

## **11.0 EARTHWORK**

### **11.1 Construction Requirements**

#### **11.1.1 Removal of Structures**

The Contractor shall raze, remove, and dispose of all structures and obstructions which are identified on the Project, except utilities and structures and obstructions removed under other contractual agreements, and salvable material designated to remain the property of the Department.

Substructures of existing structures, regardless of location, shall be removed a minimum of one (1) foot below the existing natural ground surface or the proposed ground surface, whichever is at a lower elevation, and a minimum of five (5) feet horizontally from proposed underground structures if a conflict exists.

#### **11.1.2 Clearing and Grubbing**

The trees, logs, limbs, stumps, brush, trash, and other unsuitable materials cleared and grubbed from the Project shall be removed from the Site to an off-Site location by the Contractor. The Contractor shall conduct a landscape walkthrough prior to the start of any construction activities according to requirements of Book 2, Section 17 – Landscaping.

#### **11.1.3 Excavations and Embankments**

New embankment shall be benched into the existing slopes, where required, in accordance with Section 203.06 of the Standard Specifications.

##### **11.1.2.2 Settlement Requirements**

Prior to beginning placement of any new embankment, a series of settlement monitoring plates shall be installed at the native undisturbed or recompacted ground surface at the locations indicated on the plans or at the locations identified by the Engineer. Survey monitoring shall occur on the top of a capped 1-1/2 inch diameter galvanized pipe. The pipe shall be attached to a cap welded to a 2-foot by 2-foot square, 1/2-inch thick steel plate placed on the subgrade surface at the bottom of embankment elevation. The cap shall be welded to the steel plate so that the plate and pipe are at right angles to each other. Prior to placing any new embankment fill, the elevation of the top of steel plate immediately adjacent the welded cap, and the top of pipe shall be taken and recorded. Embankment fill placement may then commence.

When placing embankment fill, care should be taken to protect the pipe or the plate from disturbance or damage. As the new embankment fill is brought up in elevation, additional segments of pipe should be added using galvanized couplers to always maintain a pipe survey point above the surrounding embankment soil. In conjunction with any new segment of pipe being added to an existing pipe, the existing top of pipe elevation, and new added top of pipe elevation should both be surveyed. This is needed to always relate the top of pipe to settlement monitoring plate surface elevation.

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Should any of the pipes be damaged during embankment fill placement activities, or during the subsequent monitoring period as described below, the Contractor shall hand dig down to the closest pipe coupler connection and reattach a new pipe to the underlying undamaged pipe. This activity will again require that the top of the underlying pipe and new pipe be surveyed as it is added in order to establish an elevation correction. This elevation correction shall be applied to any subsequent elevation survey shots if replacement of a damaged pipe is performed.

After the embankment fill is brought to the design subgrade elevation, an initial survey settlement reading shall be taken immediately. Subsequent survey settlement readings shall occur at least once a week until the embankment is complete, followed by readings every two weeks thereafter until it is determined primary settlement is complete. The Contractor shall provide the Engineer with a copy of each settlement reading within 48 hours of collecting the reading in the field. The Contractor shall make every effort to preserve the integrity of the settlement survey including protecting the settlement locations from disturbance throughout the remainder of the construction activities.

During the monitoring period, work on the embankment area shall be minimal and limited to maintaining the contractor's SWMP and other similar Contract commitments. The purpose of the monitoring period is to allow primary settlement of embankment and foundation soil prior to construction of the pavement structure. The contractor shall monitor the settlement of the foundation soil through the use of the above described settlement monitoring plates using professional land survey equipment and methodologies capable of accurately surveying settlements to 0.01 of a foot. Each settlement reading shall include the date and time of the reading and the elevation of each survey location and shall be procured under the direct supervision of and sealed by a Colorado registered Professional Land Surveyor.

**11.1.2.1.2 I-25 Mainline, New Auxiliary Lanes, Ramps and City Streets**

The top two feet of subgrade immediately under the proposed Pavement Structure on all newly constructed composite pavements shall have a minimum resistance value (R-value) of 60 when tested by the Hveem Stabilometer and shall consist of A-1 or A-2 material when classified in accordance with AASHTO M 145. The minimum horizontal limits for this material shall be the outer limits of the Pavement Structure plus two feet on each side, including shoulders and curb and gutter.

The embankment within the roadway prism below the top two feet of sub-grade shall consist of materials within the AASHTO Classification of A-1, A-2 or A-3 with a maximum Plasticity Index of 20. The roadway prism shall be defined as the horizontal limits from 2 feet outside the pavement structure and then slope at 1:1 to meet existing ground.

The Contractor shall utilize the soils information included in Book 3 - Reference Documents and conduct a supplemental soil survey to confirm/ascertain whether the existing roadway soil satisfies the above conditions if it is desired to re-use the on-site materials in the "roadway prism". If the on-site materials are re-used, the material will be tested as stated in the 2014 CDOT Field Materials Manual during construction. This supplemental soil survey shall conform to the requirements as stated in the 2015 CDOT Field Materials Manual. Test holes are required

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at least every 1,000 feet. The Contractor shall provide any additional mitigation required as a result of the supplemental soil survey.

Where Roadway embankment is retained by structurally designed walls (retaining walls), the retained embankment material properties must be compatible with the soil parameters used in design of the walls. This applies to both externally stabilized and internally stabilized wall systems.

The results of the supplemental soil survey, along with any additional mitigation measures required, shall be submitted to CDOT for Approval before any embankment, aggregate base course, pavement and pavement related Work commences. The above information shall be submitted in a report format that clearly and concisely describes the existing soil conditions, delineates areas needing additional mitigation, and defines the required mitigation measures. The report shall include a soil profile, boring log, and the test results.

All Work shall be conducted per the 2015 CDOT Pavement Design Manual and the 2015 CDOT Field Materials Manual.

Alternative subgrade treatment shall be submitted to CDOT for Approval before any embankment, aggregate base course, pavement, and pavement related Work commences.

#### **11.1.2.1.3 Bikeway**

Bikeways shall be underlain by 6 inches of ABC Class 6 material. Soil 1 foot beneath the ABC Class 6 material shall be treated per the CDOT Standards. The ABC Class 6 material, and the subgrade moisture treatment/recompaction shall extend to the outer limits of the bikeway pavement, plus two feet on each side. City of Colorado Springs bikeways and trails shall conform to current City of Colorado Springs standards.

#### **11.1.2.2 Compaction Requirements**

The type of compaction for the Project shall be per the 2011 CDOT Standard Specifications with depth of moisture-density control as follows:

1. Full depth of all embankments
2. Six (6) inches for bases of cuts and fills unless otherwise specified.
3. Twelve (12) inches underneath the proposed pavement section (pavement/base course).
4. Compaction shall comply with AASHTO T-180, Modified Proctor, testing procedures.

#### **11.1.2.3 Reuse of Materials**

The Contractor is allowed to use broken concrete that is less than 6 inches in maximum dimension or broken asphalt that is less than 6 inches in maximum dimension for embankment material provided it is placed in accordance with Section 203.06 of the Standard Specifications unless otherwise noted. The contractor shall assume all the risk for materials placed in embankments and potential conflicts with the proposed landscaping, utilities, drainage and other sub surface features.

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Asphalt millings are allowed to be used for embankment material and shall be placed in accordance with the Standard Specifications. Asphalt millings will not be allowed to be used within the top 2 feet of embankment material immediately below the proposed Pavement Structure or as ABC within the Pavement Structure.

With Approval of CDOT, the existing subgrade may remain in place if it meets all other requirements herein, before any embankment, aggregate base course, pavement and pavement related Work commences.

The Contractor shall not use soil directly excavated from the Waldo Canyon burn area or soil displaced due to erosion from the post fire flooding. The soil is not suitable for embankment material and shall not be utilized on this project.

**11.1.2.4 Available Potential Source of Material**

An available potential source of material has not been identified for this Project.

**11.2 Deliverables**

At a minimum, the Contractor shall submit the following to CDOT for review, Approval, and/or Acceptance:

<b>Deliverable</b>	<b>review, Acceptance or Approval</b>	<b>Schedule</b>
Alternative subgrade treatment	Approval	Proposal shall be submitted a minimum of one month before any pavement and pavement related Work commences
Use of broken concrete or broken asphalt or asphalt millings as embankment Material	Approval	Proposal shall be submitted a minimum of one month before any pavement and pavement related Work commences

All deliverables shall also conform to the requirements of Section 3.

**11.3 Exhibits**

Exhibit A-Settlement Plate Locations