

## CDOT Water Quality Specifications

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**DIVISION 100  
GENERAL PROVISIONS**

**SECTION 101  
DEFINITIONS AND TERMS**

Titles used in these specifications having a masculine gender, such as “workmen” and the pronouns “he” or “his”, are for the sake of brevity and are intended to refer to persons of either sex.

The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not have any bearing on their interpretation.

When the Contract indicates that work is to be “accepted, acceptable, subject to approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, deemed insufficient, subject to interpretation, interpreted, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory,” it shall be understood that these expressions are followed by the words “By the Engineer,” or “To the Engineer.”

When the Contract indicates that something “shall” be done, the action is required and is not discretionary.

Wherever the following abbreviations or terms are used in these specifications, plans, or other contract documents, the intent and meaning shall be interpreted as follows:

**101.01 Abbreviations.**

AAN	American Association of Nurserymen
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute, Inc.
ARA	American Railway Association
AREA	American Railway Engineering Association
ARTBA	American Road and Transportation Builders Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATSSA	American Traffic Safety Services Association
AWG	American Wire Gauge
AWPA	American Wood Protection Association
AWS	American Welding Society
AWWA	American Water Works Association
CCA	Colorado Contractors Association
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CP	Colorado Procedure
CP-L	Colorado Procedure - Laboratory
CRS	Colorado Revised Statutes, 1973, as amended
CRSI	Concrete Reinforcing Steel Institute
EIA	Electronic Industries Association
FHWA	Federal Highway Administration
FSS	Federal Specifications and Standards,
IEEE	Institute of Electrical and Electronics Engineers

IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ITE	Institute of Transportation Engineers
MASH	Manual for Assessing Safety Hardware
MIL	Military Specifications
MS4	Municipal Separate Storm Sewer System
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation (NSF)
OSHA	Occupational Health and Safety Administration
PCI	Prestressed Concrete Institute
ROW	Right of Way
SWMP	Stormwater Management Plan
SAE	Society of Automotive Engineers
UL	Underwriters Laboratories, Inc.

**101.02 Advertisement.** A public announcement, inviting proposals for work to be performed or materials to be furnished.

**101.03 Affected Area.** As related to mined land reclamation, the total disturbed surface of a pit or quarry such as sand, gravel, topsoil, or borrow, that is being mined or will be mined. The area includes, but is not limited to, the excavation area, plant, and stockpile areas, parking and storage areas, and the haul roads.

**101.04 Award.** The acceptance by the Department of a proposal.

**101.05 Basis of Payment.** The terms under which "work" is paid, as a designated "Pay Item" in accordance with the quantity measured and the "Pay Unit."

**101.06 Bidder.** An individual, firm, corporation, or other legal entity submitting a proposal for the advertised work. A contractor intending to contract with the Department for performance of prescribed work.

**101.07 Bridge.** A structure, including supports, erected over a depression or an obstruction, such as water, highway, or railroad, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of roadway of more than 20 feet between undercopings of abutments or extreme ends of openings for multiple boxes.

*Length.* The length of a bridge structure is the over-all length measured along the line of survey stationing back to back of backwalls of abutments, if present, otherwise, end to end of the bridge floor; but in no case less than the total clear opening of the structure.

*Roadway Width.* The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom of curbs or guard timbers or in the case of multiple height of curbs, between the bottoms of the lower risers.

**101.08 Calendar Day.** Each and every day shown on the calendar, beginning and ending at midnight. When day is used, it shall mean calendar day unless otherwise defined.

**101.09 CDOT Resident Engineer.** The Resident Engineer is directly responsible for the overall administration of assigned construction projects. Unless the CDOT Project Engineer is a Professional Engineer, the Resident Engineer is CDOT's full time engineer in responsible charge of the project. The Resident Engineer will delegate authority to Project Engineers consistent with their experience and abilities. Only a CDOT Resident Engineer can approve and sign vouchers for interim and final Contractor pay estimates. Only a CDOT Resident Engineer can authorize and sign changes to the Contract if the Project Engineer is a Consultant Employee.

**101.10 Certificate of Compliance.** A certification, including a signature by a person having legal authority to act for the manufacturer, stating that the product or assembly to be incorporated into the project was fabricated in accordance with and meets the applicable specifications.

**101.11 Certified Invoice.** Any invoice or billing endorsed by the Contractor, certifying that material, specialty work, subcontract work, rental, lease, services, etc. were acquired for the project and that the invoiced or billed amount represents the actual costs.

**101.12 Certified Test Report.** A test report from the manufacturer or an independent testing laboratory, including a signature by a person having legal authority to act for the manufacturer or the independent testing laboratory stating that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

**101.13 Conformity.** Compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, conformity means compliance with such working tolerances.

**101.14 Construction Drawings.** A complete set of plans, reviewed shop drawings, working drawings, and other submittals kept available on the project site at all times by the Contractor.

**101.15 Construction Requirements.** Specifications covering performance of work required for proper completion and acceptance.

**101.16 Contract.** The written agreement between the State of Colorado through the Department of Transportation and the Contractor setting forth the obligations of the parties for the performance of the work and the basis of payment.

The Contract includes the invitation for bids, proposal, contract bonds, standard specifications, supplemental specifications, special provisions, general and detailed plans, Notice to Proceed, contract modification orders, and authorized extensions of time, all of which constitute one instrument.

**101.17 Contract Item (Pay Item).** A specifically described unit of work for which a price is provided in the Contract.

**101.18 Contract Modification Order.** A written order issued to the Contractor by the Department covering contingencies, extra work, increases or decreases in contract quantities, and additions or alterations to the plans or specifications, within the scope of the Contract, and establishing the basis of payment and time adjustments for the work affected by the changes. The Contract Modification Order is the only method authorized for changing the Contract. Contract Modification Orders must be approved as established in subsection 105.14.

**101.19 Contract Payment Bond.** The security executed by the Contractor and Surety or Sureties and furnished to the Department to guarantee payment of all legal debts of the Contractor pertaining to the Construction of the project.

**101.20 Contract Performance Bond.** The security executed by the Contractor and Surety or Sureties and furnished to the Department to guarantee completion of the work in accordance with the Contract.

**101.21 Contract Time.** The number of work days or calendar days allowed for completion of the Contract, including authorized time extensions. Where a calendar date of completion is specified, the Contract shall be completed on or before that date.

**101.22 Contractor.** The individual, firm, or corporation contracting with the State of Colorado through the Department of Transportation for performance of prescribed work.

**101.23 Contractor's Engineer.** A professional engineer registered in the State of Colorado who is an employee of either the Contractor, a consulting engineer under contract to the Contractor, or a manufacturer or supplier of materials supplied to the project.

**101.24 Control Measures for Stormwater Pollution Prevention.** Control measures prevent or reduce the pollutants in stormwater discharges from the construction site.

**101.25 County.** The county in which the work is to be done.

**101.26 Culvert.** Any structure not classified as a bridge which provides an opening under the roadway.

**101.27 Day.** See subsection 101.09.

**101.28 Department.** State Department of Transportation. A department within the executive branch of the State of Colorado.

**101.29 Engineer.** The Chief Engineer of the Department acting directly or through an authorized representative, who is responsible for engineering and administrative supervision of the project.

**101.30 Equipment.** All machinery, tools, and apparatus together with supplies for upkeep and maintenance, necessary for the proper construction and acceptable completion of the work.

**101.31 Extra Work.** Work not provided for in the Contract as awarded but found by the Engineer to be essential to the

satisfactory completion of the Contract within its intended scope.

**101.32 Falsework.** Falsework is temporary construction used to support structural elements of concrete, steel, masonry, or other materials during their construction or erection until they become self-supporting. Falsework may also be used to provide temporary support to elements of a structure during demolition or reconstruction.

**101.33 Force Account Work.** Work paid for on the basis of actual costs plus approved additives. See subsection 109.04.

**101.34 Formwork.** Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens.

**101.35 Highway.** A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

**101.36 Holidays.** Holidays recognized by the State of Colorado are:

New Year's Day
Dr. Martin Luther King, Jr.'s Birthday (observed)
Washington-Lincoln Day
Cesar Chavez Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veterans' Day
Thanksgiving Day
Christmas Day

When New Year's Day, Cesar Chavez Day, Independence Day, or Christmas Day falls on a Sunday, the following Monday shall be considered a holiday. When one of these days falls on a Saturday, the preceding Friday shall be considered a holiday.

Additional legal holidays, when designated by the Governor or the President of the United States will also be recognized by the State.

**101.37 Inspector.** The Engineer's authorized representative assigned to make detailed inspections of contract performance.

**101.38 Invitation for Bids.** All documents, whether attached or incorporated by reference, utilized for soliciting proposals. The advertisement will indicate with reasonable accuracy the quantity and location of the work to be done or the character and quantity of the material to be furnished and the time and place of the opening of proposals.

**101.39 Laboratory.** The testing laboratory of the Department, or any other testing laboratory designated by the Engineer.

**101.40 Materials.** All components required for use in the construction of the project.

**101.41 Method of Measurement.** The manner in which a "Pay Item" is measured to conform with the "Pay Unit."

**101.42 Notice to Proceed.** Written notice to the Contractor to proceed with the contract work including, when applicable, the date of beginning of contract time.

**101.43 Ordinary High Water Mark.** The term "ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. This is typically the 2-year storm event elevation.

**101.44 Original Contract Amount.** The sum of the total dollar amounts bid for all the construction pay item quantities. In subsection 626.02 this figure is modified for use in calculating partial payments for mobilization.

**101.45 Pavement Structure.** The combination of one or more of the following courses placed on a subgrade to support and distribute the traffic load to the roadbed.

- (1) Subbase. The layer or layers of specified or selected material placed on a subgrade to support a base course, surface course, or both. Subgrade that has been treated with lime, fly ash, cement kiln dust, or combinations thereof for stabilization will be considered subbase.

- (2) **Base Course.** The layer or layers of specified or selected material placed on a subbase or a subgrade to support a surface course.
- (3) **Surface Course.** One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called “Wearing Course.”

**101.46 Planned Force Account.** Items of work, included on the plans, which will be paid for in accordance with subsection 109.04.

**101.47 Plans.** The drawings, or reproductions, provided by the Department which show the location, character, dimensions, and details of the work to be done.

**101.48 Pre-construction Conference.** A meeting of CDOT project personnel, Contractor project personnel and other stake holders held prior to the beginning of construction at which topics pertinent to the successful prosecution of the work are discussed.

**101.49 Profile Grade.** The trace of a vertical plane usually intersecting the top surface of the proposed wearing surface and usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of such trace according to the context.

**101.50 Project.** The specific section of the highway on which construction is to be performed as described in the Contract.

**101.51 Project Engineer.** The Chief Engineer’s duly authorized representative who may be a CDOT employee or an employee of a consulting engineer (consultant) under contract to CDOT as defined below:

- (a) *CDOT Project Engineer.* The CDOT employee, assigned by the Resident Engineer, who is the Chief Engineer’s duly authorized representative. The CDOT Project Engineer is in direct charge of the work and is responsible for the administration and satisfactory completion of the project under contract.
- (b) *Consultant Project Engineer.* The consultant employee under the responsible charge of the consultant’s Professional Engineer who is in direct charge of the work and is responsible for the administration and satisfactory completion of the project. The Consultant Project Engineer’s duties are delegated by the CDOT Resident Engineer in accordance with the scope of work in the consultant’s contract with CDOT. The Consultant Project Engineer is not authorized to sign or approve Contract Modification Orders.

**101.52 Project Special Provisions.** See definition for special provisions in subsection 101.72.

**101.53 Project Termini.** Limits of the Project as shown on the plans.

**101.54 Proposal.** The offer of a bidder, on the prescribed form, to perform the work at the prices quoted. Also called bid.

**101.55 Proposal Form.** The documents furnished by the Department on which the offer of a bidder is submitted. Also called bid proposal.

**101.56 Proposal Guaranty.** The security furnished with a proposal to guarantee that the bidder will enter into the Contract if the proposal is accepted.

**101.57 Record Set.** A reproduction of a drawing or set of drawings, design calculations, or other record of engineering work required to be performed by the Contractor’s engineer, which is signed and sealed by the Contractor’s engineer in accordance with the Rules of Procedures of the State Board of Registration for Professional Engineers and Land Surveyors.

**101.58 Region Transportation Director.** The Department’s representative, responsible for construction, maintenance and safety activities, within the geographical jurisdiction established by the Department. The Region Transportation Director is responsible for acting on written appeals made by the Contractor relating to contract claims for additional compensation or extension of contract time.

**101.59 Right of Way.** A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

**101.60 Road.** A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

**101.61 Roadbed.** The graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulders.

**101.62 Roadside.** A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

**101.63 Roadside Development.** Those items necessary for the preservation of landscape materials and features. The rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers. Suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the highway.

**101.64 Roadway.** The portion of a highway within limits of construction.

**101.65 Roadway Prism.** The portion of the roadway defined as the prism of embankment situated beneath the shoulders and pavement structure and inside the lines projected downward and outward on a one to one slope from the outside edges of the roadway shoulders to their intersection with the base of the embankment.

**101.66 Safety Critical Work.** Elements of the work that, if performed improperly, could encroach upon and endanger traffic that is following all traffic regulations. Safety critical work may include work elements performed under one or more of the following situations:

- (1) Work that is constructed on, over, or near a traffic route and could become unstable over time if installed improperly.
- (2) Work that requires the use of lifting devices in the vicinity of traffic.

Elements of work considered safety critical for the project will be identified in a project special provision titled *Revision of Section 107 – Performance of Safety Critical Work*.

“Traffic”, as used above, is defined as the vehicles, railroad, pedestrians, aircraft, and watercraft moving along a route. The route may be permanent or temporary, such as a detour.

**101.67 Salvable Material.** Material that can be saved or salvaged. Unless otherwise specified in the Contract, all salvable material shall become the property of the Contractor.

**101.68 Shop Drawings.** A general term that includes drawings, diagrams, illustrations, samples, schedules, calculations, and other data which provide details of the construction of the work and details to be used by the Engineer for inspection. Shop drawings shall be prepared by the Contractor, subcontractors, manufacturers, suppliers, or distributors. Shop Drawings are submitted to the Engineer for formal review and return to the Contractor in accordance with subsection 105.02(c). Shop drawings include data which illustrates material, equipment, and items which are incorporated in and become part of the permanent work in accordance with the Contract.

**101.69 Shoring.** Shoring is temporary construction that is used to support the earth adjacent to excavation or embankment.

**101.70 Shoulder.** The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

**101.71 Sidewalk.** That portion of the roadway constructed for pedestrian use.

**101.72 Special Provisions.** Additions and revisions to the standard and supplemental specifications covering conditions specific to an individual project or group of projects. Special provisions fall within one of the two following categories and take precedence as specified in subsection 105.09.

- (a) *Project Special Provisions.* Additions and revisions to the Standard and Supplemental Specifications, specific to the project.
- (b) *Standard Special Provisions.* Additions and revisions to the Standard and Supplemental Specifications, specific to a selected group of projects or which are intended for temporary use.

**101.73 Specifications.** A general term applied to all directions, provisions and requirements pertaining to performance of the work.

- (a) *Standard Specifications:* The Department’s printed book (including errata) titled *Standard Specifications for Road and Bridge Construction*. The book is divided into three parts namely:
  - (1) General Provisions (Division 100)

- (2) Construction Details (Divisions 200 thru 600)
- (3) Material Details (Division 700)

(b) *Supplemental Specifications*: Additions and revisions to the Standard Specifications that are adopted subsequent to the issuance of the printed book.

The outline for “Work” items in the Construction Details contains the following:

- (1) Description
- (2) Materials
- (3) Construction Requirements
- (4) Method of Measurement
- (5) Basis of Payment

**101.74 Specified Completion Date.** The date on which the contract work is specified to be completed.

**101.75 Standard Special Provisions.** See definition for Special Provisions, subsection 101.72.

**101.76 State.** The State of Colorado acting through its authorized representative.

**101.77 State Waters.** State Waters means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.

Examples of State waters include, but are not limited to, perennial streams, intermittent or ephemeral gulches and arroyos, ponds, lakes, reservoirs, irrigation canals or ditches, wetlands, stormwater conveyances (when they discharge to a surface water), and groundwater.

Note that for the purposes of these specifications “surface waters” means all State waters, except groundwater.

**101.78 Stormwater Management Plan (SWMP).** The Stormwater Management Plan comprises those contract documents containing the requirements necessary to accomplish all the following:

- (1) Protect and identify sensitive environments (state waters, wetlands, habitat, and existing vegetation).
- (2) Minimize the amount of disturbed soil.
- (3) Control and minimize erosion and sedimentation during and after project construction.
- (4) Minimize runoff from offsite areas from flowing across the site.
- (5) Slow down the runoff.
- (6) Reduce pollutants in stormwater runoff.

**101.79 Street.** A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

**101.80 Structures.** Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, endwalls, buildings, storm drains, service pipes, underdrains, foundation drains, fences, guardrail, signs, end sections, traffic signals, light standards, and other features which may be encountered in the work and not otherwise classified.

**101.81 Subcontractor.** An individual, firm, corporation, or other legal entity to whom the Contractor sublets part of the Contract.

**101.82 Subgrade.** The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed. Subgrade that has been treated with lime, fly ash, cement kiln dust, or combinations thereof for stabilization will be considered subbase.

**101.83 Substructure.** All of the structure below the bearings of simple and continuous spans, skewbacks of arches, and tops of footings of rigid frames, together with the backwalls, wingwalls, and wing protection railings.

**101.84 Superintendent.** The Contractor’s authorized employee in responsible charge of the work.

**101.85 Superstructure.** The entire structure except the substructure, as defined in subsection 101.83.

**101.86 Supplemental Specifications.** See definition for Specifications, subsection 101.73.



**101.87 Surety.** The corporation, partnership, or individual, other than the Contractor, executing a bond furnished by the Contractor.

**101.88 Traffic Control Plan (TCP).** The parts of the contract documents for each project that contain the requirements for the maintenance of traffic during construction of the project.

**101.89 Traveled Way.** The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

**101.90 Value Engineering Change Proposal (VECP).** A change to contract requirements proposed by the Contractor which will accomplish the project's functional requirements at less cost or improve value or service at no increase or at a minor increase in cost.

**101.91 Wheel Path.** Wheel paths are the two sections of each through-traffic lane that bear the wheel loading. The center of each wheel path is located 3 feet from the center of the lane; each wheel path is 2 feet wide.

**101.92 Work.** The furnishing of all labor, materials, equipment, and incidentals necessary to successfully complete the project according to all duties and obligations imposed by the Contract.

**101.93 Working Day.** Any day, exclusive of Saturdays, Sundays and holidays, on which weather and other conditions not under the control of the Contractor will permit construction operations to proceed with the normal working force engaged in performing those items controlling the completion of the work.

**101.94 Working Drawings.** A general term that includes drawings, diagrams, illustrations, samples, schedules, calculations, and other data which illustrate the construction of the work, material, equipment, methods, and items which are necessary to construct the work in accordance with the plans and specifications. Working drawings shall be prepared by the Contractor, subcontractors, manufacturers, suppliers, or distributors. Working drawings are submitted to the Engineer for information only, and are not formally reviewed and returned to the Contractor.

**101.95 Workplace Violence.** Workplace violence is conduct in the workplace against employees, employers, or outsiders committed by a person who either has an employment related connection with CDOT, or is a contractor working on a CDOT project. This conduct includes:

- (1) Physical acts against persons or their property, or against CDOT or Contractor property that are perceived to be harmful or threatening.
- (2) Veiled or direct verbal threats, profanity, or vicious statements or gestures that are meant to harm or create a threatening or intimidating work environment.
- (3) Written threats, profanity, vicious cartoons or notes that are meant to create a threatening or intimidating environment
- (4) Any other acts that are perceived to be threatening or intended to injure or convey hostility.

There shall not be any liability on them either personally or as employees of the Department.

**107.21 No Waiver of Legal Rights.** Upon completion of the Contract, the Department will make final inspection and notify the Contractor of acceptance. Final acceptance shall not preclude the Department from correcting any measurement, estimate, or certificate made before or after completion of the Contract, nor from recovering from the Contractor or surety or both, overpayments sustained because the Contractor failed to fulfill the obligations under the Contract. A waiver on the part of the Department of any breach of any part of the Contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor without prejudice to the terms of the Contract, shall be liable to the Department, for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Department's rights under any warranty or guaranty.

**107.22 Third Party Beneficiary.** It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of any part of the Contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize any one not a party to this Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Contract. The duties, obligations and responsibilities of the parties to this Contract with respect to third parties shall remain as imposed by law.

**107.23 Archaeological and Paleontological Discoveries.** When the Contractor's operations, including materials pits and quarries, encounter plant or animal fossils, remains of prehistoric or historic structures, prehistoric or historic artifacts (bottle dumps, charcoal from subsurface hearths, old pottery, potsherds, stone tools, arrowheads, etc.), the Contractor's affected operations shall immediately cease. The Contractor shall immediately notify the Engineer, or other appropriate agency for contractor source pits or quarries, of the discovery of these materials. When ordered to proceed, the Contractor shall conduct affected operations as directed. Additional work, except that in contractor source materials pits or quarries under subsection 106.02(b), will be paid for by the Department as provided in subsection 104.02 when contract unit prices exist, or as extra work as provided in subsection 104.03 when no unit prices exist. Delays to the Contractor, not associated with work in contractor sources, because of the materials encountered may be cause for extension of contract time in accordance with subsection 108.08. If fossils, prehistoric or historic structures, or prehistoric or historic artifacts are encountered in a contractor source materials pit or quarry, all costs and time delays shall be the responsibility of the Contractor.

**107.24 Air Quality Control.** The Contractor shall comply with the "Colorado Air Quality Control Act," Title 25, Article 7, CRS and regulations promulgated thereunder.

**107.25 Water Quality Control.** The project work shall be performed using practices that minimize water pollution during construction. All the practices listed in (b) below shall be followed to minimize the pollution of any State waters, including wetlands.

(a) *Definitions.*

1. Areas of Disturbance (AD). Locations where any activity has altered the existing soil cover or topography, including vegetative and non-vegetative activities during construction.
2. Construction Site Boundary/Limits of Construction (LOC). The project area defined by the Stormwater Construction Permit.
3. Discharge of Pollutants. One or more pollutants leaving the LOC or entering State waters or other conveyances.
4. Limits of Disturbed Area (LDA). Proposed limits of ground disturbance as shown on the Plans.
5. Pollutant. Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal, or agricultural waste, as defined in the Colorado Code of Regulations (CCR) [5 CCR 1002-61, 2(76)]
6. Pollution. Man-made, man-induced, or natural alteration of the physical, chemical, biological, and radiological integrity of water. [25-8-103 (16), CRS]
7. State waters. Defined in subsection 101.77.
8. Owner. The party that has overall control of the activities and that has funded the implementation of the construction plans and specifications. This is the party with ownership of, a long term lease of, or easements on the property on which the construction activity is occurring (e.g. CDOT).
9. Operator. The party that has operational control over day-to-day activities at a project site which are necessary to ensure compliance with the permit. This party is authorized to direct individuals at a site to carry out activities required by the permit (e.g. the general contractor).

(b) *Construction Requirements.*

1. The Contractor shall comply with the “Colorado Water Quality Control Act” (Title 25, article 8, CRS), the “Protection of Fishing Streams” (Title 33, Article 5, CRS), the “Clean Water Act” (33 USC 1344), regulations promulgated, certifications or permits issued, and to the requirements listed below. In the event of conflicts between these requirements and water quality control laws, rules, or regulations of other Federal, or State agencies, the more restrictive laws, rules, or regulations shall apply.
2. If the Contractor determines construction of the project will result in a change to the permitted activities or LDA, the Contractor shall detail the changes in a written report to the Engineer. Within five days after receipt of the report, the Engineer, after coordination with Region Planning and Environmental Manager (RPEM), will approve or reject in writing the request for change, or detail a course of action including revision of existing permits or obtaining new permits.
3. If construction activities result in noncompliance of any permit requirement, the project will be suspended and the permitting agency notified, if required. The project will remain suspended until the Engineer receives written approval by the permitting agency.
4. The Contractor is legally required to obtain all permits associated with specific activities within, or off the Right of Way, such as borrow pits, concrete or asphalt plant sites, waste disposal sites, or other facilities. It is the Contractor’s responsibility to obtain these permits. The Contractor shall consult with the Engineer, and contact the Colorado Department of Public Health and Environment (CDPHE) or other appropriate federal, state, or local agency to determine the need for any permit.
5. The Contractor shall conduct the work in a manner that prevents pollution of any adjacent State waters. Erosion control work shall be performed in accordance with Section 208, this subsection, and all other applicable parts of the Contract.
6. Prior to the Environmental Pre-construction Conference, the SWMP Administrator, identified in subsection 208.03(c), shall identify and describe all potential pollutant sources, including materials and activities, and evaluate them for the potential to contribute pollutants to stormwater discharges associated with construction activities. The list of potential pollutants shall be continuously updated during construction. At a minimum, each of the following shall be evaluated for the potential for contributing pollutants to stormwater discharges and identified in the SWMP, if found to have such potential:
  - (1) All exposed and stored soils.
  - (2) Vehicle tracking of sediments.
  - (3) Management of contaminated soils.
  - (4) Vehicle and equipment maintenance and fueling.
  - (5) Outdoor storage activities (building materials, fertilizers, chemicals, etc.).
  - (6) Significant dust or particle generating processes.
  - (7) Routine maintenance involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
  - (8) On site waste management practices (waste piles, dumpsters, etc.).
  - (9) Dedicated asphalt and concrete batch plants.
  - (10) Concrete truck and equipment washing, including the concrete truck chute and associated fixtures and equipment.
  - (11) Concrete placement and finishing tool cleaning.
  - (12) Non-industrial waste sources that may be significant, such as worker trash and portable toilets.
  - (13) Loading and unloading operations.
  - (14) Other areas or procedures where spills could occur.

The SWMP Administrator shall record the location of potential pollutants on the site map. Descriptions of the potential pollutants shall be added to the SWMP.

At or prior to the Environmental Pre-construction Conference the Contractor shall submit a Spill Response Plan for any petroleum products, chemicals, solvents, or other hazardous materials in use, or in storage, at the work site. See subsection 208.06(c) for Spill Response Plan requirements. Work shall not be started until the plan has been submitted to and approved by the Engineer.

On site above ground bulk storage containers with a cumulative storage shell capacity greater than 1,320 U.S. gallons, or storage containers having a “reasonable expectation of an oil discharge” to State waters, are subject to the Spill

Prevention, Control and Countermeasure Plan (SPCC) Rule. Oil of any type and in any form is covered, including, but not limited to: petroleum; fuel oil; sludge; oil refuse; oil mixed with wastes other than dredged spoil. EPA Region 8 is responsible for administering and enforcing the SPCC plan requirements in Colorado. Prior to start of work, the Contractor shall submit a SPCC Form which has been approved by the EPA for the project.

7. The Contractor shall obtain a Construction Dewatering (CDW) permit from CDPHE anytime uncontaminated groundwater, including groundwater that is commingled with stormwater or surface water, is encountered during construction activities and the groundwater or commingled water needs to be discharged to State waters. If contaminated groundwater is encountered, a Remediation permit may be needed from CDPHE in accordance with Section 250.
8. Water from dewatering operations shall not be directly discharged into any State waters, unless allowed by a permit. Water from dewatering shall not be discharged into a ditch unless:
  - (1) Written permission is obtained from the owner of the ditch.
  - (2) It is covered in the approved CDW or Remediation Permit that allows the discharge.
  - (3) A copy of this approval is submitted to the Engineer. A copy of the Permit shall be submitted to the Engineer prior to dewatering operations commencing.

Construction Dewatering may be discharged to the ground on projects where CDPHE's Low Risk Guidance Document for Discharges of Uncontaminated Groundwater to Land are met. The conditions of this guidance are:

- (1) The source of the discharge is solely uncontaminated groundwater or uncontaminated groundwater combined with stormwater and does not contain pollutants in concentrations that exceed water quality standards for groundwater referenced above.
- (2) Discharges from vaults or similar structures shall not be contaminated. Potential sources of contamination include process materials used, stored, or conveyed in the structures, or introduced surface water runoff from outside environments that may contain oil, grease, and corrosives.
- (3) The groundwater discharge does not leave the project boundary limits where construction is occurring.
- (4) Land application is conducted at a rate and location that does not allow for any runoff into State waters or other drainage conveyance systems, including but not limited to streets, curb and gutter, inlets, borrow ditches, open channels, etc.
- (5) Land application is conducted at a rate that does not allow for any ponding of the groundwater on the surface, unless the ponding is a result of implementing control measures that are designed to reduce velocity flow. If the control measures used result in ponding, the land application shall be done in an area with a constructed containment, such as an excavation or berm area with no outfall. The constructed containment shall prevent the discharge of the ponding water offsite as runoff.
- (6) A visible sheen is not evident in the discharge.
- (7) Control measures are implemented to prevent any sediment deposited during land application from being transported by stormwater runoff to surface waters or other conveyances.
- (8) All control measures used shall be selected, installed, implemented, and maintained according to good engineering, hydrologic, and pollution control practices. The selected control measures shall provide control for all potential pollutant sources associated with the discharge of uncontaminated groundwater to land. The discharge shall be routed in such a way that it will not cause erosion to land surface. Energy dissipation devices designed to protect downstream areas from erosion by reducing the velocity of flow (such as hose attachments, sediment and erosion controls) shall be used when necessary to prevent erosion.

All dewatering operations shall be recorded in the SWMP as follows:

- (1) The source is identified in the SWMP and updated by the SWMP Administrator.
- (2) The SWMP describes and locates the practices implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater.
- (3) The SWMP describes and locates the practices to be used that will ensure that no groundwater from construction dewatering is discharged from the LOC as surface runoff or to surface waters or storm sewers.

- (4) Groundwater and groundwater combined with stormwater do not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42.

If surface waters are diverted around a construction area and no pollutants are introduced during the diversion, a CDW Permit is not required. If the diverted water enters the construction area and contacts pollutant sources (e.g. disturbed soil, concrete washout, etc.), the Contractor shall obtain a CDW permit for the discharge of this water to State waters or to the ground.

9. At least 15 days prior to commencing dredging or fill operations in a watercourse, the Contractor shall provide written notification to owners or operators of domestic or public water supply intakes or diversion facilities, if these facilities are within 20 miles downstream from the dredging or fill operations. Notification shall also be given to Owners or operators of other intakes or diversions that are located within five miles downstream from the site of the project. Identities of downstream owners and operators can be obtained from Colorado Division of Water Resources, Office of the State Engineer.
10. Temporary fill into wetlands or streams will not be allowed, except as specified in the Contract and permits. If such work is allowed, upon completion of the work all temporary fills shall be removed in their entirety and disposed of in an upland location outside of flood plains unless otherwise specified in the Contract.
11. Construction operations in waters of the United States as defined in 33 CFR Part 328.3, including wetlands, shall be restricted to areas and activities authorized by the U.S. Army Corps of Engineers as shown in the Contract. Forging waters will be allowed only as authorized by the U.S. Army Corps of Engineers 404 Permit.
12. Wetland areas outside of the permitted limits of disturbance shall not be used for storage, parking, waste disposal, access, borrow material, or any other construction support activity.
13. Pollutant byproducts of highway construction, such as concrete, asphalt, solids, sludges, pollutants removed in the course of treatment of wastewater, excavation or excess fill material, and material from sediment traps shall be handled, stockpiled, and disposed of in a manner that prevents entry into State waters, including wetlands. Removal of concrete waste and washout water from mixer trucks, concrete finishing tools, concrete saw, and all concrete material removed in the course of construction operations or cleaning shall be performed in a manner that prevents waste material from entering State waters and shall not leave the site as surface runoff. A minimum of ten days prior to the start of the construction activity, the Contractor shall submit in writing a Method Statement for Containing Pollutant Byproducts to the Engineer for approval.
14. The use of chemicals such as soil stabilizers, dust palliatives, herbicides, growth inhibitors, fertilizers, deicing salts, etc., shall be in accordance  
with the manufacturer's recommended application rates, frequency, and instructions.
15. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with the original manufacturer's label. Materials shall not be stored in a location where they may be carried into State waters at any time.
16. Spill prevention and containment measures conforming to subsection 208.06 shall be used at storage, and equipment fueling and servicing areas to prevent the pollution of any State waters, including wetlands. All spills shall be cleaned up immediately after discovery, or contained until appropriate cleanup methods can be employed. Manufacturer's recommended methods for spill cleanup shall be followed, along with proper disposal methods. When required by the Colorado Water Quality Control Act, Regulation 5 CCR 1002-61, spills shall be reported to the Engineer and CDPHE in writing.
17. The Contractor shall prevent construction activities from causing grass or brush fires.
18. The construction activities shall not impair Indian tribal rights, including, but not limited to, water rights, and treaty fishing and hunting rights.
19. Prior to start of work, the Contractor shall certify in writing to the Engineer that construction equipment has been cleaned prior to initial site arrival. Vehicles and equipment shall be free of soil and debris capable of transporting noxious weed seeds or invasive species onto the site. Additional equipment required for construction shall also be certified prior to being brought onto the project site.
20. Vehicles which have been certified by the Contractor as having been cleaned prior to arrival on site may be cleaned on site at an approved area where wash water can be properly contained. Vehicles leaving and reentering the project site shall be recertified.
21. At the end of each day the Contractor shall collect all trash and dispose of it in appropriate containers.
22. Construction waste that is considered a pollutant or contaminant shall be collected and disposed of in appropriate containers. This material may be stockpiled on the project when it is contained or protected by an appropriate control measure.

23. If the project area is covered by a CDPS-SCP, permittees are authorized to discharge stormwater associated with construction activity and specified non-stormwater associated with construction activity to State waters.

A. Allowable Stormwater Discharges:

- (1) Stormwater discharges associated with construction activity.
- (2) Stormwater discharges associated with producing earthen materials, such as soils, sand, and gravel dedicated to providing material to a single contiguous site, or within ¼ mile of a construction site (i.e. borrow or fill areas).
- (3) Stormwater discharges associated with dedicated asphalt, concrete batch plants and masonry mixing stations. (Coverage under the CDPS-SCP is not required if alternative coverage has been obtained.)
- (4) Discharges resulting from emergency firefighting activities.

B. Allowable Non-Stormwater Discharges if identified in the SWMP with appropriate control measures:

- (1) Discharges from uncontaminated springs that do not originate from an area of land disturbance.
- (2) Discharges to the ground of concrete washout water associated with the washing of concrete tools and concrete mixer chutes. Discharges of concrete washout water shall not leave the site as surface runoff or reach receiving waters.
- (3) Discharges of landscape irrigation return flow.

Discharges authorized by the CDPS-SCP shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any applicable water quality standard, including narrative standards for water quality.

All construction site wastes shall be properly managed to prevent potential pollution of State waters. The CDPS-SCP does not authorize on-site waste disposal.

- (c) *Stormwater Construction Permit.* A Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) will be obtained from CDPHE by CDOT. The Contractor and CDOT will be co-permittees. The Contractor shall coordinate with CDOT to become the Operator permittee of the respective permit upon award of the Contract. The Contractor shall provide a copy of permit certification as the Operator to the Engineer prior to or at the Pre-construction Conference. No work shall begin until the CDPS-SCP permit with Owner and Operator has been approved by CDPHE. A copy of the permit shall be placed in the project SWMP.

The Contractor is legally required to obtain all other permits associated with specific activities within or outside of the right of way, such as borrow pits, concrete or asphalt plant sites, waste disposal sites, or other facilities. Staging areas within a ¼ mile, but not within CDOT right of way shall be considered a common plan of development and permits for these facilities require permitting in the Contractor's name as Owner and Operator. These permits include local agency, federal, or other stormwater permits. The Contractor shall consult with the Engineer and contact the CDPHE or other appropriate federal, state, or local agency to determine the need for any permit.

When a Utility Company has obtained a CDPS-SCP within a CDOT project area, prior to the Contractor being on-site, the Contractor shall coordinate with the Engineer and the Utility Company to transfer or reassign the permit area within the project's Limits of Construction to the Contractor and CDOT prior to work commencing. The Contractor shall not commence construction until CDPHE issues a new CDPS-SCP identifying the Contractor as the Operator, and the permit is put in the SWMP.

To initiate acceptance of the stormwater construction work (including seeding and planting required for erosion control), the Contractor shall request in writing a Stormwater Completion Walkthrough. The Engineer will set up the walkthrough. It will include the Engineer or designated representative, Superintendent or designated representative, Stormwater Management Plan (SWMP) Administrator, Region Water Pollution Control Manager (RWPCM), Landscape Architect, and a Regional Maintenance representative. Unsatisfactory and incomplete stormwater and sediment/erosion control work will be identified in this walkthrough, and will be summarized by the Engineer in a punch list.

The completed action items associated with the corrective work will be shown as completed on the punch list. Upon completion of all items shown, the Contractor shall notify the Engineer. Upon written agreement that the punch list is completed from the Engineer, the Contractor shall submit the appropriate form to the CDPHE such that CDOT Maintenance becomes the Operator permittee of the CDPS-SCP.

Until the transfer of the permit has been approved by the CDPHE, the Contractor shall continue to adhere to all permit requirements. Requirements shall include erosion control inspections, control measure installation, control measure maintenance, control measure repair including seeded areas, and temporary control measure removal. All documentation shall be submitted to the Engineer and placed in the SWMP.

All costs associated with the Contractor applying for, holding, and transferring the CDPS-SCP permit between parties will not be measured and paid for separately, but shall be included in the work in accordance with subsection 107.02.

(d) *Measurement and Payment.*

1. All the work listed in (b) 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 measured and paid for separately, but shall be included in the work.
2. The Contractor shall be liable for any penalty (including monetary fines) applied to the Department caused by the Contractor's noncompliance with any water quality permit or certification. Monetary fines shall be deducted from any money due to the Contractor. If the monetary fine is in excess of all the money due to the Contractor, then the Contractor shall pay to the Department the amount of such excess.
3. The Contractor will not receive additional compensation, or time extensions, for any disruption of work or loss of time caused by any actions brought against the Contractor for failure to comply with good Engineering, hydrologic and pollution control practices.
4. If a spill occurs as a direct result of the Contractor's actions or negligence, the cleanup of such spill shall be performed by the Contractor at the Contractor's expense.
5. Areas exposed to erosion by fire resulting from the Contractor's operations shall be stabilized in accordance with Section 208 by the Contractor and at the Contractor's expense.

## **SECTION 207 TOPSOIL**

### **DESCRIPTION**

**207.01** This work consists of salvaging and stockpiling topsoil, and excavating suitable topsoil from stockpiles, contractor sources, available sources, or from the approved natural ground cover to place on designated areas. It shall include the placing of topsoil upon constructed cut and fill slopes after grading operations are completed.

### **MATERIALS**

**207.02** Topsoil shall consist of loose friable soil from the zone of major root development free of subsoil, refuse, stumps, woody roots, rocks, brush, noxious weed seed and reproductive plant parts from current state and county weed lists, heavy clay, hard clods, toxic substances, or other material which would be detrimental to its use on the project.

Wetland topsoil material shall consist of the moist, organic soil, including any existing wetland vegetation and seeds, to be excavated from areas as shown on the plans or as directed.

### **CONSTRUCTION REQUIREMENTS**

**207.03** Wetland topsoil material shall be excavated from the designated area to a maximum depth of 12 inches, or as otherwise designated, and placed within 24 hours in the specified area. The Contractor shall prepare the relocation site to elevations specified and approved by the Engineer prior to excavating the wetlands. If the Engineer determines that this is not possible, then the Contractor shall stockpile the material in an approved area, to remain undisturbed until the relocation site has been prepared. Storage time within the stockpile shall be as short as possible. Wetland topsoil material shall be placed over the prepared relocation areas to a depth of 12 inches, or as otherwise designated.

Topsoil within the limits of the roadway shall be salvaged prior to beginning hauling, excavating, or fill operations by excavating and stockpiling the material at designated locations in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage. Topsoil shall be placed directly upon completed cut and fill slopes whenever conditions and the progress of construction will permit.

Topsoil shall be placed at locations and to the thickness provided in the Contract and shall be keyed and tracked to the underlying material without creating a compacted surface by the use of harrows, bulldozers, rollers, or other equipment suitable for the purpose.

Salvaged topsoil exceeding the quantity required under the Contract shall be disposed of at locations acceptable to the Engineer.

### **METHOD OF MEASUREMENT**

**207.04** 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 203.11, and paid for as Topsoil.

Topsoil generated from the roadway and placed in windrows will be measured at its source in cubic yards, as described in subsection 203.11, 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.

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.

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 203.11, and paid for as Wetland Topsoil.

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.



**BASIS OF PAYMENT**

**207.05** 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.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Stockpile Topsoil	Cubic Yard
Topsoil	Cubic Yard
Stockpile Wetland Topsoil	Cubic Yard
Wetland Topsoil	Cubic Yard

## SECTION 208 EROSION CONTROL

### DESCRIPTION

**208.01** This work consists of constructing, installing, maintaining, and removing when required, control measures during the life of the Contract to prevent or minimize erosion, sedimentation, and pollution of any State waters as defined in subsection 107.25, including wetlands.

Stormwater runoff from all disturbed areas and soil storage areas for which permanent or interim stabilization is not implemented, must flow to at least one control measure to minimize sediment in the discharge. This shall be accomplished through filtering, settling, or straining. The control measure shall be selected, designed, installed, and adequately sized in accordance with good engineering, hydrologic, and pollution control practices. The control measures shall contain or filter flows in order to prevent the bypass of flows without treatment and shall be appropriate for stormwater runoff from disturbed areas and for the expected flow rate, duration, and flow conditions (i.e., sheet or concentrated flow).

The Contractor shall coordinate the construction of temporary control measures with the construction of permanent control measures to assure economical, effective, and continuous erosion and sediment control throughout the construction period.

When a provision of Section 208 or an order by the Engineer requires that an action be immediate or taken immediately, it shall be understood that the Contractor shall at once begin affecting completion of the action and pursue it to completion in a manner acceptable to the Engineer, and in accordance with the Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) requirements.

### MATERIALS

**208.02** Erosion control materials are subject to acceptance in accordance with subsection 106.01. Erosion control materials shall be subject to the following approval process:

Material	Approval Process	Notes
Erosion Bales (Weed Free)	COC	The Contractor shall provide a transit certificate number or a copy of the transit certificate as supplied from the producer.
Silt Fence	COC	
Silt Berm	APL	
Erosion Log (Type 1, Type 2, and Type 3)	COC	
Silt Dikes	COC	
Pre-fabricated Concrete Washout Structures (above ground)	APL	
Pre-fabricated Vehicle Tracking Pad	APL	
Aggregate Bag	COC	
Storm Drain Inlet Protection (Type I, II, and III)	APL	
COC = Certificate of Compliance; APL= Approved Product List		

The material for control measures shall conform to the following:

- (a) *Erosion Bales*: Material for erosion bales shall consist of Certified Weed Free hay or straw. The hay or straw shall be certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free erosion bale shall be identified by blue and orange twine binding the bales.

The Contractor shall not place certified weed free erosion bales or remove their identifying twine until the Engineer has inspected them.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Weed Free Forage Program, 305 Interlocken Pkwy, Broomfield, CO

80021, Contact: Weed Free Forage Coordinator at (303) 869-9038. Also available at [www.colorado.gov/ag/csd](http://www.colorado.gov/ag/csd).

Bales shall be approximately 5 cubic feet of material and weigh at least 35 pounds. Stakes shall be wood and shall be 2 inch by 2 inch nominal.

- (b) *Silt Fence*. Silt fence posts shall be wood with a minimum length of 46 inches. Wood posts shall be 1.5 inch width by 1.5 inch thickness actual dimensions with 1/8 inch tolerance. Geotextile shall be attached to wood posts with three or more staples per post.

Silt fence geotextile shall conform to the following requirements:

#### Physical Requirements for Silt Fence Geotextiles

Property	Wire Fence Supported Requirements	Self-Supported Requirements Geotextile Elongation <50%	Test Method
Grab Strength, lbs	90 minimum	124 minimum	ASTM D4632
Permittivity sec-1	0.05	0.05	ASTM D4491
Ultraviolet Stability	Minimum 70% Strength Retained	Minimum 70% Strength Retained	ASTM D4355

*Silt Fence (Reinforced)*. Silt fence posts shall be metal "studded tee" T-post with a minimum length of 66 inches. Metal posts shall be "studded tee" with .095 inch minimum wall thickness. Wire fabric reinforcement for the silt fence geotextile shall be a minimum of 14 gauge with a maximum mesh spacing of 6 inches. Geotextile shall be attached to welded wire fabric with ties or nylon cable ties at 12 inches on center at top, middle, and bottom wire. Welded wire fabric shall be attached to the post with a minimum three 12 gauge wire ties per post. Vinyl or rubber safety caps shall be installed on all T-post.

- (c) *Temporary Berms*. Temporary berms shall be constructed out of embankment (subsoil) and not out of salvaged topsoil.
- (d) *Temporary Slope Drains*. Temporary slope drains shall consist of fiber mats, plastic sheets, stone, concrete or asphalt gutters, half round pipe, metal or plastic pipe, wood flume, flexible rubber, or other materials suitable to carry accumulated water down the slopes. Outlet protection riprap shall conform to Section 506. Erosion control geotextile shall be a minimum Class 2, conforming to subsection 712.08.
- (e) *Silt Berm*. Silt berm shall consist of permeable multi-use material consisting of ultraviolet (UV) stabilized high-density polyethylene or other approved material effective in reducing water velocity. Designed and tested system shall be installed on a Turf Reinforcement Mat or Soil Retention Blanket in accordance with Section 216. The segment shall be secured to the ground with either metal or wood stakes. Minimum requirements for securing stakes shall be in accordance with the plans. Dimensions of individual segments shall meet the following criteria:

Width	6 - 11 inches
Height	6 - 10 inches
Weight	> 0.25 lbs./sq. ft.
Percent Open Area	20% – 50%

- (f) *Rock Check Dam*. Rock Check dams shall be constructed of stone. Stone shall meet the requirements of Section 506.
- (g) *Sediment Trap*. In constructing an excavated sediment trap, excavated soil may be used to construct the dam embankment, provided the soil meets the requirements of subsection 203.03. Outlet protection riprap shall be the size specified in the Contract and shall conform to Section 506. Erosion control geotextile shall be a minimum Class 1, conforming to subsection 712.08.
- (h) *Erosion Logs*. Erosion logs shall be one of the following types unless otherwise shown on the plans:
- (1) Erosion Log (Type 1) shall consist of cylinder casings filled with curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, photo-degradable tube netting. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.

- (2) Erosion Log (Type 2) shall consist of cylinder casings filled with Erosion Log (Type 2) Compost in accordance with subsection 212.02. The compost-wood chip blend may be pneumatically shot into a geotextile cylindrical casing or be pre-manufactured. The geotextile casing shall consist of HDPE or polypropylene mesh (knitted, not extruded) with openings of 1/8 to 3/8 inch and contain the compost-wood chip material while not limiting water infiltration.
- (3) Erosion Log (Type 3) shall consist of cylinder casings filled with curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, 100 percent natural fiber cylinder netting (compostable) and shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log shown on the plans. Netting shall be a woven cotton or cellulose base mesh that has an approval to compost certification with a maximum mesh size of 0.075 inches and index values as shown in Table 208-2. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.

Natural compostable fiber netting shall not contain any synthetic material woven into the netting such as polypropylene, nylon, polyethylene, or polyester dyes. Oxo-degradable or oxo-biodegradable petrochemical-based fiber shall not be part of the netting material. Burlap netting material shall not be used for Erosion Log (Type 3).

Erosion Log (Type 1, Type 2, and Type 3) shall have minimum dimensions as shown in Table 208-1, based on the specified diameter of the log.

**Table 208-1  
Dimensions of Erosion Logs**

Diameter Type 1 & 3 (Inches)	Diameter Type 2 (Inches)	Length (feet)		Weight (minimum) (pounds/foot)	Stake Dimensions (Inches)
		Min.	Max.		
9	8	10	180	1.6	3/4 thickness by 3/4 width by 18 long
12	12	10	180	2.5	1.5 thickness by 1.25 width by 24 long
20	18	10	100	4.0	1.5 thickness by 1.25 width by 30 long

Wood stake acceptable tolerance +/- 1/8 inch.

**Table 208-2  
Index Values for Natural Fiber Netting**

Property	Requirement	Test Method
Fabric Tensile Strength	>70 lbs.	ASTM D3822
Biodegradable	100%	ASTM D5988
Mesh Pattern	Rib	

Stakes to secure erosion logs shall consist of pinewood or hardwood.

- (i) *Silt Dikes*. Silt dikes shall be pre-manufactured flexible sediment barrier that will fully rebound when driven over by heavy equipment. Material shall consist of outer geotextile fabric covering closed cell urethane or polyethylene foam core. The geotextile fabric aprons shall extend beyond the foam core a minimum of 8 inches on both sides.

**Table 208-3  
Geotextile Requirements**

Property	Requirement	Test Method
Water Flow Rate	100 - 150 gallons per minute/square foot	ASTM D4491
Grab Breaking Load	200 lbs. minimum in each direction	ASTM D4632
Ultraviolet Degradation	70% of original unexposed grab breaking load after 500 hours	ASTM D4595

Each silt dike segment shall have the following dimensions:

Dimension	Length
Vertical height after installation	>5 inches
Geotextile sleeve section to interlock segments	>8 inches

Silt dike segments shall be anchored down using the minimum requirements shown in Table 208-4.

**Table 208-4  
Silt Dike Segment Requirements**

Surface	Nail	Washers
Soil Surface	Installed in 4 inch deep trench with 6 inch nails no more than 4 feet O.C. (on center)	1 inch washers
Hard Surface	1 inch concrete nails no more than 4 feet O.C.	1 inch washers and solvent-free adhesive

- (j) *Concrete Washout Structure.* The Contractor shall construct a washout structure that will contain washout from concrete placement, construction equipment cleaning operations, and residue from cutting, coring, grinding, grooving, and hydro-concrete demolition. Embankment required for the concrete washout structure may be excavated material, provided that this material meets the requirements of Section 203 for embankment. If the bottom of the excavated structure is within 5 feet of anticipated high ground water elevation or the soil does not have adequate buffering capacity to meet water quality standards, an impermeable synthetic liner shall be installed with the minimum properties shown in Table 208-5.

**Table 208-5  
Impermeable Synthetic Liner Requirements**

Tested Property	Test Method	Units	Value
Thickness	ASTM D5199	mil	>30 +/- 1.5
Tear Strength	ASTM D1004	lbs	>8
Low Temperature Impact	ASTM D1790	° F	Pass at -20

- (k) *Pre-Fabricated Concrete Washout Structure.* Pre-Fabricated Concrete Washout Structures shall be one of the following types unless otherwise shown on the plans:
- (1) Pre-Fabricated Concrete Washout Structure (Type 1). Type 1 portable bins shall be used only when specified in the Contract. It shall consist of a watertight multi-use container designed to contain liquid concrete washout wastewater, solid residual concrete waste from washout operations, and residue from saw cutting, coring, grinding, grooving, and hydro-concrete demolition. Minimum capacity including freeboard shall be 440 gallons.
  - (2) Pre-Fabricated Concrete Washout Structure (Type 2). Type 2 portable bins shall be used only when specified in the Contract. It shall consist of a watertight one-time use container designed to contain liquid concrete washout wastewater, solid residual concrete waste from washout operations, and residue from saw cutting, coring, grinding, grooving, and hydro-concrete demolition. The structure shall have a system to secure to the ground. Minimum capacity including freeboard shall be 50 gallons.
- (l) *Vehicle Tracking Pad (VTP).* Aggregate for the vehicle tracking pad shall be crushed natural aggregate with at least two fractured faces that meets the following gradation requirements:

Sieve size	Percent by weight
	Passing Square Mesh Sieves
75 mm (3 inch)	100
50 mm (2 inch)	0-25
19.0 mm (¾ inch)	0-15

Recycled crushed concrete or asphalt shall not be used for vehicle tracking pads.

Erosion control geotextile shall be a minimum Class 2, conforming to subsection 712.08.

Pre-fabricated or manufactured vehicle tracking pads shall only be used if specified in the Contract. Multi-use pads shall consist of industrial grade materials and shall be designed to minimize sediment leaving the project.

Minimum dimensions of the modular systems shall be:

Width	12 feet
Length of pad	35 feet

To accommodate construction traffic turning radii between the tracking pad and a stabilized surface, additional flared sections of approved pads or aggregate in accordance with this specification shall be used at no additional cost to CDOT.

Weight (min.) (lbs./sq. ft.)	8
Crush strength (min.) (psi)	400

If pads weigh less than 8 pounds per square foot, an anchoring system approved by the manufacturer shall be used for pads placed on soil and hard surfaces.

A thin layer of stone, geotextile, or other stable surface may be required to stop rutting under the pad or area where the vehicles mount or dismount the manufactured trackout control device.

(m) *Aggregate Bag.* Aggregate bags shall consist of crushed stone or recycled rubber filled fabric with the following properties:

Diameter (inches)	Weight (minimum) (pounds per foot)
6-8	6
10	10
12	15

Rubber used in bags shall be clean, 95 percent free of metal and particulates.

Crushed stone contained in the aggregate bags shall conform to Table 703-1 for Coarse Aggregate No. 6.

The aggregate bag shall consist of a woven geotextile fabric with the following properties:

Property	Requirement	Test Method
Grab Tensile Strength	90 lbs. min.	ASTM D4632
Trapezoid Tear Strength	25 lbs. min.	ASTM D4533
Mullen Burst	300 psi	ASTM D3786
Ultraviolet Resistance	70%	ASTM D4355

(n) *Storm Drain Inlet Protection.* Storm drain inlet protection shall consist of aggregate filled fabric with the following dimensions:

Storm Drain Inlet Protection Properties	Protection Types		
	<sup>1</sup> Type I	<sup>2</sup> Type II	<sup>3</sup> Type III
Diameter	4 in.	4 in.	N/A
Minimum Section Length	7 ft.	5 ft.	5 ft.
Apron Insert	---	30 in. or sized to grate	30 in. or sized to grate
<sup>1</sup> Type I protection shall be used with Inlet Type R. <sup>2</sup> Type II protection shall be used with Combination Inlet. Option A or B <sup>3</sup> Type III protection shall be used with Vane Gate Inlet only. Option A or B Note: Options A and B are shown on Standard Plan M-208-1.			

The Storm Drain Inlet Protection (Type I, II, and III) shall consist of a woven geotextile fabric with the following properties:

Property	Test Method	Unit	Requirement
Grab tensile strength	ASTM D4632	lbs.	minimum 150x200
Mullen Burst Strength	ASTM D3786	lbs.	400
Trapezoid Tear Strength	ASTM D4533	lbs.	minimum 60x60
Percent Open Area	COE-22125-86	%	≥20
Water Flow Rate	ASTM D4491	gal./min./sq. ft.	≥100
Ultraviolet Resistance	ASTM D4355	%	≥70

Curb roll for Storm Drain Inlet Protection (Type I and II) shall have a weight >4 pounds per linear foot of device. The device shall be capable of conforming to the shape of the curb. Aggregate contained in the storm drain inlet device shall consist of gravel or crushed stone conforming Table 703-1 for Coarse Aggregate No. 6.

## CONSTRUCTION REQUIREMENTS

**208.03 Project Review, Schedule, and Erosion Control Management.** Prior to construction, an on-site Environmental Pre-construction conference shall be held. The conference shall be attended by:

- (1) The Engineer.
- (2) The Superintendent.
- (3) The Contractor's Stormwater Management Plan (SWMP) Administrator. The SWMP Administrator is equivalent to the CDPS-SCP Qualified Stormwater Manager.
- (4) Supervisors or Foremen of subcontractors working on the project.
- (5) The Region Water Pollution Control Manager (RWPCM).
- (6) CDOT personnel (e.g., CDOT Landscape Architect) who prepared or reviewed the Stormwater Management Plan (SWMP).

At this Conference, the attendees shall discuss the SWMP, CDPS-SCP, sensitive habitats on-site, wetlands, other vegetation to be protected, and the enforcement mechanisms for not meeting the requirements of this specification.

Prior to beginning construction, the Contractor shall evaluate the project site for storm water draining into or through the site. When such drainage is identified, control measures shall be used if possible to divert stormwater from running on-site and becoming contaminated with sediment or other pollutants. The diversion may be accomplished with a temporary pipe or other conveyance to prevent water contamination or contact with pollutants. Run-on water that cannot be diverted shall be treated as construction runoff and adequate control measures shall be employed.

The SWMP Administrator shall evaluate all non-stormwater coming onto the site, such as springs, seeps, and landscape irrigation return flow. If such flow is identified, control measures shall be used to protect off-site water from becoming contaminated with sediment or other pollutants.

The SWMP Administrator shall review existing inlets and culverts to determine if inlet protection is needed due to water flow patterns. Prior to beginning construction, inlets and culverts needing protection shall be protected and the location of the implemented control measure added to the SWMP site map.

Prior to construction, the Contractor shall implement appropriate control measures for protection of wetlands, sensitive habitat, and existing vegetation from ground disturbance and other pollutant sources, in accordance with the approved project schedule as described in subsection 208.03(b).

When additional control measures are required and approved by the Engineer, the Contractor shall implement the additional control measures and the SWMP Administrator shall record and describe them on the SWMP site map. The approved control measures will be measured and paid for in accordance with subsections 208.11 and 208.12.

(a) *Project Review.* The Contractor may submit modifications to the Contract's control measures in a written proposal to the Engineer. The written proposal shall include the following information:

- (1) Reasons for changing the control measures.
- (2) Diagrams showing details and locations of all proposed changes.
- (3) List of appropriate pay items indicating new and revised quantities.
- (4) Schedules for accomplishing all erosion and sediment control work.
- (5) Effects on permits or certifications caused by the proposed changes.

The Engineer will approve or reject the written proposal in writing within seven days after receipt of the submittal. The Engineer may require additional control measures prior to approving the proposed modifications. Additional modifications and additional control measures will be paid for at the Contract Unit Price for the specific items involved. If no items exist, they will be paid for as extra work in accordance with subsection 109.04.

(b) *Erosion and Sediment Control Activities.* The erosion and sediment control activities shall be included in the weekly meeting update. The project schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features and stabilization. The project schedule shall include erosion and sediment control work for haul roads, borrow pits, storage and asphalt or concrete batch sites, and all areas within the project limits. If during construction the Contractor proposes changes which would affect the Contract's control measures, the Contractor shall propose revised control measures to the Engineer for approval in writing. If necessary, the SWMP Administrator shall update proposed sequencing of major activities in the SWMP. Revisions shall not be implemented until the proposed measures have been approved in writing by the Engineer.

(c) *Erosion Control Management (ECM).* Erosion Control Management for this project shall consist of SWMP Administration and Erosion Control Inspection. 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 with not more than 40 acres of disturbed area. The ECI and the SWMP Administrator are equivalent to the CDPS-SCP Qualified Stormwater Manager.

1. SWMP Administration. The SWMP shall be maintained by a SWMP Administrator. 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:

- (1) Complete the SWMP as described in subsection 208.03(d).
- (2) Participate in the Environmental Pre-construction Conference.
- (3) Attend weekly erosion and sediment control meetings.
- (4) Attend all Headquarters and Region water quality control inspections. The Contractor and the Contractor's SWMP Administrator will be notified a minimum of five days in advance of each inspection by Headquarters or Region water quality staff.
- (5) Coordinate with the Superintendent to implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.
- (6) Coordinate with the Superintendent to ensure that all labor, material, and equipment needed to install, maintain, and remove control measures are available as needed.
- (7) During construction, the SWMP site map shall be updated to reflect current field conditions and include, at a minimum, the following:
  - (i) Limits of Construction (LOC).
  - (ii) Areas of disturbance (AD), including areas of borrow and fill.
  - (iii) Limits of Disturbance (LDA).
  - (iv) Areas used for storage of construction materials, equipment, soils, or wastes.
  - (v) Location of dedicated asphalt, concrete batch plants, and masonry mixing machines.
  - (vi) Location of construction offices and staging areas.



- (vii) Location of work access routes during construction.
  - (viii) Location of waste accumulation areas, including areas for liquid, concrete, masonry, and asphalt.
  - (ix) Location of temporary, interim, and permanent stabilization.
  - (x) Location of outfalls.
  - (xi) Flow arrows that depict stormwater flow directions on-site and runoff direction.
  - (xii) Location of structural and non-structural control measures.
  - (xiii) Location of springs, streams, wetlands, and other State waters, including areas that require pre-existing vegetation be maintained within 50 horizontal feet of a receiving water, unless infeasible.
  - (xiv) Location of stream crossings located within the construction site boundary.
- (8) The SWMP shall reflect the field conditions and shall be amended to reflect control measures, including the following:
- (i) A change in design, construction, operation, or maintenance of the site which would require the implementation of new or revised control measures; or
  - (ii) Changes when the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity.
  - (iii) Changes when control measures are no longer necessary and are removed.
- (9) Complete vegetative survey transects when required in accordance with CDOT Erosion Control and Stormwater Quality Guide.
- (10) Start a new site map before the current one becomes illegible. All site maps shall remain as part of the SWMP.
- (11) Document all inspection and maintenance activities. The SWMP and documentation shall be kept on the project site.
- (12) When adding or revising control measures in the SWMP, add a narrative explaining what, when, where, why, and how the control measure is being used, and add a detail to the SWMP.
- (i) How to install and inspect the control measure.
  - (ii) Where to install the control measure.
  - (iii) When to maintain the control measure.
- (13) If using existing topography, vegetation, etc. as a control measure, label it as such on the SWMP site map; add a narrative as to when, where, why, and how the control measure is being used.
- (14) Indicate control measures in use or not in use by recording them on Standard Plans M-208-1, M-216-1, and M-615-1 in the SWMP.
- (15) Record on the SWMP, the approved Method Statement for Containing Pollutant Byproducts.
- (16) Update the potential pollutants list in the SWMP and Spill Response Plan throughout construction.
- (17) Vegetative buffers shall not be used as a sole control measure. They shall only be used as the final stage of a treatment train.

## 2. Erosion Control Inspector.

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.

### (1) ECI duties shall be as follows:

- (i) Coordinate with the SWMP Administrator on reporting the results of inspections and how to install and inspect the control measure.

- (ii) Review the construction site for compliance with the Stormwater Construction Permit.
- (iii) Inspect with the Superintendent and the Engineer (or their designated representatives) the stormwater management system at least every seven calendar days. Post-storm event inspections shall be conducted within 24 hours after the end of any precipitation or snow melt event that may cause surface erosion. If no construction activities will occur following a storm event, post-storm event inspections shall be conducted prior to commencing construction activities, but no later than 72 hours following the storm event. The occurrence of delay in inspections shall be documented in the inspection report. Form 1176 (Stormwater Field Inspection Report – Active Construction) shall be used for all seven-day inspections and inspections following storm events. The Contractor shall notify the ECI when a storm event occurs.

Inspections are not required at sites when construction activities are temporarily halted, when snow cover exists over the entire site for an extended period and melting conditions do not pose a risk of surface erosion. This exception shall be applicable only during the period where melting conditions do not exist, and applies to the routine seven-day, Headquarters and Region inspections, as well as the post-storm event inspections. The following information shall be documented on Form 1176 for use of this exclusion: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

(2) The order of precedence for required inspections shall be as follows:

- (i) Headquarters or Region water quality routine audits
- (ii) Post-storm event inspections
- (iii) Seven-day inspections

When one of the listed inspections is performed, the inspections listed below it need not be performed on that day if the required CDOT and Contractor personnel participated in the inspection.

A seven-day inspection is not required on the same day a Headquarters or Region water quality routine audit is conducted, as long as all of the inspection scope requirements for a seven-day and post-storm event inspection are met. A sheet shall be placed in the inspections area of the SWMP to refer to the date the inspection was performed.

(3) Seven-day inspections and post-storm inspections shall include inspection of the following areas, if applicable, for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system, or discharging to State waters:

- (i) Construction site perimeter
- (ii) Disturbed areas
- (iii) Designated haul routes
- (iv) Material and waste storage areas exposed to precipitation
- (v) Locations where stormwater has the potential to discharge offsite
- (vi) Locations where vehicles exit the site

(4) Inspections shall include the following:

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

Follow all other agency Stormwater requirements and inspections unless a waiver or other agreement has been

made.

- (5) The Contractor shall report the following circumstances orally to CDOT, CDPHE, the Contractor's Superintendent, and the SWMP Administrator within 24 hours from the time the permittee becomes aware of the circumstances, and shall mail to the Division a written report containing the information requested within five working days after becoming aware of the following circumstances:
    - (i) Noncompliance which may endanger health or the environment, regardless of the cause of the incident.
    - (ii) Unanticipated bypass which exceeds any effluent limitations in accordance with the CDPS-SCP.
    - (iii) Upset conditions which causes an exceedance of any effluent limitation in accordance with the CDPS-SCP.
    - (iv) Daily maximum violations for any of the pollutants limited by the permit. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.
  - (6) Document spills, leaks, or overflows that result in the discharge of pollutants on the Form 1176. The ECI shall record the time and date, weather conditions, reasons for spill, and how it was remediated.
- (d) *Documentation Available on the Project.* The following Contract documents and references will be made available for reference at the CDOT field office during construction:
1. SWMP. The Engineer will provide an approved SWMP design at the Pre-construction Conference, which is and shall remain the property of CDOT. Prior to construction, CDOT will provide the documentation for items (1) through (4), and (18) as listed below, when available. The Contractor shall provide the contents required for items (5) through (17). The SWMP shall be stored in the CDOT field office or at another on-site location approved by the Division. The SWMP Administrator shall modify and update the SWMP as needed to reflect actual site conditions prior to the change or as soon as practicable, but in no case more than 72 hours after the change. The following Contract documents and reports shall be kept, maintained, and updated in the SWMP under the appropriate items by the SWMP Administrator:
    - (1) SWMP Plan Sheets – Notes, tabulation, site description. The SWMP site description shall include, at a minimum, the following:
      - (i) The nature of the construction activity at the site.
      - (ii) The proposed schedule for the sequence for major construction activities and the planned implementation of control measures for each phase. (e.g. clearing, grading, utilities, vertical, etc.)
      - (iii) Estimates of the total acreage of the site, and the acreage expected to be disturbed by clearing, excavation, grading, or any other construction activities.
      - (iv) A summary of any existing data used in the development of the construction site plans or SWMP that describe the soil or existing potential for soil erosion.
      - (v) A description of the percent of existing vegetative ground cover relative to the entire site and the method for determining the percentage, in accordance with CDOT Erosion Control and Stormwater Quality Guide.
      - (vi) A description of any allowable non-stormwater discharges at the site, including those being discharged under a division low risk discharge guidance policy.
      - (vii) A description of areas receiving discharge from the site. Including a description of the immediate source receiving the discharge. If the stormwater discharge is to a municipal separate storm sewer system, the name of the entity owning the system, the location of the storm sewer discharge, and the ultimate receiving water(s).
      - (viii) A description of all stream crossings located within the construction site boundary.
    - (2) SWMP Site Maps and Project Plan Title Sheet.
    - (3) Specifications – Standard and project special provisions related to stormwater and erosion control.

- (4) Standard Plans M-208-1, M-216-1 and M-615-1.
- (5) Control Measure Details not in Standard Plan M-208-1 – Non-standard details.
- (6) Weekly meeting sign-in sheet and weekly meeting notes.
- (7) Calendar of Inspections – Calendar of inspections marking when all inspections take place.
- (8) Contractor Stormwater Field Inspection Reports (Forms 1176, 1177, 1388).
- (9) All Water Quality Audit Reports and Form 105(s) relating to Water Quality.
- (10) Description of Inspection and Maintenance Methods – Description of inspection and maintenance methods implemented at the site to maintain all control measures identified in the SWMP and items not addressed in the design.
- (11) Spill Response Plan – Reports of reportable spills submitted to CDPHE.
- (12) List and Evaluation of Potential Pollutants – List of potential pollutants as described in subsection 107.25 and approved Method Statement for Containing Pollutant Byproducts.
- (13) Other Correspondence including agreements with other MS4s, approved deferral request, CDPHE audit documentation, Water Quality Permit Transfer to Maintenance Punch List, and other miscellaneous documentation such as documented use agreements for areas outside of the permitted area.
- (14) TECS Certifications of the SWMP Administrator and all ECIs, kept current through the life of the project.
- (15) Environmental Pre-construction Conference – Conference agenda with a certification of understanding of the terms and conditions of the CDPS-SCP and SWMP. The certification shall be signed by all attendees. A certification shall also be signed by all attendees of meetings held for new subcontractors beginning work on the project that could adversely affect water quality after the Environmental Pre-construction Conference has been held.
- (16) Project Environmental Permits – All project environmental permits and associated applications and certifications, including: CDPS-SCP, Senate Bill 40, USACE 404, temporary stream crossings, dewatering, biological opinions, and all other permits applicable to the project, including any separate CDPS-SCP obtained by the Contractor for staging area on private property, asphalt or concrete batch plant, etc.
- (17) Photographs Documenting Existing Vegetation – Project photographs shall include the following information with the record: project number, project code, name of the person who took the picture, date and time the picture was taken, and location and approximate station number or mile marker. The Contractor shall submit photographs documenting existing vegetation, prior to construction commencing, on paper with a maximum of four colored images per side of 8 ½ inch by 11 inch sheet or a digital copy on CD-ROM/Flash Drive (JPG format) as directed by the Engineer.
- (18) Permanent Water Quality Plan Sheets – Plan sheets and specifications for permanent water quality structures and riprap.

The Engineer will incorporate the documents and reports available at the time of award. The Contractor shall provide and insert all other documents and reports as they become available during construction. The SWMP Administrator shall finalize the SWMP for CDOT Maintenance use upon completion of the project. SWMP completeness shall be approved by the Engineer. Corrections to the SWMP shall be made at the Contractor's expense.

2. Reference Materials. The following Reference materials shall be used:

- (1) CDOT Erosion Control and Stormwater Quality Guide.
- (2) CDOT Erosion Control and Stormwater Quality Field Guide.

- (e) *Weekly Meetings*: The Engineer, the Superintendent, and the SWMP Administrator shall conduct a weekly meeting with supervisors involved in construction activities that could adversely affect water quality. The meeting shall follow an agenda prepared by the Engineer, or a designated representative, and have a sign in sheet on which the names of all attendees shall be recorded. The SWMP Administrator shall take notes of water quality comments and action items at each weekly meeting, and place the agenda and sign in sheet in the SWMP. At this meeting the following shall be discussed and recorded in tab 6 of the

SWMP:

- (1) Recalcitrant, chronic, and severe inspection findings.
- (2) Unresolved issues from previous inspections.
- (3) Requirements of the SWMP.
- (4) Problems that may have arisen in implementing the site specific SWMP or maintaining control measures.
- (5) Control measures that are to be installed, removed, modified, or maintained, and associated SWMP modifications.
- (6) Planned activities that will affect stormwater in order to proactively phase control measures.

All subcontractors not in attendance at the Environment Pre-construction Conference shall be briefed on the project by the Engineer, Superintendent, and the SWMP Administrator prior to start of work. The SWMP Administrator shall record the names of these subcontractors as an addendum to the list of attendees, and add it to the SWMP.

**208.04 Control Measures for Stormwater.** The SWMP Administrator shall modify the SWMP to clearly describe and locate all control measures implemented at the site to control potential sediment discharges.

Vehicle tracking pads shall be used at all vehicle and equipment exit points from the site to prevent sediment exiting the limits of construction (LOC) of the project site. Access shall be provided only at locations approved by the Engineer. The SWMP Administrator shall record vehicle tracking pad locations on the SWMP site map.

New inlets and culverts shall be protected during their construction. Appropriate protection of each culvert and inlet shall be installed immediately. When riprap is called for at the outlet of a culvert, it shall be installed within 24 hours of completion of each pipe. The Contractor shall remove sediment, millings, debris, and other pollutants from within the newly constructed drainage system in accordance with the CDPS-SCP, prior to use, at the Contractor's expense. All removed sediment shall be disposed of outside the project limits in accordance with all applicable regulations.

Concrete products wasted on the ground during construction including, but not limited to, excess concrete removed from forms, spills, slop, and all other unused concrete are potential pollutants that shall be removed from the site or contained at a pre-approved containment area that has been identified in the SWMP. The concrete shall be picked up and recycled in accordance with 6 CCR 1007-2 (CDPHE Regulations Pertaining to Solid Waste Sites and Facilities) at regular intervals, as needed, or as directed by the Engineer. The uses of recycled concrete from permitted recycling facilities shall be in accordance with Section 203.

- (a) *Unforeseen Conditions.* The Contractor shall design and implement erosion and sediment control measures for correcting conditions unforeseen during the design of the project, or for emergency situations, that develop during construction. The Department's Erosion Control and Stormwater Quality Guide shall be used as a reference document for the purpose of designing erosion and sediment control measures. Measures and methods proposed by the Contractor shall be reviewed and approved in writing by the Engineer prior to installation.
- (b) *Other Agencies.* If CDPHE, US Army Corps of Engineers (USACE), the Environmental Protection Agency (EPA), or a Local Agency reviews the project site and requires additional measures to prevent and control erosion, sediment, or pollutants, the Contractor shall cease and desist activities resulting in pollutant discharge and immediately implement these measures. If the work may negatively affect another MS4, the Contractor shall cease and desist activities resulting in the discharge and shall implement appropriate measures to protect the neighboring MS4, including installing additional measures. Implementation of these additional measures will be paid for at contract unit prices.
- (c) *Work Outside the Right of Way.* Disturbed areas, including staging areas, which are outside CDOT ROW and outside easements acquired by CDOT for construction, are the responsibility of the Contractor. These areas shall be subject to a separate CDPS-SCP and all other necessary permits, as they are considered a common plan of development if within a ¼ mile of the construction site. The Contractor shall acquire these permits and submit copies to the Engineer prior to any disturbance. These permits, shall be acquired and all erosion and sediment control work performed at the Contractor's expense. These areas are subject to inspections by CDOT or any other agency, as agreed upon in writing. A documented use agreement between the permittee and the owner or operator of any control measures located outside of the permitted area that are utilized by the permittee's construction site for compliance with the CDPS-SCP, but not under the direct control of the permittee shall be placed in the project's SWMP.
- (d) *Construction Implementation.* The Contractor shall incorporate control measures into the project as outlined in the accepted schedule.

- (e) *Stabilization.* Once earthwork has started, the Contractor shall maintain erosion control measures until permanent stabilization of the area has been completed and accepted. Clearing, grubbing and slope stabilization measures shall be performed regularly to ensure final stabilization. Failure to properly maintain erosion control and stabilization methods, either through improper phasing or sequencing will require the Contractor to repair or replace sections of earthwork at the Contractor's expense. The Contractor shall schedule and implement the following stabilization measures during the course of the project:
1. *Temporary Stabilization.* At the end of each day, the Contractor shall stabilize disturbed areas by surface roughening, vertical tracking, or a combination thereof. Disturbed areas are locations where actions have been taken to alter the existing vegetation or underlying soil of a site, such as clearing, grading, road bed preparation, soil compaction, and movement and stockpiling of sediment and materials. Designated topsoil distributed on the surface or in stockpiles shall not receive temporary stabilization. Other stabilization measures may be implemented, as approved. The maximum area of temporary stabilization (excluding areas of designated topsoil) shall not exceed 20 acres.
  2. *Interim Stabilization.* As soon as it is known with reasonable certainty that work will be temporarily halted for 14 days or more, sediment and material stockpiles and disturbed areas shall be stabilized using one or more of the following methods:
    - (1) Application of 1.5 tons per acre of mechanically crimped certified weed free hay or straw in combination with an approved organic mulch tackifier.
    - (2) Placement of bonded fiber matrix in accordance with Section 213.
    - (3) Placement of mulching (hydraulic) wood cellulose fiber mulch with tackifier, in accordance with Section 213.
    - (4) Application of spray-on mulch blanket in accordance with Section 213. Magnesium Chloride, Potassium Chloride, and Sodium Chloride or other salt products shall not be used as a stabilization method.
    - (5) Topsoil stockpiles shall receive interim stabilization unless specified in accordance with Section 207 as a different material than the other disturbed areas on-site.
  3. *Summer and Winter Stabilization.* Summer and winter stabilization is defined as stabilization during months when seeding is not permitted. As soon as the Contractor knows shutdown is to occur, interim stabilization shall be applied to the disturbed area. Protection of the interim stabilization method is required. Reapplication of interim stabilization may be required as directed.
  4. *Permanent Stabilization.* Permanent stabilization is defined as the covering of disturbed areas with topsoil, seeding, mulching with tackifier, soil retention coverings, and such non-erodible methods as riprap, road shouldering, etc., or a combination thereof as required by the Contract. Other permanent stabilization techniques may be proposed by the Contractor, in writing, and shall be used if approved in writing by the Engineer. Permanent stabilization requirements shown on the plans shall be completed within four working days of the placement of the topsoil in accordance with Section 207.
  5. *Final Stabilization.* Final stabilization is achieved when all ground disturbing activities at the site have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent physical erosion reduction methods have been employed.
- (f) *Maintenance.* Erosion and sediment control practices and other protective measures identified in the SWMP as control measures for stormwater pollution prevention shall be maintained in effective operating condition until the CDPS-SCP has been transferred to CDOT. Control measures shall be continuously maintained in accordance with good engineering, hydrologic, and pollution control practices, including removal of collected sediment when silt depth is 50 percent or more of the effective height of the erosion control device. When possible, the Contractor shall use equipment with an operator rather than labor alone to remove the sediment.

Maintenance of erosion and sediment control devices shall include replacement of such devices upon the end of their useful service life as recommended by the Contractor and approved by the Engineer. Maintenance of rock check dams and vehicle tracking pads shall be limited to removal and disposal of sediment or addition of aggregate. Damages resulting from failure to maintain control measures shall be repaired at the Contractor's expense.

Complete site assessment shall be performed as part of comprehensive inspection and maintenance procedures to assess the adequacy of control measures at the site and the necessity of changes to those control measures to ensure continued effective performance. Where site assessment results in the determination that new or replacement control measures are necessary, the control measures shall be installed to ensure continuous effectiveness. When identified, control measures shall be maintained, added, modified or replaced as soon as possible, immediately in most cases.

Approved new or replaced control measures will be measured and paid for in accordance with subsections 208.11 and 208.12. Devices damaged due to the Contractor's negligence shall be replaced at the Contractor's expense.

From the time seeding and mulching work begins until project acceptance the Contractor shall maintain all seeded areas. Damage to seeded areas or to mulch materials shall be immediately restored. Damage to seeded areas or to mulch materials due to Contractor negligence shall be immediately restored at the Contractor's expense. Restoration of other damaged areas will be measured and paid for under the appropriate bid item.

Temporary control measures may be removed upon completion of the project, as determined by the Water Quality Partial Acceptance walk-through. If removed, the area in which these control measures were constructed shall be returned to a condition similar to that which existed prior to its disturbance. Removed control measures shall become the property of the Contractor.

If the Contractor fails to complete construction within the approved contract time, the Contractor shall continue erosion and sediment control operations at its expense until acceptance of the work.

Sediment removed during maintenance of control measures and material from street sweeping may be used in or on embankment, provided it meets the requirements of Section 203 and is distributed evenly across the embankment.

Whenever sediment collects on the paved surface, the surface shall be cleaned. Street washing will not be allowed. Storm drain inlet protection shall be in place prior to shoveling, sweeping, or vacuuming. Sweeping shall be completed with a pickup broom or equipment capable of collecting sediment. Sweeping with a kick broom will not be allowed.

Material from pavement saw cutting operations shall be cleaned from the roadway surface during operations using a vacuum. A control measure, such as a berm, shall be placed to contain slurry from joint flushing operations until the residue can be removed from the soil surface. Aggregate bags, erosion logs or other permeable control measures shall not be used. Residue shall not flow into driving lanes. It shall be removed and disposed of in accordance with subsection 107.25(b). Material containment and removal will not be paid for separately, but shall be included in the work.

**208.05 Construction of Control Measures.** Control measures shall be constructed in accordance with Standard Plans M-208-1 and M-216-1, and with the following:

- (a) *Seeding, Mulching, Sodding, Soil Retention Blanket.* Seeding, mulching, sodding, and soil retention blanket installation shall be performed in accordance with Sections 212, 213, and 216.
- (b) *Erosion Bales.* The bales shall be anchored securely to the ground with wood stakes.
- (c) *Silt Fence.* Silt fence shall be installed in locations specified in the Contract.
- (d) *Temporary Berms.* Berms shall be constructed to the dimensions shown in the Contract, and sufficiently compacted to prevent erosion or failure. If the berm erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.
- (e) *Temporary Diversion.* Diversions shall be constructed to the dimensions shown in the Contract and graded to drain to a designated outlet. The berm shall be sufficiently compacted to prevent erosion or failure. If the diversion erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.
- (f) *Temporary Slope Drains.* Temporary slope drains shall be installed prior to installation of permanent facilities or growth of adequate ground cover on the slopes. Temporary slope drains shall be securely anchored to the slope. The inlets and outlets of temporary slope drains shall be protected to prevent erosion.
- (g) *Silt Berm.* Prior to installation of silt berms, the Contractor shall prepare the surface of the areas in which the berms are to be installed such that they are free of materials greater than 2 inches in diameter and are suitably smooth for the installation of the silt berms, as approved. Silt berms shall be secured with spikes. The Contractor shall install the silt berm in a manner that will prevent water from going around or under the silt berm. Silt berms shall be installed on top of soil retention blanket or turf reinforcement blanket.
- (h) *Rock Check Dam.* Rock shall be installed at locations shown on the plans. Rock check dams shall conform to the dimensions shown on the plans.
- (i) *Rip rap Outlet Protection.* Geotextile used shall be protected from cutting or tearing. Overlaps between two pieces of geotextile shall be 1 foot minimum. Riprap size shall be as shown on the plans.
- (j) *Storm Drain Inlet Protection.* Prior to installation, the Contractor shall sweep the surface of the area in which the storm drain inlet protection devices are to be installed such that the pavement is free of sediment and debris. The ends of the inlet protection Type 1 and Type 2 shall extend a minimum of 1 foot past each end of the inlet.

The Contractor shall remove all accumulated sediment and debris from the surface surrounding all storm drain inlet protection devices after each rain event or as directed. The Contractor shall remove accumulated sediment from each Type II and III containment area when it is more than one third full of sediment, or as directed.

The Contractor shall protect storm drain facilities adjacent to locations where pavement cutting operations involving wheel cutting, saw cutting, sand blasting, or abrasive water jet blasting are to take place.

- (k) *Sediment Trap*. Sediment traps shall be installed to collect sediment laden water and to minimize the potential of pollutants leaving the project site. Locations shall be as shown on the plans or as directed.

Sediment traps shall be constructed prior to disturbance of upslope areas and shall be placed in locations where runoff from disturbed areas can be diverted into the trap.

The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and roots.

Fill material for the embankment shall be free of roots or other vegetation, organic material, large stones, and other objectionable material.

Sediment shall be removed from the trap when it has accumulated to one half of the wet storage depth of the trap and shall be disposed of in accordance with subsection 208.04(f).

- (l) *Erosion Logs*. Erosion logs shall be embedded 2 inches into the soil. Stakes shall be embedded so that the top of the stake does not extend past the top erosion log more than 2 inches, at the discretion of the Engineer, a shallower stake depth may be permitted if adverse site conditions are encountered, e.g. rock or frozen ground.

The Contractor shall maintain the erosion logs during construction to prevent sediment from passing over or under the logs.

- (m) *Silt Dikes*. Prior to installation of silt dikes, the Contractor shall prepare the surface of the areas in which the silt dikes are to be installed such that they are free of materials greater than 2 inches in diameter and are suitably smooth for the installation of the silt dikes, as approved by the Engineer.

- (n) *Concrete Washout Structure*. The concrete washout structure shall meet or exceed the dimensions shown on the plans. Work on this structure shall not begin until written acceptance of location is provided by the Engineer.

Control measures designed for concrete washout waste shall be implemented. If the bottom of the excavated structure is within 5 feet of anticipated high ground water elevation or the soil does not have adequate buffering capacity to meet water quality standards, an impermeable synthetic liner shall be installed with the minimum properties shown in Table 208-5 or use a prefabricated washout.

The following requirements shall be met:

- (1) The structure shall contain all washout water.
- (2) Stormwater shall not carry wastes from washout and disposal locations.
- (3) The site shall be located a minimum of 50 horizontal feet away from State waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.
- (4) The site shall be signed as "Concrete Washout".
- (5) The site shall be accessible to appropriate vehicles.
- (6) Freeboard capacity shall be included in the structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.
- (7) The Contractor shall prevent tracking of washout material out of the washout structure.
- (8) Solvents, flocculants, and acid shall not be added to wash water.
- (9) The structure shall be surrounded on three sides by a compacted berm.
- (10) The structure shall be fenced with orange plastic construction fencing to provide a barrier to construction equipment and to aid in identification of the concrete washout area.



(11) Concrete waste, liquid and solid, shall not exceed  $\frac{2}{3}$  the storage capacity of the washout structure.

- (o) *Pre-fabricated concrete washout structures (Type 1 and Type 2)*. Structures and sites shall meet the following requirements:
- (1) Structure shall contain all washout water. If bins are determined to be leaking, the Contractor shall replace the bin on-site and clean up the spilled material.
  - (2) Structure shall be located a minimum of 50 horizontal feet away from State waters, and shall be confined so that no potential pollutants will enter State waters and other sensitive areas as defined in the Contract. Locations shall be as approved by the Engineer. The pre-fabricated structure shall be signed as "Concrete Washout". Sign can be on portable bin.
  - (3) The site shall be accessible to appropriate vehicles.
  - (4) Washout bins shall be covered with a tarp tied down to the structure or staked to the ground when a storm event is anticipated.
  - (5) Solvents, flocculants, and acid shall not be added to wash water.
  - (6) Concrete waste, liquid and solid, shall not exceed  $\frac{2}{3}$  the storage capacity of the washout structure.
  - (7) Prefabricated structures cannot be moved when they contain liquid, unless otherwise approved.
  - (8) The concrete washout structure shall be installed and ready for use prior to concrete placement operations.
  - (9) Washout areas shall be checked and maintained as required. On-site permanent disposal of concrete washout waste is not allowed.

All liquid and solid wastes, including contaminated sediment and soils generated from concrete washout shall be hauled away from the site and disposed of properly at the Contractor's expense.

Delivery to the site shall not occur until written acceptance is provide by the Engineer for both the product and the concrete waste disposal facility.

- (p) *Vehicle Tracking Pad (VTP)*. Vehicle tracking pads shall be constructed to the minimum dimensions shown in the Contract, unless otherwise directed by the Engineer. Construction of approved vehicle tracking pads shall be completed before any disturbance of the area.

The Contractor shall maintain each vehicle tracking pad during the entire time that it is in use for the project. The vehicle tracking pad shall be removed at the completion of the project unless otherwise directed by the Engineer. Additional aggregate may be required for maintenance and will be paid for under Pay Item, Maintenance Aggregate (Vehicle Tracking Pad).

- (q) *Detention Pond*. Permanent detention ponds shown on the plans may be used as temporary control measures if the following conditions are met:
- (1) The pond is designated as a construction control measure in the SWMP.
  - (2) The pond outfall and outlet are designed and implemented for use as a control measure during construction in accordance with good engineering, hydrologic, and pollution control practices. The stormwater discharges from the outfall shall not cause degradation or pollution of State waters, and shall have control measures as appropriate.
  - (3) All silt shall be removed and the pond returned to the design grade and contour prior to project acceptance.
- (r) *Aggregate Bag*. Aggregate bags shall be placed on a stable surface, consisting of hardscape or compacted gravel. If approved by the Engineer, the aggregate bag may be placed on compacted dirt areas, where bags conform to the surface and can effectively minimize sediment transport. Aggregate bags shall not be placed in concentrated flow areas. Aggregate bags shall be placed to conform to the surface without gaps to ensure that discharge water does not cause erosion.
- (s) *Surface roughening*. Surface roughening creates horizontal grooves along the contour of the slope. Roughening may be accomplished by furrowing, scarifying, ripping, or disking the soil surface to create a 2 to 4 inch minimum variation in soil surface.

- (t) *Vertical Tracking.* Vertical tracking involves driving a tracked vehicle up and down the soil surface and creating horizontal grooves and ridges along the contour of the slope. Sandy soils or soils that are primarily rock need not be tracked.

**208.06 Materials Handling and Spill Prevention.** The SWMP Administrator shall clearly describe and record on the SWMP, all practices implemented at the site to minimize impacts from procedures or significant material that could contribute pollutants to runoff. Areas or procedures where potential spills can occur shall have a Spill Response Plan in place as specified in subsections 107.25(b) or 208.06(c). Construction equipment, fuels, lubricants, and other petroleum distillates shall not be stored or stockpiled within 50 horizontal feet of any State waters or more if the Contractor determines necessary. Equipment fueling and servicing shall occur only within approved designated areas.

- (a) *Bulk Storage Structures.* Bulk storage structures for petroleum products and other chemicals shall have impervious secondary containment or equivalent adequate protection so as to contain all spills and prevent any spilled material from entering State waters. Secondary containment shall be capable of containing the combined volume of all the storage containers plus at least 10 percent freeboard. For secondary containment that is used and may result in accumulation of stormwater within the containment, a plan shall be implemented to properly manage and dispose of all accumulated stormwater which is deemed to be contaminated (e.g., has an unusual odor or sheen).
- (b) *Lubricant Leaks.* The Contractor shall inspect equipment, vehicles, and repair areas daily to ensure petroleum, oils, and lubricants (POL) are not leaking onto the soil or pavement. Absorbent material or containers approved by the Engineer shall be used to prevent leaking POL from reaching the soil or pavement. The Contractor shall have onsite approved absorbent material or containers of sufficient capacity to contain any POL leak that can reasonably be foreseen. The Contractor shall inform all Spill Response Coordinators in accordance with the Spill Response Plan if unforeseen leakage is encountered. All materials resulting from POL leakage control and cleanup shall become the property of the Contractor and shall be removed from the site. Control, cleanup, and removal of by-products resulting from POL leaks shall be performed at the Contractor's expense.
- (c) *Spill Response Plan.* A Spill Response Plan shall be developed and implemented to establish operating procedures for handling potential pollutants and preventing spills.

The Response Plan shall contain the following information:

- (1) Identification and contact information of each Spill Response Coordinator.
- (2) Locations of areas on the project site where equipment fueling and servicing operations are permitted.
- (3) Location of clean-up kits.
- (4) Quantities of chemicals and locations stored on-site.
- (5) Label system for chemicals and Safety Data Sheets (SDS) for products.
- (6) Clean-up procedures to be implemented in the event of a spill that does not enter State waters or ground water.
- (7) Procedures for spills of any size that enter surface waters or ground water, or have the potential to do so. CDOT's Erosion Control and Stormwater Quality Guide contains spill notification contacts and phone numbers required in the Spill Response Plan.
- (8) A summary of the employee training provided.

Information in items (1) through (8) shall be updated in the SWMP when they change.

**208.07 Stockpile Management.** Material stockpiles 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 as defined in the Contract. Locations shall be approved by the Engineer.

Erodible stockpiles (including topsoil) shall be contained with acceptable control measures at the toe (or within 20 feet of the toe) throughout construction. Control measures shall be approved by the Engineer. The SWMP Administrator shall describe, detail, and record the sediment control devices on the SWMP.

**208.08 Limits of Disturbance.** The Contractor shall limit construction activities to those areas within the limits of disturbance shown on the plans and cross-sections. Construction activities, in addition to the Contract work, shall include the on-site parking of vehicles or equipment, on-site staging, on-site batch plants, haul roads or work access, and all other activities which would disturb existing soil conditions. Staging areas within the LDA shall be as approved by the Engineer. Construction activities beyond the limits of disturbance due to Contractor negligence shall be restored to the original condition by the Contractor at the Contractor's expense. The SWMP Administrator shall tabulate additional disturbances not identified in the CDPS-SCP

application and indicate changes to locations and quantities on the SWMP. The Contractor shall report the changes and additional disturbances to the Engineer, Water Quality Control Division of CDPHE, and all other involved agencies.

The Contractor shall pursue stabilization of all disturbances to completion.

**208.09 Regulatory Mechanism for Water Quality.** The Department will identify and document findings not in compliance with the Water Quality Specifications, as specified in subsection 208.09(a)7, during Headquarters and Region water quality control inspections or observation by the Engineer. The Engineer will immediately notify the Contractor of these findings by issuing Form 105, which will be tracked in ESCAN/CARL software. Failure by the Contractor to clarify a finding location with the Engineer shall not interrupt the timelines noted in subsection 208.09(b).

Timelines noted in subsection 208.09(b) do not indemnify the Contractor from failing to comply with CDPS-SCP timelines for corrective actions. The CDPS-SCP (Part I.D.8) states corrective actions "...must be addressed as soon as possible, immediately in most cases, to minimize the discharge of pollutants."

(a) *Definitions.*

1. **Compliance Assistance.** A low risk event as determined by the Region Water Pollution Control Manager (RWPCM). Compliance assistance events are not considered Findings and not subject to the Regulatory Mechanism noted in subsection 208.09(b).
  2. **Deferment.** A request from the Contractor to the Engineer to delay implementation of corrective actions for Regular Findings pertaining to Water Quality Specifications. Deferments may only be granted due to extraordinary circumstances. However, it is at the Department's discretion to approve or reject these requests.
  3. **Finding.** An incident discovered through inspection by the Department or by Engineer observation, which is noncompliant with the Water Quality Specifications. A Finding will be classified as one of the following:
    - (1) **Regular Finding.** A situation upon inspection that is in noncompliance with the Water Quality Specifications.
    - (2) **Severe Finding.** A discharge outside the project's Limits of Construction (LOC), subsection 107.25(a), to State waters or to a live inlet where the pollutant cannot be reclaimed.
    - (3) **Chronic Finding.** A Chronic Finding is assessed when the same Regular Finding at the same location is documented twice in the last three Headquarters or Region water quality control inspections. Engineer observed findings outside these inspections will not apply.
  4. **Inspection Form 105.** The Form 105 issued by the Engineer documenting findings from Headquarters or Region led water quality inspection in accordance with subsection 208.03(c).
  5. **Location.** The place where the finding was observed; can be a document (e.g., stormwater management plan [SWMP]) or physical location. A physical location must be described with enough detail to guide an independent party to the spot of the finding. Physical locations must be supported with at least one photograph.
  6. **Recalcitrance.** Contractor has shown willful negligence or misrepresentation or unwillingness to adhere to the Water Quality Specifications.
  7. **Water Quality Specifications.** Subsection 107.25, Sections 208, 213 and 216, and Standard Plans M-208-1 and M-216-1.
- (b) *Liquidated Damages and Stop Work Orders.* The Contractor will be subject to Liquidated Damages for incidents of failure to comply with the Water Quality Specifications and implement corrective actions to resolve noncompliance in the time frame established in subsection 208.09(b and c). Liquidated damages will not be considered a penalty but will be assessed to recover costs associated with environmental damages, and engineering and administrative expenses incurred by the Department for the Contractor's failure to comply with the Water Quality Specifications. Liquidated damages will accumulate for each finding, for each cumulative day that the finding remains uncorrected. Liquidated damages associated with incidents pertaining to this subsection do not indemnify the Contractor of other Liquidated Damages associated with this project.

In addition to Liquidated Damages, the Contractor will be subject to a project-wide Stop Work Order for recalcitrance and the Engineer may, in writing, issue a Stop Work Order for Chronic and Severe Findings in accordance with subsection 105.01.

Findings are closed when the corrective action is complete, reported to ESCAN and accepted by the Department. The Department will notify the Contractor through ESCAN when the corrective action is accepted or denied. Liquidated damages will be assessed by the type of finding as follows and will continue until the corrective action is approved by the Department.

1. **Regular Finding.** The time required to repair a Regular Finding shall begin at 11:59 PM on the date the Inspection Form 105 is issued. The Contractor shall have no more than a seven day grace period to correct the Regular Finding before Liquidated Damages are assessed. The grace period extends until 11:59 PM on the seventh day after the Inspection Form 105 was issued.

The Engineer will issue a Form 105 notifying the Contractor that Liquidated Damages are accruing at \$1,500 per day for each full or partial calendar day a Regular Finding remains uncorrected after the seven day grace period. At 11:59 PM on the 14<sup>th</sup> day after the Form 105 was issued, each uncorrected, undeferred Regular Finding will be assessed as recalcitrant and the Engineer will issue a project-wide stop work order. The Contractor shall fix each recalcitrant finding and submit a plan to avoid future instances of each recalcitrance to the Department for approval. The recalcitrance plan shall be in writing, signed by the Superintendent and shall include:

- (1) Each Recalcitrant Finding.
- (2) Why the corrective action for each Recalcitrant Finding was not implemented within 14 days.
- (3) How the Contractor will avoid future recalcitrance.

The Department will discuss the recalcitrance plan and may meet with the Superintendent to recommend modifications, if needed. The Engineer will issue a Form 105 accepting or rejecting the recalcitrance plan within 24 hours of the Contractor submitting a plan or resubmitting a modified plan.

The Contractor will neither be reimbursed for costs incurred to fix each Recalcitrant Finding pertaining to a control measure in the SWMP plan nor costs to prepare the recalcitrance plan. The Contractor shall propose additional control measures, if needed, according to subsection 208.04(a). The project-wide Stop Work Order and Liquidated Damages will be assessed until approval of the corrective action for each Recalcitrant Finding and approval of the Contractor's recalcitrance plan by the Department is given. After written approval by the Engineer, the project-wide Stop Work Order will be lifted and accrual of Liquidated Damages will cease.

2. **Severe Finding.** In response to a Severe Finding, the Engineer will issue Inspection Form 105 and immediately assess Liquidated Damages of \$3,500 per Severe Finding. Severe Findings shall not be eligible for the seven day grace period (subsection 208.09(b)1). Liquidated damages will accrue at \$3,500 per Severe Finding per calendar day beginning at 11:59 PM of day the Inspection Form 105 is issued.
  - A. If the Severe Finding is a discharge to State waters, the Contractor shall prevent any further discharge and shall reclaim discharge which has not yet entered State waters. The Contractor shall report the discharge to CDPHE in accordance with CDPS-SCP requirements.
  - B. If the Severe Finding is a discharge outside the LOC that does not enter State waters, the Contractor shall fully reclaim the discharge before it enters State waters and implement relevant CDPS-SCP noncompliance notification procedures.

The Engineer may require the Contractor to submit a plan for permanent stabilization of disturbed areas outside the LOC per 208.04(e)4 for approval. Permanent stabilization plans pertaining to Severe Findings and subsequent stabilization activities are not subject to 208.09(b).

The Contractor shall not be reimbursed for activities undertaken to reclaim the discharge, stabilize areas outside the LOC and implement relevant CDPS-SCP noncompliance notification procedures.

3. **Chronic Finding.** In response to a Chronic Finding, the Engineer will issue Inspection Form 105 and immediately assess Liquidated Damages of \$1,500 per Chronic Finding. Chronic Findings shall not be eligible for the seven day grace period (subsection 208.09(b)). Liquidated damages will accrue at \$1,500 per Chronic Finding per day beginning at 11:59 PM of day the Inspection Form 105 is issued.

When the Chronic Finding is comprised of two Severe Findings, the Department will assess Liquidated Damages in accordance with this specification.

(c) *Deferment.* If the Contractor seeks deferment, the Superintendent shall submit a deferment request to the Engineer by 11:59 PM of the day after the issuance of Inspection Form 105. Chronic and Severe Findings are not eligible for deferment. The deferment request shall be in writing, signed by the Superintendent and shall include:

- (1) Regular Findings to be deferred
- (2) The reasons why the Findings cannot be corrected in seven days
- (3) An action plan containing:
  - (i) Methodology to protect water quality until each deferred Finding is corrected and accepted
  - (ii) Milestones to measure progress toward completion
  - (iii) Additional control measures to be implemented until each deferred Finding is corrected and accepted
  - (iv) Corrective completion dates for each Finding

The Department will discuss the deferment request and may meet with the Superintendent to recommend modifications to the action plan. The Engineer will issue a Form 105 accepting or rejecting the deferment request by 11:59 PM of the third day after the Inspection Form 105 documenting the Regular Finding is issued. The Department will not accept a deferment for operational error, lack of resources, improperly installed control measures, inadequate control measures, lack of preventative maintenance, careless or improper operation, or other non-proactive reason.

Preparation of deferment documentation and additional materials, including additional control measures, required to complete the action plan shall be at the Contractor's expense. Time frames noted in subsection 208.09(b)1 will not be stopped during the deferment review period, therefore, Liquidated Damages will be assessed beginning 11:59 PM on calendar day seven if the deferment request is rejected and, furthermore, a rejected deferment plan (subsection 208.09(c)) shall not absolve the Contractor from recalcitrance.

The Engineer will assess Liquidated Damages in the amount of \$1,500 per calendar day, and partial day, for each uncorrected Deferred Finding. These Liquidated Damages will start on the date the uncorrected work was deferred to be completed (subsection 208.09(c)(3)). In addition, Liquidated Damages of \$1,500 per calendar day will be assessed retroactively to 11:59 PM of the day the finding was originally noted on the Inspection Form 105.

- (d) *Conflict Resolution.* Subsections 105.22, 105.23, and 105.24 detail the process through which the parties (CDOT and the Contractor) agree to resolve any issue that may result in a dispute.
- (e) *Exemptions.* The Engineer will exempt from subsection 208.09(b) situations of Compliance Assistance, Documented Upset Conditions, Documented Reportable Spills and Documented Winter Exemptions. Release from subsection 208.09(b) does not exempt the Contractor from compliance with CDPS-SCP, Part I.D.8.
  1. Documented Upset Condition. The Contractor shall report, both verbally and in writing, the Upset Condition to CDPHE per CDPS-SCP Part II.A.6 and subsection 208.03(c) and provide written documentation to the Engineer. The Engineer will issue a Form 105 and recognize the exemption to the Regulatory Mechanism. The Contractor shall also update the SWMP with the Form 105 and the documented Upset Condition.
  2. Documented Reportable Spills. The Contractor shall report, both verbally and in writing, the Reportable Spill to CDPHE per subsection 107.25(b) and provide written documentation to the Engineer. The Engineer will issue a Form 105 and recognize the exemption to the Regulatory Mechanism. The Contractor shall also update the SWMP with the Form 105 and the documented Reportable Spill.
  3. Winter Exemptions. The Contractor is unable to address findings noted on the Headquarters or Region led water quality control inspection due to:
    - (1) Snow covers the entire site for an extended period and;
    - (2) No construction activity and;
    - (3) Melting conditions posing a risk of surface erosion do not exist.

The Contractor shall request a Winter Exemption to the Department. If approved, the Engineer will issue a Form 105 and

recognize the exemption to subsection 208.09(b). The Contractor shall also update the SWMP with the Form 105 and the documented Winter Exemption. Liquidated Damages, if assessed, will only accrue up to the point where the Winter Exemptions are approved.

4. Compliance assistance during Headquarters or Region led water quality control inspections. The RWPCM will record compliance assistance in ESCAN/CARL software.

#### **208.10 Items to Be Completed Prior to Requesting Partial Acceptance of Water Quality Work.**

- (a) *Reclamation of Washout Areas.* After concrete operations are complete, washout areas shall be reclaimed in accordance with subsection 208.05(n) at the Contractor's expense.
- (b) *Survey.* When Permanent Water Quality (PWQ) control measures are required on the project and once built, the Contractor shall survey the control measures to confirm that the PWQ control measures conform to the configuration, grade, and volume shown on the plans. The survey shall conform to Section 625. The results of the survey shall be submitted in accordance with CDOT's Survey Manual (AutoCAD to GIS and TMOSS Codes), or GIS with attribute tables, showing both designed and final elevations and configurations. Paper versions of the drawings shall be submitted with the stamp and seal of the Contractor's Surveyor.

PWQ control measures that do not meet the Contract requirements will be identified in writing by the Engineer, and shall be repaired or replaced at the Contractor's expense. Correction surveys shall be performed at the Contractor's expense to confirm the locations, dimensions, and volume certification (for water quality capture volume structures only) of each PWQ control measure. The Engineer, CDOT Hydraulics Engineer for the region, Headquarters Permanent Water Quality Manager, and Headquarters Maintenance staff will perform a walkthrough of the PWQ control measures to confirm conformance to material requirements, locations, and dimensions. Before the walkthrough, the Contractor shall provide the corrected survey to the Engineer, Regional, and Headquarters Permanent Water Quality Managers.

- (c) *Locations of Temporary Control Measures.* The Engineer will identify locations where modification, cleaning, or removal of temporary control measures are required and will provide these in writing to the Contractor. Upon completion of work required, the SWMP Administrator shall modify the SWMP to provide an accurate depiction of control measures to remain on the project site.

All punch list and walkthrough items shall be completed and approved by the Engineer and Maintenance.

### **METHOD OF MEASUREMENT**

**208.11** 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. 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.

Erosion bales and rock check dams will be measured by the actual number installed and accepted.

Silt fence, silt berms, erosion logs, aggregate bags, silt dikes, temporary berms, temporary diversions, and temporary slope drains, will be measured by the actual number of linear feet that are installed and accepted. Measured length will not include required overlap.

Concrete washout structure will be measured by the actual number of structures that are installed and accepted.

Pre-fabricated concrete washout structures will be measured by the actual number of structures delivered to the site. It shall not include structures moved on-site.

Storm drain inlet protection will be measured by linear foot or actual number of devices that are installed and accepted.

Sediment trap quantities will be measured by the actual number installed and accepted.

Removal of trash that is not generated by construction activities will be measured by the actual number of hours that Contractor workers actively remove trash from the project. Each week the Contractor shall submit to the Engineer a list of workers and the hours spent collecting such trash.

Removal of accumulated sediment from traps, basins, areas adjacent to silt fences and erosion bales, and other clean out excavation of accumulated sediment, and the disposal of such sediment, will be measured by the number of hours that equipment, labor, or both are used for sediment removal.

Vehicle tracking pads will be measured by the actual number constructed and accepted.

Additional aggregate required for maintaining vehicle tracking pads will be measured as the actual number of cubic yards installed and accepted.

Pre-fabricated vehicle tracking pads will be measured by the actual number of pads delivered to the site and set up to the minimum dimensions. It shall not include pads moved on-site.

## BASIS OF PAYMENT

**208.12** ECM and control measures will be paid for at the Contract unit price for each of the items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Aggregate Bag	Linear Foot
Concrete Washout Structure	Each
Erosion Bales (Weed Free)	Each
Erosion Control Management	Day
Erosion Log (Type 1) (____ Inch)	Linear Foot
Erosion Log (Type 2) (____ Inch)	Linear Foot
Erosion Log (Type 3) (____ Inch)	Linear Foot
Pre-Fabricated Concrete Washout Structure (Type 1)	Each
Pre-Fabricated Concrete Washout Structure (Type 2)	Each
Pre-Fabricated Vehicle Tracking Pad	Each
Maintenance Aggregate (Vehicle Tracking Pad)	Cubic Yard
Removal and Disposal of Sediment (Equipment)	Hour
Removal and Disposal of Sediment (Labor)	Hour
Removal of Trash	Hour
Rock Check Dam	Each
Sediment Basin	Each
Sediment Trap	Each
Silt Berm	Linear Foot
Silt Dike	Linear Foot
Silt Fence	Linear Foot
Silt Fence (Reinforced)	Linear Foot
Storm Drain Inlet Protection (Type __)	Linear Foot
Storm Drain Inlet Protection (Type __)	Each
Sweeping (Sediment Removal)	Hour
Temporary Berm	Linear Foot
Temporary Diversion	Linear Foot
Temporary Slope Drain	Linear Foot
Vehicle Tracking Pad	Each

Payment for Erosion Control Management (ECM) will be full compensation for all labor, materials and equipment necessary for the SWMP Administrator and Erosion Control Inspectors to perform all the work described in this specification. This includes

assembling items (5) to (18) in subsection 208.03(d)1 and required updates to the SWMP.

The SWMP Administrator and ECI's commute times will not be measured and paid for separately, but shall be included in the work.

Modifications to the SWMP due to construction errors or survey errors by the Contractor shall be made at the Contractor's expense.

Surface roughening and vertical tracking (temporary stabilization) will not be measured and paid for separately but shall be included in the work. Payment for each control measure item will be full compensation for all work and materials required to furnish, install, maintain, and remove the control measure when directed.

Payment for Removal and Disposal of Sediment (Equipment) will be full compensation for use of the equipment, including the operator. Payment for Removal and Disposal of Sediment (Labor) will be full compensation for use of the labor.

Payment for concrete washout structure, whether constructed or prefabricated, will be full compensation for all work and materials required to install, maintain, and remove the item. Maintenance and relocation, as required, of these structures throughout the duration of the project will not be measured and paid for separately, but shall be included in the work.

Silt berm spikes and wood spikes will not be measured and paid for separately, but shall be included in the work. When required, soil retention blankets will be measured and paid for in accordance with Section 216.

Compost and wood stakes for Erosion Log (Type 2) will not be measured and paid for separately, but shall be included in the work.

Spray-on mulch blankets required by the Contract, including those used in both interim and final stabilization, will be measured and paid for in accordance with Section 213.

Payment for storm drain inlet protection will be full compensation for all work, materials, and equipment required to complete the item, including surface preparation, maintenance throughout the project, and removal upon completion of the work. Aggregate will not be measured and paid for separately, but shall be included in the work.

Sweeping, when used as a control measure as shown in the Contract, will be measured by the number of hours that a pickup broom or equipment capable of collecting sediment, authorized by the Engineer, is used to remove sediment from the roadway or other paved surfaces. Each week the Contractor shall submit to the Engineer a statement detailing the type of sweeping equipment used and the number of hours it was used to pick up sediment. The operator will not be measured and paid for separately, but shall be included in the work.

Stakes, anchors, connections, geotextile, riprap, and tie downs used for temporary slope drains will not be measured and paid for separately, but shall be included in the work.

Payment for vehicle tracking pad will be full compensation for all work, materials and equipment required to construct, maintain, and remove the entrance upon completion of the work. Aggregate and geotextile will not be measured and paid for separately, but shall be included in the work. If additional aggregate for maintenance of vehicle tracking pads is required, it will be measured by the cubic yard in accordance with Section 304 and will be paid for under this Section as Maintenance Aggregate (Vehicle Tracking Pad).

Seeding, sod, mulching, soil retention blanket, and riprap will be measured and paid for in accordance with Sections 212, 213, 216, and 506.

All work and materials required to perform the permanent control measure survey and furnish the electronic files shall be included in the original unit price bid for surveying. Surveying will be measured and paid for in accordance with Section 625.

Payment will be made for control measures replaced as approved by the Engineer. Temporary erosion and sediment control measures required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer or for the Contractor's convenience, shall be performed at the Contractor's expense. If the Contractor fails to complete construction within the contract time, payment will not be made for Section 208 pay items for the period of time after expiration of the contract time. These items shall be provided at the Contractor's expense.



## SECTION 212 SEEDING, FERTILIZER, SOIL CONDITIONER, AND SODDING

### DESCRIPTION

**212.01** This work consists of soil preparation, application of fertilizer, soil conditioners, or both, and furnishing and placing seed and sod. The work shall be in accordance with the Contract and accepted horticultural practices.

### MATERIALS

**212.02 Seed, Soil Conditioners, Fertilizers, and Sod.**

- (a) *Seed.* All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. All seeds shall be free from noxious weed seeds in accordance with current state and local lists and as indicated in Section 213. The Contractor shall furnish to the Engineer a signed statement certifying that the seed is from a lot that has been tested by a recognized laboratory for seed testing within thirteen months prior to the date of seeding. The Engineer may obtain seed samples from the seed equipment, furnished bags, or containers to test seed for species identification, purity, and germination. Seed tested and found to be less than 10 percent of the labeled certified PLS and different than the specified species will not be accepted. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.

Seed types and amount of PLS required per acre shall be provided in accordance with the Contract.

Seed and seed labels shall conform to all current State and Federal regulations and will be subject to the testing provisions of the Association of Official Seed Analysis. Computations for quantity of seed required on the project shall include the percent of purity and percent of germination.

The formula used for determining the quantity of PLS shall be:

Bulk Pounds of Seed Species • (%Purity • %Germination) = Pounds of PLS

(b) *Soil Conditioners and Fertilizer.*

1. Fertilizer: Fertilizer (plant nutrients) shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer which becomes caked or damaged will not be accepted.
2. Soil Conditioner: Soil conditioner shall consist of compost, biological nutrient, biological culture or humic acid based material.

Humic acid based material (Humate) shall include the following:

- (1) A pH of 3 to 5.
- (2) Maximum 20 percent inert ingredient.
- (3) Minimum 80 percent organic matter with 40 percent minimum humic acid.

Compost shall be weed-free, organic compost derived from a variety of feed stocks including agricultural, biosolids, forestry, food, leaf and yard trimmings, manure, tree wood with no substances toxic to plants. Material shall be aerobically composted in a facility permitted by the Colorado Department of Public Health and Environment (CDPHE) to produce or sell compost in accordance with House Bill (HB) 1181. The Contractor shall submit a copy of this permit to the Engineer for approval and the project records. The compost shall be tested in accordance with the U.S. Composting Council's Test Methods for Examining of Composting and Compost (TMECC) manual.

The compost manufacturer shall be a participating member of in the U.S. Composting Council's Seal of Testing Assurance Program (STA). The Contractor shall provide a participation certificate and test data on a Compost Technical Data Sheet.

Compost shall have the following physical properties:

Compost Parameters	Reported as	Requirement	Test Method
pH	pH units	6.0 – 8.5	TMECC 04.11-A
Soluble Salts (Electrical Conductivity)	dS m-1 or mmhos cm-1	Maximum 10dS/m	TMECC 04.10-A
Moisture Content	%, wet weight basis	30 – 60%	TMECC 03.09-A
Organic Matter Content	%, dry weight basis	30 – 65%	TMECC 05.07-A
Particle Size (sieve sizes)	%, dry weight basis for each sieve fraction	Passing 1 inch – 100% ½ inch – 95%	TMECC 02.02-B
Man-made Inert Contamination	%, dry weight basis	< 1%	TMECC 03.08-A
Stability (Respirometry)	mg CO <sub>2</sub> -C per g TS per day mg CO <sub>2</sub> -C per g OM per day	8 or below	TMECC 05.08-B
Select Pathogens	(PASS/FAIL) Limits: Salmonella <3 MPN/4grams of TS, or Coliform Bacteria <1000 MPN/gram	Pass	TMECC 07.01-B Fecal Coliforms, or 07.02 Salmonella
Trace Metals	(PASS/FAIL) Limits (mg kg <sup>-1</sup> , dw basis): As 41, Cd 39, Cu 1500, Pb 300, Hg 17, Ni 420, Se 100, Zn 2800	Pass	TMECC 04.06
Maturity (Bioassay) Percent Emergence	%, (average)	> 80%	TMECC 05.05-A
Relative Seedling Vigor	%, (average)	> 80%	
The Contractor shall provide a CTR in accordance with subsection 106.13 confirming that the material has been tested in accordance with TMECC.			

- (c) *Sod*. Sod shall be nursery grown and 99 percent weed free. Species shall be as shown on the plans. Other sod types may be used only if approved in writing by the Engineer. The one percent allowable weeds shall not include any undesirable perennial or annual grasses or plants defined as noxious by current State statute. Soil thickness of sod cuts shall not be less than ¾ inch nor more than 1 inch. Sod shall be cut in uniform strips with minimum dimensions of 18 inches in width and 48 inches in length. The Contractor shall submit a sample of the sod proposed for use, which shall serve as a standard. Any sod furnished, whether in place or not, that is not up to the standard of the sample may be rejected. Sod that was cut more than 24 hours prior to installation shall not be used.

Each load of sod shall be accompanied by a certificate from the grower stating the type of sod and the date and time of cutting.

## CONSTRUCTION REQUIREMENTS

**212.03 Seeding Seasons.** Seeding in areas that are not irrigated shall be restricted according to the following time table and specifications.

Zone	Spring Seeding	Fall Seeding
<b>Areas other than the Western Slope</b>		
Below 6000'	Spring thaw to June 1	September 15 until consistent ground freeze
6000' to 7000'	Spring thaw to June 1	September 1 until consistent ground freeze
7000' to 8000'	Spring thaw to July 15	August 1 until consistent ground freeze
Above 8000'	Spring thaw to consistent ground freeze	
<b>Western Slope</b>		
Below 6000'	Spring thaw to May 1	August 1 until consistent ground freeze
6000' to 7000'	Spring thaw to June 1	September 1 until consistent ground freeze
Above 7000'	Spring thaw to consistent ground freeze	

- (1) "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried ½ inch into the surface soil (topsoil) thru normal drill seeding methods.
- (2) "Consistent ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed ½ inch thru normal drill seeding operations. Seed shall not be sown, drilled, or planted when the surface soil or topsoil is in a frozen or crusted state.

Seeding accomplished outside the time periods listed above will be allowed only when ordered by the Engineer 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.

When seeding is ordered by the Engineer outside the time periods listed above, the cost of additional material will be paid for by the Department. The Contractor will not be responsible for failure of the seeded area to produce species indicated in the Contract due to reasons beyond the control of the Contractor.

The seeding, the soil conditioning, and the fertilizing application rate shall be as specified. The Engineer may establish test sections for adjusting the seeding and the fertilizing equipment to assure the specified rate. The Engineer may order equipment readjustment at any time.

Seed, soil conditioner and fertilizer shall not be applied during inclement weather including rain and high winds, or when soil is frozen or soil moisture is too high to evenly incorporate seed, soil conditioner or fertilizer.

**212.04 Lawn Grass Seeding.** Lawn grass seeding shall be accomplished in the seeding seasons described in subsection 212.03.

- (a) *Soil Preparation.* Preparatory to seeding lawn grass, irregularities in the ground surface, except the saucers for trees and shrubs, shall be removed. Measures shall be taken to prevent the formation of low places and pockets where water will stand.

Immediately prior to seeding, the ground surface shall be tilled or hand worked into an even and loose seedbed to a depth of 4 inches, free of clods, sticks, stones, debris, concrete, and asphalt in excess of 2 inches in any dimension, and brought to the desired line and grade.

- (b) *Fertilizing and Soil Conditioning.* The first application of fertilizer, soil conditioner, or both shall be incorporated into the soil prior to seeding, and shall consist of a soil conditioner, commercial fertilizer, or both as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

The second application of fertilizer shall consist of a fertilizer having an available nutrient analysis of 20-10-5 applied at the

rate of 100 lbs. per acre. It shall be uniformly broadcast over the seeded area three weeks after germination or emergence. The area shall then be thoroughly soaked with water to a depth of 1 inch.

Fertilizer shall not be applied when the application will damage the new lawn.

- (c) *Seeding.* After the surface is raked and rolled, the seed shall be drilled or broadcast and raked into the top ¼ inch of soil. Seeding shall be accomplished by mechanical landscape type drills. Broadcast type seeders or hydraulic seeding will be permitted only on small areas not accessible to drills. Seed shall not be drilled or broadcast during windy weather or when the ground is frozen or untillable. All loose exposed rock larger than 2 inches shall be removed from slopes that are to be seeded by drilling.

Hydraulic seeding equipment shall include a pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure, unless otherwise directed. The equipment shall have a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank.

### **212.05 Sodding.**

- (a) *Soil Preparation.* Preparatory to sodding, the ground shall be tilled or hand worked into an even and loose sod bed to a depth of 4 inches, and irregularities in the ground surface shall be removed. Sticks, stones, debris, clods, asphalt, concrete, and other material more than 2 inches in any dimension shall be removed. Any depressions or variances from a smooth grade shall be corrected. Areas to be sodded shall be smooth before any sodding is done.
- (b) *Sodding.* The sod shall be laid by staggering joints with all edges touching. On slopes, the sod shall run approximately parallel to the slope contours. Where the sod abuts a drop inlet, the subgrade shall be adjusted so that the sod shall be 1½ inch below the top of the inlet.

Within one hour after the sod is laid and fertilized it shall be watered. After watering the sod shall be permitted to dry to the point where it is still wet enough for effective rolling. It shall then be rolled in two directions with a lawn roller weighing at least 150 pounds.

- (c) *Fertilizing and Soil Conditioning.* Prior to laying sod, the 4 inches of subsoil underlying the sod shall be treated by tilling in fertilizer, soil conditioner, or both. The rate of application shall be as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied uniformly onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

After laying, the sod shall be fertilized with a fertilizer having an available nutrient analysis of 20-10-5 at the rate of 200 pounds per acre. Fertilizer shall not be applied when the application will damage the sod.

### **212.06 Native Seeding.** Areas that are unirrigated shall be seeded in accordance with subsection 212.03.

- (a) *Soil Preparation.* Slopes flatter than 2:1, shall be tilled into an even and loose seed bed 4 inches deep. Slopes 2:1 or steeper shall be left in a roughened condition. Slopes shall be free of clods, sticks, stones, debris, concrete, and asphalt in excess of 4 inches in any dimension, and brought to the desired line and grade.
- (b) *Fertilizing and Soil Conditioning.* Prior to seeding, fertilizer, soil conditioner, or both shall be applied. The fertilizer and soil conditioner type and rate of application shall be as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil. No measurable quantity of organic amendment shall be present on the surface after incorporation.
- (c) *Seeding.* Seeding shall be accomplished within 24 hours of tilling or scarifying to make special seed bed preparation unnecessary. The seeding application rate shall be as designated in the Contract. All slopes flatter than 2:1 shall be seeded by mechanical power drawn drills followed by packer wheels or drag chains. Mechanical power drawn drills shall have depth bands set to maintain a planting depth of at least ¼ inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application.

If strips greater than 7 inches between the rows have been left unplanted or other areas skipped, the Engineer will require additional seeding at the Contractor's expense.

When requested by the Contractor and approved by the Engineer, seeding may be accomplished by broadcast or hydraulic type seeders at twice the rate specified in the Contract at no additional cost to the project.

All seed sown by broadcast-type seeders shall be "raked in" or covered with soil to a depth of at least ¼ inch. Broadcasting seed will be permitted only on small areas not accessible to machine methods.

Hydraulic seeding equipment and accessories shall conform to the equipment and accessories described in subsection 212.04(c).

Seeded areas damaged due to circumstances beyond the Contractor's control shall be repaired and reseeded as ordered. Payment for this corrective work, when ordered, shall be at the contract prices.

Multiple seeding operations shall be anticipated as portions of job are completed to take advantage of growing conditions and to comply with Section 208 and subsection 212.03.

**METHOD OF MEASUREMENT**

**212.07** 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 Engineer, 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, and seed applied, completed, and accepted.

The quantity of sod to be measured will be the actual number of square feet, including soil preparation, water, fertilizer, and sod, completed and accepted.

When soil conditioner is measured and paid for separately, it will be measured by the actual number of acres to which soil conditioner is applied and will be paid for as Soil Conditioning.

The Contractor shall furnish the Engineer 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 Engineer's approval will not be paid for.

Measurement for acres will be by slope distances.

**BASIS OF PAYMENT**

**212.08** 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.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Seeding (Lawn)	Acre
Seeding (Native)	Acre
Sod	Square Foot
Soil Conditioning	Acre

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.

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

## SECTION 213 MULCHING

### DESCRIPTION

**213.01** This work consists of mulching the seeded areas, furnishing and placing wood chip mulch in the planting beds and plant saucers, furnishing and applying hydromulch with tackifier on roadway ditches and slopes, furnishing and placing tackifier on mulch or soil on roadway ditches or slopes, and furnishing and installing metal landscape border for the separation of planting beds, in accordance with the Contract or as directed. Mulching may be accomplished by the crimping method using straw or hay, by the hydraulic method using wood cellulose fiber mulch, or by other approved methods with approved materials. When a specific mulching method is required, it will be designated in the Contract.

This work includes furnishing and applying spray-on mulch blanket or bonded fiber matrix on top of rock cuts and slopes after seeding or as temporary stabilization as shown on the plans or as directed by the Engineer.

### MATERIALS

**213.02** Materials shall conform to the following requirements.

(a) *Mulching.* Materials for mulching shall consist of Certified Weed Free field or marsh hay or straw of oats, barley, wheat, rye or triticale certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free mulch bale shall be identified by one of the following:

- (1) One of the ties binding the bale shall consist of blue and orange twine, or
- (2) The bale shall have a regional Forage Certification Program tag indicating the Regional Forage Certification Program Number.

Mulch shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List for Colorado, Wyoming, Montana, Nebraska, Utah, Idaho, Kansas and South Dakota.

The Contractor shall not unload certified weed free mulch bales or remove their identifying twine, wire, or tags until the Engineer has inspected and accepted them.

The Contractor shall provide a transit certificate that has been filled out and signed by the grower and by the Department of Agriculture inspector.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Division of Plant Industry.

Straw or hay in a stage of decomposition (discolored, brittle, rotten, or moldy) or old, dry mulch which breaks in the crimping process will not be accepted.

The type and application rate of mulch material shall be as designated in the Contract.

(b) *Wood Cellulose Fiber Mulch.* Wood cellulose fiber mulch shall consist of virgin wood fibers manufactured expressly from clean whole wood chips. The chips shall be processed in such a manner as to contain no growth or germination inhibiting factors. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. The wood cellulose fibers of the mulch must maintain uniform suspension in water under agitation. Upon application, the mulch material shall form a blotter like mat covering the ground. This mat shall have the characteristics of moisture absorption and percolation and shall cover and hold seed in contact with the soil. The Contractor shall obtain certifications from suppliers that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch.

The wood cellulose fiber mulch shall conform to the following specifications:

Property	Requirement
Percent moisture content	10.0% ± 3.0%
Percent Organic Matter* (Wood Cellulose Fiber)	99.3% ± 0.2%
Percent Ash Content*	0.7% ± 0.2%
pH	4.9 ± 0.5
Water Holding Capacity*	1200-1600 grams**
*Oven Dried Basis **Per 100 grams of fiber	

The wood cellulose fiber mulch shall be packaged in units containing current labels, with the manufacturer's name, the net weight, and certification that the material meets the foregoing requirements for wood cellulose fiber mulch.

- (c) *Mulch Tackifier*. Material for mulch tackifier shall consist of a free-flowing, noncorrosive powder produced either from the natural plant gum of *Plantago Insularis* (Desert Indianwheat) or pre-gelatinized 100 percent natural corn starch polymer. The powders shall possess the following properties:

*Plantago Insularis* (Desert Indianwheat):

Property	Requirement	Test Method
pH 1% solution	6.5 - 8.0	
Mucilage content	75% min.	ASTM D7047

Pre-gelatinized 100 percent natural corn starch polymer:

Property	Requirement
Organic Nitrogen as protein	5.5-7%
Ash content	0-2%
Fiber	4-5%
pH 1% solution	6.5 – 8.0
Size	100% thru 850 microns (20 mesh)
Settleable solids	<2%

All fibers shall be colored green or yellow with a biodegradable dye.

The material used for mulch tackifier shall not contain any mineral filler, recycled cellulose fiber, clays, or other substances which may inhibit germination or growth of plants. Water shall conform to subsection 209.02.

- (d) *Wood Chip Mulch*. Wood chip mulch shall consist of fresh, moist pole peelings material having approximate dimensions;

Width: ¼ to ½ inch; Length: 3 to 4 inches

The Contractor shall submit a sample to the Engineer for approval at least 30 days prior to placing on the project.

- (e) *Metal Landscape Border*. The metal landscape border shall consist of a strip of metal such as steel conforming to ASTM A1011 or approved equal.

(f) *Spray-on Mulch Blanket*. Spray on mulch blanket shall be one of the following, unless otherwise shown on the plans:

- (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 (be compostable) and shall not release metals or toxins. 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	3,000 lb./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 interlocking fibers cannot be produced from sawdust, cardboard, paper, or paper by-products.

- (2) Spray-on Mulch Blanket (Type 2) shall be a hydraulically applied matrix pre-packaged in 50 pound bags containing both a soil and fiber stabilizing compound and thermally processed wood fiber.

The sterilized weed-free wood fiber mulch shall be manufactured through a thermo-mechanical defibrating process containing a specific range of fiber lengths averaging 0.25 inches or longer.

Mulch Blanket (Type 2) shall meet the following requirements:

Property	Requirement	Test Method
Fiber Retention On 28-Mesh Screen	≥ 40%	Tyler Ro-Tap Method
Moisture Content	12% ± 2%	Total Air Dry Weight Basis
Organic Matter	99.2% ± 0.2%	Oven Dry Weight Basis
Ash Content	0.8% ± 0.2%	Oven Dry Weight Basis
pH At 3% Consistency In Water	4.5-7.0 ± 0.5%	
Sterilized Weed-Free	Yes	
Non-Toxic To Plant Or Animal Life	Yes	
Application		
Application rate	3,000 lb./acre	

The soil and fiber stabilizing compound shall be composed of linear anionic copolymers of acrylamide pre-packed within the bag having a minimum content of 1.0 percent. The compound shall conform to the following:

Property	Requirement
Molecular Weight	≥ 12x10 <sup>6</sup>
Charge Density	> 25%
Non-Toxic To Plant Or Animal Life	Yes

- (g) *Bonded Fiber Matrices (BFM)*. BFM shall consist of hydraulically-applied matrix with a minimum of 70 percent non-toxic thermally processed or refined long strand organic fibers and water soluble tackifier to provide erosion control and shall be designed to be functional for a minimum of 9 months. BFMs form an erosion-resistant blanket that promotes vegetation and



prevents soil erosion. The BFM shall be 100 percent biodegradable. The binder in the BFM shall also be biodegradable. BFM's shall conform to the following requirements:

Property	Requirement	Test Method
Ground Cover (%)	95	ASTM D6567
Bio-degradability (%)	100	ASTM D5338
Functional Longevity (months)	9 month minimum	
Cure Time (hours)	24-48	
Cross-linked Tackifier	10% minimum	
Application		
Application Rate (lbs./Acre)	3000	

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

## CONSTRUCTION REQUIREMENTS

### 213.03

- (a) *Hay or Straw Mulching.* After seeding has been completed or when required for erosion control, hay or straw shall be uniformly applied, with no bare soil showing, at the rate designated in the Contract or as directed. It shall be crimped in with a crimper or other approved equipment. The Engineer may order hand-crimping on areas where mechanical methods cannot be used.

The seeded area shall be mulched and crimped within four hours after seeding. Areas not mulched and crimped within four hours after seeding or prior to precipitation or damaging winds on site shall be reseeded with the specified seed mix at the Contractor's expense, prior to mulching and crimping.

When tackifier is required in the Contract it shall be applied in the following order: (1) mulching, (2) mulch tackifier.

- (b) *Hydraulic Mulching.* Wood cellulose fiber mulch and mulch tackifier shall be added to water to form a homogeneous slurry. The operator shall spray apply the slurry mixture uniformly over the designated seeded area.

Hydraulic mulching shall not be done in the presence of free surface water.

Mixing procedure for the hydraulic mulch and tackifier mixture shall be as follows:

- (1) Fill tank with water approximately  $\frac{1}{4}$  full.
- (2) Continue filling while agitating with engine at full rpm.
- (3) Pour tackifier, at a moderate rate, directly into area of greatest turbulence.
- (4) With the recommended amount of tackifier in solution, add wood cellulose fiber mulch. Do not add fertilizer.

Apply the hydromulch and tackifier mixture at the following rate:

<b>Wood Cellulose Fiber Mulch</b>	<b>Tackifier</b>
2000 lbs./Acre	100 lbs./Acre

- (c) *Mulch Tackifier.*

Mixing procedure for mulch tackifier shall be as follows:

- (1) Fill tank with desired amount of water and run engine at full R.P.M.
- (2) Add wood cellulose fiber. Agitate until a homogenous, non-lumpy slurry is formed. Do not add fertilizer

(3) Slowly sift powdered tackifier into slurry and continue to agitate for at least five minutes.

Mulch tackifier shall be sprayed over hay or straw using a nozzle that will disperse the spray into a mist that will uniformly cover the mulch.

Application Rate: Apply this as an overspray at the following rate or as approved by the Engineer.

<b>Powder</b>	<b>Wood Cellulose Fiber</b>	<b>Water</b>
200 lbs./Acre	300 lbs./Acre	2000 gal./Acre

(d) *General.* Mulch shall be tacked simultaneously or immediately upon completion of mulching and crimping to avoid non-uniform coverage. Areas not properly mulched, or areas damaged due to the Contractor's negligence, shall be repaired and remulched as described above, at the Contractor's expense.

Mulch removed by circumstances beyond the Contractor's control shall be repaired and remulched as ordered. Payment for this ordered corrective work shall be at the contract prices.

The Engineer may order test sections be established for adjusting the mulching equipment to assure conformance with the specified application rate. The Engineer may order equipment readjustment at any time.

(e) *Wood Chip Mulch.* A 4-inch layer, unless otherwise shown in the plans, of wood chip mulch shall be uniformly applied to all planting beds as shown on the plans or as directed. Wood chip mulch shall be placed in all tree and shrub saucers in seeded areas. Wood chip mulch shall be capable of matting together to resist scattering by the wind.

(f) *Metal Landscape Border.* Metal landscape border shall be installed along the lines and at the grades shown on the plans by an approved method that will not damage the border. Ends of metal landscape border shall overlap the next adjacent section a minimum of 6 inches. Metal landscape border shall be anchored with wire tie-downs at intervals of approximately 2 feet. Wire tie-downs shall be 9 gage wire at least 14 inches long. Metal landscape border shall be inserted into the ground by driving against the wire tiedowns; ground may be moistened to ease entrance into the ground. Driving on edge of metal landscape border will not be permitted except when the edge is properly shielded. Metal landscape border may be bent for sharp angles, and overlapped at closure of perimeter.

(g) *Spray-On Mulch Blanket.* Spray-on mulch blanket installation shall strictly comply with the Manufacturer's mixing recommendations and installation instructions. No chemical additives with the exception of fertilizer, soil pH modifiers, extended-term dyes and bio nutrients will be permitted. The spray-on mulch blanket shall be mixed and applied as follows:

The hydromulching vessel shall be filled with water to at least  $\frac{1}{3}$  capacity (high enough to cover agitators) prior to adding any material. Continue to fill vessel with water and slowly add the fibers while agitators are in motion. Run agitators at  $\frac{3}{4}$  speed. Continue to mix tank a minimum of 10 minutes prior to application.

Apply spray-on mulch blanket in a uniform application using a minimum 22 degree arc type nozzle. Apply hydro slurry in two directions (from top of slope down and from toe of the slope up, as well as, be applied at a minimum of two layers).

Co-polymer shall not be used use in channels, swales, or other areas where concentrated flows are anticipated and should not be used on saturated soils that have groundwater seeps.

(h) *Bonded Fiber Matrices (BFM).* Bonded fiber matrices shall strictly comply with the Manufacturer's mixing recommendations and installation instructions. No chemical additives with the exception of fertilizer, soil pH modifiers, extended-term dyes, and bio stimulant materials shall be permitted. BFMs shall be applied in a uniform application using a minimum 22 degree arc type nozzle. BFMs shall be applied in two directions (from top of slope down and from toe of the slope up, as well as, be applied at a minimum of two layers).

Biodegradable BFMs shall not be applied immediately before, during, or immediately after rainfall if the soil is saturated.

BFMs shall not be used use in channels, swales, or other areas where concentrated flows are anticipated and shall not be used on saturated soils that have groundwater seeps.

Foot traffic, mechanical traffic or grazing shall not be permitted on treated areas until vegetated. Treated areas damaged due to circumstances beyond the Contractor's control shall be repaired or re-applied as ordered. Payment for corrective work, when ordered, shall be at contract unit prices.

## METHOD OF MEASUREMENT

**213.04** The quantity of hay and straw mulch, wood chip mulch, wood fiber and, spray-on mulch blanket, bonded fiber matrix, and tackifier will not be measured but shall be the quantity designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. Measurement for acres will be by slope distances.

The quantity of mulch tackifier to be measured will be the actual number of pounds of dry tackifier powder used.

Metal landscape border will be measured by the linear foot of completed and accepted metal border. Measured length of metal landscape border will not include required overlap splices.

Spray-on mulch blanket and bonded fiber matrix will be measured by the acre or by the actual pounds of product applied, as shown on the plans. The area will be calculated on the basis of actual or computed slope measurements. The Contractor shall verify, prior to application, weight of spray on mulch blanket and bonded fiber matrix bags for certification of materials and application rate.

## BASIS OF PAYMENT

**213.05** The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Mulching ( )	Acre
Mulching (Hydraulic)	Acre
Mulching (Weed Free Hay)	Acre
Mulching (Weed Free Straw)	Acre
Mulching (Wood Chip)	Cubic Foot
Mulch Tackifier	Pound
Metal Landscape Border      Inch	Linear Foot
Spray-on Mulch Blanket	Acre
Spray-on Mulch Blanket	Pound
Bonded Fiber Matrix	Acre
Bonded fiber Matrix	Pound

Water, wood fiber, mixing and application for mulch tackifier will not be measured and paid for separately but shall be included in the work.

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

Payment for spray-on mulch blanket and bonded fiber matrix will be full compensation for all work and materials necessary to complete the item.

## SECTION 214 PLANTING

### DESCRIPTION

**214.01** This work consists of furnishing and planting trees, shrubs, wetland perennials, and other plant material, hereinafter referred to as “plants” and obtaining live brush layer cuttings from onsite willow species designated by the Engineer near the project site and planting them in moist areas as shown on the plans or as directed.

### MATERIALS

**214.02 General.** Plants shall be of the species or variety designated in the Contract, in healthy condition with normal well developed branch and root systems, and shall conform to the requirements of the current American Standard for Nursery Stock. The Contractor shall obtain certificates of inspection of plant materials that are required by Federal, State, or local laws, and submit the certificates to the Engineer.

All plants shall be free from plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine regulations of the State of origin and destination, and the Federal regulations governing Interstate movement of nursery stock.

The minimum acceptable sizes of all plants, with branches in normal position, shall conform to the measurements specified in the Contract.

Plants hardy in hardiness zones 2, 3, 4, and 5 only will be accepted. Hardiness zones are defined in U.S. Department of Agriculture publications.

All container grown plants shall be those plants that have been growing in a nursery for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.

Trees and shrubs shall have been root-pruned during their growing period in the nursery in accordance with standard nursery practice.

If plants of acceptable quality and specified variety or size are not available locally, the Contractor may:

- (1) Substitute acceptable plants that are larger than specified at no change in contract price.
- (2) On written approval, substitute smaller plants than those specified in the Contract at the adjusted price stated in the written approval.
- (3) On written approval, substitute plants of a different genus, species, or variety at the adjusted price stated in the written approval.

Before any substitution of plants will be considered, the Contractor shall furnish to the Engineer written statements from three sources verifying that the plants designated on the plans are not available.

At the landscape Pre-construction Conference, the Contractor shall name the nursery stock supplier for all items. The Contractor shall tag all nursery stock for inspection by the Engineer. The Engineer will reject any nursery stock not meeting the Contract at any of the three following times and locations:

- (1) At the named supplier’s location. The Engineer will notify the Contractor when nursery stock will be inspected at the supplier’s location.
- (2) On the project site at the time of delivery, prior to planting.
- (3) At the time of installation. Final acceptance of all plant material will be made at the time of installation on the project site.

Deciduous plants, broadleaf evergreens, and conifers shall be balled and burlapped, or in containers used in standard nursery practice. Balling and burlapping shall conform to the recommended specifications in the American Standard for Nursery Stock. The ball of the plant shall be natural, not made, and the plant shall be handled by the ball at all times. No balled and burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball.

Each species shall be identified by means of grower's label affixed to the plant. The grower's label shall include the data necessary to indicate conformance to specifications.

Plants for fall planting shall be furnished balled and burlapped or container-grown unless otherwise designated in the Contract or approved.

- (a) *Brush Layer Cuttings.* Brush layer cuttings taken from designated plants shall be at least 0.5 inch in diameter or larger. Brush layer cuttings shall be 24 to 36 inches long with the bottom end cut off at an angle and the top end with a straight cut. Cuttings shall be taken and installed while dormant in early spring. Cuttings shall not be planted when the ground is frozen. Brush layer cuttings shall be stored no longer than one week. The cuttings shall be stored by submerging them at least  $\frac{2}{3}$  of their length in containers of water, free from any harmful oil, chemical, sprays, or other materials. The containers shall be kept in the shade.
- (b) *Wetland Perennial Plants.* Perennial wetland plants shall be supplied in containers as designated in the Contract; no bare root material will be allowed. The original plant stock for the plants shall be from Colorado. Perennial plants shall have been growing at least one growing season in the nursery. Perennial shall not be shipped while in a dormant condition. Perennials shall be a minimum of 6 inches in height when applicable to the species. Water shall be applied to wetland perennial plants until soil is saturated. Wetland perennial plants shall be watered thoroughly every day for a period of one month.
- (c) *Stakes.* Wood stakes shall be 2 inches x 2 inches square, or 2  $\frac{1}{2}$  inch diameter and 6 feet long free from bends. Metal stakes shall be 6 feet long standard T-bar steel fence post or #4 or larger rebar. Wood stakes shall be made of untreated wood guaranteed to last in the ground at least two growing seasons. The bottom of wood stakes shall be pointed.
- (d) *Soil Conditioners and Fertilizer.* Soil conditioner shall consist of composted plant material, 90 percent  $\frac{1}{4}$  inch or less with a carbon to nitrogen ratio of 15:1 to 25:1. A sample of the soil conditioner and certificate of compliance shall be provided to the Engineer to verify the organic matter content, and carbon matter to nitrogen ratio shall be submitted one month prior to planting for approval.

Fertilizer for planting shall be used as specified in the Contract.

## CONSTRUCTION REQUIREMENTS

**214.03 General.** All plants shall be protected from drying out or other injury. Broken and damaged roots shall be pruned before planting.

- (a) *Planting Seasons.* Plants shall be planted in accordance with the Contract.

Areas to be planted shall be brought to the lines and grades designated or approved. The location of plants shown in the Contract is approximate to the degree that unsuitable planting locations shall be avoided. Trees shall be planted at least 30 feet from the edge of the traveled way, except when guardrail or vertical curb exists, this distance may be reduced to 20 feet. Locations and layouts shall be approved before preparatory work for planting is started. Shrubs shall not be planted closer than 6 feet from the edge of pavement.

All layout staking for planting shall be done by the Contractor and shall be approved by the Engineer before planting holes are prepared.

The Contractor shall place all plant material according to the approved planting plans, or as directed.

- (b) *Excavation.* Planting pits shall be circular in outline with vertical or sloped sides. Pits for trees and shrubs shall be at least two times greater in diameter than the earth ball.
- (c) *Planting.* Planting shall be done in accordance with good horticultural practices. Plants of upright growth shall be set plumb and plants of prostrate type shall be set normal to the ground surface. Plants with dry, broken, or crumbling roots will not be accepted for planting.

Planting pits shall be dug 2 to 4 inches shallower than the height of the rootball for trees, and 2 inches shallower for shrubs. In non-irrigated areas, planting pits shall be dug so that the top of the rootball is level with the final grade. The tree rootball shall be set in the center of the planting pit on undisturbed soil. Trees shall be stabilized and then the wire basket, any twine or wire, and burlap shall be removed before the pit is backfilled. Shrubs shall be planted in the center of the pit. Plastic, metal, fabric, or peat containers shall be removed. Shallow scores  $\frac{1}{4}$  to  $\frac{1}{2}$  inch deep shall be made along the edges of the rootball.

Areas to be planted with ground cover shall be prepared by placing topsoil and a  $\frac{1}{2}$  inch layer of soil conditioner on the ground surface, and roto-tilling to a depth of 6 inches. Ground cover shall be planted by excavating to a depth sufficient to accommodate the root structure of plant materials without crimping or bending roots. After planting, backfill shall be placed around the ground cover and compacted firmly around the roots. The planted areas shall be brought to a smooth and uniform grade, and then top dressed with a 2 inch mulch cover of the type specified on the plans.

- (d) *Backfilling.* When soil conditioner is specified, composted plant material shall be added and thoroughly mixed into the backfill material at the rate of 0.5 cubic foot per tree and 0.1 cubic foot per shrub.

Backfill shall be thoroughly worked and watered-in to eliminate air pockets. Watering shall be done immediately after the plant is placed. Backfilling of the planting pit shall be resumed after this water is absorbed. Roots and crown shall be covered with soil at this time. After the soil has settled, plants must be in the proper position and at the proper depth. Saucers shall be prepared around each plant to the dimensions shown on the planting details. When saucers are required they shall be covered with a 4 inch thick layer of fresh moist wood chip mulch conforming to Section 213. After completion of all planting and before acceptance of the work, the Contractor shall water plants installed under this Contract, as needed to maintain a moist root zone optimum for plant growth. Plants damaged by the Contractor's operations shall be replaced at the Contractor's expense.

Surplus soil remaining after backfilling is completed shall be used for constructing water retention berms, or, if not needed for berms, shall be thinly distributed (wasted) in the vicinity, subject to approval of the Engineer.

- (e) *Pruning.* All deciduous trees and shrubs shall be pruned in accordance with standard horticultural practice, preserving the natural character of the plant. Guidelines for pruning are indicated in the planting details. Pruning cuts shall be made with sharp clean tools.

All clippings shall become the property of the Contractor and be removed from the site.

- (f) *Staking.* All deciduous trees 2 inch caliper and greater shall be staked with two stakes. Stakes shall conform to subsection 214.02(c). Stakes shall be driven 2 feet into the ground with one stake on the side of the prevailing wind (generally the west side) and the other stake on the opposite side. Stakes shall be driven at least 1 foot outside each edge of the planting pit. Trees shall be guyed with 1 to 2 inch wide strips of nylon webbing with metal grommets.

Coniferous trees 4 feet or taller shall be staked as designated in the Contract or as directed.

Stakes shall be spaced equally around the tree.

Trees specified to be guyed with wire shall be secured with No. 12 gage annealed galvanized steel wire free of bends and kinks.

- (g) *Wrapping Materials.* Wrapping material shall be horticulturally approved waterproof wrapping paper. Wrapping shall be applied from the base of the tree upward to the second scaffold branch and secured with arbor tape. Populus sp. are exempt from tree wrap. The Contractor shall submit the manufacturer's certification for the wrapping material requirements. Wrapping shall be done in the fall months prior to freeze, and removed in the spring. Wrapping shall not remain on any trees throughout the summer months. Wrapping shall be removed by the Contractor.

All plant tags shall be removed from plants and all packing or other material used by the Contractor shall be removed from the site.

- (h) *Brush Layer Cuttings.* Using a rock bar or other tool, holes at least 20 inches deep shall be made in the stream bank or other areas. A cutting shall be placed in each hole. If in riprap, the hole shall be backfilled with soil to within 3 inches of the riprap surface. The top 3 inches of the void shall be filled with gravel from the stream bank or streambed and compacted slightly. The remaining exposed length shall be cut off 2 to 3 inches above the ground line. The placement of these cuttings shall be in areas shown on the plans that remain damp or are seasonally inundated, as directed. Brush layer cuttings shall be planted at a density of one cutting per square yard on streambank or other designated areas that have been regraded, riprapped, or disturbed. The strip that is most successful for brush layer cutting establishment is only several yards wide and approximately, plus or minus, 2 feet from the ordinary high water line.

Water shall be applied to the brush layer cuttings planted areas until the soil mass is saturated. Brush layer cuttings shall be watered thoroughly every day for a period of one month.

- (i) *Irrigation.* Plantings that are to be irrigated shall be planted so that the irrigation system is operating and supplying the designated amount of water as planting is occurring. Plants shall be watered within 15 minutes of planting.

**214.04 Landscape Establishment.** From the time of installation, during construction, and throughout the Landscape Establishment period the Contractor shall maintain all plant material and seeded areas in a healthy and vigorous growing condition, and ensure the successful establishment of vegetation. This includes performing establishment, replacement work, and landscape maintenance work as described below.

The beginning of the Landscape Establishment period depends upon receipt of the written Notice of Substantial Landscape

Completion from the Engineer. Substantial Landscape Completion occurs when all plant materials in the Contract have been planted and all work under Sections 212, 213, 214 and 623 has been performed, except for the Section 214 pay item, Landscape Maintenance. If the Notice of Substantial Landscape Completion is issued during the spring planting season, the Landscape Establishment period begins immediately and lasts for a period of 12 months. If the Notice of Substantial Landscape Completion is issued at any other time, the Landscape Establishment period begins at the start of the next spring planting season and lasts for a period of 12 months.

- (a) *Establishment and Replacement.* After all planting on the project is complete, a plant inspection shall be held including the Contractor, Engineer and CDOT Landscape Architect to determine acceptability of plant material. During the inspection, an inventory of rejected material will be made, and corrective and necessary cleanup measures will be determined.

Dead, dying, or rejected material shall be removed each month during the Landscape Establishment period as directed. Plant replacement shall be performed during the spring planting seasons at the beginning and end of the Landscape Establishment Period. Plant replacement stock shall be planted in accordance with the Contract and is subject to all requirements specified for the original material. Plant replacement shall be at the Contractor's expense.

- (b) *Landscape Maintenance.* During the Landscape Establishment period the Contractor shall perform landscape maintenance as described herein. The Contractor shall maintain all landscaped areas in the condition they were in when first installed and accepted.

Prior to the Notice of Substantial Landscape Completion, the Contractor shall submit a detailed maintenance plan which includes a schedule showing the number of hours or days personnel will be present, the type of work to be performed, supervision, equipment and supplies to be used, emergency program and responsible person to contact for emergency work, and inspection schedule. The detailed maintenance plan is subject to review and approval by the Engineer. The Engineer will not issue the Notice of Substantial Completion until the Engineer has received and approved the maintenance plan.

The proposed types, brand names, material safety data sheets, and rates of application of herbicides, pesticides, and fertilizers to be used shall be submitted for approval with the detailed maintenance plan. Herbicides, pesticides, and fertilizers shall meet all local, state, and federal regulations and shall be applied by a licensed applicator.

The Contractor shall perform start-up, watering, programming, operation, and fall winterization of the irrigation system. The Contractor shall do a spring start-up of the irrigation system prior to Final Acceptance and perform all irrigation system warranty work as specified in Section 623.

The Contractor shall keep a project diary documenting all landscape and irrigation maintenance activities including work locations and time spent. The Contractor shall provide copies of the diary to the Engineer upon request.

The Contractor shall restore and reseed eroded areas and areas of poor establishment in accordance with Sections 212 and 213. The Contractor shall maintain staking and guying until the end of the Landscape Establishment period. The Contractor shall remove all guying wire, straps, and stakes at the end of the Landscape Establishment period.

During the landscape establishment period, the Contractor shall water, cultivate, and prune the plants and repair, replace, or readjust guy material, stakes, and posts as required or directed by the Engineer. The Contractor shall reshape plant saucers, repair washouts and gullies, replace lost wood chip mulch, keep all planting sites free from weeds and do other work necessary to maintain the plants in a healthy and vigorous growing condition. This includes seasonal spraying or deep root watering with approved insecticides or fungicides as required.

1. *Watering in Irrigated Areas.* Trees planted at all locations on the project shall be watered once per month at the rate of 30 gallons per tree for the months November through April until the Landscape Establishment period ends.

Shrubs planted at all locations on the project shall be watered once per month at the rate of 10 gallons per shrub for the months November through April until the Landscape Establishment period ends.

2. *Watering in Non-irrigated Areas.* Trees planted shall be watered twice per month by the Contractor at the rate of 30 gallons per tree per watering for the months May through October, and once per month at the rate of 30 gallons per tree for the months November through April of the 12 month period following planting.

Shrubs planted in upland areas shall be watered twice per month by the Contractor at the rate of 10 gallons per shrub per watering for the months May through October, and shall be watered once per month at the rate of 10 gallons per shrub for the months November through April of the 12 month period following planting.

The contract performance bond, required by subsection 103.03, shall guarantee replacement work during the plant establishment period.

If all other work is completed on a project, no contract time will be charged during the plant establishment period.

## METHOD OF MEASUREMENT

**214.05** The quantity of planting to be measured will be the number of plants, of the types and sizes designated in the Contract, that are actually planted and accepted.

The quantity of brush layer cuttings will be measured by the actual number planted, complete in place and accepted.

Landscape Maintenance will not be measured, but will be paid for on a lump sum basis.

## BASIS OF PAYMENT

**214.06** The accepted quantities of planting, and brush layer cuttings will be paid for at the contract unit price for each of the various items listed below that appear in the bid schedule.

Payment for the total cost of the item will be made at the completion of planting.

Cost of the performance bond shall be included in the cost of the plant items.

Payment will be made under:

Pay Item	Pay Unit
____ Tree ____ Inch Caliper	Each
____ Tree ____ Foot	Each
____ Shrub ( ____ Gallon Container)	Each
Perennials ( ____ Quart Container)	Each
Perennials ( ____ Gallon Container)	Each
Brush Layer Cuttings	Each
Landscape Maintenance	Lump Sum

Water required for all items of work will not be measured and paid for separately, but shall be included in the work.

Payment shall be full compensation for all work necessary to complete the item.

For each month that landscape maintenance is performed and accepted during the landscape maintenance period as specified in subsection 214.04, payment for landscape maintenance will be made in installments as follows:

- (1) 10 percent of the lump sum amount will be paid for each of the eight growing season months, March through October.
- (2) 5 percent of the lump sum amount will be paid for each of the winter months, November through February.

Landscape maintenance performed during construction will not be measured and paid for separately, but shall be included in the work.

Landscape Establishment, except for landscape maintenance, will not be paid for separately, but shall be included in the work.



## SECTION 215 TRANSPLANTING

### DESCRIPTION

**215.01** This work consists of transplanting trees, shrubs, plugs of wetland material including root mats from existing wetlands, and other plant material, hereinafter referred to as "plants," of the designated species in accordance with this specification and accepted standard horticultural practice at the designated locations. Transplanting season is that period when plants are in a dormant condition and can be moved. Dormant means that deciduous material is without leaves and coniferous material is without new candle growth. Transplanting done in periods not considered dormant transplanting season shall require advance approval.

### MATERIALS

**215.02** Plants to be transplanted shall be those which are flagged on the project site within the right of way, or as directed.

Plugs shall be dug from areas noted in the Contract or as directed by the Engineer. Removal shall be dispersed throughout the areas so as not to impact the existing wetland. Plugs shall be taken in early spring, when plants are emerging. Plugs shall be a minimum of 4 inches in diameter and 6 inches to 8 inches deep with the root mat to remain intact. Plugs shall not be stockpiled but shall be transplanted directly to wetland mitigation sites as directed. Transplanting shall be accomplished the day they are dug. Plugs shall be kept moist and shall not be placed in holding beds

### CONSTRUCTION REQUIREMENTS

**215.03** Plants shall be dug, properly pruned, and prepared for transplanting in accordance with standard practice. The root system shall be kept moist and plants shall be protected from adverse conditions due to climate and transporting from the time they are dug to the actual planting.

Prior to removal for transplanting, all coniferous trees shall be sprayed with an approved anti-desiccant.

The following table represents the minimum diameter of root balls for collected plants.

<b>Type 6 - Collected Pinon Pine</b>	
<b>Caliper</b>	<b>Min. Ball Dia.</b>
1 to 1½ inch	15 inch
1½ to 2 inch	17 inch
2 to 2½ inch	20 inch h
2½ to 3 inch	24 inch
3 to 3½ inch	26 inch
3½ to 4 inch	28 inch
4 to 4½ inch	30 inch
4½ to 5 inch	32 inch
<b>Type 7 - All Collected Plants Other than Pinon Pine</b>	
<b>Caliper</b>	<b>Min. Ball Dia.</b>
1 to 1½ inch	14 inch
1½ to 2 inch	16 inch
2 to 2½ inch	20 inch
2½ to 3 inch	24 inch
3 to 3½ inch	28 inch
3½ to 4 inch	32 inch
4 to 4½ inch	36 inch
4½ to 5 inch	40 inch

For caliper sizes larger than those given under Type 7, the ratio of ball diameter to caliper shall be 8:1.

Planting pits for balled and burlapped trees shall be circular in outline with vertical sides. Pits shall be at least two times greater in diameter than the earth ball. Before a tree is placed in a plant pit, the pit shall be filled half full of water. Backfill shall be thoroughly worked and watered to eliminate air pockets. Unsuitable backfill soils shall be replaced.

Trees shall be machine transplanted with tree spades. The following table represents the minimum size of spade machine equipment to be used for transplanting plants based upon caliper size. The table also represents the minimum diameter of root-

balls for machine transplanted plants.

<b>Caliper</b>	<b>Min. Spade Machine Size (Based upon root ball width)</b>
1 to 3 inch	44 inch
3 to 6 inch	65 inch
6 to 9 inch	80 inch
9 to 12 inch	90 + inch

Each tree shall be transported to the new site using the same spade with which it was dug, or several trees may be spade-dug and transported in a pod trailer manufactured specifically for this purpose. Trees shall not be removed from spade or transported in a haul truck. The Contractor shall give the Engineer one week notice prior to transplanting trees. At the time of transplanting the Engineer will designate a Department landscape architect to be on the site to oversee all tree planting.

Planting pits for machine-dug trees shall have the same dimension as the machine ball being placed. Before a tree is placed in a planting pit, the pit shall be filled half full of water and allowed to drain. Once the tree is placed, voids in the pit shall be filled with clean suitable backfill and tamped. If unsuitable soil is encountered in the planting pits, the Contractor shall dispose of said material and backfill with suitable material as determined by the Engineer.

After the tree is planted (collected or machine transplanted), a basin shall be built to hold at least 30 gallons of water. For each inch of trunk diameter greater than 3 inches, the basin capacity shall be increased by 10 gallons. The depth of saucer shall not be below the top of the root system of the tree. The basin shall be filled with water three times and allowed to stand each time until empty before refilling. Saucers shall be covered with a 4 inch thick layer of fresh moist wood chip mulch as shown on the plans. The size of mulch shall be approximately ¼ to ½ inch wide and 3 to 4 inches long. A sample shall be submitted in advance to the Engineer for approval.

Transplanting shall be accomplished within one day. Trees shall not be placed in holding beds.

All transplanted trees shall be subject to a 180 day maintenance period during one or more growing seasons and shall be watered every seven calendar days. Each watering shall be 100 gallons per tree.

All transplanted trees shall be guyed in accordance with Standard Plan M 214 1. Guying material shall be removed at the end of the 180 day maintenance period. All trees damaged by the Contractor's operations shall be replaced and replanted at the Contractor's expense as approved. At the end of the 180 day maintenance period all dead trees shall be replaced and replanted with trees at the Contractor's expense. Further maintenance will not be required.

The Contractor shall not damage existing landscaped areas, including but not limited to turf, irrigation equipment, and other plants, during the transplanting operation. The Contractor may use suitable platform material over existing turf to prevent damage from heavy machinery.

Wetland plugs shall be a minimum of 4 inches in diameter and 6 to 8 inches in depth. Holes left in the existing wetlands from plug removal shall be filled with topsoil and tamped lightly. After tamping, the filled hole shall be at the same elevation as the existing surrounding wetlands.

Transplant plugs shall be placed in containers (one plug per container) after harvesting to facilitate handling and placing of material.

Plugs shall be spaced as directed in the Contract. Plugs shall be planted to match surrounding grade.

Water shall be applied to plugs until soil is saturated. Plugs shall be watered thoroughly every day for a period of one month.

## **METHOD OF MEASUREMENT**

**215.04** The quantity of transplanting to be measured will be the actual number of plants of the various types transplanted and accepted.

The quantity of transplanted trees to be measured will be the actual number of trees of the various calipers and types transplanted and accepted in their final location.

Caliper measurement shall conform to the USA Standard for Nursery Stock, sponsored by the American Association of Nurserymen, Inc.

Only living plants in healthy condition at the end of the maintenance period will be accepted. If all other work is completed on the project, contract time will not be charged during the maintenance period.

The quantity of transplanted plugs to be measured will be the actual number of plugs transplanted and accepted in their final locations.

**BASIS OF PAYMENT**

**215.05** The accepted quantities of transplanting measured as provided above will be paid for at the contract unit price each.

Payment will be made under:

<b>Pay Item</b>		<b>Pay Unit</b>
Transplant Tree	Inch	Each
Transplant Shrub		Each
Transplant Plug		Each

Water required will not be measured and paid for separately, but shall be included in the work.

Hauling plants to their new location, removing unsuitable backfill, and providing clean suitable backfill for planting pit voids will not be measured and paid for separately but shall be included in the work

## SECTION 216 SOIL RETENTION COVERING

### DESCRIPTION

**216.01** This work consists of furnishing, preparing, applying, placing, and securing soil retention blankets and turf reinforcement mats for erosion control on roadway slopes or channels as designated in the Contract.

### MATERIALS

**216.02** Soil retention covering shall be either a soil retention blanket or a turf reinforcement mat as specified in the Contract. It shall be one of the products listed on CDOT's Approved Products List and shall conform to the following:

- (a) *Soil Retention Blanket*. Soil retention blanket shall be composed of degradable natural fibers mechanically bound together between two slowly degrading synthetic or natural fiber nettings to form a continuous matrix and shall conform to the requirements of Tables 216-1 and 216-2. The blanket shall be of consistent thickness with the fiber evenly distributed over the entire area of the mat.

When specified, lightweight polypropylene netting shall be 1.5 pounds per 1000 square feet; heavyweight netting shall be 2.9 pounds per 1000 square feet.

When biodegradable blanket is specified, the thread shall be 100 percent biodegradable; polypropylene thread is not allowed.

When photodegradable netting is specified, the thread shall be polyester, biodegradable or photodegradable.

Blankets and nettings shall be non-toxic to vegetation and shall not inhibit germination of native seed mix as specified in the Contract. The materials shall not be toxic or injurious to humans. Class 1 blanket shall be an extended term blanket with a typical 24 month functional longevity. Class 2 blanket shall be a long term blanket with a typical 36 month functional longevity. The class of blanket is defined by the physical and performance characteristics.

1. *Soil Retention Blanket (Straw-Coconut)*. Soil Retention Blanket (Straw-Coconut) shall be a machine produced mat consisting of 70 percent certified weed free agricultural straw or Colorado native grass straw and 30 percent coconut fiber. The blanket shall be either biodegradable or photodegradable. Blankets shall be sewn together on a maximum 2 inch centers.

Netting shall be as follows:

When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave unattached at intersections which allows the strands of the net to move independently of each other.

When photodegradable netting is specified, the bottom side shall be lightweight polypropylene. The top side shall be heavyweight or lightweight polypropylene.

2. *Soil Retention Blanket (Excelsior)*. Soil Retention Blanket (Excelsior) shall consist of a machine produced mat of 100 percent curled wood excelsior, 80 percent of which shall be 6 inches or longer in fiber length. It shall be either biodegradable or photodegradable. Blankets shall be sewn together at a maximum of 4 inch centers.

Netting shall be as follows:

When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave unattached at intersections which allows the strands of the net to move independently of each other.

When photodegradable netting is specified, the bottom side shall be lightweight polypropylene. The top side shall be heavyweight or lightweight polypropylene.

3. *Soil Retention Blanket (Coconut)*. Soil Retention Blanket (Coconut) shall be a machine produced mat consisting of 100 percent coconut fiber. It shall be either biodegradable or photodegradable.

Netting shall be as follows:

When biodegradable netting is specified, the top and bottom netting shall be 100 percent biodegradable organic jute fiber. Netting shall be constructed using a weave which is unattached at the intersections, and which allows the strands of the net to move independently of each other.

When photodegradable netting is specified, the bottom and top side shall be heavyweight polypropylene.

**Table 216-1  
PHYSICAL REQUIREMENTS  
FOR SOIL RETENTION BLANKET –  
PHOTODEGRADABLE OR BIODEGRADABLE BLANKETS**

Photo/Bio Degradable Class	Minimum Roll Width	Minimum Thickness ASTM D6525	Acceptable Matrix Fill Material	Min. Mass per Unit Area ASTM D6475	Size of Net Opening	
					Photo-degradable	Bio-degradable
1	6.5 ft.	250 mils	Straw/Coconut	8 oz/sy	Minimum: 0.50"x0.50"	Minimum: 0.50"x0.50"
					Maximum: 0.75"x0.75"	Maximum: 0.5"x1.0"
1	6.5 ft.	250 mils	Excelsior	8 oz/sy	Minimum: 0.50"x0.50"	NONE
					Maximum: 1.0"x2.0"	
2	6.5 ft.	200 mils	Coconut	8oz/sy	Minimum: 0.50" x0.5"	Minimum: 0.50"x0.50"
					Maximum: 0.75"x0.75"	Maximum: 0.5"x1.0"

**Table 216-2  
PERFORMANCE REQUIREMENTS  
FOR SOIL RETENTION BLANKET –  
PHOTODEGRADABLE OR BIODEGRADABLE BLANKETS**

Photo/Bio Degradable Class	Slope Application "C" Factor <sup>1</sup> ASTM D6459	Minimum Tensile Strength MD <sup>2</sup> ASTM D6818
1	< 0.10 at 3:1	8.33 lbs/in
2	< 0.10 at 3:1	10.42 lbs/in
Notes: <sup>1</sup> "C" Factor is calculated as ratio of soil loss from soil retention blanket protected slope (tested at specified or greater gradient, 3H:1V) to ratio of soil loss from unprotected (control) plot in large-scale testing. <sup>2</sup> MD is for machine direction testing (along the length of the roll).		

Blankets shall be tested for physical properties and have published data from an independent testing facility.

Large scale testing of Slope Erosion Protection ("C" factor) shall be performed by an independent testing facility.

- (b) *Turf Reinforcement Mat.* Turf reinforcement mat (TRM) shall be a rolled mat consisting of UV stabilized, corrosion resistant, non-degradable synthetic fibers, filaments, or nets processed into a permanent three-dimensional matrix of the thickness specified in Tables 216-3 and 216-4. TRMs shall provide sufficient thickness, strength and void space to permit soil filling and retention, and the development of vegetation within the matrix. The class of TRM is defined by the physical and performance characteristics as specified in the following tables.

**Table 216-3  
PHYSICAL REQUIREMENTS<sup>1</sup>  
FOR TURF REINFORCEMENT MAT**

Product Class	Minimum Roll Width	Minimum Thickness ASTM D6525	Acceptable Matrix Fill Material <sup>2</sup>	Size of Net Opening <sup>2</sup>
1	6.5 ft.	250 mils	Excelsior, Straw/Coconut, Coconut, or Polymer fibers	Minimum: 0.50"x0.50"
				Maximum: 0.75"x0.75"
2	6.5 ft.	250 mils	100% UV Stabilized Synthetic or Coconut Fibers	Maximum 0.50"x 0.50"
3	6.5 ft.	250 mils	100% UV Stabilized Synthetic Fibers	Maximum 0.50"x 0.50"
<b>Notes:</b>				
<sup>1</sup> For TRMs containing degradable components, all property values shall be obtained on the non-degradable portion of the matting alone.				
<sup>2</sup> For TRMs with nets and fill material. Netted TRMs shall be sewn together on a maximum 2 inch centers.				

**Table 216-4  
PERFORMANCE REQUIREMENTS  
FOR TURF REINFORCEMENT MAT**

Product Class	Tensile Strength MD ASTM D6818	Minimum UV Stability at 500 Hours ASTM D4355	Minimum Permissible Shear Stress <sup>1</sup> (Unvegetated) ASTM D6460
1	125 lbs/ft	80%	1.8 lbs/sf
2	150 lbs/ft	80%	2.5 lbs/sf
3	175 lbs/ft	80%	3.1 lbs/sf
<b>Notes:</b>			
<sup>1</sup> Permissible shear stress is the minimum shear stress that a product must be able to sustain when placed on a channel un-vegetated without physical damage or excess soil loss. Failure is defined as ½ inch of soil loss during a 30 minute flow event in large scale testing.			

TRMs shall be tested for physical properties and have published data from an independent testing facility.

Large scale testing of Permissible Shear Stress shall be performed by an independent testing facility.

- (c) *Staples*. Staples shall be made of ductile steel wire, 0.165 inches in diameter, 8 inches long and have a 1 inch crown. "T" shaped staples will not be permitted.

A sample of the staples and a Certificate of Compliance (COC) including the manufacturer's product data showing that the product meets the Contract requirements shall be submitted for approval at the Environmental Pre-construction Conference. Installation of the blanket will not begin until approval has been received from the Engineer in writing.

- (d) *Earth Anchors*. The mechanical earth anchor shall be composed of a load bearing face plate, a tendon rod or wire rope, and a locking head or percussion anchor. Each element of the anchor shall be composed of corrosion resistant materials. The anchor and wire rope shall have a breaking strength of 9,500 pounds utilizing standard tensile testing and ASTM A1007-07. The anchor shall have a minimum 1,000 pounds ultimate holding strength in normal soil and a manufacturer's recommended

minimum driven depth of 3.5 feet.

A sample of the anchors and a Certificate of Compliance (COC) including the manufacturer's product data showing that the product meets the Contract requirements shall be submitted for approval at the Environmental Pre-construction Conference. Installation of the blanket will not begin until approval has been received from the Engineer in writing.

## CONSTRUCTION REQUIREMENTS

**216.03** The Contractor shall install soil retention coverings in accordance with Standard Plan M-216-1 and the following procedure:

- (1) Prepare soil in accordance with subsection 212.06(a).
- (2) Apply topsoil or soil conditioning as directed in the Contract to prepare seed bed.
- (3) Place seed in accordance with the Contract.
- (4) Unroll the covering parallel to the primary direction of flow.
- (5) Ensure that the covering maintains direct contact with the soil surface over the entirety of the installation area.
- (6) Do not stretch the material or allow it to bridge over surface inconsistencies.
- (7) Staple the covering to the soil such that each staple is flush with the underlying soil.
- (8) Ensure that staples or earth anchors are installed full depth to resist pull out. No bent over staples will be allowed. Install anchor trenches, seams, and terminal ends as shown on the plans.

The Contractor shall install TRMs using the following procedure:

- (1) Place 3 inches of topsoil or soil amended with soil conditioning.
- (2) Apply half of the specified seed at the broadcast rate and rake it into the soil.
- (3) Install TRM.
- (4) Place 1 inch of topsoil or soil amended with soil conditioning into the matrix to fill the product thickness.
- (5) Apply the remaining half of the specified seed at the broadcast rate and rake it into the soil.
- (6) Install soil retention blanket (Photodegradable or Biodegradable Class 1) over the seeded area and TRM.

When applicable, the covering shall be unrolled with the heavyweight polypropylene netting on top and the lightweight polypropylene netting in contact with the soil.

**216.04 Slope Application.** Soil retention coverings shall be installed on slopes as follows:

The upslope end shall be buried in a trench 3 feet beyond the crest of the slope if possible. Trench depth shall be a minimum of 6 inches unless required by the manufacture to be deeper. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over trench and secured with staples or earth anchors at 1 foot on center.

There shall be an overlap wherever one roll of fabric ends and another begins with the uphill covering placed on top of the downhill covering. Staples shall be installed in the overlap.

There shall be an overlap wherever two widths of covering are applied side by side. Staples shall be installed in the overlap.

Staple checks shall be installed on the slope length at a maximum of every 35 feet. Each staple check shall consist of two rows of staggered staples.

The down slope end shall be buried in a trench 3 feet beyond the toe of slope. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over the trench and secured with staples or earth anchors. If a slope runs into State waters or cannot be extended 3 feet beyond the toe of slope, the end of covering shall be secured using a staple check as described above.

Coverings shall be securely fastened to the soil by installing staples or earth anchors at the minimum rate shown on the Standard Plan M-216-1. Staple or earth anchor spacing shall be reduced where required due to soil type or steepness of slope.

**216.05 Channel Application.** Soil retention coverings shall be installed as follows on a channel application:

Coverings shall be anchored at the beginning and end of the channel across its entire width by burying the end in a trench. Trench depth shall be a minimum of 6 inches, unless a larger depth is specified by the manufacturer's recommendations. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil and compacted by foot tamping, and seeded. Fabric shall be brought back over the trench and stapled.

Covering shall be unrolled in the direction of flow and placed in the bottom of the channel first. Seams shall not be placed down

the center of the channel bottom or in areas of concentrated flows when placing rolls side by side.

There shall be an overlap wherever one roll of covering ends and another begins with the upstream covering placed on top of the downstream covering. Two rows of staggered staples shall be placed.

There shall be an overlap wherever two widths of covering are applied side by side. Staples shall be placed in the overlap.

The covering shall have a channel check slot every 30 feet along the gradient of the flowline. Check slots shall extend the entire width of the channel. The covering shall be buried in a trench. Before backfilling begins, staples shall be placed across the width of the trench. The trench shall then be backfilled to grade with soil amended with soil conditioning or topsoil, compacted by foot tamping, and seeded. Fabric shall be brought back over the trench and continued down the channel.

Coverings shall be securely fastened to the soil by installing staples at the minimum rate shown on the plans. Staple spacing shall be reduced where needed due to soil type or high flows.

**216.06 Maintenance.** The Contractor shall maintain the soil retention coverings until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damage is due to the Contractor's operations. Maintenance shall be performed at the Contractor's expense. Repair of those areas damaged by causes not attributable to the Contractor's operations shall be repaired by the Contractor and will be paid for at the contract unit price. Areas shall be repaired to reestablish the condition and grade of the soil and seeding prior to application of the covering.

## METHOD OF MEASUREMENT

**216.07** Soil retention coverings, including staples, complete in place and accepted, will be measured by the square yard of finished surface, excluding overlap, which is installed and accepted. Earth anchors will be measured by the actual number of earth anchors complete in place and accepted.

## BASIS OF PAYMENT

**216.08** The accepted quantities of soil retention coverings will be paid for at the contract unit price per square yard. The accepted quantities of earth anchors will be paid for at the contract unit price for each installed.

Payment will be made under:

Pay Item	Pay Unit
Soil Retention Blanket ( ) (Photodegradable Class )	Square Yard
Soil Retention Blanket ( ) (Biodegradable Class )	Square Yard
Turf Reinforcement Mat (Class )	Square Yard
Earth Anchors	Each

Preparation of seedbed, fertilizing, and seeding will be measured and paid for in accordance with Section 212.

Placing and preparation of seedbed, fertilizing, and seeding of soil under the TRM layer will be measured and paid for in accordance with Section 212.

Topsoil or amended soil and seed placed on the TRM will be measured and paid for in accordance with Sections 207 and 212.

Staples will not be measured and paid for separately, but shall be included in the work.



## SECTION 217 HERBICIDE TREATMENT

### DESCRIPTION

**217.01** This work consists of furnishing and applying herbicides to prevent or control plant growth in areas shown on the plans or designated.

### MATERIALS

**217.02** Herbicides shall be designated in the contract.

All herbicide labels shall be currently registered with the Colorado Department of Agriculture and the U.S. Environmental Protection Agency. All herbicides shall be supplied to the project in labeled containers. The labels shall show the product name, chemical composition, expiration date, and directions for use.

### CONSTRUCTION REQUIREMENTS

**217.03** All herbicides shall be applied by commercial pesticide applicators licensed by the Colorado Department of Agriculture as qualified applicators. The Contractor shall furnish documentation of such licensing prior to herbicide application. Herbicide mixing and application shall be done in accordance with instructions on the registered product label. The Engineer shall be furnished such label information prior to mixing and application.

The Contractor shall notify the Engineer at least 24 hours prior to each herbicide application and shall indicate the time and location application will begin. Application will not be allowed on Saturdays, Sundays, or holidays unless otherwise approved by the Engineer.

Herbicides shall not be applied when weather conditions, including wind conditions, are unsuitable for such work. Herbicides shall not be applied when soil is extremely dry.

Herbicide application method shall be such that plant growth outside the designated treatment areas will not be damaged. All damage caused by improper herbicide application shall be repaired at the Contractor's expense.

Herbicides shall not be used on areas that are to be topsoil sources unless otherwise approved by the Engineer.

### METHOD OF MEASUREMENT

**217.04** The quantity of herbicide treatment to be measured will be the actual number of square yards treated in accordance with the foregoing requirements or the actual number of hours the Contractor spends applying the herbicide and accepted by the Engineer. Areas designated to receive herbicide treatment will be measured once for each designated application. Reapplication of herbicide required due to inappropriate timing of the original application will not be measured or paid for.

### BASIS OF PAYMENT

**217.05** The accepted quantities of herbicide treatment will be paid for at the contract unit price per square yard or per hour.

Payment will be made under:

Pay Item	Pay Unit
Herbicide Treatment	Square Yard
Herbicide Treatment	Hour

Water will not be measured and paid for separately but shall be included in the work.