

DIVISION 200

SITE PROTECTION AND PREPARATION

ITEM SUBJECT

201 Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control

202 Landscaping

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ITEM 201. TEMPORARY EROSION, SEDIMENTATION, AND WATER POLLUTION PREVENTION AND CONTROL

201.1. DESCRIPTION

This Item shall govern the control measures necessary to prevent and control soil erosion, sedimentation, and water pollution that may degrade receiving waters including rivers, streams, lakes, reservoirs, groundwater, and wetlands. The control measures contained herein shall be installed and maintained throughout the construction contract and coordinated with any permanent or temporary pollution control features specified elsewhere on the plans and in the specifications to assure effective and continuous water pollution control throughout the construction and post construction periods. These control measures shall not be used as a substitute for the permanent pollution control measures unless otherwise directed by the CITY in writing. The controls may include silt fences, rock berms, diversion dikes, interceptor swales, sediment traps and basins, pipe slope drains, inlet protection, stabilized construction entrances, seeding, sodding, mulching, soil retention blankets, or other structural or non-structural storm water pollution controls.

The CITY reserves the right to have required temporary erosion sedimentation and water pollution prevention and control work performed by others should the CONTRACTOR fail to perform required temporary erosion, sedimentation, and water pollution prevention and control work in a timely fashion or should the CONTRACTOR fail to prevent and control soil erosion, sedimentation, and water pollution which may degrade receiving water. All costs including engineering and right-of-way costs for the work required shall be borne by the CONTRACTOR. The CONTRACTOR shall reimburse the CITY for all such costs within 30-days after receipt of the reimbursement request from the CITY. Failure to submit payment for such reimbursement costs in the time prescribed above may result in the CITY withholding the reimbursement due from the monthly progress payments to the CONTRACTOR until reimbursement to the CITY is made.

201.2. ITEMS OF WORK AND MATERIALS

The items, estimated quantities, and locations of the control measures will be shown on the plans; however, the CITY may increase or decrease the quantity of these items as needs arise. The materials will be shown on the plans and in the specifications. The CITY may allow, in writing, the use of other materials and work methods as the need arises.

201.3. PRECONSTRUCTION SUBMITTALS

Prior to the start of construction, the CONTRACTOR shall submit to the CITY'S representative for acceptance schedules for accomplishment of the storm water pollution control measures in accordance with the erosion and sediment control plan or the Storm Water Pollution Prevention Plan (SWPPP). Work on the project shall not begin until the schedules for implementation of the controls and methods of operations have been reviewed, and accepted by the CITY. The CONTRACTOR shall provide the CITY, for information purposes, proposed methods of storm water pollution control for CONTRACTOR operations in areas which are outside the limits of the erosion control plan or the SWPPP (such as construction and haul roads, field offices, equipment and supply storage areas, portable process plants, and source material storage), as well as a plan for disposal of waste materials.

201.4. CONSTRUCTION REQUIREMENTS

201.4.1. General. The CONTRACTOR shall provide control measures to prevent or minimize the impact of the CONTRACTOR'S operations to receiving waters as required by the plans or Storm Water Pollution Prevention Plan (SWPPP) and/or as directed by the CITY in writing.

In any disturbed area where construction activities have ceased, permanently or temporarily, the CONTRACTOR shall initiate stabilization of the area by the use of seeding, mulching, soil retention blankets or other appropriate measures within 14-days, except in areas where construction activities are scheduled to resume within 21-days.

The CONTRACTOR shall effectively prevent and control erosion and sedimentation on the site at the earliest practicable time as outlined in the approved schedule. Control measures, where applicable, will be implemented prior to the commencement of each construction operation. The CONTRACTOR shall limit the amount of disturbed earth to the area(s) shown on the plans or as directed by the CITY. The CITY has the authority to limit the disturbed surface area exposed by construction operations. If, in the opinion of the CITY, the CONTRACTOR is not able to effectively control soil erosion and sedimentation resulting from construction operations, the CITY will limit the amount of disturbed area to that which the CONTRACTOR is able to control.

Should the control measures fail to function effectively, the CONTRACTOR shall act immediately to bring the erosion and sedimentation under control by maintaining existing controls or by providing additional controls as directed by the CITY. When, in the opinion of the CITY, the site is adequately stabilized, the control measures, except mulches and soil retention blankets, will be removed and properly disposed of by the CONTRACTOR. Soil retention blankets shall be removed only when, in the opinion of the CITY, final permanent perennial seeding would be adversely affected by the presence of an existing soil retention blanket.

All erosion, sediment, and water pollution controls will be maintained in good working order. A rain gauge provided by the CONTRACTOR will be located at the project site. Every 14-days, and also within 24-hours of a rainfall event of 0.5-in. or more as measured by the project rain gauge, the CONTRACTOR and CITY will inspect the entire project to determine the condition of the control measures. Sediment will be removed and devices repaired as soon as practicable but no later than 7-days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment operations needed for repairs.

In the event of continuous rainfall over a 24-hour period, or other circumstances that preclude equipment operation in the area, the CONTRACTOR will install additional backup devices, as determined by the CITY, by other appropriate methods. The CONTRACTOR will remove silt accumulations and deposit the spoils in an area approved by the CITY as soon as practical. Any corrective action needed for the control measures will be accomplished in the sequence directed by the CITY; however, areas adjacent to receiving waters shall generally have priority, followed by devices protecting storm sewer inlets.

In the event of conflict between these requirements and storm water pollution control laws, rules or regulations of other Federal, State, or Local agencies, the more restrictive laws, rules or regulations shall apply.

201.4.2. Other Practices and Controls. The CONTRACTOR shall also conform to the following practices and controls.

201.4.2.1. Location and Construction of CONTRACTOR'S Auxiliary Areas. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any floodplain or receiving waters. Construction roads may not be located in or cross any receiving waters without prior approval of the CITY and shall be done in compliance with applicable rules and regulations. Staging areas and vehicle maintenance areas shall be constructed by the CONTRACTOR in a manner to minimize the runoff of pollutants and at a location approved by the CITY. The CONTRACTOR shall prevent pollution of receiving waters with petroleum products or other hazardous or regulated substances.

201.4.2.2. Activity In or Near Waters. Construction operations in receiving waters shall be restricted to those areas where it is necessary to perform the work shown on the plans. Wherever streams are crossed, temporary bridges, timber mats, or other structures shall be used and approved by the CITY. When work areas or material sources are located adjacent to a receiving water, control measures such as diversion dikes or rock berms shall be used to keep sediment and other contaminants from entering the adjacent receiving water. Care shall be taken during the construction and removal of such barriers to minimize down-gradient sedimentation.

All receiving waters shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris, or other obstructions placed during construction operations that are not a part of the finished work.

201.4.2.3. Materials Storage. Protected storage for paints, chemicals, solvents, fertilizers, and other potentially toxic materials will be provided by the CONTRACTOR at a location approved by the CITY.

201.4.2.4. Vegetation. Disturbance of vegetation shall be minimized and limited to only what is shown on the construction plans or as directed by the CITY in writing. Operations shall be in accordance with Item 202. Landscaping.

201.4.2.5. Keeping Roadways Clean. The CONTRACTOR shall clean paved surfaces, as necessary, to remove sediment that has accumulated on the roadway.

201.4.3. Cleaning and Stabilizing Project Area. The project will not be accepted until the CONTRACTOR has cleaned up. Project Clean-up to the satisfaction of the CITY. The project will also not be accepted until the CONTRACTOR provides a uniform perennial vegetative cover with a density of 70-percent of adjacent undisturbed areas or, if in the opinion of the CITY, permanent measures (such as riprap, gabions, geotextiles, or other stabilization methods approved by the CITY), supplemented by temporary measures (such as mulching with seed, silt fences, earth dams, etc.) have been employed that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

201.5. SILT FENCE

201.5.1. Description. Silt Fence is a barrier consisting of geotextile fabric supported by metal posts to prevent soil and sediment loss from a site. This includes all labor and materials associated with installation and maintenance of the silt fence as shown in the construction drawings or similar document.

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence shall not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6-inches or installation of support post to depth of 12-inches. If concentrated flow occurs after installation, corrective action shall be taken such as placing rock berm in the areas of concentrated flow.

201.5.2. Materials.

201.5.2.1. Geotextile. Silt Fence Fabric shall be a synthetic fabric that conforms to Item 803.4. Geotextiles Used in Drainage and Stabilization Applications unless otherwise specified. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 90-lbs. Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60-lbs.

Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280-psi.

Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 70

201.5.2.2. Posts. Fence Posts shall be galvanized steel and may be rolled, formed or tubular in cross-section in accordance with Item 801.4.2.2. Posts. "T" posts may be used when in conformance with specification.

201.5.2.3. Wire Support. The minimum acceptable support material shall be W 1.4 x W 1.4, 4" x 4", zinc coated (galvanized) steel, 14-gauge wire fence fabric. Standard 2" x 2" chain link fence fabric is acceptable as well as other welded or woven steel fabrics consisting of equal or greater gauge wire and equal or smaller spacing as that listed herein.

201.5.3. Construction. Silt Fence shall consist of synthetic fabric supported by wire mesh, W 1.4 x W 1.4 and galvanized steel posts set a minimum of 1-foot depth and spaced not more than 6-feet on center. A 6-inch wide trench is to be cut 6-inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel. This entrenchment prevents any bypass of runoff under the fence. Fabric shall overlap at abutting ends a minimum of 3-feet and shall be joined such that no leakage or bypass occurs.

201.6. INTERCEPTOR SWALE

201.6.1. Description. A temporary interceptor swale is excavated as required by the erosion control plan. This includes all labor and materials associated with installation and maintenance of the interceptor swale as shown in the construction drawings or similar document.

Interceptor swales may have a V-shape or be trapezoidal with a flat bottom and sideslopes of 3:1 or flatter, whichever may be shown on the plans. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales shall remain in place until the disturbed area is permanently stabilized.

201.6.2. Materials. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6-feet-per-second and shall consist of a layer of crushed stone 3-inches thick, riprap (Item 803.3 Riprap) or high velocity erosion control mats (Item 201.16 Erosion Control Matting). Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 3-inches above the design water surface elevation based on a 2-year storm.

201.6.3. Construction and Maintenance. Interceptor swale shall be installed across exposed slopes during construction and should intercept no more than 5-acres of runoff. Swales shall have a minimum bottom width of 2.0-feet and a maximum depth of 1.5-feet with side slopes of 3:1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 2-percent, or velocities exceed 6-feet-per-second (regard-

less of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. CONTRACTOR shall inspect swales on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.

201.7. DIVERSION DIKE

201.7.1. Description. A temporary diversion dike is a barrier created by the placement of an earthen embankment to reroute the flow of runoff to an erosion control device or away from an open, easily erodible area. This includes all labor and materials associated with installation and maintenance of the diversion dike as shown in the construction drawings or similar document.

A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure. Dikes are generally used for the duration of construction to intercept and reroute runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized.

201.7.2. Materials.

201.7.2.1. Stone Stabilization. Stone stabilization (required for velocities in excess of 6-fps) shall consist of Type A Riprap conforming to Item 803.3. Riprap and shall be placed in a layer of at least 3-inches thickness and shall extend a minimum height of 3-inches above the design water surface up the existing slope and the upstream face of the dike.

201.7.2.2. Geotextile. Fabric shall be a non-woven polypropylene fabric conforming to Item 803.4. Geotextiles Used in Drainage and Stabilization Applications unless otherwise specified, and be designed specifically for use as a soil filtration media with an approximate weight of 6-oz./yd², a mullen burst rating of 140-psi as measured by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and having an apparent opening size (AOS) greater than a #50 sieve as measured by ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile.

201.7.3. Construction. Diversion dikes shall be installed prior to and maintained for the duration of construction and should intercept no more than 10-acres of runoff. Dikes shall have a minimum top width of 2.0-ft. and a minimum height of compacted fill of 18" measured from the top of the existing ground at the upslope toe to top of the dike and having side slopes of 3:1 or flatter. The soil for the dike shall be placed in lifts of 8" or less and be compacted to 95-percent standard proctor density. The channel formed by the dike must have positive drainage for its entire length to an outlet. When the slope exceeds 2-percent, or velocities exceed 6-feet-per-second (regardless of slope), stabilization is required. Situations in which velocities do not exceed 6-fps, vegetation may be used to control erosion.

201.8. TRIANGULAR SEDIMENT FILTER DIKE

201.8.1. Description. The work shall consist of installing a temporary triangular sediment filter dike as shown on the plans during the construction period to control erosion, sedimentation and dust.

The purpose of a triangular sediment filter dike is to intercept and detain water-borne sediment from unprotected areas of limited extent. The triangular sediment filter dike is used where there is no concentration of water in a channel or other drainage way above the barrier and the contributing drainage area is less than 1-acre. If the uphill slope above the dike exceeds 10-percent, the length of the slope above the dike should be less than 50-feet. If concentrated flow occurs after installation, CONTRACTOR shall take corrective action such as placing rock berm in the areas of concentrated flow. This measure is effective on paved areas where installation of silt fence is not possible.

201.8.2. Materials.

201.8.2.1. Geotextile. Fabric shall be a non-woven polypropylene fabric conforming to Item 803.4. Geotextiles Used in Drainage and Stabilization Applications unless otherwise specified, and be designed specifically for use as a soil filtration media with an approximate weight of 6-oz./yd², a mullen burst rating of 140-psi as measured by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and having an apparent opening size (AOS) greater than a #50 sieve as measured by ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile.

201.8.2.2. Wire Mesh Support. The dike structure shall be 6-gauge 6" x 6" wire mesh folded into triangular form being 18-inches on each side.

201.8.3. Construction. Triangular sediment filter dikes shall be installed across exposed slopes during construction with ends of the dike tied into existing grades to prevent failure and should intercept no more than 1-acre of runoff. Filter material shall lap over ends 6-inches to cover dike-to-dike junction; each junction shall be secured by shoat rings.

201.9. ROCK BERM

201.9.1. Description. The work shall consist of constructing temporary rock berm as shown on the plans during the construction period to control erosion, sedimentation and dust. This includes all labor and materials associated with installation and maintenance of the rock berm as shown in the construction drawings or similar document.

The purpose of a rock berm is to serve as a check dam in areas of concentrated flow to intercept sediment-laden runoff, detain the sediment and release the water in sheet flow. The rock berm should be used when the contributing drainage area is less than 5-acres.

201.9.2. Materials.

201.9.2.1. Stone. Stone shall consist of Type A riprap conforming to Item 803.3. Riprap.

201.9.2.2. Wire Mesh Support. The berm structure shall be secured with a woven wire sheathing having maximum opening of 1-inch and a minimum wire diameter of 20-gauge galvanized and shall be secured with shoat rings.

201.9.3. Construction and Maintenance. Rock berm shall be installed at the toe of a slope or the perimeter of a developing or disturbed area. The purpose of a rock berm is to intercept sediment-laden water from unprotected areas, detain the sediment and release the water in sheet flow. Rock berm should have a maximum flow through rate of 60-gallons-per-minute-per-square-foot. Minimum height shall be 18-inches measured from the top of the existing ground at the upslope toe to top of the berm. Berm shall have a top width of 2-feet minimum with side slopes being 2:1 or flatter. Berm shall be built along the contour at zero-percent grade or as near as possible. The ends of the berm shall be tied into existing upslope grade and the berm shall be buried in a trench approximately 3-inches to 4-inches deep to prevent failure of the control.

The area upstream from the rock berm shall be maintained in a condition that will allow sediment to be removed following the runoff of a rainfall event. Inspection shall be made weekly and after each rainfall by the responsible party and when the silt reaches a depth equal to the height of the berm or 1-foot, whichever is less, it shall be removed and the accumulated silt disposed of properly. For installations in streambeds, additional daily inspections shall be made on rock berm. Silt shall be removed when accumulation reaches approximately ½ the height of the berm. The berm shall be reshaped as needed during inspection. The rock berm shall be left in place until all upstream areas are stabilized and accumulated silt removed.

201.10. STABILIZED CONSTRUCTION ENTRANCE

201.10.1. Description. The work shall consist of constructing a temporary stabilized construction entrance as shown in the plans and remaining in place for the duration of the construction period to prevent sediment from leaving the project site and becoming a nuisance on a paved surface. This includes all labor and materials associated with installation and maintenance of the stabilized construction entrance as shown in the construction drawings or similar document.

201.10.2. Materials.

201.10.2.1. Stone. Stone material shall consist of Type A riprap conforming to Item 803.3. Riprap and shall be placed in a layer of at least 6-inches thickness.

201.10.2.2. Geotextile. Fabric shall be a non-woven polypropylene fabric conforming to Item 803.4. Geotextiles Used in Drainage and Stabilization Applications unless otherwise specified, and be designed specifically for use as a soil filtration media with an approximate weight of 6-oz./yd², a mullen burst rating of 140-psi as measured by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and having an apparent opening size (AOS) greater than a #50 sieve as measured by ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile.

201.10.3. Construction and Use. A temporary stabilized construction entrance shall be installed at any point where traffic will be entering or leaving a construction site to or from a paved surface such as a street, alley, sidewalk or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or flowing of sediment onto paved surfaces. The entrance shall be properly graded or incorporate a drainage swale to prevent runoff from leaving the construction site. The length of the entrance shall be as shown on the plans.

The temporary stabilized construction entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto paved surfaces. This may require periodic top dressing with additional stone as conditions demand. All sediment spilled, dropped, washed or tracked onto public rights of way shall be removed immediately by the CONTRACTOR.

When necessary, vehicles must be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin or other sedimentation/filtration device. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

201.11. SAND BAG BERM

201.11.1. Description. The work shall consist of installing a temporary sand bag berm as shown in the plans for the duration of construction to control erosion, sedimentation and dust. This includes all labor and materials associated with installation and maintenance of the sand bag berm as shown in the construction drawings or similar document.

The purpose of a sand bag berm is to intercept sediment-laden water from disturbed areas such as construction in streambeds, create a retention pond, detain sediment and release water in sheet flow.

201.11.2. Materials.

201.11.2.1. Bag and Sand. Bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight 4-ounces-per-square-yard, mullen burst strength exceeding 300-psi as determined by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and ultraviolet stability exceeding 70-percent. Bag length shall be 24-inches to 30-inches, width shall be 16-inches to 18-inches and thickness shall be 6-inches to 8-inches and having an approximate weight of 40-pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.

201.11.2.2. Pipe. Pipe shall be schedule 40 or stronger polyvinyl chloride (PVC) having a nominal internal diameter of 4-inches.

201.11.3. Construction and Maintenance. A temporary sand bag berm shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5-acres. The berm shall be a minimum height of 18-inches, measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized as shown in the plans but shall have a minimum width of 48-inches measured at the bottom of the berm and 16-inches measured at the top of the berm.

The sand bag berm shall be inspected after each rain. The sandbags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the CONTRACTOR and when the silt reaches 6-inches, the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal shall be done by hand.

201.12. STONE OUTLET SEDIMENT TRAP

201.12.1. Description. A stone outlet sediment trap is an impoundment created by the placement of an earthen and stone embankment to prevent soil and sediment loss from a site. This includes all labor and materials associated with installation and maintenance of the stone outlet sediment trap as shown in the construction drawings or similar document.

The purpose of a sediment trap is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights-of-way below the sediment trap from sedimentation. A sediment trap is usually installed at points of discharge from disturbed areas. The drainage area for a sediment trap is recommended to be less than 5-acres.

201.12.2. Materials.

201.12.2.1. Filter Stone. Filter stone shall consist of Type A riprap conforming to Item 803.3. Riprap.

201.12.2.2. Geotextile. Fabric shall be a non-woven polypropylene fabric conforming to Item 803.4. Geotextiles Used in Drainage and Stabilization Applications unless otherwise specified, and be designed specifically for use as a soil filtration media with an approximate weight of 6-oz./yd², a mullen burst rating of 140-psi as measured by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and having an apparent opening size (AOS) greater than a #70 sieve as measured by ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.

201.12.3. Construction and Maintenance.

201.12.3.1. Earth Embankment. CONTRACTOR shall place fill material in layers not more than 8-inches in loose depth. Before compaction, CONTRACTOR shall moisten or aerate each layer as necessary to provide the optimum moisture content of the material in order to achieve 95-percent standard proctor density on each compacted layer. CONTRACTOR shall not place material on surfaces that are muddy or frozen. Sideslopes for the embankment shall be 3:1. A gap shall be left in the embankment in the location where the natural confluence of runoff crosses the embankment line. The gap shall have a width in feet equal to 6 times the drainage area in acres.

201.12.3.2. Geotextile Covered Rock Core. A core of filter stone having a minimum height of 1.5-feet and a minimum width at the base of 3-feet shall be placed across the opening of the earth embankment and shall be covered by geotextile fabric which shall extend a minimum distance of 2-feet in either direction from the base of the filter stone core.

201.12.3.3. Filter Stone Embankment. Filter stone shall be placed over the geotextile and is to have a sideslope which matches that of the earth embankment of 3:1 and shall cover the geotextile/rock core a minimum of 6-inches when installation is complete.

201.12.3.4. Maintenance. Accumulated silt shall be removed from behind the embankment when the level of silt is 1-foot below the top of the filter stone at its lowest point.

201.13. PIPE OUTLET SEDIMENT BASIN

201.13.1. Description. A temporary pipe outlet sediment basin is an impoundment created by the placement of an earthen embankment and an integral pipe spillway structure for the purpose of de-watering the impoundment as well as an emergency spillway structure for heavy flows. This includes all labor and materials associated with installation and maintenance of the pipe outlet sediment basin as shown in the construction drawings or similar document.

The purpose of a sediment basin is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties and rights-of-way below the sediment basin from sedimentation. A sediment basin is usually installed at points of discharge from disturbed areas. The drainage area for a sediment basin is recommended to be less than 100-acres.

201.13.2. Materials. Riser shall be corrugated metal or reinforced concrete pipe or box and shall have watertight fittings or end-to-end connections of sections. Riser shall be anchored by 3000-psi concrete base. An outlet pipe of corrugated metal or reinforced concrete shall be attached to the riser and shall have positive flow to a stabilized outlet on the downstream side of the embankment. An anti-vortex device and rubbish screen shall be attached to the top of the riser and shall be made of polyvinyl chloride or corrugated metal.

201.13.3. Construction and Maintenance.

201.13.3.1. Earth Embankment. CONTRACTOR shall place fill material in layers not more than 8-inches in loose depth. Before compaction, CONTRACTOR shall moisten or aerate each layer as necessary to provide the optimum moisture content of the material in order to achieve 95-percent standard proctor density on each compacted layer. CONTRACTOR shall not place material on surfaces that are muddy or frozen. Sideslopes for the embankment shall be 3:1.

201.13.3.2. Principal Outlet Control Device. The principal outlet control device shall consist of a rigid vertically oriented pipe or box of corrugated metal or reinforced concrete. Attached to this structure shall be a horizontal pipe which shall extend through the embankment to the toe of fill to provide a de-watering outlet for the basin. Attached to the inlet portion of the principal outlet control device shall be an anti-vortex device that shall be made to serve as a rubbish screen. A concrete base shall be used to anchor the principal outlet control device and shall have dimensions of 18-inches depth and twice the diameter of the riser pipe in width minimum in all directions.

201.13.3.3. Emergency Spillway. An emergency spillway shall be installed adjacent to the embankment on undisturbed soil and shall be sized to carry the full amount of flow generated by a 10-year-storm less the amount which can be carried by the principal outlet control device. The emergency spillway shall be lined with riprap as shall the swale leading from the spillway to the normal watercourse at the base of the embankment.

201.13.3.4. Maintenance. Accumulated silt shall be removed and the basin shall be re-graded to its original dimensions at such point that the capacity of the impoundment has been reduced to one-half of its original storage capacity. The removed sediment shall be stockpiled or redistributed in areas that are protected from erosion.

201.14. PIPE SLOPE DRAIN

201.14.1. Description. A temporary pipe slope drain is an erosion control device that combines an earthen embankment and a rigid or flexible pipe to carry runoff over an exposed slope to a stabilized outlet apron. This includes all labor and materials associated with installation and maintenance of the pipe slope drain as shown in the construction drawings or similar document. Pipe slope drains can also be used as emergency spillways for sediment basins.

201.14.2. Materials.

201.14.2.1. Pipe. The drain pipe shall be made of any material, rigid or flexible capable of conveying runoff. Regardless of material, the drain pipe shall be completely water-tight so that no water leaks onto the slope to be protected.

201.14.2.2. Riprap. Riprap to be used in the outlet apron shall consist of either crushed stone or broken Portland cement concrete. All stones used shall weigh between 50-pounds and 150-pounds each, shall have a thickness of at least 12-inches and shall be as nearly uniform in section as is practicable.

201.14.3. Construction.

201.14.3.1. Pipe Slope Drain. A diversion dike shall be constructed at the top of the slope which shall be protected. This dike shall be sized so that no runoff may overtop the dike. A rigid section of pipe shall be installed through the dike with length as necessary to completely cross the dike section. Attached to the inlet end of the pipe, using water-tight fittings, shall be a standard flared-end section with an integral toe plate extending a minimum of 6-inches from the bottom of the end section to prevent runoff from washing out the soil under the inlet. Attached to the other end of this pipe shall be rigid or flexible pipe to be used for containment of the runoff from the top of the slope to the bottom.

201.14.3.2. Riprap Lined Apron. A riprap lined apron shall be excavated to accept the runoff from the pipe and dissipate the energy of the flow. The width of the bottom of the apron shall be 3 times the pipe diameter, and the length shall be a minimum of 6 times the pipe diameter of the drain pipe. The apron shall be a minimum of 12-inches in depth and shall be lined with riprap weighing between 50-pounds and 150-pounds per stone with a thickness of 12-inches minimum. The apron shall be designed so that the released flow has a velocity less than 3-feet-per-second and is not concentrated in any way.

201.15. INLET PROTECTION

201.15.1. Description. Temporary inlet protection is a series of four different measures that provide protection against silt accumulation in storm sewer systems. Clogging can greatly reduce or completely stop the flow in the pipes. The different measures are used for different site conditions and inlet types. These measures include all labor and materials associated with installation and maintenance of inlet protection as shown in the construction drawings or similar document.

Filter barrier protection using silt fence is appropriate when the drainage area is less than 1-acre and the basin slope is less than 5-percent. This type of protection is not applicable in paved areas.

Block and gravel protection is used when flows exceed 0.5-cubic-feet-per-second and it is necessary to allow for overtopping to prevent flooding. This form of protection is also useful for curb type inlets as it works well in paved areas.

Wire mesh and gravel protection is used when flows exceed 0.5-cfs and construction traffic may occur over the inlet. This form of protection may be used with both curb and drop inlets.

Excavated impoundment protection around a drop inlet may be used for protection against sediment entering a storm drain inlet. With this method, it is necessary to install weep holes to allow the impoundment to drain completely. The impoundment shall be sized such that the volume of excavation shall be 1800- to 3600-cubic-feet-per-acre of disturbed area entering the inlet.

201.15.2. Materials.

201.15.2.1. Geotextile. Filter fabric shall be a synthetic fabric conforming to Item 201.5.2.1. Geotextile.

201.15.2.2. Posts. Posts for fabric shall be galvanized steel, tubular in cross-section in accordance with Item 801.4.2.2. Posts, or they may be standard fence "T" posts.

201.15.2.3. Filter Gravel. Filter gravel shall conform to as defined in Item 504.2.2.5. Natural Gravel.

201.15.2.4. Concrete Blocks. Concrete blocks shall be standard 8" x 8" x 16" concrete masonry units and shall be in accordance with ASTM C139, Concrete Masonry Units for Construction.

201.15.2.5. Wire Mesh. Wire mesh shall be standard hardware cloth or comparable wire mesh with an opening size not to exceed ½-inch.

201.15.3. Construction and Maintenance.

201.15.3.1. Filter Barrier Protection. Silt Fence shall consist of geotextile supported by galvanized steel posts set a minimum of 1-foot depth and spaced not more than 6-feet on center. A 6-inch wide trench is to be cut 6-inches deep at the toe of the fence to allow the fabric to be laid below the surface and backfilled with compacted earth or gravel. This entrenchment prevents any bypass of runoff under the fence.

201.15.3.2. Block and Gravel Protection. Concrete blocks are to be placed on their sides in a single row around the perimeter of the inlet, with ends abutting. Openings in the blocks should face outward, not upward. Wire mesh shall then be placed over the outside face of the blocks covering the holes. Filter stone shall then be piled against the wire mesh to the top of the blocks with the base of the stone being a minimum of 18-inches from the blocks. Periodically, when the stone filter becomes clogged, the stone shall be removed and cleaned in a proper manner or replaced with new stone and piled back against the wire mesh.

201.15.3.3. Wire Mesh and Gravel Protection. Wire mesh shall be placed across the opening of the inlet with at least a 12-inch extension beyond the opening of the inlet. For curb inlet applications, the wire fabric shall be firmly secured to prevent loss of rock into the protected storm sewer system.

Gravel shall be placed around and over the inlet such that a 12-inch layer of stone covers the opening of the inlet and extends at least 12-inches beyond the inlet in all directions. CONTRACTOR shall ensure that any flow to the inlet passes through a minimum of 12-inches of gravel.

For areas subjected to high flows or high velocities, CONTRACTOR shall inspect the protection on a regular basis to ensure integrity of the gravel filter.

201.15.3.4. Excavated Impoundment Protection. An excavated impoundment shall be sized to provide a storage volume of between 1800- and 3600-cubic-feet-per-acre of disturbed area. The trap shall have a minimum depth of 1-foot and a maximum depth of 2-feet as measured from the top of the inlet and shall have sideslopes of 2:1 or flatter. Weep holes shall be installed in the inlet walls to allow for the complete de-watering of the trap. When the storage capacity of the impoundment has been reduced by one-half, the silt shall be removed and disposed in a proper manner.

201.16. EROSION CONTROL MATTING

201.16.1. Description. An erosion control mat (ECM) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Erosion control mats are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Matting is used in areas that are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.

201.16.2. Materials.

201.16.2.1. Matting. Erosion control mat shall be of a type and class appropriate to site-specific requirements as determined by the Engineer. Installed materials shall meet the applicable "Minimum Performance Standards for TxDOT" as published by TxDOT in its "Erosion Control Report" unless materials are otherwise approved

by the CITY. Proving compliance with TxDOT standards is the responsibility of the CONTRACTOR and may be proven by official listing on the most current annual "Approved Products List for TxDOT" applicable to TxDOT Item 169 Soil Retention Blanket and its Special Provisions.

201.16.2.2. Fasteners. Fasteners shall conform to the recommendations shown within the manufacturer's published literature for the approved soil retention blanket. In the absence of manufacturer's recommendation for fasteners, a minimum 11-gauge wire staples 6-inches in length and 1-inch in width shall be used.

201.16.3. Construction and Maintenance.

201.16.3.1. Erosion Control Matting. Prior to the installation of any erosion control matting, all rocks, dirt clods, stumps, roots, trash and any other obstructions that would prevent the mat from lying in direct contact with the soil shall be removed. Anchor trenching shall be located along the entire perimeter of the installation area. These trenches shall be 6-inches deep and 6-inches wide and the matting shall be laid into the trench then backfilled with compacted soil or gravel. Matting shall be fastened to the ground according to the manufacturer's instruction. CONTRACTOR shall submit staple pattern to the CITY. Installations shall be in accordance with manufacturers recommended guidelines with the exception of the minimum criteria stated herein.

201.16.3.2. Maintenance. Matted areas must be inspected on a weekly basis, and after each significant rainfall event to locate bare spots caused by weather or other events. Missing or loosened matting shall be promptly replaced or re-anchored.

201.17. MULCHING

201.17.1. Description. Mulching provides protection for bare soil by absorbing the energy of each raindrop prior to the point when this energy would dislodge individual soil particles and begin the erosion process. Mulching fosters plant growth by providing insulation from temperature extremes and retaining valuable moisture necessary for proper germination.

201.17.2. Materials.

201.17.2.1. Organic Mulches.

201.17.2.1.1. Straw. The best quality straw mulch comes from wheat, oats or barley and shall be free of weed and grass seed that may not be desired vegetation for the area to be protected. Straw mulch is light and therefore shall be properly anchored to the ground.

201.17.2.1.2. Hay. Hay is very similar to straw with the exception that it is made of grasses and weeds and not grain stems. This form of mulch is very inexpensive and is widely available but does introduce weed and grass seed to the area. Like straw, hay is light and shall be anchored.

201.17.2.1.3. Wood Chips. Wood chips are suitable for areas that will not require mowing frequently and are heavy enough that they do not require anchoring. They do however deplete nitrogen from the soil, which is a necessary nutrient for all plants. To alleviate this condition wood chips must be treated with 12-pounds ammonium-nitrate-per-ton of mulch used.

201.17.2.1.4. Bark Chips. Bark chips are popular for ornamental applications as they do not require anchoring, do not decompose very rapidly and serve as an excellent insulation material. When using bark chips, it is not necessary to treat for nitrogen deficiency or to fertilize.

201.17.2.1.5. Other. Other types of organic mulches are available but usually are very seasonal and may have a limited availability.

201.17.2.2. Matting and Geotextiles. Many geotextile materials are very beneficial when used in conjunction with other mulching agents. Geotextile materials and installation shall be specified by the Engineer. Matting shall conform to requirements of Item 201.16. Erosion Control Matting.

201.17.3. Construction and Maintenance.

201.17.3.1. Organic Mulch. Prior to the placement of any mulch, the area to be protected shall be graded completely in accordance with plans. Fertilization and soil treatment shall then be done prior to placement of mulch with the exceptions of when seed is to be applied by means of hydraulic seeding or when seed is distributed following straw mulch spreading during winter months. Organic mulches may be distributed by hand or by mechanical means, so long as a complete covering is achieved. Straw and hay mulches shall be distributed at the rate of 75- to 90-pounds-per-1000-feet of treated area. To be fully effective, straw or hay mulch shall be anchored by means of application of a fiber mulch binder, the application of a synthetic liquid mulch binder or by using a tractor-drawn crimper to punch mulch into the soil.

201.17.3.2. Maintenance. All mulching materials shall be inspected on a weekly basis, and after each significant rainfall event to locate areas of erosion. Where erosion has occurred, either additional mulch shall be

applied or an alternative method shall be considered and implemented, as required by the Engineer. Missing or loosened matting shall be promptly replaced or re-anchored.

ITEM 202. LANDSCAPING

202.1. REMOVAL, PROTECTION, AND REPLACEMENT OF TREES, SHRUBBERY, PLANTS, SOD, AND OTHER VEGETATION

No trees shall be removed unless so noted on the plans or upon the specific approval of the CITY. Where trees, plants, shrubbery, etc., are adjacent to the line of the work and are not to be removed or are designated on the plans to be removed and replaced, the CONTRACTOR shall protect such trees, plants, shrubbery, etc. by substantial wooden boxes and guards and shall not permit machinery or employees to scrape, tear the limbs from, damage or attach guy cables to them. If, in the opinion of the CITY, such trees, plants, shrubbery, etc., would be damaged by machinery, etc., hand excavation may be required. Shrubby, plants, etc. shall be removed with a ball of dirt about their roots and shall be carefully stored and given proper attention. Where sod is to be saved, it is to be removed in squares cut out with a sharp spade and of such sizes that they may be handled conveniently without breaking. They shall be carefully stored and given proper attention. During hot, dry weather the stored sod shall be protected by covering with canvas or burlap.

The CONTRACTOR shall be responsible for all damage to adjacent trees, plants, shrubbery, etc., and any such damage shall be remedied to the satisfaction of the CITY. All damaged limbs over 1-inch in diameter shall be sawed clean adjacent to the damaged area or at the trunk and dressed with acceptable tree wound treatment material, unless dressing is waived by the CITY.

The cost of removal shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract. The cost of protection shall not be paid for as a separate contract pay item; the costs thereof shall be included in such pay items as are provided for in the proposal and contract.

Where sod, shrubbery, plants, etc., are removed in making the excavation, such areas shall have the same sod, shrubbery, plants, etc., of the same kind and in good condition, replaced in their prior positions. Trees that are to be removed and subsequently replaced shall be designated on the plans. When backfilling is completed, the sod, shrubbery, plants, etc. shall be carefully replaced in their original location and the area thoroughly wet down.

The cost of such replacement shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract.

202.2. TOPSOIL

202.2.1. Description. This Item shall consist of furnishing and placing topsoil, free from rock and foreign material, as indicated on the plans, to the lines and grades as established by the construction plans.

202.2.2. Materials and Storage. All excavated material which is suitable for topsoil shall be used before any topsoil is obtained from a borrow source. Topsoil shall be secured from borrow sources as required to supplement suitable material secured from project excavation. Topsoil material secured from excavations shall be stockpiled at locations approved by CITY.

202.2.3. Construction Methods. Approved topsoil shall be a minimum thickness of 6-inches unless otherwise specified on the plans, and shall be placed on areas formed to the line and grade specified in the plans.

202.3. SOIL AMENDMENTS

202.3.1. General. Where indicated on the plans and defined in the specifications, soil amendments shall be added as defined or as noted in these specifications.

202.3.2. Sand. All sand shall be thoroughly washed, coarse grade construction or brick sand, free of clay balls, weeds or grass. So-called cushion sand, blow sand, creek silt or water treatment solid byproducts shall not be acceptable. A quart sample of the sand proposed to be used shall be submitted for the CITY's approval.

202.3.3. Minerals.

202.3.3.1. Elemental Sulfur. Sulfur shall be a commercially produced, granular product of pure sulfur.

202.3.3.2. Gypsum. Gypsum (calcium sulphate) shall be ground to the size specified on the plans.

202.3.3.3. Lime. Lime shall be of finely ground or pulverized raw, commercial grade dolomitic limestone, all of which shall pass through a #10 (210mm) sieve, and at least half of which shall pass through a #100 (150mm) sieve. Solomitic lime shall contain roughly equal portions of magnesium and calcium carbonates, which together total 90-percent or more of the value of neutralizing power or the calcium oxide equivalent. A producer's specification or a sample label of the lime proposed to be used shall be submitted for the CITY's approval.

202.3.4. Compost. This Item shall govern for the furnishing and placing of approved compost material to the depths and area shown on the plans or as directed by the Engineer.

202.3.4.1. Materials. Compost material shall be an organic substance produced by the aerobic (biological) decomposition of organic matter. All compost is to be clean and free of visible refuse, live plants, seed, excessive cotton lint and any chemical elements harmful to plant growth. Composted matter may include, but is not limited to, leaves and yard trimmings, brush, biosolids, food scraps, food processing residues, manure and/or other agricultural residuals, forest residues and bark, and soiled and/or unrecyclable paper. Mixed municipal solid waste compost, and Class B Biosolids (as defined in 40 CFR part 503) shall not be allowed. Raw organics in the finished compost shall not be allowed.

Compost materials furnished shall meet all applicable Federal (40 CFR Part 503 Standards for Class A Biosolids) and TCEQ health and safety regulations (TAC Chapter 332). All compost material supplied shall be processed to meet the time and temperature standards in TAC Chapter 332 Subchapter B Part 23 to control noxious weeds, pathogen and vector attraction; and the physical requirements shown in Table 202.3.4.1.(a) Compost Physical Requirements.

Table 202.3.4.1.(a) Compost Physical Requirements

Compost for Manufactured Topsoil	Erosion Control Compost	General Use Compost
Organic Matter Content as determined by loss on ignition (ASTM D5268 Standard Specification for Topsoil Used for Landscaping Purposes @ 824°F)		
30% (dry mass)	40-60% (dry mass)	40-60% (dry mass)
Particle Size as determined by TEX-110-E Particle Size Analysis of Soils		
100% passing 1"	100% passing 3" <70% passing 2"	100% passing 3/4" <70% passing No. 20
Soluble Salts as determined by TEX-129-E Measuring the Resistivity of Soil Materials		
5.0 max. mmhos/cm)	5.0 max. mmhos/cm	5.0 max. mmhos/cm
Maturity		
Finished	Finished	Finished
pH as determined by TEX-128-E Determining Soil pH		
5.5 - 8.5	5.5 - 8.5	5.5 - 8.5

202.3.4.2. Construction Methods. After the designated areas have been completed to the lines, grades, and cross sections shown on the plans and as provided for in other items to the contract, compost of the type specified shall be placed in accordance with the requirements hereinafter described and as directed by the Engineer. Any stockpile areas shall be well drained, and shall be left in a neat and presentable condition upon completion of the removal of the materials. Where rolling is specified, the roller shall be a light corrugated drum roller of the type approved by the Engineer. Compost shall be loose and friable and not dusty at the time of application. Compost may be required to be brought to an acceptable moisture content, as directed by the Engineer. No compost materials shall be placed within 30-yards of any source of surface water or drinking water supply.

202.3.4.2.1. Compost Manufactured Topsoil. Compost manufactured topsoil shall consist of soil constituents amended with 5- to 30-percent compost, measured by volume, as shown on the plans. Any trash, stumps, roots, weeds, or other objectionable materials in the soil shall be removed and disposed of, as approved by the Engineer, prior to beginning the mixing process.

Blended On-Site. Compost shall be spread in a uniform layer over the previously prepared subgrade area and thoroughly incorporated into the soil materials, to the depths shown on the plans, by rototilling, harrowing, or other suitable methods. After the topsoil has been produced and shaped, it shall be sprinkled and rolled as directed by the Engineer.

Pre-Blended. Topsoil manufactured from sources outside the right-of-way shall be produced in accordance with the requirements for Blended On-Site topsoil, and spread over the prepared subgrade so as to form a uniform layer of loose material of the thickness shown on the plans. After the topsoil has been placed, it shall be raked carefully to remove all objectionable materials and to yield a consistent grade, and then sprinkled and rolled as directed by the Engineer.

202.3.4.2.2. Erosion Control Compost. Compost shall be spread evenly over the previously prepared subgrade or slopes so as to form a uniform layer of loose material of the thickness shown on the plans. Erosion Control Compost shall not be placed on any slope having a slope ratio steeper than 2:1. After the compost has been placed, it shall be sprinkled and rolled as directed by the Engineer.

202.3.4.2.3. General Use Compost. General use compost shall be applied as a top dressing by placing the material evenly upon established areas of turf, grass, or other ground cover growth to the depth specified on the plans or as directed by the Engineer. Compost applications shall not bury or kill existing vegetation. All stems, roots, or other debris larger than 2-inches diameter shall be removed from the ground surface.

202.4. FERTILIZER

202.4.1. General. Fertilizer shall be a commercial product, uniform in composition, free flowing, with uniform particle size, minimal dust, and suitable for application with approved equipment. Fertilizer may be a natural organic, synthetic organic or inorganic fertilizer. A sample label or specification of proposed fertilizer(s) to be used shall be submitted to the CITY for approval.

All fertilizer used shall be delivered in original bags or containers clearly labeled to show analysis of the contents. Fertilizer shall be in good physical condition. Fertilizer which has been exposed to high humidity and moisture or has become caked or otherwise damaged, making it unsuitable for use, shall be rejected.

The fertilizer is subject to testing by the CITY in accordance with the Texas Fertilizer Law. A fertilizer shall be used with an analysis as indicated below. The figures in the analysis represent the percent of nitrogen, phosphoric acid and potash nutrients, respectively, as determined by the methods of the Association of Official Agricultural Chemists. In the event it is necessary to substitute a fertilizer of a different analysis with a lower concentration, the total amount of nutrients furnished and applied per unit area shall equal or exceed that specified for each nutrient.

202.4.2. Preplanting Application. Fertilizer analysis shall be based on soil test results and the nitrogen requirements for the turfgrass specified. If the CITY waives soil testing, fertilizer analysis shall be, by weight, in a 1-1-1 or 1-2-1 (N-P-K) ratio (such as 13-13-13 or 10-20-10,) and 10- to 15-percent sulphate and traces of iron and zinc as required and approved by the CITY.

Preplanting application rate shall be 10-lbs.-fertilizer-per-1,000-sq.ft.

202.4.3. Post Planting Application. Fertilizer analysis shall be based on soil test results and the nitrogen requirements for the turfgrass specified. If the CITY waives soil testing, fertilizer analysis shall be as specified below except that for autumn applications a complete fertilizer with a 4-1-2 to 3-1-2 (N-P-K) ratio shall be applied.

Fertilizer shall contain 30- to 50-percent slow release nitrogen, unless specified otherwise by the CITY.

202.4.3.1. Seeds or Sprigs. As soon as new growth starts after seeding or sprigging, grass shall be fertilized every 10- to 14-days with 0.75- to 1.0-lb.-nitrogen-per-1,000-sq.ft. Applications shall alternate between nitrogen only fertilizer whose analysis is, by weight, 21-0-0 or 45-0-0 (N-P-K) and a complete fertilizer with a 3-1-2 or 4-1-2 (N-P-K) ratio (such as 21-7-14.)

202.4.3.2. Sod. Fertilizer analysis shall be based on soil test results. Fertilizer shall be applied every 4-to 6-weeks at 1.0-lb.-(actual)nitrogen-per-1,000-sq.ft.

202.5. SODDING

202.5.1. Description. Sodding shall consist of furnishing and planting grass as designated on the plans and in accordance with the requirements of this specification and special conditions.

202.5.2. Materials. Sod shall be "Stenotaphrum secundatum" (St. Augustine grass), "Cynodon dactylon" (Common Bermudagrass), "Buchloe dactyloides" (Buffalograss), an approved hybrid of Common Bermudagrass, or an approved Zoysiagrass. Sod shall consist of stolons, leaf blades, rhizomes, and roots with a healthy, virile system of dense, thickly matted roots throughout the soil of the sod for a thickness not less than 0.75-in. (2cm). Sod shall be alive, healthy, vigorous, free of insects, disease, stones, and undesirable foreign materials, weeds and grasses deleterious to its growth or which might affect its subsistence or hardiness when transplanted. The grass shall have been mowed prior to sod cutting so that the height of the grass shall not exceed 2-inches (5cm). St. Augustine grass sod shall have been produced on growing beds of clay or clay loam topsoil. Bermudagrasses and zoysiagrasses shall have been grown on sand or sandy loam soils. Sod shall not be harvested or planted when its moisture condition is so excessively wet or dry that its survival shall be affected. Sod shall be protected from exposure to wind, sun and freezing. If sod is stacked, it shall be kept moist and shall be stacked roots to roots and grass to grass.

Sod to be placed between curb and walk and on terraces shall be the same type grass as adjacent grass or existing lawn.

Sod to be placed during the dormant stage of these grasses shall be inspected by the CITY to verify that the grass is acceptable.

202.5.2.1. Dimensions. All sod shall have been machine cut to uniform soil thickness of ½-in. (13mm) ± ~-in. (3mm). All sod shall be of the same thickness. Rectangular sections of sod may vary in length, but all shall be of equal width and of a size that permits the sod to be lifted, handled and rolled without breaking. Broken pads and torn, uneven ends shall be rejected.

202.5.3. Construction Methods. After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of the contract, sodding of the type specified shall be performed in accordance with the requirements hereinafter described. Sodding shall be either plugging or solid.

Care shall be taken at all times to retain native soil on the roots of the sod during the process of excavating, hauling and planting. Sod material shall be kept moist from the time it is dug until planted. When so directed by the CITY, the sod existing at the source shall be watered to the extent required prior to excavating. Sod material shall be planted within 3-days after it is excavated unless preserved by techniques such as shrink wrapping and transporting in refrigerated trucks, in which case the CITY shall approve the time interval between excavation and planting.

When necessary, the sodded areas shall be smoothed after planting has been completed and shaped to conform to the cross section previously provided and existing at the time sodding operations were begun. Any excess dirt from planting operations shall be spread uniformly over the adjacent areas or disposed of as directed by the CITY, so that the completed surface shall present a slightly appearance.

202.5.3.1. Plugging. Furrows parallel to the curb line or sidewalk lines, 12-in. (300mm) on centers or to the dimensions shown on the plans, shall be opened on areas to be sodded. In all furrows, sod approximately 3-in.-square (75mm-square) shall be placed on 12-in. (300mm) centers at proper depth so that the top of the sod shall not be more than ½-in. (13mm) below finished grade. Holes of equivalent depth and spacing may be used instead of furrows. Soil shall be firm around each block; then the entire sodded area shall be carefully rolled with a heavy, hand roller developing 15- to 25-lb.-per-square-inch (100- to 170-kPa) compression. Hand tamping may be required on terraces.

202.5.3.2. Solid Sodding. At locations on the plans, or where directed, sod blocks shall be carefully placed on the prepared areas. Sod shall be so placed that the entire designated areas shall be covered. Any voids left in the solid sodding shall be filled with additional sod and tamped. The entire sodded area shall be rolled and tamped to form a thoroughly compact solid mass. Surfaces of solid sod which, in the opinion of the CITY, may slide due to the height or slope of the surface or nature of the soil, shall, upon direction of the CITY, be pegged with wooden pegs driven through the sod block to the firm earth, sufficiently close to hold the sod firmly in place.

202.5.3.3. Fertilizing Sod. Fertilizing shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with these specifications. The fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed. Fertilizer for sod shall comply with applicable provisions of Item 202.4. Fertilizer.

202.5.3.4. Watering and Finishing Sod. Sodded areas shall be thoroughly watered immediately after they are planted. Large areas shall be planted by irrigation zones, so areas can be watered as soon as they are planted. Sod shall be subsequently watered and mowed at such time and in a manner and quantity directed by the CITY until completion and final acceptance of the project by the CITY.

Sod shall not be considered finally accepted until the sod has started to peg down (roots growing into the soil), and is free from dead blocks or rolls of sod.

202.6. SEEDING TURFGRASS

202.6.1. General. Seeding shall consist of preparing the ground, providing and planting seed or a mixture of seed of the kind specified along and across such areas as may be designated on the plans and in accordance with these specifications.

202.6.2. Materials. All material for turfgrass provided shall be in accordance with these specifications and as noted in the plans and contract documents. Prior to planting, CONTRACTOR shall provide the CITY with the State of Texas Certificate stating analysis of purity and germination of seed.

Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations.

202.6.2.1. Bermuda Grass Seed. Turfgrass seed shall be “Cynodon Dactylon” (Common Bermuda Grass). The seed shall be harvested within 1-year prior to planting, free of Johnsongrass, field bind weed, dodder seed, and free of other weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. The seed shall not be a mixture. The seed shall be hulled, extra fancy grade, and have a germination and purity that shall produce, after allowance for Federal Seed Act tolerances, a pure live seed content of not less than 85-percent. Pure Live Seed (PLS) Percent shall be determined using the formula:

$$\text{Percent Pure Live Seed} = \%Purity \times [(\%Germination + \%Firm \text{ or Hard Seed}) \div 100]$$

202.6.2.2. Ryegrass Seed. Turfgrass seed shall be “Lolium multiflorum” (Italian or Annual Ryegrass). The seed shall be harvested within 1-year prior to planting and shall be free of perennial ryegrass seed, other grass seed and weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. Seed shall be at least 95-percent pure, treated with fungicide, and shall have a 90-percent minimum germination rate.

202.6.2.3. Sprigs. Turfgrass sprigs and stolons shall be “Cynodon Dactylon” (Common Bermuda Grass) (Hybrid Bermuda Grass of the Tifway 419/ Tifton 10/Tifgreen Strain). Sprigs shall be acquired from a healthy stand of grass, free of weeds and other grasses. The source is to be inspected and approved by the CITY. Sprigs and stolons are to be delivered and planted within 24-hours of harvest unless special precautions are taken to prevent drying of sprigs to assure optimum rooting.

202.6.3. Planting Season and Application Rates. All planting shall be done between the dates specified for each grass type except when specifically authorized in writing. The seeds planted per acre shall be of a type specified with the mixture, rate and planting dates as shown in Table 202.6.3.(a) Seeding Turfgrass, or as specified by the CITY.

Table 202.6.3.(a) Seeding Turfgrass

Type	Planting Season	Seed and Rate
Type I	March through September	Bermuda Grass, hulled, 50-lb.- (22.7-kg)-PLS ¹ -per-acre
Type II	October through February	Rye Grass, 100-lb.- (45.4-kg)-PLS ¹ -per-acre combined with Bermuda Grass, unhulled, 20-lb.- (9.1-kg)-PLS ¹ -per-acre
Other	specified on the plans	specified on the plans

1. Pure Live Seed (PLS) is determined by multiplying the gross weight times purity times the germination. (For example, a 100-lb. (45.4-kg) bag with 85% purity and 80% germination: PLS = pounds (kg) in bag x purity x germination = 100-lb. (45.4-kg) x 0.85 x 0.80 = 60.8-lb. (27.6-kg) of pure live seed.)

202.6.4. Construction Methods.

202.6.4.1. General. After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of this contract, seeding of the type specified shall be performed in accordance with the requirements hereinafter described. All seeding operations shall be performed by either "drilling" or "cultipacker" process or approved equivalent. Seed shall be covered by + ¼" (6mm) topsoil.

The CITY may reject seeded area on the basis of weed populations.

202.6.4.2. Broadcast Seeding. Area to be treated shall be rough graded and raked. Seed or seed mixture in the quantity specified shall be uniformly distributed over the areas shown on the plans and where directed. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. Seed and fertilizer may be distributed at the same time, provided the specified uniform rate of application for both is obtained.

202.6.4.3. Disced Seeding. Soil over the area shown on the plans as directed to be seeded shall be loosened to a minimum depth of 3-in. (75mm). All particles in the seedbed shall be reduced to less than 1-in. (25mm) in diameter, or they shall be removed. The area shall then be finished to the line and grade as specified under Item 202.6.4.6. Watering, Maintaining, and Finishing Seeded Areas.

Seed or seed mixture specified shall then be planted at the rate required, and application shall be made uniformly. If the sowing of seed is by hand rather than by mechanical methods, seed shall be sown in two directions at right angles to each other. Seed and fertilizer may be distributed at the same time, provided the specified uniform rate of application for both is obtained. After planting, the seed shall be raked or harrowed into the soil to a depth of approximately 0.125-in. (3mm).

202.6.4.4. Hydraulic Mulching. All mulch shall be cellulose fiber mulch and shall be refined specifically for lawn hydraulic mulch applications. Use "Conwed" or an approved equal. Adhesive (Tacking) agents for mulch may include guar gum, polyacrylamide, or other tacking agent, as approved by the CITY. Tacking agent shall be evenly distributed in the hydraulic mulch before land application in the proportion recommended by the mulch manufacturer.

Seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed. Seed and fertilizer are to be distributed as a water slurry, and the mixture shall be applied to that area to be seeded within 30-minutes after all components are placed in the equipment. Fertilizer shall conform to the applicable requirements of Item 202.4. Fertilizer. After placement is completed, the planted area shall be watered sufficiently to assure uniform moisture from the surface to a minimum 6-in. (150mm) depth.

202.6.4.5. Fertilizing. Fertilizing shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with applicable requirements of Item 202.4. Fertilizer. The fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed.

202.6.4.6. Watering, Maintaining, and Finishing Seeded Areas. Seeded areas shall be thoroughly watered immediately after they are planted. Seeded areas shall be watered as directed by the CITY at least twice daily for at least 14-days after seeding in such a manner as to prevent washing of the slopes or dislodgment of the seed. Water shall be applied to the cultivated areas until a minimum depth of 6-inches is thoroughly moistened. CONTRACTOR shall re-seed washed areas. The CONTRACTOR shall be responsible for proper watering until final acceptance.

Seeded areas shall be maintained, including watering and mowing, at such time and in a manner and quantity directed by the CITY until completion and final acceptance of the project by the CITY. At minimum, the CONTRACTOR shall maintain the seeded area until each of the following conditions is achieved: vegetation is evenly distributed, without large bare areas, and covers 70% of the seeded area.

Where applicable, the shoulders, slopes and ditches shall be smoothed after seeding has been completed and shaped to conform to the cross section previously provided and existing at the time planting operations were begun.

202.7. REJECTION

Landscape materials may be rejected for failure to meet any of the requirements of this specification or as shown on the plans or in the contract specifications.

ITEM 203. SITE PREPARATION

203.1. DETERMINING LOCATION AND PROTECTION OF EXISTING STRUCTURES AND UTILITIES

Determining location and protection of existing structures and utilities shall comply with this Item 203.1.

203.1.1. Determining Location. Determining the location of existing structures, utilities and appurtenances shall proceed according to the specifications herein.

BIDDERS must satisfy themselves as to the actual existing subsurface conditions, including but not limited to the depth, location and sizes of pipe or conduits of various kinds in place. Where the exact depth of any utility or obstruction is not shown on a plan, excavation shall be made prior to reaching the obstruction in order to determine adjustments in grade if needed to prevent interference. Redesign to eliminate conflicts may be necessary. Extra compensation shall not be paid for such delays.

203.1.2. Protection. All existing structures, improvement and utilities designated to remain shall be adequately protected, at the expense of the CONTRACTOR, from damage that might otherwise occur due to construction operations. Where construction comes in close proximity to existing structures, utilities or appurtenances, or if it becomes necessary to move services, poles, guy wires, pipe lines or other obstructions, the CONTRACTOR shall notify and cooperate with the owner of the utility, structure, or appurtenance. The utility lines and other existing structures shown on the plans are for information only and are not guaranteed by the CITY to be complete or accurate as to location and/or depth. The CONTRACTOR shall be liable for damage to any utilities resulting from the CONTRACTOR'S operations. During construction, all fire hydrants, valve boxes, fire or police call boxes and other existing utility controls shall be left intact, unobstructed and accessible unless noted on the plan.

All water mains, wastewater collection mains, wastewater collection house laterals, storm drains, power conduits, gas mains, gas service laterals and other lines or appurtenances encountered during construction shall be supported or replaced as detailed on the plans. Water service lines shall not be removed during excavation, and the CONTRACTOR shall provide adequate support for the services across the open ditch.

203.1.2.1. Utility Supports. Pipe capable of supporting its weight approximately at right angles to the ditch shall not require additional support, unless otherwise directed by the CITY or shown on the plans, other than the exercise of care in placing new conduit under same and in placing backfill, except when the span is excessive. If directed by the CITY, utilities shall be replaced with cast iron or any suitable piping to convey the contents, supported with concrete or a concrete utility support per details on the plans, as directed by the CITY. After the new utility is laid, the backfill to the base of the concrete support shall be stabilized by the use of cementstabilized soil, if directed by the CITY.

Pipes parallel to and in the edge of cut, shall be supported or rerouted if so indicated on the plans. Utilities parallel to and in edge of cut shall be adequately protected without additional compensation except as set out in the contract and proposal.

203.1.3. Relocating or Replacing Structures, Utilities or Appurtenances. Utility locations shall be obtained prior to the commencement of work.

Unless noted on plans that utilities are to be moved by others, any cost of temporarily or permanently relocating utilities shall be borne by the CONTRACTOR. The cost of these replacements shall be included in the CONTRACTOR'S bid price for the various items of work, and no separate payment shall be made. In case damage to an existing structure or utility occurs, whether such damage results directly or indirectly from the CONTRACTOR'S operations, the CONTRACTOR shall be responsible to restore the structure or utility to its original condition and position with out extra compensation. Temporary shut down of water and/or storm or wastewater services shall not extend overnight, holidays or weekends. The CITY shall approve all shut downs and may assist in the shut down operations.

When it is necessary to remove or adjust another utility, a representative of that utility shall be notified to decide method and work to be done.

The CONTRACTOR shall make satisfactory arrangements with other utilities for the required cutting or adjustments at the CONTRACTOR'S own expense, other than for items that may be provided in the contract for such work. No extra compensation shall be paid due to delays caused by removal of public utility structures.

203.1.3.1. Interrupted Wastewater Services. All wastewater collection services damaged during construction shall be replaced at the CONTRACTOR'S expense. Cuts or breaks in wastewater collection mains and laterals, or service connections shall be restored at the earliest practicable moment. Temporary restoration of service shall be installed within 4-hours of damage. Permanent repairs shall be in place in agreement with the

CITY. Wastewater collection service reconnections, including necessary adjustments to a replacement, shall not require the services of a master plumber, if being replaced by an approved utility CONTRACTOR; however, in all cases, repair shall be inspected by the CITY. It shall be the responsibility of the CONTRACTOR to maintain such services throughout the construction process.

Any spill of wastewater must be returned to the sanitary sewer and remediation of the spill is the responsibility of the CONTRACTOR. Spill and remediation will be reported by the CITY to the TCEQ and USEPA. The CONTRACTOR shall be responsible for notifying customers of temporary interruption of service.

203.1.3.2. Street Sign Posts and Signs. The CONTRACTOR shall be responsible for all damage to street sign posts and signs within the limits of the CONTRACTOR'S operations that remain in place or are removed and replaced. In the event that street sign posts and signs are damaged or destroyed by the CONTRACTOR'S operations, they shall be replaced at the CONTRACTOR'S expense.

203.1.3.3. Methods of Removal and Disposal. Materials or parts of structures which are to be broken up, dismantled or removed, and which are to be salvaged, shall be removed, loaded, cleaned and unloaded at sites designated by the CITY. Materials that are not salvageable shall become the property of the CONTRACTOR. Disposal of such materials, in accordance with applicable local, state, and federal regulations, shall be at the CONTRACTOR'S expense.

203.2. MAINTENANCE OF STREETS DURING CONSTRUCTION

The CONTRACTOR shall at all times maintain the surfaces of streets on which work was or is being performed. The maintenance required shall include the filling of holes; blading or otherwise smoothing of the street surfaces (particularly in a trench area); cleaning and removal of surplus excavation material rubbish, etc.; sprinkling of streets to abate dust nuisances and the elimination of interference resulting from blocking the street to residents thereon. Any or all of such operations shall be performed by the CONTRACTOR upon demand by the CITY, but the CONTRACTOR shall not wait for instruction from the CITY before performing maintenance work obviously in need of being done to meet the requirements of these specifications. All costs of work covered by this paragraph shall be included in the price bid for the various items of work, and no separate payment shall be made.

In the event the CONTRACTOR fails or refuses to properly maintain the surfaces of streets on which work was or is being performed, the CITY, after due notice to the CONTRACTOR, shall perform the necessary maintenance. All costs to the CITY incurred in the performance of such work shall be deducted from any monies due or to become due to the CONTRACTOR for work performed, or the CONTRACTOR shall be billed for such costs directly as the CITY shall elect. Notice to the CONTRACTOR to be given by the CITY shall be in writing, and it shall be delivered to the CONTRACTOR or an authorized agent. Except in emergency cases, where immediate action is required. The CONTRACTOR shall have 24-hours in which to comply with the instructions from the CITY. Should the CONTRACTOR fail to do so, the CITY shall proceed with the work as set forth above.

Where traffic must cross open trenches, such as street intersections and driveways, the CONTRACTOR shall provide suitable backfill bridges, protective barricades and such other safety equipment as required. The use of machinery must be so regulated as to preclude any unnecessary interference with traffic, utilities, etc. The CONTRACTOR shall abide by all applicable federal, state or local laws governing excavation work, including OSHA and USEPA regulations.

203.3. GENERAL SITE PREPARATION

203.3.1. Description. This Item shall consist of preparing the right-of-way and designated easements for construction operations by the removal and disposal of all obstructions from the right-of-way and from designated easements, where removal of such obstructions is not otherwise provided for in the plans and specifications. Such obstructions shall be considered to include remains of houses not completely removed by others, founda-

tions, floor slabs, concrete, brick, lumber, plaster, septic tanks, basements, abandoned utility pipes or conduits, equipment or other foundations, fences, retaining walls, outhouses, shacks and other debris.

This item shall also include the removal and disposal of curb and gutters, driveways, paved parking areas, miscellaneous stone, brick, concrete sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, all rubbish and debris, whether above or below ground except live utility facilities. This Item shall also include the removal and disposal of designated trees, stumps, bushes, vegetation, roots, shrubs, brush, and logs. It is the intent of this specification to provide for the removal and disposal of all obstructions and objectionable materials not specifically provided for elsewhere in the plans and specifications. This Item does not include the removal and disposal of hazardous material.

203.3.2. Construction Methods. The entire right-of-way for this project and such additional areas, including public or corporate areas and public or corporate lands, as made available for construction of this project, shall be cleared of all structures and obstructions, as defined above, except that trees or shrubs shall be protected unless specifically designated by the CITY for removal. Unless designated for removal without replacement, trees and shrubs shall be treated according to Item 202.1. Removal, Protection, and Replacement of Trees, Shrubbery, Plants, Sod, and Other Vegetation. Unless otherwise indicated on the plans, trees and stumps to be removed shall be cut off or otherwise removed as close to the natural ground as practicable on areas which are to be covered by at least 3-ft. (1m) of embankment. On areas required for borrow sites and material sources, stumps, roots, etc., shall be removed to the complete extent necessary to prevent such objectionable matter becoming mixed with the material to be used in construction.

Unless otherwise indicated on plans, all foundations and underground obstructions shall be removed to the following depths:

- (1) In areas to receive embankment, 2-ft. (0.6m) below natural ground or to bottom of structure.
- (2) In areas to be excavated, 2-ft. (0.6m) below the lower elevations of the excavation, or to the bottom of structure.
- (3) In all other areas, 1-ft. (0.3m) below natural ground or to bottom of structure.

All basement walls and floors, septic tanks and storage tanks within the limits of the right-of-way shall be removed and the resulting holes backfilled as directed by the CITY. Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc., shall be backfilled. The CONTRACTOR shall complete the operation of preparing right-of-way so that the prepared right-of-way shall be free of holes, ditches and other abrupt changes in elevations and irregularities to contour.

The remaining ends of all abandoned-in-place storm sewers, culverts, sanitary sewers, conduits and water or gas pipes shall be plugged with an adequate quantity of concrete to form a tight closure. All materials and debris removed shall become the property of the CONTRACTOR unless otherwise provided for on the plans or in the specifications and shall be removed from the right-of-way. Unless otherwise provided, all merchantable timber removed as previously specified shall become the property of the CONTRACTOR. Gravel, brick, stone or broken concrete, when permitted by special conditions, may be used in the roadway embankment.

203.4. UNCLASSIFIED STREET EXCAVATION

203.4.1. Description. Unclassified street excavation shall consist of all the required excavation within the limits of the right-of-way and areas adjacent thereto (except excavation specifically described and provided for elsewhere in the specifications); the removal, proper utilization or disposal of all excavated material; and the shaping and finishing of all earthwork in conformity with the lines and grades as shown on the plans or as established by the CITY all in accordance with the specification requirements contained herein.

203.4.2. Classification. Without regard to materials encountered, all street excavations shall be unclassified and shall be designated as "Unclassified Street Excavation," which shall include all materials excavated. It is to be distinctly understood that any reference to rock or other material on the plans and/or in this specification is solely for the CITY'S and CONTRACTOR'S information and is not to be taken as an indication of classification of excavation.

203.4.3. Construction Methods. All excavation shall be in accordance with the lines, grades and typical sections as shown on the plans or as established by the CITY. Unless otherwise shown on the plans or established by the CITY, the street excavation shall be made to the subgrade of the roadway and finished grade of park-

ways. Where excavation to grades established in the field by the CITY would terminate in unstable soil, the CONTRACTOR shall remove the unstable soil and backfill to the required grade.

Unless otherwise approved in writing by the CITY, where excavation to grade established in the field by the CITY terminates in loose or solid rock, the CONTRACTOR shall excavate 6-inches (15cm) below the required subgrade elevations for the entire roadbed width and shall backfill with suitable selected materials approved by CITY. Payment for such work will be made in accordance with the contract documents.

The CONTRACTOR shall conduct operations in such a manner that adequate measurements may be taken before any backfill, as required above, is placed. Dragging, pushing or scraping of material along or across the surface of the complete concrete improvements or pavements shall not be permitted.

203.4.4. Provisions For Drainage. If it is necessary in the execution of the work to interrupt the natural surface drainage or the flow of artificial drains, the CONTRACTOR shall provide temporary drainage facilities that shall prevent damage to public or private interest and shall restore the original drains as soon as the work shall permit.

The CONTRACTOR shall be held liable for all damages which may result from neglecting to provide for either natural or artificial drainage which its work may have interrupted.

203.4.5. Excess Excavation. The CONTRACTOR shall dispose of excavation in excess of that needed for construction. In general, suitable excess street excavation shall be used in construction of parkways, widening of embankments, flattening of slopes, etc., but, if it becomes necessary to waste any material, it shall be disposed of in such a manner as to present a neat appearance and to not obstruct proper drainage or cause injury to any street improvements or abutting property. If necessary to haul off excess or unsuitable material, the CONTRACTOR shall dispose of it in accordance with local, state, and federal guidelines.

203.4.6. Parkway. Parkway shall be finished as shown on plans. Whenever the adjacent property is lower than the design curb grade and drains away from the street, the parkway grade may be set level with the top of the curb, if approved by the CITY. The CITY may approve variations from these standards in special cases.

Sprinklers that are damaged as a result of Work shall be repaired by the CONTRACTOR to pre-Work condition.

203.5. UNCLASSIFIED CHANNEL EXCAVATION

203.5.1. Description. Channel excavation shall consist of required excavation for channels within the limits of the CITY's right-of-way or designated easements; the removal and proper utilization or disposal of all excavated materials; compacting and refilling, after settlement of all excavated areas; and constructing, shaping and finishing of all earthwork involved in conformity with the required lines, grades and typical cross sections in accordance with specification requirements herein outlined.

203.5.2. Classification. All authorized channel excavation shall be "unclassified" and involves removal of all materials necessary to permit carrying on the completion of the work.

203.5.3. General. In general, all excavation shall be made in open cut from the surface of the ground and shall be no greater in width or depth than is necessary to permit the proper construction of the work in accordance with the plans and these specifications. Work shall be executed in a neat workmanlike manner. A trench safety plan shall be submitted. All excavation shall be to the line and grade as provided by the CITY. The CONTRACTOR shall abide by all applicable federal, state and/or local laws governing excavation work.

The CONTRACTOR shall provide for the uninterrupted flow of storm and wastewater lines and surface waters during progress of the construction.

Completed work shall conform to the established alignment, grades and cross sections.

203.5.4. Dewatering. During construction, the channel shall be kept drained, insofar as practicable, and the Work shall include the installation and operation of all pumping, bailing and draining necessary to keep the excavation free from seepage water, water from storm drains, wastewater collection systems, ditches, creeks and other sources. The CONTRACTOR shall remove all water from any source that may accumulate in the excavation. The embedment or pipe shall not be installed in water. No water shall be allowed to flow through or over unset

concrete or through the completed line. All water removed from excavations shall be disposed of in a manner approved by the CITY, and to avoid the discharge of solids into the storm drain or watercourse, so as not to create unsanitary conditions, injure persons or property, damage the work in progress, and/or interfere unduly with the use of streets, private driveways or entrances. Pumping, bailing and draining, underdrains, ditches, etc. shall be considered as incidental work and shall not be paid for as separate items, but their cost shall be included in such contract prices as are provided for in the contract.

203.5.5. Excavated Material. Excavated materials shall be handled at all times in such manner as to cause a minimum of inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the work.

All suitable materials removed from the excavation shall be used, insofar as practicable, in the formation of embankments as required by Item 203.7. Embankment, or shall be otherwise utilized. Desirable topsoil, sod, etc. shall be carefully removed and piled separately adjacent to the work when required. Suitable excavated materials may be piled adjacent to the work to be used for backfilling.

Unsuitable channel excavation and suitable channel excavation in excess of that needed for construction shall be known as "waste" and, unless specified otherwise, shall become the property of the CONTRACTOR to be disposed of outside the limits of the right-of-way in accordance with local, state, and federal guidelines. The excavated material in rock that is not suitable material for bedding or backfill shall similarly be disposed of by the CONTRACTOR. Suitable bedding or backfill material shall be provided at no additional cost to the CITY.

The CONTRACTOR shall indemnify and hold harmless the CITY and all related officers, agents, and employees from all suits, actions or claims of any character resulting from arrangements for and disposal of soil.

203.5.6. Open Cut Construction Methods.

203.5.6.1. Trench Bottom Elevation. All trenches for installation of water, storm water collection system and/or wastewater collection system lines shall be excavated to a point below the barrel of the pipe for the type of embedment specified and as described in Item 504.5. Embedment.

203.5.6.2. Trench Overcut. Should the CONTRACTOR excavate below the plan trench bottom for water or wastewater collection system lines, the CONTRACTOR shall backfill to trench bottom grade shown on the plans with approved aggregate, consolidated and compacted to meet the CITY's approval.

If the CONTRACTOR elects to overcut the trench and use gravel and drain pipe as an underdrain in lieu of or in conjunction with pumping, draining or well pointing, the additional work shall be considered as incidental work and additional compensation shall not be allowed.

Where the character of the foundation material is such that a proper foundation cannot be prepared at the elevation shown on the plans, then, when directed by the CITY, the CONTRACTOR shall deepen the excavation to where a proper foundation entirely satisfactory to the CITY can be prepared. Such materials removed shall be replaced with foundation materials as specified in Item 504.3. Excavation and Foundation, or with other material satisfactory to the CITY and thoroughly compacted in place to finish grade elevation in a manner satisfactory to the CITY.

203.5.6.3. Excess Trench Width. When the plan trench width is not maintained to a point of 1-ft. (0.3m) above the top of the pipe, the CONTRACTOR shall provide embedment as directed by the CITY, which shall provide adequate support at no additional cost to the CITY.

203.5.6.4. Progress. The CITY shall have the right to limit the amount of trenches that shall be opened, or partly opened, in advance of or following the pipe laying operation. Unless otherwise directed by the CITY, the completion of backfill shall immediately follow the pipe laying. In the event the CONTRACTOR fails to comply with the requirement, the CITY may stop the pipe laying until the requirements are met.

203.5.6.5. Excavation for Altered Grade. If excavation for the conduit or appurtenance due to the altered grade is altered more than 1-ft. (0.3m) and has not been classified as a separate contract pay item, the increased or decreased amount of excavation due to the altered grade may constitute a basis for revised consideration by either party to the contract.

203.5.7. Alternate Methods of Excavation. Prior to commencing any excavation, the CONTRACTOR shall provide ample labor, equipment, shoring material and such other safety equipment as required to insure that the work shall be carried on without interruption or damage to existing installations and to provide the least interruption of traffic commensurate with the project requirements.

203.5.7.1. Blasting. In cases where the plans and specifications do not require the use of explosives, if (after written approval by the CITY) the CONTRACTOR elects to use explosives in the performance of the work, utmost care shall be exercised so as not to endanger life or property. The CONTRACTOR shall use only such methods as are currently utilized by persons, firms or corporations engaged in a similar construction business. The CONTRACTOR shall be solely responsible for the determination as to whether explosives shall be used and for any

result from the use of explosives. The CONTRACTOR shall indemnify and hold the CITY whole and harmless against any claim for damage or injury to persons or property, real or personal, as the result of the use of explosives by the CONTRACTOR or any subcontractor.

The following criteria with regard to the use of explosives and blasting shall be satisfied:

- (1) Certification. Certification by the proper authorities for personnel involved with the actual use of explosives is required and must be obtained prior to the use of explosives.
- (2) Insurance. The CONTRACTOR shall furnish the CITY with evidence of insurance sufficient to cover any such possibility, which insurance shall either include the CITY as an assured or be of such character as to protect the CITY.
- (3) Restrictions. No blasting shall be permitted within highway right-of-way or railroad right-of-way without written permission from TxDOT, the railroad involved and the CITY.
- (4) Limitations. When blasting is authorized, the blast shall be covered with heavy timbers chained together, a rope mat, or some other equally effective method of blast effect protection, approved by the CITY. All explosives shall be stored in a safe and secure manner and such storage places shall be clearly marked, "DANGEROUS — EXPLOSIVES." Blasting caps and explosives shall be stored separately. In addition to the "DANGEROUS — EXPLOSIVES" sign which must be displayed, at least two signs marked, "EXPLOSIVES, TURN ALL RADIOS OFF," shall be placed in a conspicuous location readily visible to vehicular traffic and not less than 350-ft. (150m) from electric explosive caps storage area. During each blast the exposed end of the pipe shall be covered with planking.
- (5) Notification. The CONTRACTOR shall notify each utility company having structures in proximity to the site of the work of the intention to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury. Such notice shall not relieve the CONTRACTOR of responsibility for any damage resulting from blasting operations.
- (6) Laws and Ordinances. The method of blasting, storing and handling explosives must be carried on in full conformance with the requirements of all federal and state laws and municipal ordinances.

203.5.7.2. Tunneling. When the CONTRACTOR installs wastewater collection system and/or water mains by jacking, boring or tunneling, the CONTRACTOR shall comply with the provisions of Item 503. Trenchless Installation.

When shown on the plans or proposal or as directed by the CITY, the CONTRACTOR shall be paid for tunneling work as outlined in the bid proposal.

If approved by the CITY, the CONTRACTOR may voluntarily elect to install by tunneling, boring or jacking any portion of the work that is designated on the plans for open cut installation. The CONTRACTOR shall be paid for only the pay items that would have been paid for if the work had been done by open cut.

203.5.7.3. Cofferdam. Where shown and/or detailed on the plans, excavation shall be performed within a cofferdam. The CONTRACTOR shall install and securely brace the cofferdam in accordance with Item 802.4. Cofferdams and shall remove the excavation within the area so protected without damage to or displacement of the cofferdam and bracing.

203.6. BORROW

203.6.1. Description. Borrow shall consist of required excavation, removal, and proper utilization of materials obtained from designated or approved sources.

203.6.2. Classification. All authorized borrow shall be "unclassified" unless otherwise noted.

203.6.3. Construction Methods. All suitable materials removed from the excavation shall be used, insofar as practicable, in the formation of the embankment as required by the governing item for embankment; or shall otherwise be utilized as indicated on the plans or as directed. The completed work shall conform to the established alignment, grades and cross section. Site of the borrow operations shall be left in a suitable and sightly condition,

such as to provide proper drainage where practicable. Where indicated on the plans, the sides and/or ends of borrow pits shall be sloped to the dimensions indicated on the plans.

203.6.4. Selection of Materials. Where shown on the plans, selected materials shall be utilized in the formation of embankment, embedment or backfill, or to improve the roadbed, in which case the work shall be performed in such manner and sequence that suitable material may be selected, removed separately and deposited in the roadway within limits and all elevations required. When required, acceptable borrow material, tested by standard laboratory methods, shall meet the requirements indicated on the plans.

203.7. EMBANKMENT

203.7.1. Description. Embankment shall consist of the placement and compaction of all suitable materials obtained from excavation, borrow or any other approved excavation.

203.7.2. Construction Methods. Prior to the placing of any embankment, all clearing and grubbing and site preparation shall have been completed. Stump holes or other small excavations within the limits of the embankment shall have been backfilled before commencing the embankment construction. The surface of the ground, including plowed or loosened ground or small ditches or washes, shall be restored to approximately its original slope.

The surface of hillsides shall be loosened by the scarifying or plowing to a depth of not less than 4-in. (100mm) or cut into steps before embankment materials are placed. The embankment shall then be placed in layers as hereinafter specified, beginning at the low side in part widths as the embankment is raised. The material which has been loosened shall be recompacted simultaneously with the embankment material placed at the same elevation. Where embankment is to be placed over or adjacent to the existing roadbeds, the slopes shall be plowed or scarified to a depth not less than 4-in. (100mm) and the embankment built up in successive layers, as hereinafter specified, to the level of the old roadbed before its height is increased. Then the old roadbed shall be scarified and recompacted with the next layer of embankment. The total depth of the scarified and added materials shall not exceed the permissible depth of the layer.

All embankments for roadbeds shall be constructed in layers approximately parallel to the finished grade of the street and shall be so constructed as nearly as possible to conform to the cross section of the subgrade section.

Embankments shall be constructed to the established grade and to the shape of the typical section shown on the plans, and each section shall conform to the detailed sections of slopes. After completion of the embankment, it shall be continuously maintained to its finished section and grade until the project is accepted.

Earth embankments shall be constructed in successive layers, for the full width of specified depth or cross sections; and in such lengths as are suitable for the sprinkling and compaction methods to be used. Each layer of earth embankment shall be uniform as to material, density, and moisture content before beginning compaction. Prior to compaction, the layers shall not exceed 6-in. (150mm) in depth for pneumatic tire rolling or 8-in. (200mm) in depth for rolling with other types of rollers.

Earth embankment placed adjacent to and over pipes, culverts, arches and bridges shall be of suitable material and shall be placed in successive layers approximately horizontal. Layers of embankment shall be brought up uniformly on each side of the structure, and special care shall be taken to prevent any wedging action against the structure. For such distances along embankments adjacent to structures where it is impracticable to obtain compaction by rolling, the embankment material shall be placed in layers not exceeding 6-in. (150mm) in depth of loose material wetted uniformly to the moisture content directed; and shall then be compacted by methods approved by the CITY, maintaining the required moisture content by additional sprinkling, if necessary, supplemented by such hand work as is necessary to secure a uniform and thoroughly compacted fill, until each layer has been uniformly compacted to the satisfaction of CITY.

All earth cuts, full or part width in the side of a hill, which are not required to be excavated below subgrade elevation for base or backfill, shall be scarified to a uniform depth of not less than 6-in. (150mm) below grade shown on the plans, and the materials shall be mixed and reshaped by blading and then sprinkled and rolled in accordance with the hereinabove outlined requirements for earth embankments.

Rock embankments shall be composed principally of rock and shall be constructed in successive layers for the full width of the specified depths or cross sections, and each layer shall be 18-in. (450mm) or less in depth. Each layer shall be constructed by starting at one end, dumping the rock on top of the layer being constructed and then pushing the dumped material ahead in such a manner that the larger rock shall be placed on the ground or preceding rock embankment layer; and the interstices between the larger stones shall be filled with smaller stones and spalls both by this operation and from the placing of succeeding loads of rock materials. The upper or final layer of rock embankment shall contain no stones larger than 4-in. (100mm) in their maximum dimension, and insofar as such is available by selection of the excavation, this layer shall be composed of materials so graded that the maximum density and uniformity of the surface layer may be secured. Each rock embankment layer shall be rolled as directed by the CITY.

In addition to the foregoing selection of materials and utilization of the materials in the embankment, the embankment shall be constructed in the proper sequence to receive select materials as specified or as shown on the plans, with any modifications as may be directed by the CITY. The layer of embankment immediately preceding the upper layer of select material shall be constructed to the required cross section and the proper elevation within a tolerance of not more than 0.1-ft. (30mm) from the established cross section or elevation after proper compaction and shall be finished as necessary to receive the select material.

203.7.3. Density. For each layer of earth embankment and select material, the relative compaction of the embankment shall be as shown on the plans. After each section of earth embankment or select material is completed, such tests as are necessary shall be made as specified by the CITY, unless otherwise specified in the special provisions or in the plans.

203.8. DUST CONTROL

203.8.1. Description. Sprinkling for dust control shall consist of the authorized application of water or other material approved by the CITY on those portions of the projects as shown on the plans or as directed and as herein specified. It shall be the responsibility of the CONTRACTOR to take preventive measures to eliminate, reduce, or alleviate any dust nuisance in the work area. This control of dust nuisance is most important in populated areas. The CITY will approve the method used. Should the CONTRACTOR fail to control dust as outlined above, the OWNER may suspend the work until corrective measures are taken.

203.8.2. Materials. Water or other material approved by the CITY shall be furnished by the CONTRACTOR and shall be clean, free from industrial waste and other objectionable matter. Emulsions shall meet the requirements of Item 2.4.5. Emulsions for Priming, Curing and Erosion Control.

203.8.3. Construction Methods. The CONTRACTOR shall furnish and operate a sprinkler equipped with positive and rapidly working cutoff valves and approved spray bars, which shall insure the distribution of material in a uniform and controllable rate of application. It shall be the CONTRACTOR'S continuous responsibility to be on call at all times including nights, holidays, weekends, etc. and respond in a timely manner, until acceptance of the project by the CITY, to maintain the project free of dust in a manner which shall cause the least inconvenience to the public.

Survey & Monumentation Standards

All subdivisions prepared for submittal to City of Temple shall be prepared by a Registered Professional Land Surveyor, licensed in the state of Texas, and all survey work shall be performed in compliance with the current Minimum Standards of Practice governed by the Texas Board of Professional Land Surveying (TBPLS).

- 1.) **CONTROL** - The perimeter boundary of the subdivision must be tied to the City of Temple Horizontal and Vertical Control system, and the physical (measured) tie (grid bearing and surface distance) must be displayed on the subdivision plat, or described thoroughly with a note on the face of the plat.

All elevations shown on construction plans or on the plat (if needed) must be tied to an existing City of Temple Control Point, and the description/location of this control point/benchmark must be noted on the plans, and in some events – on the plat.

- 2.) **BOUNDARY MONUMENTATION** - All subdivisions shall have the perimeter boundary of the subdivision properly marked and said markers must consist of monuments that are set or found (and appropriately described on the plat and in the accompanying surveyor's field notes), and are of sufficient size and depth to retain a stable and distinctive location and to withstand the deteriorating forces of nature, and shall be of such material that, in the surveyor's judgment, will best achieve this goal (this is required in order to comply with TBPLS rules).

All of the perimeter corners of the subdivision must have actual "in the ground" markers that meet the TBPLS minimum standards, or have reference markers in the event of drastic terrain creating a situation where a marker cannot be placed at the actual corner.

All street Rights-Of-Way (ROW) corners (this includes block corners, angle points, points of curvature and points of tangency) must have a marker placed by a surveyor prior to final plat approval by the City of Temple or recording of plat and prior to final acceptance of the subdivision. In accordance with the TBPLS rules, where practical, all monuments/markers set by professional land surveyors to delineate or witness a boundary corner shall be marked in a way that is traceable to the responsible surveyor or associated firm.

- 3.) **INDIVIDUAL LOT CORNERS** - Each and every lot corner is not required to be in place at the time the plat is approved or recorded, unless said corner is a subdivision perimeter corner, block corner, or ROW corner. Prior to commencement of building/structure construction, all lot corner monuments for the lot(s) included in the permit must be in place.

DSAB Approved: 10/10/2007

**City Council Approved: 1/17/2008
City Ordinance # 2008-4194**