SPECIFICATIONS FOR:

Green Restoration – 2021 Main Street

Tender Nº: 652-2020

KILDONAN PARK GOLF COURSE

Winnipeg, Manitoba

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PART 1 - GENERAL

1.1 Definitions

.1 Clearing consists of cutting off tree and brush vegetation growth to not more than a specified height above ground and disposing of felled trees and surface debris.

.2 Close-cut clearing consists of cutting off or removing at or near flush with original ground surface; standing trees, brush, scrub, roots, stumps and embedded logs and disposing of fallen timber surface debris.

.3 Clearing isolated trees consists of cutting off not more than a specified height above ground of trees designated for removal, grubbing out stumps and disposing of felled trees and debris.

.4 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments to a minimum specified depth below the soil surface.

1.2 Protection

.1 Prevent damage to trees, natural features, bench marks, site appurtenances, water courses, and root system of trees which are to remain. Make good on damage as directed by the Contract Administrator.

.2 Apply approved tree paint to cuts or scars suffered by vegetation designated to remain within 24 hours of damage or pruning.

.3 Avoid rapid turning with equipment in order to prevent disruption of existing turf.

.4 Do not gouge soil surface while piling cleared material.

PART 2 - MATERIALS

Not applicable.

PART 3 - EXECUTION

3.1 Clearing

.1 Ensure limits of clearing are approved by the Contract Administrator prior to the start of tree removal.

.2 Clear trees, shrubs, uprooted stumps and surface debris not designated to remain.

.3 Close-cut trees, brush and scrub as directed by the Contract Administrator.

.4 Cut off unsound branches and cut down dangerous trees overhanging area cleared as directed by the Contract Administrator.

3.2 Isolated Trees

.1 Cut off isolated trees to maximum height of 18" (500 mm) or as directed by the Contract Administrator.

.2 Close-cut off isolated trees as directed by the Contract Administrator.

.3 Grub out stumps of felled trees.

3.3 Grubbing

.1 Grub out stumps and all roots larger than 1" (25 mm) in diameter to a minimum depth of 8" (200 mm) below finished ground surface.

.2 Grubbing of roots may be eliminated in areas where fill depths exceed 24" (600 mm).

.3 Grub out visible rock fragments and boulders greater than 6" (150 mm) in the greatest dimension, as directed by the Contract Administrator.

3.4 Underbrush Clearing

.1 Clearing shrubs, saplings, logs and debris within treed areas to remain will be completed with manual labour (provided and supervised by the City of Winnipeg).

3.5 Removal And Disposal

.1 Cleared and grubbed trees, roots, branches, rocks and woody debris are to removed from the site, and disposed of in a legally appropriate manner.

3.6 Finished Surface

.1 Leave ground surface in cleared areas in a condition which will not impede topsoil stripping, grading and topsoil placement.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

.1 Clearing and grubbing shall be paid for on a Lump Sum basis for work completed in accordance with this specification, acceptable to the Contract

Administrator. No measurement will be made for this work.

4.2 Basis of Payment

.1 Clearing and grubbing shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

i) Clearing and Grubbing

PART 1 - GENERAL

1.1 Related Work

.1	Site Grading	Section 02210
.2	Topsoil Stripping and Placement	Section 02260

1.2 Source Quality

.1 Obtain approval of plant material at source from the Contract Administrator.

.2 Notify the Contract Administrator of source of material at least seven (7) days in advance of shipment. No work under this section is to proceed without approval.

.3 Acceptance of plant material at its source does not prevent rejection on site prior to or after planting operation.

.4 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal and Provincial regulations.

1.3 Shipment and Pre-Planting Care

.1 Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.

.2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy the natural shape of plant. Give full support to root ball of large trees during lifting.

.3 Cover plant foliage with tarpaulin and protect bare roots by means of dampened straw, peatmoss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

.4 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 25 mm (1″) diameter with wound dressing.

.5 Keep roots moist and protect from sun and wind. Heel-in trees and shrubs which cannot be planted immediately in shaded areas and water well.

1.4 Guarantee of Nursery Stock

.1 Provide a written guarantee, stating that the plant material as itemized on plant list is guaranteed against defects for a period of two (2) years from the date of the Final Certificate of Completion for all deciduous trees over 75 mm (3″) caliper and all evergreen trees over 3m (10′) height and for one (1) year for all other

nursery stock.

.2 The Contractor agrees and guarantees to replace and replant any nursery stock found dead and/or in poor condition one (1) year from the recognized completion date, without cost to the City of Winnipeg. "Poor Condition" shall be interpreted as meaning nursery stock on which branches are dead or dying, or have not shown satisfactory growth in leaves. Exempted is nursery stock damaged by accidental causes or vandalism, which stock shall be replaced at the cost of the City of Winnipeg.

.3 End-of-Warranty inspection will be conducted.

.4 The City of Winnipeg reserves the right to extend the Contractor's warranty responsibilities for an additional one year if, at the end of the initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.5 Replacements

.1 During warranty period, remove from site any plant material that has died or failed to grow satisfactorily as determined by the Contract Administrator. Remove such plants from site within 15 days of notice by the Contract Administrator. Stake and number plant locations for future replacement.

.2 Replace any plant material in the next planting season.

.3 Extend warranty on replacement plant material for a period equal to the original warranty period.

.4 Continue such replacement and warranty until plant material is acceptable.

.5 All required replacements shall be by plants of at least the same size and species as specified, and shall be supplied and planted in accordance with the original drawings and specifications, and the replaced material shall carry an additional one year guarantee. Should the replaced plant material not survive, the Contractor will be responsible to replace it a third time and guarantee it for one year unless it is determined that unique site conditions or inadequate maintenance causes the death of plants.

PART 2 - PRODUCTS

2.1 Plant Material

.1 Quality and Source: Comply with The Canadian Standard for Nursery Stock, 2006 edition of Canadian Nursery Landscape Association referring to size and development of plant material and root ball. Measure plant material and root ball. Measure plants when branches are in their natural position. Height and spread dimensions refer to main body of plant and not from branch tip to branch tip. Measure caliper for trees minimum 300 mm (12″) above grade.

.2 Additional plant material qualifications:

.1 Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in a protected area until conditions are suitable for planting.

.2 Use trees with strong fibrous root system free of disease, insects, defects or injuries and structurally sound. Use trees with straight trunks, well and characteristically branched for species. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site. Plant material that has come out of dormant stage and is too far advanced will not be accepted unless prior approval is obtained.

.3 Cold storage: Approval required for plant material which has been held in cold storage.

.4 Container grown stock: Acceptable if containers large enough for root development. Trees must have grown in container for minimum of one growing season but not longer than two. Root system must be able to "hold" soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

.5 Balled and burlapped: Coniferous and broad leaf evergreens over 500 mm (20″) tall must be dug with soil ball. Deciduous trees in excess of 3m (10′) height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 13 mm (1/2″) diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.

.6 Tree spade dug material: Dig plant material with mechanized digging equipment of hydraulic spade or clam-shell type. Root balls to satisfy CNTA standards. Lift root ball from hole, place in wire basket designed for this purpose and line with burlap. Replace root ball and tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket ties or rope.

.7 Collected or native plant material: Use only native trees indigenous to area into which they are to be transplanted. Select trees from reasonably open stands. Trees must have well developed crown and must be characteristically branched. Not more than 40% of overall tree height may be free of branches.

.8 Substitutions to plant material as indicated on Planting Plan not permitted unless written approval has been obtained from the Contract

Administrator as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.

.9 Refer to Plant Specification List: Section 2.3 for species/quality and size of plant.

2.2 Materials

.1 Water: existing golf course irrigation system may be utilized subject to availability after existing golf course water requirements have been met. Alternative sources must be suitable for plant growth.

.2 Topsoil mix for planting: well mixed and screened combination of the following: 1/3 clay textured or clay loam textured dark topsoil; 1/3 sand textured or sandy loam textured topsoil; 1/3 shredded peatmoss.

.1 pH value of 6.0 to 7.5.
.2 Conductivity value of less than 1.5 ms/cm
.3 Free of subsoil, roots, vegetation, debris, toxic materials, and stones over 40 mm (1-1/2″) diameter.
.4 Free of couch grass or Canadian Thistle rhizomes.

.3 Mulch: chipped or shredded wood fibre. Size gradation satisfactory to the Contract Administrator. Submit samples for approval.

.4 Tree anchors: underground 100mm (4″) diameter steel disc tree anchors, screw in type.

.5 Guy Wires: malleable, galvanized 9 gauge strand wire to CSA G4-M1977.

.6 Tree rings: fabricated from 3 mm (1/8″) galvanized wire encased in 13 mm (1/2″) diameter, two ply reinforced rubber hose or equivalent.

.7 Stakes: Hardwood stakes 2″x 2″ x 18″ (50 mm x 50 mm x 450mm) in length. Alternate: T-bar stakes.

.8 Wire tighteners: "P.G. Wire Tightener" or approved equal.

.9 Root ball burlap: 150g Hessian burlap, biodegradable.

.10 Tree wrapping material: new, clean, plain burlap strips min. 2.5 kg/m mass and 150mm (6″) wide.

.11 Anti-desiccant: wax-like emulsion to provide film over surfaces reducing evaporation but permeable enough to permit transpiration.

.12 Wound dressing: horticulturally accepted non-toxic, non-hardening emulsion.

.13 Chicken wire: 25 mm (1″) galvanized mesh, 900 mm (36″) height.

2.3 Plant Specification List

i) 3 - Scotch Pine 8′ Tall (2.4 m)

PART 3 - EXECUTION

3.1 Workmanship and Planting Time

.1 Plant deciduous plant material during spring dormant period before buds have broken or following full bud formation for fall planting. Plant material noted for fall planting must be planted in fall dormant period.

.2 Plant material imported from region with warmer climatic conditions may only be planted in early spring.

.3 When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.

.4 Plant evergreens in spring before bud break. Planting of such stock with root balls may start after middle of August. Apply anti-desiccant to evergreens before digging. Contractor to verify to the satisfaction of the Contract Administrator that anti-desiccant has been applied prior to digging.

.5 When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout the growing season.

.6 Plant only under conditions that are conducive to health and physical conditions of plants.

.7 Provide the Contract Administrator with a planting schedule prior to start of work. Extending planting operations over a long period using limited crew will not be accepted.

3.2 Excavation

.1 Small trees up to 3 m (10′): excavate holes 600 mm (24″) deep with diameter of 300 mm (12″) greater than root spread or root ball.

.2 Large trees: excavate to depth of at least 200 mm (8″) deeper than height of root ball, with width of 750 mm (30″) greater than diameter of root ball, or use hydraulic tree spade sized to suit.

.3 Protect bottom of excavations against freezing.

.4 Remove water which enters excavations prior to planting. Ensure source of water is not ground water.

3.3 Planting

.1 Loosen bottom of planting hole to depth of 150-200 mm (6″-8″). Cover bottom of each excavation with minimum of 100 mm (4″) of topsoil mixture.

.2 Plant trees and shrubs vertically with roots placed straight out in hole. Orient plant material to give best appearance in relation to golf course features such as tees, greens and cart paths.

.3 Place plant material to depth equal to depth they were originally growing in nursery.

.4 With balled and burlapped root balls, loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non-biodegradable wrappings must be removed.

.5 Tamp planting soil around root system in layers of 150 mm (6″) eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil have been placed, fill hole with water. After water has completely penetrated into soil, complete backfilling.

.6 When planting is completed, give surface of planting saucer dressing of organic 10-6-4 fertilizer at rate of 40 to 50 g/mm caliper of trees. Mix fertilizer thoroughly with top layer of planting soil and water in well.

.7 Place mulch to a depth of 100 mm (4″).

3.4 Tree Support

.1 Tree support is shown on planting details.

.2 Staking for trees up to 3 m (10′) and evergreens up to 2 m (6′) in height: backfill planting hole 2/3, drive T-rail stake 900 mm (36″) into bottom of pit, taking care not to damage main roots. Place stake or anchor 150 mm (6″) away from trunk on side of prevailing wind. Fasten trunk to stake or anchor with tree-ring. Different methods of fastening tree trunk to stake or anchor are acceptable if no damage to bark of tree will occur. Obtain the Contract Administrator approval prior to using alternate methods and securing details.

.3 Guy wires for trees up to 150 mm (6″) caliper:

1. For deciduous trees taller than 3 m (10′) and evergreen taller than 2 m (6′), fasten three wires to tree where a branch will prevent slipping down. Use tree rings to prevent abrasion of bark.

2. Fasten wires to anchors at distance from tree base equal to height where wire is attached to trunk. Install wire tighteners and tighten slightly.

3. Where guy wires are used close to pedestrian traffic ways, fasten metal flags

to wires to make them clearly visible.

4. Use sufficient number of guy wires to support large shrubs.

3.5 Rodent Protection

.1 Wrap chicken wire loosely around trunk of all deciduous trees from grade to 900 mm (36″) above grade. Fold wire in to prevent sharp projections outward or inward.

3.6 Wrapping

.1 Where indicated on Plant Specification List, wrap deciduous trees spirally from ground up, to height of second branches. Treat trunk with paste of long residual insecticide, lindane or equivalent before applying wrapping. Secure burlap with binder twine wound in opposite direction to burlap at 100 mm (4″) intervals. Place wrapping neatly and snugly with 40 mm (1-1/2″) overlap.

3.7 Pruning

.1 Prune trees after planting, as indicated, to compensate for loss of roots suffered during transplanting. Postpone pruning of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp tools and make cut flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches and branches that rub causing damage to bark. Trim out crown of trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches. Treat cuts in excess of 25 mm (1″) diameter and damaged parts with application of wound dressing.

3.8 Maintenance

.1 Maintain plant material from date of installation to date of completion of contract.

.2 Refer to Section 02498 for detail maintenance requirements. (N/A)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

.1 Trees shall be measured on a Unit basis. The units to be paid for shall be the total number of trees that are placed in the completed work in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

.1 Tree Planting shall be paid for at the Contract Unit Price per unit for the "Items of Work" listed below, which price shall be payment in full for supplying and

placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

i) Tree Planting

PART 1 - GENERAL

1.1 Related Work

.1	Site Grading	Section 02210
.2	Topsoil & Finish Grading	Section 02260

1.2 Site Conditions

.1 The Contractor shall examine the work of other Sections upon which the work of this Section depends and correct any defects.

1.3 Laying Out Work & Inspections

.1 All work shall be laid out by the Contractor who shall be fully responsible for the accuracy thereof.

.2 The Contractor shall stake locations of heads and valves and receive approval from the Contract Administrator prior to excavation and installation.

.3 The Contractor shall have all materials inspected and approved by the Contract Administrator prior to installation.

.4 The Contractor shall not allow nor cause any of his work to be covered or enclosed until it has been inspected, tested, and approved by the Contract Administrator. Should any of the work be enclosed or covered before such inspection and test, it shall be uncovered at the Contractor's expense; and after it has been inspected, tested and approved, the Contractor shall make all repairs with like materials necessary to restore all work and that of other Contractors to its original conditions.

.5 The Contractor agrees to supply all necessary conduit, trenching, fasteners and line for the proper installation of automated systems.

.6 Notification shall be made to the Contract Administrator 48 hours in advance of commencing irrigation system installation.

1.4 Testing

.1 Upon completion of the irrigation system, the entire system shall be tested and balanced. The Contractor shall notify the Contract Administrator for a final test to allow the Contract Administrator to be on site to consult. All components shall then be checked for proper operation; and the system shall not be accepted by the Contract Administrator until all portions are operating as intended and until all deficiencies have been corrected. The Contractor shall provide all pumps, gauges and fittings required for testing.

1.5 Balancing & Adjustments

.1 The Contractor shall balance and adjust the various components of the irrigation system so the overall operation is most efficient and coverage is uniform.

1.6 As-Built Plan

.1 The as-built irrigation plan must be updated daily in the field as work progresses. The as-built drawings shall be marked to indicate any and all changes made. The Contractor shall supply the Contract Administrator with three copies of the as-built plan showing the exact location and size of all components of the system including the exact trench location for all buried wire. Refer to Section 01300 for additional submission requirements.

1.7 Warranty Maintenance

.1 The Contractor shall test and adjust all equipment for smooth, trouble-free operation of the irrigation system.

.2 Defects or misalignment of any part of the work caused by settlement of bedding or backfill material within the warranty period shall be corrected by the Contractor at their expense. Depressions caused by such settlement in excess of specified depths shall be repaired by the Contractor at their expense. The Contractor shall carry out corrections to defective or deficient work within 48 hours of notification by the Contract Administrator.

.3 Emergency repairs may be required to protect property or permit operation of the work. The Contract Administrator shall notify the Contractor immediately. The Contractor must make repairs within 24 hours of notification by telephone. If repairs are not made within 24 hours, the Contract Administrator will arrange for the emergency repairs to be carried out and will invoice the Contractor. Maintenance not of an emergency nature shall be brought to the attention of the Contractor in writing and he shall take the necessary action to correct the faulty work.

.4 The Contractor shall blow-out all irrigation water lines prior to freeze-up in the fall of the year of completion and reactivate the system in the spring of the following year.

.5 The Contractor shall familiarize the City of Winnipeg with the operation of the irrigation system and locations of control equipment.

1.8 Warranty

.1 All irrigation system equipment and installations shall be warranted for one (1)

full year following the issuance of the substantial performance certificate for the project. Equipment and installation damaged by accidental causes or vandalism is exempt.

PART 2 - PRODUCTS

2.1 Materials

.1 **Irrigation Pipe:**

.1 H.D.P.E.: Type PE3408, DR 13.5, Series 128 or better (Pipe sizes 2" and greater), high density polyethylene to ASTM F-714, - CGSB 41-GP25M and CSA B137.1-M1983. Join by thermal butt fusion in strict accordance with manufacturer's written instructions. The pipe and material must meet or exceed the requirements of paragraph 4.1 and 4.4 of the Canadian General Standards Board - Pipe, Polyethylene, for the Transport of Liquids, 41-GP-25M and requirements of ASTM 1248 for PE3408 materials and ASTM F714.

.2 **Fittings:**

.1 H.D.P.E.: Manufacturer approved saddle fittings (wedge type) at head connections. Butt fusion fittings at pipe connections. Fittings to be approved by pipe manufacturer for fusion with pipe. Use pipe manufacturer's approved brass saddles and flange assemblies to connect to non-fusion materials.

.2 Swing Joints and Risers: Unitized "O" ring type. Spears or Lasco.

.3 Isolation valves: All manual brass ball or butterfly valves are to be lever type, brass valves of approved manufacturer's quality. Located and sized as indicated on drawings or as required to suit application.

.4 Quick Coupling Valves: 25 mm (1") brass valves. Rainbird 5RC, Toro 475-00 or 475-01, Buckner QB5RC10, Hunter HQ-5RC are acceptable.

2.2 Sprinklers

Rotary Pop-up Sprinklers: Acceptable Products:

.1 At greens and tees: At 80 psi. operating pressure must have a minimum radius of 65' and a minimum flow rate of 21 g.p.m.

Rain Bird Eagle 705E-18-80
Toro 834S-06-328

.2 At fairways: At 80 psi. operating pressure must have a minimum radius of 84' and a minimum flow rate of 25 g.p.m.

Rain Bird Eagle 950E-24-80
Toro 854S-06-558

2.6 Control Wiring

.1 Control wires shall be direct burial CSA approved TWU-40 #14 gauge minimum. Control wire to be a different colour than the 120-volt services to controllers.

.2 The 24-volt common ground shall be white in colour. Colours for other 24 volt wires shall be other than white.

.3 Control wires shall be individually identified with "Brady" markers or equivalent inside the controller housing.

.4 Splices shall be made waterproof with the use of an outdoor waterproof wire connector such as Pentite or approved alternate. Field splices shall be looped and located in a valve or junction box.

.5 All wiring shall be bundled together, taped every 10′ (3m), and placed at the bottom of the pipe trench unless "pulled in" with vibratory plow. Some slack in the wire shall be provided to allow for contraction and expansion.

.6 In instances where control wire does not follow the irrigation line and is beneath a cart-path, walkway or driveway, the control wire shall be installed in a separate polyethylene or PVC sleeve of applicable diameter and length.

.7 Standards for control wire shall meet the Canadian Electrical Code Standards.

2.7 Automatic Controllers

.1 Controllers shall be suitable for the application and for the sprinklers selected. Rain Bird Stratus II or Toro TouchNet station controllers are acceptable.

.2 Controllers shall be housed in painted steel, weatherproof, and vandal resistant pedestal enclosure that is CSA approved and lockable. Set on 2′ x 2′ x 6″ (600 x 600 x 150mm) thick concrete pad.

.3 Controllers shall have electrical surge protection capacity and proper grounding to protect the controller from electrical shock and lightning.

.4 The initial programming of the controller shall be undertaken by the irrigation Contractor (or supplier as required) prior to take-over by City of Winnipeg.

2.8 Valve Boxes

.1 Valve boxes shall be prefabricated plastic boxes complete with locking cover. Carson Industries VB 1419-12-L; for single valve locations, or variant to suit valve size or approved alternate.

2.9 Sleeves

.1 Sleeves shall be two-dimensional sizes larger than pipe diameter to allow clear passage of all water lines. Sleeves shall extend a minimum of 12″ (300 mm) beyond the edge of surfaces.

.2 Sleeves in areas subject to vehicular traffic shall be schedule 40 steel or corrugated culverts.

.3 Sleeves in areas subject to pedestrian traffic only shall conform to the following:

.1 PVC: SDR-35, or SDR-28, or
.2 ABS: DB-2, or approved equal.
.3 Pipe sleeves shall be one continuous length.

PART 3 - EXECUTION

3.1 Excavation

.1 All excavation shall be unclassified and shall include all materials encountered except materials which cannot be excavated by normal mechanical excavation means. Such exceptions shall be brought to the attention of the Contract Administrator and an adjustment shall be agreed upon before excavation of these areas proceeds. Such price adjustments and agreement shall include responsibility for disposal of the unsuitable materials removed from the trench and the acquiring of additional backfill material.

.2 All piping should be laid and continuously supported on undisturbed or well-compacted soil.

.3 The minimum depth of cover over 1″ (25 mm), 1-1/2″ (38 mm), 2″ (50 mm) and lateral pipes shall be 12″ (300 mm). The minimum cover depth over 3″ (75 mm) and 4″ (100 mm) main lines shall be 18″ (450 mm). The minimum depth of cover over 6″ (150 mm) main lines shall be 24″ (600 mm). Adequate clearance should be maintained between plastic lines and all other underground utilities or other sources of heat.

.4 Where trenches are over-excavated, they shall be backfilled and tamped to provide compacted bearing for the pipe.

.5 Backfill material shall be free from rocks, large stones, and other unsuitable substances which could damage the pipe or create unusual settling problems. Backfilling shall be done in 6″ (150 mm) lifts and tamped after each lift is placed to prevent excessive settling.

.6 Chain trenchers shall be equipped with a "crumber", or trenches shall be manually cleaned of loose material before sand bedding begins.

.7 Excavated material shall not be left on the turf (where applicable) beside the trench for a period of more than 24 hours.

.8 The Contractor shall repair all concrete and asphalt damaged in the course of this contract.

.9 Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction during warm weather. Such backfilling can be done in early morning hours or the pipe may be water-cooled prior to backfilling procedures.

.10 The Contractor shall avoid damage to any and all underground utilities and structures. The Contractor shall notify the the Contract Administrator and the City of Winnipeg of all underground utilities including power, gas, and telephones and have the locations staked prior to commencing excavations.

.11 Sleeves shall be installed where pipes or electrical wires pass under roads or walks.

.12 The minimum width of trenches for main pipes shall be 4″ (100mm) wider than the nominal size of the pipe in the trench (i.e. 4″ (100 mm) pipe requires 8″ (200mm) trench width, etc.)

.13 Where trenches cross existing turf areas that are to be re-seeded or sodded the backfilled trench must be re-compacted and re-seeded using the seed mixture appropriate for that area, and approved by the Contract Administrator. After the trench has been backfilled, re-compacted and topsoil placed, all trenching debris shall be removed from the grass on each side of the trench by hand raking or other suitable means. The Contractor shall be responsible for watering the trench area until the turf is established and accepted as per the specification for seeding and shall repair any settling of the trench during the warranty period.

.14 In all cases pipe and heads shall be located a minimum of 18″ (450 mm) inside the property lines or perimeter boundaries as indicated on drawings.

3.2 Installation of Pipes

.1 Lateral lines may be installed by standard trenching techniques or by "pulling in" pipe. If the pull-in method is used, the pipe "plow" shall be a vibratory type. The "Bullet" which precedes the pipe and is used to form the opening for the pipe, shall not be less than 1″ (25 mm) larger in diameter than the outside diameter of the pipe.

.2 The ridge created by the vibratory plow shall be eliminated by mechanical tamping so that the soil over the pipe is returned to its original grade.

.3 In situations where extensive rock is present in the trench bottom, all 3″ (75 mm) and larger main water pipe shall be sand bedded to a minimum depth of 4″ (100 mm) below the pipe and up to the centerline of the pipe. The pipe shall be left uncovered at this stage for inspection by the Contract Administrator and shall not be backfilled until approval has been given.

.4 HDPE is generally joined above grade alongside the trench or at a central location, then pulled to the ditch. It may be pressure tested prior to installation.

.5 Pipe may be lowered or rolled into the trench and woven slightly from side to side, which is desirable from the standpoint of expansion and contraction but not absolutely necessary. At points in the system where the line must cross under existing lines, across or through inaccessible areas, the pipe shall be joined on firm ground and pushed or pulled into place.

.6 In warm weather, sufficient time should be allowed for contraction, as the pipe reaches ground temperature before joining sections of termination points.

.7 Changes in direction may be made with field bends, elbows and tees. Pipe may be field bent to a radius of 35 times the diameter of the pipe.

.8 Where gasket repair couplings are used for splicing or joining, the enclosed gap in the pipe shall not exceed 1″ (25 mm) for pipe sizes 4″ (100 mm) and smaller.

3.3 Sprinkler Heads

.1 All sprinkler heads shall be installed on approved unitized swing joints.

.2 The sprinkler heads shall be installed so that the top is at the finished grade level and marked with a 24″ (600 mm) coloured flag to prevent damage by equipment.

.3 Backfill around the swing joint and sprinkler with coarse sand as shown on detailed drawings.

3.4 Quick Coupling Valves

.1 All quick-coupling valves shall be installed on approved unitized swing joints.

.2 The quick-coupling valve shall be installed so that the top is at finished grade level and marked with a 24″ fluorescent orange stake to prevent damage by equipment.

.3 Backfill around the swing joint and quick-coupling valves shall be free of rocks larger than 1″ (25mm) in diameter or roots, debris, and other extraneous matter.

3.5 Isolation Valves

.1 Valves shall be installed according to manufacturer's instructions. Valve locations in the line should be bell-holed to accommodate the valve so that the line can rest firmly on the ground.

.2 The valve shall be installed in a valve box set plumb and flush with grade. The valve must rest upon compacted granular base.

.3 The valve box shall have 6″ (150mm) depth of 1/2″ down crushed stone below the valve.

.4 The valve box shall be marked with a 24″ (600mm) fluorescent orange stake to prevent damage by equipment.

.5 The top of the valve cross-handle shall be 4″ (100mm) minimum below the bottom of the valve box lid.

.6 Locate valves at well drained points along the pipe alignment. Do not place the valves in localized low areas subject to periodic inundation.

.7 The bottom of the valve box shall be supported on crushed rock and compacted soil so that it can support the weight of turf maintenance machinery without sinking.

3.6 Electrical Wiring

.1 Control wires shall be installed in a neat and orderly fashion and may be installed in the pipe trenches or plowed in. The wires shall be bundled together and taped every 10′ (3m) when placed in trenches.

.2 Splicing shall be minimized.

.3 Splices, where required, shall be housed in valve boxes and shall be made waterproof with the use of "Pentite" waterproof connectors or approved alternate. Allow 24″ (600mm) of conductor above the top of the valve box anywhere splices are required.

.4 All electrical wiring shall be installed in accordance with existing codes. Common 24-volt wire to valves will be white. Tracer wire (where used) for main lines will be green. Zone wire to valves shall be any colour but white or green. All zone wiring shall be tagged at all termination or splice points as to which valve number they operate.

.5 All 120-volt wiring shall be installed and connected by a qualified electrician.

.6 Where wire is installed by plowing, standard wire plowing techniques and equipment shall be used (wire chutes and reels). Care must be taken to provide adequate "slack" in the wire as it enters the wire chute. If motorized wire reels are not in use, then an assistant shall walk behind the plow and manually unreel the wire and feed slack into the wire chute.

.7 Connect 120-volt wiring to electrical panel in pump house, provided by Irrigation Contractor.

.8 Connect to master controller in pump house, see drawing.

3.7 Automatic Controllers

.1 Automatic controllers shall be installed on concrete pads according to the manufacturer's recommendations.

.2 Automatic controller location is diagrammatic and shall be specifically located by the Contractor for approval by the Contract Administrator.

.3 All wiring shall be done in a neat, professional manner and shall be in compliance with local codes and the Canadian electrical codes, including grounding. All 24-volt control lines shall be run to the outside in an electrical conduit.

.4 The Contractor shall place the two 2″ (50 mm) PVC pipe sleeves from inside the controller to a point 12″ (300 mm) outside the concrete base at a depth of 24″ (600 mm). These sleeves will be used for the power feed to the controller and for the valve wiring. The radius of the bend will be 6 times the diameter of the conduit.

3.8 Master Controller

.1 Master controller shall be installed according to the manufacturer's recommendations.

.2 Master controller location is diagrammatic and shall be specifically located by the Contractor and approved by the Contract Administrator.

.3 All wiring shall be done in a neat, professional manner and shall be in compliance with local codes and the Canadian electrical codes, including grounding. All 24-volt control lines shall be run to the outside in an electrical conduit.

PART 4 - MEASUREMENT & PAYMENT

4.1 Method of Measurement

.1 Irrigation system materials and installation shall be measured from the as-built plan on a lump sum price basis for work completed in accordance with this specification, and acceptable to the Contract Administrator. Any additions or deletions from the contract will be paid or credited on a unit price basis as noted in the list of unit prices.

4.2 Basis of Payment

.1 Irrigation system materials and installation shall be paid for at the Contract Price for the "Items of Work" listed below, in which this sum shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

i) Irrigation System

PART 1 - GENERAL

1.1 Related Work

.1 Topsoil & Finish Grading Section 02260

1.2 Delivery & Storage

.1 Deliver and store seed in original containers showing:
.2 Analysis of seed mixture.
.3 Percentage of pure seed.
.4 Year of production.
.5 Net mass.
.6 Date when tagged and location.
.7 Percentage germination.
.8 Name and address of distributor.
.9 Deliver fertilizer, mulch and erosion control agent in bags showing manufacturer and content.

1.3 Scheduling

.1 Schedule seeding to coincide with commissioning of the irrigation system.

PART 2 - PRODUCTS

2.1 Materials

.1 Grass Seed: Certified Canada No. 1 Grade to Government of Canada, Seed Regulations and having minimum germination of 85% and minimum purity of 97%. Acceptable limit of weed seed is 0.5%. Manufacturers tags guaranteeing variety purity, germination and percentage of pure live seed are to be included.

.1 Greens:
Penn A1 Creeping Bentgrass
Seeding Rate: 1.5 lbs./1,000 sq. ft.

PART 3 - EXECUTION

3.1 Workmanship

.1 Keep site well drained.

.2 Clean up immediately, soil, mulch or debris spilled onto cart paths, dispose of

deleterious materials.

3.2 Preparation of Surfaces

.1 Fine grade approved topsoil areas to be seeded free of humps and hollows and free of deleterious and refuse material.

.2 Obtain Contract Administrator's approval of prepared seed bed grade and depth before starting seeding.

3.3 Seeding

.1 Seed grass as soon as practicable after commissioning of part or all the irrigation system. Seeding to be completed by September 15, 2020.

.2 Sow during calm weather (winds less than 6 km/hr) using "Brillion" type seeder or other equipment suitable for area involved to the approval of the Contract Administrator. Sow half of required amount of seed in one direction and remainder diagonally, at 45° to the original line. Incorporate seed into soil to a minimum depth of 3/8" (10 mm) simultaneously or within one hour after seeding operation. Mix carefully with light chain harrow or wire rakes and roll area immediately afterward with water ballast type lawn or agricultural type roller.

.3 Water with fine spray, avoiding washing out of seed. Apply enough water to ensure minimum penetration of 2" (50 mm).

.4 Hydro-mulch tops of mounds and slopes greater than 1:4 immediately after seeding. Complete slurry to be applied per unit area:

.1 Mulch - 1700 lbs./Ac, 1900 kg/Ha.

.2 Water - as required to completely suspend all materials

.3 Erosion Control Agent - 60 lbs/Ac, 67 kg/Ha

.4 Use erosion control agent on slopes and swale bottoms. Double mulch quantity on all slopes greater than 1:3 and in ditch bottom.

.5 Apply mulch in light winds (less than 10 km/hr) using equipment suitable for the area and satisfactory to the Contract Administrator.

.6 Immediately clean mulch from surfaces not designated to be treated.

.7 Insure seeded areas are protected against damage until accepted by the Contract Administrator.

.8 In the case of dormant seeding (late fall) protect seeded areas from pedestrian and vehicular damage.

.9 Reseed at two (2) week intervals where germination has failed. Reseed only under favourable conditions as directed by the Contract Administrator.

3.4 Maintenance

.1 Refer to Section 02498. (N/A)

3.5 Acceptance of Grass Seeding

.1 Seeding will be accepted as complete by the Contract Administrator providing:

.1 Seeded areas are completely established.

.2 Turf is free of eroded, bare or dead spots and 98% free of weeds.

.3 No surface soil is visible when grass has been cut to a height of 1 3/4" (45 mm).

.4 All seeded areas are fully established and have been cut at least twice, the last cut being carried out within 24 hours of acceptance.

.2 Any areas seeded in fall will be accepted in the following spring, one month after start of growing season provided the acceptance conditions are fulfilled.

PART 4 - MEASUREMENT & PAYMENT

4.1 Method of Measurement

.1 Seeding and hydro-mulching shall be paid for on a Lump Sum basis for work completed in accordance with this specification, acceptable to the Contract Administrator. No measurement will be made for this work.

4.2 Basis of Payment

.1 Seeding and hydro-mulching shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

i) Seeding and Hydro-mulching

PART 1 - GENERAL

1.1 Related Work

.1	Subgrade Drainage	Section 02710
.2	Tee Construction	Section 02952
.3	Bunker Construction	Section 02954

1.2 Site Conditions

.1 Locate underground and surface utility lines and buried objects.

1.3 Protection

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, surface or underground utility lines which are to remain. Make good any damage.

.2 Protect approved materials from contamination.

1.4 Inspections

.1 The Contract Administrator will review and approve stages of work as follows;

.1) Location and initial layout staking of green
.2) Subgrade excavation and shaping
.3) Trenching and placement of drainage pipe
.4) Placement of root zone mix

PART 2 - PRODUCTS

2.1 Materials

.1 Fill: Selected material from excavation, grading, or other sources, approved by the Contract Administrator for use intended, unfrozen and free from rocks larger than 3" (75 mm), cinders, ashes, sods, refuse or other deleterious materials.

.2 Use approved fill to create green surround contouring to elevations indicated on drawings and approved by the Contract Administrator. Refer to Sections 02210 and 02260.

.3 Non-calcareous pea gravel: rounded and washed, free from clay and silt fines. Soft limestones, sandstones or shale are not acceptable. Particle size distribution:

Particle Size	% Allowable
≥ 12 mm	zero
6 mm to 9 mm	minimum 65%
≤ 2 mm	less than 10%

≤ 1 mm	less than 5%

Materials shall be tested for weathering stability (ASTM - C - 88), and must show a loss of material less than 12% by weight to be acceptable. LA Abrasion Test (ASTM C - 131) for mechanical stability, values must not exceed 40.

.4 Medium sand for root zone mix (greens mix): non-calcareous, sub-rounded to rounded shape. Particle size distribution:

Particle Size	% Allowable
> 3.4 mm	0%
2 to 3.4 mm (Gravel)	0% preferable (maximum 10% allowable)
1 to 2 mm (Very coarse sand)	0-10% (including all larger sizes)
0.50 to 1.0 mm (Coarse sand)	82% min. in range w/ 50-70% med. sand
0.25 to 0.50 mm (Medium sand)	82% min. in range w/ 50-70% med. sand
0.15 to 0.25 mm (Fine sand)	82% min. in range w/ 50-70% med. sand
0.05 to 0.15 mm (Very fine sand)	0-8% total in this range
Silt 0.002 to 0.05mm	0-8% total in this range
Clay < 0.002 mm	0-8% total in this range

.5 Corrugated Drain Pipe: 4" (100 mm) diameter polyethylene pipe, 1/16" x 1-1/2" slotted and solid types including only manufacturer specified insert type couplers and fittings required to complete the installation as shown on the drawings.

.6 Creeping Bentgrass: Certified Penn A1, or approved alternate. Deliver and store grass seed in original containers showing:

.1 Analysis of seed mixture
.2 Percentage of pure seed
.3 Year of production and name of producer
.4 Net Mass
.5 Date when tagged and location
.6 Percentage germination
.7 Name and address of distributor

.7 Fertilizer: C.I.L. Turf Starter 16-32-6 or approved alternate, and trace mineral amendments as identified by soil testing.

2.2 Materials Testing

.1 Provide the Contract Administrator with two (2) samples, each weighing one (1) pound (454 gm) of proposed greens mix, consisting of 60% sand, 30% soil and 10% peat. Sealed, airtight containers must be used to maintain optimal moisture during transportation to facilitate proper testing.

.2 Provide samples a minimum of four (4) weeks prior to the start of work or as directed by the Contract Administrator.

.3 The Contract Administrator will determine acceptability of materials and conduct frequent on site testing during construction to confirm the conformity of mixing.

PART 3 - EXECUTION

3.1 Layout

.1 The Contract Administrator will install reference hubs and will undertake initial green layout staking as indicated on drawings and will mark proposed finish grade elevations. The Contractor will be responsible for subsequent staking at the direction of the Contract Administrator.

3.2 Strip & Stockpile Native Topsoil

.1 Strip, stockpile and screen topsoil from area designated for green surrounds and adjacent mounding. Obtain approval from Contract Administrator for all stockpile locations.

3.3 Excavation & Subgrade Shaping

.1 Excavate green area to a depth of 8″ (200 mm) below proposed finish grades. The slope of the subgrade should conform to the general slope of the finished grade. Thoroughly compact subgrade (i.e. 95% standard proctor density) to prevent future settlement.

.2 Fine grade subgrade, eliminating uneven areas and all low spots where water will collect. Remove all loose fill, debris, building materials, roots, branches, stones in excess of 2" (50 mm) diameter. Remove subsoil that has been contaminated.

.3 Grades must be verified and the sub-grade contours must be approved by the Contract Administrator prior to cutting drain trenches and placing drainage materials.

3.4 Excavation for Drainage Pipe

.1 Locate main trench line(s) along the line of maximum slope. Locate lateral lines at an angle of 30 to 45˚ to the subgrade slope with a continuous fall to the main line(s).

.2 Unless directed otherwise by the Contract Administrator, lateral lines are to be spaced a maximum of 15′ (4.6 m) apart. All lateral lines shall extend to the perimeter of the green and run parallel to each other while sloping toward the main line(s).

.3 At the low end of each green or green section(s), place a drain line at the perimeter of the green extending from the end of the first set of lateral lines to the

main lines exit from the green. This is to ensure that water does not accumulate in the low end of the drainage area.

.4 Excavate drainage trenches a minimum of 8″ (200 mm) wide and a minimum of 8″ (200 mm) deep into a thoroughly compacted subgrade and ensure all drainage lines slope uniformly. Spoil from the trenches must be removed from the subgrade cavity, and the floor of each trench left smooth and clean.

.5 Offset junctions of lateral lines with main line by 18″ (450 mm) to facilitate use of insert fittings for each lateral line.

3.5 Installation of Drain Pipe

.1 Place a minimum 1" (25 mm) depth of pea gravel into trench, to level trench bottom and insure continuous positive slope (minimum 0.5%) along the entire run of the drain pipe.

.2 Place slotted pipe into centre of trenches and hand back fill with pea gravel to fill trench flush with green subgrade. (DO NOT OVERFILL TRENCHES). Ensure that the pipe is not displaced laterally or vertically during back filling. If movement occurs excavate and repeat levelling and back filling operation.

.3 At the time of installation, all pipe ends and joints are to be capped and/or coupled with manufacturer approved fittings to prevent soil or stone entering pipes prior to completion of back filling.

3.6 Greens Mix Preparation and Delivery

.1 Mix Preparation

If metered blending equipment is to be used, blend slow release fertilizer (0-20-10) into greens mix at a rate of 0.5 lbs. per cubic yard. Additional amendment of trace elements as determined by testing may be added during this process. (Optional)

.2 Following the Contract Administrator's approval of off-site mixture, deliver to site as required.

.3 Protect mixed soil from segregating or contamination during preparation, storage or transport. Do not stockpile in unprotected conditions. Deliver directly to each installation location.

.4 The Contract Administrator will undertake random testing of delivered greens mix to ensure conformity to specification.

3.7 Placing Greens Mix

.1 Do not place greens mix until the Contract Administrator has approved subgrade.

.2 Place greens mix by depositing material into edge of green cavity and pushing gently out onto subgrade, insuring subgrade is not disturbed.

.3 Ensure that the mix is moist when being spread to assist in firming.

.4 Place material to approximate finish grades as directed by the Contract Administrator. The greens mix should form a uniform compacted depth of 12" (300 mm). Attain initial compaction using spreading machinery, traveling in a circular or oval pattern.

3.8 Finish Grading and Compaction

.1 Fine grade entire green area to contours and elevations as indicated on drawings and as confirmed by the Contract Administrator. Eliminate rough spots and low areas to ensure positive drainage.

.2 Compact mix to prevent settlement and retain surface contours using equipment and methods approved by the Contract Administrator.

.3 Level ridges left by compaction equipment.

.4 Leave surface smooth, uniform and firm against foot printing in excess of 1/4" (6 mm).

.5 Following the Contract Administrator's approval of finish contours, thoroughly soak entire green profile to enhance compaction.

.6 Allow top 2" to 3" (75 mm) to dry. Rake or float green surface in a circular pattern to eliminate all low spots or undulations.

.7 Repeat as necessary to produce a firm, gently contoured surface suitable for seeding.

3.9 Application of Fertilizer

.1 Spread C.I.L. Turf starter fertilizer (or approved alternate) over entire green surface at a rate of 3 lbs. per 1,000 square feet. Application is to be completed within 48 hours prior to seeding.

3.10 Seeding

.1 Do not seed until surface contours have been approved by the Contract Administrator.

.2 Lightly rake green surface to prepare seed bed.

.3 Using a drop seeder, apply Bentgrass seed at a rate of 1.5 lbs. (0.68 kg) per 1,000 sq. ft. (92.9 sq. m.).

.4 Spread seed in two (2) directions at 45° to each other.

.5 Bury seed to a depth of 1/8" (3 mm) by lightly raking by hand or with a small turf tractor.

.6 Roll green surface to firm seed bed and insure good soil/seed contact.

.7 Begin watering program using a fine spray immediately following completion of seed bed firming.

.8 Continue watering at intervals required to maintain a constantly moist seed bed. (Three to five times per day during daylight hours depending on drying conditions present).

3.11 Maintenance (N/A)

.1 Maintain seeded area from the start of work until the recognized completion date and acceptance by the Contract Administrator.

.2 Ensure maintenance equipment is appropriate for the intended use and suitable to Contract Administrator.

.3 Cut grass only after substantial germination and the majority of grass is 1/2" (12 mm) to 3/4" (19 mm), or reached the three leaf stage.

.4 Gradually reduce mowing height from 1/2" (12 mm) by 1/16" (1.5 mm) each week to reach desired height of 3/16" (4.5 mm).

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

.1 Green construction shall be measured on a lump sum basis for work completed in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

.1 Greens shall be paid for at the Contract Lump Sum Price per green, including greenside bunkers for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

i) Green Construction