

Addendum #1



Capital Project Committee

Project Information

Project Name:	Centerplace Turn Lane Improvements - Phase 1
Bid Number:	RFP #FD20-02-026
Date:	March 4, 2020
Project Manager:	Brian Ward

Addendum Items

Item 1:	Can the start date be in July? No, the intent is to start as soon as possible hopefully in April, 2020
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Landscape and Irrigation Remediation

Item 2:	<p>Can a more detailed description of what is needed be provided? The work associated with Landscape and Irrigation Remediation includes all work associated with repair, adjustments, and replacement of existing landscaping and existing irrigation systems reset and accepted by the City. Work shall be done in accordance with City of Greeley Landscaping Standard Specifications.</p> <p>Payment will be made at the applicable contract unit price for the bid item and will include full compensation for all labor, equipment, tools, and materials necessary to complete the work. Payment for Landscape and Irrigation Remediation will include all landscaping, sod, piping, wiring, valves, sprinkler heads, drip emitters, fittings, excavation, backfill, and all other items of work involved in the reset and modifications necessary to the irrigation systems to complete the work.</p>
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Item 3:	Is there an irrigation as-built available for the areas identified to be remediated? No.
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Item 4:	What is expected for replacing of the planter beds at the southwest corner of 46 th Avenue? Will the replacement trees need to be replaced at their current size, or a different height or caliper depending on the type of tree? All removed trees will be replaced 1 to 1 with a tree of the same species of a 2" caliber. The planter bed shall be replaced exactly how it exists and will require adjustments to the irrigation system. The Contractor shall document with photos and replace the planters beds accordingly
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Item 5:	I can't find the City of Greeley specification Section 2920, which is referenced in the bid documents, on the City's website. Please provide this specification section or let me know where I can find it on the website. See attached City Landscape and Irrigation specifications.
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Stone Landscape Wall

Item 6:	The landscape stone wall notes on the plans states the wall "shall conform to the revision of Section 504. Is this the CDOT specification? Yes, Section 504 refers to CDOT.
Item 7:	Is the quantity of stone landscape wall of 470 SF the exposed area only, or is it the amount of wall above the levelling pad as is stated in the Revision of Section 504? Stone Landscape Wall will be measured by the number of square feet of facial area from leveling pad to top of wall.

CITY OF GREELEY IRRIGATION CONTROLLER SPECIFICATION

Baseline Specification

All irrigation controllers and online web management platform will be as manufactured by Baseline Control Systems. Controllers will be Base Station 3200 painted steel wall mounts and/or stainless-steel pedestals.

BaseManager Online Management System

Real-time internet connectivity that works on any web enabled device. With the ability to run any number of controllers across two controller platforms, using one interface.

Map-based user interface utilizing Bing maps with interactive map icons, giving the user the ability to turn zones on and off with user defined runtime, learn flow on a single station, chart zone activity, view what programs the zone is in and its associated runtime, test electrical circuit providing an AC voltage at the solenoid, amp draw, voltage drop reading along the two-wire path, and custom notes. Ability to geo locate zones, master valves, moisture sensors, flow meters, hydrometers, event switches, temperature sensors, and custom markers on map interface through mobile access. Interactive map icons must be color coded with 11 different colors displaying current status of that device. Colors for zone icon activity status and program status must transcend the entire control platform from controller face plate, to mobile phone access, internet and or self-hosted management platform. System can be configured to send alerts and messages via text message and email.

All sensor status and activity must be available in all access points from controller, to mobile phone, and web platform access. System must be able to interface with a rain switch in a manner that allows for user defined start, stop and pause conditions. Weather Access and weather-based schedules programmed on a by zone basis in watering schedule, with the ability to combine timed runtimes, weather-based runtimes and soil moisture-based runtimes in the same program. Allowing for a combination of weather-based or soil moisture activated runtimes on the same zones, depending on specific needs.

Allow the ability to customize zone names, sensor names, and program names and populate those customized descriptions throughout the entire platform from controller face plate, to mobile phone access, internet and or self-hosted management platform.

Requires the ability to manage controller access between users, giving users access to specific controllers, while other users have access to the same controllers or different controllers.

Basemanager must be available as a cloud-based service provided by Baseline Systems, as a subscription- based access platform or a self-hosted server or virtual machine server-based platform.

Minimum security protocol requirements: AES256-bit encryption along with the TLS1.2 protocol.

Baseline Communication Methods

All controllers must have the capability of utilizing all of the following methods of communication. Cellular (minimum of 4G), Ethernet, 900Mhz Ethernet Radio, Wi-Fi, and Two-Wire as a true two-way

communication path. Must have the ability to connect to the online central without the use of a cellular modem device. Also, must be able to utilize 900Mhz Ethernet radio to connect multiple controllers to the internet through a single controller Ethernet and/or Cellular access point. Controller supports up to 8 available addresses for TCP/IP-based connections. These addresses are used to connect the following performance components: Flow station, SubStation, and Munro Pump Station.

Baseline Controller and Two-Wire Specification

Wall mount controllers will be in powder coated steel or 304 grade stainless steel cabinets. Pedestal mount controllers will be in 304 grade stainless steel flip top pedestals mounts. Wall mount controller dimensions are: 15.5" x 12.38" x 6.4", 16-gauge powder coated steel or stainless steel. Pedestal mount enclosure dimensions are: 17.38" x 36.25" x 12.63" 16-gauge stainless steel. Controller display will meet the following minimum requirements: Built in full color display with High contrast 3.5-inch TFT LCD screen, resolution is 320x240 at 65,536 colors, screen brightness of 200 lumens for easy viewing in direct sunlight. Controllers must have a built in Ethernet port and be capable of running two-wire and conventional wire out of the same controller. With a zone count of up to 200 stations per controller in any combination of conventional and decoder stations, not exceeding the 200 stations. Controllers must utilize true two-way communication on the two-wire path. Controller is capable of operating non-irrigation zones with ease. Controller allows for operation of 15 concurrent zones and a up to 99 concurrent zones through the use of SubStations. Allows for the ability to back up and restore all programming and historical data with any USB flash drive. Controller will store all program and history information in its non-volatile memory. Controller will allow for the establishment of 3 levels of 4-digit PIN password protection: operator, programmer, and administrator.

Programming Features are as follows: All controllers must provide up to 99 automatic programs, with 8 programmable start times, allowing 1-15 concurrent zone to operate in each program, as long as it does not exceed the hydraulic and electrical limitations of the system. Controller will be able to utilize weather-based schedules, moisture sensor-based schedules and traditional runtime-based schedules, and will allow for all three of these methods to be utilized in the same program. Other programming features must include: Water source prioritization, program prioritization, and intelligent water rationing. The controller allows a program to be started by the following options: Start time, moisture percent, temperature value, event switch contacts open or closed, pressure sensor readings.

Each controller must be able to read and manage up to 8 master valves and 8 flow sensors and utilize pressure readings to stabilize flow. Every controller will have the ability to monitor up to 25 soil moisture sensors. Pressure sensors can be used to create start, stop or pause conditions based on a user defined pressure reading. Controller will search for and identify all devices connected to the two-wire path and lists them according to device type and serial number.

Messaging and Alerts: Provides real-time soil moisture measurements and watering feedback to the user, alerts and alarms are self-diagnosed and displayed on the screen. Displays on-screen historical-run-time chart that includes time watered for the last 6 days of program, and a historical water use chart showing actual water used for the last 6 days by flow meter. Displays a 6-day scalable soil moisture history graph with integrated run-time bar chart. Displays high flow alerts, low flow alerts, pause messages and conditions, rain delays, wire faults, and other operating conditions.

Decoders will have built in diagnostic LED indicator lights that tell you at a glance the device is working. Two-wire must utilize true two-way communication on the two-wire path. Requires smart two-way communication allowing you to assign any decoder to a zone or function from the controller after the decoder has been installed in the field. Multi-station decoders can be assigned any station number in any order.

Available devices for two-wire include but are not limited to the following: Single station decoder, two station decoder, four station decoder, master valve decoder, dc latching decoder, event decoder, pump start switching decoder, flow decoder, pause decoder and coach's button, and pressure sensor decoder. Controller must be able to identify every two-wire device connected to the two-wire path and must be able to list them in the controller. Controller is capable of re-addressing any station decoder to a new station number while leaving it installed in the field, by re-assigning the devices serial number to a new station number.

All decoders will be fully sealed, submersion-proof, and approved for direct bury, and will carry a standard 5-year warranty out of the box.

Acceptable wire and wire connectors for two-wire path: Paige P7072D or Regency 14/2 and 12/2 Maxi Wire, connectors will be DBR/Y-6. Other wire and wire connectors may be approved as an equal but must be submitted to owner prior to installation, and owner makes all final decisions on all specifications.

Controller and Two-Wire Path Grounding and Surge Protection Specification

All installations should conform to manufacturer's instructions and must meet or exceed the American Society of Irrigation Consultants (ASIC) Earth Grounding Electronic Equipment in Irrigation Systems—Guidelines (<http://www.asic.org>).

Grounding Electrodes In all cases where it does not conflict with appropriate grounding grid design for the site in question, grounding electrodes (such as rods or plates) referred to in this specification must conform to the following standards.

Grounding Rods:

- All grounding rods must be bare copper of 5/8" diameter or greater and a minimum of 8' length or longer.
- Grounding rods must be located at a minimum distance to assure that the two-wire path is outside of the electrode sphere of influence for the grounding rod. For an 8' grounding rod, this means that the grounding rod must be connected at least 8' away from the two-wire path, at a right angle to the two-wire path. See the BL-LA01 Surge Arrestor Installation Guide for details on connecting the grounding rod to the device or surge arrestor.
- Install all grounding rods in a 10-inch round valve box to facilitate the use of a clamp-on ground resistance tester. If you use a smaller box, you will not be able to clamp the tester around the ground rod or the conductor.
- Drive grounding rods into the ground to a minimum of 8' in a vertical or oblique position. The angle of the rod relative to the vertical must be no more than 45°.

Grounding Plates:

- All grounding plates must be a minimum of 5 square feet, as outlined in ASIC Earth Grounding Electronic Equipment in Irrigation Systems—Guidelines.

- Grounding plates must be located a distance equal to the diagonal measurement (the distance from one corner of the grounding plate to the opposite corner) of the grounding plate from the two-wire path. The longest side of the grounding plate must run parallel to the two-wire path.
- Install grounding plates in a horizontal position a minimum of 30" below ground level and below the frost line. Position the plate flat at the bottom of the trench.

Consult the ASIC Earth Grounding Electronic Equipment in Irrigation Systems–Guidelines for correct minimum recommended distances for different grounding rod or grounding plate sizes and grounding grid designs.

Connections to Grounding Rods & Plates:

All connections to grounding rods/plates must conform to ASIC Earth Grounding Electronic Equipment in Irrigation Systems–Guidelines and must consist of either a CADWELD type or screw clamp type of connection. CADWELD or equivalent connections are preferred. All clamps must be suitable for direct burial or exothermic weld. The resistance reading on this connection should be less than 1milliohm.

Any wire extensions required to connect from a grounding rod to a surge arrestor or enclosure ground lug must be 6-gauge bare copper wire and must not have any sharp bends, coils, or kinks. Wire extensions connected to surge arrestors must use a split bolt connector, CADWELD connector, or screw clamp connector where the bare copper ground wire meets the green grounding wire from the surge arrestor.

Never use solder to make connections in the grounding system because it will melt during a lightning discharge.

Grounding Options:

While the best option for grounding irrigation equipment is a direct physical connection to the earth, there are times when this is impossible or impractical. The following options are available for special cases. All other requirements in Baseline’s Grounding Specifications apply.

- **Controller Enclosure:** When direct physical connection to the earth is not possible, the irrigation controller’s enclosure ground can be connected to the building ground. However, DO NOT connect the two-wire surge arrestor ground to the building ground. The ground on an electrical receptacle (outlet) is not allowed, and is not sufficient.
- **Irrigation System on a Green Roof or Green Wall:** When grounding the irrigation system on a green roof or green wall, the irrigation controller’s enclosure ground can be connected to the building ground, and it is acceptable to connect the green wire from each surge arrestor to the building system ground.

Two-wire Grounding with Surge Arrestors:

The surge arrestor is a critical part of the surge protection scheme for the two-wire path. Surge arrestors attach directly to the two-wire path and help dissipate electricity generated by nearby lightning strikes and other electromagnetic events. While two-wire components have optical isolators and other surge arresting features, the surge arrestor provides an extra measure of protection. **IMPORTANT:** Surge arrestors are required for proper operation and for warranty coverage.

Installation of Surge Arrestors:

- Connects directly to the red and black wires
- Attaches to grounding rod via the green wire
- Install in a valve box
- Surge arrestors must be connected to bare copper ground wires using split bolt connectors, CADWELD connectors, or screw clamp connectors suitable for direct burial (no wire nuts of any kind are supported for grounding wires).

Two-Wire Grounding Installation:

Two-wire supports a large number and variety of wiring configurations. As more wires are connected to a piece of electronic equipment, more lightning energy enters the equipment, and a more substantial grounding grid must be used. Consult the Baseline Two-Wire Specification for more details. The two-wire must have properly installed surge arrestors as outlined in the Baseline Surge Arrestor Install Guide and elsewhere in this document. Surge arrestors must be installed as outlined below:

- The first surge arrestor on the two-wire path must be within 25' of the controller. This grounding point must be separate from the irrigation controller's enclosure grounding point.
- Place a surge arrestor every 600' on the two-wire path. Each surge arrestor protects a 300-foot radius of the two-wire path.
- In lightning prone regions, consider grounding every 300' rather than going out to the maximum distance.
- There must be a surge arrestor at the end of the two-wire that is the maximum distance from the controller or if looped at the point of maximum distance from the controller.
- Any branch of the two-wire that exceeds 50' must have a surge arrestor at the end.
- On an uninterrupted run of more than 600', it is acceptable to have a surge arrestor at each end. Note: On any wire run with no splices, do not cut the wire to install a surge arrestor, just place one at the end.

Controllers in Steel Wall Mount Enclosures:

The following applies to all controllers, controller extensions, add on components, in steel wall mount enclosures. If the controller is on or within an existing building, the unit must be grounded as outlined below: The ground lug, located in the interior in the lower right region of the enclosure, must be connected directly to the building ground using a bare copper wire of 6 AWG or larger, as outlined in article 250 of the National Electric Code (NEC), so that a single point of connection with the building ground is achieved. If the controller is mounted at a remote location more than 25' away from the building or grounded AC power source, the unit must be grounded as outlined below: A bare copper grounding wire of 6 AWG or larger must be connected from the ground lug to an appropriate grounding rod as outlined in the previous sections of this document.

Controllers in Stainless Steel Enclosures:

If the controller is within 25' of an existing building, and is connected to the AC power system within that building, the unit must be grounded as outlined below: The ground lug, located in the interior on the back panel in the lower-left corner under the AC power box in the pedestal enclosure, must be connected directly to the building ground using a bare copper wire of 6 AWG or larger, as outlined in article 250 of the National Electric Code (NEC), so that a single point of connection with the building ground is achieved. If the controller is mounted at a remote location more than 25' away from a

building or grounded AC power source, the unit must be grounded as outlined below: A bare copper grounding wire of 6 AWG or larger must be connected from the ground lug to an appropriate grounding rod as outlined in the previous sections, and in conformance with the ASIC Earth Grounding Electronic Equipment in Irrigation Systems– Guidelines.

IMPORTANT: All clamps used to connect the 6 AWG wire to the grounding electrode must be suitable for direct burial or exothermic weld.

Baseline Extended Ten Warranty

All Baseline manufacturer specifications must be adhered to including all grounding specifications for the controller and or the two-wire path. Once the controller has been installed the contractor is required to have Authorized Baseline Technical Service Representative perform the Baseline Extended Warranty testing. All equipment must meet or exceed the testing standards set forth by Baseline Systems. Controllers must be grounded to 10 ohms or less. After you have installed your grounding system on the two-wire path, Baseline requires that you measure the ground resistance in order to prove that each grounding point meets Baseline's specifications. Resistance readings of 5 to 10 ohms are desirable, and a reading of no more than 25 ohms is required. An Authorized Baseline Technical Service Representative will measure the ground resistance and will perform all other necessary testing, inspections and will submit all paperwork to Baseline for approval.

The Baseline Extended Ten Year Warranty Testing should be specified as follows:

AUTHORIZED BASELINE EXTENDED WARRANTY CERTIFICATION TECHNICIAN TO PERFORM GROUNDING OHMS TEST AT CONTROLLERS AND ALONG TWO-WIRE PATH GROUNDING RODS. CONTROLLERS MUST BE GROUNDED TO 10 OHMS OR LESS, AND TWO-WIRE GROUNDING RODS (5-10 OHMS DESIRABLE) MUST BE 25 OHMS OR LESS. INCLUDES ALL FIELD INSPECTIONS AND SUBMISSION TO BASELINE FOR APPROVAL.

Important: Consult Baseline's Two-Wire Technical Specification and the Surge Arrestor & Grounding Specification for details on surge protection installation. Failure to install surge protection hardware to specification will void surge protection coverage under this warranty.

THIS WARRANTY IS LIMITED SOLELY TO BASELINE EQUIPMENT, AND DOES NOT WARRANT AGAINST DAMAGE CAUSED BY LIGHTNING OR OTHER POWER SURGES TO NON-BASELINE EQUIPMENT, WIRING, LANDSCAPE, OR FACILITIES. THIS WARRANTY DOES NOT COVER ANY EFFECTS TO LANDSCAPE OR PROPERTY DUE TO BASELINE EQUIPMENT'S OPERATION OR FAILURE TO OPERATE FOLLOWING A SURGE OR LIGHTNING STRIKE, NOR DOES IT COVER LABOR COSTS ASSOCIATED WITH TROUBLESHOOTING OR REPAIRS.

BASELINE IRRIGATION SPECIFICATIONS

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PART 4 SUPPLEMENTAL BASELINE SPECIFICATIONS

DIVISION 2-SITE WORK

SECTION 02810 - IRRIGATION

PART 1: GENERAL

1.01 SCOPE:

Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. Items of work specifically included are:

- I. Procurement of all applicable licenses, permits, and fees.
- II. Coordination of Utility Locates ("Utility Notification Center").
- III. Connection of electrical power supply to the irrigation control system.
- IV. Sleeving for irrigation pipe and wire.
- V. Preparation of Record Drawings.
- VI. Spring start-up and winterization.
- VII. Maintenance period.

1.02 WORK NOT INCLUDED:

Items of work specifically excluded or covered under other sections are:

- I. Provision of electrical power supply to the irrigation control system.
- II. Provision for water to the site (water meter).

1.03 SUBMITTALS:

- I. Deliver four (4) copies of all submittals to the Owner's Representative within 10 working days from the date of Notice to Proceed. Provide information in a 3-ring binder with table of contents and index sheet. Provide sections that are indexed for different components and labeled with the specification section number and the name of the component. Submittals must be made for all the components on the material list. Indicate which items are being supplied on the catalog cut sheets when multiple items are shown on one sheet. Submittal package must be complete prior to being reviewed by the Owner's Representative. Incomplete submittals will be returned without review.

- II. Materials List: Include sleeving, pipe, fittings, mainline components, sprinkler, drip irrigation components, control system components, shop drawings and all other components shown on the drawings and installation details or described herein. Components such as pipe sealant, wire, wire connectors, ID tags, etc. must be included. Quantities of materials need not be included.
- III. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, and operating instructions for equipment shown on the materials list.
- IV. Shop Drawings: Submit shop drawings called for in the installation details. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail.
- V. The following items are required to receive Baselines's installation verification and warranty verification: Baseline's Controller and Communications. Prior to final acceptance of the project, the contractor shall be responsible for contacting and coordinating installation verification for any and all of the aforementioned products required by and installed on this project. Prior to starting work on this project, the contractor shall contact an authorized Baseline Distributer, and conduct an on-site meeting with the Baseline representative and a City representative to coordinate all required verification services in a timely manner, to include Radio Site Survey and equipment needs. The contractor shall provide documentation of this meeting to the City of Greeley. Prior to final acceptance of the work, the contractor shall provide proof of installation verification of all required equipment by the authorized Baseline representative to the City of Greeley.

1.04 RULES AND REGULATIONS:

- I. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.
- II. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.
- III. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only, it is the Contractor's responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.05 QUALITY ASSURANCE:

- I. Engage an experienced Installer who has completed irrigation work similar in material, design, and extent to that indicated for this project and with a record of successful irrigation installations.

Installer's Field Supervision: Field supervision shall be on site, full time during installation. Field supervisor shall have at least 5 years experience in 2 wire installation.

II. 1.06 TESTING:

- I. Notify the Owner's Representative three days in advance of testing.
- II. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.
- III. Subsections of mainline pipe may be tested independently, subject to the review of the Owner's Representative.
- IV. Furnish clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests. Pressure gauge resolution must be suitable for recording losses less than 5 psi.
- V. All costs, including travel expenses for site visits by the Project Manager, for any reinspection that may be required due to non-compliance with the Construction Documents shall be the sole responsibility of the Contractor.
- VI. Hydrostatic Pressure Test (Solvent Weld Mainline Pipe):
 - A. Subject mainline pipe to a hydrostatic pressure equal to 140 PSI for two hours. Test with mainline components installed.
 - B. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
 - C. Expose all remote control valves their riser pipe and service tee fittings.
 - D. Purge air from mainline pipe before test. Attach pressure gauge to mainline pipe in test section.
 - E. Observe pressure loss on pressure gauge. If pressure loss is greater than 5 PSI, identify reason for pressure loss. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pressure loss is equal to or less than 5 PSI.
 - F. Visually inspect irrigation pipe for leakage and replace defective pipe, fittings, joint, valve, or appurtenance. Repeat test until pipe passes test.
 - G. Cement or caulking to seal leaks is prohibited.
- VII. Volumetric Leakage Test:
 - A. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
 - B. Purge air from pipeline before test.
 - C. Subject mainline pipe to 140 PSI for two hours. Maintain constant pressure.
 - D. Provide all necessary pumps, bypass piping, storage tanks, meters, 3-inch

- test gauge, supply piping, and fittings in order to properly perform testing.
- E. Testing pump must provide a continuous 140-PSI to the mainline. Allowable deviation in test pressure is 5-PSI during test period. Restore test pressure to 140-PSI at end of test.
- F. Water added to mainline pipe must be measured volumetrically to nearest 0.10 gallons.
- G. Use the following table to determine maximum allowable volume lost during test:

Leakage Allowable (Gallons per (100 Joints) / Hour)

Pipe Size (INCHES)	Test Pressure (PSI)								
	60	70	80	90	100	110	120	130	140
2 ½"	0.39	0.42	0.45	0.48	0.51	0.53	0.56	0.58	0.61
3"	0.48	0.51	0.55	0.58	0.62	0.65	0.68	0.70	0.73
4"	0.62	0.66	0.71	0.75	0.80	0.84	0.87	0.91	0.94
6"	0.90	0.97	1.04	1.11	1.18	1.23	1.29	1.34	1.40

VIII. Operational Test:

- A. Activate each remote control valve in sequence from controller. The Owner's Representative will visually observe operation, water application patterns, and leakage.
- B. Replace defective remote control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
- C. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
- D. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
- E. Repeat test(s) until each lateral passes all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to the Owner.

IX. Control System Acceptance Test:

- A. Upon completion of construction, City of Greeley Parks Department Representatives will administer a System Acceptance Test.
- B. Following construction completion and a Review by the Project Manager, an evaluation period will begin. After 30 days of continuous service without major system problems, the system will be accepted and the guarantee/warranty period will begin. If at any time during the 30-day evaluation period, a major system problem occurs, the source of the problem will be determined and corrected and the 30-day evaluation period will start again. Equipment will not be accepted until such time as the System Acceptance Test is passed.
- C. If successful completion of the System Acceptance Test is not attained within 90 days following commencement of the evaluation period, the Project Manager has the option to request replacement of equipment, terminate the order, or portions thereof, or continue with the System Acceptance Test.

These options will remain in effect until such time as a successful completion of the System Acceptance Test.

- D. Final payment will be made after successful completion of the System Acceptance Test.

X. Control System Grounding:

- A. Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.
- B. Replace defective wire, grounding rod, or appurtenances. Repeat the test until the manufacturer's guidelines are met.

1.07 CONSTRUCTION REVIEW:

The purpose of on-site reviews by the Owner's Representative is to periodically observe the work in progress, the Contractor's interpretation of the construction documents, and to address questions with regard to the installation.

- I. Scheduled reviews such as those for irrigation system layout or testing must be scheduled with the Project Manager as required by these specifications.
- II. Impromptu reviews may occur at any time during the project.
- III. A review will occur at the completion of the irrigation system installation and Project Record Drawing submittal.

1.08 COORDINATION AND SCHEDULING:

- I. The irrigation construction schedule is to be provided at the Pre-Construction meeting depicting the dates the various stages of the project will start and when they will be completed.

1.09 GUARANTEE/WARRANTY AND REPLACEMENT:

The purpose of this guarantee/warranty is to insure that the Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

- I. For a period of one year from commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within seven days of notification from the Owner's Representative.
- II. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.
- III. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

PART 2: MATERIALS

2.01 QUALITY:

Use materials that are new and without flaws or defects of any type, and which are the best of their class and kind.

2.02 SUBSTITUTIONS:

- I. Alternative equipment must be approved by the Engineer prior to bidding. The Contractor is responsible for making any changes to the design to accommodate alternative equipment.
- II. Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the Contractor.

2.03 SLEEVING:

- I. Install a separate sleeve beneath paved areas to route each run of irrigation pipe or wiring bundle.
- II. Sleeving material beneath pedestrian pavements shall be PVC Class 200 pipe with solvent welded joints.
- III. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.
- IV. Sleeving diameter: equal to twice that of the pipe or wiring bundle.
- V. All sleeving located under concrete, pavement or other hard surfacing shall be notched on both sides to mark the sleeve location.

2.04 PIPE AND FITTINGS:

- I. Mainline Pipe and Fittings:
 - A. Use rigid, un-plasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end suitable for solvent welding.
 - B. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters that are not manufactured in Class 200.
 - C. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

II. Lateral Pipe and Fittings:

- A. Use rigid, un-plasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B. ASTM Standard D1784, with an integral belled end suitable for solvent welding.
- B. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241.
- C. Use solvent weld pipe for lateral pipe. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 for PVC pipe. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564, of a type approved by the pipe manufacturer.

III. Specialized Pipe and Fittings:

- A. Low Density Polyethylene Hose:
 - 1. Use pipe specifically intended for use as a flexible swing joint.
Inside diameter: 0.490₋+0.010 inch.
Wall thickness: 0.100+0.010 inch.
Color: Black.
 - 2. Use spiral barbed fittings supplied by the same manufacturer as the hose.
- B. Assemblies calling for flanged connections shall utilize stainless steel studs and nuts and rubber gaskets.
- C. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 and 40 threaded fittings and Spears pre-manufactured swing-joint assemblies. Use PVC Schedule 80 nipples.
- D. Joint sealant: Use non-hardening, nontoxic pipe thread sealant formulated for use on threaded connections and approved by the pipe fitting and valve manufacturers. Where directed by valve manufacturers, use thread tape for threaded connections at valves instead of thread paste.
- E. Copper Pipe: Use Type "K" rigid pipe conforming to ASTM Standard B88. Use wrought copper or cast bronze fittings, soldered, flared mechanical, or treaded joint per installation details or local code. Use a 95-percent tin and 5-percent antimony solder.
- F. Pressure Supply Lines (downstream of backflow prevention units) – HDPE, DR11.

IV. Joint Restraint Harness:

- A. Use a joint restraint harnesses wherever joints are not positively restrained by flanged fittings, threaded fittings, and/or thrust blocks.
- B. Use a joint restraint harness with transition fittings between metal and PVC pipe, where weak trench banks do not allow the use of thrust blocks, or where extra support is required to retain a fitting or joint.
- C. Use bolts, nuts, retaining clamps, all-thread, or other joint restraint harness materials that are zinc plated or galvanized.
- D. Use on pipe greater than or equal to 3-inch diameter or any diameter rubber gasket pipe.

2.05 MAINLINE COMPONENTS:

- I. Flow Sensor Assembly: As presented in the installation details.
- II. Isolation Gate Valve Assembly: As presented in the installation details. Acceptable manufacturers are American AVK, Clow, Kennedy, Mueller, Matco, Nibco, or Waterous.
- III. Quick Coupling Valve Assembly: As presented in the installation details.
- IV. Air Vacuum Relief Valve Assembly: as presented in the details. Provide a continuous action combination air vacuum relief valve with an operating pressure rating of 150 PSI. Acceptable manufactures are Bermad, Crispin, Fresno, or Waterman.

2.06 SPRINKLER IRRIGATION COMPONENTS:

- I. Remote Control Valve (RCV) Assembly for Sprinkler Laterals: as presented in the installation details. Use wire connectors and waterproofing sealant to join control wires to solenoid valves. Use standard Christy I.D. tags with hot-stamped black letters on a yellow background. Install a separate valve box over a 3-inch depth of 3/4-inch gravel for each assembly. Provide PRS-Dial pressure regulators for all spray nozzles when inlet pressure exceeds 15 psi of desired outlet pressure. Install 2-wire decoder on each control valve.
- II. Sprinkler Assembly: As presented in the drawings and installation details.
- III. Sprinkler Pressure Test Kit: Provide Rain Bird PHG assembly, and Rain Bird Pitot Tube (part no. 41017), for use in pressure adjustment for spray and rotors sprinklers.

2.07 DRIP IRRIGATION COMPONENTS:

- I. Remote Control Valve (RCV) /assembly fir Drip Laterals.
 - A. As presented in drawing and installation details.
- II. Inline Drip Tubing:
 - A. Tubing: Use UV resistant polyethylene drip tubing with integral pressure compensating drip emitters. Emitter spacing as noted in drawings and installation details. Use emitters that are pressure compensating from 8 to 70 PSI. Use tubing with O.D. of 0.660", and I.D. of 0.560". Use tubing stakes or landscape fabric staples to hold above-ground pipe in place.
 - B. Blank Drip Tubing: Use UV resistant polyethylene blank tubing for supply and exhaust manifolds with flows less than five (5) GPM, and start connections between manifolds and drip tubing. Use PVC insert line fittings compatible with inline drip tubing. Compression fittings will not be allowed. Use blank tubing from same manufacture as inline drip tubing.
 - C. Flush Valve Assembly: As presented in drawings and installation details.

2.08 CONTROL SYSTEM COMPONENTS:

- A. Automatic Controller (2-Wire) - Size and type shown on Drawings; mounted as detailed.
 - 1. Single Station Decoders (2-Wire) - Size and type shown on Drawings; mounted as detailed.
 - a. Install decoders and wire per manufacture recommendations and requirements.
 - b. Grounding for all decoders and 2-wire cable, to be per manufactures recommendations and requirements. Minimum one grounding assembly per every 600' of wire and at all ends of the wire runs.

- B. Baseline Controller Assembly: All incidental parts which are not specified herein and are necessary to complete the system shall be furnished and installed as though such parts were shown on plans or specified. All systems shall be in satisfactory operation at the time of completion. Contractor is responsible to meet with designated City of Greeley Parks Division staff as well as authorized Baseline Technical Services Staff to determine appropriate communication path from the below options BEFORE PACKAGE SYSTEM IS TO BE ORDERED. Contractor is also required to provide designated City of Greeley Parks Division Staff with a final Package System sales order from an authorized Baseline dealer for approval BEFORE ordering of system occurs. (refer to supplemental Baseline Specification section).
 - 1. Lightning protection: Provide one 4" x 96" x 0.0625" ground plate, one 5/8"x10 foot copper clad UL listed grounding rod, 30 feet of #6 AWG bare copper grounding wire, and one CADWELD connector, and two 6-inch round valve boxes at each satellite controller group. Contractor responsible for adding to the grounding path until test measures 10 ohms or less.
 - 2. Wire markers: Pre-numbered or labeled with indelible nonfading ink, made of permanent, nonfading material.

 - 3. Power Wire:
 - A. Electric wire from the power source to satellite control unit shall be solid or stranded copper, Type UF single conductor cable or multi-conductor with ground cable, UL approved for direct underground burial. Power wires shall be black, white, and green in color. The Contractor is responsible for verifying that the power wire sizes are compatible and adequate for the control system being used.
 - B. Splices: Use 3M 82-A series connectors.
 - C. Conduit: PVC Schedule 40.
 - D. Warning tape: Inert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in

soils. Three inches wide, colored yellow, and imprinted with "CAUTION: BURIED ELECTRIC LINE BELOW"

4. Control Wire:

A. Low Voltage:

1. Electrical Control Wire - UFUL approved No. 12/12 (2-wire Paige #7072Dor Regency Maxi Wire 14/2 or 12/2 or as per manufactures requirements) direct burial copper wire to operate system as designed.
2. If multiple controllers are utilized, refer to wire routing plan for individual wire runs.
3. Control Wire connections and splices shall be made with 3M DBRy-6 direct bury splice.
4. Loop five (5) feet minimum of 2-wire cable into all valve boxes.
5. If multiple controllers are utilized, each controller shall have it's own 2-wire cable run. Controllers cannot be connected with the same 2-wire run and each must be independently color coded.

- B. Warning tape: Insert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. Three inches wide, colored yellow, and imprinted with "CAUTION: BURIED ELECTRIC LINE BELOW."

2.09 OTHER COMPONENTS SUPPLIED BY CONTRACTOR:

- I. Tools and Spare Parts: Provide operating keys, servicing tools, spare parts and other items indicated in the General Notes of the drawings.
- II. Other Materials: Provide other materials or equipment shown on the drawings or installation details that are part of the irrigation system, even though such items may not have been referenced in these specifications.
- III.

PART 3: EXECUTION

3.01 INSPECTIONS AND REVIEWS:

I. Site Inspections:

- A. Verify construction site conditions and note irregularities affecting work of this section. Report irregularities to the Owner's Representative prior to beginning work.
- B. Beginning work of this section implies acceptance of existing conditions.

II. Utility Locates ("Utility Notification Center of Colorado"):

- A. Arrange for and coordinate with local authorities the location of all underground utilities.
- B. Repair any underground utilities damaged during construction. Make repairs at no additional cost to the contract price.

- C. Irrigation System Layout Review: Irrigation system layout review will occur after the staking has been completed. Notify the Owner's Representative one week in advance of review. Modifications will be identified by the Owner's Representative at this review.

3.02 LAYOUT OF WORK:

- I. Stake out the irrigation system. Items staked include: back flow device, sprinklers, mainline and lateral pipe, control valves, quick coupling valves, controller, and isolation valves.
- II. Install all mainline pipe and mainline components inside of project property lines.

3.03 EXCAVATION, TRENCHING, AND BACKFILLING:

- I. Excavate to permit the pipes to be laid at the intended elevations and to permit work space for installing connections and fittings.
- II. Minimum cover (distance from top of pipe or control wire to finish grade):
 - A. 24-inches over mainline pipe and over electrical conduit.
 - B. 28-inches over control wire.
 - C. 18-inches over lateral pipe to sprinklers.
- III. Maintain at least 15-foot clearance from the centerline of any tree.
- IV. PVC lateral pipes may be pulled into the soil utilizing a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depths equal minimum cover listed above.
- V. Backfill only after lines have been reviewed and tested.
- VI. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects that may damage the pipe.
- VII. Backfill unsleeved pipe in either of the following manners:
 - A. Backfill and puddle the lower half of the trench. Allow to dry 24 hours. Backfill the remainder of the trench in 6-inch layers. Compact to density of surrounding soil.
 - B. Backfill the trench by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting to the density of surrounding soil.
- VIII. Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves. Minimum compaction of backfill for sleeves shall be 95% Standard Proctor Density, ASTM D698-78. Use of water for compaction around sleeves,

"puddling", will not be permitted.

XI. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades.

XI. Where utilities conflict with irrigation trenching and pipe work, contact the Owner's Representative for trench depth adjustments.

3.04 SLEEVING AND BORING:

I. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

II. Extend sleeve ends six inches beyond the edge of the paved surface. Cover pipe ends and mark with stakes.

III. Bore for sleeves under obstructions that cannot be removed. Employ equipment and methods designed for horizontal boring. Hand excavating under sidewalks and hardscapes will not be allowed.

3.05 ASSEMBLING PIPE AND FITTINGS:

I. General:

A. Keep pipe free from dirt and pipe scale Cut pipe ends square and debur. Clean pipe ends.

B. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.

C. Trenches may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe. Minimum radius of curvature and offset will be based on manufactures recommendations. Installer will be required to provide chart of allowable deflection with pipe submittals. No deflection will be allowed at a pipe joint.

II. Mainline Pipe and Fittings:

A. Use only strap-type friction wrenches for threaded plastic pipe.

B. PVC Rubber-Gasket Pipe:

1. Use pipe lubricant. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.

2. Ductile iron fittings shall not be struck with a metallic tool. Cushion blows with a wood block or similar shock absorber.

C. PVC Solvent Weld Pipe:

1. Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.

2. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.

3. Snake pipe from side to side within the trench.

D. Fittings: The use of cross type fittings is not permitted. Do not strike ductile

iron fittings with metallic tools. Cushion blows with wood block or similar shock absorber

III. Lateral Pipe and Fittings:

- A. Use only strap-type friction wrenches for threaded plastic pipe.
- B. PVC Solvent Weld Pipe:
 - 1. Use primer and solvent cement. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
 - 2. Cure for 30 minutes before handling and 24 hours before allowing water in the pipe.
 - 3. Snake pipe from side to side within the trench.
- C. Fittings: The use of cross type fittings is not permitted.

IV. Specialized Pipe and Fittings:

- A. Low Density Polyethylene Hose: Install per manufacturer's recommendations.
- B. Flanged connections: Install stainless steel studs and nuts and rubber gaskets per manufacturer's recommendations.
- C. PVC Threaded Connections:
 - 1. Use only factory-formed threads. Field-cut threads are not permitted.
 - 2. Use only non-hardening, nontoxic thread sealant.
 - 3. When connection is plastic-to-metal, the plastic component shall have male threads and the metal component shall have female threads.
- D. Make metal-to-metal, threaded connections with non-hardening, nontoxic pipe sealant applied to the male threads only.
- E. Copper Pipe:
 - 1. Use flux and solder. Join pipe in manner recommended by manufacturer and in accordance with local codes and accepted industry practices.
 - 2. Solder so that continuous bead shows around the joint circumference.

3.06 INSTALLATION OF MAINLINE COMPONENTS:

- I. Master Valve Assembly: Install where indicated on the drawings.
- II. Flow Sensor Assembly: Install where indicated on the drawings according to manufactures installation guidelines.
- III. Isolation Gate Valve Assembly:
 - A. Install where indicated on the drawings.
 - B. Locate at least 12-inches from and align with adjacent walls or edges of paved areas.
- IV. Quick Coupling Valve Assembly: Install where indicated on the drawings.

3.07 INSTALLATION OF SPRINKLER IRRIGATION COMPONENTS:

- I. Remote Control Valve (RCV) Assembly for Sprinkler Laterals:

- A. Flush mainline before installation of RCV assembly.
- B. Install where indicated on the drawings. Connect control wires to remote control valve wires using 3M DBY-6 or DBR-6 waterproof connectors. Install connectors per the manufacturer's recommendations.
- C. Install only one RCV to a valve box. Locate valve box at least 12-inches from and align with nearby walls or edges of paved areas. Group RCV assemblies together where practical. Arrange grouped valve boxes in rectangular patterns. Allow at least 12-inches between valve boxes.
- D. Attach ID tag with controller station number to control wiring.
- E. Install 2-wire decoder, per manufacture standards and recommendations.
- F. Brand valve box lid with appropriate station number for each remote control valve. Branding device must create letters a minimum of 3-inches in height and 0.2-inches deep in lid.

II. Sprinkler Assembly:

- A. Flush lateral pipe before installing sprinkler assembly.
- B. Install per the installation details at locations shown on the drawings.
- C. Locate rotary sprinklers 6-inches from adjacent walls, fences, or edges of paved areas.
- D. Locate spray sprinklers 3-inches from adjacent walls, fences, or edges of paved areas.
- E. Install sprinklers perpendicular to the finish grade.
- F. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
- G. Adjust the radius of throw of each sprinkler for best performance.

III. Sprinkler Pressure Test Kit (if applicable):

- A. Use a Pitot tube and pressure gauge at the worst-case rotor sprinkler assembly, from the respective remote control valve. Adjust PRS-Dial at each rotor remote control valve, to provide the design operating pressure at the worst-case rotor sprinkler head. Typically the worst-case sprinkler is the sprinkler furthest from the remote control valve. Complete pressure adjustment for every rotor remote control valve.
- B. Using pressure gauge and necessary fittings, place pressure gauge on worst-case spray sprinkler, from the respective remote control valve. Adjust PRS-Dial at each spray remote control valve to provide an operating pressure of 30 PSI at the worst-case spray sprinkler head. Typically the worst-case sprinkler is the sprinkler furthest from the remote control valve. Complete pressure adjustment for each spray remote control valve.
- C. Turn over Pitot tube and pressure gauge to the City of Greeley at completion of construction.

3.08 INSTALLATION OF DRIP IRRIGATION COMPONENTS:

I. Remote Control Valve (RCV) Assembly for Drip Laterals:

- A. Flush mainline pipe before installing RCV assembly.
- B. Locate as shown on drawings. Connect control wires to remote control valve

- wires using wire connectors and waterproof sealant. Provide 3M DBRY-6 or DBR-6 connectors and sealant per manufacturer's recommendations.
- C. Install only one RCV per valve box. Locate at least 12-inches from and align with nearby walls or edges of paved areas. Group RCV assemblies together where practical. Align grouped valve boxes in uniform patterns. Allow at least 12-inches between valve boxes. Brand controller letter and station number on valve box lid in 2-inch high letters.
 - D. Arrange grouped valve boxes in rectangular patterns.
- II. Inline Drip Tubing: Install inline drip tubing components in strict accordance with tubing manufacturer's details, guidelines, and recommendations.
 - III. Flush Valve Assembly: Provide at end of each dripper line grid as show and directed on drawings and installation details. Install at least 12-inches from and align with adjacent walls or edges of paved areas. Brand "FV" on valve box lid in 2-inch high letters.
- 3.09 INSTALLATION OF CONTROL SYSTEM COMPONENTS:
- I. Satellite Controller Assemblies:
 - A. The location of the Controller Assemblies as depicted on the drawings is approximate; the Project Manager will determine the exact site location during sprinkler layout review.
 - B. Assemble controller assembly, sensors, and appurtenance controller enclosure per authorized manufacturer representative recommendation and shop drawings. Provide pre-fabrication and testing of controller assembly by authorized Baseline distributor representative prior to installation in field. Provide installation observation and wire connections in field by manufacturer's personnel or trained distributor personnel.
 - C. Provide combination switch/GFCI outlet in accordance with local codes inside satellite controller assembly enclosure.
 - D. Provide electrical service connection for Controller Assemblies under direction and observation of manufactures' personnel or trained distributor personnel. Utilize existing electrical source. Provide primary surge protection arrestors on incoming power lines in accordance with control system manufacturer recommendations.
 - E. Lightning protection: Drive grounding rod into soil its full length. Space rod and grounding plate according to manufactures installation guidelines regarding spacing from controller in order to achieve 10 ohms or less upon testing. Connect #6 AWG copper grounding wire to rod from plate using CADWELD connection. Install 6-inch round valve box over each CADWELD connection and grounding plate connection. Connection of grounding wire to the satellite must be per satellite manufacturer or distributor's recommendations.
 - F. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification number (see drawings) of the remote control valve to which the control wire is connected.

G. Connect control wires to the corresponding controller terminal.

II. Power Wire:

- A. Install with a minimum number of field splices. If a power wire must be spliced, make splice with recommended connector, installed per manufacturer's recommendations. Locate all splices in a separate 12-inch standard valve box. Coil 2 feet of wire in valve box.
- B. All power wire shall be laid in trenches. The use of a vibratory plow is not permitted.
- C. Green wire shall be used as the ground wire from power source to all satellites.
- D. Carefully backfill around power wire to avoid damage to wire insulation or wire connectors.
- E. Unless noted on plans, install wire parallel with mainline pipe. Install wire a minimum of 2-inches below top of PVC mainline pipe.
- F. Encase wire not installed with PVC mainline pipe in electrical conduit with a continuous run of warning tape placed in the backfill, 6-inches above the wiring.

III. 2- Wire cable:

- A. Install with mainline pipe wrapping with tape spaced at 10-foot intervals.
- B. Provide a 24-inch excess length of 2-wire cable in an 8-inch diameter loop at each 90-degree change of direction, at both ends of sleeves, and at 100-foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil 5' length of 2-wire cable within each remote control valve box.
- C. If a 2-wire cable must be spliced, make splice with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Locate splice in a valve box that contains an irrigation valve assembly, or in a separate 12-inch standard valve box. Use same procedure for connection to valves as for in-line splices.
- D. Unless noted on plans, install wire parallel with and below PVC mainline pipe.
- E. Protect wire not installed with PVC mainline pipe with a continuous run of warning tape placed in the backfill six inches above the wiring.

3.10 INSTALLATION OF OTHER COMPONENTS:

- I. Tools and Spare Parts: Prior to the Review at completion of construction, supply to the Owner operating keys, servicing tools, spare parts, and any other items indicated in the General Notes on the drawings.
- II. Other Materials: Install other materials or equipment shown on the drawings or installation details that are part of the irrigation system, even though such items may not have been referenced in these specifications.

3.11 PROJECT RECORD DRAWINGS:

- I. The Contractor is responsible for documenting changes to the design. Maintain

on-site and separate from documents used for construction, one complete set of contract documents as Project Documents. Keep documents current. Do not permanently cover work until as-built information is recorded.

- II. Record pipe and wiring network alterations. Record work that is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller or control unit, each sleeve end, each stub-out for future pipe or wiring connections, and other irrigation components enclosed within a valve box.
 - III. Prior to construction completion, obtain from the Owner's Representative an AutoCAD data file for this project. Using CAD, duplicate information contained on the project drawings maintained on site. Label each sheet "Record Drawing". Data delivered should conform to the current coordinate system used by the City of Greeley which is HARN NAD83 Stateplane US Survey Feet Northern Colorado projection. Vertical values should be captured in NAVD 88. Reference control point data can be obtained via the City of Greeley's web site within the GIS page or by contacting the GIS division at 970-350-9300.
 - IV. Turn over the "Record Drawings" to the Owner's Representative. Completion of the Record Drawings will be a prerequisite for the Review at the completion of the irrigation system installation.
 - V. Installer will be required to turn over a list of valves and corresponding decoder numbers installed in field.
- 3.12 WINTERIZATION AND SPRING START-UP:
- I. Winterize the irrigation system in the fall after the installation, and start-up the irrigation system the following spring. Repair any damage caused in improper winterization at no additional cost to the Owner. Coordinate the winterization and start-up with the landscape maintenance personnel.
- 3.13 MAINTENANCE:
- I. Upon completion of construction and Review by the Owner's Representative, maintain irrigation system for a duration of 30 calendar days. Make periodic examinations and adjustments to irrigation system components so as to achieve the most desirable application of water.
 - II. Following completion of the Contractor's maintenance period, the Owner will be responsible for maintaining the system in working order during the remainder of the guarantee/warranty period, for performing necessary minor maintenance, for trimming around sprinklers, for protecting against vandalism, and for preventing damage after the landscape maintenance operation.
- 3.14 CLEANUP:
- I. Upon completion of work, remove from the site all machinery, tools, excess

materials, and rubbish.

END OF SECTION

LANDSCAPING SPECIFICATIONS
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SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the plant material, and warranty as shown on the drawings, the installation details, and as specified herein. Items of work specifically included:
 - 1. Procurement of all applicable licenses and permits.
 - 2. Coordination of Utility Locates ("Utility Notification Center").
 - 3. Procurement and installation of Plant Material.
 - 4. Maintenance period.
 - 5. Warranty.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This section includes the following:
 - 1. Planting of B&B and container trees and shrubs.
 - 2. Plant quality.
 - 3. Planting seasons.
 - 4. Topsoil and soil amendments.
 - 5. Mulches.
 - 6. Stakes and guys.
 - 7. Inspection and warranties.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract, and Division 1 Specification Sections. Direct submittals to the Project Manager and receive approval in writing before work commences.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

- C. Samples of each of the following:
 - 1. 5 lbs. of organic mulch for material and composition required for project, in labeled plastic bags.
 - 2. 2 lbs. of organic compost required for project, in labeled and sealed plastic bags.
 - 3. 2 lbs. of topsoil required for project, in labeled and sealed plastic bags.
- D. Soil analysis from approved testing facility for all soil and compost products.
- E. Maintenance instructions: Recommended procedures to be established by Owner for maintenance of landscaping for one full year. Submit prior to completion of planting for review by Project Manager.
- F. Certification of Testing: The Contractor shall furnish to the City a signed statement certifying that the topsoil/compost product furnished is from the lot that has been tested.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Installer shall provide a staff member with a minimum of 3 years of field experience as the supervisor on the project site full-time when landscaping is in progress.
- B. Quality:
 - 1. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock", and conform to the requirements of the Colorado Nursery Act.
 - 2. All plants will have well-formed buds with size normal for the species. Growth increments of shoots for the previous year shall be of a length that is consistent with normal growth for that season.
 - 3. All plants shall be free of harmful insects, mites, diseases and mechanical injuries to trunks and major scaffold branches.
 - 4. The plants supplied under these specifications shall consist of plants coming from propagating houses, beds, frames or nurseries. "Collected stock" will not be accepted unless specified or as approved substitute. All plants shall conform to the most current Colorado Standards for Nursery Stock, Colorado Department of Agriculture.

C. Size:

1. All plants shall be of size(s) specified.
2. Measure trees and shrubs according to ANSI Z60.1 "American Standard for Nursery Stock", with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

D. Source Quality Control: Ship landscape materials with certificates of inspection as required by governing authorities. Comply with governing regulations applicable to landscape materials.

E. Growing Area:

1. Provide trees and shrubs grown in one of the following areas:
 - a. Colorado Grown: Trees and shrubs grown in Colorado nursery fields for major portion of plant life.
 - b. Out of State Container Grown: Plants from hardiness zones other than 1 through 5 which have been acclimatized to site conditions at time of planting.
 - c. Northern Grown: Trees and shrubs grown in nurseries for at least one year in USDA Hardiness Zones 1-5.

F. Planting Season: Unless otherwise agreed by Project Manager, balled and burlapped and machine-dug trees shall be planted in one of two planting seasons within a calendar year, namely, when plants are dormant in early spring and early fall no later than the end of October. Either of these seasons shall comprise that period of time in spring or fall that favors the recovery of plants from transplanting and encourages that resumption of healthy growth at the planting site.

G. Inspection: The Project Manager reserves the right to inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for name, variety, size and quality. All plant material must be acceptable to Project Manager.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

- B. Trees and Shrubs: Deliver freshly dug or delivered trees and shrubs. Do not prune before delivery, except as approved by Project Manager. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering (shade cloth) during delivery. Apply anti-desiccants (Wilt Proof or equal) to all plant material prior to leaving the nursery. Do not drop trees and shrubs during delivery.
- C. Handle balled and burlapped stock by the root ball.
- D. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, provide shade, and protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container grown stock from containers before time of planting.
 - 3. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Project Manager before planting.
- C. Open Holes or Pits: No hole or pit shall remain open without safety devices to protect the Owner from liability for personal accidental injury.
- D. Preservation of Properties: The Contractor shall be responsible for the preservation of all public or private property including: existing trees, shrubs, turf, fences and other landscape features. If any direct or indirect damage or injury is done to public or private properties by or on account of any act, omission, neglect or misconduct in the execution of the work, on the part of the Contractor, such property shall be restored by the Contractor, at his expense. Restoration shall be to a condition similar or equal to that existing before such damage or injury in such other manner as may be acceptable to the Project Manager.

1.8 COORDINATION AND SCHEDULING

- A. The landscape construction schedule is to be provided at the Pre-Construction meeting depicting the dates the various stages of the project will start and when they will be completed.
- B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required, only when weather and soil conditions permit and are in accordance with locally accepted practices, and approved by the Project Manager.
- C. If planting of trees and shrubs occurs after turf installation, protect lawn areas and promptly repair damage to lawns resulting from planting operations. Insure irrigation system is operating to provide adequate water.
- D. Trees shall be planted in the same growing season in which they were dug. Fall dug trees will be allowed.
- E. If plant material is to be stored on site for more than 8 consecutive hours, submit a detailed staging and care plan.

1.9 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions, unusual for warranty period, or incidents such as damage due to vandalism, hail, fire, owner neglect, or other circumstances that are beyond Contractor's control.
 - 1. Trees
 - 2. Shrubs
 - 3. Perennials and Ground Covers
- C. Remove plants within seven (7) days of notification, replace dead planting materials within 10 days of notification from owner's representative unless required to plant in the succeeding planting season.

- D. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- E. All plant material is to be warranted throughout the warranty period and shall be replaced with plants of the same size and variety.

1.10 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by cultivating, watering, weeding, fertilizing, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree protection devices. Maintain trees and shrubs for the following period:
 - 1. Maintenance Period: Contractor responsible for plant and landscape maintenance up until project is turned over to owner upon acknowledgment of final acceptance.

PART 2 - MATERIALS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, and conform to the requirements of the Colorado Nursery Act, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1, for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Project Manager, with a proportionate increase in size of roots or balls.
 - 1. Containers: All plants specified in containers shall be container grown as defined by the Colorado Nursery Act. Container grown stock will have a healthy vigorous root system, not overgrown, not rootbound, and no encircling roots. Containerized stock that has been transplanted up to the next container size will be well established in its new container.
 - 2. Balled and Burlapped: All plants specified as balled and burlapped (B&B), shall conform to or exceed the minimum sizes specified in the Colorado Nursery Act. No balled and burlapped plant shall be accepted if the ball is broken or the trunk loose in the ball or viable roots exposed. Root balls will be solid (not soft, spongy or excessively sandy) and free from large cracks or other damage to the ball.

- a. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- b. Plants that do not appear to conform to the Colorado Standards for Nursery Stock may be subject to official inspection by a representative of the Colorado Department of Agriculture. If any plant or plants are condemned by the Colorado Department of Agriculture, replacement with plants that conform to the Colorado Standards for Nursery Stock will be at the expense of the Contractor.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1, for type of trees required.
 1. Branching Height: $\frac{1}{2}$ of tree height.
- B. Small Flowering Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as indicated on plan planting schedule.
- C. Provide balled and burlapped shade and flowering trees.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1, for type, shape, and height of shrub.
- B. Provide container-grown deciduous shrubs as indicated. Container-grown stock to meet ANSI Z60.1, limitations.

2.4 CONIFEROUS EVERGREEN TREES AND SHRUBS

- A. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens of the following grade:
 1. Heavy Grade: "XX"
- B. Provide balled and burlapped coniferous evergreen trees conforming to ANSI Z60.1, no options for container grown plant materials allowed.
- C. Provide container-grown coniferous evergreen shrubs subject to meeting ANSI Z60.1, limitations for container stock.

2.5 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 8, four percent (4%) organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Amend existing on-site soil excavated from tree pits to produce topsoil.

2.6 SOIL AMENDMENTS

- A. Compost: One hundred percent (100%) humus rich organic matter. The compost shall be a well decomposed, stable, weed free organic matter source derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings, or source-separated or mixed solid waste. Product must be certified as fully composted at permitted solid waste processing facility. Product to be registered with the Colorado Department of Agriculture and approved for use on Colorado Certified Organic Farms by the Division of Plant Industry of the State of Colorado. Product shall contain no solid particle of greater than one-half inch ($\frac{1}{2}$ ") in length or diameter and be free from un-composted or non-stabilized wood bulking agents. Product shall contain no substances toxic to plants and shall be reasonably free (<1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived.
- B. Provide analysis for the following:
 - 1. Organic Matter Content: 30 - 70% (Dry Basis)
 - 2. Soluble Salt Concentration: 5 dS (mmhols/cm) or less (As Received)
 - 3. PH range: 5.5 to 8.0 (As Received)
 - 4. Final carbon to nitrogen ratio: 20:1 or less.
 - 5. Nutrient Content (dry weight basis): N 1% or above, P 1% or above, K 0.5% or above.
 - 6. Moisture Content: 35% - 55%
- C. Certification of Compost Testing: The Contractor shall furnish to the City a signed statement certifying that the compost furnished is from the lot that has been tested.

2.7 HERBICIDES

- A. Herbicides: Coordinate EPA registered and approved, of type utilized by City of Greeley Parks Department maintenance program.
- B. Applicators must possess an applicators license issued by the Colorado Department of Agriculture.

2.8 WATER

- A. Water Source: Potable water from existing quick coupling valves at various locations on the site.

2.9 MULCHES

- A. Organic Mulch: Organic mulch, free from deleterious materials, noxious weed seed and all foreign matter harmful to plant life, suitable as a top dressing of trees and shrubs.
 1. Medium Bark Nuggets: Submit sample for approval.
 2. Western Red Cedar Mulch: Submit sample for approval.

2.10 STAKES AND GUYS

- A. Upright and Guy Stakes: Steel "T" posts, six feet (6') in length. Two stakes per tree required.
- B. Guy and Tie Wire: ASTM A 641 (ASTM A 641M), Class I, galvanized-steel wire, 2-strand, twisted, 0.080 inch in diameter.
- C. Chafing Straps: Two inch (2") wide nylon straps with grommets at each end, cut to lengths required to protect tree trunks from damage.
- D. Use safety caps on all T-Posts.
- E. Standard surveyor's plastic flagging tape, white, 6 inches long.

2.11 MISCELLANEOUS MATERIALS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.
- B. Tree Wrap: Nurseryman's standard crepe tree wrap tape not less than 4" wide, consisting of two layers of crinkled paper cemented together with bituminous material and with a stretch factor of 33%.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Prior to any excavation, all underground utilities shall be identified by the proper authority.

3.2 PREPARATION

- A. General: Requirements for approval of placement of plant materials prior to installation to be set forth during a pre-construction conference in accordance with Division I Specifications Section.
- B. Lay out individual tree and shrub locations and areas for multiple plantings in accordance with the plan. Stake locations, outline areas, and secure Project Manager's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- C. Mix 33% organic compost with 67% on-site topsoil as required at rates indicated. If additional backfill material is needed, it shall be of the same soil type as found on the planting site.
- D. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.
- E. Any and all excess material and or debris shall be removed from site and properly disposed of.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Tree planting pits may be excavated by hand or by mechanical means. Pits dug mechanically will have the resulting walls scarified to eliminate glazing. Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
- B. Balled and Burlapped Trees: Excavate pit a minimum of two times as wide as ball diameter, with ball depth (per drawings) so that top of the uppermost root flare is 1.5" above finish grade. The root ball shall be placed on firm, undisturbed soil in the planting pit to prevent settling.
- C. Container grown Trees and Shrubs: Excavate pit a minimum of two times container width, and depth per drawings.
- D. Obstructions: Notify Project Manager if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

- E. Drainage: Notify Project Manager if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- F. Fill excavations with water and allow to percolate out, before placing and positioning trees and shrubs.

3.5 PLANTING TREES AND SHRUBS

- A. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before installation.
- B. Set balled and burlapped stock plumb, and in center of pit or trench with top of uppermost root flare raised above adjacent finish grades as indicated.
 - 1. Place stock on undisturbed soil at bottom of planting pit.
 - 2. Wire baskets will be removed completely prior to completion of backfilling. All twine or plastic will be removed and the burlap will be removed from trunk and from the top 1/3 of the root ball. Do not use planting stock if ball is cracked or broken before or during planting operation.
- C. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately ½ backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- D. Additional watering is required every two weeks, or as directed by the Project Manager, until final acceptance.
- E. Set container-grown stock plumb, and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. All containers will be removed and root balls scarified. Carefully remove containers so as not to damage root balls.
 - 2. Place stock on undisturbed soil at bottom of planting pit.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately ½ backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- F. Set uppermost root flare 1.5" above adjacent finish grades, unless otherwise indicated.
- G. Do not cover top of root ball with backfill. A water retaining berm, sufficient

to hold 10-15 gallons of water at one time, will be built and compacted just outside the edge of the planting pit.

- H. After backfilling and watering to settle all voids, all trees should be watered with a minimum of seven (7) gallons, and all shrubs with a minimum of two (2) gallons of root stimulant, 'Upstart' or equal, mixed at the manufacturer's recommended rate.
- I. Protect all trees with tree wrap as specified between Halloween and Easter.

3.6 TREE GUYING AND STAKING

- A. Upright Staking and Tying: Use a minimum of two stakes of length required to penetrate at least 24 inches below finish grade and to extend at least 48 inches above grade. One stake will be placed on the northwest side of the tree and the other 180 degrees opposite on the southeast side. Safety caps will be installed on all posts. Set vertical stakes in undisturbed soil to avoid penetrating balls or root masses. Support trees with two strands of tie wire attached to nylon tree straps at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Flag guy wire with standard surveyor's plastic flagging tape.

3.7 MULCHING

- A. Mulch all trees inside of bermed tree wells and around all shrubs as indicated.
- B. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
- C. Thickness: Four inches (4").

3.8 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 - 1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.9 CLEANUP AND PROTECTION

- A. During landscaping, store materials and equipment where directed.
- B. The City prohibits the tracking, dropping, or depositing of soils or any other

materials onto City streets by or from a vehicle or machinery. Any inadvertent deposited material shall be removed by the end of business day.

- C. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.
- D. At the end of construction, all holes, ruts, settlements, and depressions resulting from the work will be filled and graded to match elevations of adjacent surfaces, and all areas disturbed by construction shall be restored to their original condition to the maximum extent practicable and as acceptable to the Project Manager.

3.10 INSPECTION AND ACCEPTANCE

- A. When the landscape work is complete, the Project Manager will, upon request, make an inspection to determine acceptability.
 - 1. The landscape work may be inspected for acceptance in parts as agreeable to the Project Manager, provided the work offered for inspection is complete, and that the area comprises one complete unit or area of substantial size.
- B. Where inspected landscape work does not comply with the requirements, replace rejected work and continue specified maintenance until reinspected by the Project Manager and found to be acceptable. Replace all such plantings at one time and within 10 working days of notifications whether for acceptance or warranty inspections. Remove rejected plants and materials promptly from the project site.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Upon completion of work, clean adjacent streets and site paving of dirt and debris accumulation.
- B. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 02900

LANDSCAPING SPECIFICATIONS

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DIVISION 2-SITE WORK

SECTION 02920 - SOIL PREP AND SEEDING

PART 1 - GENERAL

1.01 SUMMARY:

- I. Section Includes:
 - A. Fine grading and preparing areas to be seeded.
 - B. Furnishing and applying soil amendments.
 - C. Furnishing and applying fertilizer, herbicides.
 - D. Furnishing and seeding new areas.

1.02 SUBMITTALS:

- I. Quality Control Submittals:
 - A. Certificates: State, Federal and other inspection certificates shall be submitted to the City prior to acceptance of material.
 - B. Seed: Certification of grass seed from seed vendor including the composition of each grass-seed mixture, stating the botanical and common name, percentage by weight of each species and variety, percentage of purity, germination, and weed seed. Include the year of production and date of packaging. Seed packaging and identification tags are to be submitted to the owner at completion of seeding.
 - C. Imported Soil Amendment Test Report: Submit test analysis to City for acceptance prior to delivery of material.
 - D. Fertilizer: State, Federal and other certificates shall accompany invoices for materials showing sources of origin. Submit to City prior to acceptance of material.

1.03 DELIVERY, STORAGE AND HANDLING:

- I. General: Handle and transport in a safe manner in compliance with local state, and federal regulations. Comply with MSDS requirements.
- II. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to state law, bearing name and warranty of producer.
- III. Soil Amendments: Do not stockpile. Distribute and till immediately upon arrival at site (same day).

- IV. Seed: Deliver seed in original sealed, labeled, and undamaged containers. All material shall be furnished in original manufactures shipping bags or containers, and remain in these bags or containers until used. All materials shall be stored in a manner which will prevent them from coming into contact with precipitation, surface water, or other contaminating substances. All materials which have become wet, moldy or otherwise damaged in transit, or stored improperly shall not be used.

1.04 PROJECT/SITE CONDITIONS:

- I. General: Do not perform work when climate and existing site conditions will not provide satisfactory results.
- II. Site Information: The Contractor shall be held to have examined the site, to ascertain the state thereof and the conditions under which the work is to be done. Note: Drawings typically indicate the physical dimensions of the site, but do not show the extent of all obstructions and subsurface conditions.
- III. Existing Utilities: Protect from damage any sewer, water, gas, electric, phone, cable TV, irrigation or other pipe lines or conduits uncovered during the work until the matter has been reviewed by the City. If such lines are found to be abandoned and not in use, remove without extra cost. If such lines are found to be in use, carefully protect and carry on work around them. If City deems it advisable to move such lines, City will pay cost of moving.
- IV. Existing Site Features: Protect from damage as noted herein or on drawings.
- V. Vehicular Access:
 - A. Vehicular accessibility on site shall be kept to a minimum. Repair damage to prepared ground and surfaces caused by vehicular movement during work under this Section to original condition at no additional cost to City. Repair, to original condition, vehicular damage to the surrounding area at no additional cost to the City.
 - B. Only those vehicles identified with Company Name/Logo are allowed in the parks.
- VI. Environmental Requirements:
 - A. Install seed between spring and fall; March 15 - September 30.
 - B. Do not install seed on saturated or frozen soil.
 - C. Do not install seed until soil preparations have been approved by the City.
 - D. Do not install seed until irrigation system is installed and tested.
 - E. Proceed with planting only when existing and forecast weather conditions are suitable for work.

PART 2 - MATERIALS

2.01 TOP SOIL AND SOIL AMENDMENTS: (Note that all percentages are by weight and not by volume.)

I. Topsoil: ASTM D 5268, PH range of 6.3 to 8.2, three percent (3%) organic material minimum, free of extraneous materials harmful to plant growth.

A. Topsoil Source:

1. The source of topsoil for this project is undesignated. Topsoil shall be fertile, friable, sandy loam or loam. Topsoil shall be of any admixture of subsoil or slag and shall be free of stones, lumps, refuse, plants or their roots, sticks, noxious weeds, salts, soil sterilant or other material detrimental to plant growth. Imported topsoil shall be obtained from a well-drained site that is free of flooding. Topsoil shall not be delivered or used onsite in any manner while in a frozen or muddy condition.
2. All imported topsoil shall be from an approved point of origin satisfactory to the Project Manager prior to delivery or placement in planting areas. Should noxious weeds be present at the topsoil source, the Project Manager will make recommendations to the Contractor as to appropriate treatment of the topsoil prior to delivery to the project site. The Contractor shall supply a sample of topsoil to the Colorado State University Soil Testing Laboratory for analysis a minimum of thirty (30) days prior to delivery of topsoil to the project site. The Contractor shall also contact the Project Manager to inspect and approve all planting areas prior to delivery or placement of topsoil. The Contractor shall submit to the Project Manager a Certificate of Compliance from the CSU Testing Laboratory verifying organic matter content, pH, sodium absorption ratio, electrical conductivity (paste test) and nutrient levels.

B. Provide analysis for the following:

1. Mechanical Analysis:
 - a. 1" Screen Passing = 100% Retained = 0%
 - b. ½" Screen Passing = 97 - 100% Retained = 3 - 0%
 - c. No. 100 Mesh Sieve Passing = 40 - 60% Retained = 60 - 40%
2. Laboratory Analysis:
 - a. Organic Matter Content: 3 - 8% (dry basis)
 - b. Soluble Salts Concentration (EC paste test): 1.8 dS (mmhols/cm) or less (as received)
 - c. PH range: 6.3 to 8.0 (as received)
 - d. Nutrient Content (dry weight basis): N 1% or above, P 1% or above, K 0.5% or above.
 - e. Sodium Absorption Ratio (SAR): 8.0
3. Certification of Topsoil Testing: The Contractor shall furnish to the City a signed statement certifying that the topsoil furnished is from the lot that has been tested.

II. Soil Amendments:

- A. Compost: One hundred percent (100%) humus rich organic matter. The compost shall be a well decomposed, stable, weed free organic matter derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings, or source-separated or mixed solid waste. Product must be certified as fully composted at a permitted solid waste processing facility. Product to be registered with the Colorado Department of Agriculture and approved for use on Colorado Certified Organic Farms by the Division of Plant Industry of the State of Colorado. Product shall contain no solid particle greater than one-half inch ($\frac{1}{2}$ ") in length or diameter and be free from un-composted or non-stabilized wood bulking agents. Product shall contain no substances toxic to plants and shall be reasonably free (<1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived.
- B. Provide analysis for the following:
 - 1. Organic Matter Content: 30 - 70% (dry basis)
 - 2. Soluble Salt Concentration (EC paste test): 5 dS (mmhols/cm) or less (as received)
 - 3. PH range: 5.5 to 8.0 (as received)
 - 4. Final carbon to nitrogen ratio: 20:1 or less.
 - 5. Nutrient Content (dry weight basis): N 1% or above, P 1% or above, K 0.5% or above.
 - 6. Bulk Density: 800 - 1,000 lbs/yd³
 - 7. Moisture Content: 35% - 55%
- C. Certification of Compost Testing: The Contractor shall furnish to the City a signed statement certifying that the compost furnished is from the lot that has been tested.

III. Amended Topsoil: Offsite, mechanically combined product.

- A. Amended Topsoil: Components of the amended topsoil product (compost and topsoil) shall meet all previously outlined criteria for the individual components.
 - 1. The Contractor shall supply a sample of amended topsoil to the Colorado State University Soil Testing Laboratory for analysis a minimum of thirty (30) days prior to delivery of amended topsoil to the project site.
 - 2. The Contractor shall contact the Project Manager to inspect and approve all planting areas prior to delivery or placement of amended topsoil. The Contractor shall submit to the Project Manager a Certificate of Compliance from the CSU Testing Laboratory verifying testing levels.
- B. Provide analysis for the following:
 - 1. Organic Matter Content: 3 - 15% (dry basis)
 - 2. Soluble Salt Concentration (EC Paste Test): 2.7dS (mmhols/cm) or less (as received)
 - 3. PH Range: 5.5 to 8.0 (as received)
 - 4. Final carbon to nitrogen ratio: 20:1 or less.

5. Nutrient Content (dry weight basis): N 1% or above, P 1% or above, K 0.5% or above.
6. Moisture content: 35 to 55%
- C. Certification of Topsoil Testing: The Contractor shall furnish to the City a signed statement certifying that the topsoil furnished is from the lot that has been tested.

IV. Fertilizer:

- A. Before seeding, apply an inorganic mixture tilled thoroughly into the top six inches (6") of soil, unless otherwise stated:
 1. 1 lb. of Nitrogen (N) per one thousand (1,000) square feet.
 2. 2 lbs. Phosphorus (P205) per one-thousand (1,000) square feet.
 3. 1 lb. Sulfur (SO4-S) per one-thousand (1,000) square feet.

2.02 SEED:

- I. Grass Seed: Fresh, clean, dry, new-crop seed conforming to all State and Federal regulations and complying with the Association of Official Seed Analysts', "Rules for Testing Seeds" for purity and germination tolerances.
 - A. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination. All materials furnished shall be free of prohibited noxious weeds and meet State and City standards for restricted noxious weeds.
 - B. Proportions and Mixing: All seed shall be mixed by a wholesale seed supplier in the proportions-necessary to obtain the application rate specified.
 - C. Labels: All seed and seed mixes shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the common, scientific and variety name(s) of the seed(s), the lot number, net weight, percent of weed seed content and the guaranteed percent of purity and germination.
 - D. Certification of Seed Testing: The Contractor shall furnish to the City a signed statement certifying that the seed furnished is from the lot that has been tested and comply with the Colorado Seed Law.

2.03 HERBICIDES:

- I. Herbicide: EPA registered and approved, of type utilized by City of Greeley Parks Department.
- II. Applicators must possess both a Colorado Department of Agriculture license and City of Greeley pesticide applicator's license.
- III. The contractor making chemical applications must have a Qualified Supervisor on staff.

2.04 EROSION CONTROL NETTING, BLANKETS, MATS, FABRICS:

- I. Erosion control blankets, mats, of other commercial products for stabilizing disturbed areas may be required on certain projects. If so, the type, manufacturer, and installation method for these products will be agreed to prior to installation.

PART 3 - EXECUTION

3.01 EXAMINATION:

- I. General:
 - A. Verify that existing site conditions are as specified and indicated before beginning work under this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - B. All work is to be performed by personnel thoroughly familiar with proper and accepted methods for soil preparation, herbicide applications, fertilizing, seeding, mulching, etc. All work is to be performed under the direct supervision of the Contractor's superintendent, who shall be thoroughly familiar with the provisions of these specifications.
- II. Damaged Earth: Inspect to verify that earth rendered unfit to receive planting due to concrete water, mortar, lime water or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Project Manager. All access roadways or compacted soil shall be ripped to loosen.
- III. Unsatisfactory Conditions: Report in writing to the City.
- IV. Acceptance: Beginning installation indicates acceptance of existing conditions by Contractor.

3.02 PREPARATION:

- I. Protection:
 - A. Locate structures, playground equipment, sewer, water, irrigation, gas, electric, phone, cable TV, other pipelines or conduits and equipment prior to commencing work.
 - B. Be responsible for proper repair to landscape, utilities, walls, soft surface paths, pavements and other site improvements damaged by operations under this section.
- II. Existing Vegetation:
 - A. Contractor shall keep a log of all pesticide applications performed throughout the duration of the project, detailing applications. Notes shall be submitted to Owner at the completion of project.

- B. Herbicides shall be applied using well maintained spraying equipment by individuals working for the Contractor who are appropriately licensed by the State or Federal agency having jurisdiction over such applications. It shall be the responsibility of the Contractor to be knowledgeable of any and all current laws and regulations pertaining to pesticide applications, and to advise the City immediately if any requests for applications made by the City are inappropriate as they pertain to these laws and regulations.
- C. Herbicides and other chemicals shall not be applied during periods when wind or other physical conditions cause the herbicides to be transported off site, or a distance of more than five (5') feet from the immediate area where they are being applied. It shall be the responsibility of the Contractor to notify the Project Manager immediately if any weather or other physical conditions exist which would make application inappropriate.
- D. All herbicides and other chemicals shall be applied at rates as determined by the Contractor and the Project Manager.
 - 1. Bluegrass areas:
 - a. Existing vegetation, excluding trees and shrubs, in all areas designated to receive new bluegrass seed, is to be sprayed with a contact non-selective post emergent herbicide (Roundup), a minimum of one (1) week and a maximum of (3) weeks prior to the ripping/tilling process.
 - 2. Native areas:
 - a. New seeding areas: Existing vegetation, excluding trees and shrubs, in all areas designated to receive new native seed mixes, shall be sprayed with a contact non-selective post emergent herbicide (Roundup), a minimum of one (1) week and a maximum of (3) weeks prior to the ripping/tilling process.
 - b. Over seeded areas: Spot treatment with selective post emergent herbicides may be required to eliminate undesirable vegetation in some areas. Coordinate herbicide application with the Project Manager a minimum of two (2) weeks prior to the seeding operation.
 - 3. Reapply herbicide if necessary to insure complete kill of existing vegetation.
- III. Surface Grade: Remove existing grass, weeds, debris and rocks larger than one and one half-inches (1½") in all areas designated to receive seed. Verify that all rough grades have been established.
- IV. Runoff: Take measure and furnish equipment, materials, and labor necessary to control the flow, drainage and accumulation of water on and off the site, as intended by the grading plans.
- V. Erosion Control: Take measure and furnish all labor, materials, and equipment necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work.

3.03 INSTALLATION:

I. SOIL/SEED BED PREPARATION:

- A. General: All ripping and tilling operations shall be done in a direction which follows the natural contours of the land on slopes of 3:1 or less. Soils on slopes greater than three 3:1 will be prepared for planting in a manner specified by the City. Any irregularities in the ground surface resulting from soil preparation operations shall be corrected and sloped to drain as intended by the grading plans.
- B. Ripping/Tilling:
 - 1. Any required soil amendments (e.g. organic soil conditioners, fertilizer, ect.) shall be uniformly spread on the surface of soil which is to be prepared as stated below and at the rates specified in section 3.03; II and 3.03; III, below.
 - 2. Soil shall be ripped or tilled to a minimum of eight inches (8"), with agricultural sub-soiler in all areas to receive seed. This includes any areas compacted by construction traffic during the construction process, with four (4) passes in at least two (2) directions.
 - 3. In areas where extremely stiff materials, or if debris is encountered during ripping, re-adjust equipment to avoid bringing up chunks of un-tillable material.
 - 4. The soils shall be worked until it has become loose and friable and no clods greater than two inches (2") in diameter remain, unless directed otherwise by the Project Manager, prior to the addition of any soil amendments, seed, or mulch.
 - 5. Remove stones larger than one and one-half inches (1½") in any dimension and sticks, roots, rubbish, and other extraneous matter.

II. Soil Amendments:

- A. Blue Grass Areas: Evenly distribute composted material in the bluegrass seed areas at the following rates:
 - 1. Apply the compost at four (4) cubic yards per one thousand (1,000) square feet.
 - 2. Spreading the compost shall be accomplished with either a truck or trailer mounted spreader, capable of being adjusted to apply varying rates of material at a given speed.
- B. Native Seed Areas: Evenly distribute composted material in the native seed areas at the following rates:
 - 1. Apply the compost at two (2) cubic yards per one thousand (1,000) square feet.
 - 2. Spreading the compost shall be accomplished with either a truck or trailer mounted spreader, capable of being adjusted to apply varying rates of material at a given speed.
 - 3. In areas inaccessible with a truck or trailer mounted spreader, the compost can be delivered and spread with a tractor and/or by hand.

- C. Over Seeding Native Seed into existing vegetation:
 - 1. No compost will be required in these areas.
 - 2. Fertilizer shall be spread evenly on the surface of the soil immediately after seeding operations have been completed. All fertilizer shall be applied using standard application equipment at the rates specified.

III. Fertilizer:

- A. See 2.01; II above.
- B. Areas receiving organic soil amendments:
 - 1. After applying soil amendments and fertilizer, thoroughly till area to a depth of six inches (6") minimum by rototilling, plowing, harrowing, or disking until soil is well pulverized.
- C. Fill, compact and grade the site to within +/- 0.1' (1 3/16 ") of grades indicated and specified.

IV. Fine Grading in all areas to receive seed:

- A. Do fine grading for areas prior to seeding: Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc. and as required to provide smooth well-contoured surface prior to proceeding.
- B. Prior to Acceptance of Grades: Hand-rake to a smooth even surface with a loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions. Remove debris, clods, rocks, vegetable matter, and any other objects that may interfere with planting or maintenance operations. Limit fine grading to areas that can be planted in the immediate future.
- C. Establish finish grades to within one-half inch (½") of grades indicated.
- D. Noxious weeds or parts thereof shall not be present in the surface grade prior to seeding.
- E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow the surface to dry before planting. Do not create muddy soil.
- F. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Leave graded surface clean and free of trash and debris. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.04 SEEDING:

- I. The Contractor shall notify the Project Manager prior to any seeding work.
- II. The Project Manager will be on site during seeding operations, and will collect representative samples of the seed used on the project for possible later testing for contract compliance.
- III. All prepared areas, need to be firm, but not compacted, prior to seed application.
- IV. Bluegrass Areas:

- A. Sow Bluegrass mix at a rate of 5 lbs. per 1,000 sq. ft.
 - B. Sow turf grass seed using mechanical Type 3 drill, (Brillion) seeding machine for slopes 4:1 and flatter.
 - 1. Distribute seed evenly over entire area by sowing equal quantities in two directions at right angles of each other.
 - 2. For areas inaccessible to seeding machines, or areas with slopes steeper than 4:1, use broadcast method. See 3.04; VI below.
- V. Native Areas:
- A. Seed the listed varieties in the areas designated on the drawings.
 - B. All seed is to be drilled 0.25 inch to 0.50 inch into the soil at the specified PLS/acre rate listed in the Seed Mix Schedule, with a mechanical, power-drawn drill seeder. Rows shall be spaced not more than eight inches (8") apart.
 - C. The contractor shall drill equal quantities in two directions at right angles of each other.
 - D. Seeding rates need to be increased 50% on slopes 6:1 or greater.
 - E. Seeding rates need to be increased 100% for areas that are seeded by hand broadcasting.
 - F. Seeding native grasses into existing vegetation, or areas that have not been ripped and tilled to a minimum of 6 inches require the use of a seeder with:
 - 1. Double Disc openers with depth bands.
 - 2. Native Grass Seed Box with agitator and picker wheels.
 - 3. Press wheels.
 - 4. In hard ground areas, the Project Manager may require the use of a, no till Coulter unit.
 - G. A cultipacker seeder (Brillion, Trillion type) is acceptable to use in well prepared (fine and firm) seed bed applications.
 - 1. The seeder should be equipped with seed boxes to handle the type of seed being planted.
 - 2. Native grass seed would need a seed box with an agitator and picker wheels.
 - 3. Seeding rates would need to be increased 50% with a cultipacker seeder since it is a broadcasting application.
- VI. Broadcast Seeding: Some areas may be inaccessible to a drill. In these mutually agreeable areas, seed shall be uniformly broadcast at 2 times the specified rate. Seed is to be evenly distributed and sown in equal quantities, in two directions at right angles to each other. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Hand broadcasted seeded areas need to be raked in to provide a minimum of ¼" cover and a maximum of ½" cover.

VII. Watering Newly Seeded Areas.

- A. Bluegrass areas: Coordinate with Project Manager the irrigation controller settings to provide adequate moisture for seed germination, and to avoid erosion.
- B. Native areas:
 - 1. Some native areas may have irrigation available, in which case follow the guidelines for Bluegrass areas above.
 - 2. Native areas without irrigation:
 - a. Spring Planting: Plan the planting operation to start as soon as the soil can be worked and prior to the spring rainy season.
 - b. Fall Planting: Place seed prior to the first hard frost in the fall, but after dormancy begins for the varieties being planted.

VIII. Companion Crops: Add the prescribed companion crop with the native seed mixes to be planted at the rate listed. If in doubt, coordinate with Project Manager.

IX. Erosion Protection:

- A. Slopes of 6:1 or less require no erosion protection.
- B. Protect seeded slopes exceeding 6:1 against erosion with jute or coir-fiber erosion-control mesh installed and stapled according to manufacturer's recommendations.
- C. Protect seeded slopes exceeding 4:1 against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.

3.05 SEED MIXTURE SCHEDULE:

- I. Greeley Parks Mixes: Provide certified grass-seed blends or mixes, proportioned by weight, as follows. If the following mix is not available, contact the Parks Department for an approved mix, prior to proceeding:

BLUEGRASS SPECIES/VARIETY	% MIX	PURITY
Kentucky Bluegrass, Moonlight	30.00	85
Kentucky Bluegrass, NorthStar	30.00	85
Kentucky Bluegrass, Quantum Leap	30.00	85
Perennial Ryegrass	10.00	92

LOW GROW MIX	
Use a minimum 8' wide on sides of pathways. Use at property lines abutting residential properties. Used in open areas where short grasses are desired.	
SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Buffalograss	8.0
Blue grama	6.5

SLOPE MIX

Used on all slopes and berms.

SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Sideoats grama	2.0
Blue grama	2.0
Little Bluestem	2.0
Sand dropseed	.06

OPEN SPACE MIX

Used in open areas wher taller grasses are desirable.

SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Sideoats grama	2.0
Blue grama	2.0
Little Bluestem	2.0
Sand dropseed	0.2
Western Wheatgrass	2.0

POND MIX

Used in and around detention/retention ponds, and in areas that are designed to hold water, but are not necessarily wet the majority of the time.

SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Little Bluestem	3.0
Yellow Indian Grass	2.0
Switchgrass	1.0
Blue grama	0.6
Sideoats grama	4.0
Prairie Sandreed	1.5
Western Wheatgrass	6.5

RIPARIAN MIX

Used along irrigation ditches and in naturally wet areas.

SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Switchgrass	6.0
Reeds Canarygrass	6.0

<u>RIGHT – OF – WAY MIX</u>	
Used along public streets, in the right of way.	
SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Buffalograss	6.4
Blue grama	0.6
Sideoats grama	3.6
Western Wheatgrass	9.6
Thickspike Wheatgrass	2.2
Slender Wheatgrass	2.2

<u>Tree Lawn Mix</u>	
For use in specified tree lawns	
SPECIES	POUNDS PER 1,000 sq/ft
Buffalograss ‘Sundancer’	4.0
Blue grama ‘Alma’	1.0

<u>COMPANION CROP</u>	
Add the appropriate companion crop to the native seed mixes to be planted.	
SPECIES	POUNDS PER ACRE – PURE LIVE SEED
Spring Planting: Oats	4.0
Fall Planting: Winter Wheat	2.0

3.06 NOTIFICATION AND INSPECTION:

- I. Inspection: Provide notice to Owner requesting inspection at least seven (7) days prior to anticipated date of completion.
- II. Deficiencies: If deficiencies exist, the City shall specify such deficiencies to the Contractor who shall make satisfactory adjustments and will again notify the City for final inspection.

3.07 CLEANING:

- I. Cleaning: Remove and haul from the site all excess materials and debris generated during the construction process. Perform daily cleaning during installation of the work, and upon completion of the work. Clean paved and finished surfaces soiled as a result of work under this section. Clean out drainage inlet structures as required. Repair any and all damage.

3.08 PROTECTION:

- I. General: Provide and install barriers as required and as directed by the City to protect the seeded areas against damage from pedestrian and vehicular traffic

until well established and accepted by the City. Provide any additional erosion control measures which are necessary for the successful establishment of grass areas.

END OF SECTION