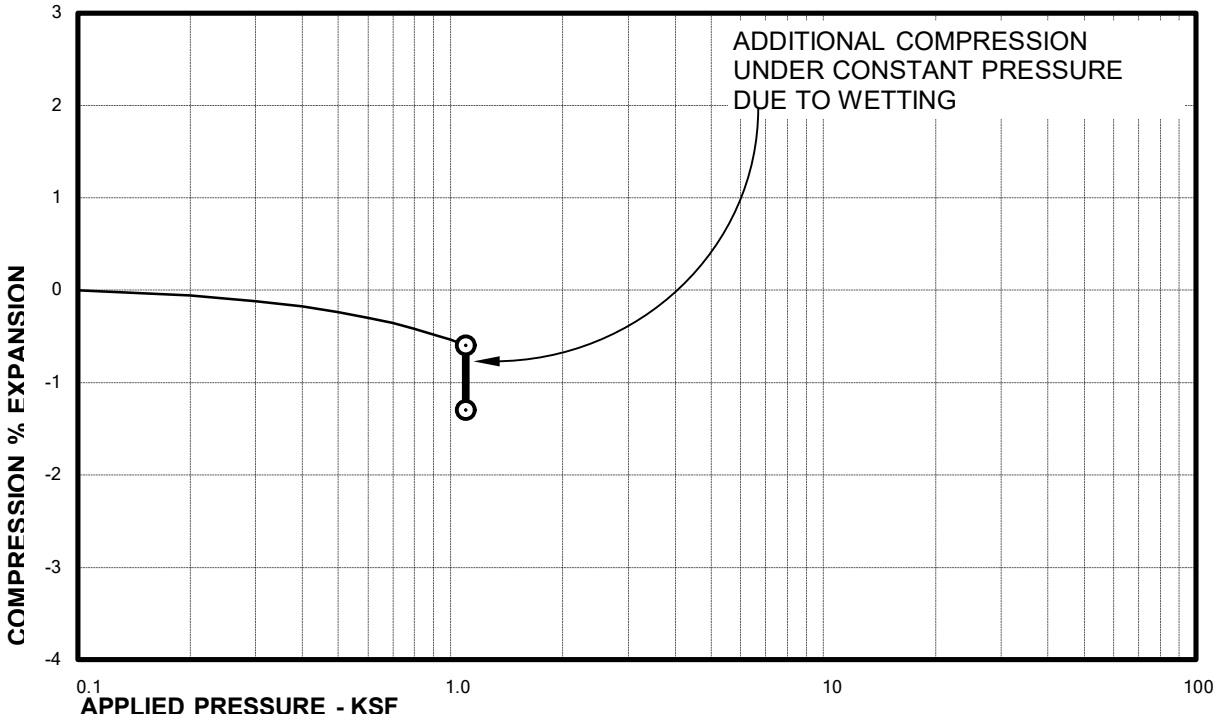
APPENDIX B

LABORATORY TEST RESULTS
TABLE B-I – SUMMARY OF LABORATORY TEST RESULTS



Sample of SAND, VERY CLAYEY (SC)
From TH-3 AT 9 FEET

DRY UNIT WEIGHT= 122 PCF
MOISTURE CONTENT= 6.1 %



Sample of CLAY, VERY SANDY (CL)
From TH-3 AT 14 FEET

DRY UNIT WEIGHT= 117 PCF
MOISTURE CONTENT= 9.1 %

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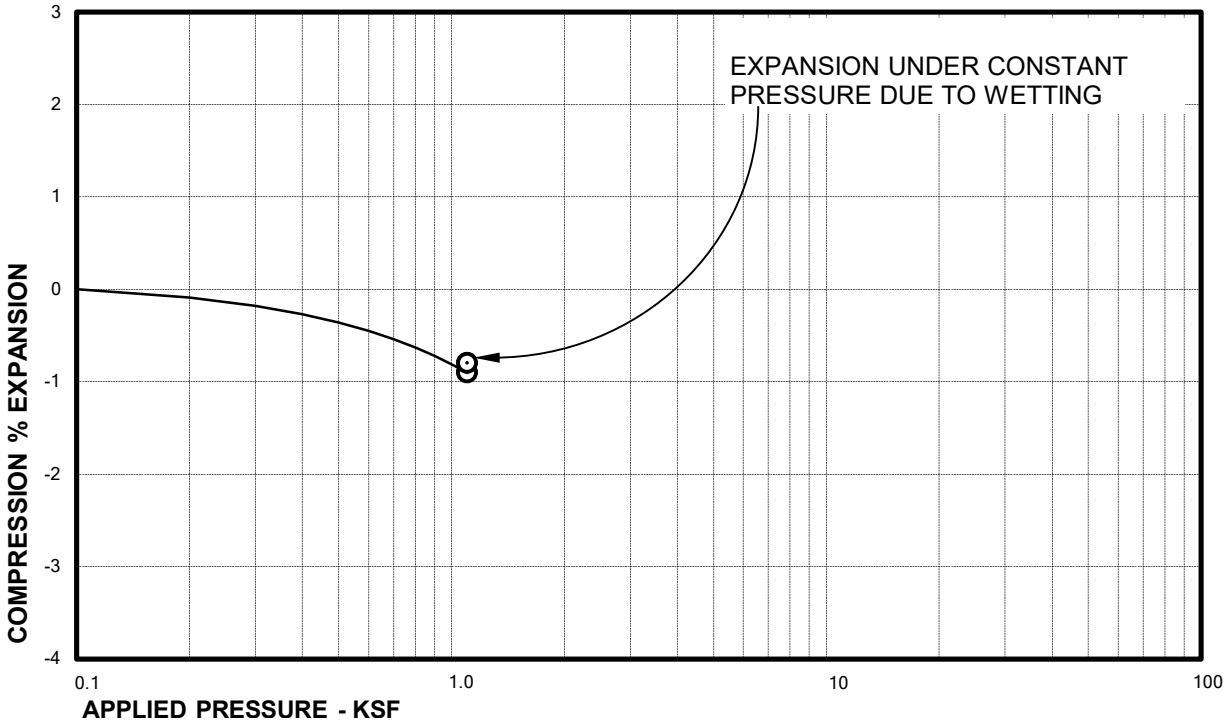
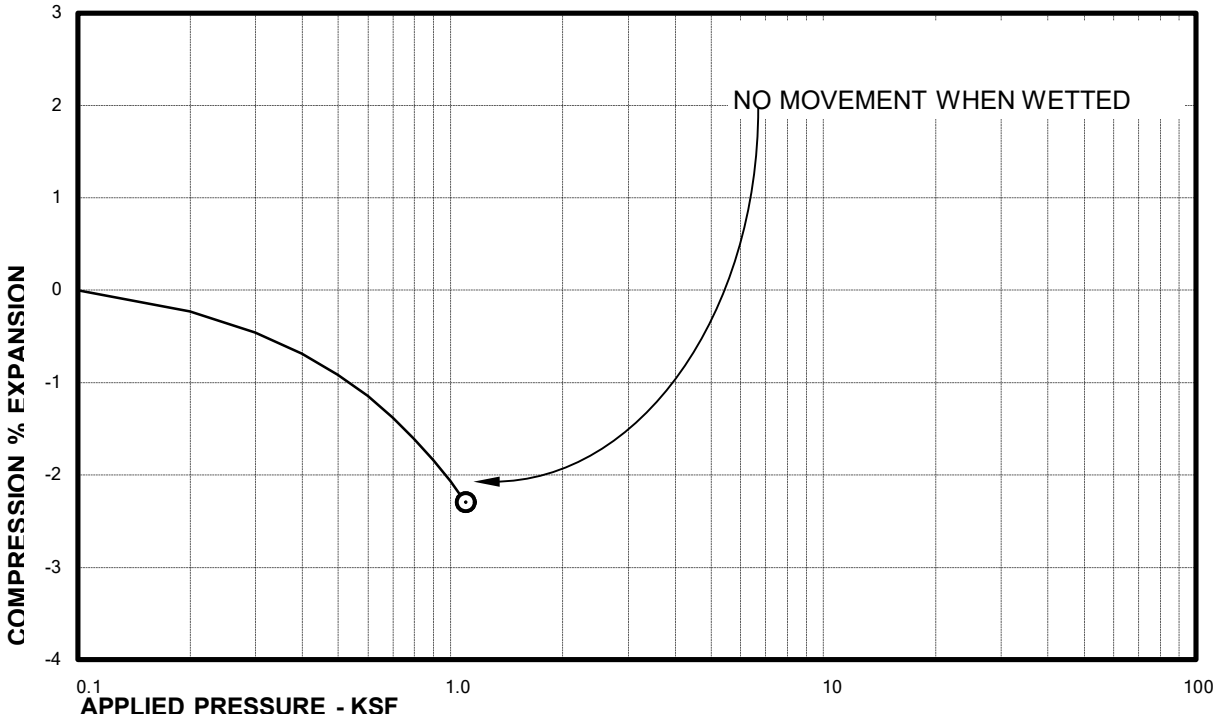
Swell Consolidation Test Results

FIG. B-1



Sample of SAND, VERY CLAYEY (SC)
From TH-5 AT 9 FEET

DRY UNIT WEIGHT= 122 PCF
MOISTURE CONTENT= 11.1 %



Sample of SAND, VERY CLAYEY (SC)
From TH-12 AT 9 FEET

DRY UNIT WEIGHT= 117 PCF
MOISTURE CONTENT= 13.5 %

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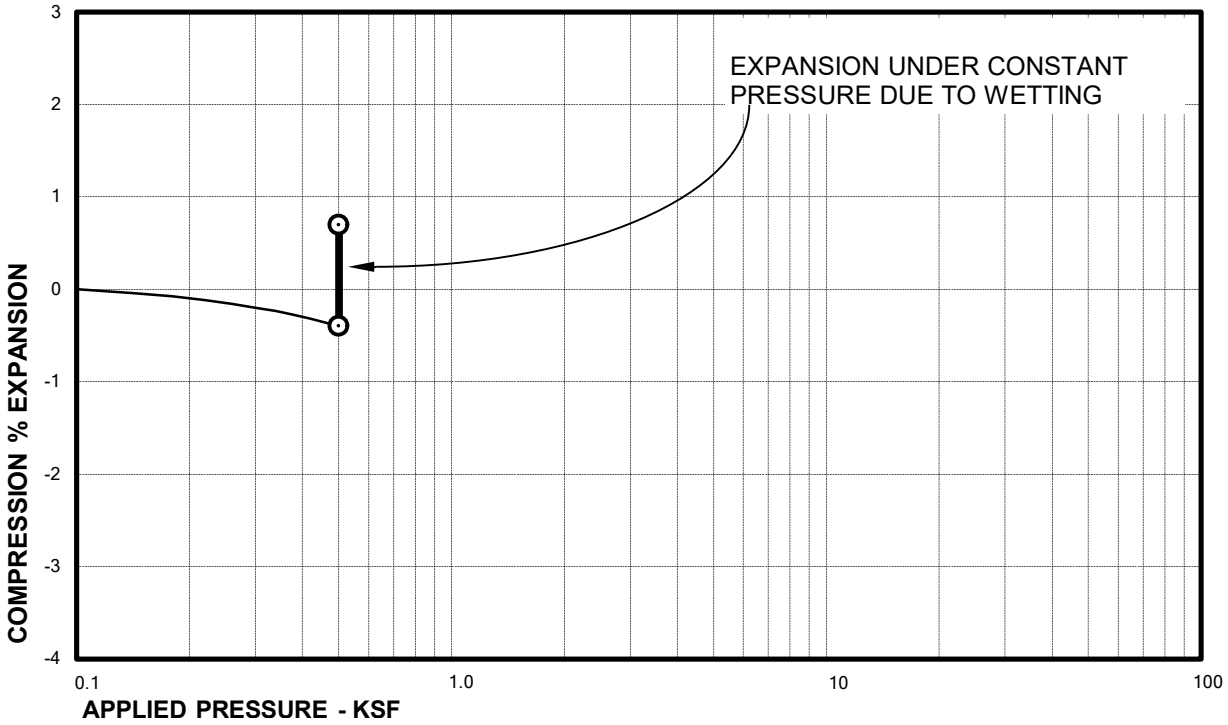
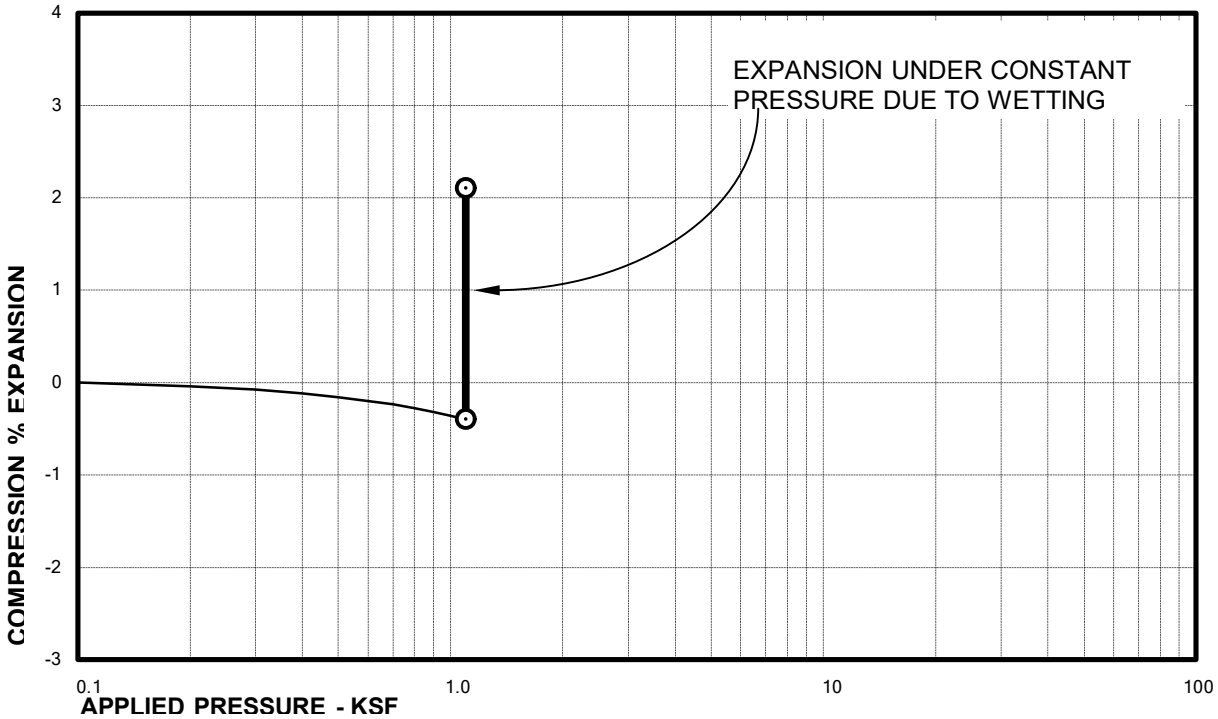
Swell Consolidation Test Results

FIG. B-2



Sample of CLAY, VERY SANDY (CL)
From TH-19 AT 4 FEET

DRY UNIT WEIGHT= 107 PCF
MOISTURE CONTENT= 6.0 %



Sample of CLAY, SANDY (CL)
From TH-20 AT 9 FEET

DRY UNIT WEIGHT= 125 PCF
MOISTURE CONTENT= 2.0 %

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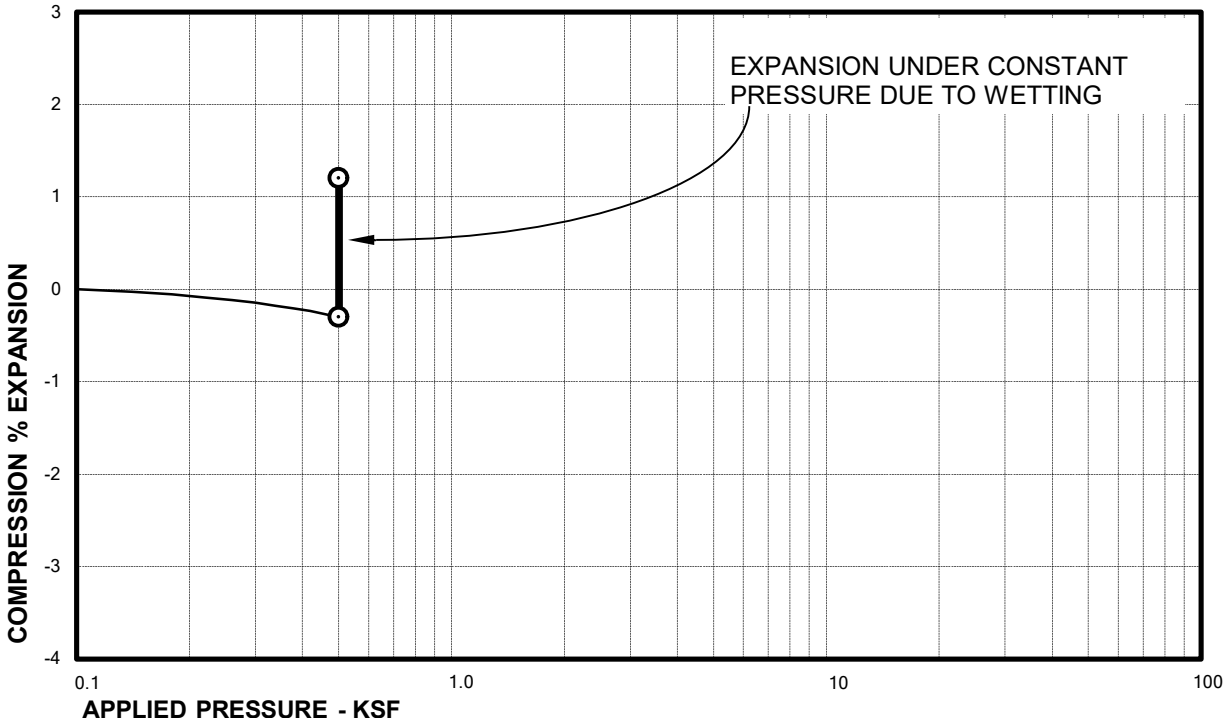
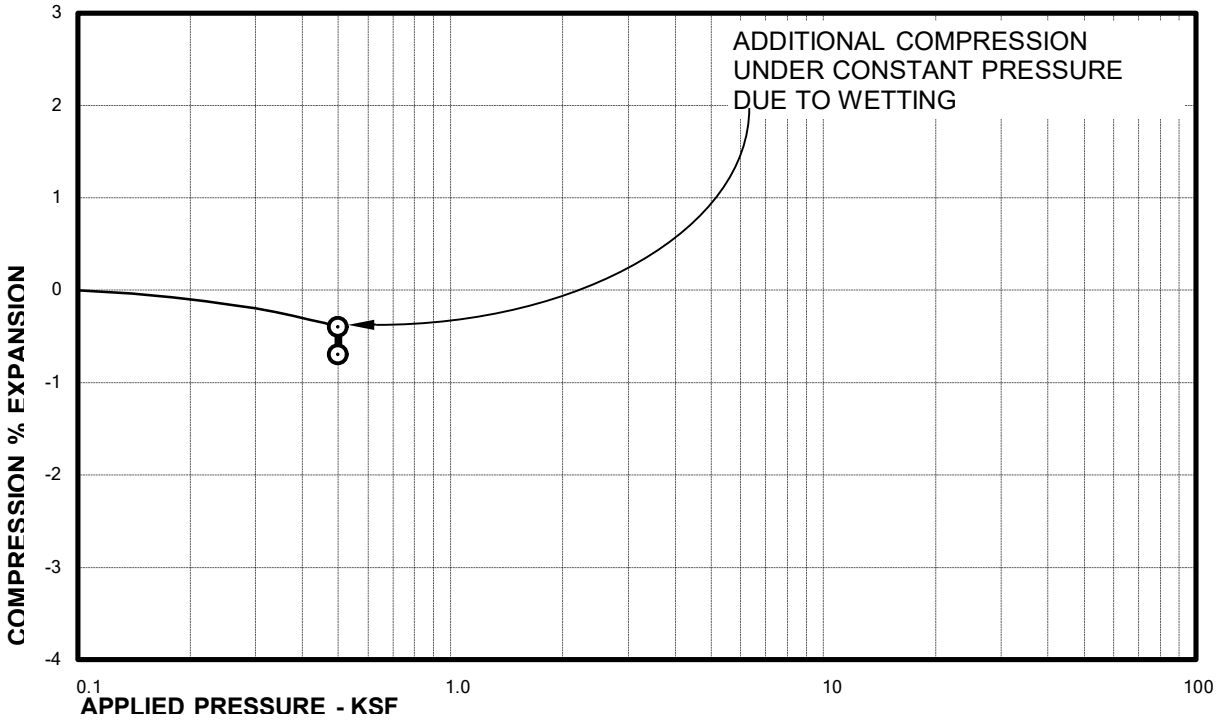
Swell Consolidation Test Results

FIG. B-3



Sample of CLAY, VERY SANDY (CL)
From TH-22 AT 4 FEET

DRY UNIT WEIGHT= 116 PCF
MOISTURE CONTENT= 6.9 %



Sample of SAND, VERY SILTY (SM)
From TH-27 AT 4 FEET

DRY UNIT WEIGHT= 107 PCF
MOISTURE CONTENT= 4.4 %

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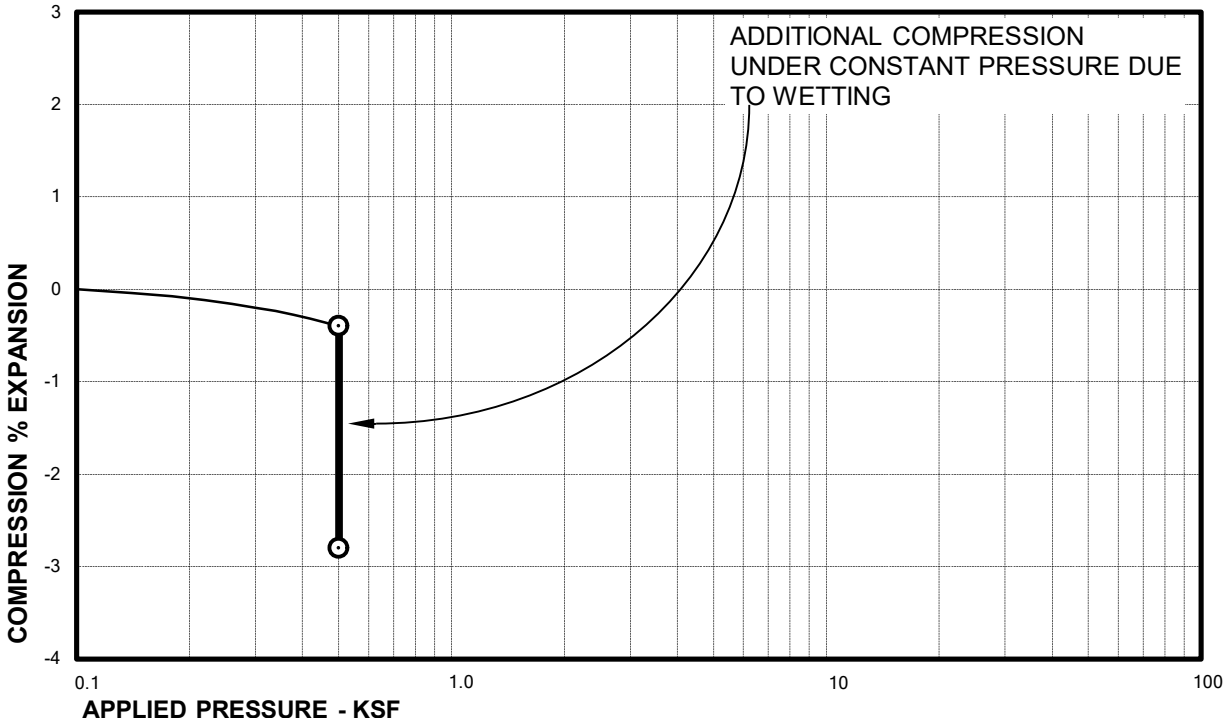
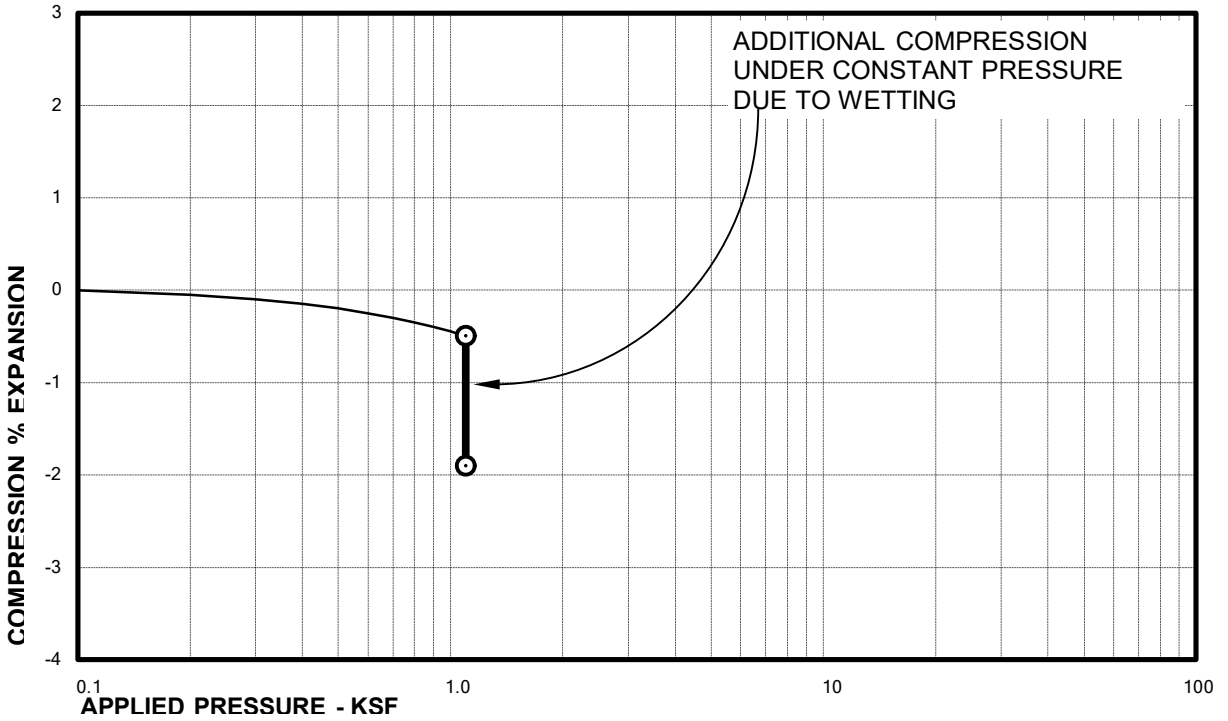
Swell Consolidation Test Results

FIG. B-4



Sample of SAND, SILTY (SM) DRY UNIT WEIGHT= 107 PCF

From TH-28 AT 4 FEET MOISTURE CONTENT= 3.9 %



Sample of SAND, SILTY (SM) DRY UNIT WEIGHT= 110 PCF

From TH-31 AT 9 FEET MOISTURE CONTENT= 5.8 %

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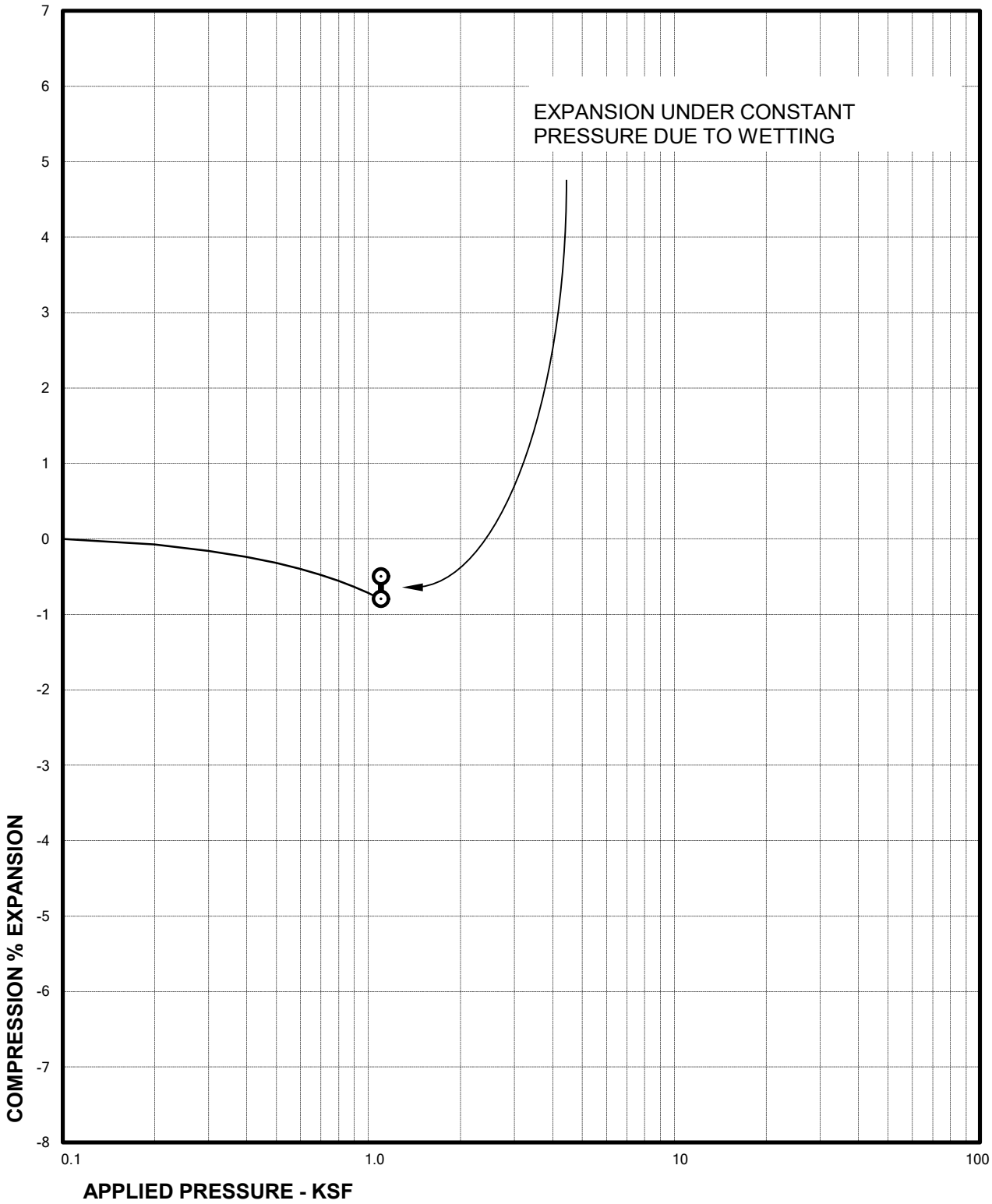
Swell Consolidation Test Results

FIG. B-5



Sample of CLAY, SANDY (CL)

From TH-34 AT 9 FEET

DRY UNIT WEIGHT= 111 PCF

MOISTURE CONTENT= 8.4 %

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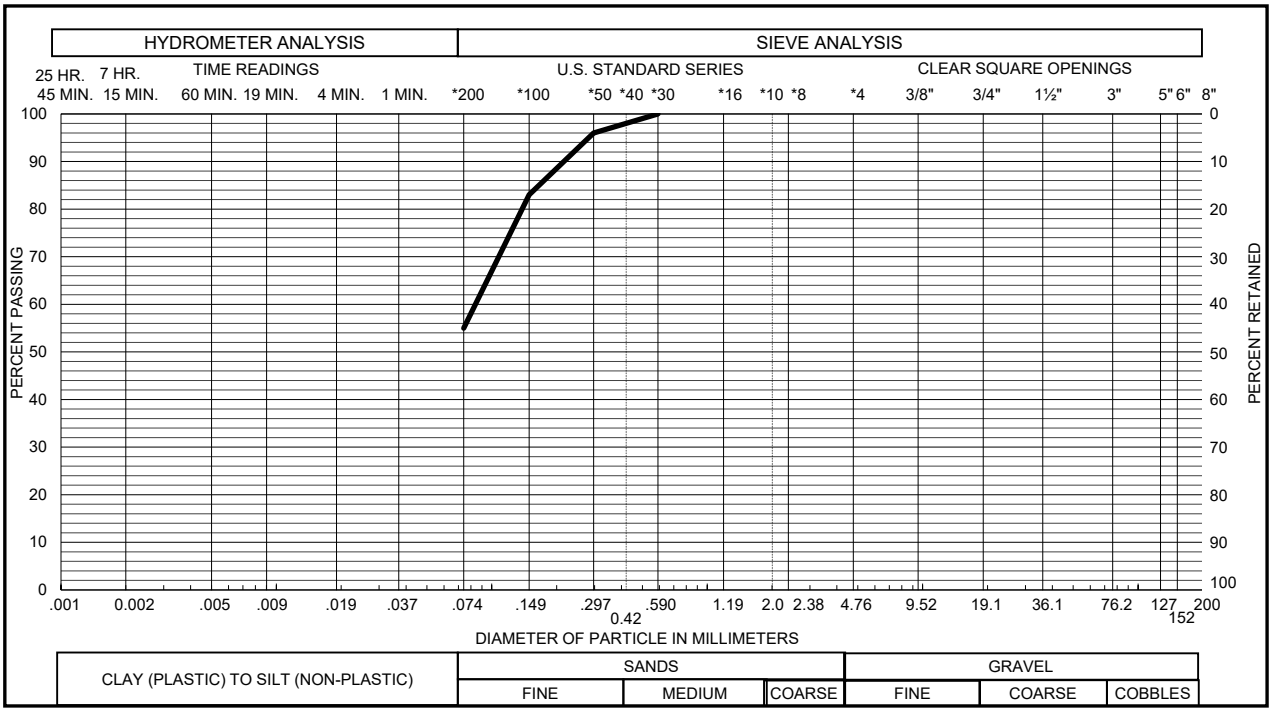
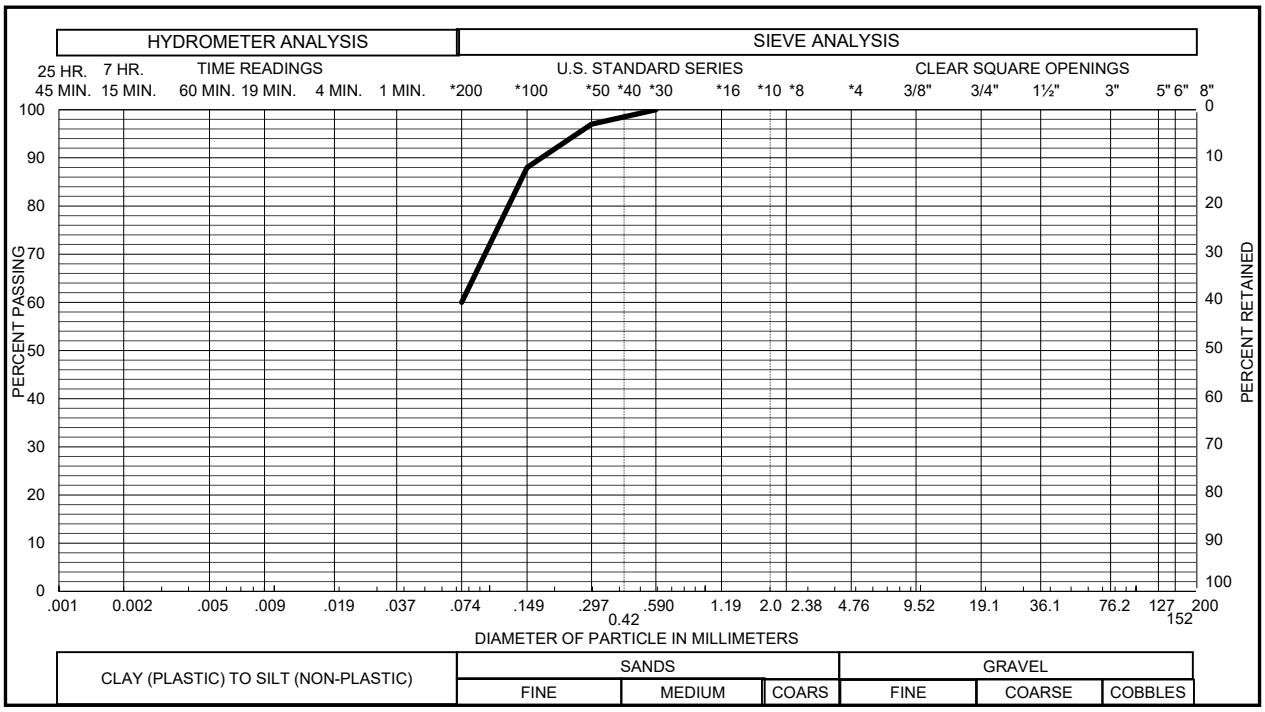
Swell Consolidation Test Results

FIG. B-6



Sample of CLAY, VERY SANDY (CL)
From TH - 1 AT 4 FEET

GRAVEL 0 % SAND 45 %
SILT & CLAY 55 % LIQUID LIMIT 27
PLASTICITY INDEX 8



Sample of CLAY, VERY SANDY (CL)
From TH - 1 AT 9 FEET

GRAVEL 0 % SAND 40 %
SILT & CLAY 60 % LIQUID LIMIT
PLASTICITY INDEX

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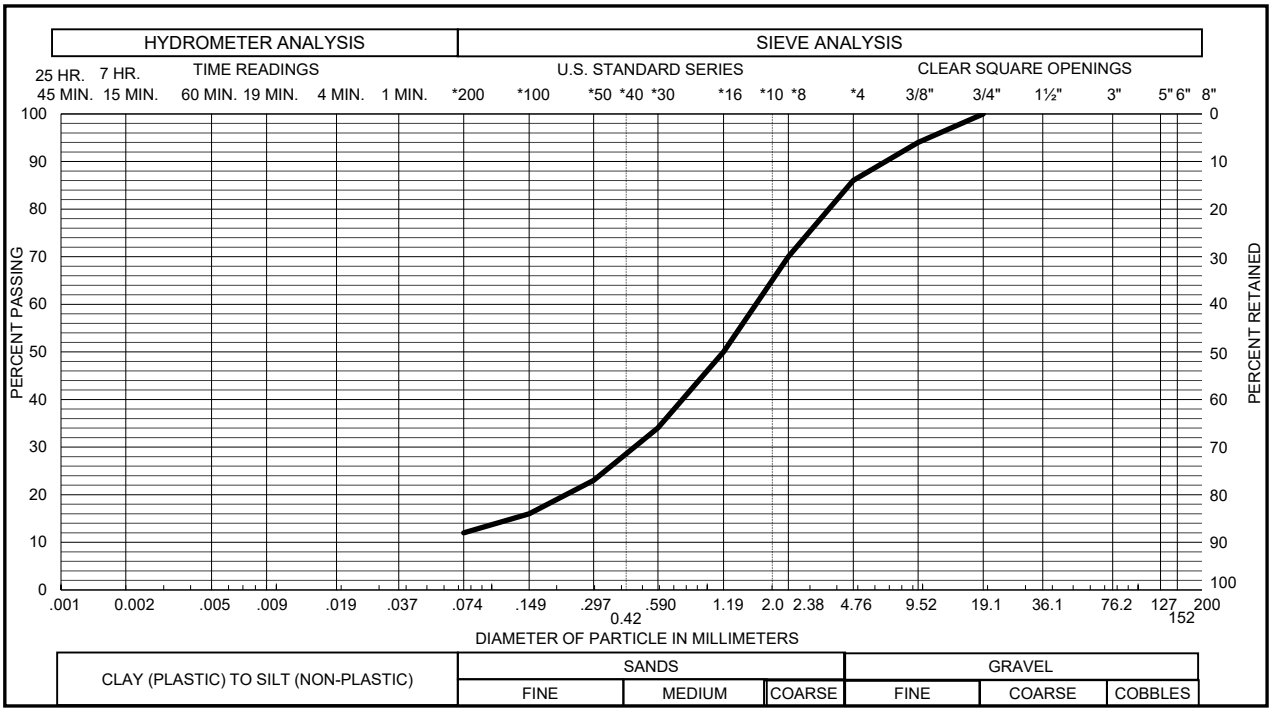
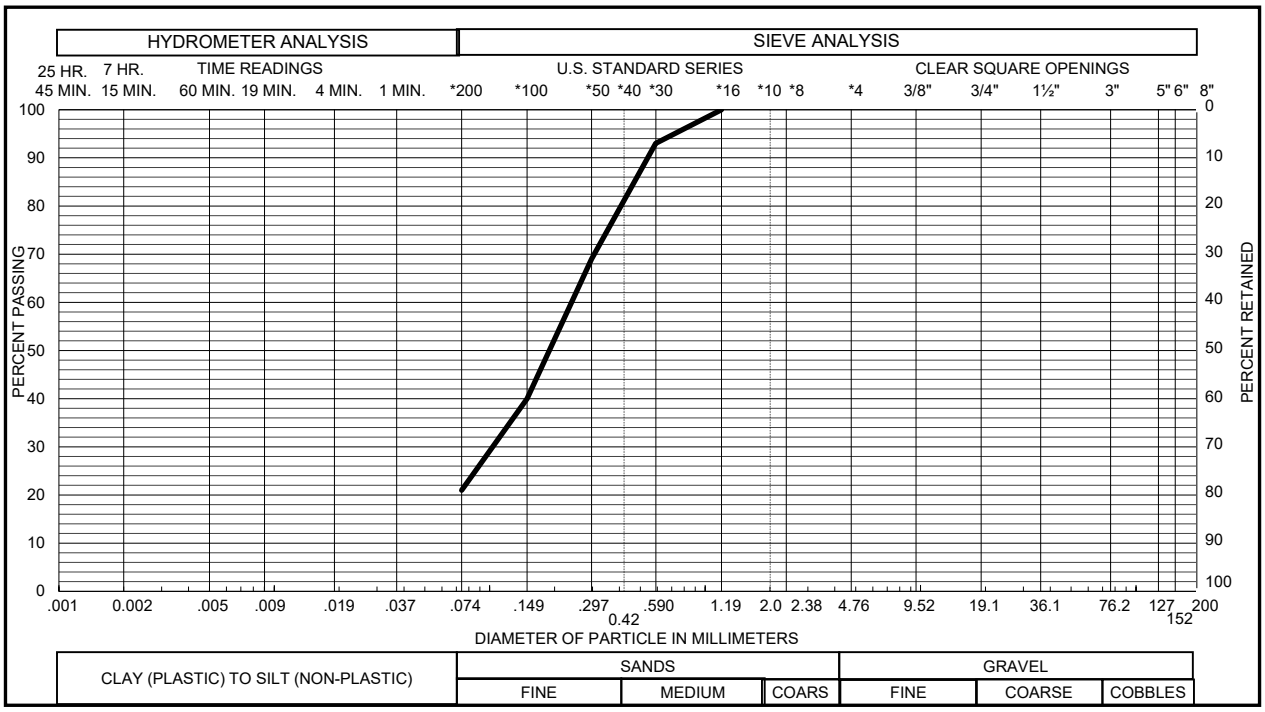
Gradation Test Results

FIG. B-7



Sample of SAND, SLIGHTLY SILTY, GRAVELLY (SP-SM)
From TH - 2 AT 9 FEET

GRAVEL 14 % SAND 74 %
SILT & CLAY 12 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, SILTY (SM)
From TH - 4 AT 9 FEET

GRAVEL 0 % SAND 79 %
SILT & CLAY 21 % LIQUID LIMIT
PLASTICITY INDEX

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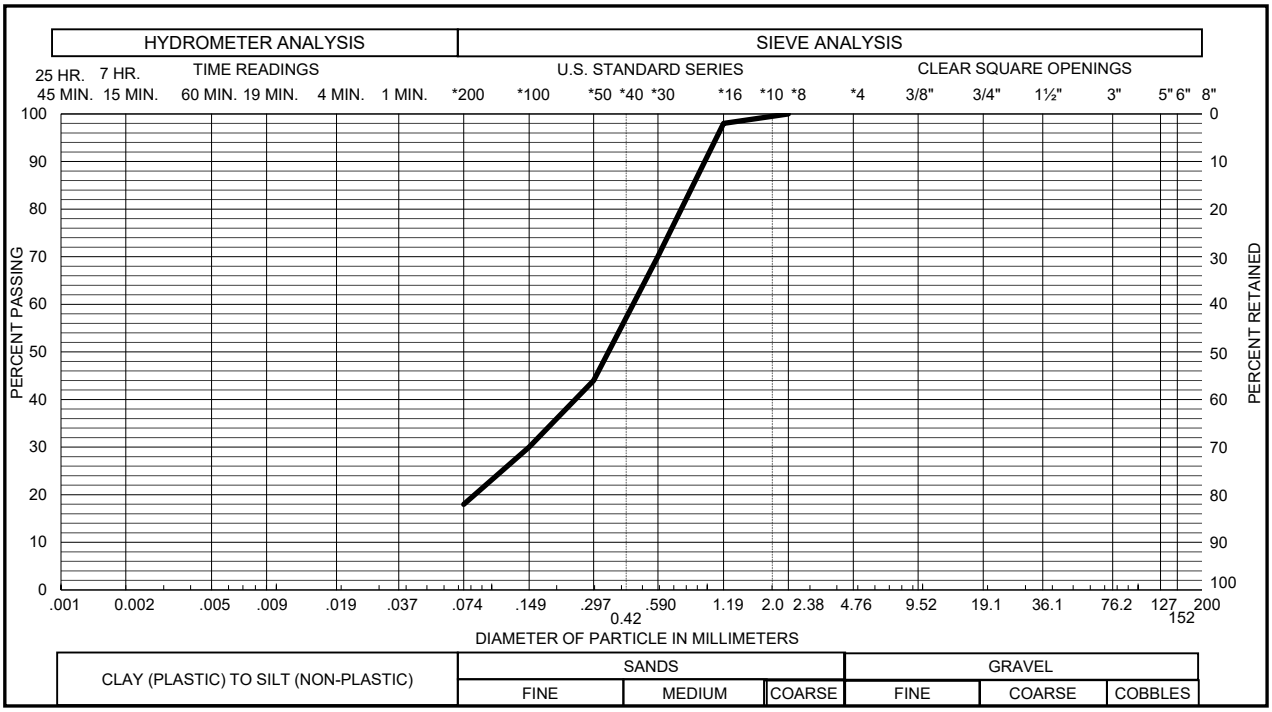
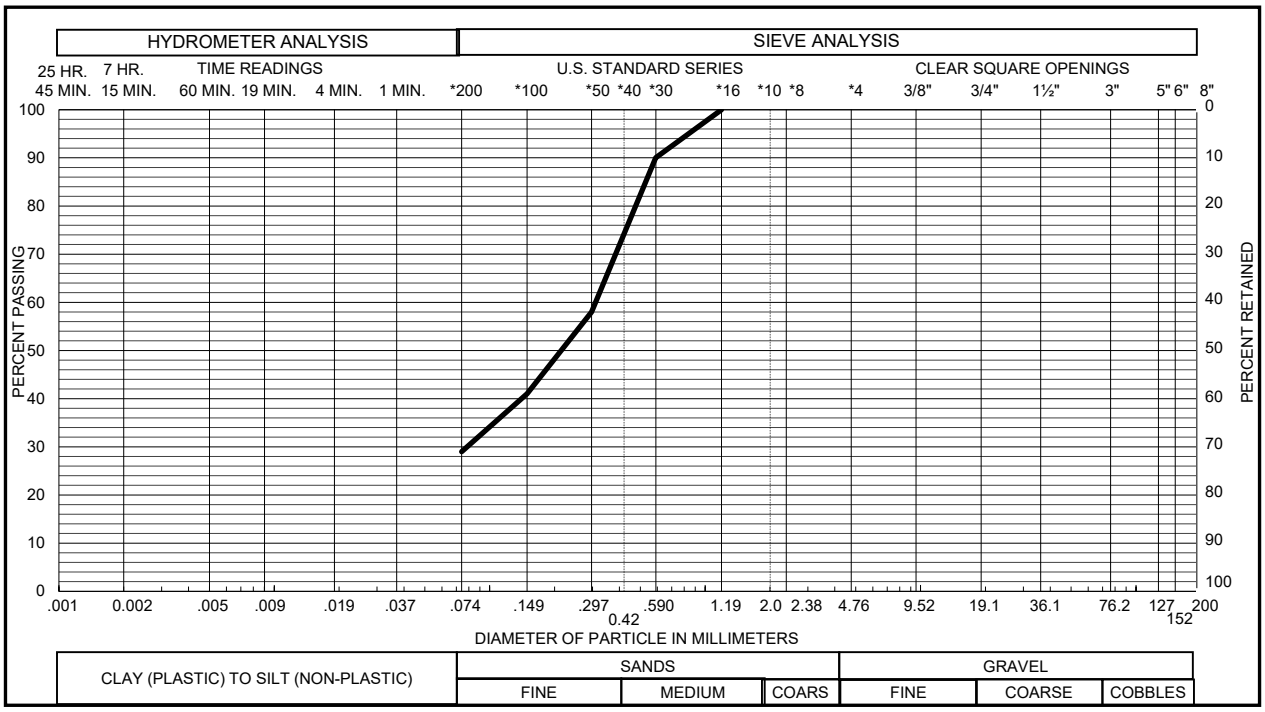
Gradation Test Results

FIG. B-8



Sample of SAND, SILTY (SM)
From TH - 5 AT 4 FEET

GRAVEL 0 % SAND 82 %
SILT & CLAY 18 % LIQUID LIMIT
PLASTICITY INDEX



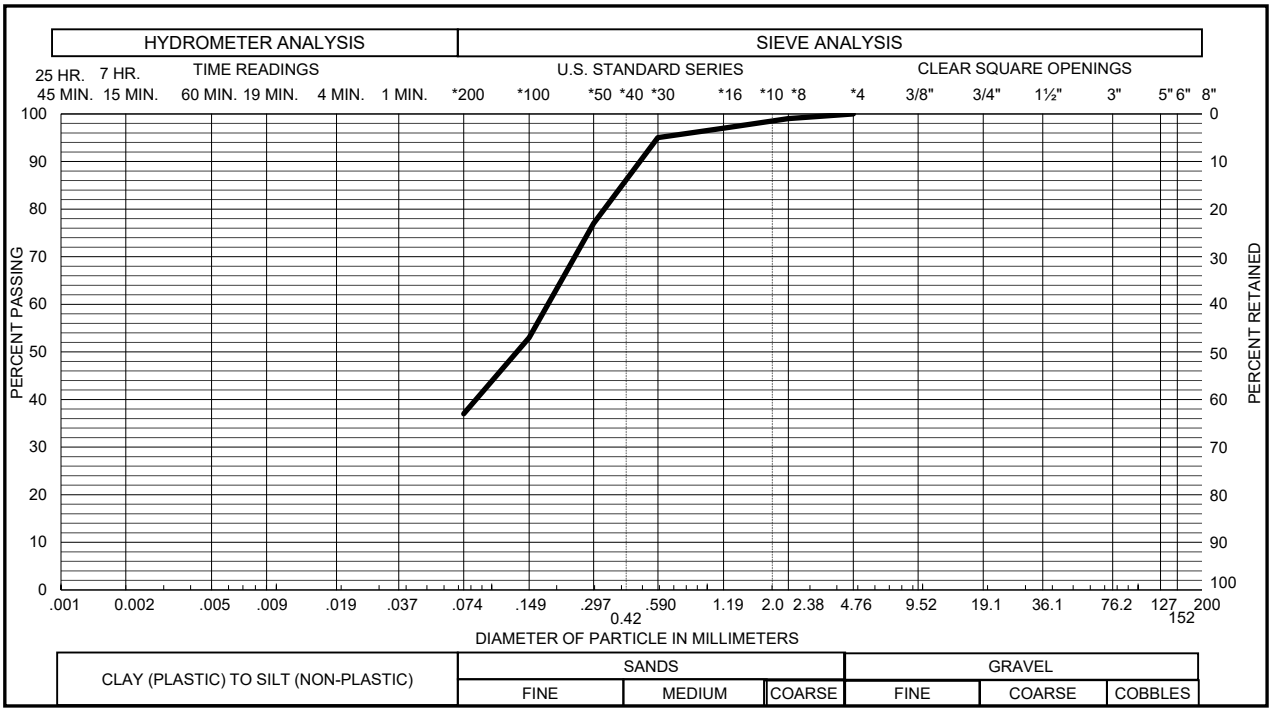
Sample of SAND, CLAYEY (SC)
From TH - 6 AT 4 FEET

GRAVEL 0 % SAND 71 %
SILT & CLAY 29 % LIQUID LIMIT 26
PLASTICITY INDEX 10

EVERGREEN DEVELOPMENT
POWERS AND GRINNEL APARTMENTS
CTL|T PROJECT NO. CS19678-125

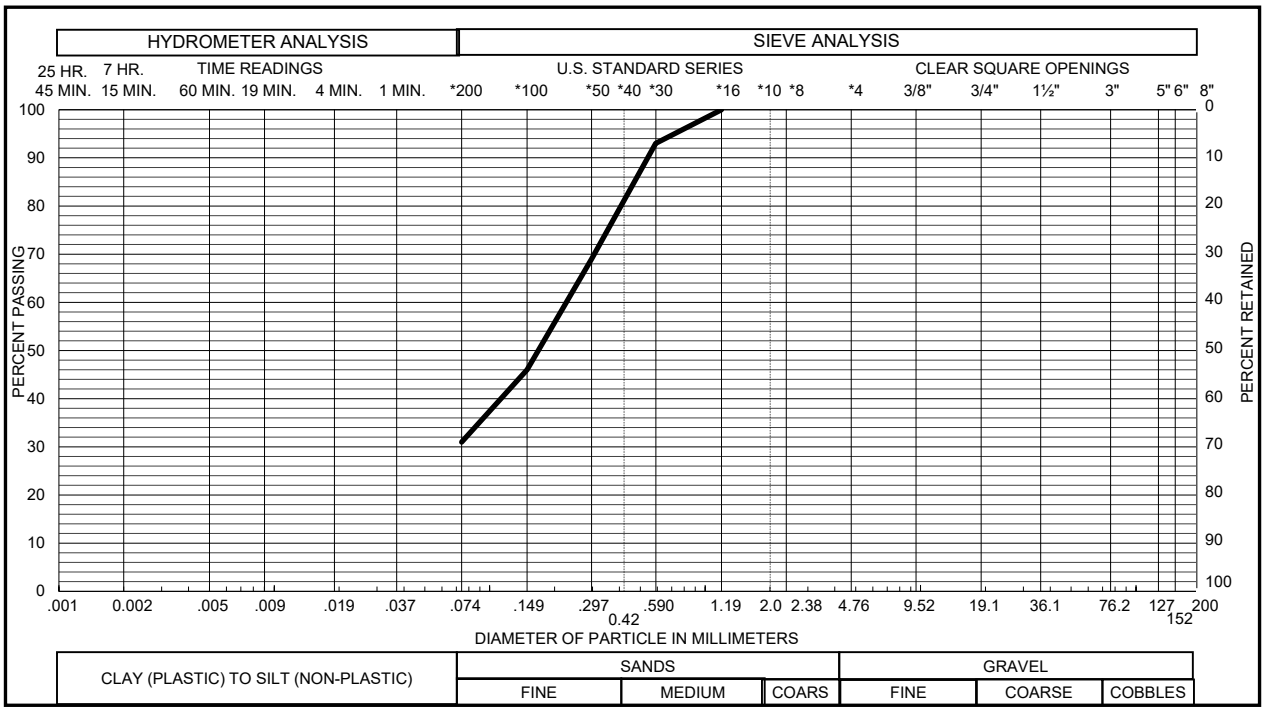
Gradation Test Results

FIG. B-9



Sample of SAND, VERY CLAYEY (SC)
From TH - 6 AT 14 FEET

GRAVEL 0 % SAND 63 %
SILT & CLAY 37 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, SILTY (SM)
From TH - 7 AT 4 FEET

GRAVEL 0 % SAND 69 %
SILT & CLAY 31 % LIQUID LIMIT
PLASTICITY INDEX

EVERGREEN DEVELOPMENT
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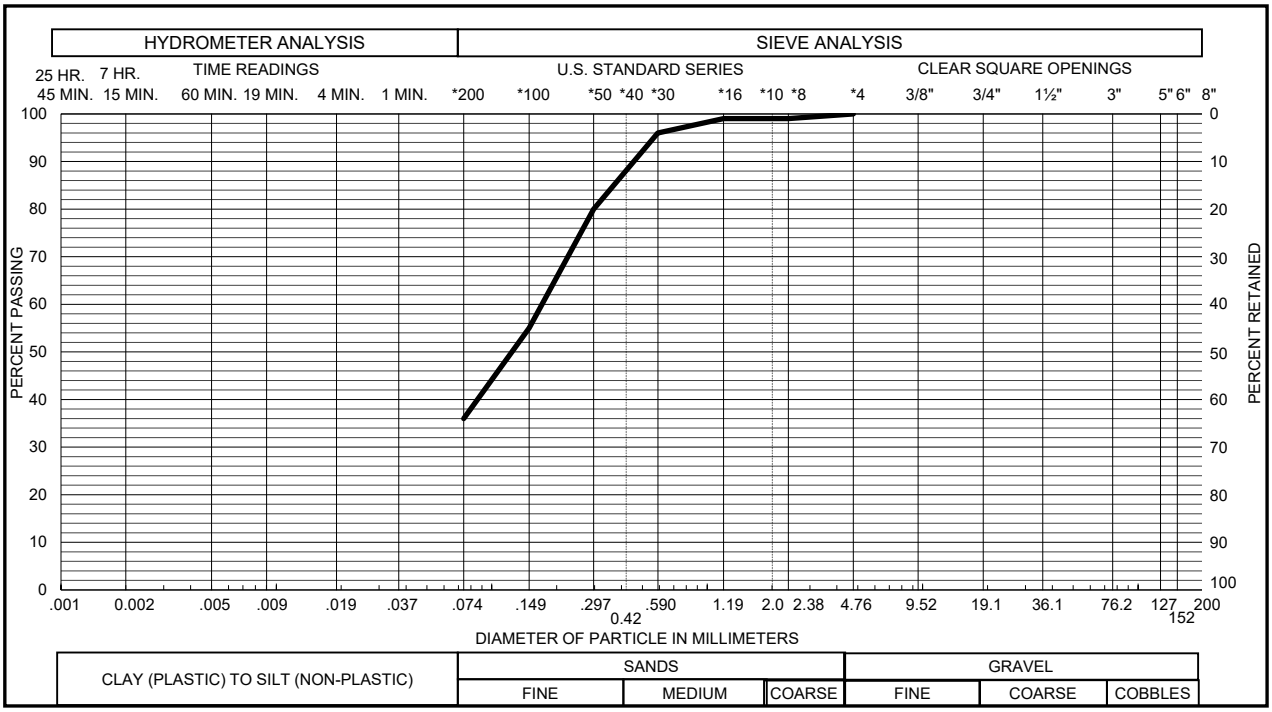
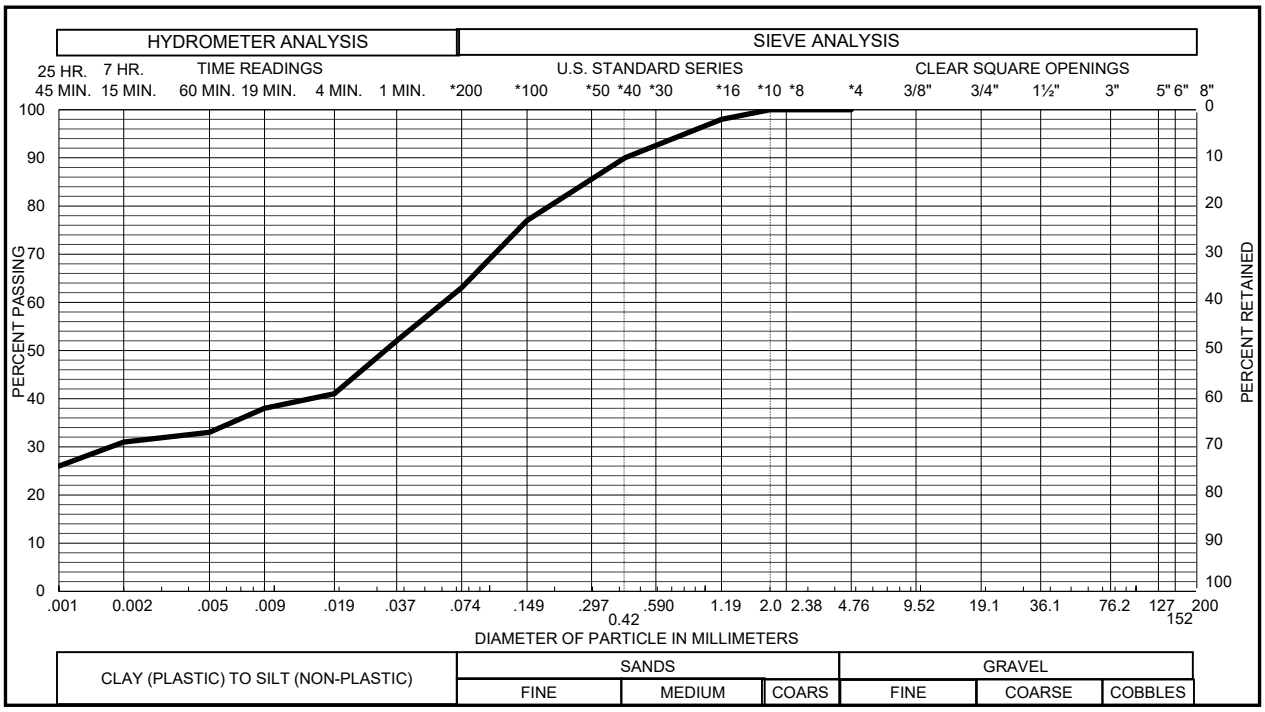
Gradation Test Results

FIG. B-10



Sample of SAND, VERY SILTY (SM)
From TH - 7 AT 9 FEET

GRAVEL 0 % SAND 64 %
SILT & CLAY 36 % LIQUID LIMIT
PLASTICITY INDEX



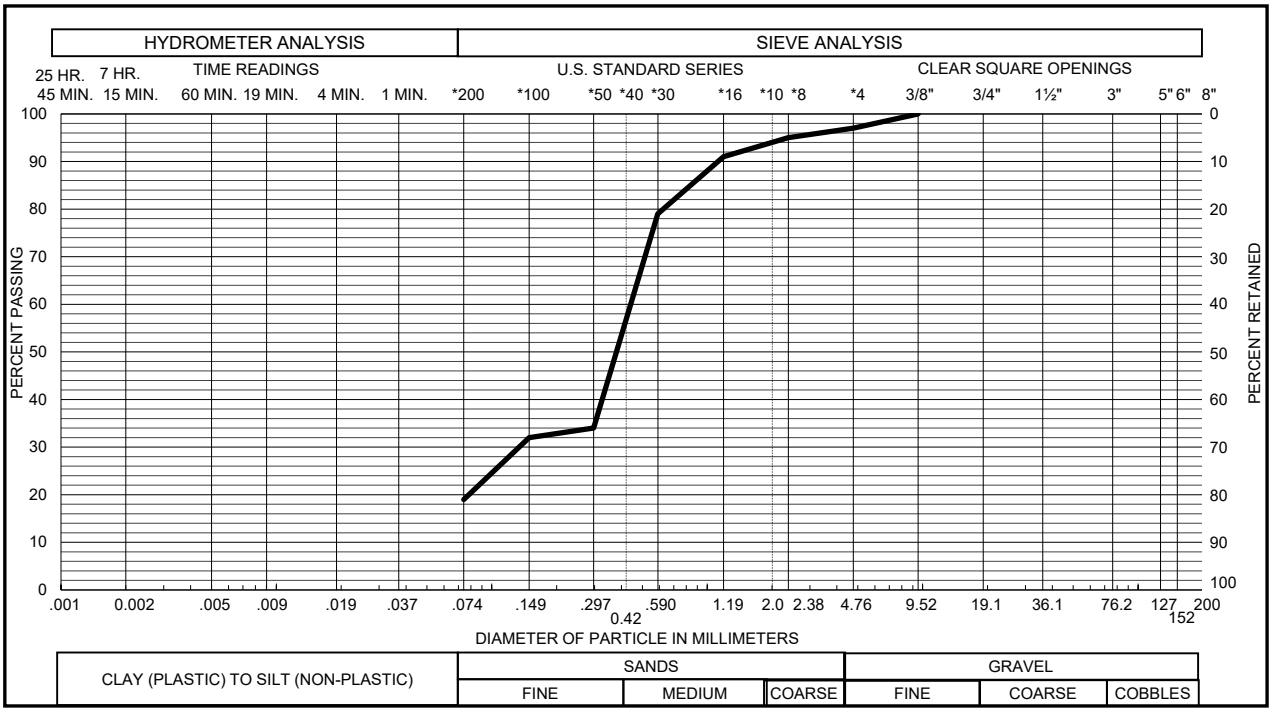
Sample of CLAY, VERY SANDY (CL)
From TH - 8 AT 14 FEET

GRAVEL 0 % SAND 37 %
SILT & CLAY 63 % LIQUID LIMIT 40
PLASTICITY INDEX 20

EVERGREEN DEVELOPMENT
POWERS AND GRINNEL APARTMENTS
CTL|T PROJECT NO. CS19678-125

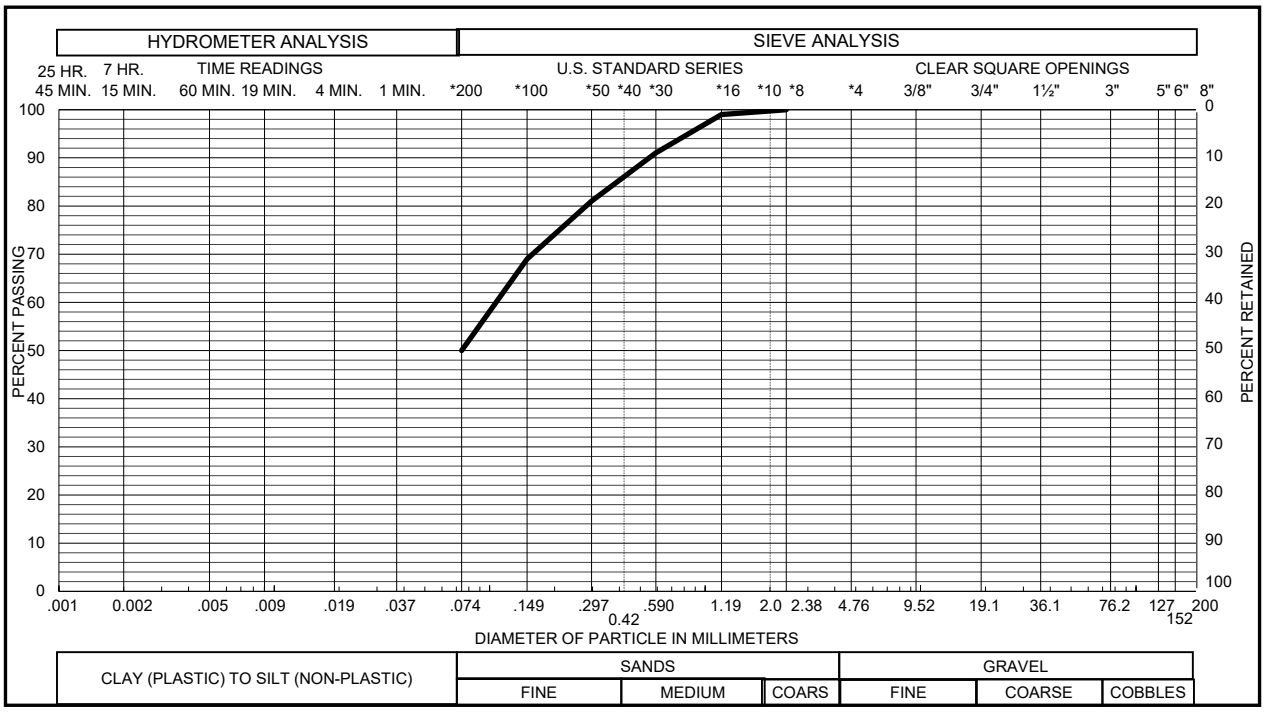
Gradation Test Results

FIG. B-11



Sample of SAND, SILTY (SM)
From TH - 9 AT 9 FEET

GRAVEL 3 % SAND 78 %
SILT & CLAY 19 % LIQUID LIMIT
PLASTICITY INDEX



Sample of CLAY, VERY SANDY (CL)
From TH - 10 AT 4 FEET

GRAVEL 0 % SAND 50 %
SILT & CLAY 50 % LIQUID LIMIT 31
PLASTICITY INDEX 14

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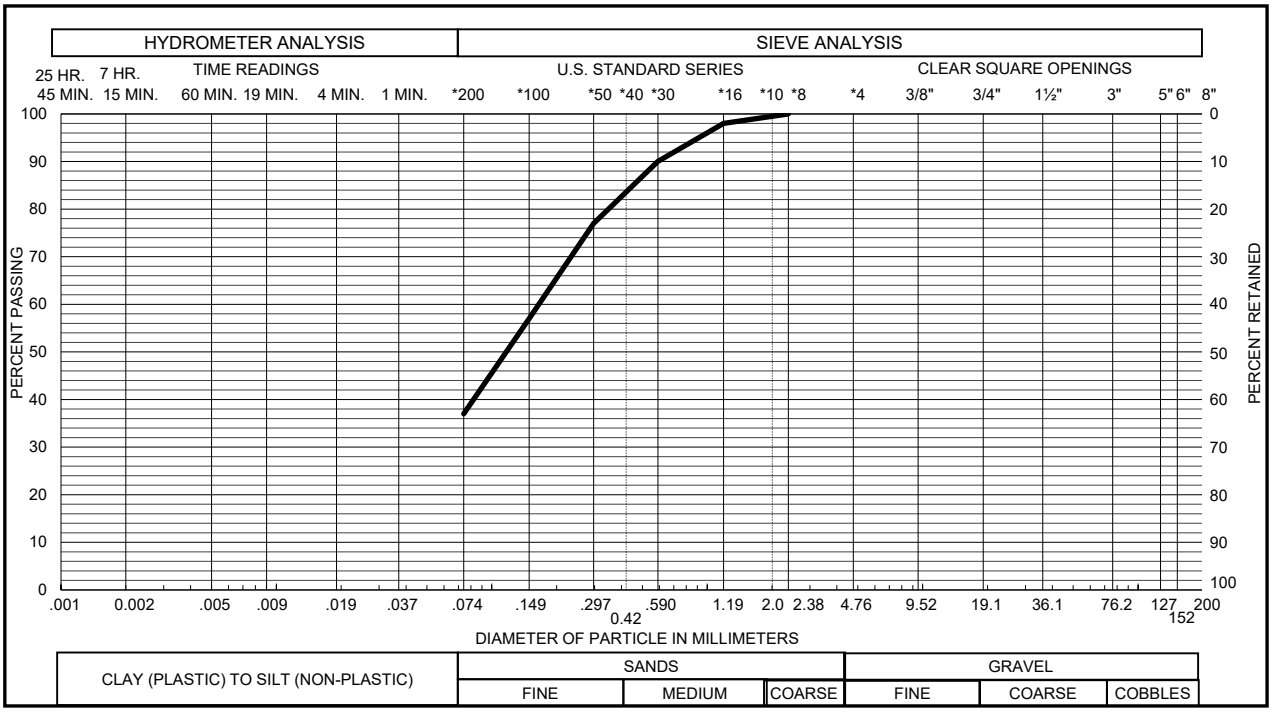
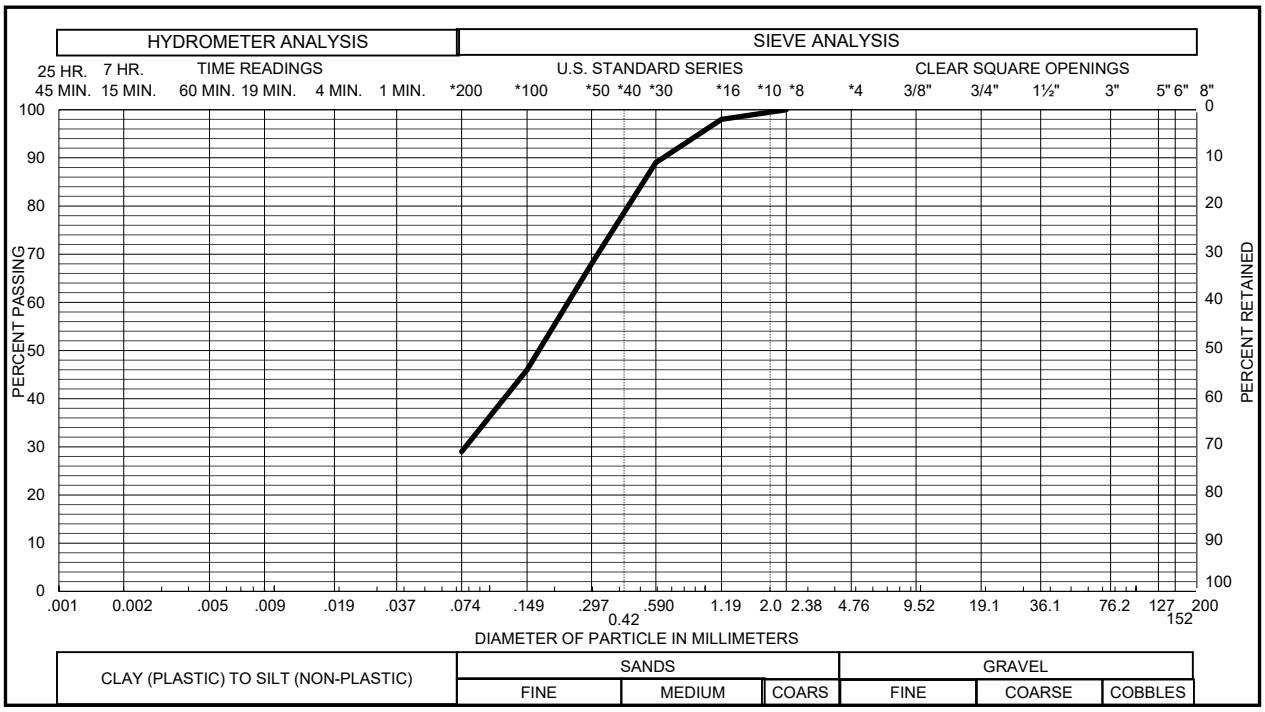
Gradation Test Results

FIG. B-12



Sample of SAND, VERY SILTY (SM)
From TH - 13 AT 4 FEET

GRAVEL 0 % SAND 63 %
SILT & CLAY 37 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, SILTY (SM)
From TH - 15 AT 4 FEET

GRAVEL 0 % SAND 71 %
SILT & CLAY 29 % LIQUID LIMIT 21
PLASTICITY INDEX 4

EVERGREEN DEVELOPMENT
POWERS AND GRINNEL APARTMENTS
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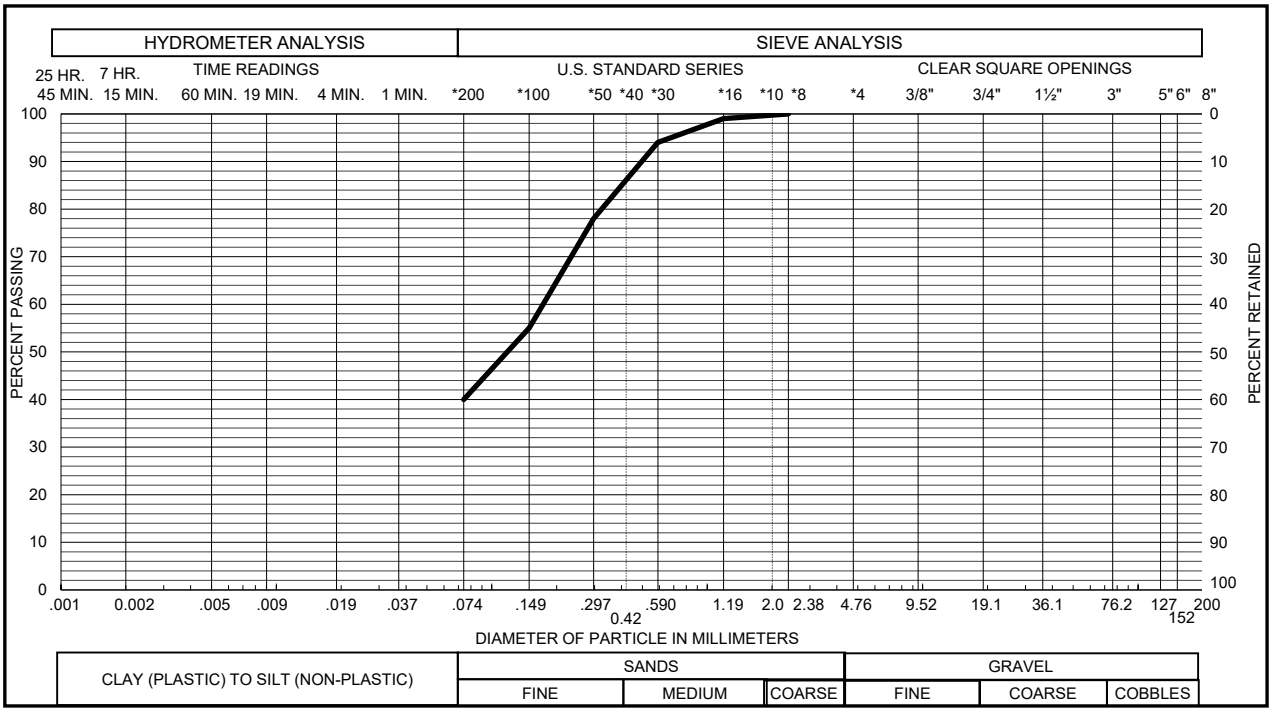
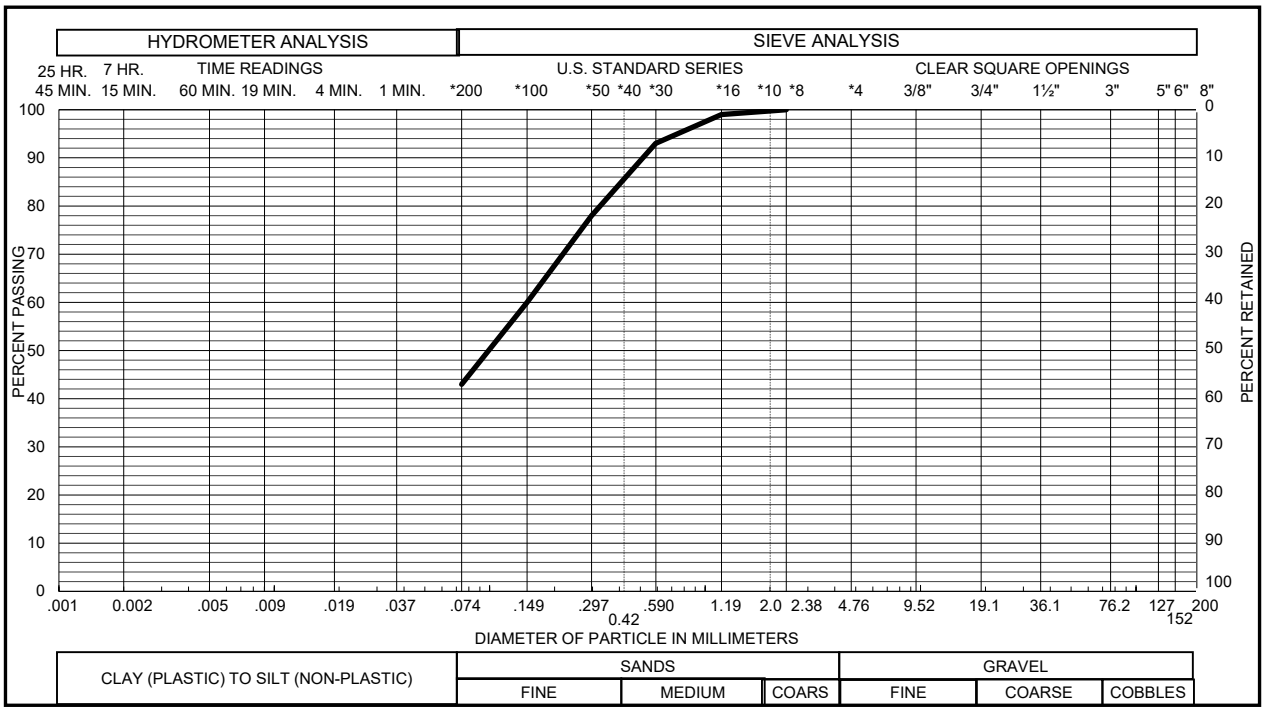
Gradation Test Results

FIG. B-13



Sample of SAND, VERY SILTY (SM)
From TH - 23 AT 9 FEET

GRAVEL 0 % SAND 60 %
SILT & CLAY 40 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, VERY SILTY (SM)
From TH - 24 AT 14 FEET

GRAVEL 0 % SAND 57 %
SILT & CLAY 43 % LIQUID LIMIT
PLASTICITY INDEX

EVERGREEN DEVELOPMENT
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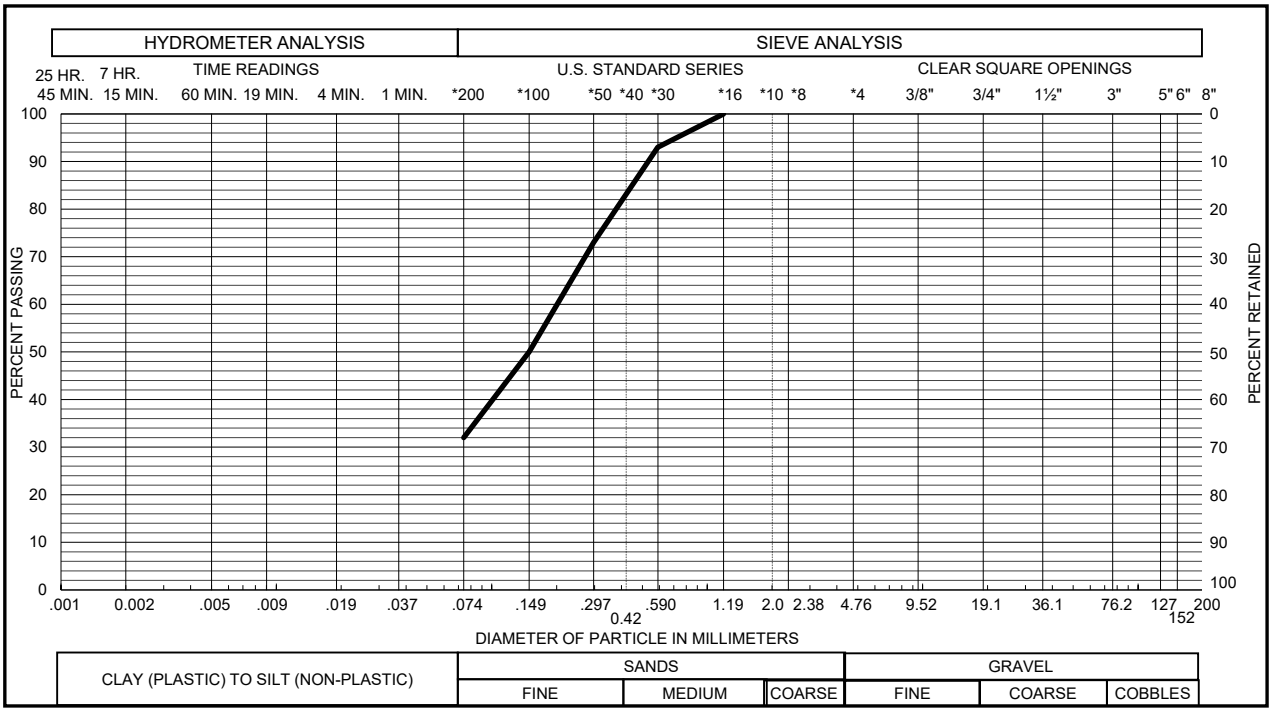
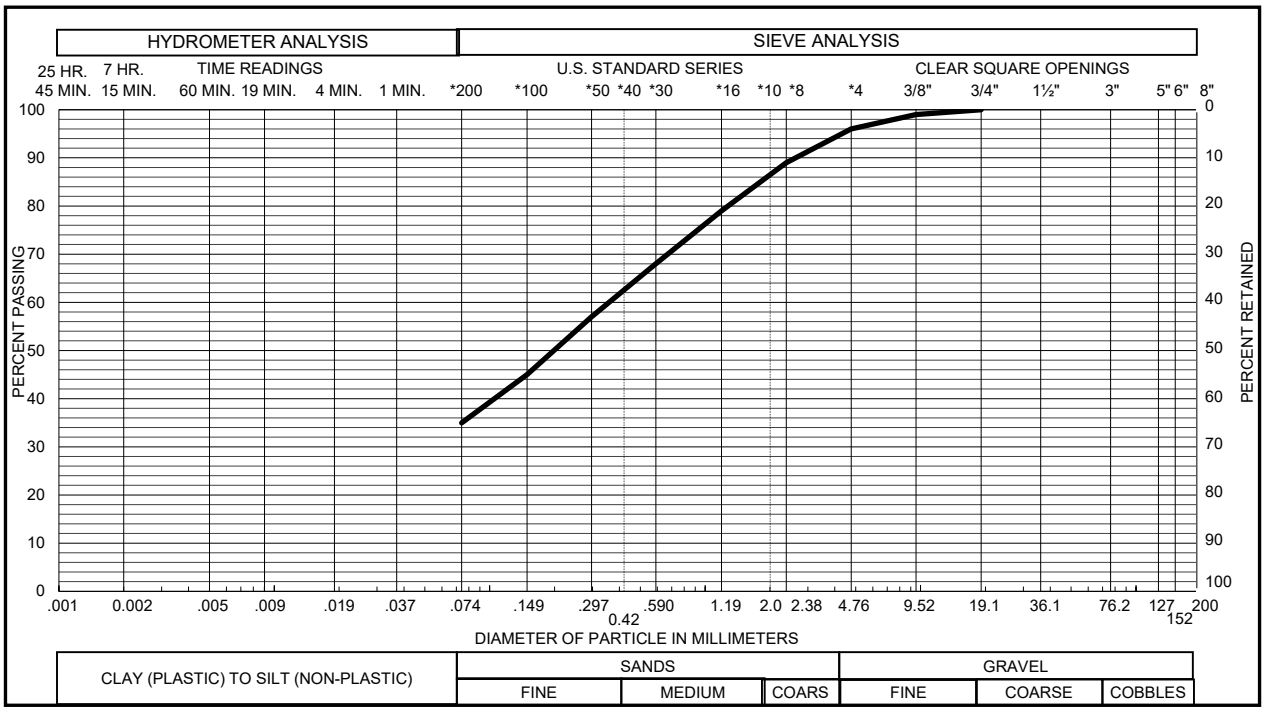
Gradation Test Results

FIG. B-14



Sample of SAND, SILTY (SM)
From TH - 26 AT 14 FEET

GRAVEL 0 % SAND 68 %
SILT & CLAY 32 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, SILTY (SM)
From TH - 34 AT 19 FEET

GRAVEL 4 % SAND 61 %
SILT & CLAY 35 % LIQUID LIMIT
PLASTICITY INDEX

EVERGREEN DEVELOPMENT
POWERS AND GRINNEL APARTMENTS
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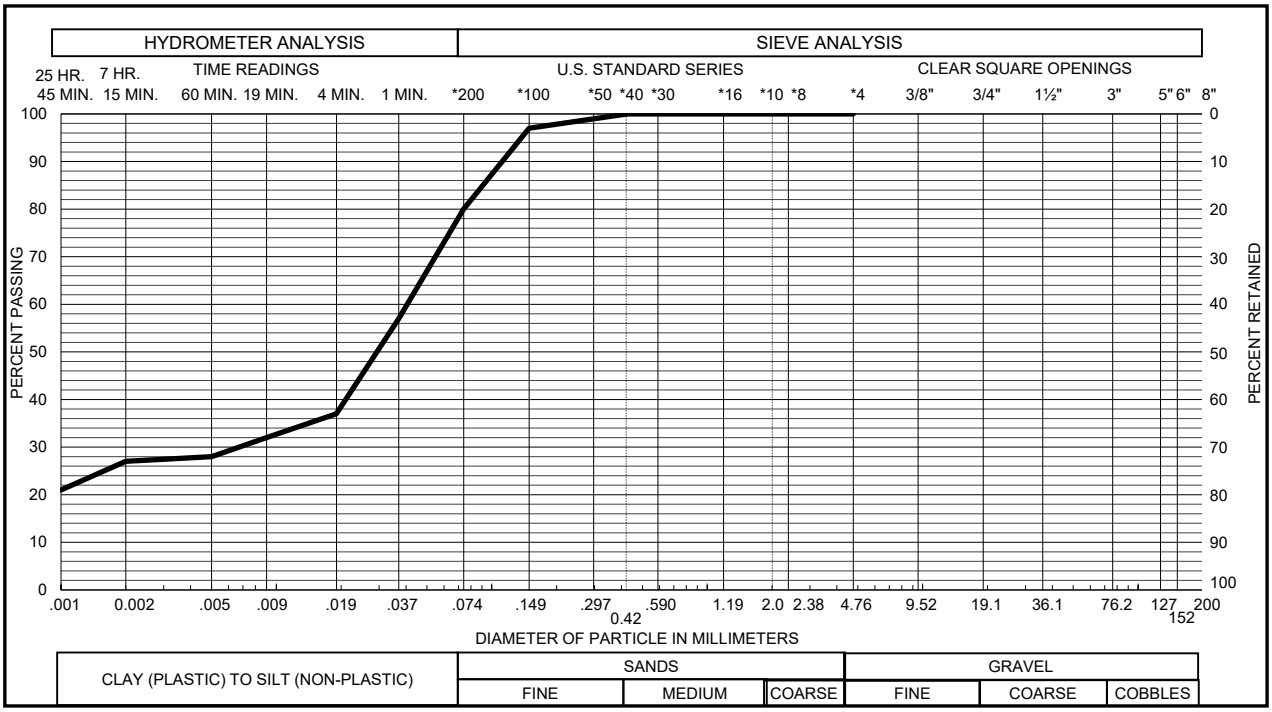
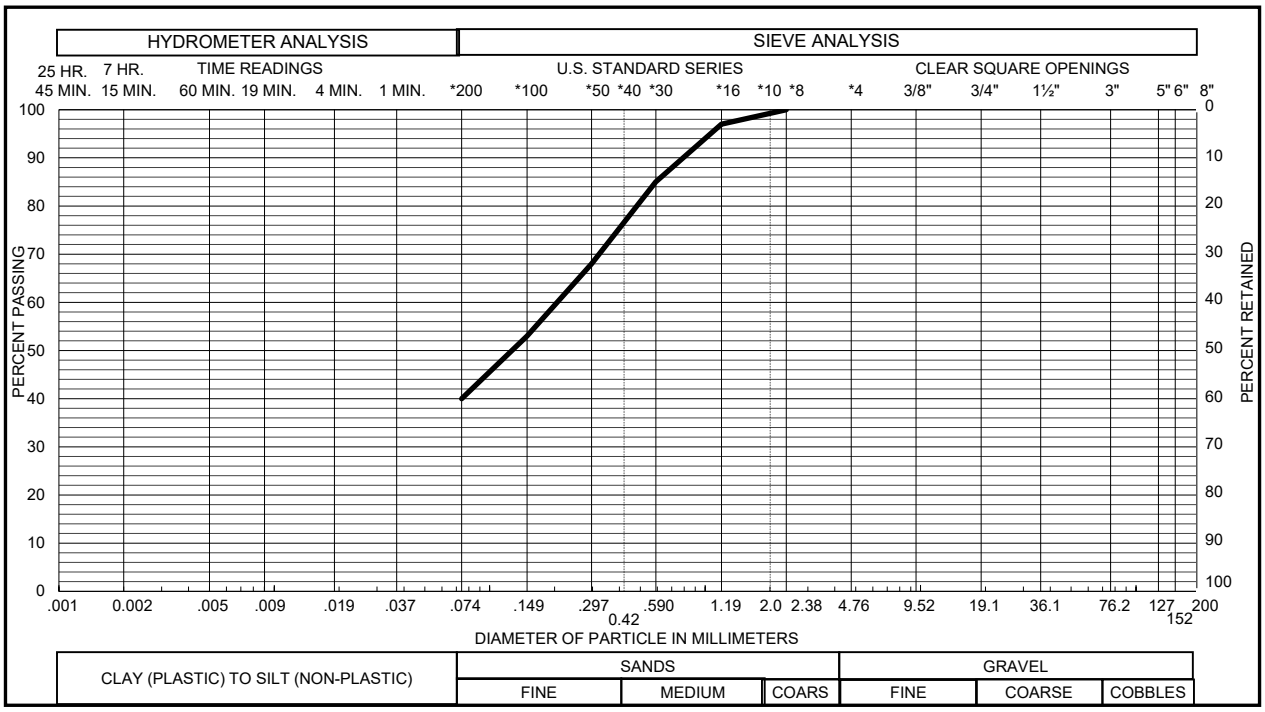
Gradation Test Results

FIG. B-15



Sample of CLAY, SANDY (CL)
From TH - 36 AT 14 FEET

GRAVEL 0 % SAND 20 %
SILT & CLAY 80 % LIQUID LIMIT 33
PLASTICITY INDEX 13



Sample of SAND, VERY SILTY (SM)
From TH - 37 AT 9 FEET

GRAVEL 0 % SAND 60 %
SILT & CLAY 40 % LIQUID LIMIT
PLASTICITY INDEX

EVERGREEN DEVELOPMENT
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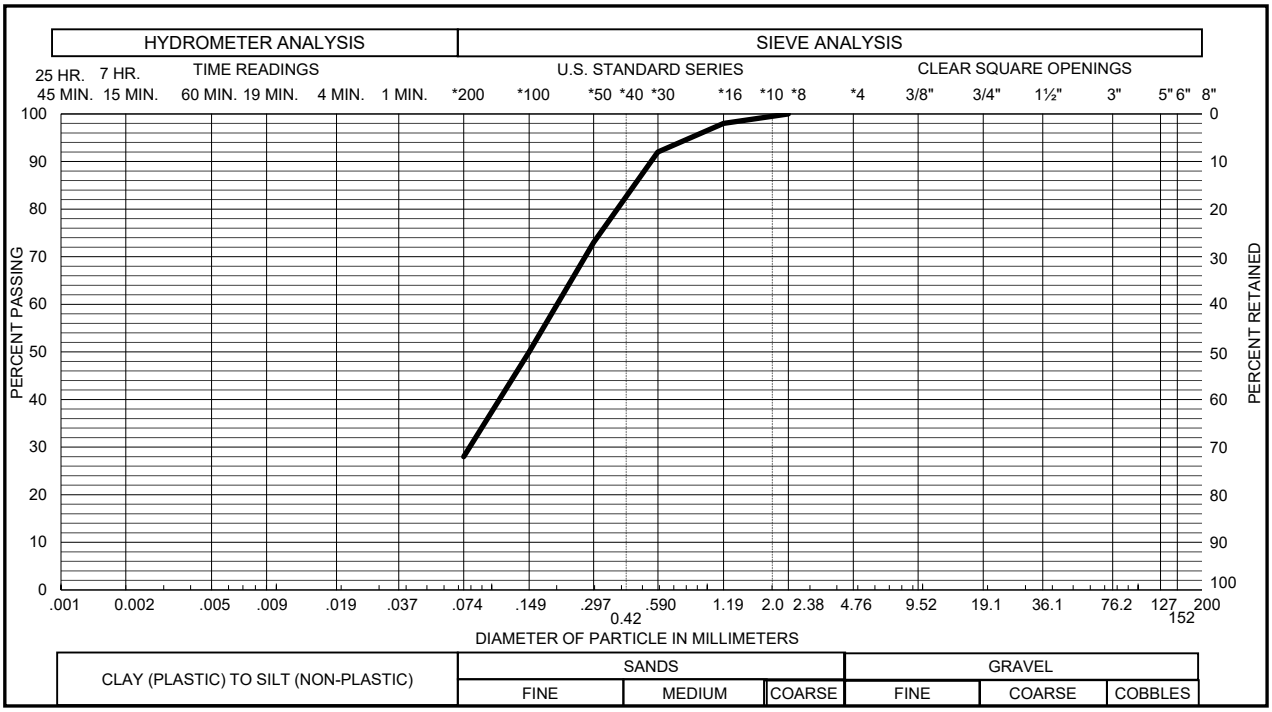
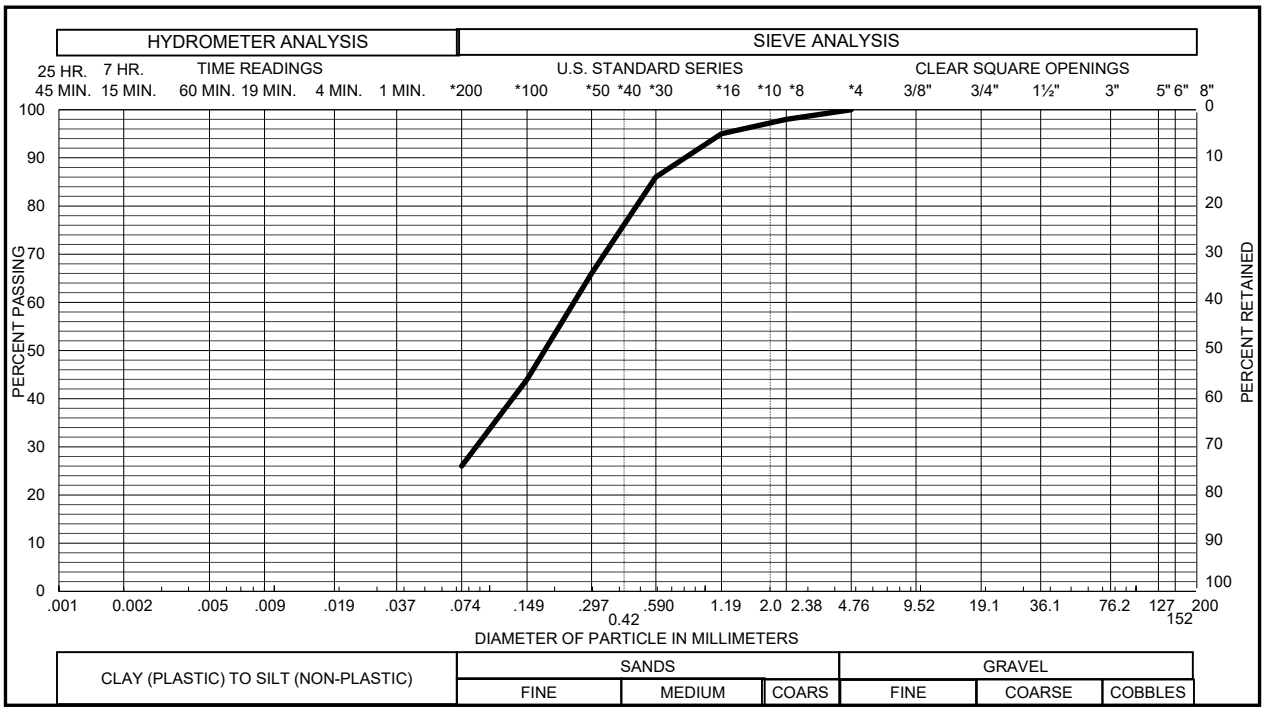
Gradation Test Results

FIG. B-16



Sample of SAND, SILTY (SM)
From TH - 39 AT 4 FEET

GRAVEL 0 % SAND 72 %
SILT & CLAY 28 % LIQUID LIMIT 20
PLASTICITY INDEX 1



Sample of SAND, SILTY (SM)
From TH - 40 AT 4 FEET

GRAVEL 0 % SAND 74 %
SILT & CLAY 26 % LIQUID LIMIT
PLASTICITY INDEX

EVERGREEN DEVELOPMENT
POWERS AND GRINNEL APARTMENTS
CTL|T PROJECT NO. CS19678-125

Gradation Test Results

FIG. B-17

TABLE B-1

SUMMARY OF LABORATORY TESTING
CTL|T PROJECT NO. CS19678-125

BORING	DEPTH (FEET)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS LIQUID LIMIT (%)	ATTERBERG LIMITS PLASTICITY INDEX (%)	SWELL TEST RESULTS* SWELL (%)	SWELL TEST RESULTS* APPLIED PRESSURE (PSF)	SWELL TEST RESULTS* SWELL PRESSURE (PSF)	PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (%)	DESCRIPTION
TH-1	4	6.6	109	27	8				55		CLAY, VERY SANDY (CL)
TH-1	9	7.8	113						60		CLAY, VERY SANDY (CL)
TH-2	9	2.0	123						12		SAND, SLIGHTLY SILTY, GRAVELLY (SP-SM)
TH-3	9	6.1	122			2.1	1100		37		SAND, VERY CLAYEY (SC)
TH-3	14	9.1	117			-0.7	1800		54		CLAY, VERY SANDY (CL)
TH-4	9	4.8	111						21		SAND, SILTY (SM)
TH-5	4	4.5	114						18	<0.1	SAND, SILTY (SM)
TH-5	9	11.1	122			0.1	1100		40		SAND, VERY CLAYEY (SC)
TH-6	4	8.8	95	26	10				29		SAND, CLAYEY (SC)
TH-6	14	11.9	121						37		SAND, VERY CLAYEY (SC)
TH-7	4	6.6	118						31		SAND, SILTY (SM)
TH-7	9	5.3	120						36		SAND, VERY SILTY (SM)
TH-8	14	16.2	114	40	20				63		CLAY, VERY SANDY (CL)
TH-9	9	3.3	114						19		SAND, SILTY (SM)
TH-10	4	6.4	112	31	14				50		CLAY, VERY SANDY (CL)
TH-11	4	3.8	110						20		SAND, SILTY (SM)
TH-12	9	13.5	117			0.0	1100		47		SAND, VERY CLAYEY (SC)
TH-13	4	4.2	110						37		SAND, VERY SILTY (SM)
TH-15	4	4.4	106	21	4				29		SAND, SILTY, CLAYEY (SC-SM)
TH-18	4	2.8	107						29		SAND, SILTY (SM)
TH-19	4	6.0	107			1.1	500			<0.1	CLAY, VERY SANDY (CL)
TH-19	9	6.9	116	28	11				57		CLAY, VERY SANDY (CL)
TH-20	9	2.0	125			2.5	1100		81		CLAY, SANDY (CL)
TH-21	4	3.6	105	20	3				27		SAND, SILTY, CLAYEY (SC-SM)
TH-22	4	6.9	116			1.5	500		61		CLAY, VERY SANDY (CL)
TH-22	9	5.2	111						32		SAND, SILTY, CLAYEY (SC-SM)
TH-23	9	7.3	114						40		SAND, VERY SILTY (SM)
TH-24	4	11.9	107	36	17				77	<0.1	CLAY, SANDY (CL)
TH-24	14	7.0	116						43		SAND, VERY SILTY (SM)
TH-26	4	3.6	113	NL	NP				32		SAND, SILTY (SM)
TH-27	4	4.4	107			-0.3	500		42		SAND, VERY SILTY (SM)
TH-28	4	3.9	107			-2.4	500		30		SAND, SILTY (SM)
TH-28	9	13.0	115	32	14				64		CLAY, VERY SANDY (CL)
TH-31	4	3.6	111						32		SAND, SILTY (SM)
TH-31	9	5.8	110			-1.4	1100				SAND, SILTY (SM)
TH-32	4	4.7	115						34		SAND, SILTY (SM)
TH-33	9	4.5	105	NL	NP				13		SAND, SILTY (SM)
TH-34	9	8.4	111			0.3	1100		75		CLAY, SANDY (CL)
TH-34	19	5.7	124						35		SAND, SILTY (SM)
TH-35	9	3.0	121	17	2				20		SAND, SILTY (SM)

* SWELL MEASURED UNDER ESTIMATED IN-SITU OVERBURDEN PRESSURE.
NEGATIVE VALUE INDICATES COMPRESSION.

TABLE B-1

SUMMARY OF LABORATORY TESTING
CTL|T PROJECT NO. CS19678-125

BORING	DEPTH (FEET)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS		SWELL TEST RESULTS*			PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (%)	DESCRIPTION
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SWELL (%)	APPLIED PRESSURE (PSF)	SWELL PRESSURE (PSF)			
TH-36	14			33	13				80		CLAY, SANDY (CL)
TH-36	19	11.8	119						67		CLAY, SANDY (CL)
TH-37	9	3.9	116						40		SAND, VERY SILTY (SM)
TH-38	14	10.7	121						80		CLAY, SANDY (CL)
TH-39	4	4.1	111	20	1				28		SAND, SILTY (SM)
TH-40	4	4.5	112						26		SAND, SILTY (SM)

* SWELL MEASURED UNDER ESTIMATED IN-SITU OVERBURDEN PRESSURE.
NEGATIVE VALUE INDICATES COMPRESSION.

APPENDIX C

GUIDELINE SITE GRADING SPECIFICATIONS
POWERS AND GRINNELL APARTMENTS
EL PASO COUNTY, COLORADO

GUIDELINE SITE GRADING SPECIFICATIONS

POWERS AND GRINNELL APARTMENTS
EL PASO COUNTY, COLORADO

1. DESCRIPTION

This item consists of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary pavement and building pad elevations. These specifications also apply to compaction of materials that may be placed outside of the project.

2. GENERAL

The Soils Engineer will be the Owner's representative. The Soils Engineer will approve fill materials, method of placement, moisture contents and percent compaction.

3. CLEARING JOB SITE

The Contractor shall remove all trees, brush and rubbish before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures of any kind.

4. SCARIFYING AREA TO BE FILLED

All topsoil, vegetable matter, and existing fill shall be removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features that would prevent uniform compaction by the equipment to be used.

5. PLACEMENT OF FILL ON NATURAL SLOPES

Where natural slopes are steeper than 20 percent (5:1, horizontal to vertical) and fill placement is required, horizontal benches shall be cut into the hillside. The benches shall be at least 12 feet wide or 1-1/2 times the width of the compaction equipment and be provided at a vertical spacing of not more than 5 feet (minimum of two benches). Larger bench widths may be required by the Engineer. Fill shall be placed on completed benches as outlined within this specification.

6. COMPACTING AREA TO BE FILLED

After the foundation for the fill has been cleared and scarified, it shall be disced or bladed until it is free from large clods, brought to a workable moisture content and compacted.

7. FILL MATERIALS

Fill soils shall be free from vegetable matter or other deleterious substances and shall not contain rocks or lumps having a diameter greater than six (6) inches.

Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer or imported to the site.

8. MOISTURE CONTENT

For fill material classifying as CH or CL, the fill shall be moisture treated to between 1 and 4 percent above optimum moisture content as determined by ASTM D 698, if it is to be placed within 15 feet of the final grade. For deep cohesive fill (greater than 15 feet below final grade), it shall be moisture conditioned to within ±2 percent of optimum. Soils classifying as SM, SC, SW, SP, GP, GC and GM shall be moisture treated to within 2 percent of optimum moisture content as determined by ASTM D 1557. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disc the fill soils to provide uniform moisture content throughout the soils.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction to be obtained, all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

9. COMPACTION OF FILL AREAS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Granular fill placed less than 10 feet below final grade shall be compacted to at least 95 percent of maximum dry density as determined in accordance with ASTM D 1557. Cohesive fills placed less than 10 feet below final grade shall be compacted to at least 95 percent of maximum dry density as determined in accordance with ASTM D 698. For deep, cohesive fill (to be placed 10 feet or deeper below final grade), the material shall be compacted to at least 98 percent of maximum standard Proctor dry density (ASTM D 698). Granular fill placed more than 10 feet below final grade shall be compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557). Deep fills shall be placed within 2 percent of optimum moisture content. Fill materials shall be placed such that the thickness of loose materials does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Soils Engineer for soils classifying as claystone, CL, CH or SC. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Soils Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to ensure that the required density is obtained.

10. COMPACTION OF SLOPES

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of 3 to 5 feet in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

11. DENSITY TESTS

Field density tests will be made by the Soils Engineer at locations and depths of his/her choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests will be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved. The criteria for acceptance of fill shall be:

A. Moisture

The allowable ranges for moisture content of the fill materials specified above in "Moisture Content" are based on design considerations. The moisture shall be controlled by the Contractor so that moisture content of the compacted earth fill, as determined by tests performed by the Soils Engineer, shall be within the limits given. The Soils Engineer will inform the Contractor when the placement moisture is less than or exceeds the limits specified above and the Contractor shall immediately make adjustments in procedures as necessary to maintain placement moisture content within the specified limits.

B. Density

1. The average dry density of all material shall not be less than the dry density specified.

2. No more than 20 percent of the material represented by the samples tested shall be at dry densities less than the dry density specified.

3. Material represented by samples tested having a dry density more than 2 percent below the specified dry density will be rejected. Such rejected

materials shall be reworked until a dry density equal to or greater than the specified dry density is obtained.

12. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Engineer indicates the moisture content and density of previously placed materials are as specified.

13. NOTICE REGARDING START OF GRADING

The Contractor shall submit notification to the Soils Engineer and owner advising them of the start of grading operations at least three (3) days in advance of the starting date. Notification shall also be submitted at least three days in advance of any resumption dates when grading operations have been stopped for any reason other than adverse weather conditions.

14. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Engineer, as specified under “Density Tests” above, will be submitted progressively to the Owner. Dry density, moisture content and percent compaction will be reported for each test taken.

APPENDIX C – Standard Operating Procedures

Outlook Powers & Grinnell Standard Operating Procedure (SOP)

Minor Spill of Material (Paint, Stain, Solvent, Glue) (Less than Reportable Quantity)

A. Purpose

The purpose of this Standard Operating Procedure is to establish uniform procedures for clean up and disposal of material from a minor accidental spill of paint, stain, solvent, or glue. The procedures outlined in this SOP are applicable to all personnel working on site. Clean up and proper disposal of spilled material into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled material from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Many construction materials may be flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Quickly control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
3. Contact the Responsible Person on site to enact the emergency response contact procedure.

a. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill. In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:
    1. Call 911 for fire control if necessary.
    2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
    3. El Paso County: (719) 385-5957
b. A release of any chemical, oil, petroleum product, sewage, etc., which may enter waters of the State of Colorado (which include surface water, ground water, and dry gullies or storm sewers leading to surface water) must be reported to CDPHE immediately (25-8-601 CRS).

4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co. to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Evergreen Development, 1873 S Bellaire St Suite 1106, Denver, CO 80222, for a period of 3 years from the date of the spill.

H. After Incident Briefing

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future

spills. All pertinent data shall be documented. All findings from the debriefing should be discussed at the next Safety Meeting. El Paso County shall be notified.

Standard Operating Procedure (SOP)

Minor Fuel or Oil Spill (Less than 5 Gallons)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a minor accidental spill of fuel (gasoline or diesel) or oil (hydraulic or motor). The procedures outlined in this SOP are applicable to all personnel working on site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Quickly control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
3. Contact the Responsible Person on site to enact the emergency response contact procedure.
    a. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill.

In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:

1. Call 911 for fire control if necessary.
2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
3. El Paso County: (719) 385-5957

b. A release of any chemical, oil, petroleum product, sewage, etc., which may enter waters of the State of Colorado (which include surface water, ground water, and dry gullies or storm sewers leading to surface water) must be reported to CDPHE immediately (25-8-601 CRS).

4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Evergreen Development, 1873 S Bellaire St Suite 1106, Denver, CO 80222, for a period of 3 years from the date of the spill.

H. **After Incident Briefing**

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data will be recorded. All findings from the debriefing should be discussed at the next Safety Meeting. El Paso County shall be notified.

Standard Operating Procedure (SOP)

Small Fuel or Oil Spill (5 Gallons to Less than 25 Gallons)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a small accidental spill of fuel (gasoline or diesel) or oil (hydraulic, or motor). The procedures outlined in this SOP are applicable to all personnel working on Site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil do not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Contact the Responsible Person on site to enact the emergency response contact procedure.
    a. The Responsible Person begins contacting Emergency Response Agencies.
        1. For gasoline or diesel spill call 911 for fire control
    b. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill.

In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:

1. Call 911 for fire control if necessary.
2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
3. El Paso County: (719) 385-5957

c. A release of any chemical, oil, petroleum product, sewage, etc., which may enter waters of the State of Colorado (which include surface water, ground water, and dry gullies or storm sewers leading to surface water) must be reported to CDPHE immediately (25-8-601 CRS).

3. Attempt to control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface, this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co. to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Evergreen Development, 1873 S Bellaire St Suite 1106, Denver, CO 80222, for a period of 3 years from the date of the spill.

H. After Incident Briefing

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data will be recorded. The CDPHE shall be notified of a major

spill by a written follow up within five days of the incident. All findings from the debriefing should be discussed at the next Safety Meeting. El Paso County shall be notified. El Paso County will require one copy of any documents that are sent to the state.

Standard Operating Procedure (SOP)

Significant Fuel or Oil Spill (25 Gallons or More)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a significant accidental spill of fuel (gasoline or diesel) or oil (hydraulic or motor). The procedures outlined in this SOP are applicable to all personnel working on site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Ensure the safety of personnel in the area. If necessary, evacuate the area and wait for Emergency Response Personnel.
3. Contact the Chain of Command on site to enact the emergency response contact procedure.
    a. Responsible Person begins contacting Emergency Response Agencies.
        1. Call 911 for fire control

2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
3. El Paso County: (719) 385-5957

b. Responsible Person consults the MSDS for spill procedure

4. If it can be safely accomplished, attempt to control the spill by stopping or securing the spill source.
5. If it can be safely accomplished, attempt to prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread along the downhill side to stop any flow.
6. If it can be safely accomplished, attempt to prevent the material from entering a storm inlet or manhole by constructing a dam of absorbent material in the gutter upstream from the inlet.
7. Emergency Response Personnel should handle stabilization of the spill and initial cleanup.
8. Final cleanup and disposal of contaminated material should be handled by the Site Contracted Emergency Response and Disposal Co.
9. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
10. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Evergreen Development, 1873 S Bellaire St Suite 1106, Denver, CO 80222, for a period of 3 years from the date of the spill.

H. After Incident Briefing

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data will be recorded. The CDPHE shall be notified of a major spill by a written follow up within five days of the incident. All findings from the debriefing should be discussed at the next Safety Meeting. El Paso County shall be notified. El Paso County will require one copy of any documents that are sent to the state.

APPENDIX D – City Standard Forms and Requirements

3275 Akers Drive
Colorado Springs, CO 80922
Phone 719-520-6460
Fax 719-520-6879
www.elpasoco.com

EL PASO COUNTY
STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
1. STORMWATER MANAGEMENT PLAN (in the "Applicant" column specify the page number for each item)			
1	Applicant (owner/designated operator), SWMP Preparer, Qualified Stormwater Manager, and Contractor Information. (On cover/title sheet)	Y	
2	Table of Contents	Y	
3	Site description and location to include: vicinity map with nearest street/crossroads description	Y	
4	Narrative description of construction activities proposed (e.g., may include clearing and grubbing, temporary stabilization, road grading, utility / storm installation, final grading, final stabilization, and removal of temporary control measures)	Y	
5	Phasing plan – may require separate drawings indicating initial, interim, and final site phases for larger projects. Provide “living maps” that can be revised in the field as conditions dictate	Y	
6	Proposed sequence for major activities: Provide a construction schedule of anticipated starting and completion dates for each stage of land-disturbing activity depicting conservation measures anticipated, including the expected date on which the final stabilization will be completed	Y	
7	Estimates of the total site area and area to undergo disturbance; current area of disturbance must be updated on the SWMP as changes occur	Y	
8	Soil erosion potential and impacts on discharge that includes a summary of the data used to determine soil erosion potential	N/A	
9	A description of existing vegetation at the site and percent ground cover and method used to determine ground cover	Y	
10	Location and description of all potential pollution sources including but not limited to: disturbed and stored soils; vehicle tracking; management of contaminated soils; loading and unloading operations; outdoor storage of materials; vehicle and equipment maintenance and fueling; significant dust generating process; routine maintenance activities involving fertilizers, pesticides, herbicides, detergents, fuels, solvents, oils, etc.; on-site waste management; concrete truck/equipment washing; dedicated asphalt, concrete batch plants and masonry mixing stations; non-industrial waste such as trash and portable toilets	Y	
11	Material handling to include spill prevention and response plan and procedures	Y	
12	Spill prevention and pollution controls for dedicated batch plants	N/A	
13	Other SW pollutant control measures to include waste disposal and off-site soil tracking	Y	
14	Location and description of any anticipated allowable non-stormwater discharge (ground water, springs, irrigation, discharge covered by CDPHE Low Risk Guidance, etc.)	N/A	
15	Name(s) of ultimate receiving waters; size, type and location of stormwater outfall or storm sewer system discharge	Y	
16	Description of all stream crossings located within the project area or statement that no streams cross the project area	Y	

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STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
17	SWMP Map to include:		
17a	construction site boundaries	Y	
17b	flow arrows to depict stormwater flow directions	Y	
17c	all areas of disturbance	Y	
17d	areas of cut and fill	Y	
17e	areas used for storage of building materials, soils (stockpiles) or wastes	Y	
17f	location of any dedicated asphalt / concrete batch plants	Y	
17g	location of all structural control measures	Y	
17h	location of all non-structural control measures	Y	
17i	springs, streams, wetlands and other surface waters, including areas that require maintenance of pre-existing vegetation within 50 feet of a receiving water	Y	
18	Narrative description of all structural control measures to be used. Modifications to EPC standard control measures must meet or exceed County-approved details	Y	
19	Description of all non-structural control measures to be used including seeding, mulching, protection of existing vegetation, site watering, sod placement, etc.	Y	
20	Technical drawing details for all control measure installation and maintenance; custom or other jurisdiction's details used must meet or exceed EPC standards	Y	
21	Procedure describing how the SWMP is to be revised	Y	
22	Description of Final Stabilization and Long-term Stormwater Quality (describe nonstructural and structural measures to control SW pollutants after construction operations have been completed, including detention, water quality control measure etc.)	Y	
23	Specification that final vegetative cover density is to be 70% of pre-disturbed levels	Y	
24	Outline of permit holder inspection procedures to install, maintain, and effectively operate control measures to manage erosion and sediment	Y	
25	Record keeping procedures identified to include signature on inspection logs and location of SWMP records on-site	Y	
26	If this project relies on control measures owned or operated by another entity, a documented agreement must be included in the SWMP that identifies location, installation and design specifications, and maintenance requirements and responsibility of the control measure(s)	N/A	
	Please note: all items above must be addressed. If not applicable, explain why, simply identifying "not applicable" will not satisfy CDPHE requirement of explanation.		
2. <u>ADDITIONAL REPORTS/PERMITS/DOCUMENTS</u>			
a	Grading and Erosion Control Plan (signed)	Y	
b	Erosion and Stormwater Quality Control Permit (ESQCP) (signed)		

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EL PASO COUNTY
STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
3. APPLICANT COMMENTS			
a			
b			
c			
4. CHECKLIST REVIEW CERTIFICATIONS			
a	Applicant: The Stormwater Management Plan was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said Plan has been prepared according to the criteria established by the County and State for Stormwater Management Plans. _____ _____ Engineer of Record and/or Date Qualified Stormwater Manager Signature		
b	Review Engineer: The Stormwater Management Plan was reviewed and found to meet the checklist requirements except where otherwise noted or allowed by an approved deviation request. _____ _____ Review Engineer Date		

APPENDIX E – Grading and Erosion Control Plan

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

OUTLOOK POWERS & GRINNELL

SITUATED IN THE NORTHWEST 1/4 OF SECTION 7,
TOWNSHIP 15 SOUTH, RANGE 65 WEST OF THE 6TH P.M.,
CITY OF COLORADO SPRINGS, COUNTY OF EL PASO,
STATE OF COLORADO.

GRADING AND EROSION CONTROL PLAN

LEGAL DESCRIPTION:

A PARCEL OF LAND IN THE SOUTHWEST QUARTER OF SECTION 6 AND THE NORTHWEST QUARTER OF SECTION 7, TOWNSHIP 15 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID SECTION 7;

THENCE SOUTH 21°16'15" EAST, A DISTANCE OF 1,234.30 FEET TO THE SOUTHEAST CORNER OF THE SAID PARCEL WHICH IS ALSO THE INTERSECTION OF THE EAST RIGHT-OF-WAY OF GRINNELL BOUELVARD AS DENOTED UNDER RECEPTION NUMBER 09080408 AND THE NORTH RIGHT-OF-WAY OF GOLDFIELD DRIVE AS DENOTED UNDER RECPETION NUMBER 207712585 BOTH WITH THE CLERK AND RECORDER OF EL PASO COUNTY AND THE POINT OF BEGINNING;

THENCE DEPARTING THE SAID NORTH RIGHT-OF-WAY OF GOLDFIELD DRIVE AND CONTINUING NORTHERLY ALONG THE SAID EAST RIGHT-OF-WAY OF GRINNELL BOULEVARD THE FOLLOWING SIX (6) COURSES:

1. NORTH 08°19'24" WEST, A DISTANCE OF 695.98 FEET TO A POINT OF CURVATURE;
2. ALONG THE ARC OF SAID CURVE TO THE RIGHT AN ARC LENGTH OF 190.45 FEET, SAID CURVE HAVING A RADIUS OF 890.00 FEET, A CENTRAL ANGLE OF 12°15'39", AND A CHORD WHICH BEARS NORTH 02°15'50" WEST, A CHORD DISTANCE OF 190.09 FEET TO A POINT OF NON-TANGENT;
3. ALONG THE ARC OF SAID CURVE TO THE RIGHT AN ARC LENGTH OF 209.47 FEET, SAID CURVE HAVING A RADIUS OF 856.07 FEET, A CENTRAL ANGLE OF 14°01'11", AND A CHORD WHICH BEARS NORTH 12°14'55" EAST, A CHORD DISTANCE OF 208.95 FEET;
4. NORTH 27°27'34" EAST, A DISTANCE OF 142.19 FEET TO A POINT OF CURVATURE;
5. ALONG THE ARC OF SAID CURVE TO THE RIGHT AN ARC LENGTH OF 143.22 FEET, SAID CURVE HAVING A RADIUS OF 844.07 FEET, A CENTRAL ANGLE OF 09°43'19", AND A CHORD WHICH BEARS NORTH 32°16'35" EAST, A CHORD DISTANCE OF 143.05 FEET TO A POINT OF NON-TANGENT;
6. ALONG THE ARC OF SAID CURVE TO THE RIGHT AN ARC LENGTH OF 122.20 FEET, SAID CURVE HAVING A RADIUS OF 110.01 FEET, A CENTRAL ANGLE OF 63°38'34", AND A CHORD WHICH BEARS NORTH 68°57'28" EAST, A CHORD DISTANCE OF 116.01 FEET TO THEA POINT OF NON TANGENT ON THE SOUTH RIGHT-OF-WAY OF POWERS BOUELVARD AS RECORDED UNDER BOOK 5307, PAGE 1472 WITH THE EL PASO CLERK AND RECORDER;

THENCE EASTERLY ALONG THE SAID SOUTH RIGHT-OF-WAY OF POWERS BOUELVARD ALONG THE ARC OF SAID CURVE TO THE LEFT AN ARC LENGTH OF 488.21 FEET, SAID CURVE HAVING A RADIUS OF 2105.00 FEET, A CENTRAL ANGLE OF 13°17'19", AND A CHORD WHICH BEARS SOUTH 60°44'03" EAST A CHORD DISTANCE OF 487.12 FEET TO THE INTERSECTION WITH THE WEST BOUNDARY OF LOT 1, PAINTED SKY AT WATERVIEW FILING NO.3 AS RECORDED UNDER RECTION NUMBER 21271398 WITH THE EL PASO CLAERK AND RECORDER;

THENCE DEPARTING THE SAID SOUTH RIGHT-OF-WAY OF POWERS BOUELVARD AND CONTINUING SOUTHERLY ALONG THE SAID WEST PROPERTY LINE OF LOT 1 SOUTH 15°45'42" WEST, A DISTANCE OF 150.36 FEET TO THE INTERSECTION OF THE NORTH RIGHT-OF-WAY OF DANCING SUN WAY AND THE WEST RIGHT-OF-WAY OF CUDAHY DRIVE, BOTH RECORDED UNDER SAID RECEPTION NUMBER 212713198;

THENCE CONTINUING SOUTHERLY ALONG THE SAID WEST RIGHT-OF-WAY OF CUDAHY DRIVE THE FOLLOWING THREE (3) COURSES:

1. SOUTH 15°45'42" WEST, A DISTANCE OF 201.74 FEET TO A POINT OF CURVATURE;
2. ALONG THE SAID WEST RIGHT-OF-WAY OF CUDAHY DRIVE ALONG THE ARC OF SAID CURVE TO THE LEFT AN ARC LENGTH OF 610.02 FEET, SAID CURVE HAVING A RADIUS OF 925.00 FEET, A CENTRAL ANGLE OF 37°47'09", AND A CHORD WHICH BEARS SOUTH 03°10'04" EAST, A CHORD DISTANCE OF 599.03 FEET;
3. SOUTH 22°03'38" EAST, A DISTANCE OF 12.90 FEET TO A POINT OF CURVATURE ON THE SAID NORTH RIGHT-OF-WAY OF GOLDFIELD DRIVE;

THENCE WESTERLY ALONG THE SAID NORTH RIGHT-OF-WAY OF GOLDFIELD DRIVE THE FOLLOWING FIVE (5) COURSES:

1. ALONG THE ARC OF SAID CURVE TO THE LEFT AN ARC LENGTH OF 91.01 FEET, SAID CURVE HAVING A RADIUS OF 736.00 FEET, A CENTRAL ANGLE OF 07°05'04", AND A CHORD WHICH BEARS SOUTH 62°27'39" EAST, A CHORD DISTANCE OF 90.95 FEET;
2. SOUTH 58°55'08" WEST, A DISTANCE OF 114.02 FEET TO A POINT OF CURAVTURE;
3. ALONG THE ARC OF SAID CURVE TO THE RIGHT AN ARC LENGTH OF 110.36 FEET, SAID CURVE HAVING A RADIUS OF 519.00 FEET, A CENTRAL ANGLE OF 12°11'02", AND A CHORD WHICH BEARS SOUTH 65°00'36" WEST, A CHORD DISTANCE OF 110.16 FEET;
4. SOUTH 83°24'45" WEST, A DISTANCE OF 105.09 FEET;
5. SOUTH 81°41'14" WEST, A DISTANCE OF 172.84 FEET TO THE POINT OF BEGINNING:

SAID PARCEL CONTAINS 363,565 SQUARE FEET OR 8.346 ACRES, MORE OR LESS;

BENCHMARK:

"A RR SPIKE SET IN CONCRETE NEXT TO A RAILROAD FENCE POST SOUTHWEST OF A 90 DEGREE CURVE IN POWERS BOULEVARD. THIS IS A SECTION CORNER FOR SECTIONS 6 AND 7, T15S, R65W, AND SECTIONS 1 AND 12, T15S, R66W OF THE SIXTH P.M. THE POINT IS DESIGNATED AS "5501V" PER THE COLORADO SPRINGS UTILITIES FACILITIES INFORMATION MANAGEMENT SYSTEM (FIMS).

ELEVATION: 5908.830 US SURVEY FEET (NAVD88 DATUM)

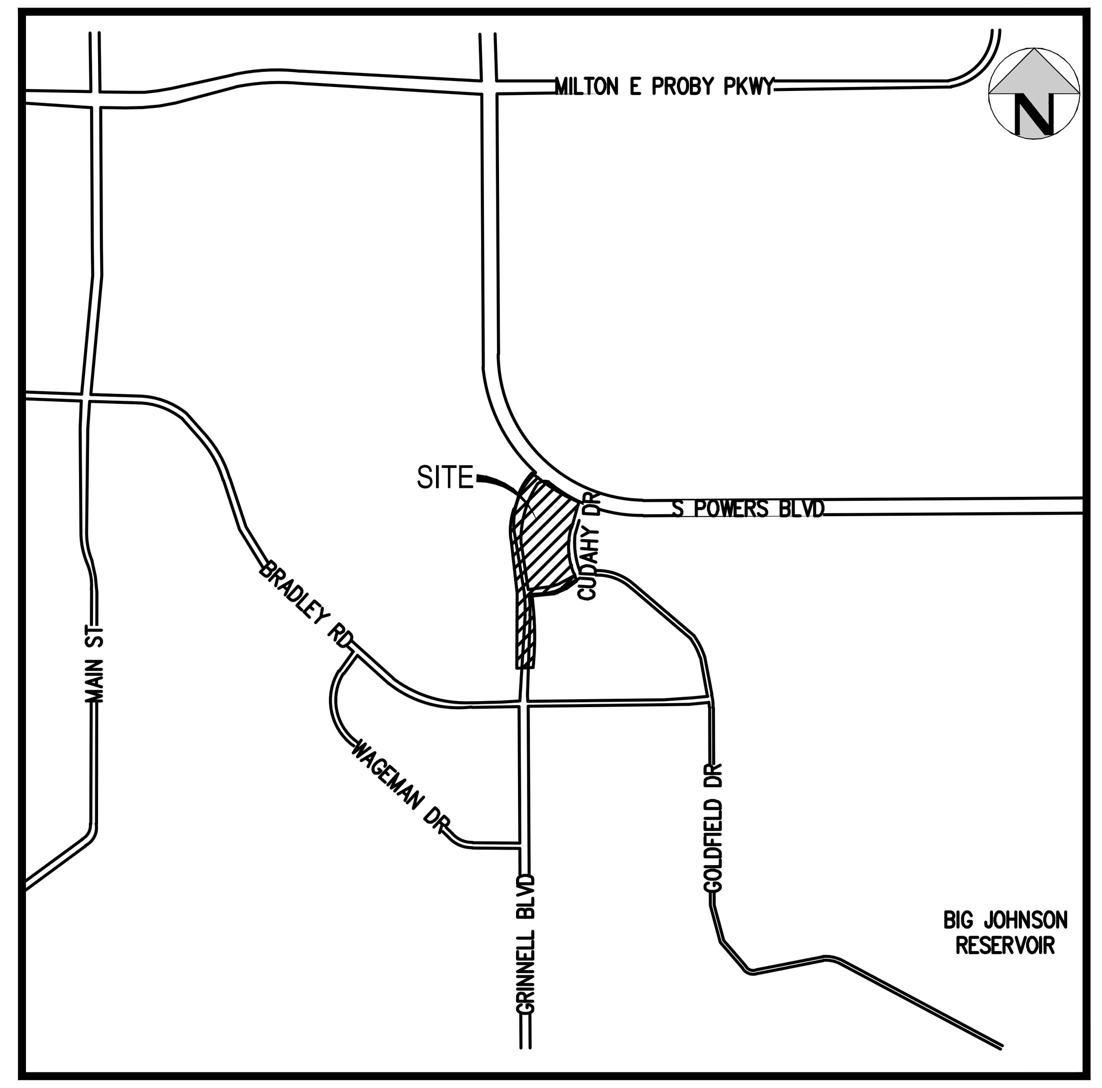
NOTE: NAVD 88 ELEVATION WAS TRANSFORMED FROM NGVD29 DATUM USING THE NGS COORDINATE CONVERSION AND TRANSFORMATION TOOL (NCAT). NGVD 29 PUBLISHED ELEVATION = 5905.440. PER NCAT, DELTA IS 3.389 US SURVEY FEET.

BASIS OF BEARINGS:

BASIS OF BEARINGS ARE BASED UPON THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 7, TOWNSHIP 15 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN AS MONUMENTED AT THE NORTHWEST CORNER OF SAID SECTION 7 BY A FOUND RR SPIKE IN CONCRETE AND THE WEST QUARTER OF SAID SECTION 7 BY A FOUND 3.25" ALUMINUM CAP IN A RANGE BOX STAMPED "17496", AS BEARING SOUTH 00°43'01" EAST, WITH ALL BEARINGS SHOWN HEREON RELATIVE THERETO.

ABBREVIATIONS

BOP	BOTTOM OF PIPE
BW	BOTTOM OF WALL (FG)
CONC	CONCRETE
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DOOR
DS	DOWNSPOUT
E	EAST, EASTING
EGL	ENERGY GRADE LINE
EL	ELEVATION
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX	EXISTING
FES	FLARED END SECTION
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
GB	GRADE BREAK
GV	GATE VALVE
HC	HANDICAP
HGL	HYDRAULIC GRADE LINE
HORZ	HORIZONTAL
HP	HIGH POINT
INV	INVERT
LP	LOW POINT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
N	NORTH, NORTHING
PHS	PHASE
PR	PROPOSED
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
ROW	RIGHT-OF-WAY
SAN	SANITARY
SS	SANITARY SEWER
STA	STATION
STM	STORM
TB	THRUST BLOCK
TBC	TOP/BACK OF CURB
TOP	TOP OF PIPE
TS	TOP OF STEP
TW	TOP OF WALL (FG)
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



VICINITY MAP
SCALE: 1" = 2000'

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EL PASO COUNTY STANDARD NOTES

1. STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF-SITE WATERS, INCLUDING WETLANDS.
2. NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
3. A SEPARATE STORMWATER MANAGEMENT PLAN (SMWP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. MANAGEMENT OF THE SWMP DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGER OR CERTIFIED EROSION CONTROL INSPECTOR. THE SWMP SHALL BE LOCATED ON-SITE AT ALL TIMES DURING CONSTRUCTION AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
4. ONCE THE ESQCP IS APPROVED AND A "NOTICE TO PROCEED"HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL MEASURES AS INDICATED ON THE APPROVED GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY STAFF.
5. CONTROL MEASURES MUST BE INSTALLED PRIOR TO COMMENCEMENT OF ACTIVITIES THAT COULD CONTRIBUTE POLLUTANTS TO STORMWATER. CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, AND DISTURBED LAND AREAS SHALL BE INSTALLED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
6. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REMAIN IN EFFECTIVE OPERATING CONDITION UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND FINAL STABILIZATION IS ESTABLISHED. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL ASSESS THE ADEQUACY OF CONTROL MEASURES AT THE SITE AND IDENTIFY IF CHANGES TO THOSE CONTROL MEASURES ARE NEEDED TO ENSURE THE CONTINUED EFFECTIVE PERFORMANCE OF THE CONTROL MEASURES. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED INTO THE STORMWATER MANAGEMENT PLAN.
7. TEMPORARY STABILIZATION SHALL BE IMPLEMENTED ON DISTURBED AREAS AND STOCKPILES WHERE GROUND DISTURBING CONSTRUCTION ACTIVITY HAS PERMANENTLY CEASED OR TEMPORARILY CEASED FOR LONGER THAN 14 DAYS..
8. FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN ALL GROUND DISTURBING ACTIVITIES ARE COMPLETE AND ALL DISTURBED AREAS EITHER HAVE A UNIFORM VEGETATIVE COVER WITH INDIVIDUAL PLANT DENSITY OF 70 PERCENT OF PRE-DISTURBANCE LEVELS ESTABLISHED OR EQUIVALENT PERMANENT ALTERNATIVE STABILIZATION METHOD IS IMPLEMENTED. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED UPON FINAL STABILIZATION AND BEFORE PERMIT CLOSURE.
9. ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
10. EARTH DISTURBANCES SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY MINIMIZE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME. PRE-EXISTING VEGETATION SHALL BE PROTECTED AND MAINTAINED WITHIN 50 HORIZONTAL FEET OF A WATERS OF THE STATE UNLESS SHOWN TO BE INFEASIBLE AND SPECIFICALLY REQUESTED AND APPROVED.
11. COMPACTION OF SOIL MUST BE PREVENTED IN AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES OR WHERE FINAL STABILIZATION WILL BE ACHIEVED BY VEGETATIVE COVER. AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED. IF COMPACTION PREVENTION IS NOT FEASIBLE DUE TO SITE CONSTRAINTS, ALL AREAS DESIGNATED FOR INFILTRATION AND VEGETATION CONTROL MEASURES MUST BE LOOSENED PRIOR TO INSTALLATION OF THE CONTROL MEASURE(S).
12. ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE A STABILIZED CONVEYANCE DESIGNED TO MINIMIZE EROSION AND THE DISCHARGE OF SEDIMENT OFF-SITE.
13. CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO ENTER STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUTS SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY, CREEK OR STREAM.
14. DURING DEWATERING OPERATIONS, UNCONTAMINATED GROUNDWATER MAY BE DISCHARGED ON-SITE, BUT SHALL NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF UNLESS AN APPROVED STATE DEWATERING PERMIT IS IN PLACE.
15. EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES STEEPER THAN 3:1.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.
17. WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. CONTROL MEASURES MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
18. TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF-SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
19. THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, SOIL, AND SAND THAT MAY ACCUMULATE IN ROADS, STORM DRAINS AND OTHER DRAINAGE CONVEYANCE SYSTEMS AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.
20. THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.
21. NO CHEMICAL(S) HAVING THE POTENTIAL TO BE RELEASED IN STORMWATER ARE TO BE STORED OR USED ON-SITE UNLESS PERMISSION FOR THE USE OF SUCH CHEMICAL(S) IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING APPROVAL FOR THE USE OF SUCH CHEMICAL(S), SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
22. BULK STORAGE OF ALLOWED PETROLEUM PRODUCTS OR OTHER ALLOWED LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL REQUIRE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS ON-SITE AND TO PREVENT ANY SPILLED MATERIALS FROM ENTERING STATE WATERS, ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR OTHER FACILITIES.
23. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
24. OWNER/DEVELOPER AND THEIR AGENTS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT"(TITLE 25, ARTICLE 8, CRS), AND THE "CLEAN WATER ACT"(33 USC 1344), IN ADDITION TO THE REQUIREMENTS OF THE LAND DEVELOPMENT CODE, DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (1041, NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND OTHER LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, LOCAL, OR COUNTY AGENCIES, THE MOST RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
25. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
26. PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
27. A WATER SOURCE SHALL BE AVAILABLE ON-SITE DURING EARTHWORK OPERATIONS AND SHALL BE UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
28. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY HARRIS KOCHER SMITH, DATE OF REPORT] AND SHALL BE CONSIDERED A PART OF THESE PLANS.
29. AT LEAST TEN (10) DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB ONE (1) ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FORSTORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITYDIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN(SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION ORAPPLICATION MATERIALS CONTACT:
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL DIVISION
WQCD -PERMITS
4300 CHERRY CREEK DRIVE SOUTH
DENVER, CO 80246-1530
ATTN: PERMITS UNIT

EL PASO COUNTY:
COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA MANUAL VOLUMES 1 AND 2, AND THE ENGINEERING CRITERIA MANUAL, AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION HAS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTOR'S DISCRETION.

COUNTY ENGINEER/ECM ADMINISTRATOR DATE

OWNER'S STATEMENT:
I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH THE REQUIREMENTS OF THE GRADING AND EROSION CONTROL PLAN.

OWNER SIGNATURE DATE

ENGINEER'S STATEMENT:
THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART PREPARING THIS PLAN.

ENGINEER OF RECORD SIGNATURE DATE

PRELIMINARY
NOT FOR
CONSTRUCTION

Know what's below. Call before you dig.

Evergreen
Development | Services | Investments

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

ISSUE DATE: 05-08-2023	PROJECT #: 221206
DATE	REVISION COMMENTS

Filepath: J:\221206\ENGINEERING\EROSION\GESC - COVER.DWG Layout: LAYOUT1
3 XREFs: evergreen logo, stamp - gesc, vic map
Plotted: MON 05/08/23 5:39:08P By: Tyler Wilson

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

EL PASO COUNTY STANDARD GRADING AND EROSION CONTROL NOTES

1. STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF-SITE WATERS, INCLUDING WETLANDS.
2. NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
3. A SEPARATE STORMWATER MANAGEMENT PLAN (SMWP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. MANAGEMENT OF THE SWMP DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGER OR CERTIFIED EROSION CONTROL INSPECTOR. THE SWMP SHALL BE LOCATED ON SITE AT ALL TIMES DURING CONSTRUCTION AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
4. ONCE THE ESCP IS APPROVED AND A "NOTICE TO PROCEED" HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL MEASURES AS INDICATED ON THE APPROVED GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY STAFF.
5. CONTROL MEASURES MUST BE INSTALLED PRIOR TO COMMENCEMENT OF ACTIVITIES THAT COULD CONTRIBUTE POLLUTANTS TO STORMWATER. CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, AND DISTURBED LAND AREAS SHALL BE INSTALLED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
6. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REMAIN IN EFFECTIVE OPERATING CONDITION UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND FINAL STABILIZATION IS ESTABLISHED. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL ASSESS THE ADEQUACY OF CONTROL MEASURES AT THE SITE AND IDENTIFY IF CHANGES TO THOSE CONTROL MEASURES ARE NEEDED TO ENSURE THE CONTINUED EFFECTIVE PERFORMANCE OF THE CONTROL MEASURES. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED INTO THE STORMWATER MANAGEMENT PLAN.
7. TEMPORARY STABILIZATION SHALL BE IMPLEMENTED ON DISTURBED AREAS AND STOCKPILES WHERE GROUND DISTURBING CONSTRUCTION ACTIVITY HAS PERMANENTLY CEASED OR TEMPORARILY CEASED FOR LONGER THAN 14 DAYS.
8. FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN ALL GROUND DISTURBING ACTIVITIES ARE COMPLETE AND ALL DISTURBED AREAS EITHER HAVE A UNIFORM VEGETATIVE COVER WITH INDIVIDUAL PLANT DENSITY OF 70 PERCENT OF PRE-DISTURBANCE LEVELS ESTABLISHED OR EQUIVALENT PERMANENT ALTERNATIVE STABILIZATION METHOD IS IMPLEMENTED. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED UPON FINAL STABILIZATION AND BEFORE PERMIT CLOSURE.
9. ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
10. EARTH DISTURBANCES SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY MINIMIZE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME. PRE-EXISTING VEGETATION SHALL BE PROTECTED AND MAINTAINED WITHIN 50 HORIZONTAL FEET OF A WATERS OF THE STATE UNLESS SHOWN TO BE INFEASIBLE AND SPECIFICALLY REQUESTED AND APPROVED.
11. COMPACTION OF SOIL MUST BE PREVENTED IN AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES OR WHERE FINAL STABILIZATION WILL BE ACHIEVED BY VEGETATIVE COVER. AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED. IF COMPACTION PREVENTION IS NOT FEASIBLE DUE TO SITE CONSTRAINTS, ALL AREAS DESIGNATED FOR INFILTRATION AND VEGETATION CONTROL MEASURES MUST BE LOOSENED PRIOR TO INSTALLATION OF THE CONTROL MEASURE(S).
12. ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE A STABILIZED CONVEYANCE DESIGNED TO MINIMIZE EROSION AND THE DISCHARGE OF SEDIMENT OFF SITE.
13. CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO ENTER STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUTS SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY, CREEK OR STREAM.
14. DURING DEWATERING OPERATIONS OF UNCONTAMINATED GROUND WATER MAY BE DISCHARGED ON SITE, BUT SHALL NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF UNLESS AN APPROVED STATE DEWATERING PERMIT IS IN PLACE.
15. EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES STEEPER THAN 3:1.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE
17. WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. CONTROL MEASURES MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
18. TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF-SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
19. THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, SOIL, AND SAND THAT MAY ACCUMULATE IN ROADS, STORM DRAINS AND OTHER DRAINAGE CONVEYANCE SYSTEMS AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.
20. THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS
21. NO CHEMICAL(S) HAVING THE POTENTIAL TO BE RELEASED IN STORMWATER ARE TO BE STORED OR USED ONSITE UNLESS PERMISSION FOR THE USE OF SUCH CHEMICAL(S) IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING APPROVAL FOR THE USE OF SUCH CHEMICAL(S), SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
22. BULK STORAGE OF ALLOWED PETROLEUM PRODUCTS OR OTHER ALLOWED LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL REQUIRE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS ONSITE AND TO PREVENT ANY SPILLED MATERIALS FROM ENTERING STATE WATERS, ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR OTHER FACILITIES.
23. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
24. OWNER/DEVELOPER AND THEIR AGENTS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT" (TITLE 25, ARTICLE 8, CRS), AND THE "CLEAN WATER ACT" (33 USC 1344). IN ADDITION TO THE REQUIREMENTS OF THE LAND DEVELOPMENT CODE, DCM VOLUME II AND THE ECM APPENDIX I, ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (1041, NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND OTHER LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, LOCAL, OR COUNTY AGENCIES, THE MOST RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
25. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
26. PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
27. A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND SHALL BE UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
28. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY CTL THOMPSON ON MAY 18, 2021 AND SHALL BE CONSIDERED A PART OF THESE PLANS.
29. AT LEAST TEN (10) DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB ONE (1) ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL DIVISION
WQCD – PERMITS
4300 CHERRY CREEK DRIVE SOUTH
DENVER, CO 80246-1530
ATTN: PERMITS UNIT

STANDARD GESC NOTES

1. SHADED BMPS WERE INSTALLED IN AN EARLIER PHASE, AND UNLESS OTHERWISE INDICATED SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY EL PASO COUNTY. CONTRACTOR SHALL VERIFY THE CONDITION OF ALL EXISTING BMPS AND REMOVE AND REPLACE THEM AS NECESSARY.
2. ALL EXISTING BMPS WILL NEED TO BE PROPERLY REFRESHED OR RE-INSTALLED BY THE CONTRACTOR TO FUNCTION AS ORIGINALLY DESIGNED.
3. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
4. SEE DETAIL SHEETS ECS-ECF FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
5. CONTRACTOR SHALL SEED AND MULCH ALL DISTURBED AREAS NOT FORMALLY LANDSCAPED PER THE APPROVED LANDSCAPE PLAN SEED MIX OR EL PASO COUNTY STANDARD SEED MIX.
6. ROCK SOCKS MAY BE SUBSTITUTED FOR SILT FENCE AS PERIMETER CONTROL ON HARDSCAPE SURFACE AREAS.
7. ALL EROSION AND SEDIMENT CONTROL PRACTICES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE SWMP MUST BE MAINTAINED IN EFFECTIVE OPERATION CONDITION. PROPER SELECTION AND INSTALLATION OF BMPS AND PROCEDURES, IN ACCORDANCE WITH THE SWMP, SHOULD BE ADEQUATE TO MEET THIS CONDITION. BMPS THAT ARE NOT ADEQUATELY MAINTAINED IN ACCORDANCE WITH GOOD ENGINEERING, HYDROLOGIC AND POLLUTION CONTROL PRACTICES, INCLUDING REMOVAL OF COLLECTED SEDIMENT OUTSIDE THE ACCEPTABLE TOLERANCES OF THE BMPS, ARE NO LONGER OPERATING EFFECTIVELY AND MUST BE ADDRESSED.
8. THE CONTRACTOR SHALL PROVIDE SURFACE ROUGHENING AND SEEDING AND MULCHING DURING THE DEMOLITION AND EARTHWORK PHASES AS REQUIRED BY THE SWMP AND EL PASO COUNTY INSPECTOR.
9. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING INLET PROTECTION ON ALL EXISTING STORM SEWER INLETS IMMEDIATELY ADJACENT TO AND DOWNSTREAM OF THE PROJECT SITE.
10. THE CONTRACTOR SHALL REFER TO THE STORMWATER MANAGEMENT PLAN (SWMP) DATED 11/01/2021; THE COUNTY/CITY GRADING, EROSION, AND SEDIMENT CONTROL SPECIFICATIONS; AND THE MILE HIGH FLOOD DISTRICT VOLUME 3: STORMWATER BEST MANAGEMENT PRACTICES (BMPS) FOR ADDITIONAL INFORMATION.
11. ALL LANDSCAPE DRAIN AREA INLETS SHALL HAVE INLET PROTECTION UNTIL THE UPSTREAM AREA HAS BEEN FORMALLY LANDSCAPED AND ESTABLISHED. REFER TO THE STORM SEWER PLANS FOR EXACT LOCATIONS OF ALL AREA INLETS.
12. EROSION CONTROL BLANKETS SHALL BE INSTALLED ON ALL PROPOSED SLOPES 4:1 OR GREATER.

GENERAL STORM NOTES:

1. THE CONTRACTOR SHALL NOTIFY COLORADO 811 PRIOR TO EXCAVATION, IN ACCORDANCE WITH COLORADO STATE STATUTES.
2. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS APPROXIMATE AND SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE, AS SUPPLIED BY THE UTILITY OWNERS. PRIOR TO EXCAVATION, THE CONTRACTOR SHALL VERIFY EXISTENCE, SIZE, AND LOCATION OF EXISTING UTILITIES AND IMMEDIATELY NOTIFY HARRIS KOCHER SMITH OF ANY DISCREPANCIES. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING UNDERGROUND FACILITIES.
3. PIPE LENGTHS ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE FOR CYLINDRICAL MANHOLES AND TO THE INSIDE FACE OF INLETS AND OTHER BOX STRUCTURES. PIPE LENGTHS ARE MEASURED TO THE END OF THE STRUCTURE FOR ALL FLARED END SECTIONS.
4. STATIONING OF INLETS SHOWN IN STORM SEWER PROFILES IS AT CENTER OF STRUCTURE.
5. ALL COORDINATES ARE AT THE CENTER OF THE STRUCTURE UNLESS OTHERWISE INDICATED.
6. CONTRACTOR SHALL USE HDPE, PVC, OR RCP PIPES FOR THE MAIN LINES, BUT SHALL NOTIFY THE JURISDICTIONAL UTILITY PROVIDER AND THE ENGINEER, PRIOR TO INSTALLATION, FOR APPROVAL.
7. FOR ALL NON-CONCENTRIC MANHOLES, MANHOLE RINGS/COVERS AND STEPS LIDS SHALL BE ROTATED AS SHOWN IN PLAN VIEW.
8. ALL TYPE C & D INLETS SHALL HAVE CLOSE MESH GRATES.
9. ALL LATERAL PIPE-TO-PIPE CONNECTIONS SHALL BE MADE USING KOR-N-TEE CONNECTORS OR ENGINEER APPROVED EQUIVALENT.
10. CONTRACTOR SHALL ADJUST ALL EXISTING RIM ELEVATIONS TO MATCH THE PROPOSED GRADE.
11. CONTRACTOR SHALL MODIFY INLET BASES AS NEEDED IN ORDER TO ENSURE ALL STORM PIPES CONNECT PROPERLY TO THE INLET. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR REVIEW AND APPROVAL BY ENGINEER, OWNER, AND CITY/COUNTY PRIOR TO INSTALLATION.
12. CONTRACTOR SHALL PROVIDE ENGINEERED SHOP DRAWINGS, DESIGNED BY A LICENSED ENGINEER, DETAILING THE STRUCTURAL DESIGN OF ALL POND IMPROVEMENTS (FOREBAY, ENERGY DISSIPATING BAFFLES, OUTLET STRUCTURE, ETC.) FOR REVIEW AND APPROVAL BY ENGINEER, OWNER, AND CITY/COUNTY PRIOR TO INSTALLATION.

WATER QUALITY/NPDES EROSION AND SEDIMENT CONTROL NOTES

1. THIS CONSTRUCTION ACTIVITIES STORMWATER MANAGEMENT PLAN HAS BEEN SUBMITTED AS THE APPLICATION FOR A STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES FROM THE WATER QUALITY CONTROL DIVISION OF COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT. I UNDERSTAND THAT ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS PLAN SHALL BE THE OBLIGATION OF THE LAND OWNER AND/OR HIS SUCCESSORS OR HEIRS; UNTIL SUCH TIME AS THE PLAN IS PROPERLY COMPLETED, MODIFIED, OR VOIDED.
2. THE CONTRACTOR SHALL LOCATE, INSTALL, AND MAINTAIN ALL EROSION CONTROL AND WATER QUALITY "BEST MANAGEMENT PRACTICES" AS INDICATED IN THE APPROVED CONSTRUCTION ACTIVITIES STORMWATER MANAGEMENT PLAN AND GEC PLANS.
3. MODIFICATION OF AN ACTIVE STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES BY THE DEVELOPER, CONTRACTOR, OR THEIR AUTHORIZED AGENTS SHALL REQUIRE TIMELY NOTIFICATION OF AND APPROVAL BY THE WATER QUALITY CONTROL DIVISION. TERMINATION OF AN ACTIVE STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES UPON COMPLETION OF THE PROJECT REQUIRES NOTIFICATION OF AND APPROVAL BY EL PASO COUNTY ENGINEERING.

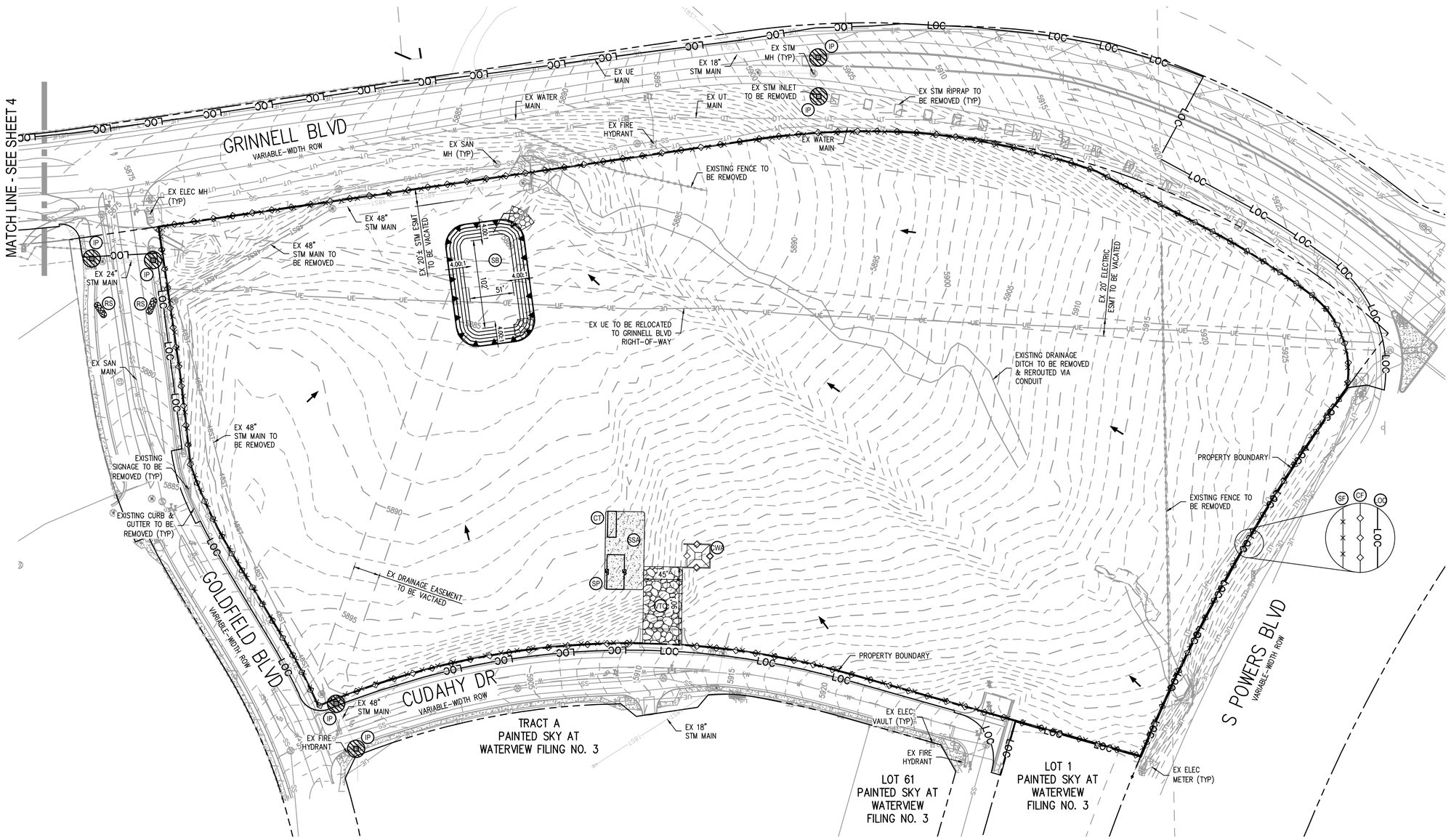
BMP MAINTENANCE NOTE

ALL EROSION AND SEDIMENT CONTROL PRACTICES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE SWMP MUST BE MAINTAINED IN EFFECTIVE OPERATING CONDITION. PROPER SELECTION AND INSTALLATION OF BMPS AND IMPLEMENTATION OF COMPREHENSIVE INSPECTION AND MAINTENANCE PROCEDURES, IN ACCORDANCE WITH THE SWMP, SHOULD BE ADEQUATE TO MEET THIS CONDITION. BMPS THAT ARE NOT ADEQUATELY MAINTAINED IN ACCORDANCE WITH GOOD ENGINEERING, HYDROLOGIC AND POLLUTION CONTROL PRACTICES, INCLUDING REMOVAL OF COLLECTED SEDIMENT OUTSIDE THE ACCEPTABLE TOLERANCES OF THE BMPS, ARE CONSIDERED TO BE NO LONGER OPERATING EFFECTIVELY AND MUST BE ADDRESSED.

UTILITY NOTES

1. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE, AS SUPPLIED BY THE UTILITY OWNERS. PRIOR TO EXCAVATION, THE CONTRACTOR SHALL VERIFY EXISTENCE, SIZE AND LOCATION OF EXISTING UTILITIES AND IMMEDIATELY NOTIFY HARRIS KOCHER SMITH OF ANY DISCREPANCIES. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING UNDERGROUND FACILITIES.
2. THE CONTRACTOR SHALL NOTIFY 811 PRIOR TO EXCAVATION, IN ACCORDANCE WITH COLORADO STATE STATUTES.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION ACTIVITIES, DEWATERING DISCHARGE, PERMITTING FOR ALL UTILITY INSTALLATION. PUMP RATE TESTS ARE HIGHLY RECOMMENDED.

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



BMP LEGEND:

LIMITS OF CONSTRUCTION	LOC
CONSTRUCTION FENCE	CF
SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
INLET PROTECTION	IP
CONCRETE WASHOUT AREA	CWA
ROCK SOCK	RS
CONSTRUCTION TRAILER	CT
SEDIMENT BASIN	SB
TEMPORARY SLOPE DRAIN	
EXISTING CONTOURS	5264 / 5265
PROPOSED CONTOURS	5173 / 5170
DRAINAGE FLOW ARROW	
EMERGENCY OVERFLOW PATH	

INITIAL PLAN NOTES:

1. SHADED BEST MANAGEMENT PRACTICES (BMPS) WERE INSTALLED IN AN EARLIER PHASE, AND UNLESS OTHERWISE INDICATED SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY COUNTY OF EL PASO. CONTRACTOR SHALL VERIFY THE CONDITION OF ALL EXISTING BMPS AND REMOVE AND REPLACE THEM AS NECESSARY.
2. ALL EXISTING BMPS WILL NEED TO BE PROPERLY REFRESHED OR REINSTALLED BY THE CONTRACTOR TO FUNCTION AS ORIGINALLY DESIGNED.
3. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
4. SEE DETAIL SHEETS 9-14 FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
5. CONTRACTOR SHALL SEED AND MULCH ALL DISTURBED AREAS NOT FORMALLY LANDSCAPED PER THE APPROVED LANDSCAPE PLAN SEED MIX OR THE EL PASO COUNTY STANDARD SEED MIX.
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10. THE CONTRACTOR SHALL REFER TO THE STORMWATER MANAGEMENT PLAN DATED 05-08-2023; THE EL PASO COUNTY GRADING, EROSION, AND SEDIMENT CONTROL SPECIFICATIONS; AND THE MILE HIGH FLOOD DISTRICT'S URBAN STORM DRAINAGE CRITERIA MANUAL, VOLUME 3 FOR ADDITIONAL INFORMATION.

811 Know what's below. Call before you dig.

60 0 60 120
SCALE: 1" = 60'

DESIGNED BY: MJS
CHECKED BY: RCP
DRAWN BY: MJS

ISSUE DATE: 05-08-2023

DATE	REVISION COMMENTS

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
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HarrisKocherSmith.com

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OUTLOOK POWERS & GRINNELL
GESC - INITIAL

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 221206
SHEET NUMBER
3

FILEPATH: J:\221206\ENGINEERING\EROSION\GESC_INITIAL.DWG LAYOUT: LAYOUT1
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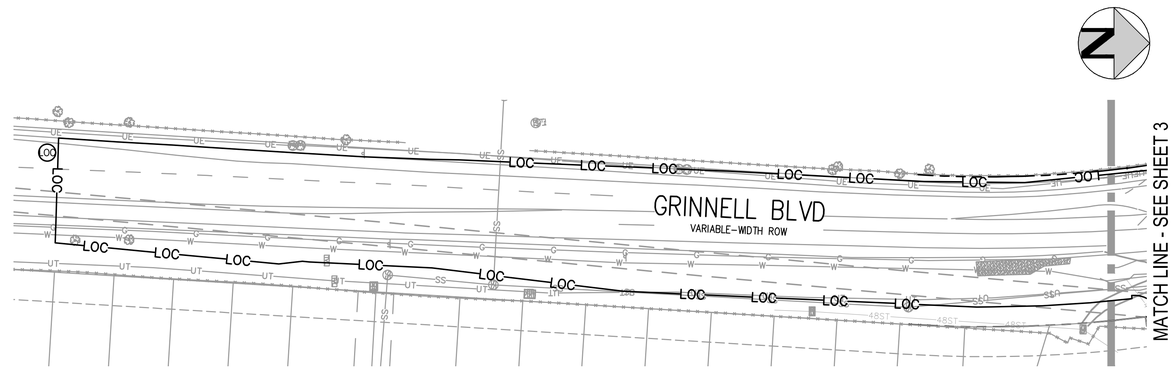

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SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
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60 0 60 120
SCALE: 1" = 60'

DESIGNED BY: MJS
CHECKED BY: RCP
DRAWN BY: MJS

ISSUE DATE: 05-08-2023

DATE	REVISION COMMENTS

HARRIS KOCHER SMITH
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Denver, Colorado 80203
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OUTLOOK POWERS & GRINNELL
GESC - INITIAL

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 221206
SHEET NUMBER
4

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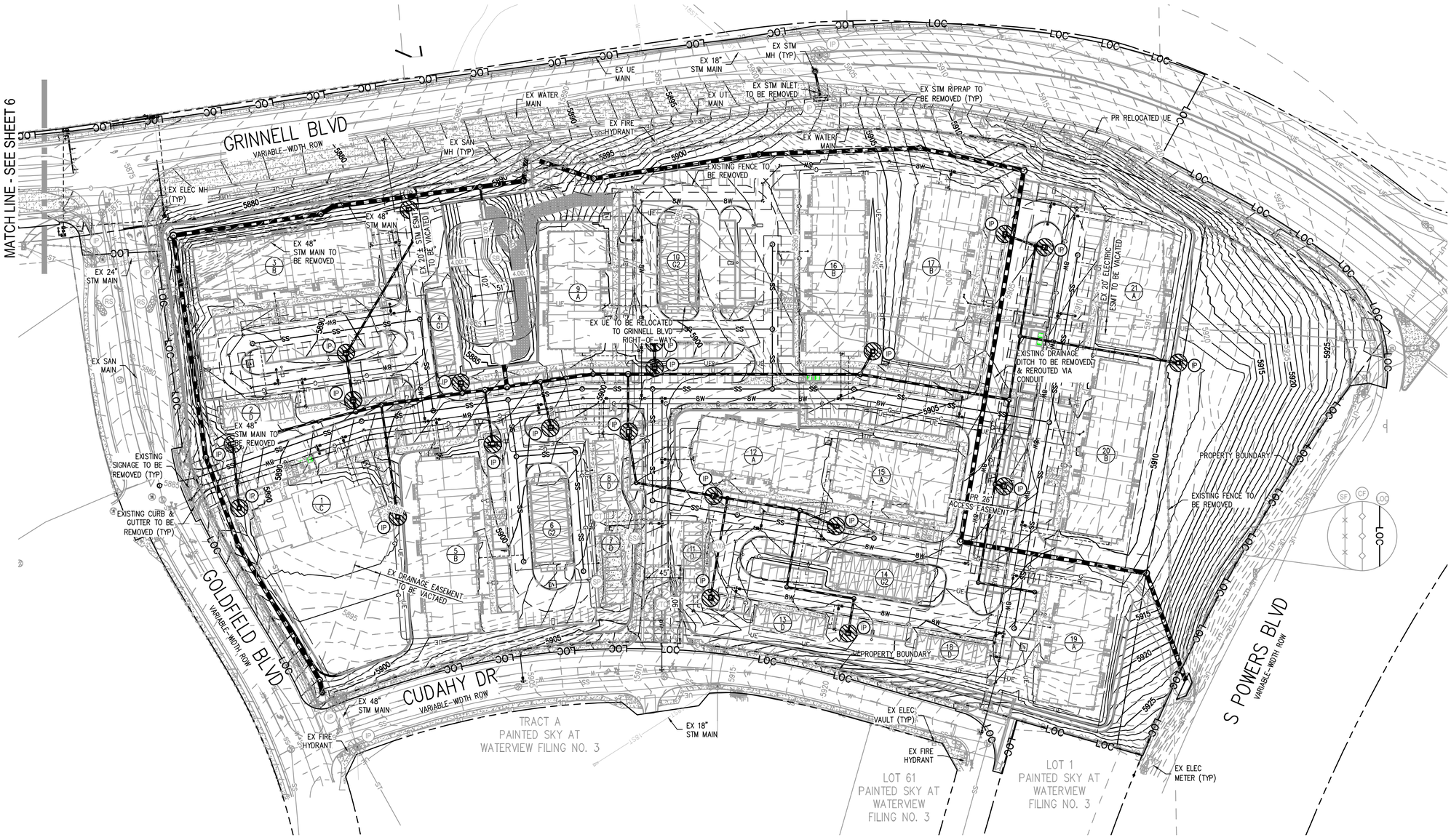

BMP LEGEND:

LIMITS OF CONSTRUCTION	LOC
CONSTRUCTION FENCE	CF
SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
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ROCK SOCK	RS
CONSTRUCTION TRAILER	CT
SEDIMENT BASIN	SB
TEMPORARY SLOPE DRAIN	
EXISTING CONTOURS	5264
PROPOSED CONTOURS	5173 5170
EMERGENCY OVERFLOW PATH	

INTERIM PLAN NOTES:

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5. SEE DETAIL SHEETS 9-14 FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
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10. THE CONTRACTOR SHALL REFER TO THE STORMWATER MANAGEMENT PLAN
    DATED 05-08-2023; THE EL PASO COUNTY GRADING, EROSION, AND SEDIMENT CONTROL SPECIFICATIONS; AND THE MILE HIGH FLOOD DISTRICT'S URBAN STORM DRAINAGE CRITERIA MANUAL, VOLUME 3 FOR ADDITIONAL INFORMATION.

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DESIGNED BY: MJS
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OUTLOOK POWERS & GRINNELL
GESC - INTERIM

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 221206
SHEET NUMBER
5
5 OF 14

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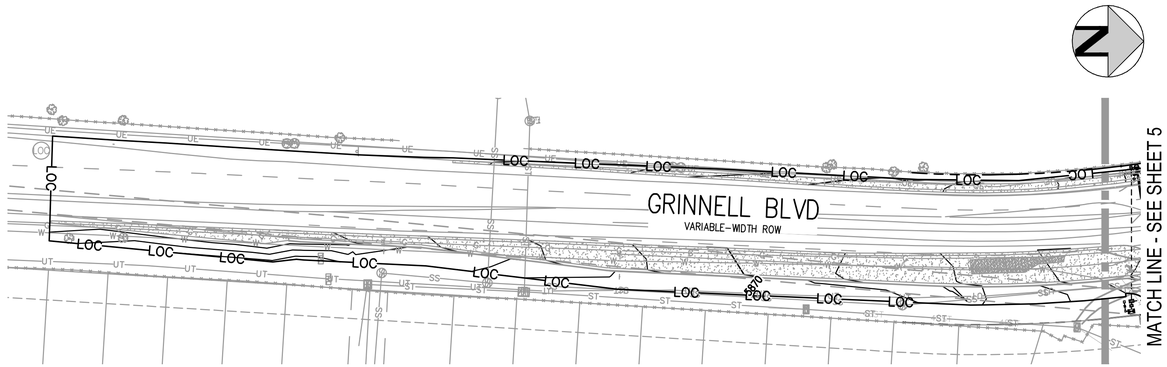

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OUTLOOK POWERS & GRINNELL
GESC - INTERIM

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PROJECT #: 221206
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6

FILEPATH: J:\221206\ENGINEERING\EROSION\GESC_INTERIM.DWG LAYOUT: LAYOUT1 (2)
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PLOTTED: MON 05/08/23 5:39:49P BY: TYLER WILSON

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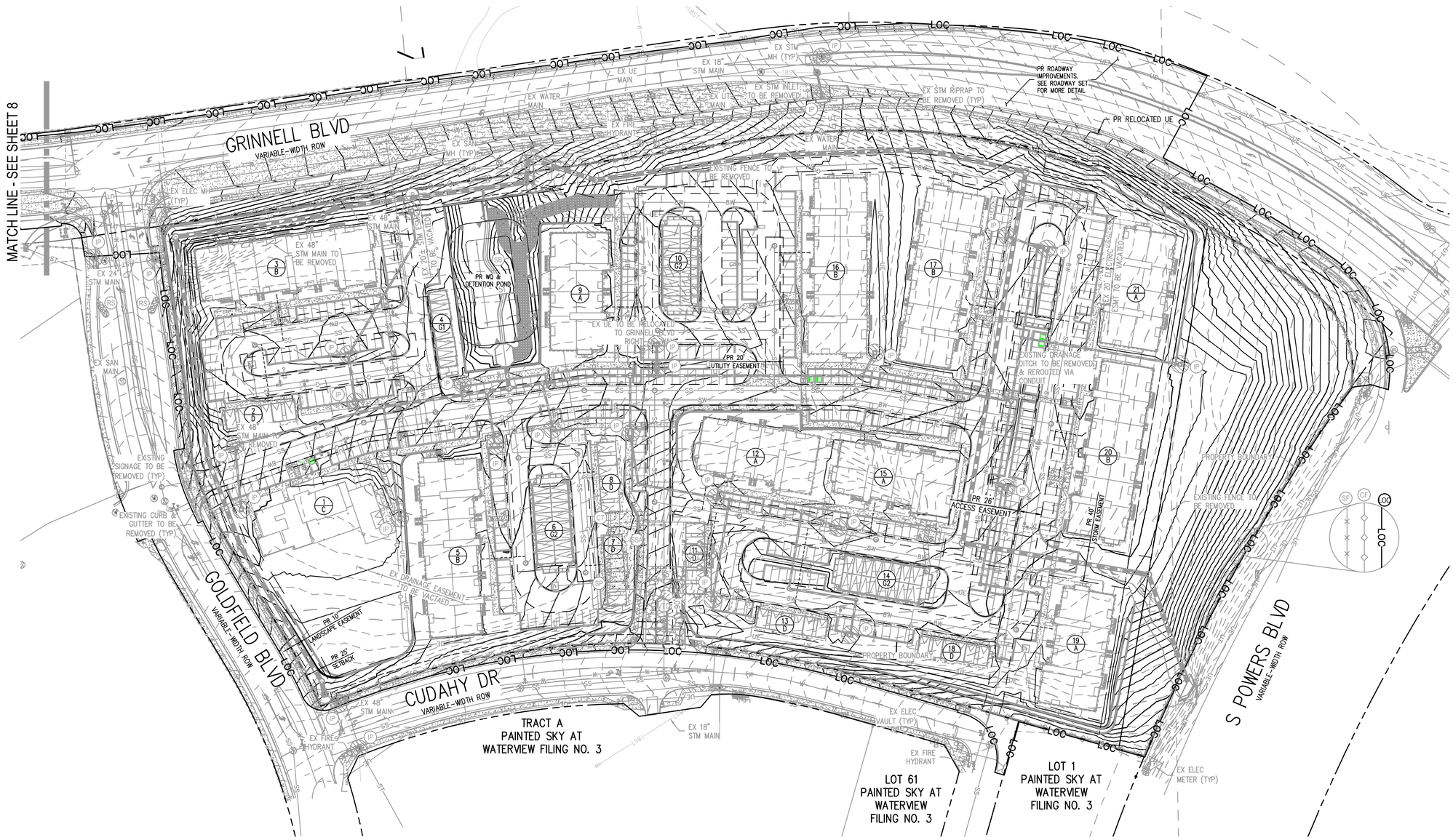

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EMERGENCY OVERFLOW PATH	

AREA SUMMARY TABLE

TOTAL SITE AREA	23.09 AC
PROJECT SITE AREA	16.57 AC
CUT VOLUME	42,804 CU YD
FILL VOLUME	135,421 CU YD
NET VOLUME	92,617 CU YD FILL

FINAL PLAN NOTES:

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9. EROSION CONTROL BLANKETS SHALL BE INSTALLED ON ALL PROPOSED SLOPES 4:1 OR GREATER.
10. THE CONTRACTOR SHALL REFER TO THE STORMWATER MANAGEMENT PLAN
    DATED 05-08-2023; THE EL PASO COUNTY GRADING, EROSION, AND SEDIMENT CONTROL SPECIFICATIONS; AND THE MILE HIGH FLOOD DISTRICT'S URBAN STORM DRAINAGE CRITERIA MANUAL, VOLUME 3 FOR ADDITIONAL INFORMATION.

811 Know what's below. Call before you dig.

60 0 60 120
SCALE: 1" = 60'

DESIGNED BY: MJS
CHECKED BY: RCP
DRAWN BY: MJS

ISSUE DATE: 05-08-2023

DATE	REVISION COMMENTS

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Denver, Colorado 80203
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Evergreen
Development | Services | Investments

OUTLOOK POWERS & GRINNELL
GESC - FINAL

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 221206
SHEET NUMBER
7
7 OF 14

FILEPATH: J:\221206\ENGINEERING\EROSION\GESC - FINAL DWG LAYOUT\ LAYOUT1
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PLOTTED: MON 05/08/23 5:40:06P BY: TYLER WILSON

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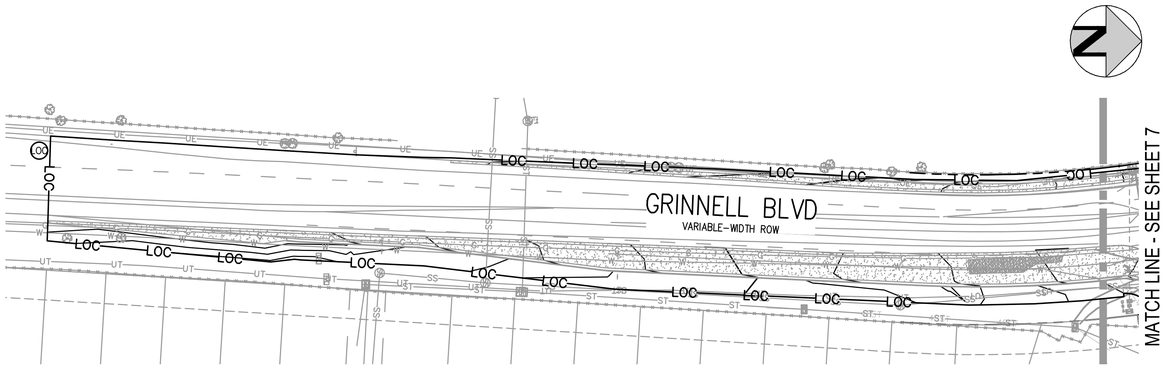

BMP LEGEND:

LIMITS OF CONSTRUCTION	LOC	LOC
CONSTRUCTION FENCE	CF	
SILT FENCE	SF	
STABILIZED STAGING AREA	SSA	
STOCKPILE PROTECTION	SP	SP
VEHICLE TRACKING CONTROL	VTC	
INLET PROTECTION	IP	
CONCRETE WASHOUT AREA	CWA	
ROCK SOCK	RS	
CONSTRUCTION TRAILER	CT	
SEDIMENT BASIN	SB	
TEMPORARY SLOPE DRAIN		
EXISTING CONTOURS		5264 / 5265
PROPOSED CONTOURS		5173 / 5170
EMERGENCY OVERFLOW PATH		

AREA SUMMARY TABLE

TOTAL SITE AREA	23.09 AC
PROJECT SITE AREA	16.57 AC
CUT VOLUME	42,804 CU YD
FILL VOLUME	135,421 CU YD
NET VOLUME	92,617 CU YD FILL

FINAL PLAN NOTES:

1. SHADED BEST MANAGEMENT PRACTICES (BMPS) WERE INSTALLED IN AN EARLIER PHASE, AND UNLESS OTHERWISE INDICATED SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY EL PASO COUNTY. CONTRACTOR SHALL VERIFY THE CONDITION OF ALL EXISTING BMPS AND REMOVE AND REPLACE THEM AS NECESSARY.
2. ALL EXISTING BMPS WILL NEED TO BE PROPERLY REFRESHED OR REINSTALLED BY THE CONTRACTOR TO FUNCTION AS ORIGINALLY DESIGNED.
3. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES
   SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
4. ALL LANDSCAPE DRAIN AREA INLETS SHALL HAVE INLET PROTECTION UNTIL THE UPSTREAM AREA HAS BEEN FORMALLY LANDSCAPED AND ESTABLISHED. REFER TO THE STORM SEWER PLANS FOR EXACT LOCATIONS OF ALL AREA INLETS.
5. SEE DETAIL SHEETS 9-14 FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
6. CONTRACTOR SHALL SEED AND MULCH ALL DISTURBED AREAS NOT FORMALLY LANDSCAPED PER THE APPROVED LANDSCAPE PLAN SEED MIX OR EL PASO COUNTY STANDARD SEED MIX.
7. ROCK SOCKS MAY BE SUBSTITUTED FOR SILT FENCE AS PERIMETER CONTROL ON HARDSCAPE SURFACE AREAS.
8. ALL EROSION AND SEDIMENT CONTROL PRACTICES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE STORMWATER MANAGEMENT PLAN (SWMP) MUST BE MAINTAINED IN PROPER FUNCTIONING CONDITION. CONTRACTOR SHALL MONITOR ALL BMPS AND IMMEDIATELY CORRECT OR REAPPLY ANY THAT ARE NO LONGER FUNCTIONING EFFECTIVELY.
9. EROSION CONTROL BLANKETS SHALL BE INSTALLED ON ALL PROPOSED SLOPES 4:1 OR GREATER.
10. THE CONTRACTOR SHALL REFER TO THE STORMWATER MANAGEMENT PLAN
    DATED 05-08-2023; THE EL PASO COUNTY GRADING, EROSION, AND SEDIMENT CONTROL SPECIFICATIONS; AND THE MILE HIGH FLOOD DISTRICT'S URBAN STORM DRAINAGE CRITERIA MANUAL, VOLUME 3 FOR ADDITIONAL INFORMATION.

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OUTLOOK POWERS & GRINNELL
GESC - FINAL

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FILEPATH: J:\221206\ENGINEERING\EROSION\GESC - FINAL DWG LAYOUT LAYOUT1 (2)
13 XREFs: e-base, e-base-byot, e-legal-byot, e-util, e-util-byot, evergreen logo, gesc - initial, gesc - interim, p-base, p-legal, p-roadway, p-util, stamp - gesc
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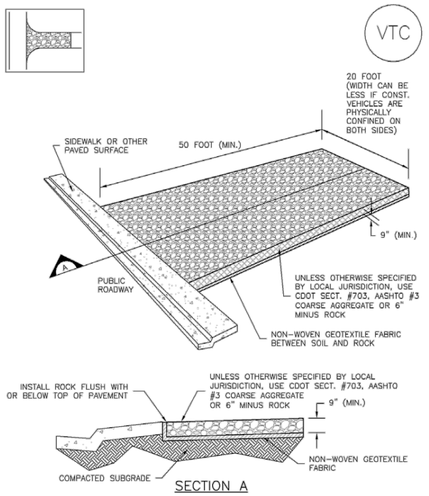
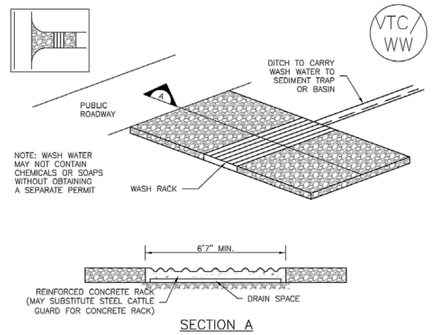
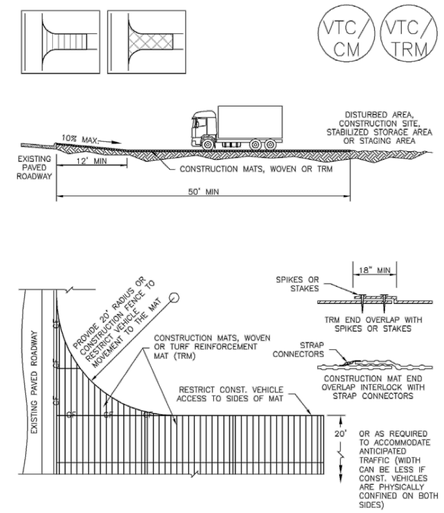


VTC-1. AGGREGATE VEHICLE TRACKING CONTROL



VTC-2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK



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

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   -LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S).
   -TYPE OF CONSTRUCTION ENTRANCE(S)/EXITS(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM).

2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.

3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT-OF-WAYS.

4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

5. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.

6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

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

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

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

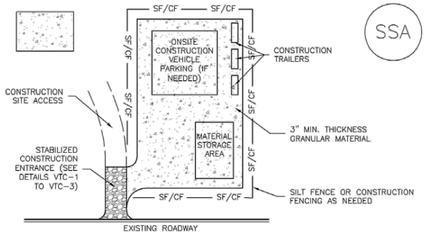
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.

5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

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

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

Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   -LOCATION OF STAGING AREA(S).
   -CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.

2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.

3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.

4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.

5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

6. ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

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

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

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

4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

SM-6 Stabilized Staging Area (SSA)

STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.

6. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE, AND THE AREA COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

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

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)

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PLOTTED: MON 05/08/23 5:40:21P BY: TYLER WILSON

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9 OF 14

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Description

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

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

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

Appropriate Uses

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

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

Do not apply mulch during windy conditions.

Design and Installation

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

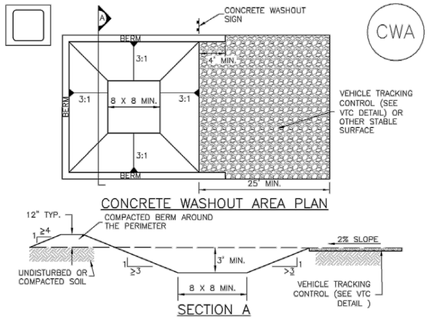
A variety of mulches can be used effectively at construction sites. Consider the following:

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

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

Maintenance and Removal

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



CWA–1. CONCRETE WASHOUT AREA

CWA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –CWA INSTALLATION LOCATION.

2. DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE, THE CWA MUST BE INSTALLED WITH AN IMPERMEABLE LINER (16 MIL MIN. THICKNESS) OR SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINED ABOVE GROUND STORAGE ARE SHOULD BE USED.

3. THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.

4. CWA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8' BY 8' SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.

5. BERM SURROUNDING SIDES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.

6. VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CWA.

7. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE CWA, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.

8. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

CWA MAINTENANCE NOTES

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

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

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

4. THE CWA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2'.

5. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER–TIGHT CONTAINER AND DISPOSED OF PROPERLY.

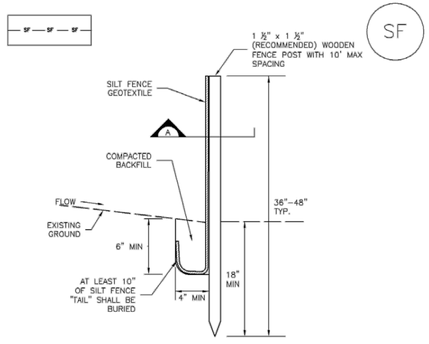
6. THE CWA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.

7. WHEN THE CWA IS REMOVED, COVER THE DISTURBED AREA WITH TOP SOIL, SEED AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND THE CITY OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD).

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

Silt Fence (SF) SC-1



SF–1. SILT FENCE

SC-1 Silt Fence (SF)

SILT FENCE INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER PONDING. SILT FENCE AT THE TOE OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST SEVERAL FEET (2–5 FT) FROM THE TOE OF THE SLOPE TO ALLOW ROOM FOR PONDING AND DEPOSITION.

2. A UNIFORM 6" X 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.

3. COMPACT ANCHOR TRENCH BY HAND WITH A "JUMPING JACK" OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.

4. SILT FENCE SHALL BE PULLED TIGHT AS IT IS ANCHORED TO THE STAKES. THERE SHOULD BE NO NOTICEABLE SAG BETWEEN STAKES AFTER IT HAS BEEN ANCHORED TO THE STAKES.

5. SILT FENCE FABRIC SHALL BE ANCHORED TO THE STAKES USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 3" ALONG THE FABRIC DOWN THE STAKE.

6. AT THE END OF A RUN OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "J–HOOK." THE "J–HOOK" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT LENGTH TO KEEP RUNOFF FROM FLOWING AROUND THE END OF THE SILT FENCE (TYPICALLY 10' – 20').

7. SILT FENCE SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

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

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

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

4. SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".

5. REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.

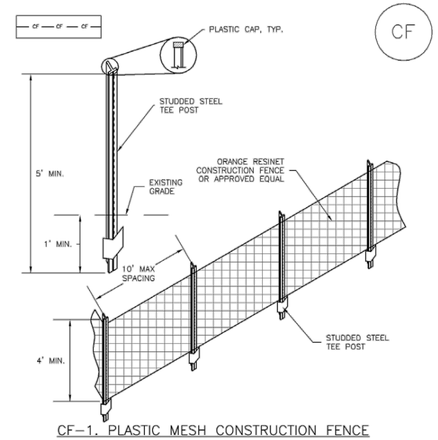
6. SILT FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION, OR IS REPLACED BY AN EQUIVALENT PERIMETER SEDIMENT CONTROL BMP.

7. WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

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

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

SM-3 Construction Fence (CF)



CF–1. PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION OF CONSTRUCTION FENCE.

2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR–GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.

4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.

5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

Construction Fence (CF) SM-3

CONSTRUCTION FENCE MAINTENANCE NOTES

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

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

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

4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

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

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

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811 Know what's below. Call before you dig.

DESIGNED BY: MJS
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DRAWN BY: MJS

ISSUE DATE: 05-08-2023

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PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 221206
SHEET NUMBER
10
10 OF 14

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IP-3. Rock Sock Inlet Protection for Sump/Area Inlet

IP-4. Silt Fence Inlet Protection for Sump/Area Inlet

IP-5. Over-excavation Inlet Protection

IP-6. Straw Bale Inlet Protection for Sump/Area Inlet

CIP-1. Culvert Inlet Protection

Propriety inlet protection devices should be installed in accordance with manufacturer specifications.

More information is provided below on selecting inlet protection for sump and on-grade locations.

Inlets Located in a Sump

When applying inlet protection in sump conditions, it is important that the inlet continue to function during larger runoff events. For curb inlets, the maximum height of the protective barrier should be lower than the top of the curb opening to allow overflow into the inlet during larger storms without excessive localized flooding. If the inlet protection height is greater than the curb elevation, particularly if the filter becomes clogged with sediment, runoff will not enter the inlet and may bypass it, possibly causing localized flooding, public safety issues, and downstream erosion and damage from bypassed flows.

Area inlets located in a sump setting can be protected through the use of silt fence, concrete block and rock socks (on paved surfaces), sediment control logs/straw wattles embedded in the adjacent soil and stacked around the area inlet (on pervious surfaces), over-excavation around the inlet, and proprietary products providing equivalent functions.

Inlets Located on a Slope

For curb and gutter inlets on paved sloping streets, block and rock sock inlet protection is recommended in conjunction with curb socks in the gutter leading to the inlet. For inlets located along unpaved roads, also see the Check Dam Fact Sheet.

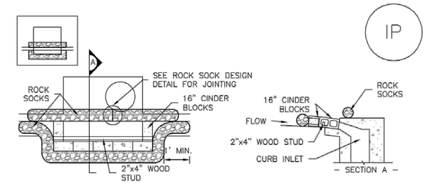
Maintenance and Removal

Inspect inlet protection frequently. Inspection and maintenance guidance includes:

- Inspect for tears that can result in sediment directly entering the inlet, as well as result in the contents of the BMP (e.g., gravel) washing into the inlet.
- Check for improper installation resulting in untreated flows bypassing the BMP and directly entering the inlet or bypassing to an unprotected downstream inlet. For example, silt fence that has not been properly trenched around the inlet can result in flows under the silt fence and directly into the inlet.
- Look for displaced BMPs that are no longer protecting the inlet. Displacement may occur following larger storm events that wash away or reposition the inlet protection. Traffic or equipment may also crush or displace the BMP.
- Monitor sediment accumulation upgradient of the inlet protection.

- Remove sediment accumulation from the area upstream of the inlet protection, as needed to maintain BMP effectiveness, typically when it reaches no more than half the storage capacity of the inlet protection. For silt fence, remove sediment when it accumulates to a depth of no more than 6 inches. Remove sediment accumulation from the area upstream of the inlet protection as needed to maintain the functionality of the BMP.
- Propriety inlet protection devices should be inspected and maintained in accordance with manufacturer specifications. If proprietary inlet insert devices are used, sediment should be removed in a timely manner to prevent devices from breaking and spilling sediment into the storm drain.

Inlet protection must be removed and properly disposed of when the drainage area for the inlet has reached final stabilization.



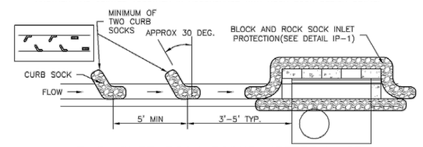
IP–1. BLOCK AND ROCK SOCK SUMP OR ON GRADE INLET PROTECTION

BLOCK AND CURB SOCK INLET PROTECTION INSTALLATION NOTES

1. SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.

2. CONCRETE "CINDER" BLOCKS SHALL BE LAID ON THEIR SIDES AROUND THE INLET IN A SINGLE ROW, ABUTTING ONE ANOTHER WITH THE OPEN END FACING AWAY FROM THE CURB.

3. GRAVEL BAGS SHALL BE PLACED AROUND CONCRETE BLOCKS, CLOSELY ABUTTING ONE ANOTHER AND JOINTED TOGETHER IN ACCORDANCE WITH ROCK SOCK DESIGN DETAIL.



IP–2. CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

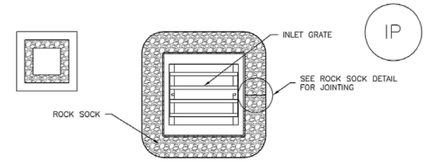
CURB ROCK SOCK INLET PROTECTION INSTALLATION NOTES

1. SEE ROCK SOCK DESIGN DETAIL INSTALLATION REQUIREMENTS.

2. PLACEMENT OF THE SOCK SHALL BE APPROXIMATELY 30 DEGREES FROM PERPENDICULAR IN THE OPPOSITE DIRECTION OF FLOW.

3. SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5 FEET APART.

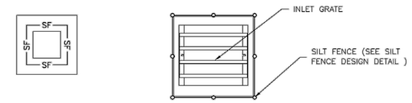
4. AT LEAST TWO CURB SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON–GRADE INLETS.



IP–3. ROCK SOCK SUMP/AREA INLET PROTECTION

ROCK SOCK SUMP/AREA INLET PROTECTION INSTALLATION NOTES
1. SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.

2. STRAW WATTLES/SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF ROCK SOCKS FOR INLETS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL.



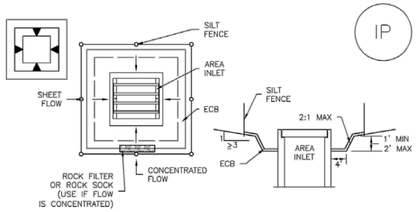
IP–4. SILT FENCE FOR SUMP INLET PROTECTION

SILT FENCE INLET PROTECTION INSTALLATION NOTES

1. SEE SILT FENCE DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.

2. POSTS SHALL BE PLACED AT EACH CORNER OF THE INLET AND AROUND THE EDGES AT A MAXIMUM SPACING OF 3 FEET.

3. STRAW WATTLES/SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF SILT FENCE FOR INLETS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL.



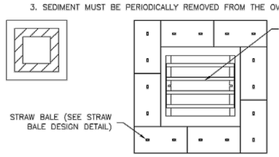
IP–5. OVEREXCAVATION INLET PROTECTION

OVEREXCAVATION INLET PROTECTION INSTALLATION NOTES

1. THIS FORM OF INLET PROTECTION IS PRIMARILY APPLICABLE FOR SITES THAT HAVE NOT YET REACHED FINAL GRADE AND SHOULD BE USED ONLY FOR INLETS WITH A RELATIVELY SMALL CONTRIBUTING DRAINAGE AREA.

2. WHEN USING FOR CONCENTRATED FLOWS, SHAPE BASIN IN 2:1 RATIO WITH LENGTH ORIENTED TOWARDS DIRECTION OF FLOW.

3. SEDIMENT MUST BE PERIODICALLY REMOVED FROM THE OVEREXCAVATED AREA.



IP–6. STRAW BALE FOR SUMP INLET PROTECTION

STRAW BALE BARRIER INLET PROTECTION INSTALLATION NOTES

1. SEE STRAW BALE DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.

2. BALES SHALL BE PLACED IN A SINGLE ROW AROUND THE INLET WITH ENDS OF BALES TIGHTLY ABUTTING ONE ANOTHER.

Description

Inlet protection consists of permeable barriers installed around an inlet to filter runoff and remove sediment prior to entering a storm drain inlet. Inlet protection can be constructed from rock socks, sediment control logs, silt fence, block and rock socks, or other materials approved by the local jurisdiction. Area inlets can also be protected by over-excavating around the inlet to form a sediment trap.

Photograph IP-1. Inlet protection for a curb opening inlet.

Appropriate Uses

Install protection at storm sewer inlets that are operable during construction. Consider the potential for tracked-out sediment or temporary stockpile areas to contribute sediment to inlets when determining which inlets must be protected. This may include inlets in the general proximity of the construction area, not limited to downgradient inlets. Inlet protection is <u>not</u> a stand-alone BMP and should be used in conjunction with other upgradient BMPs.

Design and Installation

To function effectively, inlet protection measures must be installed to ensure that flows do not bypass the inlet protection and enter the storm drain without treatment. However, designs must also enable the inlet to function without completely blocking flows into the inlet in a manner that causes localized flooding. When selecting the type of inlet protection, consider factors such as type of inlet (e.g., curb or area, sump or on-grade conditions), traffic, anticipated flows, ability to secure the BMP properly, safety and other site-specific conditions. For example, block and rock socks will be better suited to a curb and gutter along a roadway, as opposed to silt fence or sediment control logs, which cannot be properly secured in a curb and gutter setting, but are effective area inlet protection measures.

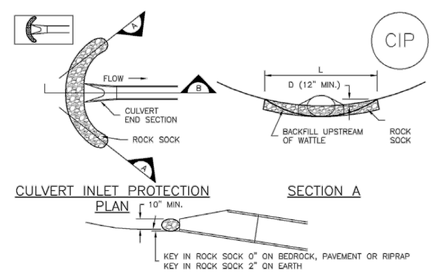
Several inlet protection designs are provided in the Design Details. Additionally, a variety of proprietary products are available for inlet protection that may be approved for use by local governments. If proprietary products are used, design details and installation procedures from the manufacturer must be followed. Regardless of the type of inlet protection selected, inlet protection is most effective when combined with other BMPs such as curb socks and check dams. Inlet protection is often the last barrier before runoff enters the storm sewer or receiving water.

Design details with notes are provided for these forms of inlet protection:

IP-1. Block and Rock Sock Inlet Protection for Sump or On-grade Inlets

IP-2. Curb (Rock) Socks Upstream of Inlet Protection, On-grade Inlets

Inlet Protection (various forms)	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No



CIP–1. CULVERT INLET PROTECTION

CULVERT INLET PROTECTION INSTALLATION NOTES

1. SEE PLAN VIEW FOR
–LOCATION OF CULVERT INLET PROTECTION.

2. SEE ROCK SOCK DESIGN DETAIL FOR ROCK GRADATION REQUIREMENTS AND JOINTING DETAIL.

CULVERT INLET PROTECTION MAINTENANCE NOTES

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

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

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

4. SEDIMENT ACCUMULATED UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS ½ THE HEIGHT OF THE ROCK SOCK.

5. CULVERT INLET PROTECTION SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

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

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

GENERAL INLET PROTECTION INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
–LOCATION OF INLET PROTECTION.
–TYPE OF INLET PROTECTION (IP.1, IP.2, IP.3, IP.4, IP.5, IP.6)

2. INLET PROTECTION SHALL BE INSTALLED PROMPTLY AFTER INLET CONSTRUCTION OR PAVING IS COMPLETE (TYPICALLY WITHIN 48 HOURS). IF A RAINFALL/RUNOFF EVENT IS FORECAST, INSTALL INLET PROTECTION PRIOR TO ONSET OF EVENT.

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

INLET PROTECTION MAINTENANCE NOTES

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

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

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

4. SEDIMENT ACCUMULATED UPSTREAM OF INLET PROTECTION SHALL BE REMOVED AS NECESSARY TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN STORAGE VOLUME REACHES 50% OF CAPACITY, A DEPTH OF 6" WHEN SILT FENCE IS USED, OR ¼ OF THE HEIGHT FOR STRAW BALES.

5. INLET PROTECTION IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED, UNLESS THE LOCAL JURISDICTION APPROVES EARLIER REMOVAL OF INLET PROTECTION IN STREETS.

6. WHEN INLET PROTECTION AT AREA INLETS IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

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

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

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

NOTE: SOME MUNICIPALITIES DISCOURAGE OR PROHIBIT THE USE OF STRAW BALES FOR INLET PROTECTION. CHECK WITH LOCAL JURISDICTION TO DETERMINE IF STRAW BALE INLET PROTECTION IS ACCEPTABLE.

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DESIGNED BY: MJS
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ISSUE DATE: 05-08-2023

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OUTLOOK POWERS & GRINNELL
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PROJECT #: 221206
SHEET NUMBER
11
11 OF 14

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

Description

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

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

Appropriate Uses

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

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

Design and Installation

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

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

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

Seedbed Preparation

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation. Overlot grading can result in loss of topsoil, resulting in poor quality subsoils at the ground surface that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, it is typically necessary to provide stockpiled topsoil, compost, or other soil amendments and rototill them into the soil to a depth of 6 inches or more.

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

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

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

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

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

Seed Mix for Temporary Vegetation

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

Seed Mix for Permanent Revegetation

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

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

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

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

Species[a] (Common name)	Growth Season[b]	Pounds of Pure Live Seed (PLS)/acre[c]	Planting Depth (inches)
1. Oats	Cool	35 - 50	1 - 2
2. Spring wheat	Cool	25 - 35	1 - 2
3. Spring barley	Cool	25 - 35	1 - 2
4. Annual ryegrass	Cool	10 - 15	½
5. Millet	Warm	3 - 15	½ - ¾
6. Sudangrass	Warm	5–10	½ - ¾
7. Sorghum	Warm	5–10	½ - ¾
8. Winter wheat	Cool	20–35	1 - 2
9. Winter barley	Cool	20–35	1 - 2
10. Winter rye	Cool	20–35	1 - 2
11. Triticale	Cool	25–40	1 - 2

[a] Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in the mulch.

[b] See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.

[c] Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.

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

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

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

Common Name	Botanical Name	Growth Season[b]	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Sandy Soil Seed Mix					
Blue grama	*Bouteloua gracilis*	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	*Schizachyrium scoparium 'Camper'*	Warm	Bunch	240,000	1.0
Prairie sandreed	*Calamovilfa longifolia*	Warm	Open sod	274,000	1.0
Sand dropseed	*Sporobolus cryptandrus*	Cool	Bunch	5,298,000	0.25
Vaughn sideoats grama	*Bouteloua curtipendula 'Vaughn'*	Warm	Sod	191,000	2.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**10.25**
Heavy Clay, Rocky Foothill Seed Mix					
Ephriam crested wheatgrass[d]	*Agropyron cristatum 'Ephriam'*	Cool	Sod	175,000	1.5
Oahe Intermediate wheatgrass	*Agropyron intermedium 'Oahe'*	Cool	Sod	115,000	5.5
Vaughn sideoats grama[e]	*Bouteloua curtipendula 'Vaughn'*	Warm	Sod	191,000	2.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**17.5**

[a] All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation.

[b] See Table TS/PS-3 for seeding dates.

[c] If site is to be irrigated, the transition turf seed rates should be doubled.

[d] Crested wheatgrass should not be used on slopes steeper than 6H to 1V.

[e] Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sideoats grama.

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

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

Mulch

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

Maintenance and Removal

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

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

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

Protect seeded areas from construction equipment and vehicle access.

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DRAWN BY: MJS

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OUTLOOK POWERS & GRINNELL
GESC - DETAILS

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Description

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

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

Appropriate Uses

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

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

Design and Installation

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

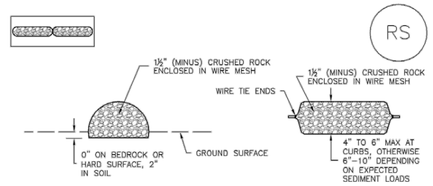
When placed in the gutter adjacent to a curb, rock socks should protrude no more than two feet from the curb in order for traffic to pass safely. If located in a high traffic area, place construction markers to alert drivers and street maintenance workers of their presence.

Maintenance and Removal

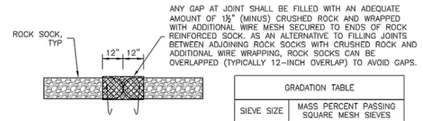
Rock socks are susceptible to displacement and breaking due to vehicle traffic. Inspect rock socks for damage and repair or replace as necessary. Remove sediment by sweeping or vacuuming as needed to maintain the functionality of the BMP, typically when sediment has accumulated behind the rock sock to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

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

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



ROCK SOCK SECTION ROCK SOCK PLAN



ROCK SOCK JOINTING

GRADATION TABLE	
SIEVE SIZE	MASS PERCENT PASSING SQUARE MESH SIEVES
	NO. 4
2"	100
1½"	90 – 100
1"	20 – 55
¾"	0 – 15
⅜"	0 – 5
MATCHES SPECIFICATIONS FOR NO. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES.	

ROCK SOCK INSTALLATION NOTES

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

RS–1. ROCK SOCK PERIMETER CONTROL

ROCK SOCK MAINTENANCE NOTES

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

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

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

4. ROCK SOCKS SHALL BE REPLACED IF THEY BECOME HEAVILY SOILED, OR DAMAGED BEYOND REPAIR.

5. SEDIMENT ACCUMULATED UPSTREAM OF ROCK SOCKS SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP. TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY ½ OF THE HEIGHT OF THE ROCK SOCK.

6. ROCK SOCKS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

7. WHEN ROCK SOCKS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

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

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

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

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CHECKED BY: RCP
DRAWN BY: MJS

ISSUE DATE: 05-08-2023

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OUTLOOK POWERS & GRINNELL
GESC - DETAILS

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Description

Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WWE.

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- **Basin Storage Volume**: Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent "clean" runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft^3/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft^3/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.
- **Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, baffling may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.
- **Dam Embankment**: It is recommended that embankment slopes be 4:1 (H:V) or flatter and no steeper than 3:1 (H:V) in any location.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- **Inflow Structure**: For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft^3) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- **Outlet Works**: The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:
  - **Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.
  - **Orifice Plate or Riser Pipe**: Follow the design criteria for Full Spectrum Detention outlets in the EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations with an emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly sized 1½ - to 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will need to be cleaned out frequently during the construction period as sediment accumulates within it. The gravel pack will need to be removed and disposed of following construction to reclaim the basin for use as a permanent detention facility. If the basin will be used as a permanent extended detention basin for the site, a trash rack will need to be installed once contributing drainage areas have been stabilized and the gravel pack and accumulated sediment have been removed.
  - **Floating Skimmer**: If a floating skimmer is used, install it using manufacturer's recommendations. Illustration SB-1 provides an illustration of a Faircloth Skimmer Floating Outlet™, one of the more commonly used floating skimmer outlets. A skimmer should be designed to release the design volume in no less than 48 hours. The use of a floating skimmer outlet can increase the sediment capture efficiency of a basin significantly. A floating outlet continually decants cleanest water off the surface of the pond and releases cleaner water than would discharge from a perforated riser pipe or plate.

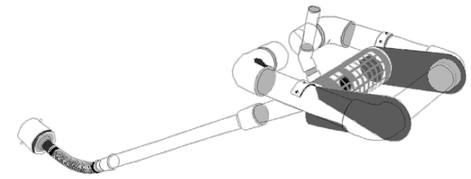


Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc., FairclothSkimmer.com.

- **Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.
  - **Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
  - **Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

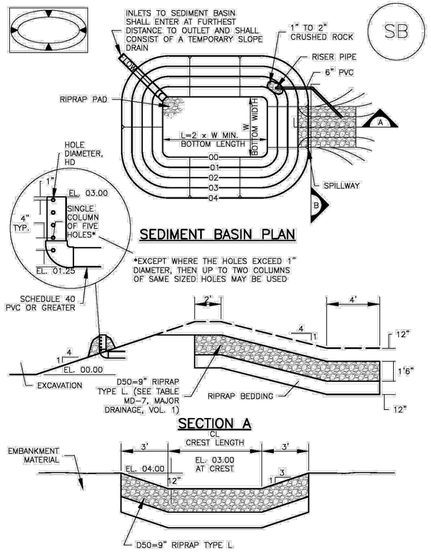
Maintenance and Removal

Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a permanent post-construction stormwater basin or whether the basin area will be returned to grade. For basins being converted to permanent detention basins, remove accumulated sediment and reconfigure the basin and outlet to meet the requirements of the final design for the detention facility. If the sediment basin is not to be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetation.

Sediment Basin (SB) SC-7



SC-7 Sediment Basin (SB)

TABLE SB-1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN

Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	2	9/32
2	21	3	13/16
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	27/32
6	43	9	31/32
7	47 ¼	11	29/32
8	51	12	27/32
9	55	13	⅞
10	58 ¼	15	15/16
11	61	16	31/32
12	64	18	7/8
13	67 ½	19	1 1/16
14	70 ½	21	1 ⅛
15	73 ¼	22	1 1/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF SEDIMENT BASIN.
   - TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.
2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.
3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.
4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.
5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
6. PIPE SCH 40 OR GREATER SHALL BE USED.
7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

Sediment Basin (SB) SC-7

SEDIMENT BASIN MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E., TWO FEET BELOW THE SPILLWAY CREST).
5. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.
6. WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO)

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

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