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DIVISION 02 – TECHNICAL SPECIFICATIONS

Division 02 – Technical Specifications shall be the Colorado Department of Transportation (CDOT) 2017 Standards Specifications for Road and Bridge Construction. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plans.

DIVISION 02 – GENERAL PROVISIONS

DIVISION 02 – PROJECT SPECIAL PROVISIONS

DIVISION 02 – CDOT STANDARD SPECIAL PROVISIONS

APPENDIX A – STORMWATER MANAGEMENT PLAN (NARRATIVE REPORT)

DIVISION 02 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Work described in the technical specifications, contract drawings, or Part I of the contract documents shall be performed in accordance with the Colorado Department of Transportation (CDOT) 2017 Standard Specifications for Road and Bridge Construction (except as noted below), the latest edition of the Colorado Standard Plans (M&S Standards).

B. Sections 100 through 109 of the above referenced “Standard Specifications” are NOT applicable and are deleted, except where specifically added in. In place of the deleted, the Division 01 General Requirements, CCD General Contract Conditions, Project Special Provisions, and Technical Specifications are attached to and made part of the contract.

1. The following sections shall apply as noted:

a. Section 101 Definitions and Terms

b. Section 105 Control of Work with the following exceptions:

1) If there are any conflicts with the Division 01 General Requirements, CCD General Contract Conditions, Project Special Provisions, and Technical Specifications and this section, those documents will take precedence.

2) Section 105.21 Acceptance shall not apply.

3) Section 105.22 through 105.24 shall not apply.

c. Section 106 Control of Material

d. Section 107.02 Permits, Licenses, and Taxes

e. Section 109.01 Measurement of Quantities

C. Alternates: Refer to Division 01 Section 012300 "Alternates" for description of Work in this Section affected by Alternates.

1.3 REFERENCES

A. All references to “CDOT or the Department” shall be changed to “City and County of Denver” unless otherwise noted.

B. All references to the CDOT Project Engineer and CDOT Regional Transportation Director shall mean DEN Project Manager and DEN Project Supervisor.

C. Any and all reference to incentives or positive pay factors within any documents pertaining to this contract shall not apply. NO incentives or increase pay factors will be paid on this project. References to disincentives, negative pay factors, corrective work or removal and rejection of work and/or materials shall apply.

1.4 APPLICABLE PUBLICATIONS

A. Copies of the Colorado Department of Transportation’s Standard Specifications for Road and Bridge Construction, Colorado Standard Plans (M&S Standards), and the Colorado Procedures Field Materials Manual are available for purchase at:

Colorado Department of Transportation
Bid Plans Room
4201 East Arkansas Avenue
Denver, CO 80222

B. The Colorado Department of Transportation Standard Special Provisions are available for download on the Department’s webpage.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION [Not Used]

PART 4 - MEASUREMENT [Not Used]

PART 5 - PAYMENT [Not Used]

END OF SECTION

SECTION 024000 - REMOVAL AND DISPOSAL OF CONCRETE AND ASPHALT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of concrete and asphalt materials.
2. Salvaging items for reuse by Owner.

B. Related Sections:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 024116 “Structure Demolition” for demolition of buildings, structures, and site improvements.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.

C. Alternates: Refer to Division 01 Section 012300 "Alternates" for description of Work in this Section affected by Alternates.

1.3 DEFINITIONS

A. Sized: Materials that are “sized” have been broken down to rubble that is generally 2-feet (length and width, or diameter) or less (2-ft minus).

B. Debris: For example, trash, rebar, geotextile, contaminated materials.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION

3.1 REMOVAL OF CONCRETE AND ASPHALT

A. Removal shall be in a manner that minimizes contamination of the underlying material.

B. The removed material shall become the property of the Contractor and shall be either disposed of properly outside the property site, or removed from the site to a DEN Recycle Yard.

C. The Contractor may utilize the DEN South Recycle Yard (Jackson Gap St and E 71st Ave) for disposal of concrete and asphalt rubble.

1. All concrete and asphalt disposed of at a DEN Recycle Yard must be sized appropriately, and clean and free of debris.

2. All disposals must be coordinated with the DEN Project Manager or the designated representative a minimum of 48 hours' in advance.

D. Debris shall be disposed of at the DADS Landfill located at 3500 E Gun Club Rd in Aurora. Use of DADS Landfill must be coordinated with the DEN Project Manager so that the hauler obtains DEN disposal tickets.

3.2 EXAMINATION

A. DEN Recycle Yard managers will designate an area for this Project within the Recycle Yard to stockpile concrete and asphalt rubble. If rubble is found to be contaminated or containing debris, it will be the responsibility of the Contractor to clean and remove all debris, at the Contractor's expense.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment must be made for work under this Section. The cost of the Work under this section shall be included in the Contract payments for Removal of Concrete, Removal of End Section, Removal of Pipe, and Removal of Structure.

END OF SECTION 024000

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Landscape Boulders.

B. Related Requirements:
   1. CDOT Standard Specification Section 203 “Excavation and Embankment” for excavation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include data substantiating that materials comply with requirements.

B. Samples for Verification: Landscape Architect shall be notified in advance to review selected boulders on-site at quarry for approval prior to ordering.

1.4 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 LANDSCAPE BOULDERS

A. Products: Subject to compliance with requirements, provide one of the following:

   1. Colorado Moss Rock blocks: Semi-rectangular in shape; Size range – 3’ht.x 2’w. x 3’d – 3’ht. x 3’ w. x 4’d.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Unless otherwise indicated, install landscape boulders prior to landscape plantings.

B. Install landscape boulders level, plumb, true, and at locations indicated on Drawings.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the Line Item Contract price.

B. Payment will be made under:

Pay Item:	**Pay Unit:**	**Item Number**
Landscape Boulder	Each	129300-01

END OF SECTION 129300

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:

C. Alternates: Refer to Division 01 Section 012300 "Alternates" for description of Work in this Section affected by Alternates.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site at a time determined by DEN Project Manager.

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.

4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.
5. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data.

B. Field quality-control reports. Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. CLOSEOUT SUBMITTALS

E. As-Built Plans: Submit complete as-built plans of all Work, including interface with other Work, in accordance with requirements as specified in Section 013300 "Submittal Procedures".

1. Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

B. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by DEN Project Manager and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

1.8 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from DEN Project Manager and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015719 "Temporary Environmental Controls" during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

E. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify DEN Project Manager if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. All the work listed above, including but not limited to dewatering, erosion control for dewatering, and disposal of water resulting from dewatering operations, including all costs for CDPHE concurrences and permits, will not be paid for separately, but shall be included in the work.

END OF SECTION 312319

SECTION 313250 - WATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for furnishing, hauling, and applying water required for compaction of embankments, backfills, sub-grade, and for landscaping, dust control, and other construction operations.

B. Related Sections:
1. Division 32 Section “Turf and Grasses”.
2. Division 32 Section “Plants”.

1.3 SUBMITTALS

A. Watering Schedule: when requested by the DEN Project Manager, the Contractor shall provide a narrative plan and preliminary schedule for Landscape Watering, as specified in this Section and in the plans.

PART 2 - PRODUCTS

2.1 WATER

A. If water supply is from a hydrant, the Contractor shall supply a Denver Water approved and calibrated water meter to measure water usage and be responsible to pay all costs related to water usage. The cost of water shall be charged at the current City and County of Denver rate through Denver Water.

B. Water applied for moisture density control, pre-wetting, and as dust palliative shall be free of debris, organic matter, and other objectionable substances.

C. Water for landscaping shall be free from oils, acids, salts or any substance that may be harmful to plant life. Non-potable water may be accepted on a case-by-case basis as approved by Project Manager.

D. When the water source proposed for use by the Contractor is not known, the Contractor shall provide an analysis of water samples from an approved testing laboratory. The analysis shall be provided to the Project Manager prior to use.

PART 3 - EXECUTION

3.1 WATER TRUCK

A. At least one water truck shall be on site or as directed by Project Manager.
   1. Truck shall have capacity of at least one-thousand (1,000) gallons, or be of adequate size related to the scope of work or as directed by the Project Manager.
   2. Water is to be metered; the Contractor shall provide and use an approved Denver Water metering device.
   3. Monthly water usage readings either from the vehicle or from a meter are to be provided to the Project Manager

3.2 APPLICATION

A. Pressure type distributors or a pipeline equipped with sprinkler system.

B. Moisture and Density Control: Ensure a uniform and controlled application of water without ponding or causing erosion for optimum moisture content.

C. Pre-wetting: Pre-wetting material in excavation areas prior to removal for placement in embankments will be allowed as approved by the Project Manager. Prior to excavation the Contractor shall drill, bore or dig test holes to the full depth of excavation to determine moisture requirements. The contractor will identify and confirm with the Project Manager the areas for pre-wetting, including equipment to be used for the pre-wetting operations.

D. Landscape Watering: The Contractor shall provide water for seeding, mulching, planting, transplanting, sodding, herbicide treatment, maintenance operations including watering during warranty periods or any other landscape related activities when called out on the Contract Drawings or Specifications.

E. If overwatering occurs during any of the above operations, dewater at no additional expense to the City.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. No separate measurement or payment will be made for Work under this Section. Watering shall be considered incidental to the Work.

END OF SECTION 313250

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION - NON-ROADS AND BRIDGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Requirements:
   1. Section 312319 "Dewatering" for dewatering excavations.

C. Alternates: Refer to Division 01 Section 012300 "Alternates" for description of Work in this Section affected by Alternates.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project site at a time determined by DEN Project Manager.

   1. Review geotechnical report.
   2. Review existing utilities and subsurface conditions.
   3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
   4. Review proposed excavations.
   5. Review proposed equipment.
   6. Review monitoring of excavation support and protection system.
   7. Review coordination with waterproofing.
   8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
   2. Include data substantiating that materials comply with requirements.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer.

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

A. As-Built Plans: Submit complete as-built plans of all Work, including interface with other Work, in accordance with requirements as specified in Section 013300 "Submittal Procedures".

1. Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.7 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify DEN Project Manager no fewer than five (5) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without DEN Project Manager's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1.8 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

F. Tiebacks: Steel bars, ASTM A 722/A 722M.

G. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from DEN Project Manager and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by DEN Project Manager.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify DEN Project Manager if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.5 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
3. Repair or replace, as approved by DEN Project Manager, adjacent work damaged or displaced by removing excavation support and protection systems.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Section. The cost of the work described in this Section is considered incidental to the work.

END OF SECTION 315000

SECTION 323116 - WELDED WIRE FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rabbit barrier fence – vinyl coated chicken wire.

B. Related Requirements:
1. CDOT Standard Specification Section 203 “Excavation and Embankment” for site excavation, fill, and backfill where welded-wire fences and gates are located.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location and time as determined by DEN Project Manager.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data substantiating that materials comply with requirements.

B. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches (300 mm) in length for linear materials.
2. Provide Samples 12 inches (300 mm) square for wire mesh.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

B. As-Built Plans: Submit complete as-built plans of all Work, including interface with other Work, in accordance with requirements as specified in Section 013300 "Submittal Procedures".

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include 10-foot (3-m) length of fence complying with requirements.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to

B. Satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 FENCE AND GATE MATERIALS

A. PVC-Coated-Steel Hex-Wire: 20 gauge chicken wire fence fabric, PVC coated after fabrication. Submit samples for color to be selected by Landscape Architect. Color samples presented shall attempt to be “non-visible” from the roadway (e.g. brown, green, black)

B. Posts: Powdercoated steel U-posts 5’ ht. to allow for 2’ buried below grade and 2’-6” above grade.

C. Iron Castings: Either gray or malleable iron unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30.
2. Malleable Iron: ASTM A 47/A 47M.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.2 MISCELLANEOUS MATERIALS

A. PVC Coated wire for tensioning. Thread through top of fence and fasten with metal fasteners to U posts.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by DEN Project Manager.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

1. Construction layout and field engineering are specified in Section 017300 "Execution."

3.3 FENCE INSTALLATION

A. Install fences by setting posts as indicated and fastening infill panels to posts.

B. Post Setting: Set posts by mechanically driving into soil at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Mechanically Driven Posts: Drive into soil to depth of 24-30 inches. Protect post top to prevent distortion.

3. Space posts uniformly at 10 feet (3.048 m) o.c. maximum.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the Line Item Contract price.

B. Payment will be made under:

Pay Item:	**Pay Unit:**	**Item Number**
Rabbit Fence	Linear Foot	323116-01

END OF SECTION 323116

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Work shall follow the latest version of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction Section 207 Topsoil.

B. All materials and construction shall follow the latest version of the CDOT Standard Specifications for Road and Bridge Construction and the latest version of the CDOT Standard Plans M&S Standards and all referenced sections therein.

C. CDOT General Provisions consisting of Section 100 through 109 of the above referenced “Standard Specifications” do not apply to this specification except where specifically added.

D. This work consists of excavating, salvaging and stockpiling existing topsoil, soil preparation and placement of acceptable topsoil from stockpiles, contractor sources, and imported sources. It shall include the placement of topsoil upon subgrade after grading operations are completed. Soil amendments shall be incorporated into the topsoil, in accordance with approved testing lab recommendations, after placement at final elevations indicated on the plans. Soil shall be amended and tested until DEN Project Manager is satisfied that the soil is suitable for plant and seed installation.

E. The following shall apply to this specification Section:

1. Section 101 Definitions and Terms.
2. Section 105 Control of Work with the following exceptions:

    a. If there are any conflicts with the City and County of Denver’s General Provisions, General Conditions, Special Conditions or Technical Specifications and this specification Section, those documents will take precedence.
    b. Any reference to incentives shall be disregarded. No Incentives will be paid as a result of these specifications. References to disincentives, corrective work or removal and rejections of work and/or materials shall apply.
    c. Section 105.21 Acceptance shall not apply.
    d. Section 105.22 through 10.24 shall not apply.

3. Section 106 Control of Material.
4. Section 109.1 Measurement of Quantities.

F. Related Requirements:
1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 REFERENCES

A. All references to “CDOT or the Department” shall be changed to “City and County of Denver” unless otherwise noted.

B. All references to the CDOT Project Engineer and CDOT Regional Transportation Director shall mean DEN Project Manager and DEN Director.

C. Any and all reference to incentives or positive pay factors within any documents pertaining to these specifications shall not apply. No incentives or increase pay factors will be paid on this project. References to disincentives, negative pay factors, corrective work or removal and rejection of work and/or materials shall apply.

1.4 ALLOWANCES (NOT USED)

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location and time as determined by DEN Project Manager.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

5. Include data substantiating that materials comply with requirements.

6. Prior to the start of earthwork operations, identify existing topsoil suitable for reuse (based on agricultural test results) for stripping, stockpiling and respreading.

7. Topsoil Samples: Provide a minimum of five (5) representative 1 quart samples of proposed topsoil for agricultural suitability analysis, from each representative on- site soil type area (seeded area, pond bottom area, planted area) to an approved testing lab for testing, analysis and recommendations. Deliver samples to testing laboratories, and have the test reports sent directly to the DEN Project Manager. Contractor to pay all costs of sampling, transport and testing. Indicate sample locations on field copy of plan and submit with test results. Label samples to correspond to the plan such that test samples and reports have the appropriate corresponding numbers printed on them. Testing shall be performed by a public extension service or a private testing laboratory approved by the Owner's Representative. Approved testing lab is Colorado Analytical Labs. Approved Public extension service is Colorado State University Soil Testing Laboratory, Fort Collins, Colorado, and phone: (970) 491-5061. Reports shall include the following tests and recommendations:

   a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. A hydrometer shall be used to determine the percentage each of clay and silt.

   b. Percent of organics shall be determined by the loss on ignition of oven- dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.

   c. Tests will include tests for hazardous elements as determined by the Owner's Representative.

   d. Chemical analysis for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH).

   e. Soil analysis tests shall show recommendations for amendments to correct soils deficiencies as necessary, and for additives necessary to accomplish particular seeding, sodding, and planting objectives noted.

F. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists. Organics or compost lab analysis of product being bid shall be performed by a US Composting Council STA-certified lab.

G. Test Analysis for organic compost shall indicate the following: Bulk Density, % Inorganics, % Moisture, Particle Size Distribution, Primary, Secondary Nutrients, Trace Elements, Organic Matter Expressed in Percentage and Pounds per CY, Ag Index, pH, Soluble Salts, Maturity Indicators: Ammonia N/Nitrate N Ratio, Carbon to Nitrogen Ratio

H. Certified Test Data for all soil amendments including sand, organics, fertilizers and all other amendments.

I. Manufacturer's product literature and test data for all soil amendments including:

1. Sand, mechanical gradation sieve analysis, source, and 1 quart sample.
2. Compost, mechanical a chemical analysis, lab analysis, total volume of compost being calculated for application.
3. Source and 1 quart sample.
4. Fertilizer, chemical analysis and manufacturer's product literature.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

C. The Contractor shall submit a 2 lb. sample of the humate and fertilizer product or approved equal product and ¼ lb. sample of the mycorrhizae product four weeks before its use on the project site for the Engineer's approval. A Certificate of Compliance shall be provided to the Engineer to verify the organic matter content, and pH of the humate product.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Topsoil Testing: Soil samples shall be tested for agricultural suitability by a certified and approved testing laboratory. Test results shall be submitted for approval by DEN Project Manager.

C. Product Supplier Qualifications: Shall have not less than five years' experience in the products specified.

D. Installation Contractor Qualifications: Contractor for soil preparation and fine grading shall have demonstrated not less than three years' experience in the successful performance of work of this type.

E. Certifications: Submit certificates of inspection required by law for transportation with delivery and invoice. File copies of certificates with DEN Project Manager after acceptance of material.

F. Inspection: Inspection by governmental officials at point of origin does not preclude rejection of materials at the project site.

G. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

H. Field quality-control reports.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.9 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:

1. Topsoil shall be imported from off-site.

2. Composition: Use as a planting medium only fertile, friable, well-drained soil, of uniform quality, free of stones over 1 in. diameter, sticks, oils, chemicals, plaster, concrete and other deleterious materials.

3. Contractor shall remove existing material to the minimum depth required, rip/disk the subgrade to a depth of eight (8) inches below subgrade, then place and compact topsoil meeting the requirements of these specifications over the subgrade area (to finished grade).

4. Topsoil shall comply with the following specifications. Topsoil shall have a mechanical analysis that complies with the requirements for "fine sandy loam" or "sandy loam" as determined by ASTM D-422, and based on the "USDA Classification System". Topsoil shall have the following mechanical analysis:

Textural Class	Percentage of Total Weight	Average Percentage
Sand (0.05 - 2.0 mm dia. range)	45 - 75	60
Silt (0.002-0.05 mm dia. range)	15 - 35	25
Clay (less than 0.002 mm dia. range)	5 - 20	15

a) The maximum retained on a Number 10 sieve shall be 15 percent by weight, 20 percent by volume of the total sample.

b) Topsoil shall not contain less than 3 percent nor more than 8 percent organic matter as determined by the loss on ignition of oven-dried samples.

c) The acidity range of the topsoil shall be pH 6.0 to 7.5.

d) Topsoil shall be free of debris and other extraneous matter. It shall be uncontaminated by salt, stumps, roots, rocks larger than ½ inch, brush, noxious weed seed, reproductive vegetation plant parts, heavy clay, hard clods, toxic substances, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve Number 10 material). Soils shall not have levels of Aluminum greater than 200 parts per million.

5. No soil preparation shall be performed until the review and approval of topsoil laboratory test results and recommendations by the Landscape architect is complete, but such approval shall not constitute final acceptance. The Landscape architect may reject any material delivered to the site that, after on-site, post-delivery testing, does not meet these specifications.

6. Samples: The Landscape Architect reserves the right to have samples taken of topsoil delivered to the site for conformance to the Specifications. Sampling and testing shall be at the Contractor's expense.

7. Rejected Topsoil: Amend and test topsoil until accepted. Immediately remove rejected topsoil off the site at Contractor's expense.

8. Stockpiling: If stockpiling is required, locations and sizes of stockpiles are subject to the approval of the Owner's Representative.

B. Organic amendments

1. Organic soil additives shall be natural humus, well-rotted manure and compost, free from excessive amounts of zinc, salinity level below 1 milliohms/cm, low in wood content, free from hard lumps and in a shredded or granular form. At least 25% of the organic amendments shall be manure. According to the methods of testing of A.O.A.C., latest edition, the acceptable pH range shall be between 5.5 and 7.6. The organic content, as measured by loss on ignition, shall not be less than 45% by

weight. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis. Acceptable materials are:

a. Bio-Comp available at A1 Organics, Golden, CO (303) 384-9259 or approved equal.

b. Biosol, a fertilizer with 90% fungal biomass (mycelium) and 10% potassium-magnesia with a grade of 6-1-3 or approved equal for native seeded areas. Biosol grade 7-2-3 or approved equal for sodded areas.

c. Humate: Humate shall conform to the following:

1) Maximum 10% retained on #50 mesh screens.
2) pH of 3 to 5.
3) Maximum 20% inert ingredient.
4) Minimum 80% organic matter with 40% minimum humic acid.

d. Mycorrhizae Fungus: Mycorrhizae shall conform to the following:

1) Powder form to be added to hydromulch mixture, 100,000 spores/lb.
2) Minimum three endomycorrhizal species.

e. Equivalent to compost is 100% Organic Fertilizer: “Biosol”, Bowman Construction Co., Denver, CO (303) 696-8960, or equal. The application rate for Biosol is 1300 lbs/acre. Biosol may be substituted for compost for up to 50% in sodded areas and up to 100% in seeded areas. For the purposes of this substitution 1 cubic yard of compost will be considered equivalent to 10 lbs of Biosol. For example an alternative mix would consist of:
1) Sodded Areas: 65CY/Acre (1.5CY/1000SF) Compost and 650lbs/Acre Biosol
2) Seeded Areas: 1300 lbs/Acre Biosol

f. For the purposes of soil preparation, include 3 cubic yards of compost for each 1000 square feet of soil preparation in lawn areas and 3 cubic yards per 500 square feet in ground cover and perennial planting beds.

C. Pre-emergent Weed Control: Enide 50W, as manufactured by Tuco Division, Upjohn Co., Kalamazoo, Michigan, or approved equal. To be used in all sod areas and planting beds.

D. Water: Clean, fresh and potable, furnished and paid for by Contractor. Where required, transport in water truck furnished by Contractor. Fill at designated, metered fire hydrants as directed by Construction Manager.

PART 3 - EXECUTION

3.1 All soil to be seeded above the water quality elevation shall be amended with the humate and a fertilizer product. The method of incorporation of amendments shall result in a uniform application of material as approved.

3.2 Liquid apply biosol/humate/mycorrhizae mixture with hydroseeder hose. All areas will be drill seeded. Hydromulching will occur within 24 hours of hand broadcasting of seed. If hand broadcast application is to be used, 150% of drill seed application rate per acre of seed mix for hand broadcast areas only. Rake broadcast seed.

3.3 Where salt content of existing soil is high per laboratory test, utilize only low-salt compost or humus as approved.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. Topsoil salvaged from the roadway and placed in stockpiles shall be measured in the stockpile in cubic yards by the method of average end areas and paid for as Stockpile Topsoil. Topsoil salvaged from the roadway, taken from stockpiles or from approved pits, hauled and placed directly upon completed cut and fill slopes shall be measured at its source in cubic yards as described in subsection 203.13 and paid for as Topsoil.

B. Topsoil generated from the roadway and placed in windrows will be measured at its source in cubic yards, as described in subsection 203.13 and paid for as Stockpile Topsoil. When it is subsequently placed upon the completed cut and fill slopes, the same quantity will be paid for as Topsoil, except that adjustment in quantity shall be made if the total windrowed quantity is not utilized.

C. Wetland topsoil material excavated from areas within the right-of-way and placed in stockpiles will be measured in the stockpile by the method of average end areas and paid for as Stockpile Wetland Topsoil.

D. Wetland topsoil material excavated from areas within the right-of-way or from stockpiles, hauled and placed directly on a relocated site will be measured at its source in cubic yards, as described in subsection 203.13 and paid for as Wetland Topsoil.

E. Topsoil secured from the Contractor’s source will be measured in place by measuring random depths of topsoil, and computing the volume by multiplying the area times the average depth

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. The accepted quantities measured as provided above will be paid for at the contract unit price per cubic yard for each of the pay items listed below that appear in the bid schedule.

B. Payment will be made under:

Pay Item:	**Pay Unit:**	**Item Number**
Topsoil (Import)	Cubic Yard	329113-01

END OF SECTION 329113

SECTION 329200 - TURF AND GRASSES (CDOT)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This work shall follow the latest version of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction Section 623 Seeding, Fertilizer, Soil Conditioner and Sodding.

B. All materials and construction shall follow the latest version of the CDOT Standard Specifications for Road and Bridge Construction and the latest version of the CDOT Standard Plans M&S Standards and all referenced sections therein.

C. CDOT General Provisions consisting of Section 100 through 109 of the above referenced “Standard Specifications” do not apply to this specification Section except where specifically added.

D. The following shall apply to this specification Section:

1. Section 101 Definitions and Terms.
2. Section 105 Control of Work with the following exceptions:
    a. If there are any conflicts with the City and County of Denver’s General Provisions, General Conditions, Special Conditions or Technical Specifications and this specification Section, those documents will take precedence.
    b. Any reference to incentives shall be disregarded. No Incentives will be paid as a result of these specifications. References to disincentives, corrective work or removal and rejections of work and/or materials shall apply.
    c. Section 105.21 Acceptance shall not apply.
    d. Section 105.22 through 10.24 shall not apply.
3. Section 106 Control of Material.
4. Section 109.1 Measurement of Quantities.

E. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 REFERENCES

A. All references to “CDOT or the Department” shall be changed to “City and County of Denver” unless otherwise noted.

B. All references to the CDOT Project Engineer and CDOT Regional Transportation Director shall mean DEN Project Manager and DEN Director.

C. Any and all reference to incentives or positive pay factors within any documents pertaining to these specifications shall not apply. No incentives or increase pay factors will be paid on this Project. References to disincentives, negative pay factors, corrective work or removal and rejection of work and/or materials shall apply.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location and time as determined by DEN Project Manager.

1. Conference participants shall include at minimum: DEN Project Manager, Landscape Architect, Civil Engineer, Landscape Contractor.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by DEN Project Manager for maintenance of native seeded areas during a calendar year. Submit before expiration of required maintenance periods.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: Spring thaw to May 15th without irrigation. Spring thaw to June 15th with irrigation.
2. Fall Planting: September 15th until consistent ground freeze with or without irrigation.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

C. Seeding accomplished outside the time periods listed above will be allowed only when ordered by the DEN Project Manager or when the Contractor's request is approved in writing. When requested by the Contractor, the Contractor must agree to perform the following work at no cost to the Department: reseed, remulch, and repair areas which fail to produce species indicated in the Contract.

1.9 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Native seed mixes as listed in the tables below, and as shown in the plans:

Table 329200-1: Upland Seed Mix for Shoulder Areas

Scientific Name:	Common Name	Variety	Pounds PLS/acre*	% of mix**
GRASSES				
Bouteloua curtipendula	Sideoats Grama	Vaughn	0.8	10
Bouteloua gracilis	Blue Grama	Bad River	0.05	2.5
Bouteloua gracilis	Blue Grama	Hachita	0.05	2.5
Buchloe dactyloides	Buffalograss	Cody	0.7	2.5
Buchloe dactyloides	Buffalograss	Native -VNS~	0.7	2.5
Distichlis spicata v. stricta	Inland Saltgrass	Native -VNS~	0.3	5
Elymus lanceolatus v. lanceolatus	Thickspike Wheatgrass	Critana	1.1	11
Elymus lanceolatus v. psammophilus	Steambank Wheatgrass	Sodar	1.0	10
Elymus trachycaulus	Slender Wheatgrass	Primar 0.5	0.5	5
Nasella viridula	Green Needlegrass	LoDorm	0.8	5
Pascopyrum smithii	Western Wheatgrass	Arriba	3.6	25
Poa secunda	Sandberg Bluegrass	Native -VNS~	0.5	5
Sporobolus cryptandrus	Sand Dropseed	Native -VNS~	0.01	4
Grass Species Subtotal			9.31	100
	TOTAL		**9.31**	**100**

Table 329200-2: Upland Seed Mix

Scientific Name	Common Name	Variety	Pounds PLS/acre*	% of mix**
Buchloe dactyloides	Buffalograss	Cody	1.4	5
Buchloe dactyloides	Buffalograss	Native	1.4	5
Distichlis spicata v. stricta	Inland Saltgrass	Native	0.8	25
Sporobolus airoides	Alkali Sacaton	Salado	0.2	20
Pascopyrum smithii	Western Wheatgrass	Arriba	2.1	15
Puccinellia distans	Alkaligrass	Fults	0.2	15
Puccinellia airoides	Nuttall Alkaligrass	Native	0.1	12
Grass species subtotal			**6.2**	**97**
SHRUBS				
Atriplex gardneri	Gardner Saltbush	Native	0.4	3
Shrub species subtotal			0.4	3
	TOTAL PLS RATE		**6.6**	**100**

Table 329200-3: Wetland Seed Mix

Scientific Name	Common Name	Variety	Pounds PLS/acre*	% of mix**
Scirpus paludosus (S. maritimus)	Alkali Bulrush	Native	3.9	50
Puccinellia airoides	Nuttall Alkaligrass	Native	0.33	25
Distichlis spicata v.	Inland Saltgrass	Native	0.65	25

stricta				
	TOTAL PLS RATE		**4.88**	**100**

Table 329200-4: Pond Bottom Seed Mix

Scientific Name	**Common Name**	**Variety**	**Pound PLS/acre***	**% of mix****
GRASSES and GRASSLIKES				
Distichlis spicata v. stricta	Inland Saltgrass	Native -VNS~	0.3	10
Juncus balticus	Baltic Rush	Native -VNS~	0.02	10
Panicum virgatum	Switchgrass	Nebraska 28	0.4	10
Pascopyrum smithii	Western Wheatgrass	Arriba	7.9	50
Puccinellia airoides	Nuttall Alkaligrass	Native -VNS~	0.06	10
Scirpus paludosus (S. maritimus)	Alkali Bulrush	Native -VNS~	1.1	10
	TOTAL		**9.8**	**100**

* PLS means Pure Live Seed; rates shown are for drill seeding, if broadcast, rates should be doubled.
** Percent by seed number
*** Wetland mixes to be used only where wetland hydrology exists. Check with DEN Environmental Services.
~VNS = Variety Not Stated

PART 3 - EXECUTION (Not Used – follow CDOT Section 212 execution specification – 212.06)

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. The quantities of lawn seeding and native seeding will not be measured but shall be the quantities designated in the Contract, except that measurements will be made for revisions requested by the DEN Project Manager, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. The quantity of lawn seeding shall include soil preparation, water, fertilizer, and seed, completed, and accepted. The quantity of native seeding shall include soil preparation, fertilizer, soil conditioner, hydro mulch, and seed applied, completed, and accepted, as specified in the plans and specifications.

B. The Contractor shall furnish the DEN Project Manager with seed certifications and analysis, fertilizer analysis, and bag weight tickets prior to placing any seed or fertilizer. Any seed or fertilizer placed by the Contractor without the DEN Project Manager's approval will not be paid for.

C. Measurement for acres will be by slope distances.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. The accepted quantities of lawn seeding, native seeding, soil conditioning, and sod will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

B. Payment will be made under:

Pay Item	Unit	Item Number
Upland Seed Mix	Square Foot	329200-01
Road Shoulder Area Seed Mix	Square Foot	329200-02
Wetland Seed Mix	Square Foot	329200-03
Pond Bottom Seed Mix	Square Foot	329200-04

C. Soil preparation, water, seed, fertilizer, and soil conditioner, incorporated into the seeding sodding, or soil conditioning will not be paid for separately but shall be included in the work.

D. Adjusting or readjusting seeding or fertilizing equipment will not be paid for separately but shall be included in the work.

END OF SECTION 329200

SECTION 329210 - MULCHING (CDOT)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Work shall follow the latest version of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction Section 213 Mulching.

B. All materials and construction shall follow the latest version of the CDOT Standard Specifications for Road and Bridge Construction and the latest version of the CDOT Standard Plans M&S Standards and all referenced sections therein.

C. CDOT General Provisions consisting of Section 100 through 109 of the above referenced “Standard Specifications” do not apply to this specification Section except where specifically added.

D. The following shall apply to this specification Section:

1. Section 101 Definitions and Terms.
2. Section 105 Control of Work with the following exceptions:

    a. If there are any conflicts with the City and County of Denver’s General Provisions, General Conditions, Special Conditions or Technical Specifications and this specification Section, those documents will take precedence.
    b. Any reference to incentives shall be disregarded. No Incentives will be paid as a result of these specifications. References to disincentives, corrective work or removal and rejections of work and/or materials shall apply.
    c. Section 105.21 Acceptance shall not apply.
    d. Section 105.22 through 10.24 shall not apply.

3. Section 106 Control of Material.
4. Section 109.1 Measurement of Quantities.

E. Related Requirements:

1. Section 129300 "Site Furnishings" for placing planting soil in exterior unit planters.
2. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
3. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
4. Section 329300 "Plants" for placing planting soil for plantings.

1.3 REFERENCES

A. All references to “CDOT or the Department” shall be changed to “City and County of Denver” unless otherwise noted.

B. All references to the CDOT Project Engineer and CDOT Regional Transportation Director shall mean DEN Project Manager and DEN Director.

C. Any and all reference to incentives or positive pay factors within any documents pertaining to these specifications shall not apply. No incentives or increase pay factors will be paid on this project. References to disincentives, negative pay factors, corrective work or removal and rejection of work and/or materials shall apply.

1.4 ALLOWANCES (NOT USED)

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location and time as determined by DEN Project Manager.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Material Certificates: For each type of mulch before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.

3. Include data substantiating that materials comply with requirements.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.9 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall be currently listed on the CDOT Approved Products List or as approved by the DEN Project Manager.

B. Wood Chip Mulch for shrubs and ornamental grasses shall be Cascade Cedar (Gorilla Hair mulch) or Landscape Architect approved equal.

C. Regional Materials: Mulching shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

PART 3 - EXECUTION [NOT USED]

PART 4 - METHOD OF MEASUREMENT

4.1 No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the Line Item Contract price.

B. Payment will be made under:

Pay Item:	**Pay Unit:**	**Item Number**
Mulch	Cubic Foot	329210-01

END OF SECTION 329210

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Shrub slow-watering devices.

B. Related Requirements:
1. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of

fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

J. Planting Area: Areas to be planted.

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location and time as determined by DEN Project Manager.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Include data substantiating that materials comply with requirements.

B. Samples for Verification: For each of the following:

1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.
2. Organic Mulch: 1-pint (0.5-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Mineral Mulch: 2 lb **(**1.0 kg**)** of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
4. Slow-Release, Shrub-Watering Device: One unit of each size required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

B. As-Built Plans: Submit complete as-built plans of all Work, including interface with other Work, in accordance with requirements as specified in Section 013300 "Submittal Procedures".

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Minimum five (5) years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one (1) of the following categories from the Professional Landcare Network:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by DEN Project Manager, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: DEN Project Manager may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. DEN Project Manager or Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify DEN Project Manager of sources of planting materials a minimum of seven (7) days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

I. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.

2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: Spring thaw to June 1st.
2. Fall Planting: September 15 until consistent ground freeze.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
b. Structural failures including plantings falling or blowing over.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion.

a. Trees, Shrubs, Vines, and Ornamental Grasses: Minimum twelve (12) months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.12 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Section 017419 "Construction Waste Management and Disposal". Documentation shall be submitted to satisfy the requirements of that Section.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to DEN Project Manager, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Reference Section 329210 "Mulching" for mulching specifications.

2.4 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 TREE-WATERING DEVICES

A. Watering Pipe: PVC pipe 4 inches (100 mm) in diameter, site-cut to length as required, and with snug-fitting removable cap.

B. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over 5-7 days; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Spectrum Products, Inc.: TreeGator Jr. Pro
   b. or approved equal.

2. Color: Tan or brown.

2.6 MISCELLANEOUS PRODUCTS

A. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by DEN Project Manager and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain DEN Project Manager's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by DEN Project Manager. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

C. Before planting, obtain DEN Project Manager's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by DEN Project Manager, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify DEN Project Manager if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify DEN Project Manager if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
   1. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   3. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

      a. Quantity: Two per plant.

   4. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

   1. Backfill: Salvaged approved topsoil mixed with soil amendment per specifications.
   2. Carefully remove root ball from container without damaging root ball or plant.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by DEN Project Manager.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by DEN Project Manager, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each shrub.

B. Place device on top of the mulch at base of shrub and fill with water according to manufacturer's written instructions.

3.8 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.9 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by DEN Project Manager.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by DEN Project Manager.

B. Remove and replace shrubs and grasses that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that DEN Project Manager determines are incapable of restoring to normal growth pattern.

1. Provide new shrubs or grasses of same size and species as those being replaced for each shrub or grass.

3.11 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.12 MAINTENANCE SERVICE

A. Maintenance Service for Shrubs and Ornamental Grasses: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of Substantial Completion.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Section.

PART 5 - PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the Line Item Contract price.

B. Payment will be made under:

Pay Item:	**Pay Unit:**	**Item Number**
5 gallon Shrub	Each	329300-01
1 gallon Ornamental Grass	Each	329300-02

END OF SECTION 329300

SECTION 206 AND 703 – STRUCTURE BACKFILL (FLOW-FILL)

Sections 206 and 703 of the Standard Specifications are hereby revised for this project as follows:

Subsection 206.02 (a) 1 shall include the following:

The Contractor may also substitute Structure Backfill (Class 3) as backfill for culverts and sewer pipes.

In subsection 206.02(a) 2, first paragraph, delete the last sentence and replace with the following:

Flash fill is a rapid setting Flow-Fill that may be used when approved by the Engineer and will be tested, accepted, and paid for as Flow-Fill.

Subsection 206.02(a) 2 shall include the following as the last paragraph:

The Contractor shall submit a Process Control (PC) Plan with the mix design to the Engineer. The PC plan shall address the batching, mixing, testing and placement of the structure backfill (Flow-Fill).

In subsection 206.03 delete the 17th paragraph and replace with the following:

When Flash Fill is used, it shall be batched with a volumetric mixing truck. Volumetric mixing trucks used to produce Flow-Fill and Flash Fill shall have a computer batching system, capable of producing the approved mix design and printing tickets. For Flash Fill, the batch weights of cement and/or fly ash per cubic yard shall be within 2 percent of the mix design batch weights and the batch weight of water per cubic yard shall be within 2 percent of the mix design batch weight.

Prior to the placement of structure backfill (Flow-Fill), the Contractor shall sample the structure backfill (Flow-Fill) in accordance with ASTM D5971. The Contractor shall test the structure backfill (Flow-Fill) unit weight in accordance with ASTM D6023. For Flash Fill, the measured unit weight shall be within 5.0 percent or 5.0 pounds per cubic foot, whichever is larger, of the approved mix design unit weight. The Contractor shall test the structure backfill (Flow-Fill) for slump in accordance with ASTM C143 or flow consistency according to ASTM D6103.

Subsection 703.08 shall include the following:

(c) Class 3 structure backfill shall be a sandy gravel and meet the following gradation:

Sieve Size	**Mass Percent Passing Square Mesh Sieves**
9.5mm (3/8”)	90 to 100
4.75mm (#4)	45 to 80
0.075mm (#200)	5 to 12

END OF SECTION

SECTION 208 – EROSION CONTROL

Section 208 of the Standard Specifications is hereby revised for this project as follows:

In subsection 208.03(c) delete the first paragraph and replace it with the following:

Erosion Control Management (ECM). Erosion Control Management for this project shall consist of Erosion Control Inspection and the SWMP Administration. All ECM staff shall have working knowledge and experience in construction, and shall have successfully completed the Transportation Erosion Control Supervisory Certificate Training (TECS) as provided by the Department. The Superintendent will not be permitted to serve in an ECM role. The Erosion Control Inspector (ECI) and the SWMP Administrator may be the same person in projects involving less than 40 acres of disturbed area.

In subsection 208.03(c)1 delete the first paragraph and replace it with the following:

SWMP Administration. The SWMP shall be maintained by a SWMP Administrator. In the case of a project requiring only one TECS, the SWMP Administrator may also be the ECI for the project. The name of the SWMP Administrator shall be recorded on the SWMP Section 3. B. The SWMP Administrator shall have full responsibility to maintain and update the SWMP and identify to the Superintendent critical action items needed to conform to the CDPS-SCP as follows:

In subsection 208.03(c)2 delete the first paragraph and replace It with the following:

One ECI is required for every 40 acres of total disturbed area which is currently receiving temporary and interim stabilization measures as defined in subsection 208.04 (e). An ECI shall not be responsible for more than 40 acres in the project. Accepted permanent stabilization methods as defined in subsection 208.04 (e) will not be included in the 40 acres.
In subsection 208.03(d)1 delete item (1) and replace it with the following:

(1) SWMP Site Maps and Plan Title Sheet - Construction site boundaries, ground surface disturbance, limits of cut and fill, flow arrows, structural BMPs, non-structural BMPs, Springs, Streams, Wetlands and surface water. Also included on the sheets is the protection of trees, shrubs and cultural resources.

In subsection 208.05(n), in the list of requirements for pre-fabricated concrete washout structures, delete item (2) and replace it with the following:

(2) Structure shall be located 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas are as defined in the Contract. Locations shall be as approved by the Engineer. The site shall be signed as “Concrete Washout”.

In subsection 208.11 delete the first paragraph and replace it with the following:

Erosion Control Management will be measured as the actual number of days of ECM work performed, regardless of the number of personnel required for SWMP Administration and Erosion Control Inspection, including erosion control inspections, documentation, meeting

participation, SWMP Administration, and the preparation of the SWMP notebook. If the combined hours of SWMP Administration and Erosion Control Inspection is four hours or less in a day, the work will be measured as ½ day. If the combined hours of SWMP Administration and Erosion Control Inspection is more than four hours in a day, the work will be measured as one day. Total combined hours of ECM work exceeding eight hours in a day will still be paid as one day.

END OF SECTION

SECTION 213 – MULCHING

Section 213 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 213.02 (f)(1) and replace with the following:

(1) Spray-on Mulch Blanket (Type 1) shall be a hydraulically applied matrix containing organic fibers, water soluble cross-linked tackifier, and reinforcing biodegradable fibers. The reinforcing fibers shall completely break down and not release any metals or toxins (compostable). Mulch Blanket (Type 1) shall conform to the following:

Properties	Requirement	Test Method
Organic Fibers	71% Min.	ASTM D2974
Cross linked Tackifiers	10% ± 2% Min.	
Reinforcing Fibers	2.5% Min.	
Biodegradability	100%	ASTM D5338
Ground Cover at Application Rate	90% Min.	ASTM D6567
Functional Longevity	12 Months Min.	
Cure Time	< 8 hours	
Application		
Application Rate	3000 lbs./acre	

The organic fiber shall not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. The organic fibers and reinforcing fibers cannot be produced from sawdust, cardboard, paper, or paper by-products.

END OF SECTION

SECTION 614 – TRAFFIC CONTROL DEVICES

Section 614 of the Standard Specifications is hereby revised as follows:

In subsection 614.09, paragraph 18, delete the word reflective and replace with retro-reflective.

END OF SECTION

SECTION 703 – CLASSIFICATION FOR AGGREGATE BASE COURSE

Section 703 of the Standard Specifications is hereby revised for this project as follows:

In subsection 703.03, delete Table 703-2 and replace with the following:

Table 703-2
CLASSIFICATION FOR AGGREGATE BASE COURSE

Sieve Size	Mass Percent Passing Square Mesh Sieves						
	LL not greater than 35			LL not greater than 30			
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
150mm (6")			100				
100mm (4")		100					
75mm (3")		95-100					
60mm (2 ½")	100						
50mm (2")	95-100			100			
37.5mm (1.5")				90-100	100		
25mm (1")					95-100	100	100
19mm (3/4")				50-90		95-100	
4.75mm (#4)	30-65			30-50	30-70	30-65	
2.36mm (#8)						25-55	20-85
75 ?m (#200)	3-15	3-15	20 max	3-12	3-15	3-12	5-15
NOTE: Class 3 material shall consist of bank or pit run material.							

END OF SECTION

STORMWATER MANAGEMENT PLAN (SWMP)

Denver International Airport
2018 Roadway Erosion Control
(Pond 2M-7)

Prepared for:

Denver International Airport

8500 Pena Blvd

Denver, CO 80249

Prepared by:

Kimley-Horn and Associates, Inc.

4582 South Ulster Street, Suite 1500

Denver, Colorado 80237

Kimley»Horn

Project #: 096349301

Prepared: June 8, 2018

DENVER INTERNATIONAL AIRPORT 2018 ROADWAY EROSION CONTROL (POND 2M-7)

STORMWATER MANAGEMENT PLAN (SWMP)

JUNE 8, 2018

Prepared By:

Kimley»Horn

TABLE OF CONTENTS

Not included in this document. All Appendixes will be included as part of the approved Erosion Control Permit Package.

CERTIFICATION

ENGINEER'S STATEMENT

"This Stormwater Management Plan for Denver International Airport 2018 Roadway Erosion Control (Pond 2M-7) was prepared by me (or under my direct supervision) in accordance with the provisions of the City and County of Denver Storm Drainage Regulations, the Colorado Department of Public Health and Environment, and the Urban Drainage Flood Control District Criteria Manual, Volumes 1-3, and was designed to comply with the provisions thereof. I understand that the City and County of Denver does not and will not assume liability for drainage facilities design."

Brain W. Valentine, PE
Licensed Professional Engineer
Colorado Registered PE # 46616

INTRODUCTION

INTRODUCTION AND PURPOSE

The purpose of this Stormwater Management Plan (SWMP) is to provide a guide for the Developer and Contractor to use for the design of sediment and erosion control measures and facilities, to support the approval of the Stormwater Management Plan through Denver International Airport (DEN) and the City and County of Denver (CCD), and the issuance of a Colorado Discharge Permit System General Permit (CDPS Permit) through CDPHE for the DIA 2018 Roadway Erosion Control (Pond 2M-7) project (the "Project"). This Report, in conjunction with the Stormwater Management Plan Construction Drawings provided in **Appendix A**, examines measures taken onsite to improve stormwater quality leaving the site, and also addresses important erosion control measures implemented prior to and during construction.

The primary goal of pollution prevention efforts during project construction is to control sediment and pollutants that originate on the site and prevent them from flowing to surface waters. A successful pollution prevention program also relies upon careful inspection and adjustments during the construction process in order to enhance its effectiveness.

This SWMP must be implemented before construction begins on the site. It primarily addresses the impact of storm rainfall and runoff on areas of the ground surface disturbed during the construction process. In addition, there are recommendations for controlling other sources of pollution that could accompany the major construction activities. Applicability of this SWMP shall be terminated when disturbed areas are stabilized, permanent erosion controls are removed, and construction activities covered herein have ceased.

PERMIT COVERAGE AND APPLICATIONS

An approved SWMP shall be approved by DEN and CCD prior to issuance of a Grading Permit.

Based upon a Site Disturbance Area of one (1) acre or more, this site requires the issuance of a Colorado Discharge Permit System (CDPS) - Stormwater Discharge Associated with Construction Activities Application (the General Permit) through the Colorado Department of Public Health and Environment (CDPHE). A copy of the CDPS General Permits are included in **Appendix B** of this report.

GENERAL LOCATION AND PROJECT DESCRIPTION

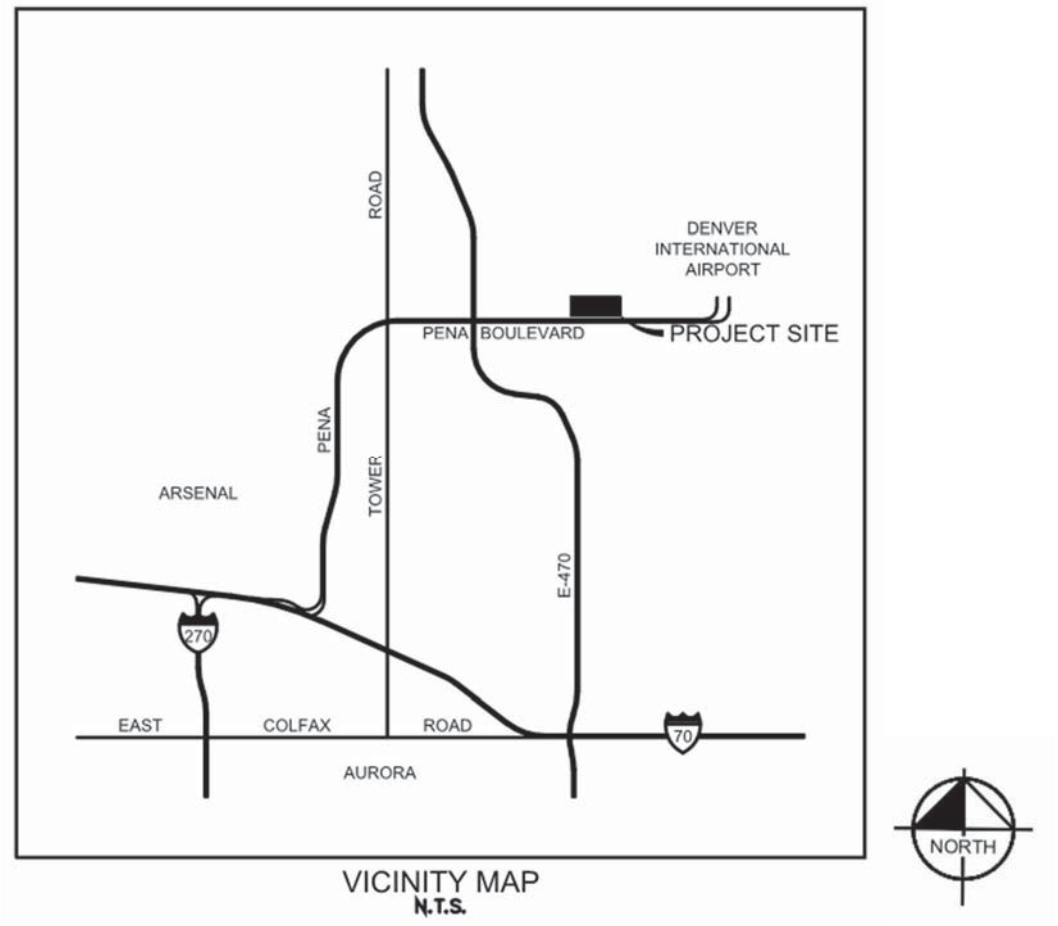
PROJECT LOCATION

The Project site starts at the southwest corner of 78th Avenue connector and Tibet Street and goes east parallel to Pena Boulevard, within Denver International Airport in the City and County of Denver, Colorado. The Site is generally bounded by the following:

- North: Gas station, cell phone lot, airport parking, and other airport facilities
- East: Jackson Gap Road
- South: Pena Boulevard
- West: 78th Avenue connector/Tibet Street

VICINITY MAP

A vicinity map is provided below for reference:



GENERAL PROJECT DESCRIPTION

The Project proposes to design and construct Pond 2M-7 as identified in the Denver International Airport Permanent Stormwater Quality Facility Planning Study (Moser & Associates Engineering, April 2009). Additionally, six of the existing water quality ponds along Pena Boulevard will be decommissioned and that area redesigned to be served by Pond 2M-7. Ancillary permanent erosion mitigation measures will also be designed along the project site to prevent further erosion. This project has been split into eleven areas to facilitate two phases of construction of the project. The below map provides reference for the locations of each area.

Each phase and area is briefly described below:

Phase 1

Phase 1 consists of the construction of Area 1. Area 1 consist of the construction of Pond 2M-7 located west of the dirt Tibet Street. The proposed design includes grading of the 2.6 acres area, construction of a new pond outlet structure, construction of concrete trickle channels, construction of two concrete forebays, and replacement of existing storm sewer inlets, outlets, and pipe.

Phase 2

Phase 2 consists of the decommission and regrading of Areas 1A – 7.

Area 1A: Existing surface runoff area adjacent to Pena Boulevard. Removal of the first 12-inches of soil and re-grading the area is proposed along with a 17-foot drainage swale parallel to Pena Boulevard. A perforated pipe set in Class A filter material and wrapped in geotextile filter fabric is proposed within the drainage swale.

Area 1B: Existing surface runoff area adjacent to Pena Boulevard, west of Area 1A. Removal of the first 12-inches of soil and re-grading the area is proposed along with a 17-foot drainage swale parallel to Pena Boulevard A perforated pipe set in Class A filter material and wrapped in geotextile filter fabric is proposed within the drainage swale.

Area 1C: Existing surface runoff area adjacent to Pena Boulevard, west of Area 1B. Removal of the first 12-inches of soil and re-grading the area is proposed along with a 17-foot drainage swale parallel to Pena Boulevard and East 78th Avenue A perforated pipe set in Class A filter material and wrapped in geotextile filter fabric is proposed within the drainage swale.

Area 1D: Existing surface runoff area adjacent to Pena Boulevard, west of Area 1C. Removal of the first 12-inches of soil and re-grading the area is proposed along with a 17-foot drainage swale parallel to Pena Boulevard. A perforated pipe set in Class A filter material and wrapped in geotextile filter fabric is proposed within the drainage swale.

Area 1E: Existing surface runoff area adjacent to Pena Boulevard, west of Area 1D. Removal of the first 12-inches of soil and re-grading the area is proposed along with a 17-foot drainage swale parallel to Pena

Boulevard. A perforated pipe set in Class A filter material and wrapped in geotextile filter fabric is proposed within the drainage swale.

Area 2: Existing water quality pond 2D, to be decommissioned, located adjacent to Pena Boulevard. A concrete trickle channel is proposed within this area to discharge into replaced storm sewer infrastructure. Runoff collected in this area will discharge into Pond 2M-7.

Area 3: Existing water quality pond 2C to be decommissioned, located adjacent to Pena Boulevard. A proposed concrete trickle channel will convey runoff in this area to Area 2.

Area 4: Existing water quality pond 2B to be decommissioned, located adjacent to Pena Boulevard. A proposed concrete trickle channel will convey runoff in this area to Area 3.

Area 5: Existing water quality pond 2A to be decommissioned, located adjacent to Pena Boulevard. A proposed concrete trickle channel will convey runoff in this area to Area 4.

Area 6: Existing water quality pond to be decommissioned, located at the southwest corner of East 78th Avenue and East 77th Avenue. An area inlet and new storm sewer pipe infrastructure is proposed to carry all existing runoff from this area to Pond 2M-7.

Area 7: Existing water quality pond to be decommissioned, located at the southeast corner of East 78th Avenue and East 76th Avenue. An area inlet and new storm sewer pipe infrastructure is proposed to carry all existing runoff from this area to Pond 2M-7.

The total proposed tributary area to Pond 2M-7 is 150-acres. Accounting for future development, approximately 108 acres are impervious.

SITE CONDITIONS

VEGETATION

The existing site currently consists of six water quality ponds and ground cover consists of native vegetation including weeds.

DRAINAGE CHARACTERISTICS

The existing topography generally drains towards the existing water quality ponds located adjacent to Pena Boulevard, at slopes of approximately 10%-35% with an average slope of approximately 20%. The existing Site varies in elevation from a high of approximately 5395 to a low of approximately 5309. It is proposed that all existing runoff maintain historic drainage patterns, discharging to proposed Pond 2M-7, which will maintain the historic outlet location. Pond 2M-7 will be designed as a water quality pond with a maximum drain time of 12 hours. All decommissioned pond areas will be designed to maintain historic flows to Pond 2M-7 with the addition of a concrete trickle and additional/updated storm sewer infrastructure.

To the west of the project site, Second Creek and Pinon Draw flow south to north, crossing Pena Boulevard. To the east of the project site, Third Creek flows south to north, also crossing Pena Boulevard. All three of these drainageways are outside the project limits of disturbance.

By scaled map location and graphical review of the Flood Insurance Rate Map (FIRM) Number 0800460128G, dated November 17, 2005, the Site lies within an area classified as Zone X. Areas classified

as Zone X are considered areas of minimal flood hazard, usually depicted by Flood Insurance Rate Maps as areas outside of the 500-year flood plain. The FIRM is provided in **Appendix C**.

ULTIMATE DISCHARGE

The majority of onsite flows will be conveyed to Pond 2M-7 located in the northwest corner of Tibet Street and East 78th Avenue connector. Flows from the six decommissioned water quality ponds will be directed to Pond 2M-7 via a proposed concrete trickle channel and proposed/existing storm sewer infrastructure. Pond 2M-7 will maintain the historical discharge location with an outlet structure. Discharge from Pond 2M-7 will travel through an existing vegetated channel with check dams, for approximately 1,500 feet, before outfalling into Second Creek.

SITE SOILS

A review of the Natural Resource Conservation Service Web Soil Survey determined that the Site is made up of Wiley-Adena-Renohill complex (WuE), Platner loam (PIC), Adena-Colby association (AcC), and Weld loam (WmB), all of which have an NRCS Soil Type C classification. Soil reports are included in **Appendix D**.

DEWATERING

According to the *Geotechnical Investigation Report* (March 23, 2018), as provided by Triax Engineering, LLC, groundwater was encountered in two of the five test borings at depths of approximately 10 feet, below existing site grades at the time of drilling. The following excerpt from the Report highlights the uncertainty in groundwater conditions at the site:

"However, ground water levels will fluctuate with seasonal climatic variations and changes in land use. It is not unusual to encounter shallow ground water during snow melt or during or after periods of precipitation. The surface water tends to percolate down until it encounters a relatively impervious layer.

Accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variation, temperature, recent precipitation, and localized construction activities that influence drainage characteristics may influence the groundwater table and volumes of water will depend on the permeability of soils. Groundwater conditions can differ between borehole locations and in areas not explored."

AREAS & VOLUMES

The total anticipated project disturbance area is 17 acres.

Estimated earthwork volumes within each area of the site are included in **Appendix E**.

ENDANGERED SPECIES

According to the U.S. Fish & Wildlife Service's Information for Planning and Consultation database, the following endangered or threatened species may be present at the project site:

- Least Tern – Endangered
- Piping Plover – Threatened
- Whooping Crane – Endangered

- Pallid Sturgeon – Endangered
- Ute Ladies'-tresses – Threatened
- Western Prairie Fringed Orchid – Threatened

The proposed site conditions do not propose to change the land use of the site. All standing water on the DEN property is designed for mitigation of wildlife use, including the proposed project. Therefore, it can be concluded that potential impacts on any endangered species would be negligible for this project.

TIMING & PHASING SCHEDULE

The operator shall utilize the following general construction practices which are required throughout the project at locations shown on the Erosion and Sediment Control Plan or as dictated by construction activities.

- Materials handling and spill prevention
- Waste management and disposal
- Hazardous material storage and containment area
- Vehicle maintenance fueling and storage
- Solid waste containment facility
- Sanitary waste facility
- Street Sweeping (SS)
- SWMP Information Sign (S)
- Good Housekeeping (GH)

These practices shall remain active and operational throughout the duration of construction and be identified on the Erosion and Sediment Control Plan. Due to the phasing required for the Project, it is understood that these BMPs may be relocated as needed to facilitate construction operations. The Operator shall locate and identify the original and current location of these BMPs on the Erosion and Sediment Control Plan throughout the construction of the Project.

General construction sequencing and activities associated with both phases of this project are described below. They are presented in the order (or sequence) they are expected to begin, but each activity will not necessarily be completed before the next begins, except Phase 1 must be completed prior to beginning Phase 2.

PHASE 1

Phase 1 consists of the construction of Pond 2M-7 in **Area 1**.

Initial Stage

The initial stage of Phase 1 shall consist of the temporary construction of BMPs to minimize potential for erosion and sediment transfer while mobilizing and preparing the site for construction activities. The operator shall minimize site disturbance by minimizing the extent of grading and clearing to effectively reduce sediment yield. The operator shall complete the anticipated initial stage sequencing for **Area 1** as follows:

1. Prepare and submit the State of Colorado, Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) General Permit. A copy of the permit shall be provided to the owner upon receipt from the CDPHE.

2. Install *SWMP Information Sign* (S) in accordance with applicable City, State, and Owner requirements.
3. Install *Vehicle Tracking Control (VTC)* at location identified on the SWMP Plans.
4. Install *Rough Cut Street Control (RCS)* at location identified on the SWMP Plans.
5. Prepare *Stabilized Staging Area (SSA).* Contractor to note the actual size and location of this area and shall minimize this area.
6. Install and denote on the plan any of the following areas: trailer, parking, lay down, porta-potty, wheel wash, mason's area, fuel and material storage containers, solid waste containers, etc.
7. Install perimeter controls including *Earth Dikes (ED) and Rock Socks (RS)* around limits as shown on plan. Ensure that the *Limits of Disturbance (LOD)* are defined as necessary or known by all parties which will be responsible for construction on the site. *Construction Fence (CF)* shall also be installed as denoted on the plan. Limits of Disturbance (LOD) may be located outside of this construction fence.
8. Install *Inlet Protection (IP)* and *Outlet Protection (OP)* for existing stormwater conveyance facilities as indicated on the SWMP plans or as necessitated by field conditions.
9. Construct *Drainage Swales (DS)* and *Check Dams (CD)* in locations and to specifications indicated on SWMP plans.
10. Construct *Earth Dikes (ED)* parallel to southern *Drainage Swale (DS)* as shown on SWMP plans.
11. Construct and stabilize proposed *Sediment Basin (SB*) with appropriate outfall structures in location and to specifications indicated in SWMP Plans (clear only those areas necessary to install the basins).
12. Upon completion of the initial BMP installation the Operator shall schedule and hold a meeting with the Contractor and Inspector that shall take place prior to the Pre-Construction Meeting.
13. The Operator shall schedule a Pre-Construction Meeting with the City and Owner to confirm BMPs installed are adequate prior to proceeding with additional land disturbing activities.
14. Begin clearing and grubbing of the site.
15. Begin grading the site. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.
16. *Temporarily Seed (TS)*, throughout construction, denuded areas that will be inactive for 14 days or more.

<u>Interim Stage</u>

The interim stage of Phase 1 shall consist of the temporary construction of BMPs to minimize potential for erosion and sediment transfer while performing construction activities. The operator shall minimize site disturbance by minimizing the extent of grading and clearing to effectively reduce sediment yield. The operator shall complete the anticipated interim stage for **Area 1** sequencing as follows:

1. Confirm existing BMPs from the initial stage, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Install *Concrete Washout Area (CWA)* prior to construction of concrete improvements.
4. Begin grading and installing proposed maintenance access. Install and maintain *Rough Cut Street Control (RCS)* during construction of maintenance access. Remove RCS upon stabilization of maintenance access. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.
5. Construct proposed Pond 2M-7 outlet structure.
6. Construct proposed inlets, storm pipes, and outlets.

7. Install *Inlet Protection (IP)* and/or *Outlet Protection (OP)* at all storm sewer structures as each inlet and/or outlet structure is installed.
8. Construct proposed concrete trickle channel, maintenance access, and forebays, and revise *Drainage Swales (DS), Check Dams (CD), and Earth Dikes (ED)* as necessary to provide proper erosion and sediment control protection.
9. Install *Earth Dike (ED)* downstream of outlet structure, utilizing pond as *Sediment Basin (SB*) until final stabilization.
10. Remove *Drainage Swales (DS), Check Dams (CD), and Earth Dikes (ED),* excluding *Earth Dikes (ED)* used for perimeter control.
11. Remove initial temporary *Sediment Basin (SB),* allowing all runoff to pond behind new outlet structure and *Earth Dikes (ED).*
12. Complete grading and construction of concrete trickle channels, maintenance access, and forebays.
13. Once forebays and trickle channels are completed and online, remove *Earth Dikes (ED)* around outlet structure.
14. Conduct maintenance in the area upstream of the new outlet structure used as a temporary *Sediment Basin (SB)* per Sediment Basin detail.

Final Stage

The final stage of Phase 1 shall consist of additional construction of site improvements, construction of permanent BMPs, and final stabilization of the Site. The operator shall complete the anticipated final stage for **Area 1** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Permanently Stabilize areas to be vegetated as they are brought to final grade.
4. Complete grading and installation of *Permanent Seeding (PS)* over all areas in accordance with approved landscape plans.
5. Remove remaining BMPs once permanent stabilization has been achieved and accepted by the City Inspector. Repair and stabilize areas disturbed through BMP removal.
6. Notify the owner of intent to file the Notice of Inactivation with CDPHE and receive Owner acceptance to proceed with Stormwater Management Close-out.
7. Proceed with filing the Notice of Inactivation with CDPHE.
8. Provide the Owner with a copy of all stormwater documentation (permits, inspection reports, logs, etc.) upon completion of Project Stormwater Notice of Inactivation.

PHASE 2

Initial Stage

The initial stage of Phase 2 shall consist of the temporary construction of BMPs to minimize potential for erosion and sediment transfer while mobilizing and preparing the site for construction activities. The operator shall minimize site disturbance by minimizing the extent of grading and clearing to effectively reduce sediment yield. The operator shall complete the anticipated initial stage sequencing for **Areas 1A-1E** as follows:

1. Prepare and submit the State of Colorado, Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) General Permit. A copy of the permit shall be provided to the owner upon receipt from the CDPHE.
2. Install *SWMP Information Sign* (S) in accordance with applicable City, State, and Owner requirements.
3. Install *Vehicle Tracking Control (VTC)* at locations identified on the SWMP Plans.
4. Prepare *Stabilized Staging Area (SSA).* Contractor to note the actual size and location of this area and shall minimize this area.
5. Install and denote on the plan any of the following areas: trailer, parking, lay down, porta-potty, wheel wash, mason's area, fuel and material storage containers, solid waste containers, etc.
6. Install perimeter controls including *Earth Dikes (ED)* around limits as shown on plan. Ensure that the *Limits of Disturbance (LOD)* are defined as necessary or known by all parties which will be responsible for construction on the site. *Construction Fence (CF)* shall also be installed and denoted on the plan. Limits of Disturbance may be located outside of this construction fence.
7. Install *Inlet Protection (IP) and Outlet Protection (OP)* for existing stormwater conveyance facilities as indicated on the SWMP plans or as necessitated by field conditions.
8. Upon completion of the initial BMP installation the Operator shall schedule and hold a meeting with the Contractor and Inspector that shall take place prior to the Pre-Construction Meeting.
9. The Operator shall schedule a Pre-Construction Meeting with the City and Owner to confirm BMPs installed are adequate prior to proceeding with additional land disturbing activities.
10. Construct modified outlet structures for existing *Sediment Basins (SB)* and construct and stabilize proposed Sediment Basin with appropriate outfall structures (clear only those areas necessary to install the basins).
11. Begin clearing and grubbing of the site.
12. Begin grading the site for storm sewer infrastructure installation. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.

The operator shall complete the anticipated initial stage sequencing for **Areas 2-5** as follows:

1. Prepare and submit the State of Colorado, Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) General Permit. A copy of the permit shall be provided to the owner upon receipt from the CDPHE.
2. Install *SWMP Information Sign* (S) in accordance with applicable City, State, and Owner requirements.
3. Install *Vehicle Tracking Control (VTC)* at location identified on the SWMP Plans.
4. Install *Rough Cut Street Control (RCS*) at locations identified on the SWMP Plans.
5. Prepare *Stabilized Staging Area (SSA).* Contractor to note the actual size and location of this area and shall minimize this area.
6. Install and denote on the plan any of the following areas: trailer, parking, lay down, porta-potty, wheel wash, mason's area, fuel and material storage containers, solid waste containers, etc.
7. Install perimeter controls including *Earth Dikes (ED) and Rock Socks (RS)* around limits as shown on plan. Ensure that the *Limits of Disturbance (LOD)* are defined as necessary or known by all parties which will be responsible for construction on the site. *Construction Fence (CF)* shall also be installed as denoted on the plan. *Limits of Disturbance (LOD)* may be located outside of this construction fence.
8. Install *Inlet Protection (IP) and/or Outlet Protection (OP)* for existing stormwater conveyance facilities as indicated on the SWMP plans or as necessitated by field conditions.
9. Install and stabilize *Diversion Swales (DS)* and *Check Dams (CD).*

10. Upon completion of the initial BMP installation the Operator shall schedule and hold a meeting with the Contractor and Inspector that shall take place prior to the Pre-Construction Meeting.
11. The Operator shall schedule a Pre-Construction Meeting with the City and Owner to confirm BMPs installed are adequate prior to proceeding with additional land disturbing activities.
12. Begin clearing and grubbing of the site.
13. Begin grading the site. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.
14. *Temporarily Seed (TS)*, throughout construction, denuded areas that will be inactive for 14 days or more.

The operator shall complete the anticipated initial stage sequencing for **Areas 6 & 7** as follows:

1. Prepare and submit the State of Colorado, Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) General Permit. A copy of the permit shall be provided to the owner upon receipt from the CDPHE.
2. Install *SWMP Information Sign* (S) in accordance with applicable City, State, and Owner requirements.
3. Install *Vehicle Tracking Control (VTC)* at locations identified on the SWMP Plans.
4. Install *Rough Cut Street Control (RCS)* at locations identified on the SWMP Plans.
5. Prepare *Stabilized Staging Area (SSA).* Contractor to note the actual size and location of this area and shall minimize this area.
6. Install and denote on the plan any of the following areas: trailer, parking, lay down, porta-potty, wheel wash, mason's area, fuel and material storage containers, solid waste containers, etc.
7. Install perimeter controls including *Earth Dikes (ED) and Rock Socks (RS)* around limits as shown on plan. Ensure that the *Limits of Disturbance (LOD)* are defined as necessary or known by all parties which will be responsible for construction on the site. *Construction Fence (CF)* shall also be installed as denoted on the plan. *Limits of Disturbance (LOD)* may be located outside of this construction fence.
8. Install *Inlet Protection (IP) and/or Outlet Protection (OP)* for existing stormwater conveyance facilities as indicated on the SWMP plans or as necessitated by field conditions.
9. Upon completion of the initial BMP installation the Operator shall schedule and hold a meeting with the Contractor and Inspector that shall take place prior to the Pre-Construction Meeting.
10. The Operator shall schedule a Pre-Construction Meeting with the City and Owner to confirm BMPs installed are adequate prior to proceeding with additional land disturbing activities.
11. Construct modified outlet structures for existing *Sediment Basins (SB)* and construct and stabilize proposed Sediment Basin with appropriate outfall structures (clear only those areas necessary to install the basins).
12. Begin clearing and grubbing of the site.
13. Begin grading the site. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.
14. *Temporarily Seed (TS)*, throughout construction, denuded areas that will be inactive for 14 days or more.

Interim Stage

The interim stage of Phase 2 shall consist of the temporary construction of BMPs to minimize potential for erosion and sediment transfer while performing construction activities. The operator shall minimize site disturbance by minimizing the extent of grading and clearing to effectively reduce sediment yield. The operator shall complete the anticipated interim stage for **Areas 1A-1E** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Install *Concrete Washout Area (CWA)* prior to construction of concrete improvements.
4. *Install Drainage Swale (DS)* and *Check Dams (CD)* as shown on SWMP plans.
5. Begin grading and installing proposed drainage swale with perforated pipe. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.

The operator shall complete the anticipated interim stage for **Areas 2-5** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Install *Concrete Washout Area (CWA)* prior to construction of concrete improvements.
4. Install proposed inlets, storm pipes, and outlets. Remove existing inlets, storm pipes, and outlets as indicated on Existing Conditions and Demolition Plans.
5. Install *Inlet Protection (IP)* and/or *Outlet Protection (OP)* at all storm sewer structures as each inlet and/or outlet structure is installed.
6. Begin grading and installing proposed maintenance access. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP. Install *Earth Dike (ED)* on south side of maintenance access. Install and maintain *Rough Cut Street Control (RCS)* during construction of the maintenance access. Remove RCS upon stabilization of the maintenance access.
7. Begin grading the existing water quality ponds for decommission. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.
8. Install proposed concrete trickle channel.
9. As construction of the concrete trickle channel is completed, remove *Drainage Swale (DS)* and relocate *Check Dams (CD)* to trickle channel.

The operator shall complete the anticipated interim stage for **Areas 6 & 7** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Install *Concrete Washout Area (CWA)* prior to construction of concrete improvements.
4. Install proposed inlets, storm pipes, and outlets.
5. Install *Inlet Protection (IP)* and/or *Outlet Protection (OP)* at all storm sewer structures as each inlet and/or outlet structure is installed.
6. Begin grading the existing water quality ponds. Stockpile materials in accordance with the *Soil Stockpile Management (SP)* BMP.

Final Stage

The final stage of Phase 2 shall consist of additional construction of site improvements, construction of permanent BMPs, and final stabilization of the Site. The operator shall complete the anticipated final stage for **Areas 1A-1E** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.

3. *Temporarily Seed (TS)*, throughout construction, denuded areas that will be inactive for 14 days or more.
4. Permanently stabilize areas to be vegetated as they are brought to final grade.
5. Complete grading and installation of *Permanent Seeding (PS)* over all areas in accordance with approved landscape plans.
6. Remove remaining BMPs once permanent stabilization has been achieved and accepted by the City Inspector. Repair and stabilize areas disturbed through BMP removal.
7. Notify the owner of intent to file the Notice of Inactivation with CDPHE and receive Owner acceptance to proceed with Stormwater Management Close-out.
8. Proceed with filing the Notice of Inactivation with CDPHE.
9. Provide the Owner with a copy of all stormwater documentation (permits, inspection reports, logs, etc.) upon completion of Project Stormwater Notice of Inactivation.

The operator shall complete the anticipated final stage for **Areas 2-5** sequencing as follows:

15. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
16. Repair and/or replace any existing BMPs which are deemed inadequate.
17. Permanently stabilize areas to be vegetated as they are brought to final grade.
18. Complete grading and installation of *Permanent Seeding (PS)* over all areas in accordance with approved landscape plans.
19. Remove remaining BMPs once permanent stabilization has been achieved and accepted by the City Inspector. Repair and stabilize areas disturbed through BMP removal.
20. Notify the owner of intent to file the Notice of Inactivation with CDPHE and receive Owner acceptance to proceed with Stormwater Management Close-out.
21. Proceed with filing the Notice of Inactivation with CDPHE.
22. Provide the Owner with a copy of all stormwater documentation (permits, inspection reports, logs, etc.) upon completion of Project Stormwater Notice of Inactivation.

The operator shall complete the anticipated final stage for **Areas 6 & 7** sequencing as follows:

1. Confirm existing BMPs from the initial phase, which are to be maintained throughout construction, are in working order and compliant with applicable regulations.
2. Repair and/or replace any existing BMPs which are deemed inadequate.
3. Permanently stabilize areas to be vegetated as they are brought to final grade.
4. Complete grading and installation of *Permanent Seeding (PS)* over all areas in accordance with approved landscape plans.
5. Remove remaining BMPs once permanent stabilization has been achieved and accepted by the City Inspector. Repair and stabilize areas disturbed through BMP removal.
6. Notify the owner of intent to file the Notice of Inactivation with CDPHE and receive Owner acceptance to proceed with Stormwater Management Close-out.
7. Proceed with filing the Notice of Inactivation with CDPHE.
8. Provide the Owner with a copy of all stormwater documentation (permits, inspection reports, logs, etc.) upon completion of Project Stormwater Notice of Inactivation.

STORMWATER MANAGEMENT PLAN SITE MAP

SITE MAP MINIMUM REQUIREMENTS

The Site Map for this project is included within **Appendix A** of this report and meets the following minimum requirements:

- Construction Site Boundaries
- Topographic contours
- Identification of Ground Surface Disturbance
- Areas of Storage of Building Materials, Equipment, Soil or Waste
- Location of Dedicated Asphalt or Concrete Batch Plants (As Applicable)
- Location of Structural BMPs
- Location of Non-Structural BMPs
- Location of Springs, Streams, Wetlands or other Surface Waters (As Applicable)

STORMWATER MANAGEMENT CONTROLS

SWMP ADMINISTRATOR

The SWMP Administrator is the Operator selected for the project. The SWMP Administrator is responsible for developing, implementing, maintaining and revising the SWMP. The activities and responsibilities of the Administrator shall address all aspects of the facility's SWMP.

Company: _____

Contact: _____

Address: _____

_____

Phone: _____

Email: _____

SWMP Administrator contact info will be given to the Owner and Operator prior to work commencing.

SITE SPECIFIC POLLUTION SOURCES

Further identification of site specific pollutants that fall within the categories outlined in the next section may be field noted using the corresponding log included in the appendices of this report. The logs are intended to record site specific pollutants, the date of arrival on the site, the date removed from the site, and the methods of treatment.

IDENTIFICATION OF POLLUTANT SOURCES

Evaluation of general sediment and non-sediment pollution sources associated with site construction activities, as outlined within the General Permit, consist of the following:

- **Disturbed and Stored Soils** – Earth disturbing activities (grading, excavation, etc.) will be necessary for this project; therefore, the potential exists for disturbed site soils to contribute sediment to stormwater discharges.
- **Vehicle Tracking and Sediment** – Construction traffic will be entering and exiting the Site; therefore, the potential exists for vehicle tracking to contribute sediment to stormwater discharges.
- **Management of Contaminated Soils** – Contaminated soils are not anticipated on this Site. If encountered, the SWMP Administrator shall take appropriate containment and treatment measures.
- **Loading and Unloading Operations** – Loading and unloading operations will be taking place at the Site; therefore, the potential exists for these operations to introduce sediment and non-sediment pollutants to stormwater discharges.
- **Outdoor Storage of Materials** – Limited outdoor storage of materials is anticipated with construction of this site; however, outdoor storage of chemicals, fertilizers, etc. is not anticipated.
- **Vehicle and Equipment Maintenance and Fueling** – Routine maintenance and fueling of vehicles and equipment is anticipated with this Site; therefore, the potential exists for pollutants associated with these activities to contribute pollutants to stormwater discharges.
- **Significant Dust or Particulate Generating Processes** – Earth disturbing activities (grading, excavation, etc.) will be necessary for this project; therefore, the potential exists for windblown site soils to contribute sediment to stormwater discharges.
- **Routine Maintenance** – Routine maintenance involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc., other than those identified within Vehicle and Equipment Maintenance and Fueling are not anticipated with this project. If encountered, the SWMP Administrator shall take appropriate containment and treatment measures.
- **Onsite Waste Management** – Waste management consisting of solid waste piles, liquid wastes, dumpsters, etc. are anticipated onsite; therefore, the potential exists for these operations to introduce sediment and non-sediment pollutants to stormwater discharges.
- **Concrete Truck / Equipment Washing** – Concrete truck and equipment washing are anticipated with this project. The SWMP Administrator shall take appropriate containment and treatment measures.
- **Dedicated Asphalt and Concrete Batch Plants** – Dedicated asphalt and/or concrete batch plants are not anticipated with this project. If encountered, the SWMP Administrator shall take appropriate containment and treatment measures and document as necessary.
- **Non-Industrial Waste Sources** – Non-Industrial waste sources limited to portable sanitary facilities are anticipated with this project.
- **Form Oil** – If encountered, the SWMP Administrator shall take appropriate containment and treatment measures and document as necessary.
- **Pesticides and/or Herbicides** – If encountered, the SWMP Administrator shall take appropriate containment and treatment measures and document as necessary.
- **Saw Cutting Operations** – Saw cutting operations are not anticipated with this project. If water is used during saw cutting, SWMP administrator shall take appropriate containment and treatment measures to prevent illicit material from leaving the site.
- **Additional Pollutant Sources** – Additional areas or procedures where potential spills could occur are not anticipated with this project. Should additional pollutant sources be present, contractor shall implement appropriate treatment methods; add source to this plan and report to the inspector.

Logs for the identification of pollutant sources are included in **Appendix F** for reference and use.

Based on the following, the potential to contribute pollutants to stormwater discharges is not significant for

most of the pollutants identified above:

- Relatively Low Frequency of the Activities
- The Ability to Schedule Activities During Dry Weather
- Existing Site Topography
- The Ability to Implement Primary and Secondary Containment for Product Storage

Potential pollutant sources noted below shall be mitigated by use of Best Management Practices (BMPs) as noted in the following sections:

- Disturbed and Stored Soils
- Vehicle Tracking and Sediment
- Loading and Unloading Operations
- Outdoor Storage
- Vehicle Equipment and Maintenance Fueling
- Significant Dust or Particulate Generating Processes
- Non-Industrial Waste Sources

NON-STORMWATER DISCHARGE COMPONENTS

Only specifically authorized non-stormwater discharges are allowed to enter the storm sewer and all authorized non-stormwater discharges shall be eliminated or reduced to the extent practicable.

Appropriate BMPs shall be used to minimize the discharge of pollutants. Such control measures will be strictly followed to ensure any impacts from non-stormwater discharges are reduced or eliminated. Appropriate BMPs are:

- Uncontaminated ground water or spring water
  If possible, direct uncontaminated ground water or spring water to stabilized points of discharge. If discharged to a disturbed area, assure measures to control erosive velocities and sediment control measures are implemented. Velocity control measures include riprap aprons and other conveyance measures. Sediment control measures might include stone check dams, sediment traps and basins.

  If uncontaminated ground water is discharged off-site, a Construction Dewatering Permit will be required. This Permit will not apply if dewatering is not performed or if water is not discharged off-site.

- Landscape Irrigation Return Flows
  Volume of water used for irrigation prior to establishment of vegetation shall be controlled to prevent excess runoff and erosion. Temporary sediment control measures shall remain in place until all upstream disturbed areas are stabilized. Sediment loss will be controlled through the use of sediment control measures such as wattles, sediment fence, and vegetative buffers.

BEST MANAGEMENT PRACTICES FOR STORMWATER POLLUTION PREVENTION

There are three general types of BMPs that will be utilized for the Project: Construction Control, Erosion Control, and Sediment Control BMPs. Construction Control BMPs are related to construction access and

staging. Erosion Control BMPs are used to limit the amount and extent of erosion. Sediment Control BMPs are designed to capture eroded sediments prior to their conveyance offsite. Several BMPs described below may be categorized into more than one of the types described above. Also, these BMPs may be categorized into one or more of the following construction stages which pertain to the stage of development in which they may be implemented. Initial Stage BMPs shall be installed on existing grades at the outset of construction. Interim Stage BMPs shall be installed on proposed grades and drainage features after initial site grading. Final Stage BMPs shall be installed as one of the last steps in the construction process. Construction of the identified improvements will take place under two phases of construction anticipated as identified within the construction sequencing included within this report.

Refer to the Erosion and Sediment Control Plans for the location and specifications for implementation of erosion control measures for the stages of the Project. The following is a brief description of temporary sediment and erosion control BMP's to be utilized on this Site and the application those BMP's are treating. Refer to the Water Quality Master Plan for Denver International Airport dated October 2017, prepared by Kimley-Horn for additional BMP details.

CONSTRUCTION CONTROL

One construction entrance with Vehicle Tracking Control (VTC) per isolated area shall be installed in an effort to reduce off-site sediment tracking. The VTC shall be installed during the initial stage of construction activities.

A Concrete Washout Area (CWA) will be installed near the VTC to help isolate concrete truck washout operations. A CWA is installed when a site anticipates the generation of concrete wash water. CWAs provide an area for the proper collection and disposal of all liquid concrete waste. The CWA will be installed during the interim stage of construction activities. Three basic approaches are available to the Contractor and include an above-grade storage area, excavation of a pit in the ground, and a prefabricated haul-away concrete washout container. All concrete washout areas shall, as a minimum adhere to the following guidelines:

- Maintain a minimum distance of 400 feet from a stream or water body.
- Maintain a minimum distance of 1,000 feet from any wells or drinking water source.
- Shall not be located in a natural draw or drainage swale.
- Shall not be located in areas of highly permeable soils, i.e., gravels and sands.
- The chosen location shall be sited so that if a failure or overtopping occurs, the flow would be directed to a flat or depressed grassy area away from any water sources.
- The use of solvents, cleaners, or hazardous materials when cleaning or removing concrete is strictly prohibited.
- Backflushing shall not be permitted on site.
- Adequate and proper disposal of contents is required once the CWA has reached ½ capacity and at the end of concrete construction activities.

A stabilized staging area (SSA) to provide an area for construction activities and material storage will be located at each isolated construction area. The SSA provides a designated area for staging of construction materials and equipment, placement of job trailer, contractor parking, etc.

A SWMP Information Sign (S) provides stormwater related information for the Site and shall be located near the project entrance, visible to the public.

EROSION CONTROL

Protection of steep slopes is anticipated on this project. Steep slopes are defined as slopes greater than 4:1 that are higher than 5-feet vertically. Temporary slopes during construction that are greater than 4:1 need to be addressed along with any permanent slopes which are greater than 4:1. The Permittee may need to implement the use of diversion ditches to reroute the storm runoff, terrace the grades to break up the flow of incidental runoff down slopes, compost mulch to protect the exposed soil or other BMP as approved by the inspector. Slopes steeper that 4:1 shall be protected with an erosion control blanket. No un-protected final grades shall be allowed greater than 3:1.

Permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed within fourteen (14) calendar days after final grading or the final earth disturbances has been completed. When it is not possible to permanently stabilize a disturbed area after an earth disturbance has been completed or where significant earth disturbance activity ceases, temporary soil erosion control measures shall be implemented within fourteen (14) calendar days. All temporary soil erosion control measures shall be maintained until permanent soil erosion measures are implemented.

All disturbed areas shall be stabilized as soon as possible. Seeding and Mulching (SM), to provide protection against rain and wind erosion, shall be performed temporarily, as needed, during the pre-construction, initial, and interim phases and maintained until final stabilization is completed. Site Stabilization will be achieved through use of temporary seeding and mulching (TS) and ultimately permanent landscaping (PS). All disturbed areas which are either final graded, or will remain inactive for a period of more than 30 days shall be required to be stabilized within 14 days of the completion of the grading activities.

SEDIMENT CONTROL

Rough Cut Street Control (RCSC) is a temporary rock or earthen berm used to control erosion and divert runoff. This BMP should be installed at construction road access points and intermittently as the proposed maintenance access road is being constructed in Areas 1, 2, 3, 4, and 5.

Check Dams (CD) are constructed from rock, gravels, sandbags, or proprietary devices and are meant to limit erosion and reduce velocity. Check dams should be installed along all drainage swales.

Drainage Swales (DS) are used as temporary storm drain conveyance channels to divert runoff or convey flow to sediment control BMPs. All drainage swales shall be installed to prevent ponding and riprap shall be grouted. Embankments should be compacted to ninety (90) percent of maximum density. All drainage swales shall be lined with geotextile or mat per **Erosion Control Blanket (ECB)** standards. Drainage swales shall be installed in the initial stage in Areas 1 – 5.

Construction Fence (CF) should be installed parallel to the Limits of Disturbance (LOD) for each phase are area of construction. Plastic mesh fence is recommended for this project.

Street Sweeping and Vacuuming (SS) is used to remove sediment that has been tracked onto a roadway and prevents sediment from being swept or washed into the storm drain or surface drainage system. Paved and impervious surfaces which are adjacent to construction sites must be swept on a weekly basis or as needed during the week when sediment and other materials are tracked or discharged onto them. Either sweeping by hand or use of street sweepers is acceptable. Street sweepers using water while sweeping is preferred in order to minimize dust. Scraped or swept material shall not be deposited in the storm sewer. Materials collected by the inlet protection shall be removed and shall not be deposited in the storm sewer.

Temporary and Permanent Seeding (TS/PS) is used to stabilize areas that have been disturbed but will be inactive for thirty (30) days or more. Refer to the DEN Turf and Grass Technical Specification for seeding requirements prior to seeding. Drill seeding is the recommended method. Hand seeding is preferred to hydroseeding in areas where the slope will not allow drilling equipment. The soil must be capable of revegetation, which may require imported topsoil of the existing soil may have to be amended so that proper conditions can be achieved. Before grading is completed, a minimum of six (6) inches of topsoil should be salvaged. Surface roughening or rototilling will need to be performed after any grading operations.

Inlet Protection (IP) serves to reduce the sediment in runoff from entering inlets. Inlet protection should be installed at all existing inlets to remain and proposed inlets. Protection should be installed immediately after completion of construction of inlet. Silt fence and straw are not acceptable forms of inlet protection at DEN.

Temporary Outlet Protection (OP) is intended to reduce any erosion that may occur downstream of the outlet. Outlet protection should be installed at all existing outlets to remain and all proposed outlets. Protection should be installed immediately after completion of construction of outlet. If riprap outlet protection is used, it must be grouted.

Earth Dikes (ED) are used to divert and slow runoff. Earth dikes are installed parallel to select Drainage Swales (DS) to provide settling prior to runoff discharge into swale. Earth dikes should also be installed in upstream construction areas where disturbance will occur, such as around the Stabilized Staging Area (SSA). All earth dikes shall be installed to prevent ponding and riprap shall be grouted. Embankments should be compacted to ninety (90) percent of maximum density.

Terracing (T) is the grading of steep slopes into a series of flat or nearly flat sections to shorten uninterrupted flow lengths on steep slopes to control erosion. Terraces should be graded back to slope at a minimum three (3) percent grade and should be compacted to ninety (90) percent of maximum density.

Rock Socks (RS) are placed upstream of inlets to prevent transport of sediment. Rock socks should be installed in the locations indicated on the SWMP Plans. They should be installed at angles along the curb line, typically near inlet protection or access driveways.

Sediment Basins (SB) are ponds designed to capture sediment from eroded or disturbed soil. During Phase 1 construction a sediment basin will be required to capture all runoff within the 2.6 acres of disturbed Area 1 area. All runoff from the existing outlets into Pond 2M-7 will be diverted around the disturbed area and therefore, is not required to enter the sediment basin during Phase 1. Phase 2 construction will not begin until completion of Phase 1. The completed Pond 2M-7 will be utilized as the sediment basin for Phase 2 construction.

Stockpile Management (SP) is intended to minimize erosion and sediment transport from soil stockpiles. All stockpiles shall be protected from stormwater with the use of appropriate erosion and sediment control BMPs to inhibit soil transport as well as at material storage areas. All stockpiles shall:

- Not be located adjacent to a waterway.
- Be stabilized within 14 days after establishment for stockpiles lasting more than 30 days. Stabilization shall include, but not be limited to, surface roughening, seeding, and mulching.
- Not exceed 15 feet in height.
- Utilize earth dikes on all down slope sides of the stockpile.

ADDITIONAL BMP DETAILS

This project will be completed in two Phases and has been split into eleven areas. As areas of the Site are completed and grade is established, the proper BMP's should be implemented in a timely manner to reduce the potential for erosion and sediment transport. Examples of these BMP's include temporary and permanent seeding.

The Permittee is not to affect areas beyond the Limits of Disturbance (LOD) noted on the SWMP Plans without the approval of the Inspector, adjacent property owners, and the Engineer of Record. Vehicle Tracking Control (VTC) is provided at each area of construction. Construction traffic shall be limited to these access points. All construction site operators shall control waste such as discarded waste materials, hazardous chemicals (to include but not be limited to, heavy equipment maintenance fluids, motor oil, antifreeze and secondary containment of vehicle fuel), litter, and sanitary waste at the construction site that may cause adverse impacts to water quality. Chemicals, paints, solvents, fertilizers, and other toxic materials must be stored in weatherproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed at an approved solid waste or chemical disposal facility.

Throughout build-out, the developer shall be responsible for implementing and maintaining Best Management Practices (BMPs) to control erosion and sediment problems on all idle areas of the project.

All persons engaged in earth disturbances shall design, implement, and maintain acceptable soil erosion and sedimentation control measures, in conformance with the erosion and sediment control technical standards adopted by DEN and CCD. All temporary erosion and sediment control facilities, and all permanent facilities intended to control erosion of any earth disturbance operation shall be installed before any earth disturbance operations take place. Any earth disturbances shall be conducted in such a manner so as to effectively control runoff volumes, reduce accelerated soil erosion, sediment movement, and deposition off-site. All earth disturbances shall be completed in such a manner so that the total amount of soil exposed at any given time shall be minimized, and the exposed area of any disturbed land shall be limited to the shortest possible period of time. Temporary soil erosion control facilities shall be removed and earth disturbance areas graded and stabilized with permanent soil erosion control measures pursuant to approved plans and specifications.

A Land Disturbance, BMP Installation, and Stabilization Log is provided in **Appendix G** and shall be filled out accordingly during BMP implementation. BMP calculations have been included in **Appendix I** for reference.

OTHER POTENTIAL POLLUTION CONSIDERATIONS

MATERIALS HANDLING AND SPILL PREVENTION

Any hazardous or potentially hazardous material that is brought onto the construction site shall be handled properly in order to reduce the potential for stormwater pollution. In an effort to minimize the potential for a spill of petroleum product or hazardous materials to come in contact with stormwater, the following steps shall be implemented:

- Material Safety Data Sheets (MSDS) information shall be kept on site for any and all applicable materials.

- All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, additives for soil stabilization, concrete, curing compounds and additives, etc.) shall be stored in a secure location, under cover and in appropriate, tightly sealed containers when not in use.
- The minimum practical quantity of all such materials shall be kept on the job site and scheduled for delivery as close to time of use as practical.
- A spill control and containment kit shall be provided on the construction site and location(s) shown on Site Maps.
- All of the product in a container shall be used before the container is disposed of. All such containers shall be triple rinsed, with water prior to disposal. The rinse water used in these containers shall be disposed of in a manner in compliance with State and Federal regulations and shall not be allowed to mix with stormwater discharges.
- All products shall be stored in and used from the original container with the original product label and used in strict compliance with the instructions on the product label.
- The disposal of excess or used products shall be in strict compliance with instructions on the product label.

Fueling for construction is anticipated to be conducted with a fuel truck that will not be kept permanently on-site. If utilized, temporary onsite fuel tanks for construction vehicles shall meet all state and federal regulations. Tanks shall have approved spill containment with the capacity required by the applicable regulations. From NFPA 30: All tanks shall be provided with secondary containment (i.e. containment external to and separate from primary containment). Secondary containment shall be constructed of materials of sufficient thickness, density and composition so as not to be structurally weakened as a result of contact with the fuel stored and capable of containing discharged fuel for a period of time equal to or longer than the maximum anticipated time sufficient to allow recovery of discharged fuel.

The tanks shall be in sound condition free of rust or other damage which might compromise containment. Fuel storage areas shall meet all Environmental Protection Agency (EPA), OSHA and other regulatory requirements for signage, fire extinguisher, etc. Hoses, valves, fittings, caps, filler nozzles and associated hardware shall be maintained in proper working condition at all times. The location of fuel tanks shall be shown on the Site Maps and shall be located to minimize exposure to weather and surface water drainage features.

The Operator shall develop and implement a Materials Handling and Spill Prevention Plan (MHSPP) in accordance with the EPA and State of Colorado requirements. In the event of an accidental spill, immediate action shall be undertaken by the Operator to contain and remove the spilled material. All hazardous materials, including contaminated soil, shall be disposed of by the Operator in the manner specified by federal, state and local regulations and by the manufacturer of such products. As soon as possible, the spill shall be reported to the appropriate agencies. As required under the provisions of the Clean Water Act, any spill or discharge entering waters of the United States shall be properly reported. The Operator shall prepare a written record of any spill and associated clean-up activities of petroleum products or hazardous materials in excess of 1 gallon or reportable quantities, whichever is less. A copy of the Spill Report Form is included in **Appendix H** of this report.

Accidental spills shall be handled expeditiously as outlined in CDPHE guidance. Any spills of petroleum products or hazardous materials in excess of Reportable Quantities as defined by EPA or the state or local agency regulations, shall be immediately reported to the Colorado Department of Public Health and Environment spill reporting lines.

- CDPHE Environmental Release and Incident Reporting Line (877) 518-5608.
- National Response Center - (800) 424-8802

For reference, a bulletin on Environmental Spill Reporting published by the CDPHE, has been included in **Appendix H** of this report.

VEHICLE TRACKING AND DUST CONTROL

Vehicle Tracking Control BMPs (structural and non-structural) shall be implemented in order to control potential sediment discharges from vehicle tracking. Practices shall be implemented for all areas of potential vehicle tracking which include, but are not limited to reduced site access and utilization of designated haul routes.

Areas of soil that are denuded of vegetation and have little protection from particles being picked up and carried by wind should be protected with a temporary cover or kept under control with water or other soil adhering products to limit wind transported particles exiting the site perimeter.

WASTE MANAGEMENT AND DISPOSAL

An effective first step towards preventing pollution in stormwater from work sites involves using a common sense approach to improve the facility's basic housekeeping methods. Poor housekeeping practices result in increased waste and potential for stormwater contamination.

No solid materials are allowed to be discharged from the site with stormwater. All solid waste, including disposable materials incidental to the construction activities, must be collected and placed in containers. Secure covers for the containers shall be provided at all times to meet state and local requirements. The location of solid waste receptacles shall be identified on the SWMP by the Operator.

Concrete waste is anticipated with this project; and therefore, a dedicated concrete washout is required. The SWMP Administrator shall take appropriate containment and treatment measures and document as necessary.

GROUNDWATER AND STORMWATER DEWATERING

Except as noted below, all discharges covered by this permit shall be composed entirely of stormwater associated with construction activity.

- Emergency Fire Fighting Activities
- Uncontaminated Spring Water or Ground Water
- Landscape Irrigation Return Flows

Groundwater dewatering may be required during storm sewer infrastructure excavation. If encountered, the operator shall file for appropriate dewatering permits (Permit No. COG070000) with the CDPHE. Testing and monitoring of the dewatered discharge may be required depending on where the water is discharged. Typically, the flow, pH, oil and grease, and total suspended solids shall be monitored at a minimum. Specific monitoring and testing requirements for the discharge outfall will vary depending on location. Once dewatering is determined to be required, CDPHE shall be contacted to determine these requirements.

STABILIZATION AND STORMWATER MANAGEMENT

TEMPORARY STABILIZATION AND SHORT TERM STORMWATER MANAGEMENT

DEN and CCD considers the completion of over-lot grading operations, by definition, to be substantially complete; therefore, all areas that will be dormant for more than 30 days after the completion of the over-lot grading will require temporary seeding within 14 days of establishment. This does not preclude the 7-day requirement for areas fully completed in the future. At a minimum in ensuring that this requirement is followed, adequate phasing/scheduling will be required.

FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT

Final Stabilization has been completed if the following three criteria have been met:

1. In areas of magnesium chloride application, stormwater runoff must be collected and diverted around the disturbed area and must include protected rundown.
2. Must attempt to reestablish a perennial vegetative cover using topsoil preserved from the site and/or with additional (preferably local) topsoil from off-site, mulch, fertilizer, and/or other methods with seeding and planting. The vegetative cover, preferably of an indigenous seed mix, should be equivalent to the background cover. Permanent stabilization is expected to occur within 3 to 3.5 years after project completion with average precipitation.
3. Must provide non-vegetative erosion control measures designed and installed for either permanent or temporary (which would completely degrade and decompose with leaving litter) placement to provide cover. BMP controls may be used in lieu of erosion control measures provided that they are selected and designed to protect the seed and surface from erosion as much as possible without active maintenance until the natural stabilizing effect of vegetation is established.

INSPECTION AND MAINTENANCE

Inspections shall be the responsibility of the SWMP Administrator throughout the construction process.

INSPECTION SCHEDULE REQUIREMENTS

Inspection and maintenance of erosion control measures shall comply with the criteria set forth by the CDPS General Permit (COR090000), or the following, whichever is more stringent.

The Permittee or Contractor shall make routine checks of all erosion control measures to determine if repairs or sediment removal is necessary. Written inspection records a minimum of once every seven (7) days and within 24 hours after every significant precipitation event or after every significant precipitation event that causes surface erosion. All necessary maintenance and repair shall be completed immediately. If more frequent inspections are required to ensure that BMPs are properly maintained and operated, the inspection schedule shall be modified to meet this need. Once construction is complete, but stabilization has not been fully established, all BMPs may be inspected once a month. A copy of the SWMP shall be maintained at the site at all times. Any degradation of the BMPs described in the SWMP or excessive accumulation of sediments shall be remedied immediately upon discovery. The Contractor shall record all storm events on the Storm Event Log included in **Appendix J**.

INSPECTION PROCEDURES

The inspection shall include observations of:

- The Construction Site Perimeter and Discharge Points;
- All Disturbed Areas;
- Vehicles and Equipment;
- Areas Used for Material / Waste Storage That are Exposed to Precipitation;
- Other Areas Determined to Have a Significant Potential for Stormwater Pollution;
- Erosion and Sediment Control Measures Identified in the SWMP; and
- Any Other Structural BMPs That May Require Maintenance.

The inspection must determine if there is evidence of, or the potential for, pollutants entering the drainage system. BMPs should be reviewed to determine if they still meet the design intent and operational criteria in the SWMP and if they continue to adequately control pollutants at the site. Any BMPs not operating in accordance with the SWMP must be addressed as soon as possible, immediately in most cases, to minimize the discharge of pollutants and the SWMP must be updated and inspections must be documented.

Examples of specific items to evaluate during site inspections are listed below. This list is not intended to be comprehensive. Ultimately, it is the responsibility of the Contractor to assure the adequacy of site pollutant discharge controls. Actual physical site conditions or contractor practices could make it necessary to install more controls than are shown on the plans. Assessing the need for additional controls and implementing them or adjusting existing controls will be an ongoing requirement until the site achieves final stabilization.

1. Vehicle Tracking Control - Locations where vehicles enter and exit the site shall be inspected for evidence of offsite sediment tracking. Exits shall be maintained as necessary to prevent the release of sediment from vehicles leaving the site. Any sediment deposited on the adjacent roadway shall be removed as necessary throughout the day or at the end of every day and disposed of in an appropriate manner. Sediment shall not be washed into storm sewer systems.
2. Erosion Control Devices - Rolled erosion control products (nets, blankets, turf reinforcement mats) and marginally vegetated areas (areas not meeting required vegetative densities for final stabilization) must be inspected frequently. Rilling, rutting and other signs of erosion indicate the erosion control device is not functioning properly and additional erosion control devices are warranted.
3. Sediment Control Devices - Sediment barriers (earth dikes, etc.) and basins must be inspected and they must be cleaned out at such time as their original capacity has been reduced by 50 percent. All material excavated from behind sediment barriers or in traps and basins shall be incorporated into onsite soils or spread out on an upland portion of the site and stabilized. To minimize the potential for sediment releases from the Project, site perimeter control devices shall be inspected with consideration given to changing up-gradient conditions.
4. Material Storage Areas - Material storage areas should be located to minimize exposure to weather. Inspections shall evaluate disturbed areas and areas used for storing materials that are exposed to rainfall for evidence of, or the potential for, pollutants entering the drainage system or discharging from the site. If necessary, the materials must be covered or original covers must be repaired or supplemented. Also, protective berms must be constructed, if needed, in order to contain runoff from material storage areas. All state and local regulations pertaining to material storage areas shall be adhered to.
5. Vegetation - Seed/Sod shall be free of weedy species and appropriate for site soils and regional climate. Seeding, sodding, tacking, and mulching shall be completed, in accordance with the requirements outlined within the Project Manual and locations identified within the plans, immediately after topsoil is applied and final grade is reached. Grassed areas shall be inspected

to confirm that a healthy stand of grass is maintained. Rip-rap, mulch, gravel, decomposed granite or other equivalent permanent stabilization measures may be employed in lieu of vegetation based on site-specific conditions and Owner approval.

6. Discharge Points - All discharge points must be inspected to determine whether erosion and sediment control measures are effective in preventing discharge of sediment from the site or impacts to receiving waters.

Based on the inspection results, all necessary maintenance and repair shall be completed immediately and in no cases longer than seventy-two (72) hours after identification. The inspection reports must be completed after each inspection. An important aspect of the inspection report is the description of additional measures that need to be taken to enhance plan effectiveness. The inspection report must identify whether the site was in compliance with the SWMP at the time of inspection and specifically identify all incidents of non-compliance.

The SWMP Administrator shall ensure that, at a minimum, the following is recorded for each inspection and kept onsite for reference:

- Inspection Date
- Name(s) and Title(s) of Inspection Personnel
- Location(s) of Discharges of Sediment and Other Pollutants from the Site
- Location(s) of BMPs Requiring Maintenance
- Location(s) of Failed BMPs
- Location(s) of Additional Required BMPs
- Deviations from the Minimum Inspections Schedule (If Applicable)
- Description of Corrective Actions
- Certification of SWMP Compliance after adequate corrective action(s) taken, or where a report does not identify any incidents requiring corrective action, this certification shall be made by the inspector indicating compliance with the permit

The use and maintenance of log books, photographs, field notebooks, drawings or maps should also be included in the SWMP records when appropriate.

BMP MAINTENANCE / REPLACEMENT AND FAILED BMPS

Site inspection procedures noted above must address maintenance of BMPs that are found to no longer function as needed and designed, as well as preventive measures to proactively ensure continued operation.

The SWMP Administrator shall implement a preventative maintenance program to ensure that BMP breakdowns and failures are handled proactively. Site inspections should uncover any conditions which could result in the discharge of pollutants to storm sewers and surface waters and shall be rectified. For example, sediment shall be removed from silt fences on a regular basis to prevent failure of the BMP. Sediment shall be removed to an appropriate location so that it will not become an additional pollutant source.

The inspection process must also include replacement of BMPs when needed or the addition of new BMPs in order to adequately manage the pollutant sources at the site.

Any BMP deficiencies, replacement or additional BMPs that may be required shall be documented on the Stormwater Management Site Map and on the appropriate Inspection Form. If amendments to the SWMP are required, these amendments shall be documented on the SWMP Amendment Log included in **Appendix L** for reference and use.

TERM AND CONDITIONS OF THE CDPS GENERAL PERMIT

In addition to the requirements already noted in the report, this section provides specific details on the terms and conditions outlined with the CDPHE CDPS General Permit.

GENERAL LIMITATIONS

The following limitations shall apply to discharges associated with construction activities:

- Stormwater discharges from construction activities shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any water quality standard, including narrative standards for water quality.
- Concrete washout water shall not be discharged to state surface waters or to storm sewer systems. Onsite permanent disposal of concrete washout waste is not authorized by this permit. Discharge to the ground of concrete washout waste that will subsequently be disposed of offsite is authorized by this permit. See Part I.D.3.c of the CDPS Permit.
- Bulk storage structures for petroleum products and any other chemicals shall have secondary containment or equivalent adequate protection so as to contain all spills and prevent any spilled material from entering State Waters.
- No chemicals are to be added to the discharge unless permission for the use of a specific chemical is granted by CDPHE. In granting the use of such chemicals, special conditions and monitoring may be addressed by separate correspondence.
- CDPHE reserves the right to require sampling and testing, on a case-by-case basis, in the event that there is reason to suspect that compliance with the SWMP is a problem, or to measure the effectiveness of the BMPs in removing pollutants in the effluent. Such monitoring may include Whole Effluent Toxicity testing.
- All site wastes must be properly managed to prevent potential pollution of State Waters. This permit does not authorize onsite waste disposal.
- All dischargers must comply with the lawful requirements of federal agencies, municipalities, counties, drainage districts and other local agencies regarding any discharges of stormwater to storm drain systems or other water courses under their jurisdiction, including applicable requirements in municipal stormwater management programs developed to comply with CDPS permits. Dischargers must comply with local stormwater management requirements, policies, or guidelines including erosion and sediment control.

The above information is taken directly from the CDPHE General Permit.

PROHIBITION OF NON-STORMWATER DISCHARGES

Except as identified within the Terms and Conditions of the General Permit (Section D.3 – Prohibition of Non-Stormwater Discharges), all discharges covered by this permit shall be composed entirely of stormwater associated with construction activity. Discharges of material other than stormwater must be addressed in a separate CDPS permit issued for that discharge.

Discharges to the ground from construction dewatering activities that do not meet the referenced criteria must be covered under a separate CDPS discharge permit. Contaminated groundwater requiring coverage under a separate CDPS discharge permit may include groundwater contaminated with pollutants from a landfill, mining activity, industrial pollutant plume, underground storage tank, or other source.

The above information is taken from the CDPHE General Permit.

SWMP RETENTION REQUIREMENTS

The permittee must document inspection results and maintain a record of the results for a period of 3 years following expiration or inactivation of permit coverage. These records must be made available to the City, County, CDPHE or EPA upon request.

In order to fulfill this requirement, the SWMP Administrator shall retain a copy of the SWMP and provide the original to the owner/permittee upon inactivation of the permit.

SWMP REVIEW / CHANGES

At nearly every site, the recommended and/or implemented BMPs will need to be modified to adapt to changing site conditions, or to ensure that the potential pollutants are consistently and properly managed. The Operator shall amend the SWMP:

- When there is a change in design, construction, operation, or maintenance 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 stormwater discharges associated with construction activity; or
- When BMPs are no longer necessary and removed.

SWMP changes shall be made prior to changes in site conditions, except as noted below. Revisions may include, but are not limited to, potential pollutant source identification, selection of appropriate BMPs for site conditions, BMP maintenance procedures and interim and final stabilization practices. The SWMP changes may include a schedule for further BMP design and implementation, provided that, if any interim BMPs are needed to comply with the permit, they are also included in the SWMP and implemented during the interim period.

RESPONSIVE SWMP CHANGES

SWMP changes addressing BMP installation and/or implementation are often required to be made in response to changing conditions, or when current BMPs are determined ineffective. The majority of these SWMP revisions can be made immediately with quick in-the-field revisions to the SWMP. In the less common situation where more complex development of materials to modify the SWMP is necessary, the revisions shall be made in accordance with the following requirements:

- The SWMP shall be revised as soon as practicable, but in no case more than 72 hours after the change(s) in BMP installation/implementation occur at the site; and
- A notation must be included in the SWMP prior to the site change(s) that includes the time and date of the change(s) in the field, an identification of the BMP(s) removed or added and the location(s) of those BMP(s).

Any BMP deficiencies, replacement or additional BMPs that may be required shall be documented on the Stormwater Management Site Map and on the appropriate Inspection Form. If amendments to the SWMP are required, these amendments shall be documented on the SWMP Amendment Log included in **Appendix L** for reference and use.

CONCLUSIONS

Temporary erosion control measures and BMPs will enhance stormwater quality within the project area by capturing and detaining sediment-laden runoff prior to discharging off-site.

REFERENCES

City and County of Denver Construction Activities Stormwater Manual - Wastewater Management Division, Department of Public Works, City and County of Denver, CO, revised June 2010

City and County of Denver Department of Public Works Storm Drainage Design and Technical Criteria, January 2006, Amended November 2013, with latest revisions.

Colorado Discharge Permit System (CDPS) – Stormwater Discharge Associated with Construction Activities Application - Prepared by Water Quality Control Division, Colorado Department of Public Health and Environment; Signed and issued on December 1, 2016 and administratively continued until June 30, 2021.

Urban Storm Drainage Criteria Manual – Volume 3 – Prepared by the Urban Drainage and Flood Control District; Current Revision November 2015.

Water Quality Master Plan – Prepared by Kimley-Horn, October 2017