

PARKS STANDARD CONSTRUCTION DOCUMENTS

Spring 2011



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SSD-PK 1000

Drainage and Grading

SSD-PK 1010	600mm Area Drain
SSD-PK1011	600mm Natural Areas Drain
SSD-PK 1020	Drainage Swale
SSD-PK 1030	Earth Berm
SSD-PK 1070	Lawn Drain
SSD-PK 1090	Sports Field Construction - PVC Storm Sewer Drain Line-Section
SSD-PK 1100	Sports Field Construction - Sediment Sump Pit
SSD-PK 1111	Sports Field Construction - PVC Lateral Clean-out (ELL)
SSD-PK 1112	Sports Field Construction - 100 to 150 mm PVC WYE-Plan View
SSD-PK 1113	Sports Field Construction - PVC Collector Drain
SSD-PK 1114	Sports Field Construction - PVC Lateral Drain

SSD-PK 2000	Irrigation
SSD-PK 2060	General Irrigation Installation
SSD-PK 2090	Irrigation Kiosk with Booster Pump
SSD-PK 2091	Irrigation Kiosk without Booster Pump
SSD-PK 2110	Irrigation Valve Assembly
SSD-PK 2120	Swing Joint Rise Assembly
SSD-PK 2130	Quick-coupler Connection
SSD-PK 4000	Paving
SSD-PK 4010	Asphalt Path
SSD-PK 4020	Unit Pavers
SSD-PK 4040	Crusher Chip Path
SSD-PK 4050	Natural Area Trail Construction
SSD-PK4070	1.2m Boardwalk
SSD-PK 4080	200 mm Concrete Wheel Stops
SSD-PK 5000	Planting
SSD-PK 5005	Tree Protection Barrier
SSD-PK 5010	Tree Planting – Residential Streets and Parks
SSD-PK-5040	Tree Planting – Structural Soil in Urban Boulevard - Plan View
SSD-PK 5050	Tree Planting – Boulevard
SSD-PK 5052	Section Through Tree Well
SSD-PK 5070	Parking Lot Guidelines
SSD-PK5078	Parking Lot Bio-Swale
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SSD-PK 6000

Site Fixtures

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SSD-PK 6061	Locking Bollard
SSD-PK 6070	1.2m Chain Link Fence – Active Areas
SSD-PK 6071	1.2m Chain Link Fence – Passive Areas
SSD-PK 6080	Post and Chain Fence
SSD-PK 6100	Barrier Gate - Double
SSD-PK 6101	Barrier Gate - Single
SSD-PK 6102	Self Closing Gate 1.2m and 1.8 m
SSD-PK 6103	Rolling Gate
SSD-PK 6104	Maintenance Access Gate
SSD-PK 6110	Log Rail Vehicle Barriers
SSD-PK 6111	Formal Vehicle Barrier
SSD-PK 6112	Three Rail Split Fence
SSD-PK6113	Two Rail Split Fence
SSD-PK 6120	Bicycle Baffle
SSD-PK 6200	Games Court Layout
SSD-PK 6250	Soccer Backstop
SSD-PK 6258	Baseball Backstop - Plan
SSD-PK 6259	Baseball Backstop – Section
SSD-PK 6260	Temporary Backstop
SSD-PK 6268	Tennis Courts - Layout
SSD-PK 6272	Tennis Courts – Chain Link Perimeter Fence

INTRODUCTION

The Parks Standard Construction Document has been developed as a reference for City of Surrey Parks Planners, Park Development staff and external consultants to guide the park development process. The Standard Construction Document is also intended to form part of the Contract Documents for contractors awarded contracts for construction projects for the City of Surrey Parks Division. The document will also guide developers constructing landscape improvements on parkland.

This is a “living” document intended to provide the most current information available to users. As a result, the contents of this package are reviewed and updated periodically.

This document is made up of specifications, appendices, and construction details. It is intended to be used as minimum acceptable standards for Surrey Parks, Recreation and Culture construction projects, and that relevant specification sections and construction details can be taken from this document to form part of Contract Documents issued by the City of Surrey, Parks Division, on a project-to-project basis. This document is to be read in conjunction with the Master Municipal Construction Documents, B.C. Landscape Standard and City of Surrey, Engineering Department General Conditions, Supplementary Specifications, and Standard Drawings.

Wherever possible, section numbers used in these specifications reflect those used in the Master Municipal Construction Documents, and the City of Surrey Supplementary Specifications, otherwise National Master Specification section numbering protocol is used.

This document is not intended to constitute or render engineering, architectural, legal or other professional services or advice. Nor is it a substitute for such services or advice from a professional directed to the specific design situation.

While the information in the document is believed to be accurate, the City of Surrey shall not be liable for damages arising from errors or omissions in this document. The document is not intended to endorse or recommend any particular product or material. Users of this document are encouraged to use wise consumer, and professional practices when selecting products and materials.

PART 1 GENERAL

1.1 Description of Work

- .1 Work under this Contract covers construction of _____.

1.2 Related Sections

- .1 Section 01 33 01 (MMCD) Project Record Documents

1.3 Codes

- .1 Perform work in accordance with British Columbia Building Code, National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of:
- .1 contract documents,
- .2 specified standards, codes and referenced documents.

1.4 Documents Required

- .1 Maintain at job site and make available to the Owners or the Owner's Representative, one copy each of following:
- .1 Contract drawings;
- .2 Specifications;
- .3 Addenda;
- .4 Reviewed shop drawings;
- .5 Change orders;
- .6 Other modifications to Contract;
- .7 Field test reports;
- .8 Copy of approved work schedule; and
- .9 Manufacturers' installation and application instructions.

1.5 Project Meetings

- .1 Hold project meetings at times and locations approved by Owner's Representative.

- .2 Contractor to notify all participants of meetings.
- .3 Contractor to record minutes of meetings and distribute to participants within 7 days of meeting.

1.6 Setting Out of Work

- .1 Owner's Representative will provide only those survey control points and set such stakes as necessary to define general location, alignment and elevations of work. Give Owner's Representative reasonable notice of requirements for such control points and stakes.
- .2 Set grades and lay out work in detail from control points and grades established by Owner's Representative.
- .3 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .4 Provide devices needed to lay out and construct work.
- .5 Supply such devices as straight edges and templates required to facilitate Owner's Representative's inspection of work.
- .6 Supply stakes and other survey markers required for laying out work.

1.7 Location of Equipment and Fixtures

- .1 Inform Owner's Representative of impending installation and obtain his approval for actual location.
- .2 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

1.8 Existing Services

- .1 Where Work involves connecting to existing services, coordinate work with authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Owner's Representative of findings.
- .3 Submit schedule to, and obtain approval from, Owner's Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

SECTION 01005
GENERAL INSTRUCTIONS
Spring 2011

- .4 Where unknown services are encountered, immediately advise Owner's Representative and confirm findings in writing.
- .5 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.
- .6 Record locations of maintained, re-routed and abandoned service lines.

1.9 Additional Drawings

- .1 Owner's Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

1.10 Relics and Antiquities

- .1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.
- .2 Give immediate notice to Owner's Representative and await Owner's Representative's written instructions before proceeding with work in this area.
- .3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.

1.11 Asbestos Discovery

- .1 Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in course of demolition work stop work and notify Owner's Representative immediately. Do not proceed until written instructions have been received from Owner's Representative.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

* This section requires the addition of project specific information.

END OF SECTION 01005 GENERAL INSTRUCTIONS

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 42 00 (MMCD) Reference Specifications

1.2 Abbreviations

- .1 AA Aluminum Association 750 Third Avenue New York, New York U.S.A. 10017
- .2 AASHTO American Association of State Highway and Transportation Officials 444 N Capitol Street, N.W., Suite 225 Washington, D.C. U.S.A. 20001
- .3 ANSI American National Standards Institute 1430 Broadway New York, New York U.S.A. 10018
- .4 ASHRAE American Society of Heating, Refrigeration and Air-Conditioning Engineers 1791 Tullie Circle NE Atlanta, Georgia U.S.A. 30329
- .5 ASTM American Society for Testing and Materials 1916 Race Street Philadelphia, Pennsylvania U.S.A. 19103
- .6 AWMAC Architectural Woodwork Manufacturers Association of Canada Suite 242 - 4229 Canada Way Burnaby, B.C. V5G 1H3
- .7 AWS American Welding Society 2501 N.W. 7th Street Miami, Florida U.S.A. 33125
- .8 AWWA American Water Works Association 6666 W. Quincy Avenue Denver, Colorado U.S.A. 80235
- .9 CITC Canadian Institute of Timber Construction 200 Cooper Street, Ottawa, Ontario K2P 0G1
- .10 CGSB Canadian General Standards Board Place du Portage, Phase III, 9C1 11 Laurier Street Hull, Quebec K1A 1G6
- .11 CISC Canadian Institute of Steel Construction 201 Consumers Road, Suite 300 Willowdale, Ontario M2J 4G8
- .12 CMB Construction Materials Board 101 Colonel By Drive, 8NT MGen George R. Pearkes Bldg. Ottawa, Ontario K1A 0K2
- .13 CSA Canadian Standards Association 178 Rexdale Blvd. Rexdale, Ontario M9W 1R3

SECTION 01092
ABBREVIATIONS
Spring 2011

- .14 CSC Construction Specification Canada 100 Lombard Street, Suite 200 Toronto, Ontario M5C 1M3
- .15 CSPI Corrugated Steel Pipe Institute 201 Consumers Road, Suite 306 Willowdale, Ontario M2J 4G8
- .16 CWC Canadian Wood Council 701 - 170 Laurier Avenue West Ottawa, Ontario K1P 9Z9
- .17 IEEE Institute of Electrical and Electronics Engineers 345 East 47th Street New York, New York U.S.A. 10017
- .18 MMCD Master Municipal Construction Document Suite 302 - 1107 Homer Street, Vancouver, B.C. V6B 2Y1
- .19 MMS Master Municipal Specification Refer to MMCD
- .20 NLGA National Lumber Grades Authority 260-1055 West Hastings Vancouver, B.C. V6E 2E9
- .21 NRC National Research Council Montreal Road Ottawa, Ontario K1A 0S2
- .22 PCI Prestressed Concrete Institute 175 W. Jackson Blvd., Suite 1859 Chicago, Illinois U.S.A. 60604
- .23 SCC Standards Council of Canada 1200-45 O'Connor Street Ottawa, Ontario K1P 6N7
- .24 SS City of Surrey Engineering Department Standard Construction Documents 14245 56th ave Surrey BC V3X-3A2
- .25 TTMAC Terrazzo, Tile and Marble Association of Canada 30 Capston Gate, Unit 5 Concord, Ontario L4K 3E8
- .26 ULC Underwriters' Laboratories of Canada 7 Crouse Road Scarborough, Ontario M1R 3A9
- .27 UL Underwriters Laboratories 333 Pfingsten road Northbrook, Illinois U.S.A. 60062

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION 01092 ABBREVIATIONS

PART 1 GENERAL

1.1 Section Includes

- .1 Product data.
- .2 Samples.

1.2 Related Sections

- .1 Section 01600 Material and Equipment
- .2 Section 01730 Operations and Maintenance Manuals
- .3 Section 01 33 01(MMCD) Project Record Documents

1.3 Administrative

- .1 Submit to Owner's Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by the submittal shall not proceed until review is complete.
- .3 Review submittals prior to submission to the Owner's Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as to the specific project will be returned without being examined and shall be considered rejected.
- .4 Verify field measurements and affected adjacent Work are coordinated.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative's review of submittals.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review.
- .7 Keep one reviewed copy of each submission on site.

1.4 Product Data

- .1 The term "Product Data" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Adjustments required to Product Data by the Owner's Representative are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Owner's Representative prior to proceeding with the Work.
- .4 Make changes to Product Data as the Owner's Representative may require, consistent with Contract Documents. When resubmitting, notify the Owner's Representative in writing of any revisions other than those requested.
- .5 Submit 4 copies of product data sheets or brochures for requirements requested in specification Sections and as the Owner's Representative may reasonably request.

1.5 Samples

- .1 Submit for review samples as requested in respective specification Sections. Label samples as to origin and intended use in the Work.
- .2 Deliver samples prepaid to Owner's Representative's business address.
- .3 Notify the Owner's Representative in writing, at the time of submission of deviations in samples from requirements of Contract Documents.
- .4 Adjustments made on samples by the Owner's Representative are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Owner's Representative prior to proceeding with the Work.
- .5 Make changes in samples which the Owner's Representative may require, consistent with Contract Documents.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

.1 Not Used.

END OF SECTION 01300 SUBMITTALS

PART 1 GENERAL

1.1 General

- .1 This Section specifies general requirements and procedures for contractors submissions of product data, samples and mock-ups to Owner's Representative for review. Additional specific requirements for submissions are specified in subsequent sections.
- .2 Do not proceed with work until relevant submissions are reviewed by Owner's Representative.
- .3 Present product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units values shall be converted to SI Metric units.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative's review of submissions.
- .6 Notify Owner's Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative's review of submission, unless Owner's Representative gives written acceptance of specific deviations.
- .8 Make any changes in submissions which Owner's Representative may require consistent with Contract Documents and re-submit as directed by Owner's Representative.
- .9 Notify Owner's Representative, in writing, when re-submitting, of any revisions other than those requested by Owner's Representative.

1.2 Submission Requirements

- .1 Coordinate each submission with requirements of Work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow 4 days for Owner's Representatives review of each submission.
- .3 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date;
 - .2 Project title and number;
 - .3 Contractor's name and address;

- .4 Identification and quantity of each instance of product data and sample;
and
- .5 Other pertinent data.
- .4 Submissions shall include:
 - .1 Date and revision dates;
 - .2 Project title and number; and
 - .3 Name and address of:
 - .1 Subcontractor;
 - .2 Supplier;
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractors authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication;
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances;
 - .3 Setting or erection details;
 - .4 Capacities;
 - .5 Performance characteristics;
 - .6 Standards;
 - .7 Operating weight;
 - .8 Wiring diagrams;
 - .9 Single line and schematic diagrams;
 - .10 Relationship to adjacent work.

SECTION 01340
PRODUCT DATA, SAMPLES AND MOCK-UPS
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- .5 After Owner's Representative's review, distribute copies.

1.3 Product Data

- .1 Product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
- .2 Submit 4 copies of product data.
- .3 Delete information not applicable to project.
- .4 Supplement standard information to provide details applicable to project.
- .5 Cross-reference product data information to applicable portions of Contract Documents.

1.4 Samples

- .1 Samples: examples of materials, equipment, quality, finishes, workmanship.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

1.5 Mock-ups

- .1 Mock-ups: field-erected example of work complete with specified materials and workmanship.
- .2 Erect mock-ups at locations acceptable to Owner's Representative.
- .3 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION 01340 PRODUCT DATA, SAMPLES AND MOCK-UP

PART 1 GENERAL

1.1 Related Requirements Specified Elsewhere

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Owner's Representative are specified under various sections.

1.2 Appointment and Payment

- .1 Owner's Representative will appoint and pay for services of testing laboratory except for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities;
 - .2 Inspection and testing performed exclusively for Contractor's convenience;
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems;
 - .4 Tests specified to be carried out by Contractor under the supervision of Owner's Representative;
- .2 Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Owner's Representative may require to verify acceptability of corrected work.

1.3 Contractor's Responsibilities

- .1 Furnish labour and facilities to:
 - .1 Provide access to work to be inspected and tested;
 - .2 Facilitate inspections and tests;
 - .3 Make good work disturbed by inspection and test; and
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Owner's Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

SECTION 01410
TESTING LABORATORY SERVICES
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- .4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Owner's Representative.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION 01410 TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 Materials and Equipment

- .1 Use new material and equipment unless otherwise specified
- .2 Within 7 days of written request by Owner's Representative, submit following information for materials and equipment proposed for supply:
 - .1 name and address of manufacturer;
 - .2 trade name, model and catalogue number;
 - .3 performance, descriptive and test data;
 - .4 manufacturer's installation or application instructions; and
 - .5 evidence of arrangements to procure.
- .3 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.

1.2 Manufacturer's Instructions

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .2 Notify Owner's Representative in writing of any conflict between these specifications and manufacturers instructions. Owner's Representative will designate which document is to be followed.

1.3 Delivery and Storage

- .1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- .2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.
- .3 Store material and equipment in accordance with suppliers instructions.

SECTION 01600
MATERIALS AND EQUIPMENT
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1.4 Conformance

- .1 When material or equipment is specified by standard or performance specifications, upon request of Owner's Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.5 Construction Equipment and Plant

- .1 On request, prove to the satisfaction of Owner's Representative that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION 01600 MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 Cleaning

- .1 Conduct cleaning and disposal operations to comply with local ordinances and environmental regulations.

1.2 Materials

- .1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 Cleaning During Construction

- .1 Provide on-site containers for collection of waste materials and debris.
- .2 Dispose of waste materials and debris off site, to location approved by Owner's Representative.
- .3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly finished surfaces nor contaminate adjacent areas.

1.4 Final Cleaning

- .1 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from finished surfaces and adjacent areas.
- .2 Broom clean, paved surfaces; rake clean other surfaces of grounds.
- .3 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .4 Remove snow and ice from access routes.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION 01710 CLEANING

PART 1 GENERAL

1.1 Manual

- .1 An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of Divisions 02 - 16.

1.2 General

- .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
- .2 Submit complete operation and maintenance manual to Owner's Representative 6 weeks prior to application for Certificate of Substantial Performance.
- .3 Submit 2 copies to Owner's Representative.
- .4 Organize data into same numerical order as contract specifications.
- .5 Material: label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .6 Type lists and notes.
- .7 Drawings, diagrams and manufacturers literature must be legible.

1.3 Binders

- .1 Binders: vinyl, hard covered, 3 "D" ring, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
- .2 Identify contents of each binder on spine.

1.4 Contents

- .1 Binder 1:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents of all binders.

- .3 List of maintenance materials.
- .4 List of special tools.
- .5 List of spare parts.
- .6 Warranties, guarantees.
- .7 Copies of approvals, and certificates.
- .2 Remaining binders:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .2 Table of Contents of individual binder.
 - .3 Provide data as specified in individual sections of Divisions 02 to 16.
 - .1 List of equipment including service depot.
 - .2 Name plate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 Installation details.
 - .5 Operating instructions.
 - .6 Maintenance instructions for equipment.
 - .7 Maintenance instructions for finishes.
- .3 Shop drawings:
 - .1 Bind separately one complete set of reviewed final shop drawings and product data.

SECTION 01730
OPERATION AND MAINTENANCE MANUALS
Spring 2011

PART 2 PRODUCTS

.1 Not Used.

PART 3 EXECUTION

.1 Not Used.

END OF SECTION 01730 OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

- 1.1 This Section is to be read in conjunction with Section 02104 of the Master Municipal Specification. Where discrepancies exist between this document and the Master Municipal Specification, the Owner's Representative shall provide clarification and direction.
- 1.2 Related Sections
- .1 Section 31 11 01 (MMCD) Clearing and Grubbing
 - .2 SS 2.2 Clearing and Grubbing
 - .3 Section 02117 Tree Pruning
 - .4 Section 31 22 01 (MMCD) Site Grading
 - .5 SS 2.3 Site Grading
 - .6 Section 31 23 01 (MMCD) Excavating, Trenching and Backfilling
 - .7 SS 2.4 Excavating, Trenching and Backfilling
 - .8 Section 02361 Chemical Control of Pests
 - .9 Section 02921 Topsoil and Finish Grading
- 1.3 References
- .1 National Standard for Pesticide Education, Training and Certification in Canada
 - .2 Surrey Tree Preservation By-law
 - .3 ANSI A300 tree pruning standard
 - .4 Current edition of BCSLA/BCLNA Landscape Standard
 - .5 Appendix E – Tree Protection in Parks
 - .6 Related City of Surrey Pesticide By-laws
- 1.4 Scheduling
- .1 Obtain approval from Owner's Representative of schedule indicating commencement of work.

PART 2 PRODUCTS

2.1 Materials

.1 Fill:

- .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
- .2 Type (B): excavated soil, free from roots, rocks larger than 50 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Owner's Representative before use as fill.

.2 Coarse washed stones: 35-75mm diameter clean round hard stone.

.3 Draintile: 100 mm diameter CSA approved rigid perforated PVC pipe complete with snap couplings.

.4 Peat Moss:

- .1 Derived from partially decomposed species of Sphagnum Mosses.
- .2 Elastic and homogeneous.
- .3 Free of wood and deleterious material which could inhibit growth.
- .4 Shredded minimum particle size: 5mm.

.5 Fertilizer:

- .1 To Canada "Fertilizer Act" and "Fertilizers Regulations".
- .2 Complete, commercial, slow release with 50% of nitrogen content in water-insoluble form.

.6 Anti-dessicant: commercial, wax-like emulsion.

.7 Filter Cloth:

- .1 Type 1: biodegradable burlap.

.8 Wood posts: 38 x 89 x 2400mm length, treated wood.

.9 Welded wire fabric (WWF): 100 x 100mm, MW 3 x MW 3, to CSA G30.5.

.10 Topsoil: to Section 32 91 21(MMCD) - Topsoil and Finish Grading.

.11 Bark mulch: to Section 02906 - Planting of Trees, Shrubs and Ground Covers.

- .12 Chainlink fencing: to Section 32 31 13 (MMCD).
- .13 Signs to indicate zone and no dumping, parking or storage permits.

PART 3 EXECUTION

3.1 Identification and Protection

- .1 Identify plants and limits of root systems to be preserved to satisfaction of Owner's Representative prior to commencement of any sitework or demolition.
- .2 Protect plant and root systems from damage, compaction and contamination resulting from construction to satisfaction of Owner's Representative prior to the commencement of any site work or demolition.

3.2 Trenching and Tunneling for Underground Services

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Owner's Representative prior to excavation. Tunnel excavation to extend 2000mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40mm diameter except at greater than 500mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Owner's Representative.
- .4 Minimum acceptable depth to top of tunnel: 1000mm.
- .5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .6 Complete tunneling and backfilling at tree within 2 weeks of starting work.

3.3 Lowering Grade Around Existing Tree

- .1 Commence work in accordance with schedule approved by Owner's Representative.
- .2 Refer to Appendix E of this document for correct distance of slope cut depending on size of tree to be preserved.
- .3 Excavate to depths as indicated. Protect root zone which is to remain from damage.
- .4 When severing roots at excavation level, cut roots with sharp, disinfected tools.

SECTION 02101
TREE AND SHRUB PRESERVATION
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- .5 Cultivate excavated surface manually to 15mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sterile sand.
 - .3 15% organic matter.
 - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m³.
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of bark mulch in accordance with Section 02906 - Planting of Tree Shrubs and Ground Covers.

3.4 Maintenance during Warranty Period

- .1 From time of acceptance by Owner's Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Owner's Representative prior to application.
 - .3 Apply fertilizer in early spring at manufacturer's suggested rate.
 - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris off-site to location approved by Owner's Representative.
 - .5 Submit monthly written reports to Owner's Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.5 Pruning

- .1 Prune only dead, broken, or infected branches.

3.6 Anti-Desiccant

- .1 Apply anti-desiccant to foliage where applicable and as directed by Owner's Representative.

END OF SECTION 02101 TREE AND SHRUB PRESERVATION

PART 1 GENERAL

1.1 Related Work

- .1 Section 31 05 17 (MMCD) Clearing and Grubbing.
- .2 Section 31 11 41 (MMCD) Tree and Shrub Preservation.

1.2 References

- .1 ANSI A 300 - pruning standard.
- .2 City of Surrey Tree Preservation By-law.
- .3 Current Edition: BCSLA/BCLNA Landscape Standard.

1.3 Qualifications

- .1 International Society of Arboriculture certification or B.C. Trades qualification in Landscape Horticulture or Arboriculture.
- .2 British Columbia trades qualification as Utility Arborist where trees to be pruned within 3m of overhead energized conductors.

1.4 Field Sample

- .1 Do sample pruning acceptable to Owner's Representative to identify:
 - .1 Knowledge of target areas including branch bark ridge and branch collars.
 - .2 Technique for selection process and pruning used to establish desired form and shape for each species.
- .2 Acceptance of work will be determined by Owner's Representative from field sample.

PART 2 PRODUCTS

2.1 Disinfectant

- .1 20% solution of sodium hypochlorite, 70% solution of ethyl alcohol, or 5% Lysol.

PART 3 EXECUTION

3.1 General

- .1 Prune in accordance with ANSI A - 300 pruning standard and as directed by Owner's Representative. Where discrepancies occur between standard and specifications, specifications govern.
- .2 Tool maintenance:
 - .1 Ensure that tools are clean and sharp throughout pruning operation. Do not use tools which crush or tear bark.
 - .2 Disinfect tools before each tree is pruned.
 - .3 On diseased plant material, disinfect tools before each cut.
- .3 Notify Owner's Representative immediately of conditions detrimental to health of plant material or operations.
- .4 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10o C.
- .5 Prune each species when in full leaf.
- .6 Retain natural form and shape of plant species.
- .7 **Do not:**
 - .1 Flush cut branches.
 - .2 Leave stubs.
 - .3 Crush or tear bark.
 - .4 Cut behind branch bark ridge.
 - .5 Damage branch collars.
 - .6 Damage branches to remain.
 - .7 Climb trees to be retained with spurs.
 - .8 Do not drain, fill, or seal cavities.

3.2 Pruning

- .1 Remove dead, dying, diseased and weak growth in order to promote healthy growth.
- .2 Remove live branches that:
 - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
 - .2 Are of weak structure including narrow crotches.
 - .3 Obstruct development of more important branches.
 - .4 Are broken.
 - .5 Are infected at least 15mm below infected area.
- .3 Remove live branches to re-establish natural species form including:
 - .1 One or more developing leaders.
 - .2 Multiple growth due to previous topping.
 - .3 Branches extending outward from natural form.
 - .4 Undesireable sucker growth.
- .4 Remove loose branches, twigs and other debris lodged in trees.
- .5 Remove vines, nails, wire, rope, signs and stakes.
- .6 For branches under 50mm in diameter:
 - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at an angle equal to that formed by line opposite to branch bark ridge.
 - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
 - .3 Do not cut lead branches unless directed by Owner's Representative.
- .7 For branches greater than 50mm in diameter:
 - .1 Make first cut on lower side of branch 300mm from trunk, one-third diameter of branch.
 - .2 Make second cut on upper side of branch 500mm from trunk until branch falls off.

.3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal. Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by Owner's Representative.

3.3 Root Girdling

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by Owner's Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.4 Care of Wounds

.1 Clean dead bark around wound ensuring minimal increase in wound size. Retain peninsulas of existing live bark and do not damage callus tissue.

.2 Do not apply wound dressing.

3.5 Clean-up

.1 Collect and dispose of pruned material daily and remove off site, to location approved by Owner's Representative.

END OF SECTION 02117 TREE PRUNING

PART 1 GENERAL

1.1 Standard

- .1 Comply with British Columbia Building Code, Part 8, Safety Measures at Construction and Demolition sites, and Provincial requirements.

1.2 Asbestos

- .1 Should material resembling spray or trowel-applied asbestos be encountered, stop work and notify Owner's Representative immediately. Do not proceed until written instructions have been received from Owner's Representative.

1.3 Protection

- .1 Prevent movement, settlement, or other damage to adjacent structures, utilities, to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to adjacent owners/occupants to minimum.
- .3 Protect building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

1.4 Required Drawings

- .1 Before proceeding with demolition, provide to authority having jurisdiction any necessary shoring and underpinning drawings prepared by qualified professional engineer registered or licensed in the province of BC in Canada showing proposed method.

1.5 Notice

- .1 Notify Owner's Representative before disrupting access or services.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

3.1 Demolition, Salvage and Disposal

- .1 Remove parts of existing construction to permit new construction. Sort materials into appropriate piles for removal, recycling and/or reuse.
- .2 Remove items to be reused, store as directed by Owner's Representative and reinstall under appropriate section of specification.

- .3 Dispose of removed materials, off-site to a location approved by Owner's Representative, except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION 02221 DEMOLITION

SECTION 02226
REMOVAL OF EXISTING ASPHALT PAVEMENT
Spring 2011

PART 1 GENERAL

1.1 Related Sections

- .1 Section 31 23 01 (MMCD) Excavating, Trenching and Backfilling.
- .2 Section 02221 Demolition.
- .3 Section 02101 Tree and Shrub Preservation

1.2 Storage and Protection

- .1 Protect in accordance with Section 31 23 01 (MMCD) - Excavating, Trenching and Backfilling.
- .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Owner's Representative and at no cost to Owner.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

3.1 Preparation

- .1 Inspect site with Owner's Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting sitework.

3.2 Sequences of Operation

- .1 Removal
 - .1 Remove items as indicated.
 - .2 Do not disturb items designated to remain in place.
 - .3 In removal of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Owner's Representative.

- .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
 - .4 When removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving, prevent contamination with base course aggregates.
 - .5 When removing pipes under existing or future pavement area, excavate at least 300mm below pipe invert.
- .2 Removal From Site
- .1 Interim removal of stockpiled material may be required by Owner's Representative, if it is deemed to interfere with operations of Owner's Representative or other contractors.
 - .2 Only dispose of specified material by selected alternative disposal option as approved by Owner's Representative.
 - .3 Remove stockpiles of like materials by an alternate disposal option once collection of that material is complete.
- .3 Salvage
- .1 Salvage items as indicated.
 - .2 Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
 - .3 Dispose of removed asphalt pavement to asphalt recycling plant approved by Owner's Representative.
- .4 Sealing
- .1 Seal pipe ends and walls of manholes or catch basins as indicated. Securely plug to form watertight seal.
- .5 Disposal of Material
- .1 Dispose of materials not designated for salvage or re-use in work, off-site to a location approved by Owner's Representative.

SECTION 02226
REMOVAL OF EXISTING ASPHALT PAVEMENT
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- .6 Backfill
 - .1 Backfill in areas as indicated and in accordance with Section 31 23 01 (MMCD) - Excavating, Trenching and Backfilling.
- 3.3 Restoration
 - .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- 3.4 Cleanup
 - .1 Upon completion of work, remove debris, trim surfaces and leave work site clean. Sweep remaining surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.
- 3.5 Reporting
 - .1 Record off-site removal of debris and materials and provide following information regarding removed materials to Owner's Representative within 24 hours.
 - .1 Time and date of removal.
 - .2 Type of material.
 - .3 Weight and quantity of materials.
 - .4 Final destination of materials.

END OF SECTION 02226 REMOVAL OF EXISTING ASPHALT PAVEMENT

PART 1 GENERAL

- 1.1 .1 City of Surrey Erosion and Sediment Control Bylaw No. 16138.**

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

3.1 Stripping of Topsoil

- .1 Remove topsoil before any construction procedures commence to avoid compaction of topsoil.
- .2 Do not handle topsoil if the structural integrity of the soil will be damaged by excessive moisture or freezing temperatures.
- .3 Remove vegetation and brush from targeted areas by non-chemical means and dispose of stripped vegetation off-site to location approved by Owner's Representative.
- .4 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
- .5 Pile topsoil in berms in locations as directed by Owner's Representative. Stockpile height not to exceed 3m.
- .6 Dispose of unused topsoil off-site to location approved by Owner's Representative.
- .7 Protect stockpiles from contamination and compaction.
- .8 Topsoil that has been piled for long-term storage will be covered with annual rye grass to maintain agricultural potential of soil and to prevent erosion and sedimentation.
- .9 Refer to Section 02379 – Preservation of Water Courses for treatment of stockpiled topsoil in close proximity to water courses.

3.2 Preparation of Grade

- .1 Verify that grades are correct. If discrepancies occur, notify Owner's Representative and do not commence work until instructed by Owner's Representative.
- .2 Grade area only when soil is dry to lessen soil compaction.
- .3 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

SECTION 02230
PRESERVATION OF TOPSOIL
Spring 2011

3.3 Placing of Stripped Topsoil

- .1 Refer to Section 02921 - Topsoil and Finish Grading.

END OF SECTION 02230 PRESERVATION OF TOPSOIL

PART 1 GENERAL

1.1 Related Sections

- .1 Section 02315 Excavating, Trenching and Backfilling - Sand Base Turf Sports Fields
- .2 Section 31 11 01 (MMCD) Clearing and Grubbing

1.2 References

- .1 City of Surrey Erosion and Sediment Control Bylaw No. 16138.

1.2 Definitions

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .3 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- .4 Grubbing consists of the excavation and disposal of stumps, roots, boulders and rock fragments of a size and to a depth, below existing grade, specified by the owners representative.

1.3 Storage and Protection

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees, which are to remain.
 - .1 Repair any damage to approval of Owner's Representative.
 - .2 Replace damaged trees as directed by Owner's Representative.
- .2 Allow Owner's Representative to inspect site for selective transplanting of natural vegetation.
 - .1 Follow transplant stipulations as set out by the Owner's Representative.

PART 2 PRODUCTS

- .1 Not applicable.

PART 3 EXECUTION

3.1 Preparation

- .1 Inspect site and verify items designated to remain with Owner's Representative.
- .2 Locate and protect utility lines. Preserve in operating condition all active utilities traversing site.
- .3 Notify utility authorities before commencing clearing and grubbing.
- .4 Ensure that clearing activities do not occur during the Bird Nesting Window without a Certified Biologist's report and the approval of the Surrey Parks Division.
- .5 Install tree protection barriers in accordance to Appendix E: Tree Protection in Parks.

3.2 Clearing

- .1 Clear, as indicated by Owner's Representative, will be executed by cutting at a height of not more than 300mm above ground. In areas to be subsequently grubbed, the height of stumps left from clearing operations to be not more than 1000mm above ground surface.
- .2 Cut down trees overhanging a cleared area as directed by Owner's Representative.
- .3 Cut off "unsound" branches on trees designated to remain as directed by Owner's Representative.

3.3 Isolated Trees

- .1 Cut down isolated trees as directed by Owner's Representative, at height of not more than 1000mm above ground surface.
- .2 Grub out isolated tree stumps.

3.4 Underbrush Clearing

- .1 Clear underbrush at ground level from areas as indicated on plans.

3.5 Grubbing

- .1 Grub out stumps and roots to not less than 800mm below ground surface.
- .2 Grub out all visible rock fragments and boulders to a depth of 800mm below finish grade elevation.

3.6 Removal and Disposal

- .1 Remove cleared and grubbed materials off site to a disposal site approved by Owner's Representative.

3.7 Finished Surface

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of Owner's Representative.

3.8 Hazard Tree Assessment

- .1 Employ a Certified Arborist acceptable to the Surrey Parks Division to perform hazard tree assessments of the properties adjacent to the land that has been cleared.

END OF SECTION 02231 CLEARING AND GRUBBING

PART 1 GENERAL

1.1 Related Sections

- .1 Section 01 57 01 (MMCD) Environmental Protection

1.2 References

- .1 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
- .2 City Of Surrey Erosion and Sediment Control Bylaw No. 16138.

1.3 Regulations

- .1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

1.4 Tests and Inspections

- .1 Testing of materials and compaction of backfill, common fill and sand base will be carried out by testing laboratory designated by Owner's Representative.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, sample of backfill material proposed for use. Designated testing agency to determine quantity of material required for testing.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Owner's Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Owner's Representative so that compaction tests can be carried out by designated testing agency.
- .5 Before commencing work, conduct, with Owner's Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.5 Buried Services

- .1 Before commencing work verify and establish the location of all buried services on and adjacent to the site.
- .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Owner to pay costs of relocating services.
- .3 Remove obsolete buried services within 2m of site work. Cap cut-offs.

1.6 Protection

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's approval.
- .3 Protect natural and man-made features that are to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.

PART 2 PRODUCTS

- .1 Not applicable.

PART 3 EXECUTION

3.1 Excavation

- .1 Strip topsoil overlaying construction site sand so that excavated material may be stockpiled without covering topsoil. Stockpile topsoil on site for later use.
- .2 Excavate as required to perform work. Do not disturb soil or rock below bearing surfaces. Notify Owner's Representative when excavations are complete. If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Owner's Representative's written authorization to be filled with common fill at Contractor's expense.
- .3 Excavate trenches to provide uniform continuous bearing and support for 150mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150mm above pipe not to exceed diameter of pipe plus 600mm.
- .4 Excavate to subgrade levels. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.2 Backfilling

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Owner's Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

SECTION 2300
EARTHWORK AND RELATED WORK
Spring 2011

- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing disturbed subgrade to same compaction as specified for fill. Fill excavated areas with selected subgrade material, or if necessary, gravel and sand approved by Owner's Representative compacted as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and basecourse material in 150mm lifts. Apply water as necessary during compaction to obtain specified density.
- .6 Compact each layer of material to 95% Modified Proctor Density for material to ASTM D698.

3.3 Shortage and Surplus

- .1 Supply all necessary fill to meet backfilling and grading requirements.
- .2 Dispose of surplus material off site.

END OF SECTION 02300 EARTHWORK AND RELATED WORK

PART 1 GENERAL

1.1 Related Work

- .1 Section 02315 Excavating, Trenching and Backfilling - Sand Base Turf Sports Fields
- .2 Section 02922 Sand, Topsoil and Finish Grading

1.2 References

- .1 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .2 City Of Surrey Erosion and Sediment Control Bylaw No. 16138.

1.3 Protection

- .1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Owner's Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent excess accumulation of mud.

PART 2 PRODUCTS

2.1 Materials

- .1 Fill material in accordance with Section 02315 - Excavating, Trenching and Backfilling - Sand Base Turf Sports Fields.
- .2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Owner's Representative.

PART 3 EXECUTION

3.1 Stripping of Topsoil

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Owner's Representative.
- .2 Commence topsoil stripping of areas as directed by Owner's Representative after area has been cleared and grubbed.

SECTION 02311
SITE GRADING
SAND BASE TURF SPORTS FIELD
Spring 2011

- .3 Strip topsoil to depths as directed by Owner's Representative. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Owner's Representative. Stockpile height to be determined by Owner's Representative on site.
- .5 Stockpiled topsoil to be protected as required by Ministry of Environment Regulations.
- .6 Dispose of unused topsoil off site as directed by Owner's Representative.

3.2 Grading

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Slope rough grade away from any existing buildings 1:50 minimum.
- .3 Prior to placing fill over existing ground, scarify surface to depth of 150mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .4 Compact filled and disturbed areas to 95% corrected maximum dry density to ASTM D698.
- .5 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 Testing

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by Owner's Representative.
- .2 Submit testing procedure, frequency of tests, to Owner's Representative for review.

3.4 Surplus Material

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site as directed by Owner's Representative.

END OF SECTION 02311 SITE GRADING - SAND BASE TURF SPORTS FIELDS

PART 1 GENERAL

1.1 Related Sections

- .1 Section 02311 Site Grading - Sand Base Turf Sports Fields
- .2 Section 02620 Sub-drainage

1.2 References

- .1 ASTM D422-63(1990), Method for Particle-Size Analysis of Soils.
- .2 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of soil Using Standard Effort (600 kN-m/m³).
- .3 ASTM D4318-84, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .4 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 Definitions

- .1 Excavation classes: two classes of excavation will be recognized: common excavation and rock excavation.
 - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1.0 m³.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.

SECTION 02315
Excavating, Trenching and, Backfilling –
Sand Base Turf Sprots Field
Spring 2011

- .2 Frost susceptible materials under excavated areas.
- .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

- .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 Samples

- .1 Inform Owner's Representative at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.
- .2 Ship samples, prepaid, to designated testing agency, in tightly closed containers to prevent contamination.

1.5 Protection of Excavated Area

- .1 Area of excavation must be protected with fencing material approved by Owner's Representative from initial commencement of excavation to completion of all backfilling operations.

1.6 Protection of Existing Features

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated on plans are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation work, notify applicable authorities having jurisdiction over buried utilities. Establish location and state of use of buried utilities and structures. Authorities having jurisdiction over buried utilities to clearly mark their locations to prevent disturbance during work.

- .3 Confirm locations of buried utilities by careful test excavations.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .5 Where utility lines or structures exist in area of excavation, obtain direction of Owner's Representative before removing or re-routing. Costs for such work to be paid by Owner.
- .6 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Owner's Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.
 - .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Owner's Representative.
- 1.7 Shoring, Bracing and Underpinning
 - .1 Protect existing features in accordance with applicable local regulations.
 - .2 Retain services of qualified professional engineer who is registered or licensed in province of British Columbia, Canada to design and inspect any shoring, and required for work.
 - .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in province of British Columbia, Canada.

PART 2 PRODUCTS

- 2.1 Materials
 - .1 Type 1 and Type 2 (Birdseye Gravel) fill: properties to the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

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Sieve Designation	% Passing	
	Type 1	Type 2 (Birdseye Gravel)
75.0 mm	-	-
50.0 mm	-	-
37.5 mm	-	-
30.0 mm	100	-
25.0 mm	75-100	-
19.0 mm	-	-
12.5 mm	50-100	-
9.5 mm	30-70	100
4.75 mm	20-45	22-85
2.00 mm	10-25	5-30
0.425 mm	0	0
0.180 mm	0	0
0.075 mm	0	0

PART 3 EXECUTION

3.1 Site Preparation

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 De-watering and Heave Prevention

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Owner's Representative's review, details of proposed dewatering or heave prevention methods.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction.

3.3 Excavation

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.

- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .4 For trench excavation, unless otherwise authorized by Owner's Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .5 Dispose of surplus and unsuitable excavated material off-site to location approved by Owner's Representative.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Notify Owner's Representative when bottom of excavation is reached.
- .9 Obtain Owner's Representative approval of completed excavation.
- .10 Remove unsuitable material from trench bottom to extent and depth as directed by Owner's Representative.
- .11 Correct unauthorized over-excavation as follows:
 - .1 Fill over-excavated areas with common fill compacted to not less than 95% of corrected maximum dry density.
- .12 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.4 Bedding and Surround of Underground Services

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.5 Backfilling

- .1 Do not proceed with backfilling operations until Owner's Representative has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

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- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfill around installations.
- .7 Install drainage system in backfill as indicated.

3.6 Restoration

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Owner's Representative.
- .2 Replace topsoil as directed by Owner's Representative.
- .3 Reinstall pavement, sidewalks and lawns to elevation which existed before excavation.
- .4 Clean and reinstall areas affected by work as directed by Owner's Representative.

END OF SECTION 02315 EXCAVATING, TRENCHING, AND BACKFILLING - SAND BASE TURF SPORTS FIELDS

PART 1 GENERAL

1.1 Safety Requirements

1. Comply with National Standard for Pesticide Education, Training and Certification in Canada Federal, Provincial, Territorial, Municipal and local pesticide control regulations of the City of Surrey.
2. Comply with the City of Surrey's Park, Recreation and Culture's Pesticide Use Policy Review 2001
3. Comply with the City of Surrey By-Law No. 17160, A By-law to Control the use of Pesticides on City Lands and on Private Single Family Residential Lands.
4. Obtain permits and licenses necessary to complete work.
5. Comply with label directions on the use of pesticide products.
6. Comply with label directions as to ambient temperature ranges for application. Applicators must wear product and application type appropriate clothing, eye protection and where required, respiratory equipment.
7. Comply with applicable personnel safety standards for handling and use of pesticides.

1.2 Measurement Procedures

- .1 Application of pesticides will be measured in square metres of area treated. Measurement to be surface area.

1.3 Delivery and Storage

- .1 Deliver, store and maintain packaged materials with manufacturer's seals and labels intact.
- .2 Storage facility construction and layout to comply with Agriculture Canada and Ministry of Environment requirements.
- .3 Prevent damage, adulteration and soiling of material during delivery, handling and storage.
- .4 Store material in accordance with label directions.
- .5 Store products in original sealed containers as supplied by manufacturer. Seal on containers to be removed at commencement of mixing and application procedures only.
- .6 Store products in sheltered, well ventilated, controlled access location approved by Owner's Representative.

- .7 Do not store control materials near feeds and food stuffs, agricultural plants, seeds, fungicides, insecticides, fertilizers or other agricultural chemicals.
- .8 Identify storage area as pesticide storage facility for fire protection purposes.
- .9 Post in a prominent place list of medical and fire department telephone numbers.
- .10 Post in a prominent location on the outside of the storage area list of products stored. Provide copy of this list to Fire Department. Keep list up-to-date.

1.4 Reference

- .1 Handbook for pesticide applicators B.C. Ministry of Environment.

1.5 Qualifications

- .1 Staff must be certified as pesticide applicators in B.C.

PART 2 PRODUCTS

2.1 Materials

- .1 Herbicides:
 - .1 Select appropriate herbicides to achieve specified control requirement.
 - .2 Herbicide products used must be currently registered for such use by Agriculture and Agri-Food Canada under Pest Control Products Act.
 - .3 Do not use herbicides containing sodium chlorate.
- .2 Adjuvants: compatible with herbicide product used.

2.2 Equipment

- .1 Tank Sprayer: do not use airblast, mist, or fog sprayer. Pressure setting of sprayer will be set at minimal functional level to minimize spray drift. Sprayer unit to meet following requirements:
 - .1 Adjustable height boom, hose and handgun for spot treatments, strainers and nozzles to produce spray pattern compatible with job.
 - .2 Tank equipped with continuous agitation device.
 - .3 Pressure gauge and regulator capable of maintaining uniform pressure between 100 and 450 kPa.

- .4 Equipment operated on turf shall have low pressure, wide profile turf tires.
- .2 [Backpack] [handheld] sprayer:
 - .1 With hose and handgun for spot treatment.
- .3 Dry formulation applicator:
 - .1 Rotary type capable of calibration.
 - .2 Equipment operated on turf shall have low pressure, wide profile turf tires.
- .4 Injection gun
 - .1 Used for spot treatments.
- .5 Ensure that precautions consistent with Ministry of Environment regulations are taken to prevent cross contamination.

PART 3 EXECUTION

3.1 Notice of Spray Operation

- .1 Post areas to be treated with signs placed at 100m intervals around perimeter.
- .2 Indicate on signs that spray program is being implemented. Obtain approval for signs from Owner's Representative prior to placement.
- .3 Put signs in place 24 hours prior to commencement of spray operation and retain in place for 48 hours after spray operation is completed for each particular area.
- .4 In non-urban areas, advise local beekeepers of intended time, date and product to be used during application with sufficient lead time to allow them to contain their colonies until residual effects of application have subsided.

3.2 Environmental Protection

- .1 Application may continue only when wind velocities range between 2 and 10 km/h.
- .2 Do not spray when air turbulence will prevent uniform application.
- .3 When spraying in the vicinity of wells, rivers, streams, lakes, marshes or other environmentally sensitive areas, ensure all activities conform to Provincial requirements.
- .4 In case of spill, notify Owner's Representative and Provincial Ministry of Environment verbally immediately and subsequently in writing.

- .5 Do not allow drifting beyond target area. Use mechanical method to minimize herbicide drift.
- .6 When spraying adjacent to flowerbeds and desirable vegetation, use sprayer fitted with protective hood suitable to prevent contamination or provide protective covering for such vegetation while spray is in progress.
- .7 Do not apply sterilants to slopes greater than 3 to 1 where killing vegetation would lead to erosion problems.

3.3 Application of Herbicides

- .1 Treat areas as indicated or as directed by Owner's Representative with appropriate herbicides.
- .2 Calibrate equipment to achieve manufacturer's recommended application rates.
- .3 Confine herbicide application to areas as designated by Owner's Representative to achieve specified control requirements.
- .4 Space successive passes to provide uniform coverage of treated area.
- .5 Use flagmen or other aids as necessary to indicate successive passes.
- .6 Apply spray at full leaf stage of plant growth and thoroughly wet foliage to point of runoff in accordance with label directions.
- .7 Spray trunk on target brush in accordance with label directions.
- .8 Apply dry formulations in accordance with label directions.
- .10 Where roots of desirable vegetation run under treatment area, use contact herbicides.
- .11 Ensure formulation and rate of sterilant will not lead to leaching outside treatment area.
- .12 Retreat areas in accordance with label directions until specified control requirements are achieved.

3.4 Control Requirements

- .1 For weed control, achieve within 30 days of treatment, minimum of 90% kill of target plants without damaging desirable vegetation.
- .2 For brush control, achieve within 12 months of treatment, minimum of 90% kill of target plants without damaging desirable vegetation.
- .3 For stump control, achieve within 12 months of treatment, a minimum of 80% kill of target stumps without damaging surrounding vegetation.

3.5 Waste Disposal

- .1 Dispose of containers in accordance with provincial requirements.
- .2 Triple rinse empty plastic herbicide containers with diluent and add rinsate to spray mixture in tank.
- .3 Puncture and crush triple rinsed plastic containers making them unsuitable for further use and dispose of material at appropriate recycling drop point.
- .4 Crush cardboard containers and dispose of material at appropriate recycling facility.
- .5 Do not rinse or wash spray tanks and equipment on site.
- .6 Dispose of wash water from spray tanks and equipment at a location approved by Owner's Representative in non-crop, non-graze area away from water sources including wells and ponds.
- .7 Dispose of unwanted or contaminated pesticides through appropriate environmental management facilities that will dispose of the pesticide by methods acceptable to the Director under the Pesticide Control Act.
- .8 Dispose of water soluble packaging (usually PVA - poly vinyl acetate) as per manufacturer's instructions in the tank of the sprayer. All safety precautions for handling and use of PVA packaging must be adhered to.

3.6 Report

- .1 Within 7 days of work completion, submit to Owner's Representative a written report containing following information:
 - .1 Full name and PCP Registration number of herbicide products used including adjuvants.
 - .2 Types and makes of application equipment used.
 - .3 Total amount of herbicide applied and rate of application expressed in kilograms of active ingredients per square metre and in kilograms of product per square metre.
 - .4 Dates and times treatment commenced and terminated each day.
 - .5 Summary of daily weather conditions during treatment.
 - .6 Number of square metres completed each day.

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- .7 Description of disposal techniques, total number of containers discarded for each chemical, exact location of disposal site.
- .8 Names of drivers, mixers and applicators.
- .9 Copies of provincial applicator's license and pesticide project application permit.
- .10 Supply a copy of the equipment log that clearly indicates the application method and nozzle pressure used during the pesticide application to the Owner's Representative.

END OF SECTION 02361 CHEMICAL CONTROL OF PESTS

PART 1 GENERAL

1.1 Related Sections

- .1 Section 02732 - Natural Area Trails
- .2 Section 02906 – Planting of Trees, Shrubs and Groundcovers
- .3 Appendix C – Coastal BC Native Plants for Naturalizing
- .4 Appendix E – Tree Protection in Parks
- .5 Appendix F – Invasive and Unacceptable Plant Species
- .6 Appendix G – Natural Area Trail Standards
- .7 Detail SSD-PK 4050 – Forest Trail Construction

1.2 References

- .1 Surrey Parks, Recreation and Culture Natural Area Management Plan
- .2 Environmental Guidelines for Planning, Design, Development and Operations
- .3 The City of Surrey Tree Hazard Management Policy
- .4 BC Landscape Standards

1.3 Design

- .1 There are four general natural area habitat types that are found in Surrey parks. Each of these is unique and is characterized by a different mix of native plants. These types are:
 - .1 Forest: a native vegetation community that is dominated by the presence of trees. Minimum size 400m² and width of 15m whether it is newly created or remnant.
 - .2 Shrubland: a native vegetation community that is dominated by the presence of shrubs. Minimum size 225m² and width of 15m whether it is newly created or remnant.
 - .3 Grassland: a native vegetation community that is dominated by the presence of grasses. Minimum size 6000m² and width of 15m whether it is newly created or remnant.

- .4 Marshland: a native vegetation community that is dominated by a mix of shrubs, sedges, rushes, grasses and aquatic plants. The vegetation community is affected by a high and/or fluctuating water table. Minimum size 225m² and width of 10m whether it is newly created or remnant.

- .2 Riparian areas must be 60 meters across.

PART 2 PRODUCTS

- 2.1 Not used

PART 3 EXECUTION

3.1 Tree Hazard Assessment and Abatement

- .1 Tree hazard assessments will be undertaken by a qualified person, such as a certified arborist or registered professional forester, with experience, training and expertise in conducting tree hazard assessments.
- .2 Tree hazard abatement work will be undertaken by a qualified person, such as a certified arborist or tree climber/worker, with experience, training and expertise in conducting tree hazard abatement work.

Tree hazard assessment procedures:

1. Delineate the site and area that will be the subject of the tree inspection and review site and tree history.
2. Identify and value the potential targets at the site.
3. Conduct a visual tree assessment to determine tree hazards that can impact the potential targets and cause significant damage.
4. If the visual tree assessment, site history information and other factors warrant the assessor may need to conduct a detailed tree assessment to determine the extent of the tree defects.
5. Record all trees that require hazard abatement work using industry standards hazard tree rating system.
6. Conduct hazard tree abatement work in a timely, cost effective manner that considers the failure potential of the tree and target values.
7. If necessary schedule further inspections to monitor the site.

Site assessment:

A site assessment is used during some tree inspection processes to determine overall tree and forest health by visually scanning for obvious and general conditions that indicate tree or forest health problems. The purpose of the site scan is to determine if there is a need to schedule further visual or detailed tree assessment as described

below. The scan would be conducted at some distance and could include assessing for the following:

- over all general tree canopy health
- over all general forest composition and health
- general site conditions

Visual Tree Assessment:

The purpose of a visual tree assessment is to assess trees for obvious tree defects and emerging problems, site conditions and other factors that are visually apparent and could contribute to tree failure and impact to a target. A visual tree assessment requires the assessor to circumnavigate the tree to assess for defects. Visual defects may lead to a subsequent more detailed tree assessment as described below.

Visual tree assessments could include inspecting for the following types of defects and site conditions:

Tree Defects:

- splits or cracks in the trunk or branches
- necrotic or chlorotic appearance
- unnatural lean (>10%)
- visible decay pocket
- fungal fruiting bodies
- seeping sap (resinous) or bark stains
- insect frass or bore holes
- canker faces
- scars or sunscald
- thick, sloughing bark
- hanging or weakly attached limbs or tops
- evidence of recent mechanical damage

Site conditions and other factors:

- newly exposed trees
- site or tree exposure to winds
- saturated or compacted soils
- recently altered grades or drainage patterns
- poor rooting substrate
- evidence of other failures nearby
- undermined or heaving roots
- topography
- depleted or contaminated soils

- co-dominant stems, included bark

Detailed Tree Assessment:

The purpose of a detailed tree assessment is to determine the extent of tree defects and is subsequent to and more comprehensive than a visual assessment. Detailed assessments follow up on the defects noted in the visual assessment often requiring the assessor to perform tests to determine the extent of the defects noted in the visual assessment.

The tests and procedures included in a detailed assessment would include:

- core sampling
- strength loss calculations
- sounding
- water table / hardpan location (soil pit)
- sample collection and analysis (fungi, foliage, wood, roots, soil, insects)
- drilling or resist-o-graphing roots or trunk
- root crown excavation and inspection
- soil compaction tests (penetrometers)
- aerial inspections (upper trunk and crown)

- .2 Tree hazard abatement will be done during the development process when new natural areas are designated

3.2 Tree Protection

- .1 Protect trees exposed to damage from construction. See Appendix E – Tree Protection in Parks

3.3 Yard Waste and Garbage

- .1 During park development or when undertaking natural area restoration works, all yard waste and garbage must be removed from the site.

3.4 Invasive Species Removal

- .1 During park development or when undertaking natural area restoration works, all non-native and invasive species will be removed. Refer to Appendix F – Invasive and Unacceptable Plant Species to determine those plants that should be removed. The removal of these plants should be done with minimal damage to existing native vegetation.

3.5 Planting

- .1 Select species from Appendix C – Coastal BC Native Plants for Naturalizing.

- .2 Trees must be planted 1m from other non-tree plant material and 4m from other trees. Other plant material must be spaced at 1m intervals.
- .3 Plant material must be installed in accordance with current edition of BCSLA/BCLNA Standards except where specified.

END OF SECTION 02378 NATURAL AREA PRESERVATION AND ENHANCEMENT

PART 1 GENERAL

1.1 Related Sections

- .1 Section 01 57 01 (MMCD) Environmental Protection.

1.2 Environmental Requirements

- .1 Operation of construction equipment in water is prohibited.
- .2 Use borrow material from watercourse beds when approved by Owner's Representative.
- .3 Design and construct temporary crossings to minimize environmental impact to watercourse.
- .4 Temporary and permanent crossings must be approved by Department of Fisheries and Oceans, Provincial Ministry of Environment prior to construction if required.
- .5 Dumping excavated fill, waste material, or debris in watercourse is prohibited.

PART 2 PRODUCTS

2.1 Preparation

- .1 Obtain necessary work permits from Department of Fisheries and Oceans, Ministry of Environment and City of Surrey.

2.2 Erosion control

- .1 Erosion control to comply with City of Surrey's Erosion and Sediment Control By-Law.
- .2 Biodegradable erosion control matting (ie. Nilex C125BN, S150BN or approved equal).

PART 3 EXECUTION

3.1 Existing Conditions

- .1 Maintain existing flow pattern in natural watercourse systems.
- .2 In natural systems maintain existing riffle/pool and step/pool patterns.

3.2 Site Clearing and Plant Protection

- .1 Conduct work to provide minimal disturbance to vegetated buffer zones. Protect trees and plants on site and adjacent properties where indicated.
- .2 Use biodegradable erosion control matting on slopes that have been stripped of vegetative cover and on areas of stockpiled topsoil.

- .3 Use temporary fence approved by Owner's Representative around trees and shrubs adjacent to construction work, storage areas and trucking lanes.
- .4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zone.
- .5 Leave cuttings from trees and other vegetation on-site as brush piles to allow for natural degradation. Secure large piles with degradable materials to prevent interference with watercourse.
- .6 Remove only trees that may offer future blockage problems as instructed by Owner's Representative.
- .7 Leave root mass and stumps in place.
- .8 Maintain temporary erosion and pollution control features installed under this contract.

3.3 Drainage

- .1 Pumping or draining construction site water into existing watercourses is prohibited.

3.4 Site Restoration

- .1 Establish vegetated buffer zones with suitable vegetation to minimum 30m along edge of watercourse banks as determined by Owner's Representative or as required by Department of Fisheries and Oceans or Ministry of Environment.
- .2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.
- .3 Control streambank erosion in upper section of watercourse by planting suitable vegetation and seeding as directed by Owner's Representative. Planting to occur within 1 day after work adjacent to watercourse is complete.

END OF SECTION 02379 PRESERVATION OF WATER COURSES

SECTION 02631
MANHOLES AND CATCH BASINS
SAND BASE TURF SPORTS FIELD
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PART 1 GENERAL

1.1 Related Work

- .1 Section 02315 Excavating, Trenching and Backfilling - Sand Base Turf Sports Fields.
- .2 Section 02620 Sub-Drainage

1.2 References

- .1 ASTM A48- 83(1990), Specification for Gray Iron Castings.
- .2 ASTM C478M-90, Specification for Precast Reinforced Concrete Manhole Sections.
- .3 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .4 CAN/CSA-A5-M88, Portland Cement.
- .5 CAN/CSA-A23.1-M90, Concrete Materials and Methods for Concrete Construction.

1.3 Material Certification

- .1 Submit manufacturer's test data and certification at least 4 weeks prior to commencing work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.4 Scheduling of Work

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

PART 2 PRODUCTS

2.1 Materials

- .1 Pre-cast concrete source to be provided in writing no less than two weeks prior to commencement of construction. Pre-cast concrete to be approved by Owner's Representative.
- .2 Joints: to be made watertight by pressure fitting.
- .3 Adjusting rings: to ASTM C478M.
- .4 Frames, gratings, covers to dimensions as indicated and following requirements:

- .1 Metal gratings and covers to bear evenly on frames. A-frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
- .2 Gray iron castings: to ASTM A48, strength class 30B.
- .3 Castings: coated with two applications of asphalt varnish.
- .5 Granular bedding and backfill to Section 02315 - Excavating, Trenching and Backfilling - Sand Base Turf Sports Fields.

PART 3 EXECUTION

3.1 Excavation and Backfill

- .1 Excavate and backfill in accordance with Section 02315 - Excavating Trenching and Backfilling - Sand Base Turf Sports Fields and as indicated.
- .2 Obtain approval of Owner's Representative before installing outfall structures, manholes or catch basins.

3.2 Installation

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 De-water excavation to approval of Owner's Representative and remove soft and foreign material before placing pre-cast concrete structures.
- .3 Precast units:
 - .1 Set bottom section of precast unit on undisturbed subgrade or subgrade compacted to 100% Modified Proctor Density. Make each successive joint watertight with Owner's Representative approved, epoxy resin cement.
 - .2 Clean surplus joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .4 Compact granular backfill to 95% Modified Proctor Density.
- .5 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.

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- .6 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- .7 Catch Basins installed in Natural Areas shall have a 18inch radius apron placed around it.

3.3 Leakage Test

- .1 Install watertight plugs or seals on inlets and outlets of each new sanitary sewer manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.
- .2 If permissible leakage is exceeded, correct defects. Repeat until acceptable to Owner's Representative.

END OF SECTION 02631 MANHOLES AND CATCH BASINS - SAND BASE TURF SPORTS FIELDS

PART 1 GENERAL

1.1 Scope of Work

- .1 The work of this Section shall govern the supply of all equipment, materials and labour necessary for the planting of street trees in urban areas where a high level of soil compaction is required.
- .2 The requirements of this Section define Stone Base Mix structural soil.

1.2 Related Work

- .1 This Section shall be read in conjunction and construed together with:
 - .1 Section 31 23 01(MMCD) Excavating, trenching and Backfilling
 - .2 SS 2.4 Excavating, Trenching and Backfilling for Trenches
 - .3 Section 02225 Site work and Removal
 - .4 Section 02117 Tree Pruning
 - .5 Section 33 11 01(MMCD) Waterworks
 - .6 SS 2.14 Waterworks
 - .7 Section 33 40 01(MMCD) Storm Sewers
 - .8 SS 2.15 Storm Sewers
 - .9 Section 33 44 01 (MMCD) Manholes and Catch Basins
 - .10 SS 2.17 Manholes and Catch Basins
 - .11 Section 02801 Landscape Irrigation
 - .12 Section 02906 Planting of Trees, Shrubs & Groundcover

1.3 Standards

- .1 All work shall conform to the current editions of the BCSLA/BCLNA Landscape Standard and the Canadian System of Soil Classification.

1.4 Quality Assurance

- .1 All structural soil material used in street tree planting shall be from a source approved by the Owner's Representative and all similar materials supplied to the site shall be of

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STRUCTURAL SOIL FOR STREET TREE PLANTING
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similar nature and from a single source. 21 days prior to supplying any material to the site, inform the Owner's Representative of proposed source and provide a copy of an analysis undertaken by a recognized testing agency appointed by the Owner's Representative, at the Contractor's expense and indicating the particle size characteristics of the proposed material in written form as laid out in 2.1.1 of this Section.

- .2 All nutritive admixtures to structural soil material supplied to the site shall be from a source approved by the Owner's Representative and all similar nutritive admixtures supplied to the site shall be of similar nature and from a single source. 21 days prior to supplying any nutritive admixture, inform the Owner's Representative of proposed source and provide a copy of an analysis undertaken by a recognized testing agency appointed by the Owner's Representative, at the Contractor's expense and indicating the following characteristics of the proposed nutritive admixture:
 - .1 Gravel, sand and fines content each as a percentage of dry weight mineral fractions.
 - .2 Organic material content as a percentage of dry weight.
 - .3 Acidity (pH).
 - .4 Salinity in millimhos/cm at 25°C.
 - .5 Basic fertility (total nitrogen available K, Ca, Mg, P).
 - .6 Recommendations for incorporation of necessary amendments.
- .3 Costs of imported materials shall include cost of modifications from source to ensure that these materials meet specifications.
- .4 The Owner's Representative may appoint a qualified consultant for the purpose of interpreting and evaluating the quality of the installation and materials used before, during and after construction.
- .5 Acceptance of material at source does not preclude future rejection if material fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.
- .6 Structural Soil volume requirements for a tree is calculated at 2 cubic feet of structural soil for every square foot of crown area at maturity.
Crown area calculation: $\text{Crown area} = \pi \times r^2$

1.5 Scheduling

- .1 Obtain approval from Owner's Representative of schedule 14 days in advance of structural soil preparation or delivery of material to site.
- .2 Schedule to include:

- .1 Date for commencement of preparation of structural soil at source.
- .2 Shipping dates.
- .3 Arrival dates on site.
- .4 Installation dates.

1.6 Field Review

- .1 Start-up meeting with Owner's Representative is required to confirm the areas of installation and mixing. If not previously submitted, ensure growing medium sample and test report, aggregate stone sample and structural soil sample and report are supplied at the start-up meeting.
- .2 Coordinate site meeting with Consultant at the following times:
 - .1 Drainage installation and connection;
 - .2 Irrigation installation;
 - .3 Mixing of structural soil mixture;
 - .4 Installation of structural soil mixture;
 - .5 Sub-grade preparation and layout; and
 - .6 Installation of trees.

1.7 Samples

- .1 Provide 2 kg samples of all materials required for the preparation of structural soil minimum 14 days prior to commencement of installation as required by the Owner's Representative.

1.8 Product Handling

- .1 All materials used in the composition of structural soil shall not be prepared, worked or travelled upon when in a wet or frozen condition.
- .2 Limestone and other chemical amendments shall be supplied and handled in standard, sealed, waterproof containers with net weight and product analysis clearly marked on exterior of package.

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1.9 Delivery, Storage and Protection

- .1 For structural soil prepared at source and delivered to site, deliver all materials to site in such a manner as to prevent damage to or separation of all materials used in the preparation of structural soil.
- .2 On-site storage of prepared structural soil shall be undertaken in such a manner as to prevent damage or separation of any materials.
- .3 Structural soils to be installed as soon as practicable after mixing, any structural soils stored overnight whether on-site or at source shall be covered with tarpaulin of material approved by the Owner's Representative until such time as material is installed.
- .4 All material to be stockpiled shall be protected in accordance with B.C. Ministry of Environment guidelines.

PART 2 PRODUCTS

2.1 Soil Stabilizer/Nutritive Admixture

- .1 Unless indicated otherwise, all material shall be imported from a source approved by the Owner's Representative.
- .2 Material shall be friable, containing a minimum of four percent (4%) and maximum six percent (6%) organic matter by dry weight, free from stones and debris over 30mm. Acidity (pH) shall be in the range 5.5 to 7.5. Carbon to nitrogen ratio shall not exceed 40:1, and salinity shall not exceed 3.0 millimhos at 25°C. Gravel greater than 2mm shall not exceed ten percent (10%) of total by weight.
- .3 Non-toxic organic binder to be approved by the Owner's Representative prior to inclusion in any structural soil mixture.
 - .1 "Humus Builder" by The Answer! Garden Products
 - .2 "The Natural Solution" by Sport Turf Inc.
 - .3 Equivalent product approved by Owner's Representative prior to commencement of mixing operations.
 - .4 Submit 5 kg sample of mixture to Owner's Representative prior to commencement of large scale mixing procedures.

2.2 Growing Medium

- .1 Provide all growing medium required to complete the work.
- .2 Comply with the requirements of table below.

- .3 Organic material in the growing medium must be well decomposed to prevent oxygen consumption caused as a result of decomposition of the organic matter in the soil mixture.

GROWING MEDIUM PROPERTIES FOR GAP-GRADED MIXTURE

TEXTURE*	PERCENTAGE OF MIXTURE
Gravel: greater than 2 mm – less than 75 mm	0
Sand: greater than 0.05 mm – less than 2 mm	maximum 30%
Silt: greater than 0.002 mm – less than 0.05 mm	maximum 50%
Clay: less than 0.002 mm	maximum 30%
Clay & Silt Combined	maximum 60%
Acidity (pH)	6.0-7.0
Drainage: Minimum saturated hydraulic conductivity (cm/hr) in place	3.0
Salinity: Saturated extract conductivity shall not exceed:	3.0 millimhos/cm at 25°C
Organic Content: Percent of Dry Weight (%)	8 – 12%

* Particle size classes by the Canadian System of Soil Classification

2.3 Stone

- .1 Clean inert stone of high angularity is preferred over washed gravel.
- .2 Stone dimension aspect ratio should approach 1:1:1 with a maximum of 2:1:1 length: width: depth.
- .3 Single size stone, 60 mm to 75 mm clear sieve designation: Blasted Quarry Rock.
- .4 Aggregate to be used for structural soil shall be free of any foreign elements or material. Provide samples and test reports as described in Section 1.5 and 1.8.
- .5 Aggregate quality: Material shall be sound hard, durable, free from soft, thin, elongated or laminated particles, organic material, clay lumps or material, or other substances that would act in a deleterious manner for use intended.

2.4 Granular Base

- .1 To Master Municipal Specification Section 02226, Aggregates and Granular Materials.

2.5 Filter Fabric

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- .1 Non-woven filter fabric shall be installed as a separation layer directly above the compacted structural soil mixture. Do not install fabric until adequate compaction of the structural soil mixture has been confirmed.
- .2 Filter fabric shall be selected and designed to withstand wear and tear during construction without deterioration of its strength and filtering properties. Conform to the following ASTM designations.
 - .1 Grab Tensile Strength ASTM-D-4632 .400 kN
 - .2 Tensile Elongation ASTM-D-4632 50%
 - .3 Mullen Burst ASTM-D-3786 1270 kPa
 - .4 Flow Rate ASTM-D-4491 6110 l/min/m²
- .3 Fabric shall be Amoco 4545 or approved equivalent.

Deep Root Silva Cells

- .1 The City of Surrey considers this to be an experimental technology. The application of this technology should be reviewed by a City of Surrey Park's Representative and installed following manufacturer's specifications.

PART 3 EXECUTION

3.1 Existing Subgrade

- .1 Excavate subgrade to establish tree pit/trench as indicated.
- .2 Areas designated as tree pits/trench for street tree planting shall be prepared to ninety five percent (95%) Modified Proctor Density and shall be free of stones, debris, roots branches, toxic materials, building materials and other deleterious materials, greater than 30 mm.

3.2 Preparation of Existing Grade

- .1 Verify that grades are correct. If discrepancies occur, notify Owner's Representative and do not commence work until directed.
- .2 Subgrade elevations shall slope parallel to the finished grades and/or toward the subsurface drain lines as indicated on the civil engineering drawings.
- .3 Do not proceed with the installation of the structural soil material until all walls, curbs, and utility work in the area has been installed.

- .4 Re-compact subgrade to requirements of Master Municipal Specifications and civil engineering drawings.

3.3 Sub-Drains

- .1 Install to requirements of Surrey Standard Construction Documents and Master Municipal Specifications. Refer to SS 2.15 - Storm Sewers (Section 02721), and SS 2.17 -Manholes and Catch Basins (Section 02725).
 - .1 Confirm location of storm sewer connections with civil engineer.
 - .2 Install prior to installation of the structural soil mixture.
 - .3 Co-ordinate all contract drainage work with other drainage on-site.

3.4 Irrigation

- .1 Install to requirements of Surrey Standard Construction Documents and Master Municipal Specifications. Refer to SS 2.14 - Waterworks (Section 02666) and Section 02801 - Irrigation System.
 - .1 Confirm location of irrigation connections with civil engineer.
 - .2 Install irrigation main lines in co-ordination with installation of the structural soil. Confirm timing at start-up meeting.
 - .3 Coordinate all contract irrigation work with other civil engineering and drainage on-site.

3.5 Mixing of Structural Soil

- .1 Ensure consistent even distribution of all components by thorough mixing. The ratio of components will vary and may require adjustment to ensure the soil volume is adequate to fill all voids.
- .2 Base Ratio of Materials for Structural Soil.
 - .1 Mix structural soil to create a homogeneous product to the following table.

MATERIAL	AMOUNT	REFERENCE
Stone	4 m ³	Part 2.3
Growing Medium	1 m ³	Part 2.2
Soil Stabilizer	2 kg	Part 2.1

- .3 Moisten mixture with fine spray of clean potable water while mixing to activate soil stabilizer product.

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- .4 Do not OVER MIX, OVER HANDLING can result in separation of the constituent materials. Further and final mixing will occur during the placement of the material.
- .5 All mixing shall be performed at the contractor's yard using appropriate soil mixing equipment. No mixing of soils at the project site shall be permitted unless approved by the Owner's Representative.

3.6 Placement of Structural Soil

- .1 Subgrade shall be approved by the Owner's Representative and unfrozen prior to placing structural soil.
- .2 Structural soil shall be moist, twenty-five to seventy-five percent (25%-75%) of field capacity, but not saturated with water when placed. Placement shall be handled to avoid damage to drainage structures, irrigation equipment, concrete structures or pavement.
- .3 Place mixture in 300mm lifts through entire area of structural soil mixture. Compact each lift to 95% MPD prior to placement of next lift.
- .4 Place structural soil such that finished grades are achieved as indicated and compact to achieve 95% of MPD.
- .5 Provide stamped Professional Engineer's Report to confirm compaction. Test to ensure uniform compaction rates have been achieved for each lift and in all areas of structural soil mixture. Refer to Quality Assurance, Section 1.4.

3.7 Installation of Filter Fabric

- .1 After approval of structural soil mixture compaction, install filter fabric, as indicated.
- .2 Ensure minimum 60cm overlap of all fabric seams and beyond edge of structural soil.

3.8 Tree Planting

- .1 Ensure tree is planted in the centre of the specified planting station straight and true.
- .2 Install tree in accordance with BCSLA Landscape Standard. Cut away synthetic root ball twine, cut back improperly sized wire baskets, pull back burlap from around trunk, etc.
- .3 Backfill with structural soil mixture to achieve finish grade as indicated.

3.9 Finish Grading, Restoration and Reinstatement

- .1 All areas shall be graded to contours and elevations as indicated on contract drawings. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Finish grade shall be as indicated and shall follow a level line.

3.10 Tolerances

- .1 Finish grade shall be to within 15 mm of proposed grades within 3.0 m of any adjacent fixed elevation points and to within 15 mm of proposed grades over any other 3.0 m length. Finish grades shall be neither uniformly high nor low.

3.11 Tree Grates

- .1 Install tree grates to manufacturer's recommendation. Refer to contract drawings for tree grates, frames and footings.

3.12 Surplus Material and Clean-up

- .1 Dispose of surplus material off site to location approved by the Owner's Representative.
- .2 Leave all hard surfaces groomed clean of soil, amendments and debris following completion of structural soil preparation and placement.

END OF SECTION 02727 STRUCTURAL SOIL FOR STREET TREE PLANTING

PART 1 GENERAL

1.1 Related Sections

- .1 Section SS 2.3 Site Grading.
- .2 Section 31 22 01(MMCD) Site Grading.

1.2 References

- .1 Canadian General Standards Board
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .2 American Society for Testing and Materials
 - .1 ASTM C 117-90 Test Method for Material Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C 136-93, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D 698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .4 ASTM E 11-87, Specification for Wire-Cloth Sieves for Testing Purposes.

1.3 Samples

- .1 Submit samples in accordance with Section 01340 - Product Data, Samples and Mock-ups.

1.4 Product Data

- .1 Submit following test data:
 - .1 Sieve analysis for gradation of crusher chip.

1.5 Protection

- .1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.

PART 2 PRODUCTS

2.1 Materials

- .1 Crusher chip or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .1 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 rather than ASTM E 11.

SIEVE DESIGNATION	% PASSING
9.5 mm	100
4.75 mm	50 – 100
2.00 mm	30 – 65
0.425 mm	10 – 30
0.075 mm	5 - 10

PART 3 EXECUTION

3.1 Subgrade

- .1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base.
- .2 Subgrade to be approved by Owner's Representative prior to installation of granular base.

3.2 Crusher Chip Base

- .1 Base minimum thickness 150 mm.
- .2 Spread and compact crushed stone or gravel base in uniform layers not exceeding 150 mm compacted thickness.
- .3 Compact base to a density of not less than 95 MPD.
- .4 Shape and roll alternately to obtain a smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.
- .5 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .6 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

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- .7 Ensure top of crusher chip base does not exceed plus or minus 10 mm over a 3 m straightedge.
- .8 Finish grade of granular base shall be neither uniformly high nor low.

END OF SECTION 02731 CRUSHED STONE PAVING

PART 1 GENERAL

- 1.1 Related Sections
 - .1 Section 2678 - Natural Areas Preservation and Enhancement
 - .2 Section 2731 – Crushed Stone Paving
 - .3 Appendix C – Coastal BC Native Plants for Naturalizing
 - .4 Appendix G – Natural Area Trail Standards
 - .5 Detail SSD-PK 4050 – Forest Trail Construction

References

- .1 Surrey Parks, Recreation and Culture Natural Area Management Plan

Equipment

- .1 Equipment used to build a trail should be determined by:
 - .1 Width of tread surface.
 - .2 Characteristics of the soil.
 - .3 Drainage patterns of the site.
 - .4 Distance that needs to be traveled to complete the work.
 - .5 Machinery width should not exceed the shoulder width.
 - .6 Machinery height should not exceed vegetation clearance limits.
 - .7 Rubber or plastic track machines are preferred, but low pressure, high floatation rubber tires are acceptable.

PART 2 PRODUCTS

- 2.1 Materials
 - .1 Crusher chip or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .1 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 rather than ASTM E 11.

SIEVE DESIGNATION	% PASSING
19 mm	100
12.5 mm	80 – 95
9.5 mm	70 – 85
4.75 mm	50 – 60
2.36 mm	30 – 40
1.18 mm	20-30
.3 mm	5-15
.075 mm	0-10

PART 3 EXECUTION

3.1 Grubbing and Base Prep

- .1 Trail sections that will be traversed by structures (ie. Suspended stairways or boardwalks) should not be grubbed.
- .2 The organic (LFH) layers of the existing soil should be scarified from the surface until mineral soil or parent material is reached.
- .3 The trail subgrade should rest on mineral soil or parent material in all sections. If the soils are too unstable or wet, avoid the area or construct an elevated crossing.
- .4 Where only very small amounts of organics are removed, it is acceptable to side cast the materials to the downhill side of the trail, being sure to broadcast it evenly over a large area as opposed to creating berms or piles.
- .5 All roots, both exposed and subsurface, must be treated with care and should be pruned only when no other options are available. Small diameter roots should be pruned cleanly to the trail edge. Larger, structural roots should not be cut. An ISA Certified Arborist should assess the tree if significant tree roots are damaged during trail construction,
- .6 Measures to protect roots should be applied, especially during construction and maintenance activities, when machinery can damage trees or compact soils. Protective bark coverings and ground pressure dispersal measures should be employed to lessen soil compaction and physical root damage.
- .7 Base materials should be contoured and compacted until stable and able to support the subgrade without allowing it to mix freely with base materials. Drainage ditches and catch ponds should be roughed out at this stage. Material should not be placed directly against the root collar or tree trunk.

3.2 Crusher Chip

- .1 Minimum thickness 150mm.
- .2 Ensure minimum 2% crown or 2% cross slope on trail.
- .3 Install drainage features as required. See Appendix G - Natural Area Trails Classifications and Construction for detail drawings on the construction of drainage features.

3.3 Trail Widths

- .1 Trail widths should be appropriate for the site and intended use of the trail (see Appendix G - Natural Area Trails Classifications and Construction).

3.4 Vegetation Clearance

- .1 All tree pruning should be performed by, or under the supervision of, a Certified Arborist. Prune all tree branches back to the specified clearance width and heights. Do not prune terminal leaders on trees adjacent to the trail.

3.5 Tree Hazard Abatement

- .1 Tree hazard abatement will be done, considering the trail as the target, when new natural area trail construction occurs. All tree hazard abatement should be performed by, or under the supervision of, an experienced ISA Certified Arborist with expertise in tree hazard abatement.

3.6 Trail Edge Rehabilitation

- .1 Place salvaged topsoil in degraded or depleted areas. Attempt to match the depth and compaction of the surrounding native soils. Place salvaged forest litter over exposed topsoil. Attempt to match the depth and compaction of the surrounding native litter layers. Place salvaged coarse woody debris and rock strategically along the trail edges to enhance visuals, for erosion control and to deter shortcutting.
- .2 Re-establish salvaged native plant stock and establish imported native plant stock to provide visual enhancement, screening, erosion control, habitat and to deter shortcutting. Match species to those that exist on the site and match the existing seral stage. Relocate high maintenance species further from the trail edge.

END OF SECTION 02732 NATURAL AREA TRAILS

PART 1 GENERAL

1.1 Scope

- .1 The work shall include, but not be limited to, all labour, materials, equipment and operations required to construct a fully operational automatically-controlled turf irrigation system, including clean up, restoration and maintenance, as required.

1.2 Work Not Included

- .1 The work will not include:
 - .1 Water connection to street mains.

1.3 Related Work

- .1 This Section shall be read in conjunction and construed together with:
 - .1 Section SS 2.4 Excavating, Trenching and Backfilling
 - .2 Section 31 23 01 (MMCD) Excavating, Trenching and Backfilling
 - .3 Section 32 91 21 (MMCD) Topsoil and Finish Grading

1.4 System Completion

- .1 The irrigation system shall be complete and operable, complying in all respects with the specifications, including all sleeving, piping, fittings, solvent weld, primer, control valves, isolation valves, wire, sprinklers, valve boxes, timers, controller backflow prevention devices and other components necessary to fabricate a fully functioning system.

1.5 Existing Conditions at Variance

- .1 Contractor shall confirm existing site conditions with the plans and specifications, he shall notify the Owner's Representative of any and all variances in writing prior to the commencement of installation of the irrigation system.

1.6 Codes and Permits

- .1 All work contained herein and as indicated shall be accomplished in strict accordance with the applicable plumbing and health codes. All wiring shall be accomplished in accordance with applicable electrical codes. The Contractor shall be responsible for obtaining all necessary permits to accomplish the work herein described and shall include the cost thereof in the price bid for the completed landscape irrigation systems.
- .2 The Contractor shall arrange and pay for all connections and services required for execution of the work.

1.7 Records

- .1 The Contractor shall maintain a current record of all pipe and equipment placement and shall record any variations from the contract documents. All variations and changes must be approved by the Owner's Representative prior to the execution of the affected portion of work. Upon completion of the irrigation system and prior to release of the final payment, the Contractor shall provide the Owner's Representative with a neat and legible drawing of the complete irrigation system as constructed. Any pipe not installed in accordance with the contract documents as originally contracted, shall be dimensioned to a survey monument or permanent structure sufficient for location after burial.

1.8 Substitutions

- .1 Substitutions to the equipment specified will be permitted only with the express written approval of the Owner's Representative. Substitutions will be approved only when the substituted item is equal or better in quality and performance than the item originally specified. Substitute sprinkler heads will be considered only when the performance by delivery, pressure, diameter and spacing are all equal to the product originally specified. The final determination for "equal or better" rests with the Owner's Representative.

1.9 Acceptance

- .1 Upon acceptance of the system by the Owner's Representative, the Contractor shall provide the keys and/or other tools necessary to operate/drain/activate the system and shall spend sufficient time with the Owner's Representative to ensure that the system operation/ maintenance/winterizing can continue on after acceptance of the system. The Contractor will be liable for all damages or losses resulting from failure to comply with the provisions of this paragraph.

1.10 Warranty

- .1 The system shall be warranted for all labour and material for a period of one (1) year from the date of acceptance of the system. During the warranty period, the Contractor will check, clean and adjust sprinkler heads and otherwise ensure adequate operation of the system.

1.11 First Season Operation

- .1 As part of the warranty under this contract, the Contractor shall be responsible for the deactivating and drainage of the irrigation system prior to the onset of the cold season and for reactivating the system at the onset of the spring growing season - each event must be accomplished once during the one (1) year warranty. In the event the system is completed in a season when the system will not be in use, the Contractor will winterize the system upon completion of testing (and approval by the Owner's Representative) and reactivate the system in the spring. The Contractor shall, upon completion of the winterizing phase, submit a letter to the Owner certifying that the system was winterized

and drained and indicate the date such action was accomplished. The Contractor shall be liable for any damage resulting from failure to comply.

1.12 First Season Repair

- .1 If repairs or replacement equipment are required due to breakage, theft, vandalism, the Contractor shall make such repairs as required to maintain operation of the system during the period of warranty. Cost of such repairs/equipment shall be at current hourly labour charges as agreed upon plus cost of parts.
- .2 Prior to undertaking any such repairs/replacements in accordance with the preceding paragraph, the Contractor shall submit an estimated cost of repair/replacement for each event and, prior to starting work, shall obtain a written directive to proceed from the Owner's Representative.

PART 2 PRODUCTS

2.1 Sleeving

- .1 Sleeving material shall be Schedule 40 PVC unless otherwise indicated.
- .2 Sleeving shall be sized to be twice the size of lateral lines and three times the size if main line.

2.2 PVC Pipe

- .1 All pipe including mains, laterals and sleeving shall be provided as PVC pipe for all sizes. Pipe shall be polyvinyl-chloride, semi-rigid, Class 200 for all sizes unless otherwise noted. PVC pipe shall be continuously and permanently marked with identification of the manufacturer, type, class or schedule and size. Pipe 4" in diameter and larger shall be gasketed pipe, only at the discretion of the Owner's Representative. Pipe 3" in diameter to 1/2" shall be solvent weld.
- .2 Pipe shall bear no evidence of interior or exterior extrusion marks and pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual, solvent-weld couplings and must conform to ASTM 2241, SC 25663 and CSA B-137-3 specifications. Fittings shall be Schedule 40 weight, full size. Fittings shall be of the brand(s) recommended by the manufacturer of the pipe. Cement shall be Weld-on 705 Grey, Weld-on 711 Grey. Primer shall be Weld-on P-70 Purple.

2.3 PVC Fittings

- .1 All PVC fittings other than special PVC nipples on triple swing joint risers and isolation valves, shall be Schedule 40 (full size), solvent weld and shall be of the same basic material as the PVC pipe. The Contractor shall only use fittings, cement and thinner (primer) recommended by the manufacturer of the pipe. The Contractor shall be prepared to submit product data if so requested by the Owner's Representative.

- .2 Fittings for the isolation valves shall be as follows:

Tees, ells, etc.	Schedule 80, full size
Nipples	Schedule 80 wall, moulded

- .3 Threaded connections of PVC to metal shall have male threads on the PVC and female threads on the metal.

2.4 Sprinklers

- .1 All sprinklers shall be new, with the size, manufacturer, and features as indicated.
- .2 Follow the relevant manufacturers recommendations in the installation of each sprinkler.
- .3 Maximum sprinkler spacing shall be equal to the radius of throw (head to head) with appropriate allowance for wind.
- .4 Pop-up riser style sprinkler must be installed to consider safety, maintenance, risk of vandalism, and appearance on the site.
- .5 Pop-up riser height must consider the intended plant material, its growth potential, interfering landscape features, and must provide optimum coverage.
- .6 Pop-up riser height to be approved by Owner's Representative prior to commencement of installation.
- .7 Sprinklers with built in check valves must be used in conditions where there is low head drainage.

2.5 Irrigation Head Performance Specification

- .1 The full and/or part circle sprinkler heads shall be gear-driven rotary motors and designed with an integral check valve for control of line drainage. The sprinkler shall be mounted at finished grade. The sprinkler shall be capable of covering as per the design specifications. Radius reduction shall be adjustable by up to twenty-five percent (25%) by means of a radius adjustment screw accessible from the cap when the sprinkler is properly installed. The nozzle assembly shall elevate 4" minimum when in operation. Nozzles shall be of a matched precipitation rate type.
- .2 Retraction shall be achieved by a heavy duty retraction spring. The sprinkler shall have a riser seal and wiper. The sprinkler housing shall be of high impact moulded plastic with a 1" N.P.T. connection. The sprinkler shall have a large strainer screen to prevent nozzle clogging. The sprinkler shall be constructed so that drive assembly, screen, and check valve are accessible through the top of the sprinkler without disturbing case installation.

2.6 Valves

- .1 Valves shall be of the size and type indicated on the plan.
- .2 Electronic solenoid valves shall be of a globe/angle configuration. The diaphragm itself shall be of a fabric-reinforced rubber construction to retain flexibility and provide maximum sealing throughout its area.

The valve shall have a manual flow control with a manual bleed screw. The valve shall be held normally closed by internal water pressure. 24" lead wires shall be attached to a 24 VAC, 50/60 Hz solenoid with waterproof moulded coil capable of being removed. The valve shall have a self-cleaning metering pin to protect bleed ports and to purge contaminants.

- .3 Electric solenoid valves performance specification:

Operating Range:

Flow: 20-200 USGPM
Pressure: 10-200 PSI

Features:

- .1 2" I.D. capacity electric remote control valve.
- .2 Up to 200 PSI rated heavy duty globe or globe/angle configuration.
- .3 Cylolac and stainless steel or glass filled nylon body and bonnet construction.
- .4 Rubber or nylon reinforced rubber diaphragm.
- .5 Low flow/low reinforced rubber diaphragm.
- .6 Low power requirement.
- .7 Flow control stern.
- .8 Manual open/close control.
- .9 Normally closed.
- .10 Brass/stainless steel flow control stern.

Electrical Characteristics:

- .1 24 VAC 50/60 cycle solenoid.
- .2 0.265 AMP - 0.41 AMP inrush current (6.3 VA - 9.9 VA).
- .3 0.20 AMP - 0.23 AMP holding current (4.8 VA - 5.5 VA).

- .4 Operating rating of 200 PSI and 150 Degrees F.

2.7 Control Valves

- .1 All valves shall be new, with the size, manufacturer, and features as indicated.
- .2 Follow the relevant manufacturers recommendations in the installation of each control valve.
- .3 Install valves vertically and centred in the box to be easily accessible for servicing.

2.8 Isolation Valves

- .1 All isolation valves shall be new, with the size, manufacturer, and features as indicated.
- .2 Valves 1/2" through 3" may be ball or gate valves while those larger shall be gear operated butterfly valves.
- .3 Install valves vertically and centred in the box to be easily accessible for servicing.

2.9 Valve Boxes

- .1 All automatic valves and quick coupling valves shall be installed in pre-fabricated boxes as indicated and shall be suitable in size to permit ease of maintenance of the enclosed item. All valves to be installed in pre-fabricated plastic, vinyl or fibreglass boxes of appropriate sizes with locking green covers and hex head lockscrews supplied. Valve boxes to Carson Brooks 1419 rectangular design. Obtain Owner's Representative's approval on all valve boxes prior to installation.

2.10 Automatic Controller

- .1 All controllers shall be of the type indicated on the plan.
- .2 All controllers shall be C.S.A. approved for use in the mounting location selected.
- .3 Controller shall be a 115 VAC minimum input - 24 VAC minimum output with number of stations as indicated. Each station shall have an off switch for zero (0) watering time, and individual variable time control for one (1) to thirty (30) minute station timing.
- 4. Features
 - .1 Internal or plug in transformer.
 - .2 Input internal connection to 115 VAC/60 HZ minimum electrical supply.
 - .3 Output capacity: either 24 VAC 60 HZ/30VA or 26.5 VAC 60 HZ/1.5A.

- .4 UL listed and CSA approved.
 - .5 Digital electronic (with power failure backup and program retention with rechargeable battery) or solid state electro-mechanical (program retention after power failure) controller.
 - .6 Minimum twelve station capability.
 - .7 Manual operation capability for each station.
 - .8 Single station operation.
 - .9 Sequential station operation.
 - .10 Manual start and stop switch and automatic on/off switch.
 - .11 Remote master valve/pump start circuit.
 - .12 Reset circuit breaker, 1.5 amp holdings/2.5 amp break.
 - .13 Multi-valve capacity, minimum of two (2) valves per station.
 - .14 Independent programs for lawn or lawn and shrub watering.
 - .15 Digital controller to have built-in standby watering schedule once power resumes in cases of extended power interruption.
 - .16 Electro-mechanical controller to retain watering schedule after prolonged power interruption.
 - .17 Watering schedule/program to be either seven or fourteen (7 or 14) day cycle.
 - .18 Six (6) start times minimum/day utilizing dual programming.
 - .19 Maximum one half (1/2) hour increments for station run times.
 - .20 Start on any one quarter (1/4) hour minimum or every one (1) hour maximum.
 - .21 Internal valve wire connection strip.
 - .5 The controller shall be mounted in a locking weatherproof stainless steel cabinet approved by Owner's Representative prior to commencement of installation.
- 2.11 Kiosk and Chamber
- .1 All electrical components shall be installed as per local electrical code in an approved locking kiosk. All irrigation related valves, blow-out connections, shut-off valves and back

flow prevention devices shall be installed in an in-ground concrete chamber as per code and the approval of the Owner's Representative.

2.12 Wire

- .1 All wire from the controller to valves shall be direct burial type, #14 AWG min. TWU-40, placed in PVC electrical conduit to 4' clear of kiosk base and buried not less than that of the main or lateral water lines and approved for use by the Department of Public Works, Government of British Columbia, as outlined in the "Rules and Regulations for the Installation and Maintenance of Electrical Equipment" handbook, current edition. Hot wire shall be any colour other than white; common neutral wire shall be white.
- .2 Wire splices shall be waterproof, use gel filled caps approved by Owner's Representative prior to installation.

2.13 Bedding and Backfill Materials

- .1 Refer to Sections SS 2.4 - Excavating, Trenching and Backfilling and MMCD 31 23 01 Excavating, Trenching and Backfilling for materials required for irrigation pipe bedding and trench excavation.

PART 3 EXECUTION

3.1 General

- .1 The following coverage to finished grade is required over the piping:
 - .1 Residential and Commercial Landscape 200 to 300mm (8 to 12 inches)
 - .2 Public Parks 300 to 400mm (12 to 16 inches)
 - .3 Sleeving under Roadways 450 to 600mm (18 to 24 inches)
 - .4 Sleeving in Landscape 200 to 300mm (8 to 12 inches)
 - .5 Piping on Slab If required depth is not available, pipe is to be on top of the filter fabric above the drain rock or voiding material.
- .2 Trenches shall be free from rock, debris or other sharp articles. Backfilling shall be accomplished in a manner to ensure minimum settlement and no damage to the pipe. The Contractor shall be responsible for compensating for all trench settlement during the period of the warranty.

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- .3 All excavated rock, shale, boulders, stumpage, etc., shall be removed from the job site; use backfill material as indicated.

3.2 Trenching and Backfilling

- .1 Refer to Section SS 2.4 - Excavating, Trenching, and Backfilling (MMS 02223) and as follows for trenching, bedding, and backfilling.
 - .1 All trenches shall be straight with a level, uniform slope along the trench bottom.
 - .2 Backfill trenches in 6" (150mm) layers, **tamping firmly** to ensure that the compaction of the trench is equal to the surrounding undisturbed or compacted areas.
 - .3 Backfill material shall be sand which is free of rocks and/or other unsuitable materials which could damage the pipe or create settlement problems.
 - .4 Backfill material around the swing joints and under the heads shall be sand as to allow appropriate movement under impact.
 - .5 Trenches shall be at least 12 inches (300mm) away from paving stone or other hard surfaces to avoid undermining such surface or its edge retention.
- .2 Main water supply line from kiosk to valve boxes to be installed in trenches as indicated and to Section SS 2.4 - Excavating, Trenching and Backfilling (MMS 02223).
- .3 Install 14 ga. copper wire in trench with main water supply from kiosk to first valve in hydraulic valve-in-line operated systems. The wire shall be installed under the main line pipe.
- .4 Contractor may have the option of installing lateral lines in a sand based field with a pipe puller subject to Owner Representative's approval of the type of pulling equipment. Puller shall be of the "Mechanical Mole" type which permits creation of an underground void sufficient in size to allow pipe to be pulled back and forth without difficulty prior to surface compaction.
- .5 Pulled pipe shall be 2" diameter or smaller, 2½" diameter and larger pipe shall be trenched in. All pulled pipe to be straight pulls. No mainlines, laterals to be installed as a curve. Pipe runs must be installed in straight lines.

3.3 Irrigation Pipe Installation

- .1 Visually inspect each pipe prior to installation, removing any dimpled or otherwise damaged sections.
- .2 Lay the pipe in a straight line between fittings, placing it on firm soil at all points in the trench.

- .3 Multiple pipes may occupy the same trench provided that a minimum of 2 inches (50mm) horizontal clearance can be maintained and the pipes are all on the same plane.
- .4 PVC pipe ends shall be cut 90° to the pipe length and cleaned of all cutting burrs prior to cementing, using an approved reaming tool. Pipe ends shall be wiped clean with a rag and the inside of the pipe must be free of dirt and debris. The pipe shall be daubed/brushed with approved PVC primer and wiped clean of excess primer with a clean rag prior to glue joint fitting. Primer must be applied to "male" pipe end as well as to "female" fittings.
- .5 Primer must be applied by dauber/brush to inside fitting and wiped of excess primer. Proper safety attire must be worn when using glue and primer.
- .6 Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excess cement shall be wiped from the outside of the pipe.
- .7 All solvent welding is to be done in careful compliance with the manufacturers recommendations with particular attention to cleanliness, air temperature, moisture, and curing time. Excess cement must be removed from all joints.
- .8 Thrust blocking is required for all pipe 3" diameter and larger at all tees and 90 degree turns.
- .9 As the pipe layout in the design is diagrammatic, care must be taken during the installation to size the pipe to keep the velocity of flow at less than 5 feet per second. Any changes to pipe size as indicated must be approved by Owner's Representative prior to Contractor ordering material.

3.4 Line Water Supply

- .1 The line water supply shall be installed by the Contractor from connections to the existing line as required to complete the system.

3.5 Valves

- .1 Valves shall be installed to manufacturer's specifications in grade-level prefabricated boxes as indicated. Provision shall be made for positive drainage away from the valve box to prevent flooding of the valve box.

3.6 Valve Boxes

- .1 Valve boxes shall be placed at grade and levelled. The box shall be installed on four bricks with one brick placed under each corner. The valve box must not rest on the pipe. A minimum of 1" clearance is required. The lid of the box must be left bolted down upon completion. An area of 4' x4' around the valve box shall be sufficiently tamped to avoid settling and then sodded.

3.7 Control Wiring

- .1 Electric wire shall be buried at sufficient depth to meet local code and, in no case, less than the bottom of the parallel pipe. Burial shall be in accordance with "Rules and Regulations for the Installation and Maintenance of Electrical Equipment" Department of Public Works, Government of British Columbia. Contractor to install one (1) unused control wire for every control wire used, for ease of connection in case of damage to wire in use.
- .2 All wiring shall be protected by being bundled and taped at 10 foot intervals and installed beneath the irrigation piping or in appropriately sized conduit if run independently.
- .3 All wire splices must be contained in a valve box.
- .4 Sufficient extra wire shall be left in each valve box such that the splice may be lifted 12" above grade, such extra wire to be neatly coiled.
- .5 White wire shall only be used as the common wire and other colours shall be consistent from valve to controller.

3.8 Direct-Burial Wiring

- .1 All direct-burial wiring shall be installed with a polyvinyl warning tape buried 300mm above the conduit in the trench.
- .2 Exit wires shall be installed in conduit until four (4) feet clear of kiosk. Connect controllers to 115 volt circuit in the control station.

3.9 Sprinklers

- .1 Sprinklers shall be installed at grade and levelled. An area of 1.2 metersx1.2 meters around the sprinkler head shall be sufficiently tamped to avoid settling and then sodded. Triple swing joints shall be used to a depth as indicated.
- .2 All sprinklers must be suitably adjusted and located to keep the irrigation water within the irrigated area, minimize overthrow, and eliminate run-off into adjacent areas.

3.10 Swing Joints

- .1 All pop-up sprinklers shall be connected to the pipe by an adjustable swing joint assembly that is sized to meet the flow requirements of the sprinkler.
- .2 All sprinklers with an inlet size larger than 1/2" shall use a PVC triple swing joint assembly or a pre-assembled swing joint only.

- .3 Triple swing joints shall be comprised of Schedule 80 PVC threaded nipples and Schedule 40 PVC threaded elbows. Nipples shall be of such length to permit the installed head to be set while the lower nipple is at a 30° angle with the trench bottom.
- .4 Joints shall be hard-hand tight and shall be made up with teflon tape.

3.11 Backflow Prevention

- .1 Backflow prevention assemblies shall be installed according to the local plumbing code and the Cross Connection Control Manual adopted by the B.C.W.W.A.
- .2 All cross connection control devices installed must be sized to accommodate the flow requirements present, and successfully tested after installation by an active certified Cross Connection Control Specialist.

3.12 Controller

- .1 The controller shall be securely mounted at 60cm above kiosk floor with all wiring done in the controller or an approved junction box.
- .2 Zones shall be wired in a logical sequence and a laminated, scale site plan shall be mounted next to the controller with each zone clearly outlined.
- .3 The installation of any rain/moisture sensing equipment shall be noted on the controller and the location of the controllers circuit breaker indicated unless obvious.

3.13 Turf Valves/Quick-Coupling Valves

- .1 All turf valves installed in the landscape shall be mounted on a suitably sized swing joint, either solidly supported by clamping to an angle iron stake or the last two fittings attached to the quick coupling valve shall be a 90 degree galvanized elbow and a galvanized nipple.
- .2 Quick-coupling valves and keys shall be, Sgnature Control Systems Model #7642 and Model #7643 respectively. They shall be installed with a Signature Brass Swivel in a Carsen Brooks 1419 valve box. No substitutions.

3.14 Sleeving

- .1 All sleeving in soil shall be installed and backfilled with the same considerations for protection of the material as if it were water pipe. Compaction shall be to the same standard as the adjoining undisturbed soil and the sleeves shall project at least 12" on either side of the hard surface being crossed.
- .2 Sleeving being installed across roads or driveways for later use, shall have the necessary pipe installed at the same time with each end elbowing to at least 36" above grade.

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3.15 Site Maintenance

- .1 The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.
- .2 All scrap and excess materials are to be regularly removed from the site, not buried in trenches.
- .3 Trenching, laying pipe, and backfilling shall be continuous so that the amount of open trench at the end of each work day is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility flagging tape.

3.16 Inspection

- .1 Upon completion of the irrigation system installation, all pressure regulation, arcs, distances of throw, sprinkler locations and height, controller zones, etc., must be adjusted to optimize the operation of the system and make it ready for testing.
- .2 Inspection will be carried out by the Owner's Representative to ensure that the work has been done in a neat and workman like fashion, and meets the intent of the contract documents for installation standards.

3.17 Testing

- .1 The entire system shall be flushed and pressure tested in the presence of the Owner's Representative prior to installation of all sprinkler heads.
- .2 All systems, connections, etc., shall be left exposed until after completion and acceptance of the initial pressure test. The system shall be capped and pressure tested at 100 psi for a period of two (2) hours. No additional external pressure is to be added to the system after the commencement of the two hour testing period. All joints and connections shall be checked visually for leaks. All leaks shall be repaired, corrected and tested again.
- .3 The Contractor shall have the option of testing one (1) valve section at a time provided the mainline has been previously tested.
- .4 After successful completion of pressure test of each valve section, that section may be completely backfilled.
- .5 Upon completion of backfilling procedures the irrigation system pressure test shall be repeated to ensure no damage to the system has occurred during backfilling procedures.
- .6 Upon completion of the flushing and pressure tests, the Contractor shall operate the system in the presence of the Owner's Representative. The automatic system shall be cycled to the satisfaction of the Owner's Representative.

- .7 The backflow prevention assembly shall be tested by a certified cross control technician upon completion of the installation. The test results shall be recorded and forwarded to the Owner's Representative.

3.18 Clean Up and Restoration

- .1 The work area shall be thoroughly cleaned of all debris, excess material and litter accumulated during the course of the work and such material shall be disposed of offsite. All disturbed areas shall be restored to the satisfaction of the Owner's Representative.

3.19 Restoration of Improvements

- .1 Private or public improvement on private or public property or rights-of-way affected by the construction shall be restored as closely as possible to the condition existing prior to construction to the satisfaction of the Owner's Representative.

3.20 Acceptance

- .1 Upon completion of all tests, final approval for the system will be contingent upon the Contractor providing signed and approved plumbing/health/electrical permits, and turning over to the Owner's Representative an operable system complete with written operating and maintenance instructions including as-built drawings of the system.
- .2 Prior to calling for inspection for acceptance, all work shown on the drawings and described in the specifications shall be completed to the satisfaction of the Owner's Representative.
- .3 Notice of Readiness for Inspection for Completion shall be given by the Contractor not less than twenty-four (24) hours prior to the desired date and time for inspection.
- .4 Final inspection shall be carried out by the Owner's Representative and the Contractor.
- .5 The Contractor shall be prepared to conduct a tour of the project identifying all features and demonstrating any operational features or peculiarities to the satisfaction of the Owner's Representative.
- .6 Any deficiencies identified during the final inspection shall be immediately identified for repair and/or completion by the Contractor.
- .7 All deficiencies shall be rectified prior to acceptance and takeover of the project.

END OF SECTION 02801 LANDSCAPE IRRIGATION

SECTION 02810
WATER PLAYGROUNDS
Spring 2011

PART 1 GENERAL

1.1 Related Sections

- | | | |
|-----|---------------------------|--|
| .1 | Section SS 2.3 | Site Grading. |
| .2 | Section 31 22 01 (MMCD) | Site Grading. |
| .3 | Section SS 2.4 | Excavating, Trenching and Backfilling. |
| .4 | Section 31 23 01 (MMCD) | Excavating, Trenching and Backfilling. |
| .5 | Section 01 57 01 (MMCD) | Environmental Protection |
| .6 | Section 32 11 16.1 (MMCD) | Granular Subbase. |
| .7 | Section 32 12 16 (MMCD) | Hot-mix Asphalt Concrete Pavement. |
| .8 | Section SS 2.15 | Waterworks. |
| .9 | Section 33 11 01 (MMCD) | Waterworks. |
| .10 | Section SS 2.16 | Storm Sewers. |
| .11 | Section 33 40 01 (MMCD) | Storm Sewers. |
| .12 | Section SS 2.18 | Sanitary Sewers. |
| .13 | Section 33 30 01 | Sanitary Sewers. |
| .14 | Section 02831 | Chain Link Fencing and Gates. |

1.2 Reference

- | | | |
|----|-----------------|---|
| .1 | CAN/CSA-Z614-07 | A Guideline on Children's Playspaces and Equipment. Revised April 2008. |
|----|-----------------|---|

1.3 Design

- | | |
|----|---|
| .1 | Water playgrounds to have central theme as indicated. |
| .2 | Water playground theme to have central attraction as indicated. |
| .3 | Hands-on activated components such as water cannon to be located in area separate from central theme. |
| .4 | All components are recommended to be located minimum 6.0m from edge of asphalt pavement. |

- .5 All components are recommended to be spaced a minimum 7.5m apart.
- .6 Locate in-ground sprays midway between components.
- .7 Horizontal spiral component configurations are unacceptable; replace with vertical arch type components.
- .8 The water playground requires a lit and heated service building containing plumbing and electrical components and washroom where indicated. Water playground service building kiosk should have a main floor drain included. It is recommended the service building also contain washrooms.
- .9 Waterparks located within 6 meters of a roadway to be surrounded by a 1.2m vinyl coated chainlink fence.

PART 2 PRODUCTS

2.1 Granular Materials

- .1 Granular base material to Section MMS 02230 Preservation of Top Soil.
- .2 Granular sub-base material to Section MMS 02234 Granular Sub-base.

2.2 Pipe

- .1 All pipe including mains, laterals, drain line and sleeving shall be provided as PVC pipe for all sizes. Pipe shall be polyvinyl-chloride, semi-rigid, Class 200 for sizes 1" and smaller, and Class 160 for sizes 1¼" and larger. PVC pipe shall be continuously and permanently marked with identification of the manufacturer, type, class or schedule and size. Pipe 4" in diameter and larger shall be gasketed pipe 3" and smaller shall be solvent weld.
- .2 Pipe shall bear no evidence of interior or exterior extrusion marks and pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual, solvent-weld couplings and must conform to ASTM 2241, SC 25663 and CSA B-137-3 specifications.
- .3 All inground pipes must be Kitec XPA Composite Pipe (25mm – 1") or Schedule 80 (NSF-61, PVC 1120, SCH. 80-630 PSI, 25 mm - 1").

2.3 Fittings

- .1 All PVC fittings other than special PVC nipples on triple swing joint risers and isolation valves, shall be Schedule 40 (full size), solvent weld shall be of the same basic material as the PVC pipe. The Contractor shall only use fittings, cement and thinner (primer) recommended by the manufacturer of the pipe. The Contractor shall be prepared to submit product data if so requested by the Owner's Representative.

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- .2 Fittings for valves shall be as follows:

Tees, ells, etc.:	Schedule 80, full size or Philmac Compression Fittings.
Nipples:	Schedule 80 wall, moulded or Philmac Compression Fittings.

- .3 Threaded connections of PVC to metal shall have male threads on the PVC and female threads on the metal.
- .4 All inground fittings must be Philmac Compression Fittings or Schedule 80 (NSF-61, PVC 1120, SCH. 80-630 PSI, 25 mm - 1").

2.4 Drainage switch san.storm Assembly:

- .1 6" Butterfly Valve Model #EL6122E (or approved equal).
- .2 Air Actuator Model #FA317 (or approved equal).
- .3 Pneumatic Solenoid Valve Model #L12BA4520 (or approved equal).
- .4 Appropriate compressor approved by Owner's Representative.

2.5 Control System

- .1 Backflow prevention and double check valve assembly:
- .1 Double check valve: Febco Model 805 or Watts 007 GT, complete with gate valves and test cocks or the equivalent.
 - .2 Wye Strainer _____
 - .3 Drain Valve _____
- .2 Manifold Assembly:
- .1 2" (50mm) Sched 80 pipe.
 - .2 Max 10/row.
 - .3 Minimum 4/union.
 - .4 Equipped with winterizing tap at lowest point of inground pipes as they enter the kiosk.
- .4 Electric Valves: Rainbird model 100 P.E.S.B. series each fitted with drain valve.
- .5 Programmable Logic Controller: Siemens model Simatic S7-200 (or approved equal) with touch screen display and a 'Real Time' clock with back-up battery.

.6 Remote Sensors.

- .1 Located on bollards at all entrances with separate lines for the PLC. Each bollard must have a proximity switch (Metal) PMP type.

2.6 Fixtures

- .1 All above ground fixtures shall be fabricated from either Schedule 40 aluminum or Schedule 40 stainless steel as indicated with powder-coat finish.
- .2 Fixture anchors shall be Schedule 40 aluminum or stainless steel.
- .3 Spray Nozzles Brass: inground spray nozzles also brass with aluminum or galvanized base or stainless steel.

2.7 Catch Basins

- .1 600mm precast concrete barrel with solid base and grate with max. ½" opening on grate.

2.8 Asphalt Concrete Pavement

- .1 Asphalt Concrete Pavement to Section MMS 02512 Hot-mix Asphalt Concrete Pavement.

PART 3 EXECUTION

3.1 Excavating, Trenching and Backfilling

- .1 To Section SS 2.4 - Excavating, Trenching, and Backfilling (MMS 02223) and as follows,
- .2 Trenches shall be free from rock, debris or other sharp articles. Backfilling shall be accomplished in a manner to ensure minimum settlement and no damage to the pipe. The Contractor shall be responsible for compensating for all trench settlement during the period of the warranty.
- .3 All excavated rock, shale, boulders, stumpage, etc., shall be removed from the job site; use backfill material as indicated.
- .4 Backfill to Section SS 2.4 - Excavating, Trenching, and Backfilling (MMS 02223) and as follows for trenching, bedding, and backfilling.
 - .1 All trenches shall be straight with a level, uniform slope along the trench bottom.
 - .2 Backfill trenches in 200mm (8") layers, tamping firmly to ensure that the compaction of the trench is equal to the surrounding undisturbed or compacted areas.

.3 Backfill material shall be free of rocks and/or other unsuitable materials which could damage the pipe or create settlement problems.

.5 Trenches should be in a direct line from the components to the kiosk draining towards the kiosk at a 1.5% drop.

3.2 Drainage

.1 To Section 02620 Sub-drains and as follows:

.1 Install switching device to Manufacturer's specifications.

.2 Install catch basin so that metal grate is flush with top of concrete barrel.

.3 Catch basin to have 200mm outlet pipe.

3.3 Water Service Pipe Installation

.1 Visually inspect each pipe prior to installation, removing any dimpled or otherwise damaged sections.

.2 Lay the pipe in a straight line between fittings, placing it on firm soil at all points in the trench.

.3 Multiple pipes may occupy the same trench provided that a minimum of 50mm horizontal clearance can be maintained and the pipes are all on the same horizontal plane.

.4 PVC pipe ends shall be cut 90° to the pipe length and cleaned of all cutting burrs prior to cementing, using an approved reaming tool. Pipe ends shall be wiped clean with a rag lightly wetted with wet and dry PVC primer.

.5 Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excess cement shall be wiped from the outside of the pipe.

.6 All solvent welding is to be done in careful compliance with the manufacturer's recommendations with particular attention to cleanliness, air temperature, moisture, and curing time. Excess cement must be removed from all joints.

.7 Follow Manufacturers specifications for installation of Philmac Compression Fittings.

.8 Thrust blocking required for gasketed pipe larger than 75 mm (3").

.9 Pipe layout design is diagrammatic, care must be taken during the installation to size the pipe to keep the velocity of flow at less than ____ feet per second.

.10 PLC to be installed in weather proof box.

3.4 Water Service

- .1 The water supply shall be installed by the Contractor from connections to the existing water service as required to complete the system.

3.5 Water Service - Connection to Main

- .1 Contractor to arrange for water service connection to be installed by City of Surrey, Engineering Operations crew.
- .2 Contractor to coordinate water service connection with other work on-site to ensure no delay or disruption to construction schedule.

3.6 Control System

- .1 Control System to be installed as indicated and to manufacturer's recommendations.

3.7 Component Installation

- .1 Install base support as indicated.
- .2 Install all components level, plumb, and true to line in accordance with manufacturer's recommendations.

3.8 Asphalt Concrete Pavement

- .1 Install Asphalt Concrete Pavement as indicated to Section MMS 02512 Hot-mix Asphalt Concrete Pavement.

END OF SECTION 02810 WATER PLAYGROUNDS

SECTION 02821
CHAIN LINK FENCES AND GATES
Spring 2011

PART 1 GENERAL

- 1.1 This Section to be read in conjunction with Master Municipal Construction Documents, Section 32 31 13 – Chain Link Fences and Gates.

Where discrepancies exist between this Section and the Master Municipal Construction Documents, this Section shall take precedence.

- 1.2 Related Work

- .1 Section 03300 Cast-in-Place Concrete.

PART 2 PRODUCTS

- 2.1 Materials

- .1 Concrete mixes and materials: to Master Municipal Construction Documents Section 03300.
- .2 Posts and rails to Master Municipal Construction Documents Section 02831.
- .3 Chain link fence fabric:
- .1 On outfield and general purpose fencing 9 ga. 50 mm galvanized mesh.
- .2 On fences 3.6 m in height and over, use 6 ga. 50 mm galvanized mesh to 12' and 9 ga. 50 mm galvanized mesh over 12'.
- .4 Gate stops: use 6mm galvanized.
- .5 Staples: 38mm galvanized.
- .6 Ties: 11 gauge galvanized steel.

PART 3 EXECUTION

- 3.1 Refer to Master Municipal Construction Documents Section 32 31 13 for execution except as follows:
- .1 All joints to be continuous saddle weld. Use bottom rails in active areas, bottom tension wire in passive park areas.
- .2 Grind excess material from all welded joints and paint all joints with zinc rich paint.
- .3 Post caps to be tack welded in place.
- .4 Posts to be flush with top rail.

- .5 Mesh to be wrapped around terminal post. Then, end of mesh to be woven onto body of mesh with 6 gauge vinyl covered wire or secured every third knuckle with 9 gauge galvanized steel ties to the full height of the fence.
 - .6 On baseball backstop, bottom of mesh to be stapled every third knuckle onto treated baseball backstop bottom board with 2 x 12 38mm galvanized staples, double row top and bottom of 2 x 12 board. Mesh to overlap 2 x 12 completely.
 - .7 Tie every knuckle with galvanized steel ties to 3.0m height. Above 3.0m height tie every third knuckle.
- 3.2 Standard Execution will vary depending on site situation as stipulated by owner's representative.
- .1 Active Area refer to SSD-PK 6070
 - .2 Passive Area refer to SSD-PK 6071
 - .3 Natural Area/ Riparian Protection Areas refer to MMCD specifications and C13

END OF SECTION 02821 CHAIN LINK FENCES AND GATES

SECTION 02906
PLANTING OF TREES, SHRUBS AND, GROUND COVERS
Spring 2011

PART 1 GENERAL

1.1 Related Work

- .1 Section SS 2.3 Site Grading.
- .2 Section 31 22 01 (MMCD) Site Grading.
- .3 Section 02921 Topsoil and Finish Grading.

1.2 Reference Standards

- .1 Trees, shrubs and ground covers work to be done in accordance with current edition BCSLA/BCLNA Landscape Standard except where specified otherwise.

1.3 Source Quality Control

- .1 Obtain approval from Owner's Representative of plant material at source prior to digging.
- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

1.4 Scheduling

- .1 Obtain approval from Owner's Representative for schedule 7 days in advance of shipment of plant material.
- .2 Schedule to include:
 - .1 Date for selection of plant material at source by Owner's Representative.
 - .2 Quantity and type of plant material.
 - .3 Shipping dates.
 - .4 Arrival dates on site.
 - .5 Planting Dates.
- .3 Schedule all operations to ensure optimum environmental protection, grading, growing medium placement, planting, seeding or sodding operations as outlined in these Specifications. Scheduling to be organized to ensure a minimum duration of on-site storage of plant material, minimum movement and compaction of growing medium and prompt mulching and watering operations. Work schedule to be coordinated with scheduling of other trades on-site.
- .4 Coordination and scheduling to be such that no damage occurs to materials before or after placement. In particular, requirements of living plant material to be met.

- .5 Planning, scheduling and execution of work to include measures to ensure a supply of water for landscape purposes in adequate amounts and at adequate pressures for satisfactory irrigation of all plants.

1.5 Product Data

- .1 Submit product data in accordance with Section 01300 - Submittals.
- .2 Provide product data for:
 - .1 Fertilizer.
 - .2 Anti-desiccant.
 - .3 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.
 - .4 Mulch.

1.6 Samples

- .1 Submit samples in accordance with Section 01300 - Submittals.
- .2 Provide samples for:
 - .1 Mulch.

1.7 Delivery, Storage and Protection

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Immediately store and protect plant material which will not be installed within 4 h after arrival at site in storage location approved by Owner's Representative.
- .3 Protect plant material from damage during transportation:
 - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulin around plants or over vehicle box.
 - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle.
- .4 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

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- .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
- .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain optimum moisture level in root zones.

1.8 Warranty

- .1 The Contractor hereby warrants that plant material as itemized on plant list will remain free of defects for 1 full growing season.
- .2 End-of-warranty inspection will be conducted by Owner's Representative.
- .3 Owner's Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

PART 2 PRODUCTS

2.1 Plant Material

- .1 Type of root preparation, sizing, grading and quality: comply with BCSLA/BCLNA Landscape Standard, current edition.
- .2 Source of plant material: grown in Zone 8 in accordance with Agriculture Canada Plant Hardiness Zone Map.
- .3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .4 Plant material: root pruned regularly, but not later than one growing season prior to arrival on-site.
- .5 Trees: with straight trunks, well and characteristically branched for species except where specified otherwise.
- .6 Trees larger than 200mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.
- .7 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .8 Collected stock: maximum 40mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
- .9 Refer to Appendices for recommended plant materials.

2.2 Water

- .1 Free of impurities that would inhibit plant growth.
- .2 Contractor to ensure adequate water supply to plant material.
- 2.3 Stakes
 - .1 Wood, pointed one end, 60mm diameter x 2,300 mm long for park type setting.
 - .2 Metal, standard snow fence stake, material to be approved by Owner's Representative prior to Contractor ordering material.
 - .3 Do not use reinforcing steel for tree staking.
- 2.4 Wire Tightener
 - .1 Type 2: turnbuckle, galvanized steel, 9.5mm diameter with 270mm open length.
- 2.5 Guying Wire
 - .1 Type 1: steel, 3mm wire.
 - .2 Type 2: 1.5mm diameter multi-wire steel cable.
 - .3 Type 3: 3mm diameter multi-wire steel cable.
 - .4 Type 4: 25mm belting fabric approved by Owner's Representative prior to installation (i.e., Arbortie or approved equal).
- 2.6 Clamps
 - .1 U-bolt: galvanized, 13mm dia, c/w curved retaining bar and hex nuts.
- 2.7 Anchors
 - .1 Wood:
 - .1 Type 1: 38 x 38 x 460mm.
 - .2 Type 2: 38 x 67 x 600mm.
 - .2 Drive-in type:
 - .1 Type 1: 13mm diameter x 75mm long, aluminum.
 - .2 Type 2: 18mm diameter x 120mm long, aluminum.

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- 2.8 Guying Collar
 - .1 25mm belting fabric approved by Owner's Representative prior to installation (i.e., Arbortie or approved equal).
- 2.9 Trunk Protection
 - .1 For urban street tree planting, use decorative metal cage approved by Owner's Representative prior to ordering of material.
 - .2 Decorative metal cage to be removable type.
- 2.10 Mulch
 - .1 In horticultural areas and street or park trees: bark chip varying in size from 25 to 50mm in diameter, from bark of Douglas Fir and/or Hemlock.
 - .2 In natural areas: chips varying in size from 25 to 50mm in diameter, from hardwood tree species.
- 2.11 Fertilizer
 - .1 Synthetic commercial type, ratio (5:3:2).
- 2.12 Root Barrier
 - .1 450mm root barrier (i.e., Deep Root UB18 or approved equal).

PART 3 EXECUTION

- 3.1 Pre-planting Operations
 - .1 Contractor to arrange nursery inspection of plant materials to be carried out with Owner's Representative prior to digging of larger stock.
 - .2 Ensure plant material acceptable to Owner's Representative.
 - .3 Remove damaged roots and branches from plant material.
- 3.2 Excavation and Preparation of Planting Beds
 - .1 Establishment of sub-grade for planting beds is specified in Section 02210 - Site Grading, MMS.
 - .2 Preparation of planting beds is specified in Section 02921 - Topsoil and Finish Grading (MMS).
 - .3 For individual planting holes:

- .1 Stake out location and obtain approval from Owner's Representative prior to excavating.
- .2 Excavate to depth and width as indicated.
- .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material off-site to location approved by Owner's Representative.
- .4 Scarify sides of planting hole.
- .5 Install root barrier adjacent to sidewalks, paths, parking lots and any other surfaces vulnerable to root heave.
- .5 Remove water which enters excavations prior to planting. Notify Owner's Representative if water source is ground water.

3.3 Planting

- .1 For bare root stock, place 50mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole. Stake all bare root trees before backfilling.
- .2 For jute burlapped root balls, cut away top one third of wire basket without damaging root ball. Do not pull burlap or rope from under root ball. Fold back top one third of burlap.
- .3 For treated burlap root balls, cut away top two thirds of wire basket without damaging root ball. Do not pull burlap or rope from under root ball. Fold back top two thirds of burlap.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
 - .1 Backfill soil in 150mm lifts. Hard tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.

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- .8 After soil settlement has occurred, fill with soil to finish grade.
- .9 Dispose of wire and container material off site, to a location approved by the Owner's Representative.
- 3.4 Trunk Protection
 - .1 Install decorative metal cage to manufacturer's recommendations.
- 3.5 Tree Supports
 - .1 Install tree supports as indicated.
 - .2 Use single stake tree support for deciduous trees less than 3m and evergreens less than 2m.
 - .3 Place stake on prevailing wind side and 150mm from trunk.
 - .2 Drive stake minimum 150mm into undisturbed soil beneath roots. Ensure stake is secure, vertical and un-split.
 - .3 Install 150mm long guying collar 1,500 mm above grade.
 - .5 Ensure that installation of tree stakes does not damage root system of tree.
 - .4 Use 3 guy wires and anchors for deciduous and broadleaf evergreen trees greater than 3m and conifers greater than 2m.
 - .1 Use Type 2 guying wire with clamps for trees less than 75mm in diameter and Type 3 guying wire with clamps for trees greater than 75mm in diameter.
 - .2 Use Type 1 anchors for trees less than 75mm in diameter and Type 2 anchors for trees greater than 75mm in diameter.
 - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5m above grade.
 - .4 Guying collars to be of sufficient length to encircle tree plus 50mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
 - .5 Install anchors at equal intervals about tree and away from trunk so that guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
 - .6 Attach guy wire to anchors. Tension wire and secure by installing clamps.

- .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
- .8 Saw tops off wooden anchors which extend in excess of 100mm above grade or as directed by Owner's Representative.
- .9 Install flagging tape to guys as indicated.
- .5 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.6 Mulching

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated, in a layer 50mm to 75mm thick after settling.

3.7 Maintenance during Establishment Period

- .1 Perform following maintenance operations from time of planting to acceptance by Owner's Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .2 Remove weeds monthly.
 - .3 Replace or respread damaged, missing or disturbed mulch.
 - .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
 - .5 Apply pesticides in accordance with Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Owner's Representative prior to application.
 - .6 Remove dead or broken branches from plant material.
 - .7 Keep tree stakes, ties and guy wires in proper repair and adjustment.
 - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

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3.8 Acceptance

- .1 Plant material will be accepted by Owner's Representative one year after planting operation is completed provided that plant material exhibits healthy growing condition and is free from disease, insects and fungal organisms.

3.9 Maintenance during Warranty Period

- .1 From time of acceptance by Owner's Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Reform damaged watering saucers.
 - .3 Remove weeds monthly.
 - .4 Replace or re-spread damaged, missing or disturbed mulch.
 - .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
 - .6 Apply pesticides in accordance with Federal, Provincial and Municipal application.
 - .7 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen per square metre.
 - .8 Remove dead, broken or hazardous branches from plant material.
 - .9 Keep tree supports in proper repair and adjustment.
 - .10 Remove tree supports and level watering saucers at end of warranty period.
 - .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
 - .12 Submit monthly written reports to Owner's Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

END OF SECTION 02906 PLANTING OF TREES, SHRUBS AND GROUND COVERS

PART 1 GENERAL

1.1 Scope of Work

- .1 The work of this Section shall govern the supply of all equipment, materials and labour necessary for the preparation of sub-grade, placement of topsoil and finish grading of all areas designated for topsoil and the blending in of restored areas with those existing planting areas surrounding the contract limit boundaries.

1.2 Related Work

- .1 This Section shall be read in conjunction and construed together with:

- .1 Section SS 2.3 Site Grading.
- .2 Section 31 22 01(MMCD) Site Grading.

1.3 Standards

- .1 All work shall conform to the current editions of the BCSLA/BCLNA Landscape Standard and the Canadian System of Soil Classification.

1.4 Quality Assurance

- .1 All topsoil shall be from a source approved by the Owner's Representative and all similar topsoil supplied to the site shall be of similar texture and from a single source. Prior to supplying any topsoil, inform the Owner's Representative or proposed source and provide a copy of an analysis undertaken by a recognized soil testing agency appointed by the Owner's Representative, indicating the following characteristics of the proposed topsoil:
 - .1 Gravel, sand and fines content each as a percentage of dry weight mineral fraction.
 - .2 Organic material content as a percentage of dry weight.
 - .3 Acidity (pH).
 - .4 Salinity in millimhos/cm at 25°C.
 - .5 Basic soil fertility (total nitrogen available K, Ca, Mg, P).
 - .6 Recommendation for incorporation of soil amendments.
- .2 Cost of imported topsoil shall include cost of modifications to topsoil from source to ensure that these materials meet specifications.

- .3 Existing topsoil shall be modified as directed by the Owner's Representative according to the recommendations of the soil testing agency to meet the same requirements for imported topsoil.
- .4 The Owner's Representative may appoint a qualified soil consultant for the purpose of interpreting and evaluating the quality of the installation and materials used before, during and after construction.

1.5 Product Handling

- .1 Import topsoil and all existing topsoil shall not be prepared, worked or travelled upon when in a wet or frozen condition.
- .2 Dolomite lime and other chemical amendments shall be supplied and handled in standard, sealed, waterproof containers with net weight and product analysis clearly marked on exterior of package.

1.6 Protection

- .1 Prevent damage to all existing structures, improvements, utilities, landscaping and existing vegetation and natural features unless designated for removal. Make good any damage in areas within the contract limits and in areas used for access to the construction site.

PART 2 PRODUCTS

2.1 Topsoil

- .1 All topsoil shall be imported from a source approved by the Owner's Representative. On-site soil shall be used for planting only on approval of the Owner's Representative.
- .2 Topsoil shall be friable, containing a minimum of four percent (4%) and maximum six percent (6%) organic matter by dry weight, free from stones and debris over 30mm. Acidity (pH) shall be in the range 5.5 to 7.5. Carbon to nitrogen ratio shall not exceed 40:1, and salinity shall not exceed 3.0 millimhos at 25°C. Gravel greater than 2mm shall not exceed ten percent (10%) of total by weight.

2.2 Common Fill

- .1 Shall consist of granular material free of rubble or debris greater than 2mm and shall not be toxic to plant or animal life in part or in concentration.

- .2 Particle size specifications for common fill material:

ISO R20 SIEVE SERIES	PERCENT BY WEIGHT PASSING GENERAL FILL (MINERAL FILL)
25.00 mm	100
2.50 mm	20 – 50
0.16 mm	5 – 20
0.08 mm	0 - 5

2.3 Dolomite lime

- .1 Shall be ground dolomite limestone containing no less than eighty-five percent (85%) of its total weight as calcium carbonate and magnesium carbonate. The degree of grind for the limestone shall allow one hundred percent (100%) of the total weight to pass a #10 (2mm) sieve, ninety percent (90%) to pass a #18 (1mm) sieve, and twenty percent (20%) to pass a #40 (.075mm) sieve. Spread-easy dolomite lime shall be used as a slow release fertilizer source of calcium and magnesium.

PART 3 EXECUTION

3.1 Existing Subgrade

- .1 Areas designated for topsoil as indicated by contract limit line and 1.0m transition/blending area beyond, shall be prepared to eighty percent (80%) Modified Proctor Density and shall be free of stones, debris, roots, branches, toxic materials, building materials and other deleterious materials, greater than 30mm. Scarify subgrade areas designated for topsoil to a depth of 200mm immediately prior to placement of topsoil.

3.2 Placement of Import Sand and Topsoil

- .1 Subgrade shall be approved by the Owner's Representative and unfrozen prior to placing fill and topsoil.
- .2 Topsoil shall be moist, twenty-five to seventy-five percent (25%-75%) of field capacity, but not saturated with water when placed. Placement shall be handled to avoid damage to drainage structures, irrigation equipment, concrete structures or asphalt pavement.
- .3 Place topsoil such that finished grades are achieved as indicated on drawings and compact by light rolling to yield a surface firm against deep footprints. Avoid excess compaction.
- .4 Remove any foreign inorganic and organic material from topsoil while placing.
- .5 Soil level shall be flush to finish grade, edgers and other such adjacent surfaces following final settlement. Fill to correct settlement exceeding 15mm at such conditions.

SECTION 02921
TOPSOIL AND FINISH GRADING
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3.3 Topsoil Amendments

- .1 Topsoil shall have dolomite lime thoroughly and evenly incorporated prior to seeding, at rates recommended in soil analysis report. Dolomite lime is to be broadcast at 10 kg/100m² (20 lb/1000 ft²). Dolomite lime shall be raked into the top 50 mm to 100 mm of topsoil.
- .2 Amendments to existing topsoil, in transition areas outside of contract limit boundaries, shall be incorporated during finish grading.
- .3 Areas with deficient levels of organic matter, less than the minimum four percent (4%) will be corrected after topsoil analysis and at the Contractor's expense. Corrective measures shall include top-dressing of approved commercially prepared compost followed by cultivation into the top 150mm to 200mm of soil.

3.4 Finish Grading, Restoration and Reinstatement

- .1 All areas shall be graded to contours and elevations as indicated on contract drawings. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Finish grade shall be flush to all adjacent horizontal surfaces and shall follow a level line at edges. Slopes shall be constant unless directed otherwise.
- .3 Grading of top and bottom of banks and at transitions in slope shall be made to blend areas together smoothly and with a natural appearance. Abrupt changes shall be made only where directed by Owner's Representative.

3.5 Tolerances

- .1 Finish grade shall be to within 10mm of proposed grades within 3.0m of any adjacent fixed elevation and to within 10mm of proposed grades over any other 3.0m length. Finish grades shall not be uniformly high or low.

3.6 Surplus Material and Clean-up

- .1 Dispose of surplus materials not required for fine grading, planting and backfilling off-site to a location approved by the Owner's Representative.
- .2 Following completion of soil preparation and grading, leave all hard surfaces groomed clean of soil, amendments and debris.

END OF SECTION 02921 TOPSOIL AND FINISH GRADING

PART 1 GENERAL

1.1 Scope of Work

- .1 The work of this Section shall govern the supply of all equipment, materials and labour necessary for the preparation of sub-grade, placement of topsoil and finish grading of all areas designated for topsoil and the blending in of restored areas with those existing planting areas surrounding the contract limit boundaries.

1.2 Related Work

- .1 This Section shall be read in conjunction and construed together with:
 - .1 SS 2.3 Site Grading.
 - .2 Section 31 22 01(MMCD) Site Grading.

1.3 Standards

- .1 All work shall conform to the current editions of Canadian System of Soil Classification.

1.4 Product Handling

- .1 Dolomite lime and other chemical amendments shall be supplied and handled in standard, sealed, waterproof containers with net weight and product analysis clearly marked on exterior of package.

1.5 Protection

- .1 Prevent damage to all existing structures, improvements, utilities, landscaping and existing vegetation and natural features unless designated for removal. Make good any damage in areas within the contract limits and in areas used for access to the construction site.

PART 2 PRODUCTS

2.1 Sand

- .1 Sand to be used for turf sport field construction shall be well graded with a particle size of 3mm and free of any foreign elements or material. Samples shall be submitted for approval by the Owner's Representative accompanied by a written analysis produced by a recognized local testing laboratory appointed by the owner or the Owner's Representative. Supply source to be identified in writing.

SECTION 02922
SAND BASE AND FINISH GRADING
SAND BASE TURF SPORTS FIELD
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PARTICLE SIZE SPECIFICATIONS FOR SAND PLANTING MEDIUM

PARTICLE CLASS	PERCENTAGE BASED ON TOTAL WEIGHT	PARTICLE SIZE SIEVE # (MM)
Fine Gravel	0-3	4 (4.76)
Very Coarse Sand	0-7	10 (2.00)
Coarse Sand	65-80	18 (1.00)
Medium Sand		35 (0.50)
Fine Sand	Maximum 20%	60 (0.25)
Very Fine Sand		140 (0.105)
Silt and Clay	Maximum 1%	270 (0.053)

- .2 Compacted, saturated hydraulic conductivity in sand planting medium shall be a minimum of 100mm per hour and a maximum of 300mm per hour.
- .3 All sand used in construction of sand base turf sports fields shall meet the requirements of the above table unless substitution is authorized by Owner's Representative prior to the start of construction.

2.2 Dolomite lime

- .1 Shall be ground dolomite limestone containing no less than eighty-five percent (85%) of its total weight as calcium carbonate and magnesium carbonate. The degree of grind for the limestone shall allow one hundred percent (100%) of the total weight to pass a #10 (2mm) sieve, ninety percent (90%) to pass a #18 (1mm) sieve, and twenty percent (20%) to pass a #40 (.105mm) sieve. Spread-easy dolomite lime shall be used as a slow release fertilizer source of calcium and magnesium.

PART 3 EXECUTION

3.1 Placement of Import Sand

- .1 Subgrade shall be approved by the Owner's Representative and unfrozen prior to placing sand.
- .2 Placement shall be handled to avoid damage to drainage structures, irrigation equipment, concrete structures or asphalt pavement.
- .3 Place sand such that finished grades are achieved as indicated on drawings and compact to 90% MPD.

- .4 Remove any foreign inorganic and organic material from sand while placing.
- .5 Soil level shall be flush to finish grade, edgers and other such adjacent surfaces following final settlement. Fill to correct settlement exceeding 15mm at such conditions.

3.2 Sand Amendments

- .1 Sand shall have dolomite lime thoroughly and evenly incorporated prior to fertilizing, at rates recommended in soil analysis report. Dolomite lime is to be broadcast at 10kg/100m² (20 lb/1000 ft²). Dolomite lime shall be raked into the top 50mm to 100mm of sand.

3.3 Finish Grading, Restoration and Reinstatement

- .1 All areas shall be graded to contours and elevations as indicated on contract drawings.
- .2 Finish grade shall be flush to all adjacent horizontal surfaces and shall follow a level line at edges. Slopes shall be constant unless directed otherwise.
- .3 Grading of top and bottom of banks and at transitions in slope shall be made to blend areas together smoothly and with a natural appearance. Abrupt changes shall be made only where directed by Owner's Representative.

3.4 Tolerances

- .1 Finish grade shall be to within 10mm of proposed grades within 3.0m of any adjacent fixed elevation and to within 10mm of proposed grades over any other 3.0 length. Finish grades shall be neither uniformly high nor low.

3.5 Surplus Material and Clean-up

- .1 Dispose of surplus materials not required for fine grading, planting and backfilling off-site to a location approved by the Owner's Representative.
- .2 Following completion of base preparation and grading. Leave all hard surfaces groomed clean of sand, amendments and debris

END OF SECTION 02922 SAND BASE AND FINISH GRADING - SAND BASE TURF SPORTS FIELDS

PART 1 GENERAL

1.1 Related Sections

- .1 Section SS 2.3 Site Grading.
- .2 Section 31 22 01(MMCD) Site Grading.
- .3 Section 02361 Chemical Control of Pests.
- .4 Section 02921 Topsoil and Finish Grading.
- .5 Appendix D: Seed mixes for Park Development.

1.2 References

- .1 Canada Seed Act and Regulations.
- .2 Canadian Fertilizer Act and Regulations
- .3 Canadian System of Soil Classification.
- .4 Current Edition; BCSLA/BCLNA Landscape Standard.

1.3 Product Data

- .1 Submit product data in accordance with Section 01340 - Product Data, Samples and Mock-ups.
- .2 Provide product data for:
 - .1 Seed
 - .2 Fertilizer

1.4 Scheduling

- .1 Schedule all operations to ensure optimum environmental protection, grading, growing medium placement, planting, or seeding. Scheduling to be organized to ensure a minimum duration of on-site storage of seed, minimum movement and compaction of growing medium and prompt water operations. Work Schedule for seeding to be coordinated with scheduling of work by other trades on-site.
- .2 Coordination and scheduling to be such that no damage occurs to seed before or after placement. In particular, requirements of living plant material to be met.
- .3 Planning, scheduling and execution of work to include measures for Contractor to ensure a supply of water for landscape purposes in adequate amounts and at adequate pressures for satisfactory irrigation of all plants.

- .4 Seed after April 15 and after all frost has left ground with completion before September 15 or with the permission of the Owner's Representative.
- .5 Schedule seeding operations to coincide with completion of the seed bed finish grade.
- .6 Schedule to complete work in one area before proceeding to next area.

1.5 Handling and Storage

- .1 All grass seed and nurse crop seed, fertilizers and related materials, where required, to be stored in dry weatherproof storage place and to be protected from damage by heat, moisture, rodents and/or other causes until time of seeding. Labels or other identification to remain intact and legible throughout storage period. Materials exposed to moisture prior to installation shall be rejected.

1.6 Drainage Control

- .1 Contractor to make provisions for proper water management and drainage of site during construction. To include silt traps, erosion control measures, temporary water collection ditches, as well as their adequate maintenance during construction period.

1.7 Quality Assurance

- .1 All products and materials used in work are subject to testing when Owner's Representative determines that such testing is necessary to ensure contract objectives are met.
- .2 Provide samples of all materials required, handle and ship in such a manner that they are representative of material or product sampled.
- .3 Testing to be carried out by an independent testing laboratory, designed by Owner's Representative. Costs will be borne by Owner.
- .4 Grass seed shall be delivered to site in original containers showing:
 - .1 Name and address of suppliers.
 - .2 Grade tags from seed bags.
 - .3 Seed lot numbers.
 - .4 Analysis of seed mixture.
 - .5 Recent certificate for purity and germination for each species.
 - .6 Year of production.

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- .7 Net weight (mass).
- .8 Date and location of bagging.

1.8 Site Examination

- .1 No landscaping work to be carried out in areas or over surfaces that are not properly prepared. Contractor to examine site before starting work to verify all surfaces are properly prepared.
- .2 Obtain Owner's Representative's written approval of seed bed prior to commencement of any seeding operations.

PART 2 PRODUCTS

2.1 Water

- .1 Free of impurities that would inhibit germination and growth.
- .2 Supplied by Contractor at designated source.

2.2 Fertilizer

- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .2 Standard brands delivered in original containers, bearing manufacturer's guaranteed analysis, dry and free flowing.

2.3 Pesticides

- .1 All pesticides and herbicides used on the project shall be properly registered products under the Pest Control Products Act and conform to purchase and use requirements set out in the Provincial Pesticide Control Act Regulations. All pesticides shall conform to the City of Surrey's Pesticide Use By-Law.
- .2 All pesticides shall be prior to application.

PART 3 EXECUTION

3.1 Workmanship

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.
- .2 Remove and dispose of weeds; debris; stones 50mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site to location as directed by Owner's Representative.

3.2 Seed Bed Preparation

- .1 Verify that grades are correct. If discrepancies occur, notify Owner's Representative and do not commence work until instructed by Owner's Representative.
- .2 Obtain Owner's Representative's written approval of seed bed prior to the commencement of application procedures.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, and to elevations indicated to tolerance of plus or minus 15mm, ensure surface draining naturally.
- .4 Cultivate fine grade approved by Owner's Representative to 25mm depth immediately prior to seeding.
- .5 Areas that are excessively compacted to have surfaces loosened by means of thorough scarification, discing or harrowing, to minimum 150mm depth.
- .6 Finish grade smooth to extent required for class of seeding to be carried out, firm against footprints, loose textured and free of all stones, roots, branches, etc., larger than diameter required for removal for class of seeding to be carried out.

3.3 Seed Placement

- .1 Carry out seeding during periods that are most favourable for establishment of healthy stand of grass. All seeding to be done during calm weather and on soil that is free of frost, snow and standing water, when seasonal conditions are likely to ensure successful germination and continued growth of all varieties of seed in grass mix.
- .2 Measure all grass seed, water and fertilizer accurately before application.
- .3 Apply dolomite lime as required by Owner's Representative.
- .4 Apply required fertilizer, and work into topsoil by discing, raking or harrowing to depth required by Owner's Representative.
- .5 For mechanical seeding:
 - .1 Use "Brillion" type mechanical landscape seeder which accurately places seed at specified depth and rate and rolls in single operation.
 - .2 Use agricultural, water ballast type roller, not less than 500mm diameter smooth steel drum, width not less than width of landscape seeder. Ballast as directed by Owner's Representative.
 - .3 Use equipment and method approved by Owner's Representative prior to commencement of seed application.
- .6 For manual seeding:

- .1 Use "Cyclone" type manually operated seeder.
- .2 Use manually operated, water ballast, landscaping type, smooth steel drum roller. Ballast as directed by Owner's Representative.
- .3 Use equipment and method approved by Owner's Representative prior to commencement of application.
- .4 Do not sow seed by hand.
- .7 On cultivated surfaces, sow seed uniformly at rate of 2.5 kg/100m².
- .8 Blend applications 150mm into adjacent grass areas and/or previous applications to form uniform surfaces.
- .9 Sow half of required amount of seed in one direction and remainder at right angles.
- .10 Embed seed into soil to depth of 10mm. Not less than 85% of seed to be placed at specified depth and covered by soil.
- .11 Immediately after mechanically seeding, consolidate seeded areas by rolling with equipment approved by Owner's Representative prior to commencement of seed application.
- .12 Immediately after manual seeding, consolidate seeded areas by rolling with equipment approved by Owner's Representative prior to commencement of seed application.
- .13 Sow during calm wind conditions.
- .14 Water with fine spray to avoid seed wash-out. Water to ensure penetration of minimum 50mm.
- .15 Protect seeded areas against damage using method approved by Owner's Representative prior to commencement of seed application. Remove this protection after lawn areas have been accepted by Owner's Representative.
- .16 Remove all debris resulting from seeding operation off-site to location approved by Owner's Representative.

3.4 Fertilizing Program

- .1 Fertilize during establishment and warranty periods to following program:
 - .1 Apply turfgrass initiating fertilizer 18-18-18 with slow release at a rate of 2.5 kg/100 m².
 - .2 Turf grass will be maintained during the growing season using a 23-3-23 fertilizer or close equivalent approved by Owner's Representative prior to application.

Application rate shall be 3.0 kg/100m² (6.0 lb/1000ft²). Fertilizer shall be applied every 4-6 weeks during maintenance period until acceptance

3.5 Maintenance During Establishment Period

- .1 Perform following operations from time of seed application until acceptance by Owner's Representative:
 - .1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
 - .2 Repair and re-seed dead or bare spots to allow establishment of seed prior to acceptance.
 - .3 Rolling to be carried out when required to remove any minor depressions or irregularities.
 - .4 Cut grass to 40mm whenever it reaches height of 60mm. Edges of seeded area to be neatly trimmed. Remove clippings immediately after mowing and trimming.
 - .5 Fertilize seeded areas, cutting in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles, water fertilized area well immediately after application of fertilizer.
 - .6 Eliminate weeds by mechanical or chemical means when density of weeds reaches 10 broadleaf weeds or 50 annual weeds or weedy grasses per 40 m² of seeded area.
 - .1 If chemical means are used, comply with Section 02361 - Chemical Control of Pests.
 - .2 Reduce weed density to zero.

3.6 Acceptance

- .1 Seeded areas will be accepted by Owner's Representative provided that:
 - .1 Areas are uniformly established, fertility levels are acceptable and turf is free of rutted, eroded, bare or dead spots and free of weeds.
 - .2 Grasses are required varieties.
 - .3 Areas have been cut at least twice, last mowing within 48 hours prior to inspection for acceptance.
 - .4 Areas have been fertilized, according to fertilizer program.

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.5 Seeded areas are free of weeds.

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

3.7 Warranty Period

.1 One year warranty period. Contractor to warrant all materials and workmanship free from defect for a period of one full year from Date of Acceptance.

.2 Replacement work under warranty includes replacing all seeded areas determined by Owner's Representative to be dead or failing at end of warranty period. Replacements to be made at next appropriate planting season, and conditions of warranty to apply to all replacement seeding for one full growing season.

.3 Warranty does not apply to seeded areas damaged after Acceptance by causes beyond Contractor's control. Contractor is responsible for warranty repair work until Acceptance.

3.8 Maintenance During Warranty Period

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.

.2 Repair and re-seed dead or bare spots to satisfaction of Owner's Representative.

.3 Cut grass to 40mm whenever it reaches height of 60mm. Edges of seeded area to be neatly trimmed. Remove clippings immediately after mowing and trimming.

.4 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles, water fertilized area well immediately after application of fertilizer.

.5 Eliminate weeds by mechanical or chemical means, when density of weeds reaches 10 broadleaf weeds or 50 annual weeds or weedy grasses per 40 m² of seeded area.

.1 If chemical means are used, comply with Section 02361 - Chemical Control of Pests.

.2 Reduce weed density to zero.

END OF SECTION 02923 SEEDING

PART 1 GENERAL

1.1 Related Sections

- .1 Section SS 2.3 Site Grading.
- .2 Section 31 22 01(MMCD) Site Grading.
- .2 Section 02361 Chemical Control of Pests.
- .3 Section 02921 Topsoil and Finish Grading.
- .4 Appendix D: Seed Mixes for Park Development

1.2 Product Data

- .1 Submit product data in accordance with Section 01340 - Product Data, Samples and Mock-ups.
- .2 Provide product data for:
 - .1 Seed.
 - .2 Mulch.
 - .3 Tackifier.
 - .4 Fertilizer.
 - .5 Humectant
- .3 Submit in writing to Owner's Representative 14 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tankloads required per hectare to apply specified slurry mixture per hectare.

1.3 Scheduling

- .1 Schedule hydraulic seeding to coincide with completion of preparation of soil surface.
- .2 Schedule hydraulic seeding using grass mixtures after frost has left ground after April 1 with completion before September 30 or with the permission of the Owner's Representative.

PART 2 PRODUCTS

2.1 Materials

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations. See Appendix D: Seed mixes for Park Development for types of seed required for sports fields, passive grass areas and natural areas.
- .2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch: 100% Canfor virgin wood fibre or pre-approved equal.
 - .1 Made from wood cellulose fibre.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of pH: 6.0.
 - .4 Potential water absorption: 800-900%.
 - .2 Tackifier: water dilutable, liquid dispersion, containing polyvinyl acetate terpolymer emulsion.
 - .3 Water: free of impurities that would inhibit germination and growth.
 - .4 Fertilizer:
 - .1 Shall have a ratio of 18-18-18 and will be 50% slow release polymer sulfur coated uses
 - .2 Owner's Representative to review soil conditions on site and determine fertilizer requirements prior to mixing of slurry. In cases where turf starter or turf maintenance fertilizer are required, formulation will be as follows:
 - .1 Turf starter mix shall have a ratio of 13-26-6 (or approved alternate).
 - .2 Turf maintenance fertilizer shall have a ratio of 23-3-23 (or approved alternate).

PART 3 EXECUTION

3.1 Workmanship

- .1 Do not spray onto structures, signs, guiderails, fences, plant material, utilities and other than surfaces intended.

- .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Owner's Representative.
- .3 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .4 Protect seeded areas from trespass until grass is established.

3.2 Preparation of Surfaces

- .1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.
- .2 Cultivated areas identified as requiring cultivation to depth of 25mm.
- .3 Ensure areas to be seeded are moist to depth of 150mm before seeding.
- .4 Obtain Owner's Representative's approval of grade and topsoil depth before starting to seed.

3.3 Preparation of Slurry

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Owner's Representative. Supply equipment required for this work.
- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After all other material is in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.4 Application Rates

- .1 Erosion Control
 - 100% Virgin Wood Fibre (Canfor or approved equivalent) @ 1000 - 2,500 kg/ha
 - Organic Tackifier @ 40 - 80kg/ha
 - Fertilizer (Analysis to suit soil conditions) @ 400kg/ha
 - Seed – Canada #1 Forage @ 80-150kg/ha
 - Cover Crop (Fall Rye where applicable) @ 80 – 100kg/ha
 - Humectant – Viscous @ 20kg/ha
- .2 Informal Activity Areas
 - 100% Virgin Wood Fibre (Canfor or approved equivalent) @ 1,800 – 2,500kg/ha
 - Organic Tackifier @ 50 – 80kg/ha
 - Fertilizer (Analysis to suit soil conditions) @ 400 kg/ha
 - Seed – Canada #1 Turf @ 300 – 400kg/ha
 - Humectant – Viscous @ 20kg/ha

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- .3 Sports Fields
 - 100% Virgin Wood Fibre (Canfor or approved equivalent) @ 2,500 – 3,000kg/ha
 - Organic Tackifier @ 60 – 80kg/ha
 - Fertilizer (Analysis to suit soil conditions) @ 400 kg/ha
 - Seed – Canada #1 Turf or Certified Varieties @ 350 – 450kg/ha
 - Humectant – Viscous @ 20kg/ha
- .4 Wildflower
 - Wildflower Seed Mix @ 10 – 20kg/ha
 - Grass Seed Blend Canada #1 Turf (Hard, Sheep's, Blue Fescue) @ 80 – 120kg/ha
 - ** Mulch & Tackifier rates would be the same as Erosion Control
- .5 Erosion Control – Severe Situations (Bonded Fibre Matrix)
 - Mulch @ Manufacturer's specifications @ 3,000 – 9,500kg/ha
 - Fertilizer (Analysis to suit soil conditions) @ 400kg/ha
 - Seed – Canada #1 Forage @ 80 – 150kg/ha
 - Cover Crop (Fall Rye where applicable) @ 80 – 100kg/ha

3.5 Slurry Application

- .1 Hydraulic seeding equipment:
 - .1 Slurry tank: minimum 4500 L..
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and mechanical agitation method.
 - .3 Pumps capable of maintaining continuous non-fluctuating flow of solution.
 - .4 Supplied with not less than 6 spray pattern nozzles.
 - .5 Capable of seeding by 50m hand operated hoses and appropriate nozzles.
- .2 Slurry mixture application rates shall be determined on-site by the Owner's Representative to match site conditions for maximum germination rate.
- .3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Use correct nozzle for application.
 - .2 Use hoses for surfaces difficult to reach and to control application.
- .4 Blend application 300mm into adjacent grass areas or sodded areas previous applications to form uniform surfaces.
- .5 Re-apply where application is not uniform.

- .6 Protect seeded areas from trespass satisfactory to Owner's Representative.
- .7 Remove protection devices as directed by Owner's Representative.
 - .1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.5 Acceptance

- .1 Seeded areas will be accepted by Owner's Representative provided that:
 - .1 Grass is uniformly established. Seeded areas are free of rutted, eroded, bare or dead spots and free of weeds.
 - .2 Areas have been mown at least twice.
 - .3 Areas have been fertilized.
- .2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.6 Maintenance During Warranty Period

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water seeded area to maintain optimum soil moisture level for continued growth. Control watering to prevent washouts.
 - .2 Repair and re-seed dead or bare spots to satisfaction of Owner's Representative.
 - .3 Mow areas seeded, remove clippings, as directed by Owner's Representative.
 - .4 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles, and water fertilized area immediately after application of fertilizer.
 - .5 Eliminate weeds by mechanical or chemical means.
 - .1 If chemical means are used, comply with Section 02361 - Chemical Control of Pests.

END OF SECTION 02924 HYDRAULIC SEEDING

PART 1 GENERAL

1.1 Related Work

- .1 Section 02361 Chemical Control of Pests.
- .2 Section 02921 Topsoil and Finish Grading

1.2 Samples

- .1 Submit samples in accordance with Section 01340 - Product Data, Samples and Mock-ups.
- .2 Submit:
 - .1 Sod for each type specified.
 - .1 Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
- .3 Obtain approval of samples by Owner's Representative.

1.3 Scheduling

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation after frost has left ground after March 1st with completion before October 15th or with approval of Owner's Representative.

PART 2 PRODUCTS

2.1 Materials

- .1 Shall be nursery grown, quality, and cultured turf grass from Canada No. 1 seed. Sod shall be grown on sand-based fields. Unless indicated otherwise, sod shall be minimum two (2) cultivars of Kentucky Bluegrass to 60% of mix and minimum three (3) cultivars of Perennial Rye Grass to 40% mix. Sod shall be free of diseases, clovers, spores, pests, debris and noxious weeds. Sod shall be cut in similar size strips and rolled or stacked as suitable. Roots shall be of sufficient density to hold sod intact and sod shall not contain netting material of any type. Planting medium thickness shall be consistent between 15mm and 25mm with less than three percent (3%) silt and clay. Grass shall have been irrigated and mown to 40mm height not more than three (3) days prior to lifting.
- .2 Water:
 - .1 Supplied by Contractor at designated source.
 - .2 Potable, free of impurities.

.3 Fertilizer:

- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .2 Turf starter mix shall have a ratio of 18-18-18 with 50% slow release (or approved alternate).
- .3 Turf maintenance fertilizer shall have a ratio of 23-3-23 (or approved alternate).

2.2 Source Quality Control

- .1 Obtain approval from Owner's Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Owner's Representative.

PART 3 EXECUTION

3.1 Preparation

- .1 Verify that grades are correct and prepared in accordance with Section 02921 - Topsoil and Finish Grading. If discrepancies occur, notify Owner's Representative and do not commence work until instructed by Owner's Representative.
- .2 Obtain Owner's Representative's written approval of base prior to commencement of sod application.
- .3 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice, or standing water.
- .4 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated, to tolerance of plus or minus 10mm, surface to drain naturally.
- .5 Remove and dispose of weeds; debris; stones 50mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site to location as directed by Owner's Representative.
- .6 Cultivate fine grade approved by Owner's Representative to 25mm depth immediately prior to sodding.

3.2 Sod Placement

- .1 Lay sod within 36 hours of being lifted.

- .2 Lay sod sections in rows, longitudinally, along contours of slopes, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Owner's Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 Sod Placement on Slopes and Pegging

- .1 Start laying sod at bottom of slopes.
- .2 Lay sod sections longitudinally, along contours of slopes as indicated.
- .3 On slopes exceeding 2 1/2 horizontal: 1 vertical, sod shall be pegged using minimum 300mm long wood lath at 600mm on centre along each length of sod. Pegs shall be set flush with top of sod soil.

3.4 Maintenance During Establishment Period

- .1 Perform following operations from time of installation until acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100mm.
- .3 Cut grass to 40mm when it reaches height of 60mm. Remove clippings.
- .4 Maintain sod areas weed free.
- .5 Fertilize areas in accordance with manufacturer's recommendations. Spread half of required amount of fertilizer in one direction and remainder at right angles, water sod area immediately after placement of fertilizer.

3.5 Acceptance

- .1 Sod areas will be accepted by Owner's Representative provided that:
 - .1 Sod is properly established, exhibiting healthy stem and root growth.
 - .2 Sod is free of bare and dead spots and without weeds.
 - .3 No surface soil is visible from height of 1,500mm when grass has been cut to height of 40mm.
 - .4 Sod areas have been cut minimum 2 times, and within 24 h prior to acceptance.
 - .5 Fertilizing in accordance with manufacturer's recommendations has been carried during the establishment period.

- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.6 Maintenance During Warranty Period

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water sodded Turfgrass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100mm.
 - .2 Repair and re-sod dead or bare spots to satisfaction of Owner's Representative.
 - .3 Cut grass and remove clippings to height as follows:
 - .1 40mm during normal growing conditions.
 - .2 60mm at end of growing season and during periods of high temperatures and low precipitation.
- .1 If chemical means are used, comply with Section 02361 - Chemical Control of Pests.

END OF SECTION 02933 TURF GRASS SOD

**SECTION 02937
CRUSHED ROCK SCREENINGS
ALL WEATHER SPORTS FIELDS
Spring 2011**

PART 1 GENERAL

1.1 Related Work

- .1 Section SS 2.3 Site Grading
- .2 Section 31 22 01 (MMCD) Site Grading.

1.2 References

- .1 ASTM C136-84a Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C117-87 Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 CAN/CGSB-8.2-M88 Sieves, Testing, Woven Wire, Metric.
- .4 ASTM E11-87 Specification for Wire - Cloth Sieves for Testing Purposes.
- .5 ASTM D4318-84 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .6 ASTM D698-78 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49-kg) Rammer and 12-in (304.8-mm) Drop.

1.3 Protection

- .1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.

PART 2 PRODUCTS

2.1 Materials

- .1 Granular material
 - .1 Rock dust: hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117.

SIEVE DESIGNATION	% PASSING
3.25 mm	100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

PART 3 EXECUTION

3.1 Subgrade

- .1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base.
- .2 Subgrade to be approved by Owner's Representative prior to installation of granular material.

3.2 Granular material

- .1 Place granular topping to compacted thickness of 100 mm.
- .2 Spread, water and roll granular topping in uniform layer.
- .3 Compact layer to 95% Modified Proctor Density in accordance with ASTM D698.

3.3 Field Quality Control

- .1 Inspection and testing of crushed stone paving will be carried out by testing laboratory, designated by Owner's Representative.
- .2 Costs of tests will be paid by Owner.

3.4 Clean-Up

- .1 Contractor shall remove all surplus materials off site to location approved by Owner's Representative.
- .2 Contractor shall leave site in broom clean condition.

END OF SECTION 02937 CRUSHED ROCK SCREENINGS - ALL WEATHER SPORTS FIELDS

PART 1 GENERAL

1.1 Related Work

- .1 This Section shall be read in conjunction with
 - .1 Section 02922 Sand Base and Finish Grading.
 - .2 Appendix D: Seed Mixes for Park Development.
 - .3 Section 02923 Seeding
 - .4 Section 02924 Hydraulic Seeding
 - .5 Section 02933 Turf Grass Sod

1.2 Seasons for Work

- .1 All seeding, sod laying, and hydro-seeding operations shall be performed during the normal season for such work or as indicated unless otherwise authorized in writing. During the specified seasons, seeding and sod laying operation shall, as far as practicable, take advantage of ground and weather conditions favourable to the work.
- .2 Schedule seeding operations, sod laying or hydraulic seeding operations to coincide with preparation of sand surface.
- .3 Commence seeding operations after April 15 with completion before September 15 or with approval of Owner's Representative.
- .4 Deliver sod within twenty-four (24) hours of lifting and install within thirty-six (36) hours of lifting.
- .5 Commence sod installation after March 1 with completion before October 15 or with approval of Owner's Representative.
- .6 Commence hydraulic seeding operations after April 1 with completion before September 30.

1.3 Standards

- .1 Canada Seed Act and regulations
- .2 Canada Fertilizer Act and regulations
- .3 Current Edition - BCSLA/BCLNA Landscape Standard
- .4 Current Edition - Nursery Sod Growers' Association Specifications

1.4 Quality Assurance

- .1 Grass seed shall be delivered to the site in original containers showing:
 - .1 Name and address of supplier;
 - .2 Grade tags from seed bags;
 - .3 Seed lot numbers;
 - .4 Recent certificates for purity and germination for each species.
- .2 All sod shall be from a single approved source. Advise the Owner's Representative at least two (2) weeks prior to schedule delivery of source of sod, species composition, date of seeding and date of last fertilization. Arrange for Owner's Representative to inspect sod at source. Owner's Representative will take representative sample of sod for testing at time of inspection. Sod will be tested for species composition and base composition.
- .3 Provide product data for the following components of hydraulic seeding slurry:
 - .1 Seed
 - .2 Mulch
 - .3 Tackifier
 - .4 Fertilizer
- .4 Submit in writing to Owner's Representative minimum 14 days prior to commencing hydraulic seeding operations:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .5 Contractor shall notify the Owner's Representative of the source for fertilizer no more than four weeks prior to the commencement of construction. Owner's Representative to approve fertilizer prior to commencement of construction. Fertilizer shall be delivered to site in manufacturer's original container clearly showing:
 - .1 Guarantee of analysis;

- .2 Formulation;
- .3 Net weight (mass).

1.5 Product Handling

- .1 All grass seed, fertilizer, and related materials shall be supplied and stored in dry and weatherproof conditions and shall be protected against damage by heat, moisture, rodents, and other causes. Product labels shall not be removed or defaced. Materials exposed to moisture prior to installation shall be rejected.
- .2 Deliver, unload and store sod on pallets. Allow excessively wet sod to dry sufficiently to prevent tearing during lifting and handling. Maintain sod adequately moist to ensure vitality and prevent soil loss during handling. Dry sod will be rejected.
- .3 Do not prepare, work or travel upon wet topsoil.

1.6 Acceptance

- .1 Conditions of acceptance of grass areas for substantial completion shall be:
 - .1 Premium grass areas (playing fields and other mown grass, lawn, etc.)
 - .1 Turf free of bare and dead spots;
 - .2 Turf of uniform density and specified composition;
 - .3 No surface soil visible when grass cut to a height of 60mm;
 - .4 Seeded areas to have been mown at least twice to a height of 60mm and the last mowing has been not more than forty-eight (48) hours prior to inspection for acceptance;
 - .5 Sod is well knit with root growth into underlying soil and has been mowed at least once to height of 60mm;
 - .6 Specified maintenance procedures have been followed.
 - .2 Rough grass areas (unmown grass):
 - .1 Turf of uniform density and specified composition;
 - .2 Grassed area free of erosion rills exceeding 50mm depth and width, sloughed areas and other such areas of washed-out seed.
 - .3 Seeded grass has generally attained a height of 50mm.

- .3 Areas seeded in the fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

PART 2 PRODUCTS

2.1 Grass Seed

- .1 Shall meet the requirements for Canada Certified No. 1 lawn grass seed and shall have minimum germination rate of eighty-five percent (85%) and minimum purity of ninety seven percent (97%). Seed mix shall be free of noxious weed seeds. Seed shall be mixed and supplied by a recognized seed house.

2.2 Seed Mix

- .1 For areas designated sand base turf sports field, the following Canada Certified No. 1 mixtures will be used:

100% Certified Perennial Ryegrass by weight.

- .2 This mixture shall consist of the following components:

- .1 Perennial Ryegrass

A minimum of three different certified Perennial Ryegrass Cultivars

- .3 All certified cultivars will be chosen from the following acceptable list unless approved by the Owner's Representative:

1. Preferred Varieties (Perennial Ryegrass)

All Star 2 & 3	Amazing	Amazing GS	Brightstar
Capri	Coastal 4-way	Derby Extreme	Elka 2&3
Elfikin	Envy	Esquire	Fiesta 4
Gartor 3	Mach 1	Margarita	Nighthawk
Regal 5	SR 4200	SR 4220	SR 4420
Top Hat II			

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.4 Sand Base Turf Sports Field Exclusions

- .1 At no time shall any component of the mixture for sand base turf sports fields include: hard fescues, sheeps fescues, tall fescues, redtop, clovers, bentgrasses, annual ryegrasses, meadow fescues, poa annua or any "common" designated seed.

2.3 Sod

- .1 Shall be nursery grown, quality, cultured turf grass from Canada No. 1 seed. Sod shall be grown on sand-based fields. Unless indicated otherwise, sod shall be minimum two (2) cultivars of Kentucky Bluegrass to 60% of mix and minimum three (3) cultivars of Perennial Rye Grass to 40% mix. Sod shall be free of diseases, clovers, spores, pests, debris and noxious weeds. Sod shall be cut in similar size strips and rolled or stacked as suitable. Roots shall be of sufficient density to hold sod intact and sod shall not contain netting material of any type. Planting medium thickness shall be consistent between 15mm and 25mm with less than three percent (3%) silt and clay. Grass shall have been irrigated and mown to 40mm height not more than three (3) days prior to lifting.

2.4 Mulch

- .1 Specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
- .2 Made from wood cellulose fibre.
- .3 Organic matter content: 95% plus or minus 0.5%.
- .4 Value of pH: 6.0.
- .5 Potential water absorption: 800-900%.

2.5 Tackifier

- .1 Water dilutable, liquid dispersion, containing polyvinyl acetate terpolymer emulsion.

2.6 Water

- .1 Free of impurities that would inhibit germination or would inhibit growth.

2.7 Fertilizer Mix

- .1 Turf starter mix shall have a ratio of 18-18-18 with 50% slow release (or approved alternate).
- .2 Turf maintenance fertilizer shall have a ratio of 23-3-23 (or approved alternate).

2.8 Pesticides and Herbicides

- .1 All pesticides and herbicides used on the project shall be properly registered products under the Pest Control Products Act and conform to purchase and use requirements set out in the Provincial Pesticide Control Act regulations.
- .2 All pesticides shall be pre-approved by the Owner's Representative.

PART 3 EXECUTION

3.1 Control of Weeds, Inspect Pests and Disease

- .1 All chemical applications must be done according to the British Columbia Pesticide Control Act and must be approved by the Ministry of Environment.
- .2 The Contractor shall make himself familiar with this Act and its regulations as it will be strictly enforced.
- .3 Take every precaution against blown spray damaging ornamental trees, shrubs and both broadleaf or coniferous evergreen plantings which may be adjacent to the area of work.
- .4 Should damage occur from carelessness or inappropriate use of any chemical, the Contractor will agree to immediately make good such damage to the satisfaction of the Owner's Representative.

3.2 Base Preparation

- .1 Verify that grades are correct. If discrepancies occur, notify Owner's Representative and do not commence work until instructed by Owner's Representative.
- .2 Do not perform work under adverse field conditions such as frozen seed bed, excessively wet or dry seed bed or seed bed covered with snow, ice or standing water.
- .3 Remove and dispose of weeds; debris; seed bed contaminated by oil, gasoline and other deleterious materials; off site to location approved by Owner's Representative.
- .4 New Grass Area
 - .1 Planting medium shall be to depth indicated and shall be free of stones, sticks and debris greater than 25mm. Planting medium shall be firm against footprints with compaction of eighty-five (85%) Modified Proctor Density. Surface shall be of uniform and loose texture with irregularities, bumps and depressions raked smooth.
 - .2 Eradicate weed growth prior to seeding, sod laying, or hydroseeding.

- .3 Apply turf starter fertilizer 13-26-6 at a rate of 3.0 kg per 100 m² (6.0 lb per 1000 ft²) of surface area. Except in the case of hydraulic seeding where turf starter fertilizer will be mixed into slurry.
- .4 Make good all damage and disturbance to other areas. Obtain the Owner's Representative's approval of surface prior to seeding or sod laying.
- .5 Renovation of Existing Grass Area
 - .1 Eradicate existing growth of broad-leaved shrubs and other non-grass plants.
 - .2 Remove all rocks greater than 25mm and debris from soil surface. De-thatch existing grass and scarify soil to a depth of 50mm.
 - .3 Fill or grade with sand or topsoil as required to eliminate local depressions or surface irregularities varying by more than 50mm from surrounding grade. Remove existing grass where fill exceeds 15mm depth. Excavate existing planting medium to 150mm depth and replace with planting medium at all areas exhibiting no growth or to depth as required where soil is contaminated with deleterious materials. Cultivate to a depth of 100mm as required to loosen compacted soil.
 - .4 Rake filled, graded and cultivated areas to yield a smooth uniform surface.
 - .5 Apply turf starter fertilizer 18-18-18 with 50% slow release at a rate of 2.5 kg per 100 m² (5.0 lb per 1000 ft²) of surface area. Except in the case of hydraulic seeding where turf starter fertilizer will be mixed into slurry.
 - .6 Make good all damage and disturbance to other areas. Obtain the Owner's Representative's approval of surface prior to seeding.

3.3 Dry Seeding

- .1 Apply seed at a rate of 2.5 kg/100 m² (5.0 lb/1000 ft²), using an approved mechanical seeder capable of accurately controlling the rate of seed application and placing the seed not deeper than 15mm into soil.
- .2 Seed all areas at the rate indicated. Apply seed in two (2) applications. Sow half of required amount of seed in one direction and remainder at right angles to first application.
- .3 Embed seed into soil to depth of 15mm. Not less than 85% of seed to be placed at specified depth and covered by soil.
- .4 Consolidated mechanically seeded areas by rolling with equipment approved by Owner's Representative immediately after seeding.

- .5 Consolidate manually seeded areas by rolling area with equipment approved by Owner's Representative immediately after seeding.
- .6 Sow during calm wind conditions.
- .7 Water with fine spray to avoid seed wash-out. Water to ensure penetration of minimum 50mm.
- .8 Protect seeded areas against damage. Remove this protection after lawn areas have been accepted by Owner's Representative.
- .9 Owner's Representative shall examine seeded areas to ensure incorporation of seed into soil. In situations of inadequate incorporation of seed, additional hand raking will be required.

3.4 Sod Laying

- .1 Sod bed to be approved by Owner's Representative prior to installing sod.
- .2 Lay sod staggered and closely knit together in such a manner that no open joints are visible and no pieces overlap. Cut out and patch thin and irregular sections.
- .3 Sod shall be laid smooth and flush with adjoining grass areas and hard surfaces and top of curbs, unless directed otherwise. If possible, begin layout at a hard edge. Lay sod perpendicular to slopes.
- .4 Use only sharp tools to cut sod.
- .5 On slopes exceeding 2 1/2 horizontal: 1 vertical, sod shall be pegged using minimum 300mm long wood lath at 600mm on centre along each length of sod. Pegs shall be set flush with top of sod soil.
- .6 Protect new sod from traffic and other damage during laying operation and until acceptance.
- .7 Light roll or tamp installed sod to ensure a good bond between sod and base without causing sod to shift.
- .8 Water immediately to obtain moisture penetration to full depth of sand or topsoil.

3.5 Hydraulic Seeding

- .1 Do not spray onto structures, signs, guiderails, fences, plant materials, utilities and other than intended surfaces.

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- .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Owner's Representative.
- .3 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.
- .4 Ensure areas to be seeded are moist to depth of 150mm before seeding.
- .5 Obtain Owner's Representative's approval of grade before starting to seed.
- .6 Preparation of Slurry
 - .1 Measure quantities of materials by weight or weight-calibrated volume measurements satisfactory to Owner's Representative. Supply equipment required for this work.
 - .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
 - .3 After all other material is in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.
- .7 Slurry Application
 - .1 Hydraulic seeding equipment:
 - .1 Slurry tank: minimum 4500 L.
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and mechanical agitation method.
 - .3 Pumps capable of maintaining continuous non-fluctuating flow of solution.
 - .4 Supplied with not less than 6 spray pattern nozzles.
 - .5 Capable of seeding by 50m hand operated hoses and appropriate nozzles.
 - .2 Slurry mixture application rates shall be determined by the Owner's Representative on site to match site conditions for maximum germination rate.
 - .3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Use correct nozzle for application.
 - .2 Use hoses for surfaces difficult to reach and to control application.

- .4 Blend application 300mm into adjacent grass areas, seeded areas or sod areas to form uniform surfaces.
- .5 Re-apply where application is not uniform.
- .6 Protect seeded areas from trespass satisfactory to Owner's Representative.
- .7 Remove protection devices as directed by Owner's Representative.

3.6 Responsibility and Guarantee

- .1 The Contractor shall be responsible for maintaining the seeded areas and protecting them from damage until final acceptance of the contract by the Owner's Representative.
- .2 The authorized representative for the Owner's Representative will reserve the right to refuse to accept any or all of the areas seeded to grass if shown to be thin with bare patches uneven in distribution, discoloured or otherwise unhealthy.
- .3 Any further preparation and reseeding required shall be done wholly at the Contractor's expense at the next earliest opportunity as decided by the Owner's Representative, weather and season permitting.

3.7 Maintenance Prior to Acceptance

- .1 All cultivated grass areas shall be maintained as described until accepted by the Owner.
- .2 Maintenance shall commence immediately after seeding, sod laying or hydraulic seeding is completed and continue until acceptance. Growing season shall be considered to be the period 1 April to 31 October.
 - .1 For cultivated grass areas (mown grass) maintenance procedures shall be as required to establish a dense and even turf and shall include but not be limited to the following:
 - .1 Irrigate, as required, to keep seed bed constantly moist without eroding soil surface or washing out seed, until seed is germinated and grass is 60mm in height.
 - .2 Irrigate germinated grass as required during growing season with sufficient frequency to keep soil within the grass root zone constantly moist.
 - .3 Mowing at regular intervals as required to maintain grass at maximum height of 60mm. Not more than one-third (1/3) of blade shall be cut at any one (1) mowing. Heavy clippings only to be removed.

SECTION 02940
TURF ESTABLISHMENT
SAND BASE TURF SPORTS FIELD
Spring 2011

- .4 Turf grass will be maintained during the growing season using a 23-3-23 fertilizer or close equivalent approved by Owner's Representative prior to application. Application rate shall be 3.0 kg/100m² (6.0 lb/1000ft²). Fertilizer shall be applied every 4-6 weeks during maintenance period until acceptance.
- .5 Weed control shall be undertaken to remove all weed growth when weed count exceeds two plants per square metre. No chemicals shall be utilized within first growing season following seeding, without approval of Owner's Representative.
- .6 Repair and re-seed all areas which exhibit absence of, or weak growth of, new grass or which have been damaged or caused to dry out to the detriment of grass growth.
- .7 Barriers and warning signs shall be maintained to provide adequate protection of seeded and sod areas.
- .8 During the first spring of growth only, a mixture of even portions of 13-26-6 and 23-3-23 shall be applied to the sports field surface at an application rate of 4.0 kg/100m² (8.0 lb/1000 ft²).

2. For rough grass areas (unmown):

- .1 Irrigate as required to encourage seed germination.
- .2 Repair and re-seed all erosion rills and areas of washed-out or ungerminated seed.

3.8 Clean Up and Restoration

- .1 Broom clean pavement and sidewalks. Wash down hard surfaces as needed. Clear soil, mulch and other debris from drainage inlets.
- .2 Leave site in neat and acceptable condition and remove excess materials from site.

END OF SECTION 02940 TURF ESTABLISHMENT - SAND BASE TURF SPORTS FIELD

PART 1 GENERAL

1.1 References

- .1 CAN/CSA-O80 Series-M89 Wood Preservation.
- .2 CAN/CSA-O80.20-M89 Fire-Retardant Treatment of Lumbering Pressure Processes.
- .3 CAN/CSA-O80.27-M89 Fire-Retardant Treatment of Plywood by Pressure Processes.
- .4 CAN/CSA-O80.201-M89 Standard for Hydrocarbon Solvents for Preservatives.
- .5 CSA O322-1976 Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.
- .6 AWWA.M2-81 Standard Inspection of Treated Timber Products.
- .7 AWWA.M4-80 Standard for the Care of Preservative-Treated Wood Products.

1.2 Quality Assurance

- .1 Plant inspection of products treated with preservative and fire-retardant by pressure impregnation will be carried out by designated testing laboratory to AWWA.M2, and revisions specified in CAN/CSA-O80 Series, Supplementary Requirements to AWWA Standard M2.
- .2 Each piece of lumber and plywood for preserved wood foundations to be identified by CSA O322 certified stamp.
- .3 Inspection and testing of insert materials will be carried out by a Testing Laboratory designated by Owner's Representative.
- .4 Owner will pay for costs of tests as specified in Section 01410 - Testing Laboratory Services.

1.3 Regulatory Requirements

- .1 Each board or bundle of fire-retardant treated material panel to bear ULC label indicating Flame Spread Classification (FSC), and smoke developed.

1.4 Certificates

- .1 For products treated with [preservative] [fire-retardant] by pressure impregnation, submit following information certified by authorized signing officer of treatment plant:

- .1 Information listed in AWP.M2 and revisions specified in CAN/CSA-O80 Series, Supplementary Requirement to AWP Standard M2 applicable to specified treatment.
- .2 Moisture content after drying following treatment with [water-borne preservative] [fire-retardant].
- .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

1.5 Alternative Wood Preservatives

- .1 Although it is not a requirement of construction in park structures, the City of Surrey endorses the use of alternative wood preservatives such as amine copper quat (ACQ) or copper azole (CA). Both products are preferred substitutes for chromated copper arsenate (CCA).

PART 2 PRODUCTS

2.1 Materials

- .1 Preservative: to CAN/CSA-O80 Series stained finish.
- .2 Fire-Retardant: to CAN/CSA-O80.20 to provide:
 - .1 Flame Spread Classification: FSC [____].
 - .2 Smoke developed of not more than: [____].
- .3 Solvent: to CAN/CSA-O80.201

PART 3 EXECUTION

3.1 Application: Preservative

- .1 Treat [indicate material] to CAN/CSA-O80 Series [indicate commodity standard number] using [____] preservative to obtain minimum net retention of [____] kg/m³ of wood.
- .2 Following water-borne preservative treatment, dry material to maximum moisture content of [____] %.

3.2 Application: Fire-Retardant

- .1 Treat [indicate material] by pressure impregnation with fire-retardant chemicals in accordance with [CAN/CSA-O80.20] [CAN/CSA-O80.27].
- .2 Following treatment, kiln-dry material to maximum moisture content of [____] %.

3.3 Application: Field Treatment

- .1 Comply with AWP.A.M4 and revisions specified in CAN/CSA-O80 Series, Supplementary Requirements to AWP.A Standard M2.
- .2 Treat all field cuts with two (2) coats of clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.
- .3 Remove chemical deposits on treated wood to receive applied finish.

* This Section should not be used as a separate Section in a project specification.

END OF SECTION 06070 WOOD TREATMENT

PART 1 GENERAL

1.1 Related Sections

- .1 Not Used

1.2 References

- .1 CSA B111-1974 Wire Nails, Spikes and Staples.
- .2 CAN/CSA-O80 Series-M89 Wood Preservation.
- .3 CAN/CSA-O80.20-M1989 Fire-Retardant Treatment of Lumber by Pressure Processes.
- .4 CAN3-O86-M84 Engineering Design in Wood (Working Stress Design).
- .5 NLGA Standard Grading Rules for Canadian Lumber-1991.

1.3 Quality Assurance

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

PART 2 PRODUCTS

2.1 Materials

- .1 Wood decking: to NLGA standard Grading Rules for Canadian Lumber Select grade Western Red Cedar, Douglas Fir, Western Hemlock. Kiln dry decking to 19% maximum moisture content.
- .2 Decking lengths: 1.8 to 6m or longer with a minimum of 90% planks exceeding 3m. Square end trimmed. For single spans shorter than 3m use decking of same length as span.
- .3 Nails: to CSA B111, hot dipped galvanized finish; sizes as recommended in CAN3-O86. Supply 200mm spiral spikes for lateral nailing.
- .4 Splines: galvanized metal, as recommended by decking manufacturer.
- .5 Wood preservative: odourless salt type to CAN/CSA-O80 for stained finish.
- .6 Wood preservative: water borne type to CAN/CSA-O80 for stained finish.
- .7 Preservative: [____]. Insert appropriate text from Section 06070 - Wood Treatment.
- .8 Fire retardant: [____]. Insert appropriate text from Section 06070 - Wood Treatment.

PART 3 EXECUTION

3.1 Installation

- .1 Do wood deck work in accordance with CAN3-086 except where specified otherwise.
- .2 Install decking in accordance with CAN3-086, controlled random pattern with a 4mm gap.
- .3 Provide minimum of one bearing support for each plank except for cantilevers which shall extend over two supports.
- .4 Stagger end joints in adjacent planks minimum of 0.5m. Separate joints in same area by at least two intervening courses. Avoid joints in first fifth of end spans. Minimize joints in middle third of any span.
- .5 Touch up end cuts with preservative.

3.2 Field Quality Control

- .1 Testing moisture content of delivered material will be by testing laboratory designated by Owner's Representative.
- .2 Costs of tests will be paid by Owner.

3.3 Cleaning

- .1 Remove tool marks, bruises, and scratches.

END OF SECTION 06150 WOOD DECKING

PART 1 GENERAL

1.1 Related Sections

- .1 Section 06070 WOOD TREATMENT.

1.2 References

- .1 N/A

1.3 Quality Assurance

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

PART 2 PRODUCTS

2.1 Materials

- .1 Selection of Product to follow the Bench Protocol (2009) refer to Appendix H.

PART 3 EXECUTION

3.1 Installation

- .1 Owner's Representative to approve sample of product prior to installation
- .2 Owner's Representative to be notified 14 days prior to commencement of installation.
- .3 Standard Park Benches to be installed following direction of Owner's representative. Non-Standard Benches to be installed following manufacturers specifications.

3.2 Warranties

- .1 Owner's Representative must be notified in writing within 14 days of the completion of installation
- .2 Owner's Representative to inspect work done within 30 days of notification. If the product is assumed to have no deficiencies upon visual inspection, final written approval of the product and installation will be given to the contractor.

3.3 Cleaning

- .1 Remove tool marks, bruises, and scratches from bench and clear site of all debris and refuse after installation prior to final written approval.

.2 Should there be any damages incurred to surrounding site feature, repairs will be made at contractors expence prior to final written approval.

END OF SECTION 10312 BENCH

Street Tree - Tree Planting Standards

Single Family Residential Areas

Street tree planting proposals will be considered for new developments when the street has been built to its ultimate width, has finished curbs (and sidewalks if planned), and has utilities located underground. The builders should complete homes prior to planting in order to avoid damage to trees. It is recognized that some developers may not wish to wait for home building to be finished before completing their involvement in the development. In these instances, money in-lieu of planted trees will be accepted by the City for planting of the trees once the homes have been completed; planting will be by or under the direction of the Parks Division.

The following are intended a guidelines only and can be relaxed upon approval of the City when adhering to these standards is impractical or impossible.

Distance From Utilities

Steel or Wooden Poles and light standards	5m minimum (species dependent)
Driveways	2m minimum - small trees 3m minimum - medium trees 5m minimum - large trees
Manholes, Valve Boxes, Service Kiosks	2m minimum
Sewer Services	2m minimum
Hydrants	1m minimum
Corners	In line with 8m site triangle
Sidewalk	1.0m minimum and 1.5m preferred
Back of curb – Local Roads – Collector Roads – Arterial Roads	1.0m minimum and 1.5m preferred Contact Design Sec. Engineering Department Contact Design Sec. Engineering Department

* Curbed roads with two metre wide curb-side boulevards.

Planting Stock

All tree's root balls and pots to be free of noxious weeds.

All trees to be of BCSLA/BCLNA Landscape Standard, and the CNTA Nursery Stock Standard.

All trees of excurrent genera to have single leaders (no trees with co-dominant stems permitted).

All trees to have encircling/girdling roots removed at the time of planting.

All tree species to be approved by Parks, Recreation & Culture and to be a minimum of 5cm caliper, branched at or above 1.3m. if deciduous, or 3m in height if coniferous. No pruning of the scaffold branches or leader should be undertaken; only broken branches should be pruned.

Lower branches may be retained for taper development, provided that they are shortened so as not to compete with the leader; leave a minimum of three buds on branches and prune to laterals.

Planting

Underground service locations (i.e., B.C. Gas, B.C. Hydro, B.C. Tel, Water, Sewer) to be determined prior to planting; tree locations shall avoid underground services and utilities.

Edges of the planting hole shall not be vertical, but rather should be shallowly angled, to avoid girdling roots. All holes should be dug a minimum of twice the diameter of the root ball of the tree. Soil at the sides of the planting hole shall not be glazed, but should be scored to facilitate root penetration.

Backfill for the tree should be of the soil taken from the planting hole, unless soil tests have shown the soil to be unsuitable for tree growth. (Soil tests should be conducted if there is any doubt about the quality of the existing soil). Backfill should be carefully tamped so as to remove air pockets. All extraneous materials are to be removed (e.g., wood, metal, etc).

Fertilizer is not to be introduced at the time of planting, unless it is a minimum of 270 day slow release formulation (e.g. Nutricote 16-10-10, 270 day), or unless soil tests have shown the soils to be deficient in nutrients. (Some planting sites are of compacted glacial till or road base material; developers should conduct soil nutrient tests when soils are suspect).

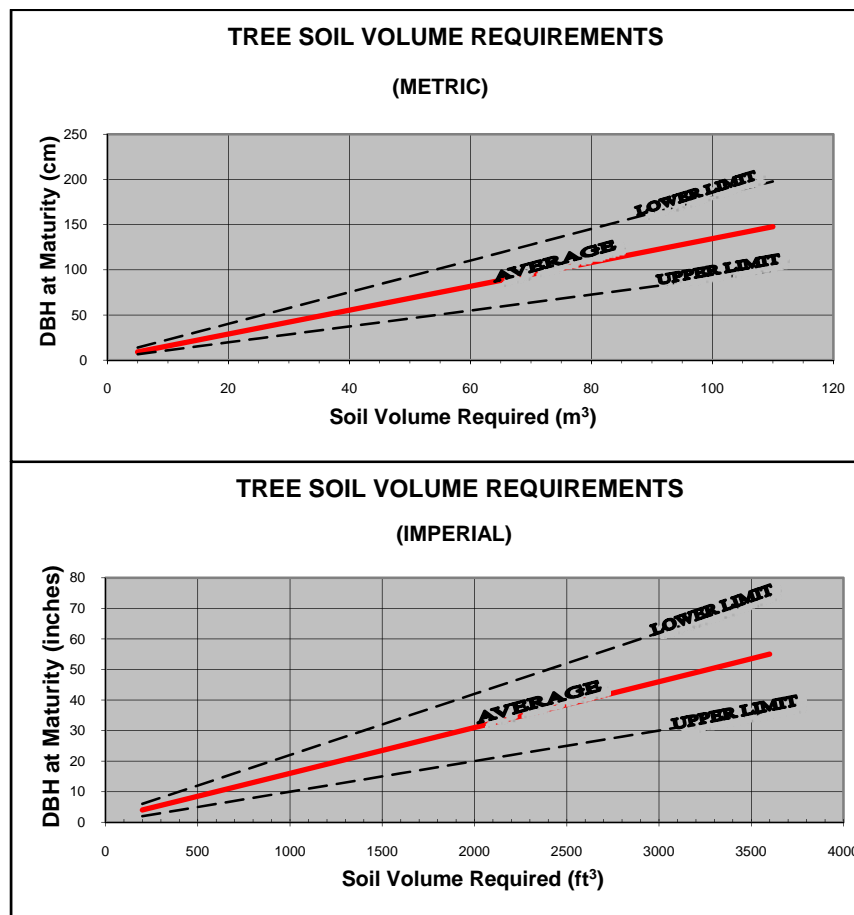
The finished planting height of the root collar of the tree relative to the covering soil shall be at the height as grown in the nursery and the trees planted height should be approximately 5cm above existing grade on the site to allow for subsidence and to prevent drowning of the tree within the hole.

On B&B trees, burlap should be rolled down to the bottom of the planting hole or preferably, be cut off. The top two layers of wires in the baskets should be cut and folded into the bottom of planting hole.

All single stem trees to be staked with a minimum 10cm diameter, pressure-treated 2.5m wooden stake, with soft strapping applied loosely with a figure eight around the stem, at a height no greater than two-thirds of the height of the tree. 5cm-wide fabric belting is an ideal material for tree strapping (e.g., Arbortie or approved equal). Care should be taken to ensure that the stake does not damage the roots of the tree as it is being pounded into place (place stake outside root ball).

A tree well of minimum diameter of 1.5m is to be established around the tree. The tree well is to be filled with good quality mulch to a minimum depth of 8cm. Mulch must be kept 15cm away from the stem of the tree. Cedar mulch must not be used.

Care should be taken to avoid damaging the bark of the tree during planting. Roots should not be exposed to sun or frost and should be kept moist.



*** The information shown above is based on data collected and published in the Journal of Arboriculture 18(2): March 1992.

Upper Limit Area (the area between the average line and the upper limit line): Values in this area should be used in the case of poor soil conditions such as compacted and/or graded soils (e.g., street medians and roadside plantings). The soil volume selected should reflect the severity of compaction and grading at the planting site.

Lower Limit Area (the area between the average line and the lower limit line): Values in this area may only be used in ideal soil conditions (e.g. native, undisturbed soils). The soil volume selected should reflect the amount of construction activity at the planting site.

Silva Cells and Structural Soil

In situations where designed boulevard area does not provide adequate rooting volume, structural soil and/or Silva C-ells should be utilized to provide further soil volume. Section 02727 of this manual gives direction on proper design and installation of structural soil. Silva Cells are considered an experimental product at the time of publication of this manual. The use of Silva Cells must be approved by the Parks

Division prior to installation on public property. Design and installation techniques are to be provided by silva cell suppliers and approved by the Parks Division.

Spacing

Spacing between trees shall reflect the chosen tree species' ultimate width, its conditions, and design criteria. Spacing shall be chosen to maximize the number of trees on the streetscape, while allowing for the development of a full crown. Within this rationale, fastigate trees could be planted closer together than trees with spreading crowns, and more small trees could be planted than larger trees. The following are recommended spacing for trees in the size classes described in the list provided in Schedule K of the Tree Preservation By-law and in the City of Surrey brochure titled "List of Acceptable Boulevard Trees."

Small/Fastigate Trees	6-9 m
Medium Trees	10-14 m
Large Trees	12-15 m

It is recommended that developers avoid planting trees at fixed distances along the boulevard, as doing so can lead to conflicts with underground utilities and above ground structures. Planting at irregular intervals will create a less formal appearance of the streetscape and will make gaps due to site constraints and removal of dead or vandalized trees less conspicuous.

Avoid planting directly in front of:

1. the main entrances to homes; and
2. large windows.

Tree Species Selection

In most residential situations, medium-sized trees should be chosen for planting. However, for many sites with larger lots with significant setbacks to the homes, large trees should be selected to maximize the urban forest impact and fit the scale of the neighbourhood. Conversely, many sites should be planted with small trees because of smaller lot size, reduced setback to the homes or in cul-de-sacs, because the frontage of the lot near the street is narrower than the rest of the lot. Avoid planting larger trees on the north side of east-west streets and on the east side of north-south streets, as this often results in excessive shade for the homes located behind the trees. In all cases, Parks, Recreation & Culture Department should visit the site prior to picking the size of trees to be planted to avoid incompatibility in mature tree size relative to neighbourhood scale.

Avoid selecting trees with fruit where sidewalks will run beneath the mature tree's canopies.

Please Note:

Surrey's Urban Forest Management plan calls for the mixing of two or more types of trees along non-arterial City streets. This is done in order to promote tree health through the lowering of the incidence of common pests and diseases. If only two different tree types are used, the chosen trees should be of similar size and form. When three or more tree types of similar size and form are chosen, the planting pattern can be random, provided that the same species is not placed adjacent to one another for more than three trees in a row.

NOTES:

- If a developer would like to use a tree that is not on the acceptable tree list the tree species needs to be approved by the Parks Division prior to planting.
Contact Robert Reny 604-501-5090
- The City is striving to ensure that the specimen tree inventory is diverse and has no greater than 15% of one genus and 10% of one species.

Recommended **Boulevard** tree list 2011

TREE NAME	HEIGHT	SPREAD
SMALL BOULEVARD TREES (up to 9 metres in height)		
Acer campestre	8m	8m
Acer campestre 'Red Shine'	8m	8m
Acer ginnala	6m	6m
Acer griseum	8m	6m
Acer palmatum	7m	7m
Acer platanoides 'Columnare'	9m	5m
Acer platanoides 'Crimson Sentry'	7m	4m
Acer platanoides 'Globosum'	5m	7m
Acer rubrum 'Scanlon'	9m	5m
Acer truncatum 'Pacific Sunset'	9m	8m
Acer truncatum 'Norwegian Sunset'	9m	8m
Carpinus japonica	6m	7m
Cercis canadensis	9m	9m
Cercis canadensis 'Forest Pansy'	9m	9m
Cornus kousa 'Satomi'	6m	6m
Cornus rutban 'Aurora'	7m	5m
Cornus rutgan 'Stellars Pink'	6m	6m
Crataegus x lavalleyi	9m	6m
Magnolia denudata	9m	7m
Magnolia 'Elizabeth'	8m	5m
Magnolia kobus	9m	7m
Parrotia persica	9m	6m
Parrotia persica 'Inges Ruby Vase'	10	6m
Prunus yeodensis 'Akebono'		
Stewartia pseudocamellia	8m	7m
Styrax japonica	7m	7m
Styrax obassia	8m	5m
MEDIUM BOULEVARD TREES (10-15 metres in height)		

APPENDIX B
RECOMMENDED TREES FOR BOULEVARDS, MEDIANS, PARKS AND HYDRO CORRIDORS
Spring 2011

TREE NAME	HEIGHT	SPREAD
Acer cappadocicum	11m	10m
Acer platanoides 'Atropurpureum'	10m	7m
Acer platanoides 'Crimson King'	10m	8m
Acer platanoides 'Deborah'	15m	13m
Acer platanoides 'Drummondii'	12m	8m
Acer platanoides 'Emerald Lustre'	13m	12m
Acer platanoides 'Fairview'	13m	12m
Acer platanoides 'Princeton Gold'	12m	10m
Acer platanoides 'Royal Red'	13m	10m
Acer rubrum 'Morgan'	13m	11m
Acer rubrum 'Scarlet Sentinel'	12m	6m
Carpinus betulus	12m	10m
Carpinus betulus 'Fastigiata'	11m	8m
Carpinus betulus 'Frans Fontaine'	10m	4m
Cercidiphyllum japonicum	12m	12m
Fagus sylvatica 'Dawyck'	13m	4m
Fagus sylvatica 'Dawyck Gold'	12m	4m
Fagus sylvatica 'Dawyck Purple'	12m	4m
Fraxinus americana 'Autumn Applause'	15m	10m
Fraxinus americana 'Autumn Purple'	15m	13m
Fraxinus americana 'Empire'	6m	12m
Fraxinus excelsior 'Westhof's Glory'	15m	15m
Fraxinus ornus	13m	10m
Fraxinus ornus 'Airy Peters'	12m	8m
Fraxinus pennsylvanica 'Patmore'	15m	10m
Fraxinus pennsylvanica 'Summit'	15m	8m
Fraxinus pennsylvanica 'Urbanite'	15m	12m
Ginkgo biloba	15m	12m
Ginkgo biloba 'Princeton Sentry'	13m	5m
Gleditsia triacanthos 'Halka'	12m	12m
Liquidambar styraciflua 'Worplesdon'	13m	8m
Nothofagus antarctica	12m	8m
Nyssa sylvatica	12m	7m
Phellodendron amurense	10m	8m
Quercus acutissima	14m	14m
Quercus phellos	13m	12m
Robinia pseudoacacia 'Inermis'	12m	9m
Tilia cordata 'Chancellor'	11m	6m
Zelkova serrata 'Green Vase'	15m	12m

APPENDIX B
RECOMMENDED TREES FOR BOULEVARDS, MEDIANS, PARKS AND HYDRO CORRIDORS
Spring 2011

TREE NAME	HEIGHT	SPREAD
LARGE BOULEVARD TREES (over 15 metres in height)		
Acer x 'freemanii 'Autumn Blaze'	16m	12m
Fagus sylvatica	16m	13m
Metasequoia glyptostroboides	20m	9m
Pseudotsuga menziesii	40m	8m
Quercus coccinea	16m	13m
Quercus robur	16m	13m
Sequoiadendron giganteum	30m	10m
Thuja plicata	30m	8m

Recommended **Median** tree list 2011

TREE NAME	HEIGHT	SPREAD
DECIDUOUS MEDIAN TREES		
Acer cappadocicum	11m	10m
Acer platanoides 'Atropurpureum'	10m	7m
Acer platanoides 'Crimson King'	10m	8m
Acer platanoides 'Deborah'	15m	13m
Acer platanoides 'Drummondii'	12m	8m
Acer platanoides 'Royal Red'	13m	10m
Acer x 'freemanii 'Jeffersred' Autumn Blaze	16m	12m
Acer rubrum 'Columnaire'	9m	5m
Acer rubrum 'Scanlon'	9m	5m
Acer rubrum 'Scarlet Sentinel'	12m	6m
Aesculus x carnea 'Briotti'	12m	10m
Aesculus hippocastanum 'Baumannii'	25m	19m
Carpinus betulus 'Fastigiata'	11m	8m
Carpinus betulus	12m	10m
Cercidiphyllum japonicum	12m	12m
Fagus sylvatica 'Dawyck Gold'	12m	4m
Fagus sylvatica 'Dawyck Purple'	12m	4m
Fagus sylvatica	16m	13m
Fraxinus americana 'Autumn Applause'	15m	10m
Fraxinus americana 'Autumn Purple'	15m	13m
Fraxinus excelsior 'Westhof's Glory'	15m	15m
Fraxinus ornus 'Airy Peters'	12m	8m
Fraxinus ornus	13m	10m
Fraxinus pennsylvanica 'Patmore'	15m	10m
Fraxinus pennsylvanica 'Summit'	15m	8m

APPENDIX B
RECOMMENDED TREES FOR BOULEVARDS, MEDIANS, PARKS AND HYDRO CORRIDORS
Spring 2011

TREE NAME	HEIGHT	SPREAD
Fraxinus pennsylvanica 'Urbanite'	15m	12m
Ginkgo biloba 'Princeton Sentry'	13m	5m
Ginkgo biloba	15m	12m
Gleditsia triacanthos 'Halka'	12m	12m
Liquidambar styraciflua 'Worplesdon'	13m	8m
Liriodendron tulipifera	20m	10m
Quercus acutissima	14m	14m
Quercus coccinea	16m	13m
Quercus palustris	23m	13m
Quercus phellos	13m	12m
Robinia pseudoacacia 'Inermis'	12m	9m
Tillia cordata 'Chancellor'	11m	6m
EVERGREEN MEDIAN TREES		
Metasequoia glyptostroboides	20m	9m
Sequoiadendron giganteum	30m	10m
Abies concolor	20m	10m
Cedrus atlantica 'Glaucua'	30m	10m
Cedrus deodara	20m	10m
Ilex aquifolium	10m	5m
Pinus nigra 'Green Select'	20m	10m
Pinus thumbergii	35m	10m
Pseudotsuga menziesii	40m	8m
Thuja plicata	30m	8m
Picea omorika	15m	5m
Pseudotsuga menziesii	80m	30m
Thujopsis dolabrata	15m	5m
Chamaecyparis nootkatensis pendula	10m	5m
Chamaecyparis obtusa	25m	5m
Magnolia grandiflora	15m	7m
Calocedrus decurrens	25m	5m

Recommended trees for **Parks** 2011

MEDIUM PARK TREES (10-15 metres in height)		
TREE NAME	HEIGHT	SPREAD
Acer cappadocicum	11m	10m
Acer platanoides 'Atropurpureum'	10m	7m
Acer platanoides 'Crimson King'	10m	8m

APPENDIX B
RECOMMENDED TREES FOR BOULEVARDS, MEDIANS, PARKS AND HYDRO CORRIDORS
Spring 2011

TREE NAME	HEIGHT	SPREAD
Acer platanoides 'Deborah'	15m	13m
Acer platanoides 'Drummondii'	12m	8m
Acer platanoides 'Emerald Lustre'	13m	12m
Acer platanoides 'Fairview'	13m	12m
Acer platanoides 'Princeton Gold'	12m	10m
Acer platanoides 'Royal Red'	13m	10m
Acer rubrum 'Morgan'	13m	11m
Acer rubrum 'Scarlet Sentinel'	12m	6m
Aesculus x carnea 'Briotti'	12m	10m
Carpinus betulus	12m	10m
Fraxinus americana 'Autumn Applause'	15m	10m
Fraxinus americana 'Autumn Purple'	15m	13m
Fraxinus excelsior 'Westhof's Glory'	15m	15m
Fraxinus ornus	13m	10m
Fraxinus pennsylvanica 'Patmore'	15m	10m
Fraxinus pennsylvanica 'Summit'	15m	8m
Fraxinus pennsylvanica 'Urbanite'	15m	12m
Ginkgo biloba	15m	12m
Gleditsia triacanthos 'Halka'	12m	12m
Liquidambar styraciflua 'Worplesdon'	13m	8m
Nothofagus antarctica	12m	8m
Nyssa sylvatica	12m	7m
Phellodendron amurense	10m	8m
Quercus acutissima	14m	14m
Quercus phellos	13m	12m
Robinia pseudoacacia 'Inermis'	12m	9m
Salix babilonica	15m	13m
Sorbus aucuparia	9m	7m
Tilia cordata 'Chancellor'	11m	6m
Zelkova serrata 'Green Vase'	15m	12m
LARGE PARK TREES & EVERGREEN PARK TREES		
Abies grandis	45m	8m
Acer x freemanii 'Jeffersred' Autumn Blaze	16m	12m
Acer macrophyllum	18m	11m
Aesculus hippocastanum 'Baumannii'	25m	19m
Fagus sylvatica	16m	13m
Liriodendron tulipifera (Not to hang over any Hardscapes)	20m	10m
Metasequoia glyptostroboides	20m	9m
Quercus coccinea	16m	13m

APPENDIX B
RECOMMENDED TREES FOR BOULEVARDS, MEDIANS, PARKS AND HYDRO CORRIDORS
Spring 2011

TREE NAME	HEIGHT	SPREAD
Quercus palustris	23m	13m
Quercus robur	16m	13m
Sequoiadendron giganteum	30m	10m
Thuja plicata	30m	8m
Abies concolor	20m	10m
Aesculus hippocastanum 'Baumannii'	25m	19m
Cedrus atlantica 'Glaucua'	30m	10m
Cedrus deodara	20m	10m
Ilex aquifolium	10m	5m
Pinus nigra 'Green Select'	20m	10m
Pinus thumbergii	35m	10m
Pseudotsuga menziesii	40m	8m
Picea omorika	15m	5m
Thujopsis dolabrata	15m	5m
Chamaecyparis nootkatensis pendula	10m	5m
Chamaecyparis obtusa	25m	5m
Calocedrus decurrens	25m	5m

Recommended trees for HYDRO corridors 2011

All trees on the recommended small boulevard tree list.		
The following trees are to be used <u>only</u> when there is adequate room to accommodate canopy growth:		
TREE NAME	HEIGHT	SPREAD
All <u>medium</u> sized Acer <u>boulevard</u> trees	varies	varies
Gleditsia triacanthos 'Halka'	13m	13m
Carpinus betulus 'Fastigiata'	22m	5m
Fraxinus ornus 'Airy Peters'	10m	7m
Zelcova serrata 'Green Vase'		

Coastal B.C. Native Plants Used in Landscaping & Naturalizing

Broadleafed Evergreens

Botanical Name	Common Name
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick
<i>Blechnum spicant</i>	Deer fern
<i>Gaultheria shallon</i>	Salal
<i>Mahonia aquifolium</i>	Tall Oregon grape
<i>Mahonia nervosa</i>	Low Oregon grape
<i>Polystichum munitum</i>	Western sword fern
<i>Vaccinium ovalifolium</i>	Oval-leaved blueberry
<i>Vaccinium ovatum</i>	Evergreen huckleberry

Trees

Botanical Name	Common Name
<i>Abies grandis</i>	Grand fir
<i>Acer circinatum</i>	Vine maple
<i>Acer macrophyllum</i>	Big leaf maple
<i>Alnus rubra</i>	Red alder
<i>Arbutus menziesii</i>	Arbutus
<i>Betula papyrifera</i> var. <i>commutata</i>	Paper birch
<i>Corylus cornuta</i>	Beaked hazelnut
<i>Cornus nuttallii</i>	Pacific dogwood
<i>Crataegus douglasii</i>	Black hawthorn
<i>Malus fusca</i>	Pacific crab apple
<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta</i> var. <i>Contorta</i>	Shore pine
<i>Populus balsamifera</i> var. <i>trichorpa</i>	Black cottonwood
<i>Pseudotsuga menziesii</i>	Douglas-fir
<i>Quercus garryana</i>	Garry oak
<i>Rhamnus purshiana</i>	Cascara
<i>Taxus brevifolia</i>	Pacific yew
<i>Thuja plicata</i>	Western red cedar
<i>Tsuga heterophylla</i>	Western hemlock

APPENDIX C
COASTAL BC NATIVE PLANTS FOR NATURALIZING
Spring 2011

Deciduous Shrubs

Botanical Name

Amelanchier alnifolia
Cornus sericea C.stolonifera
Holodiscus discolor
Lonicera ciliosa
Lonicera involucrata
Myrica gale
Menziesia ferruginea
Oemleria cerasiformis
Philadelphus lewisii
Physocarpus capitatus
Poystichum munitum
Prunus emarginata
Ribes bracteosum
Ribes sanguineum
Rosa gymnocarpa
Rosa nutkana
Rubus parviflorus
Rubus spectabilis
Salix hookeriana
Salix lasiandra
Salix scouleriana
Salix sitchensis
Sambucus racemosa
Spirea douglasii
Symphoricarpus albus
Symphoricarpus mollis
Vaccinium parvifolium

Common Name

Saskatoon berry
Red-osier dogwood
Oceanspray
Western trumpet honeysuckle
Black twinberry honeysuckle
Sweet gale
False azalea
Indian plum
Mock orange
Pacific ninebark
Sword fern
Bitter cherry
Stink currant
Red currant
Bald hip rose
Nootka rose
Thimbleberry
Salmonberry
Hooker willow
Pacific willow
Scouler willow
Sitka willow
Red elderberry
Hard hack
Snowberry
Trailing snowberry
Red huckleberry

SEED MIXES FOR PARK DEVELOPMENT

This Appendix to be read in conjunction with:

Section 02378 - Natural Area Preservation and Enhancement
Section 02923 - Seeding
Section 02924 - Hydraulic Seeding
Section 02940 - Turf Establishment Sand Base Turf Sports Field

Sports Fields

For areas designated sand base turf sports field, the following Canada Certified No. 1 mixtures will be used:

100% Certified Perennial Ryegrass by weight.

A minimum of three different certified Perennial Ryegrass Cultivars to be used in the mix.

All certified cultivars will be chosen from the following acceptable list unless approved by the Owner's Representative:

1. Preferred Varieties (Perennial Ryegrass)

All Star 2 &3	Amazing	Amazing GS	Brightstar
Capri	Coastal 4-Way	Derby Extreme	Elka 2 & 3
Elfkin	Envy	Esquire	Fiesta 4
Gator 3	Mach 1	Margarita	Nighthawk
Regal 5	SR 4200	SR 4220	SR 4420
Top Hat II			

APPENDIX D
SEED MIXES FOR PARK DEVELOPMENT
Spring 2011

Passive Grass

For areas designated passive grass area, the following Canada Certified No. 1 mixtures will be used:

60% Certified Perennial Ryegrass by weight.

40% Certified Chewings Fescue/Creeping Fescue by weight.

All certified cultivars will be chosen from the following acceptable list:

Perennial Ryegrasses: See list above.

Fine Fescues:

Boreal	Shademaster	Victory
Cindy	Longfellow	
Vista	Dawson	
Barcrown	Salem	
Marker	SR 5000	
Enjoy	SR 5100	

Natural Area

The following seed mixes are required when working in parkland designated as natural area. Contact the Urban Forestry and Environmental Services Section (UFESS) for the appropriate mix for sites requiring seeding. All seed mixes in natural areas must not contain invasive species such as white sweet clover and/or reed canary grass.

Reclamation Mix

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Tall Fescue	20	10.5
Italian Ryegrass	20	10.5
Perennial Ryegrass	10	6
Creeping Red Fescue	10	14.5
Orchardgrass	6	9
Timothy	3	9
Red Top	1	11.5
S.C. Red Clover	20	13
Alsike Clover	10	16

Reclamation Mix with Blue Wildrye

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Blue Wildrye	30	8.5
Tall Fescue	20	11.5
Creeping Red Fescue	10	16
Orchardgrass	6	10
Timothy	3	10
Red Top	1	12.5

Meadow Mix

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Sheep Fescue	25	27.25
Fiesta 3 Perennial Ryegrass	20	8
Creeping Red Fescue	20	20
Canada Bluegrass	5	20
Red Top	1	8
Optional Russell Lupine	4	.14

Old Field Mix

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Tall Fescue	25	14
Transist Intermediate Ryegrass	22	13.5
Creeping Red Fescue	15	23
Orchardgrass	10	16.5
Timothy	3	9.95
S.C. Red Clover	15	11
Russell Lupine	3	.16

APPENDIX D
SEED MIXES FOR PARK DEVELOPMENT
Spring 2011

Erosion Control Mix

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Transist Intermediate Ryegrass	25	12.5
Creeping Red Fescue	15	19
Hard Fescue	15	17
Tall Fescue	10	5
Orchardgrass	10	13
Timothy	2	5
Red Top	1	10
S.C. Red Clover	15	8.5
Alsike Clover	7	10

Wetland Mix

<u>Seed Type</u>	<u>% by Seed Weight</u>	<u>% by Seed Count</u>
Tall Fescue	49	23.5
Meadow Foxtail	10	12
Timothy	10	27.5
Red Top	1	10.5
Birdsfoot Trefoil	30	26.5

Tree Protection For Construction In and Adjacent to Parks

Tree Preservation Guidelines

Construction activities can have a detrimental impact on the health of trees on a construction site. Trees suffer tremendously from compaction, mechanical damage, excavation, drainage and grade changes. There is no need for this to happen. Damage to trees can be kept to a minimum or eliminated all together, by following simple tree protection procedures.

These procedures are:

- **Pre-construction Phase:** Getting the people involved with the development to understand the importance of saving trees. Having all tree barriers in place before work on the site begins.
- **Impact Reduction Strategies:** Procedures that will reduce the impact and damage to trees to be left on site.
- **Post Construction Remedial Work:** Procedures that will help the recuperation of trees after all construction on site is finished.

Pre-construction Stages

Before construction begins, there are several actions to ensure the health of trees to be retained on site. These are:

1. Set up a pre-construction meeting with the developer, contractors and park staff to outline where barriers are to be placed (see Item 4) or inspect any barriers that are already in place. The barriers must be up and inspected before any work commences. Also, any special provisions can be detailed at this time. The contractor must designate a representative to contact if trees are damaged. At this time any fines or penalties must be discussed for tree protection violations.
2. Education and the dedication of all those on site is the best way to preserve trees. If everyone believes in the goal of tree preservation, the task becomes much easier. Everyone from the Engineer, Project Manager, Contractor, Machine Operator, to the Labourer must be aware of work been done on site to preserve the trees. It only takes one careless act to destroy the work of everyone else. Once a tree is damaged it cannot be repaired like a road or building.
3. Hazard trees on park land must be evaluated by a City Arborist and removed by the contractor. Special consideration will be given to trees that are more tolerant to abuse as they may take some degree of root pruning and not have to be removed.
4. To ensure that barriers are properly placed:

- City Arborist may spray paint lines which indicate their location
- Barriers in short sections (25 meters or less) are to be made with 2x4's and staked to the ground with cross braces and snow fence. See Figure #1.
- Barriers should be 4' (1.2 meters) in height.
- Barriers for long forested sections will be built with wooden posts in ground, at 8' centres, with snow fence and wire running along the top, to keep the fence straight.
- Permanent fences to be erected between Parkland and the development must be installed before the construction begins.
- Minimum protection distance from trees and barriers, use the "Tree Protection Distance Table", Table #1. (Page 3).

Figure #1: Proper design for tree barriers under 25 meters long.



Table # 1: Tree Barrier Protection

General:

1. The minimum protection ratio will be 6:1 with a preferred ratio of 8:1

Trunk Diameter (DBH)

Minimum Protection Required Around Tree

cm	in	ft	Distance from Trunk (metres)	Total Diameter (metres)
20	8	0.6	1.2	2.60
25	10	0.8	1.5	3.25
30	12	1.0	1.8	3.90
35	14	1.2	2.1	4.55
40	16	1.3	2.4	5.20
45	18	1.5	2.7	5.85
50	20	1.7	3.0	6.50
55	22	1.8	3.3	7.15
60	24	2.0	3.6	7.80
75	30	2.5	4.5	9.75
90	36	3.0	5.0	10.90
100	40	3.3	6.0	13.00

Impact Reduction Strategies

Below are several approaches to prevent injury to trees during construction.

1. In circumstances where utilities must go through the tree's root zone, tunnelling procedures are necessary.
2. On forested sites, it is beneficial to leave "guard trees" during construction. Guard trees are trees that are slated for removal, but are retained, as a temporary buffer to protect the trees behind them. The trees are removed by being flush cut to the soil surface and leaving the roots in the ground at a time determined by the on-site arborist.
3. In situations where workers or equipment must travel over root zones, plywood and 'hog' fuel (min. 6") must be laid down to lessen the impact on the roots.
4. Where branches are interfering with the construction work, pruning may be the more acceptable solution as opposed to the complete removal of the tree. Instead of removing a tree because of interfering branches or roots, they should be pruned by a skilled I.S.A. Certified Arborist.
5. After the project is completed the developer, contractors and park staff meet on site to discuss the tree protection process and detail how it can be improved. Ideas from that meeting could then be used to better help the Construction community protect trees.

Post Construction Remedial Work

Most remedial work will be done by or under the supervision of the consulting or City Arborist. These measures could include but are not limited to:

1. Water trees with major root loss and stress. These trees need an abundance of water. This could mean watering on a daily basis either by hand (water trucks and hoses) or sprinklers.
2. Mulch from the edge of the root damage area to the edge of work site. Don't raise the grade with mulch around the trunk of the tree as it can rot the cambium layer that lies behind the bark of the tree. Preferred mulches to use - shredded bark, compost, or leaves.
3. Cut back roots that are damaged, cleanly, with a handsaw or loppers. Do not use a chain saw. After the roots have been cut back, they should be back filled immediately with growing medium. Do not use subsoil. Backfilling of the site should be done with topsoil (12" min.) and kept clear of machine fluids, drywall, and other construction debris. The soil should be compacted to original firmness, but no more, watered to moisten roots and to remove any air pockets that may have developed.
4. Remove damaged trees due to excavation. An I.S.A. Certified Arborist will be the one to make this decision. The trees will be flush cut to the ground and the root system left intact. In some cases the trees can be "wild-lifed".
5. Add forest "litter" from the original forest to add some needed mycorrhizae to the damaged roots. Also planting small, non-evasive shrubs within the root zone to shade the new developing roots can be helpful over a hot summer.
6. Conduct a post construction monitoring process of all the trees affected, to check for possible decline in the trees. If decline is observed, then remedial measures are required to return them to their original state of health. Monitoring practices could be soil samples, tissue samples, and compaction tests.

For further information please see:

Trees and Development" by Matheny and Clark 1998

Vancouver Tree By-law at:
www.city.vancouver.bc.ca/commssvcs/planning/treebylaw/treeidxj.htm

Chris Velin – Parks Development – Phone: 604-501-5086

INVASIVE PLANT SPECIES

Due to their invasive nature, the following plants should not be utilized in City of Surrey park development projects:

Bambusa sp.	Bamboo
Convolvulus arvensis	Morning Glory
Cytisus scoparius	Scotch Broom
Hedera helix	English ivy
Heracleum mantegazzianum	Giant Hogweed
Ilex aquafolium	English Holly
Impatiens glandulifera	Policemen's Helmet
Lamium album	Dead-nettle Lamium
Lythrum salicaria	Purple Loosestrife
Polygonum sp.	Japanese Knotweed
Rubus laciniatus	Himalayan Blackberry
Rubus discolor	Evergreen Blackberry
Tanacetum vulgare	Tansy
Vinca minor	Periwinkle

UNACCEPTABLE STREET TREE SPECIES

(Consult with Urban Forestry)

Acer rubrum 'Armstrong'
Crataegus x mordenensis 'Toba'
Fraxinus oxycarpa 'Raywood'
Malus sp.
Pinus contorta
All Prunus except Prunus yeodensis 'Akebono'
Pyrus sp.
Syringa reticulata 'Ivory Silk'
Tilia x euchlora
Tilia cordata 'Greenspire'
Quercus palustris
Fraxinus excelsior 'Golden Desert'
Fraxinus nigra 'Fall Gold'
Robinia Pseudoacacia 'Purple Rope'
Magnolia seiboldi
Magnolia acuminata 'Yellow Bird'
Magnolia Butterfly
Liriodendron tulipifera (Not to hang over any hardscapes)

APPENDIX G
NATURAL AREA TRAIL STANDARDS
Spring 2011

Trail	UNIVERSAL ACCESS / BARRIER FREE TRAIL	GENERAL ACCESS AND RECREATION TRAIL	RECREATIONAL NATURE TRAIL	VEHICLE ACCESS PATHWAY	EQUESTRIAN TRAIL
Trail Type CODE	1	2	3	4	5
PURPOSE	Unimpeded, relatively safe access for users of varying physical abilities. For transportation and low impact or passive recreational activities	Multi-access and medium and low impact recreational uses. Connective travel corridors. i.e. school-forest-residential area	Exploration, discovery and recreation based foot traffic and slow off-road bicycling.	Multi use and designed to bear weight of larger vehicles for service or emergency access to a site.	Horseback riding, other uses possible.
INTENDED USAGE RATE	Low-High	Medium-High	Low-Medium	Low-High (location dependant)	Medium-High
TREAD WIDTH	1.5m-2.5m	1.5m.-2.5m.	1.0m.-1.5m.	2.5m-4.0m.	0.5m.-2.5m.
SURVEILLANCE AREA WIDTHS (WIDTH EACH SIDE OF TRAIL)	1.0m-4.0m. each side	1.0m.-4.0m. each side	1.0m-2.0m. each side	Line of sight maintained Obstructions cleared. 1.0m.-4.0m each side	Line of sight maintained Surveillance area provided (x). Tread width +2x = min 2.5m
SURVEILLANCE AREA VERTICAL RANGES (ABOVE TREAD SURFACE)	clear between 0.75m.-1.8m.	clear between 0.75m.-1.8m.	clear between 0.75m.-1.8m.	clear between 0.75m.-1.8m. on demand	on demand, as required for safety
SURFACE TYPE	Crushed rock, Wood shreds, Concrete, Asphalt No bumps, dips or other obstructions greater than 2cm.	Crushed rock, Wood shreds, bark mulch.	Crushed rock, Wood shreds, bark mulch, native mineral soils.	Compacted crushed rock, soil cement, asphalt, concrete	Crushed rock, wood shreds, bark mulch.
SUBGRADE (AS REQUIRED)	Crushed rock, Rip-rap, geotextiles, geo grids	Crushed rock, Rip-rap, geotextiles.	Crushed rock, Rip-rap, geotextiles	Road mulch, rip-rap, geotex., geogrids	Crushed rock, Rip-rap, geotextiles, geo grids,
PREFERRED GRADE	0%-3% preferred 8%<4m. max. >5%= handrails >10%=steps	8%:max. <5%=preferred	0%-8% average 10% maximum	3%: sustained 5%: 30m. or less 10%: 15m. or less	0%-10% variable up to 15% for <25m.
OVERHEAD VEGETATION CLEARANCE	2.5m. above tread surface	2.5m. above tread surface	2.5m. above tread surface.	3.0m. above tread surface	3.0m. above tread surface.
ADDITIONAL FEATURES (SITE AND DEMAND DEPENDANT)	Wheel-stops, pullouts, boardwalks, bridges, ramps, benches, garbage receptacles, maps, signs	Boardwalks, stairs, bridges, benches, garbage receptacles, maps, signs	Only as needed	Not applicable	Tethering sites, pullouts, manure disposal area, bridges.
COMMENTS	Build according to local demand. Limited applications.	Use sparingly in sensitive natural areas.	Utilize in more sensitive natural sites.	Use only when service / emergency access to a given area is absolutely necessary	Utilize when local public demand dictates.

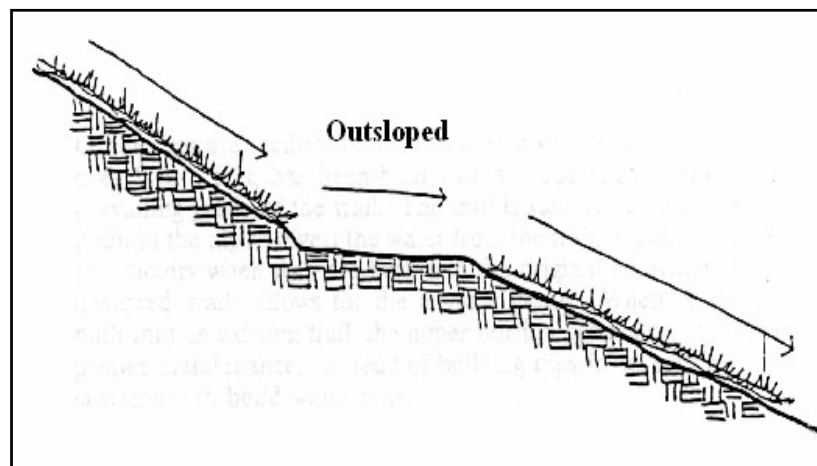
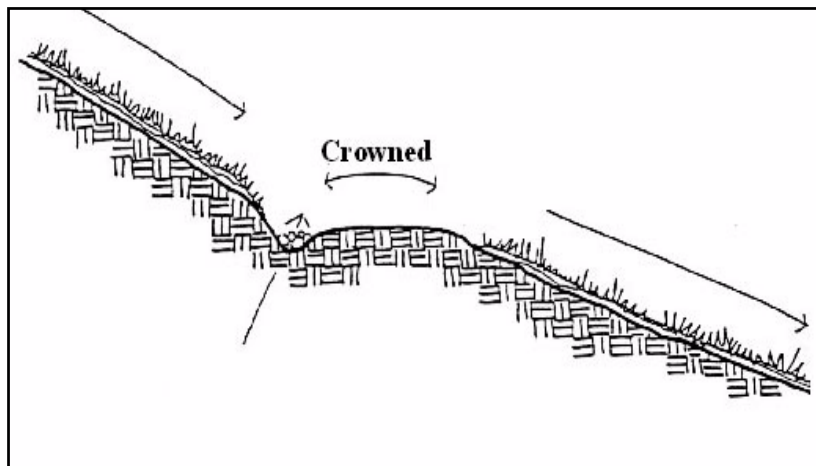
APPENDIX G
NATURAL AREA TRAIL STANDARDS
Spring 2011

MULTI-USE PATHWAY (AS PER ENGINEERING STANDARDS)	NATURE TRAIL	OFF ROAD BICYCLE TRAIL	UNSANCTIONED TRAIL	CLOSED TRAIL
6	7	8	9	10
Designed to accommodate mass alternative transportation. Refer to Urban Systems Document re: Multi-use Pathway Standards	Urban hiking, solitude, nature interpretation	Technical, off-road bicycling. Not recommended for pedestrians	Not sanctioned for use. No management program in effect. Used for purposes that are inconsistent or contradictory to site objectives.	Closed due to negative environmental impacts or conflict with sanctioned uses
Medium-High	Low	Medium-High	none	None
3.0m-4.0m	0.5m.-1.0m.	0.3m.-1.2m.	Variable	None
1.0m.-2.0m. each side	None provided Line of sight maintained	0.5m-2.0m each side. Line of sight maintained Handle-bar clearance maintained.	Not applicable	Green-up encouraged. Physical barriers maintained.
clear between 0.75m.-1.8m.	to maintain line of sight only	clear between 0.75m.-1.8m.	Not applicable	Not applicable
Asphalt, concrete, compacted crushed rock.	Crushed rock, Wood shreds, bark mulch, native mineral soils, log corduroy.	Crushed rock, Wood shreds, bark mulch, native mineral soils, log corduroy.	Native soils or log corduroy, planks and plywood	Coarse woody debris, rocks, native plants / trees/ grasses, native soils.
Road mulch, rip-rap, geotex., geogrids	Crushed rock, Rip-rap, geotextiles, logs	Crushed rock, Rip-rap, geotextiles, logs	Not applicable	Not applicable
3%: sustained 5%: 30m. or less 10%: 15m. or less	0%-10% variable up to 15% for <25m.	10%-15% max. sust. 15%-25% maximum	Not applicable	Not applicable
2.5m.-3.0m. above tread surface	Obstructions only to 2.4m. above tread surface	2.75m.-3.0m. above tread surface.	Not applicable	Favour "chest high" barriers.
Wheel-stops, pullouts, boardwalks, bridges, ramps, benches, garbage receptacles, maps, signs, bike racks	Only as needed	Technical challenge features, safety rails, wheel stops, pullouts, bike racks, maps, signs, bike wash areas.	Remove all forts, tree houses, plank bridges, raw log tread, garbage, yardwaste, fire pits, makeshift benches, etc	Closure signs, fabricated barriers, gates.
Do not use in forests or near trees. Do not use in sensitive sites.	Urban hiking- rough, wet, uneven tread surfaces would be expected. Resurface if ecological damage occurring.	Utilize when local public demand dictates. Build as per Parks Division Guidelines for Bicycle Recreational Facilities.	To be closed and deactivated upon detection in sensitive sites. Formalize trails if heavily used and appropriate for the site.	Closure should be enforced when needed

Drainage Features

The function of drainage features is to minimize the disruptions to the site's hydrology while also minimizing the degrading effects that moving or standing water can have on the trail.

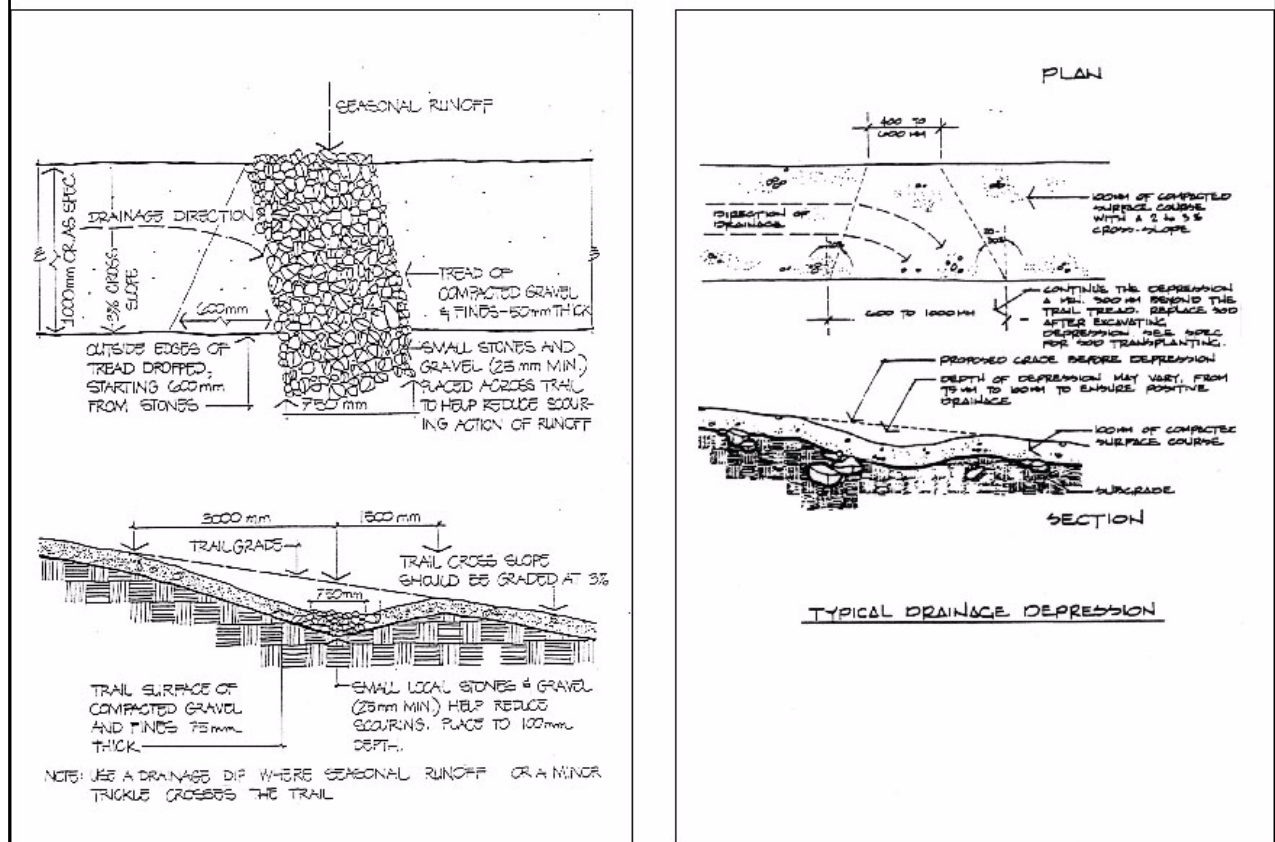
Crowns and Cross Slopes: All trail surfaces should be crowned or cross-sloped by 2-3%, then compacted to a stable density. This alone will reduce the need for other drainage features. Crowns can be used where the trail is on level ground or where ditches are present on both sides of the trail. Cross slopes should shed water to the outside of a slope (fill bank) except where the inside of the slope (cut bank) is ditched.



Drainage Dips: Drainage dips should be incorporated into the tread during the initial base preparation by creating sections of opposing grades.

Cross Drains: Cross drains intercept water on slopes and shed it to the outside of the trail. These should be built with rock. A French-drain style cross ditch is the preferred method as it lies flush with the trail tread and provides no obstructions.

Cross Drain Designs

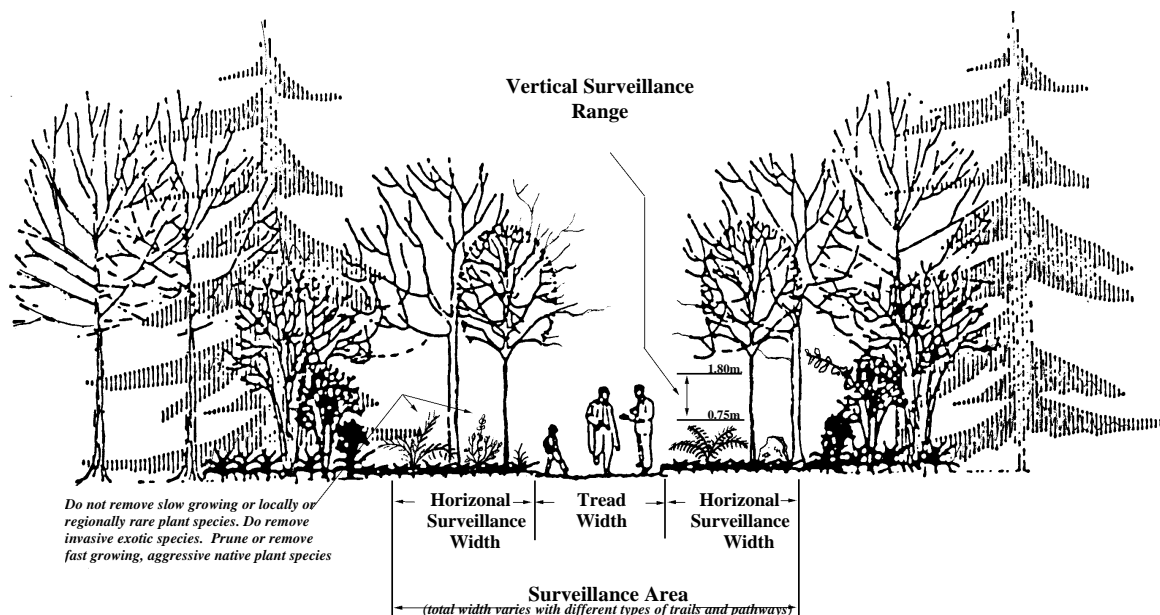


Surveillance Area

The trail surveillance area has two dimensions, horizontal and vertical. Horizontal surveillance width is the distance from the trail edge into the adjacent natural area where vegetation is selectively managed for security purposes. Vertical surveillance range is the elevation span above the trail's tread surface where vegetation is selectively managed for security purposes.

Natural Areas Trails and Pathways

Surveillance Areas and Overhead Vegetation Clearances



Bench Protocol (2011)

			Operators		
	Surrey's 'In-House' Park Bench	Contextually Chosen Park Bench	Building Operator	Engineering Dept	Park Operation N or S .
PARKS:					
B & C Park / Neighbourhood parks	1				X
B & C Pocket parks	1				X
(B) Community Parks	1				X
A & B - Athletic Parks	1				X
"A" Parks	1	2			X
Urban Forests	1	2			X
Urban Parks		2			X
Gardens		2			X
Beaches		2			X
Donation Benches	1	2			X
OTHER CITY SITES:					
Street Furniture		2		X	
City Plaza's		2		X	
Public Buildings		2	X		

1. "Surrey's 'In House' Park Bench" (previously called "Surrey Park Bench") - black powder coated finish with recycled plastic or lpee boards
2. "Contextually Chosen Park Bench" - Final design is chosen by the operator and the design team and is blending in or highlighting its surroundings.

Examples: 1. Donation Bench
2. 'A' Level Front Entrance Park Specific Bench
3. Urban Forest Bench

Donation Benches to match selected benches (see above chart), donation prices to vary as per true cost of bench.

Formula for Donation Bench:

Purchase price cost for bench and metal plaques
Installation cost for bench and metal plaques
Maintenance cost: 25% of Purchase and installation
Administration cost 5% of Purchase and installation
Total cost: all of the above

Donation bench will be included in new inventory 1 year after installation.

All benches (donation and others) will be maintained to the same Park Standard.

Urban Parks are always located in high residential or commercial dense areas

The above was concluded in March 2009 with involvement of staff from Planning and Design, PDS, North and south Operations.

DETAILS

SSD-PK 1000

Drainage and Grading

SSD-PK 1010	600mm Area Drain
SSD-PK 1011	600mm Area Drain – Natural Areas
SSD-PK 1020	Drainage Swale
SSD-PK 1030	Earth Berm
SSD-PK 1070	Lawn Drain
SSD-PK 1090	Sports Field Construction - PVC Storm Sewer Drain Line-Section
SSD-PK 1100	Sports Field Construction - Sediment Sump Pit
SSD-PK 1111	Sports Field Construction - PVC Lateral Clean-out (ELL)
SSD-PK 1112	Sports Field Construction - 100 to 150 mm PVC WYE-Plan View
SSD-PK 1113	Sports Field Construction - PVC Collector Drain
SSD-PK 1114	Sports Field Construction - PVC Lateral Drain

SSD-PK 2000

Irrigation

SSD-PK 2060	General Irrigation Installation
SSD-PK 2090	Irrigation Kiosk with Booster Pump
SSD-PK 2091	Irrigation Kiosk without Booster Pump
SSD-PK 2110	Irrigation Valve Assembly
SSD-PK 2120	Swing Joint Rise Assembly
SSD-PK 2130	Quick-coupler Connection

SSD-PK 4000

Paving

SSD-PK 4010	Asphalt Path
SSD-PK 4020	Unit Pavers
SSD-PK 4040	Crusher Chip Path
SSD-PK4050	Natural Area Trail Construction
SSD-PK 4070	1.2m Boardwalk
SSD-PK 4080	200mm Concrete Wheel Stops

SSD-PK 5000

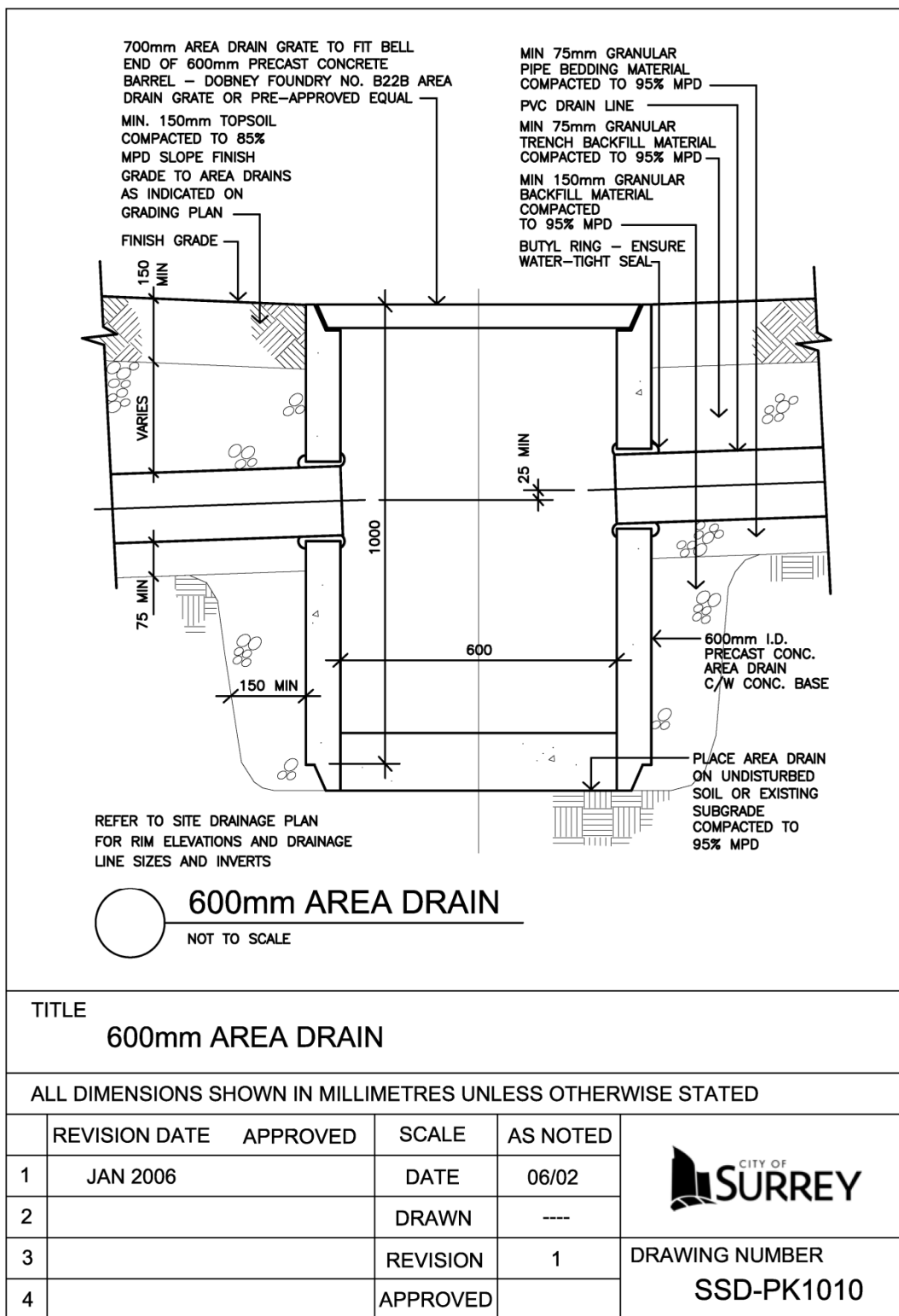
Planting

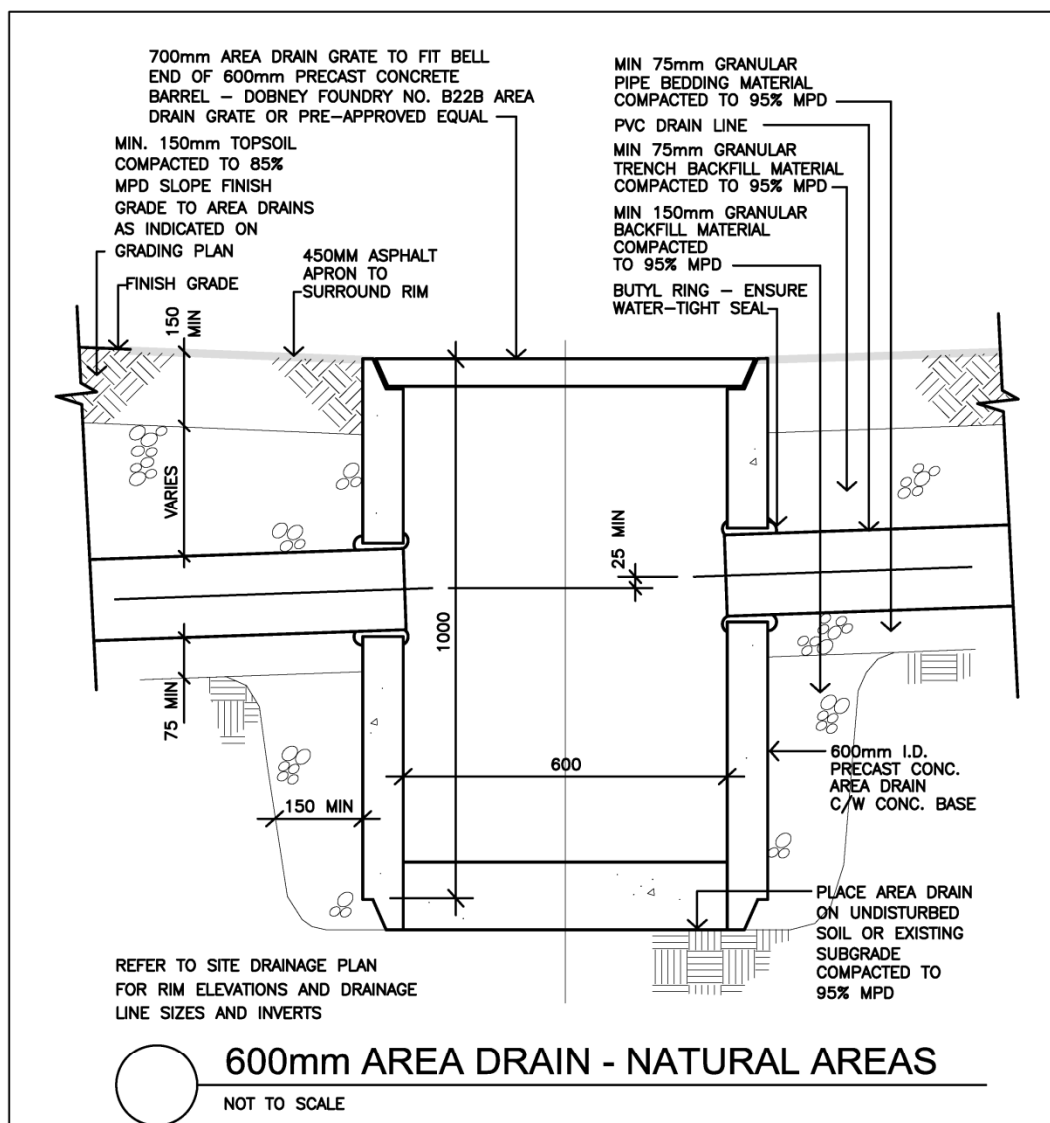
SSD-PK 5005	Tree Protection Barrier
SSD-PK 5010	Tree Planting – Residential Streets and Parks
SSD-PK-5040	Tree Planting – Structural Soil in Urban Boulevard - Plan View
SSD-PK 5050	Tree Planting – Boulevard
SSD-PK 5052	Section Through Tree Well
SSD-PK 5070	Parking Lot Guidelines
SSD-PK5078	Parking Lot Bioswale
SSD-PK 5079	Median Planting – Section
SSD-PK 5092	Tree Grate – Plan View
SSD-PK 5120	Root Barriers
SSD-PK 5130	Shrub Planting
SSD-PK 5140	Ground Cover Planting
SSD-PK 5170	Grass Area - Seeded

SSD-PK 6000

Site Fixtures

SSD-PK 6060	Cast-in-place Bollard
SSD-PK 6061	Locking Bollard
SSD-PK 6070	1.2m Chain Link Fence – Active Areas
SSD-PK 6071	1.2m Chain Link Fence – Passive Areas
SSD-PK 6080	Post and Chain Fence
SSD-PK 6100	Barrier Gate - Double
SSD-PK 6101	Barrier Gate - Single
SSD-PK 6102	Self Closing Gate 1.2m and 1.8m
SSD-PK 6103	Rolling Gate
SSD-PK 6104	Maintenance Access Gate
SSD-PK 6110	Log Rail Vehicle Barriers
SSD- PK6111	Formal Vehicle Barrier
SSD-PK6112	Three Rail Split Fence
SSD-PK6113	Two Rail Split Fence
SSD-PK 6120	Bicycle Baffle
SSD-PK 6200	Games Court Layout
SSD-PK 6250	Soccer Backstop
SSD-PK 6258	Baseball Backstop - Plan
SSD-PK 6259	Baseball Backstop – Section
SSD-PK 6260	Temporary Backstop
SSD-PK 6268	Tennis Courts - Layout
SSD-PK 6272	Tennis Courts – Chain Link Perimeter Fence




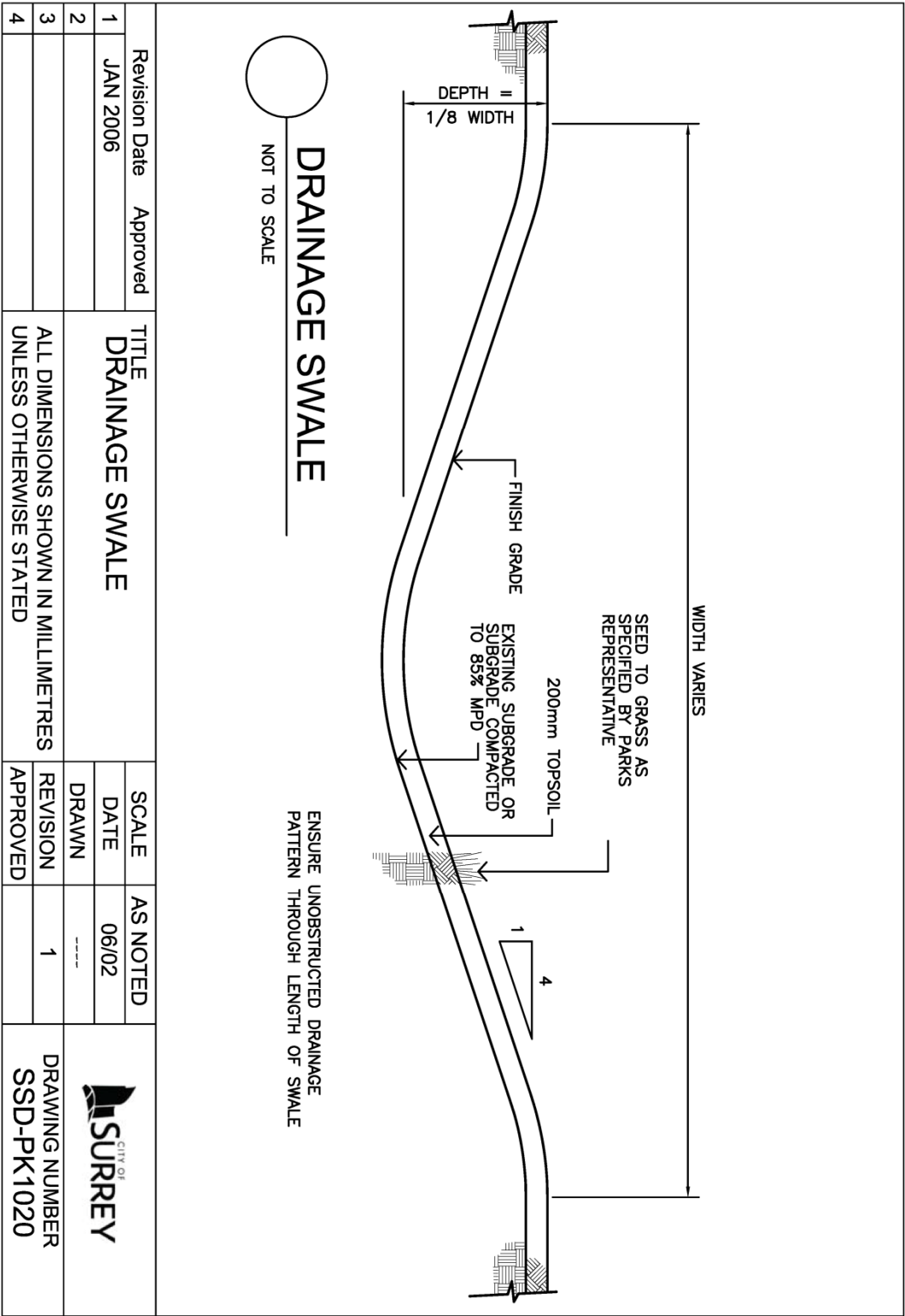


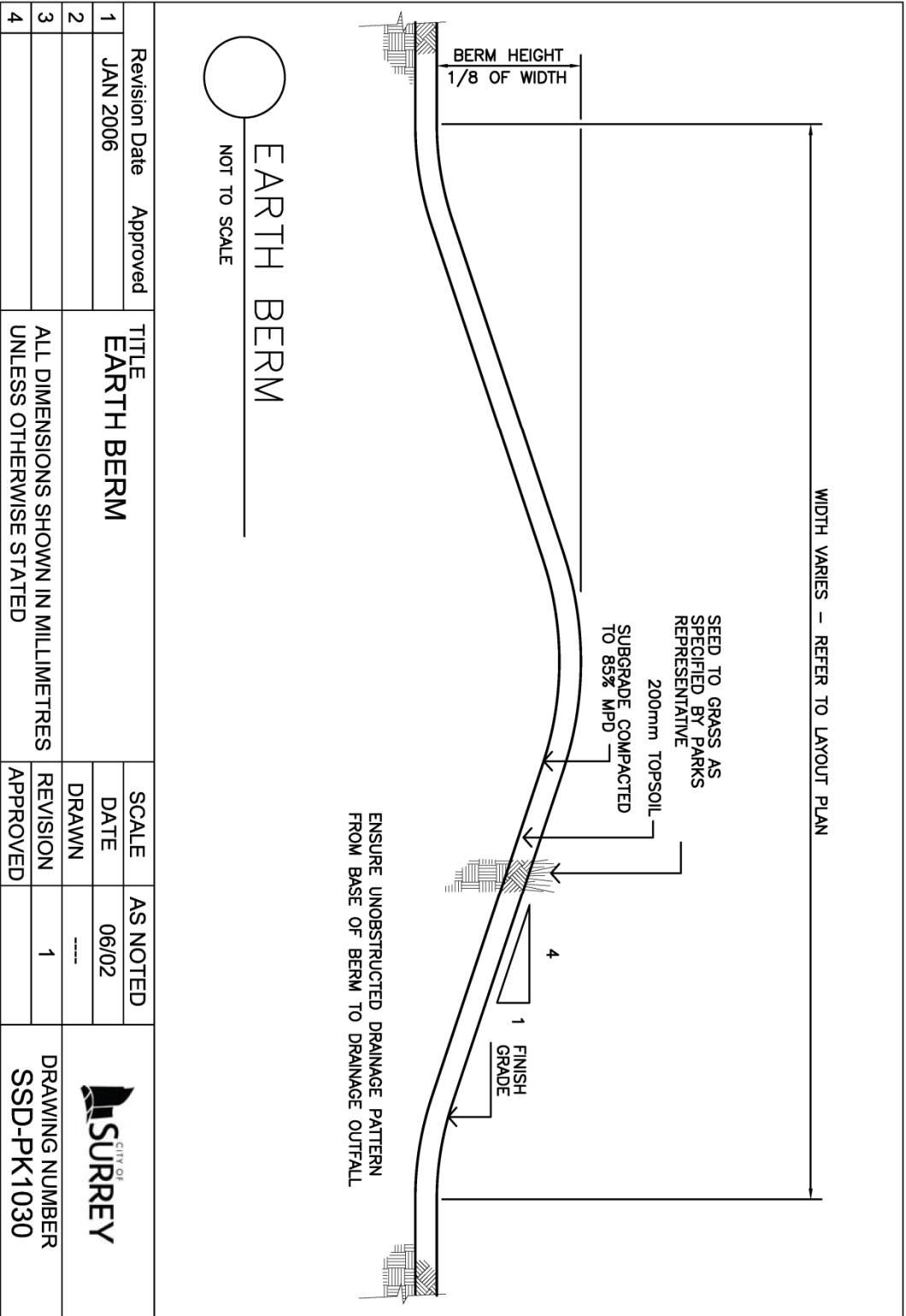
TITLE

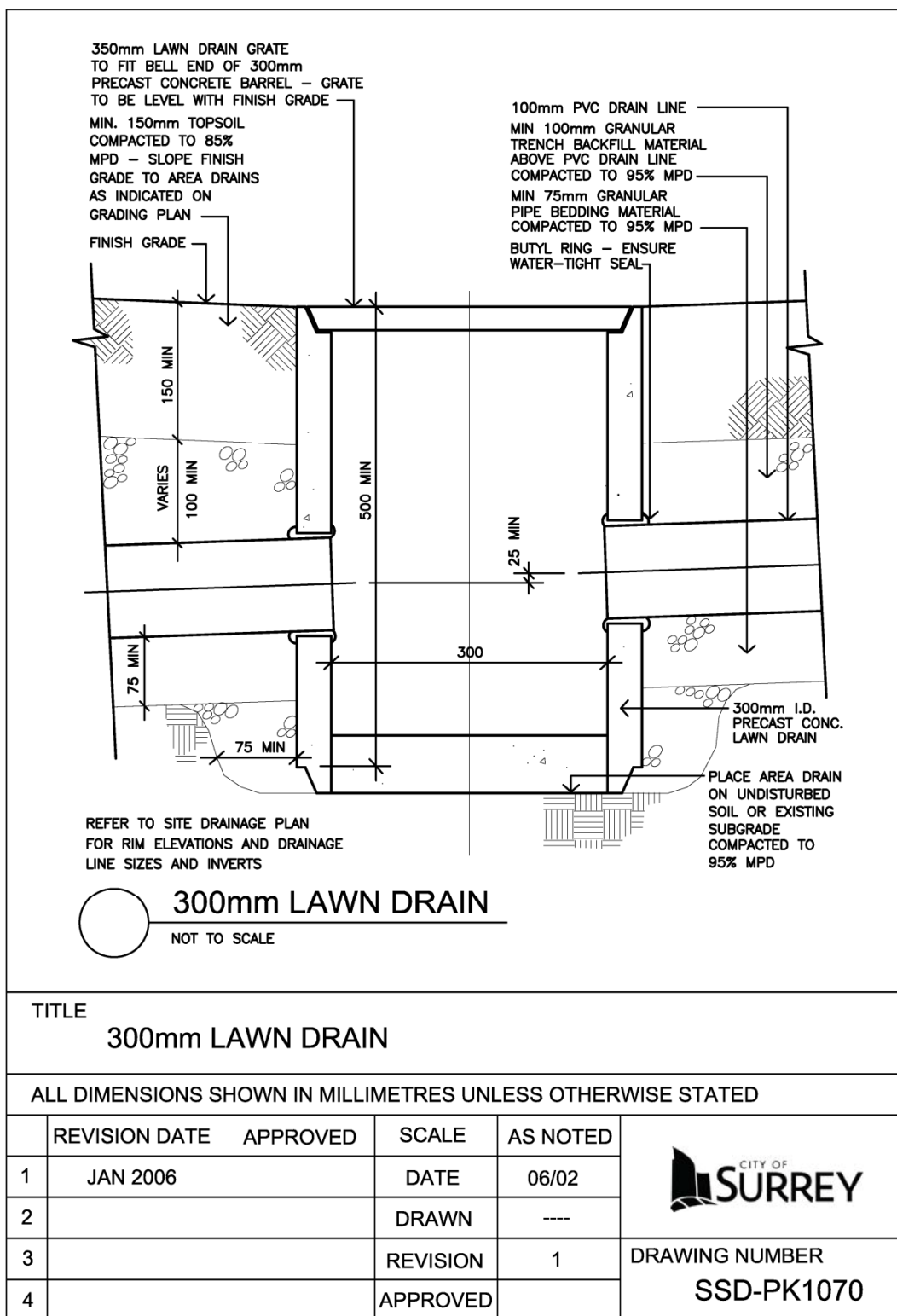
600mm NATURAL AREAS DRAIN

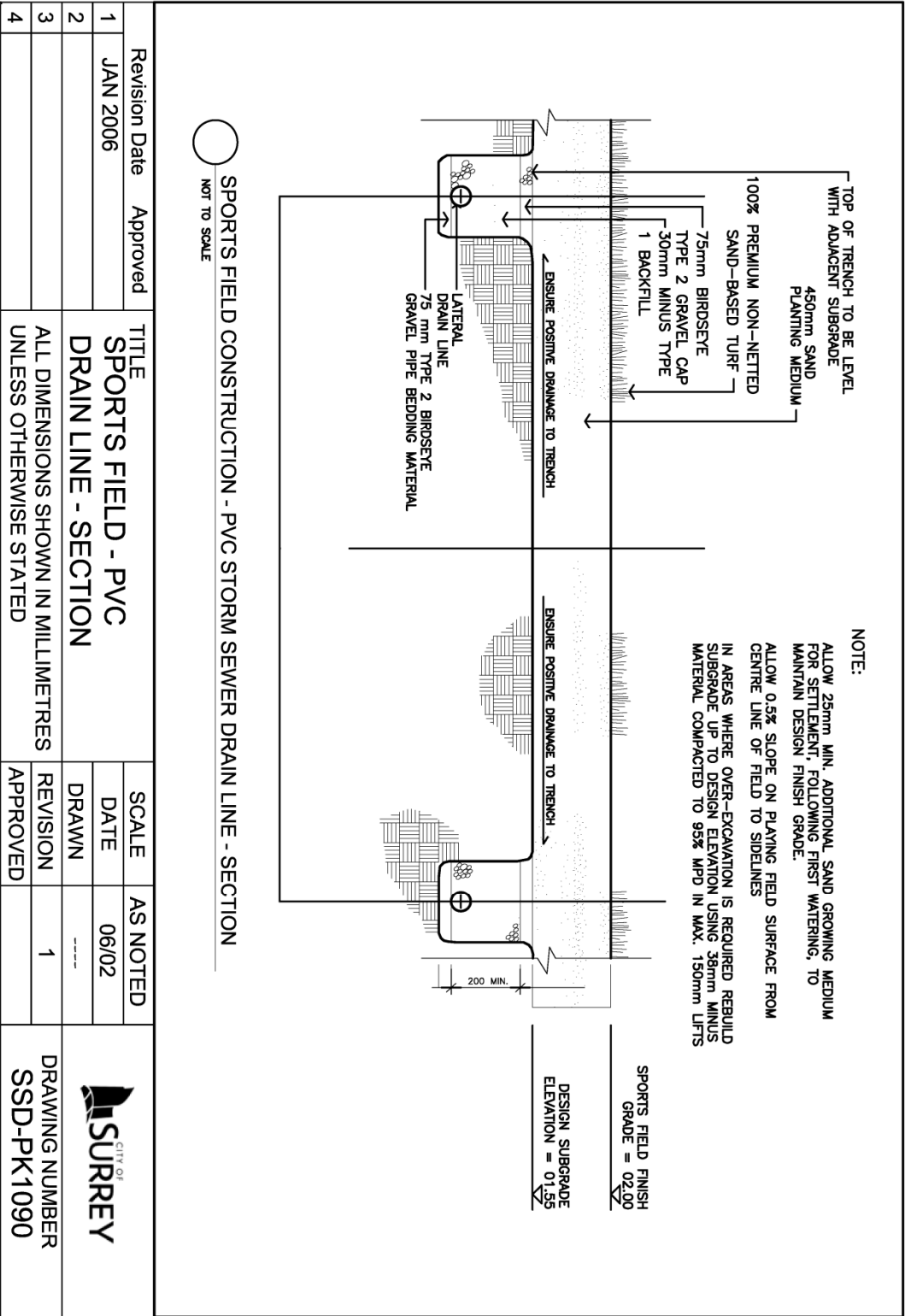
ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

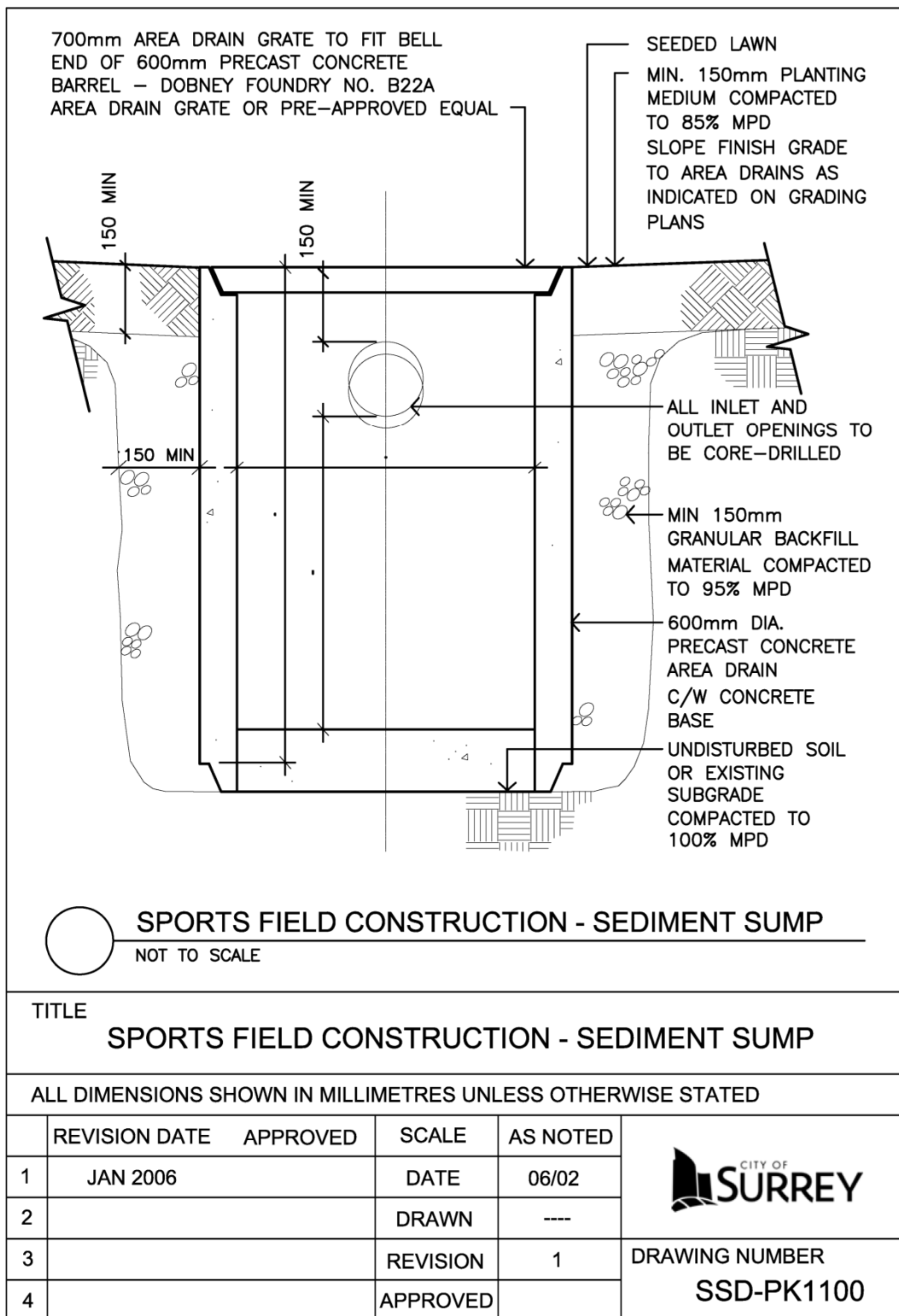
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1	JAN 2006		DATE	10/09	
2			DRAWN	MEB	
3			REVISION	1	
4			APPROVED		

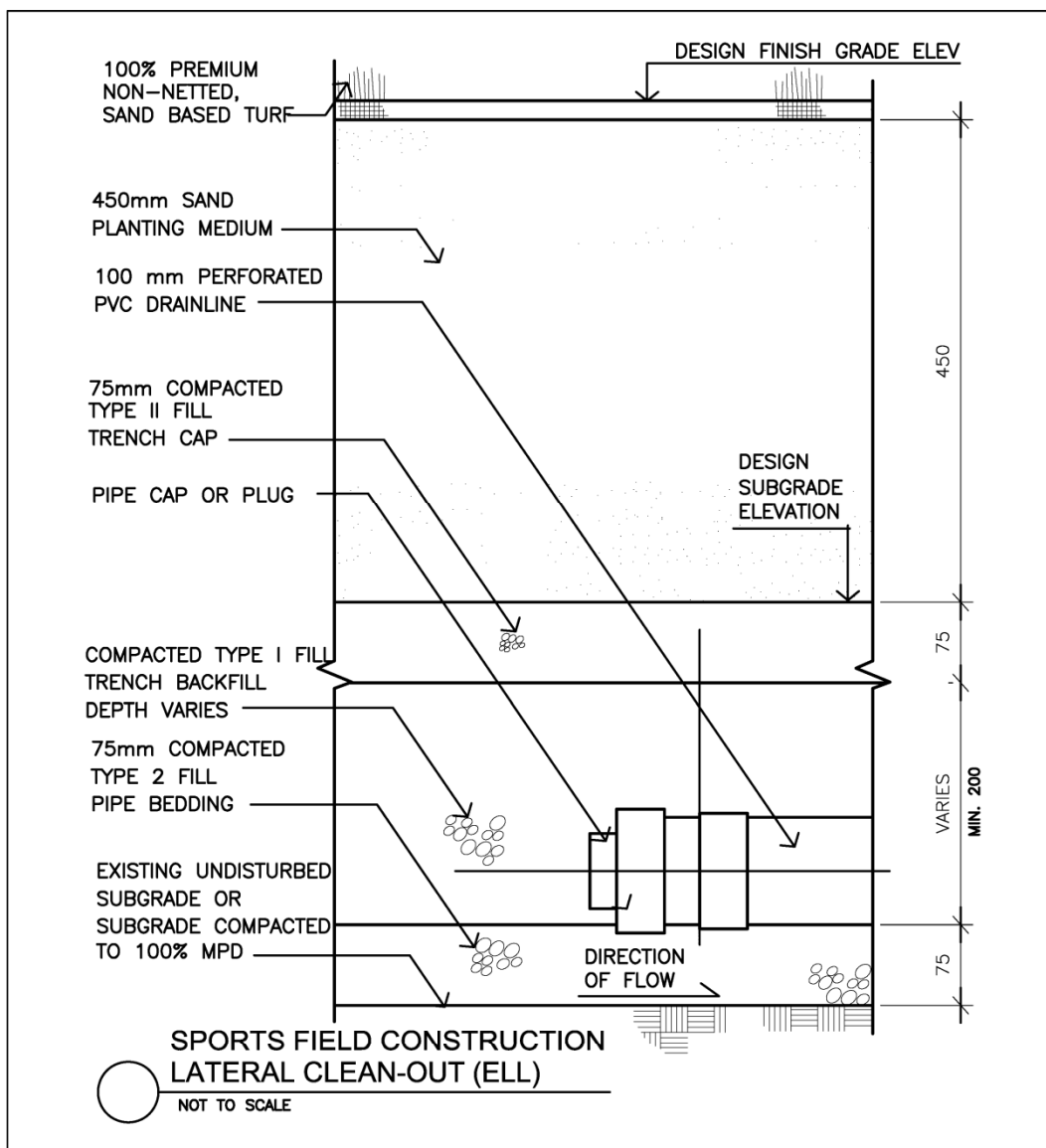









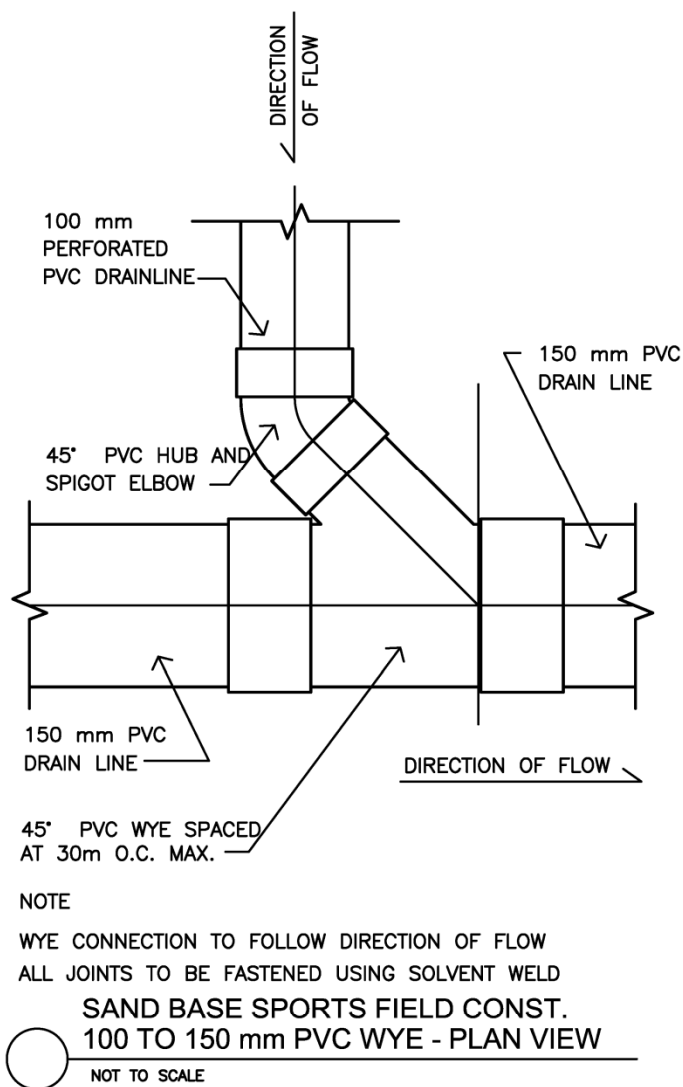




TITLE **SPORTS FIELD CONSTRUCTION LATERAL CLEAN-OUT
(ELL)**

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED


	REVISION DATE	APPROVED	SCALE	AS NOTED	 DRAWING NUMBER SSD-PK1111
1	JAN 2006	TLU	DATE	06/02	
2			DRAWN	---	
3			REVISION	1	
4			APPROVED		

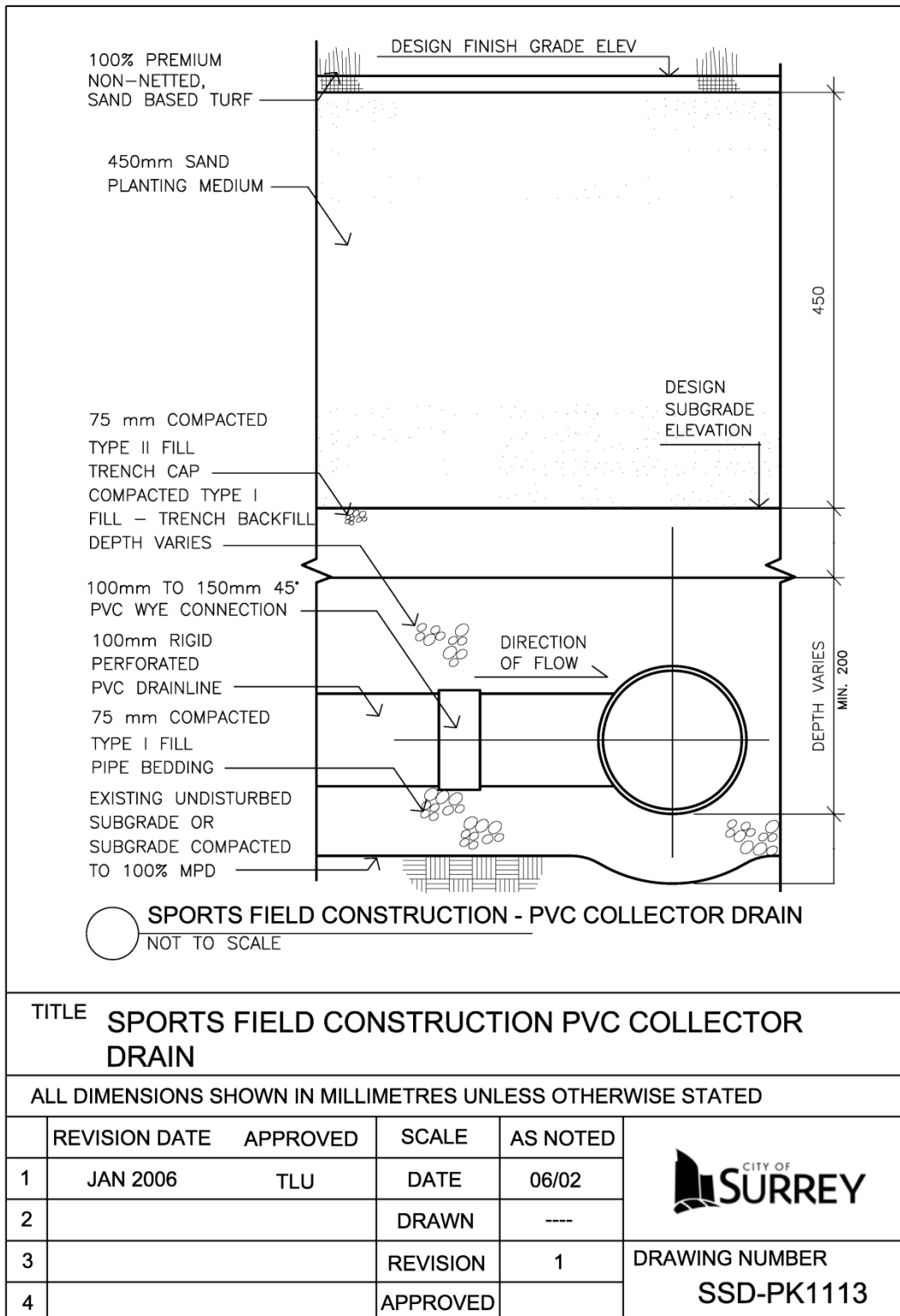


TITLE

100 TO 150mm PVC WYE - PLAN VIEW


ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

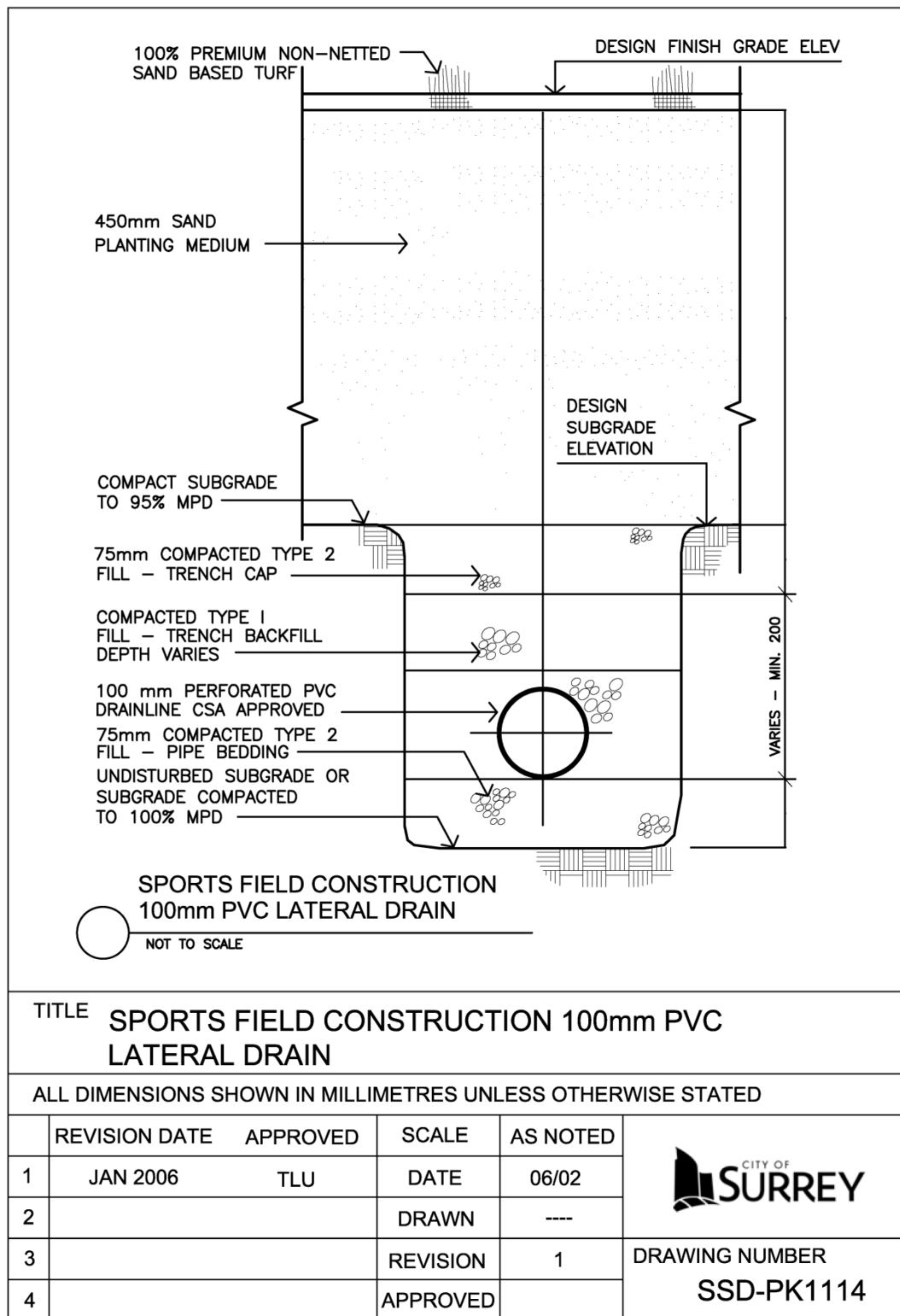
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1	JAN 2006		DATE	06/02	
2			DRAWN	----	
3			REVISION	1	
4			APPROVED		DRAWING NUMBER SSD-PK1112



TITLE **SPORTS FIELD CONSTRUCTION PVC COLLECTOR DRAIN**

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

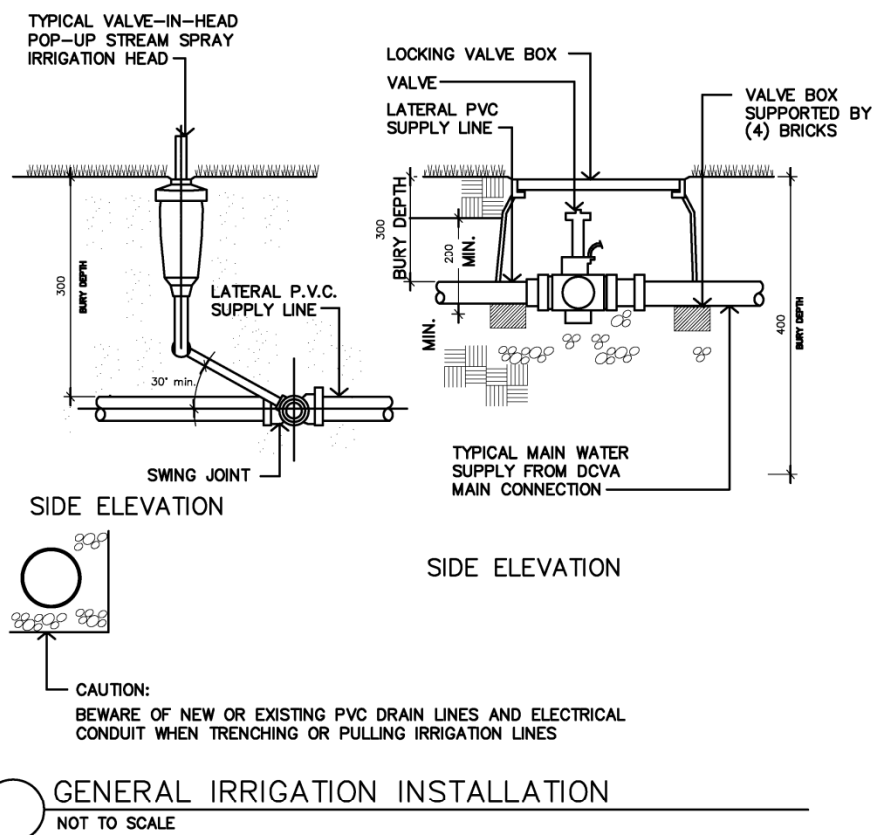
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1	JAN 2006	TLU	DATE	06/02	
2			DRAWN	---	
3			REVISION	1	
4			APPROVED		



NOTES:

BACKFILL MATERIAL TO MATCH SPECIFICATIONS FOR FIELD DRAINAGE MEDIA/FIELD OR GRASS AREA CONSTRUCTION AND CONSOLIDATION AS PER SURROUNDING/ADJACENT AREA.


PROVIDE 200mm MIN. DRAINAGE MEDIUM BENEATH ELECTRIC VALVE AND VALVE BOX, TO FACILITATE DRAINAGE.

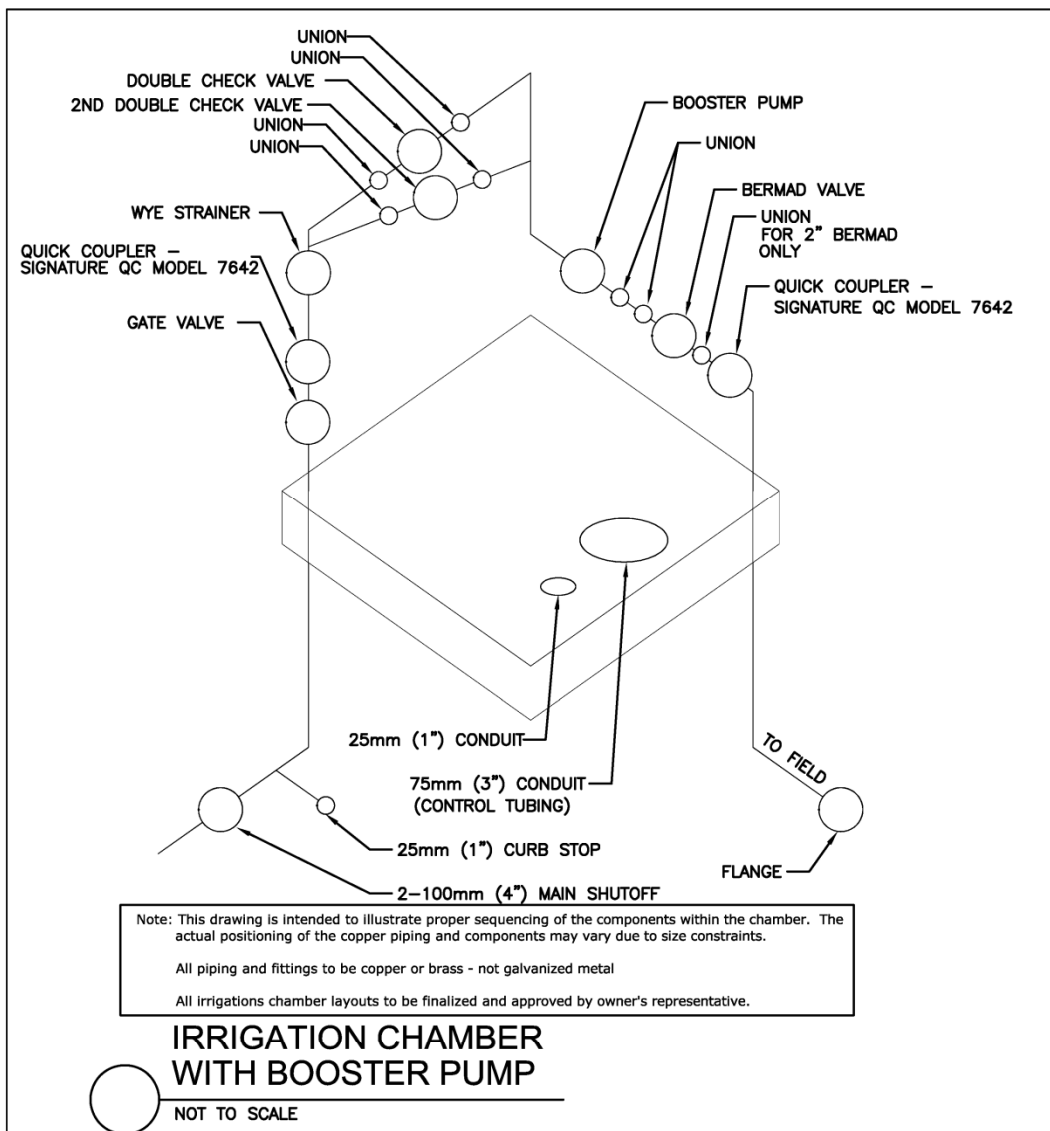


TITLE

GENERAL IRRIGATION INSTALLATION

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED


	REVISION DATE	APPROVED	SCALE	AS NOTED	 CITY OF SURREY DRAWING NUMBER SSD-PK2060
1	JAN 2006	TLU	DATE	06/02	
2	FEB 2011	TLU	DRAWN	----	
3			REVISION	2	
4			APPROVED		

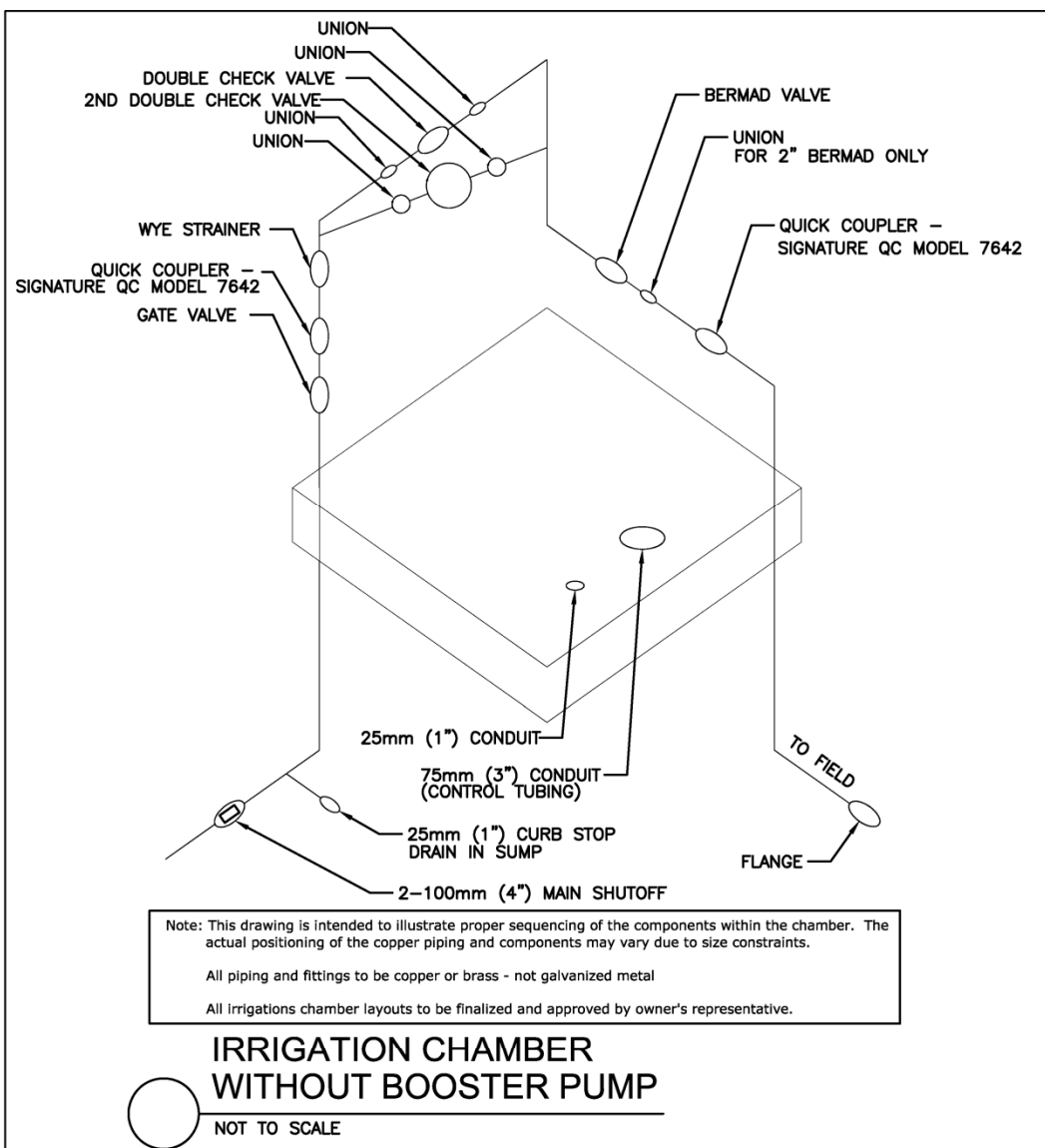


TITLE

IRRIGATION CHAMBER WITH BOOSTER PUMP

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED


	REVISION DATE	APPROVED	SCALE	AS NOTED	 DRAWING NUMBER SSD-PK2090
1	JAN 2006	TLU	DATE	06/02	
2	FEB 2011	TLU	DRAWN	----	
3			REVISION	2	
4			APPROVED		



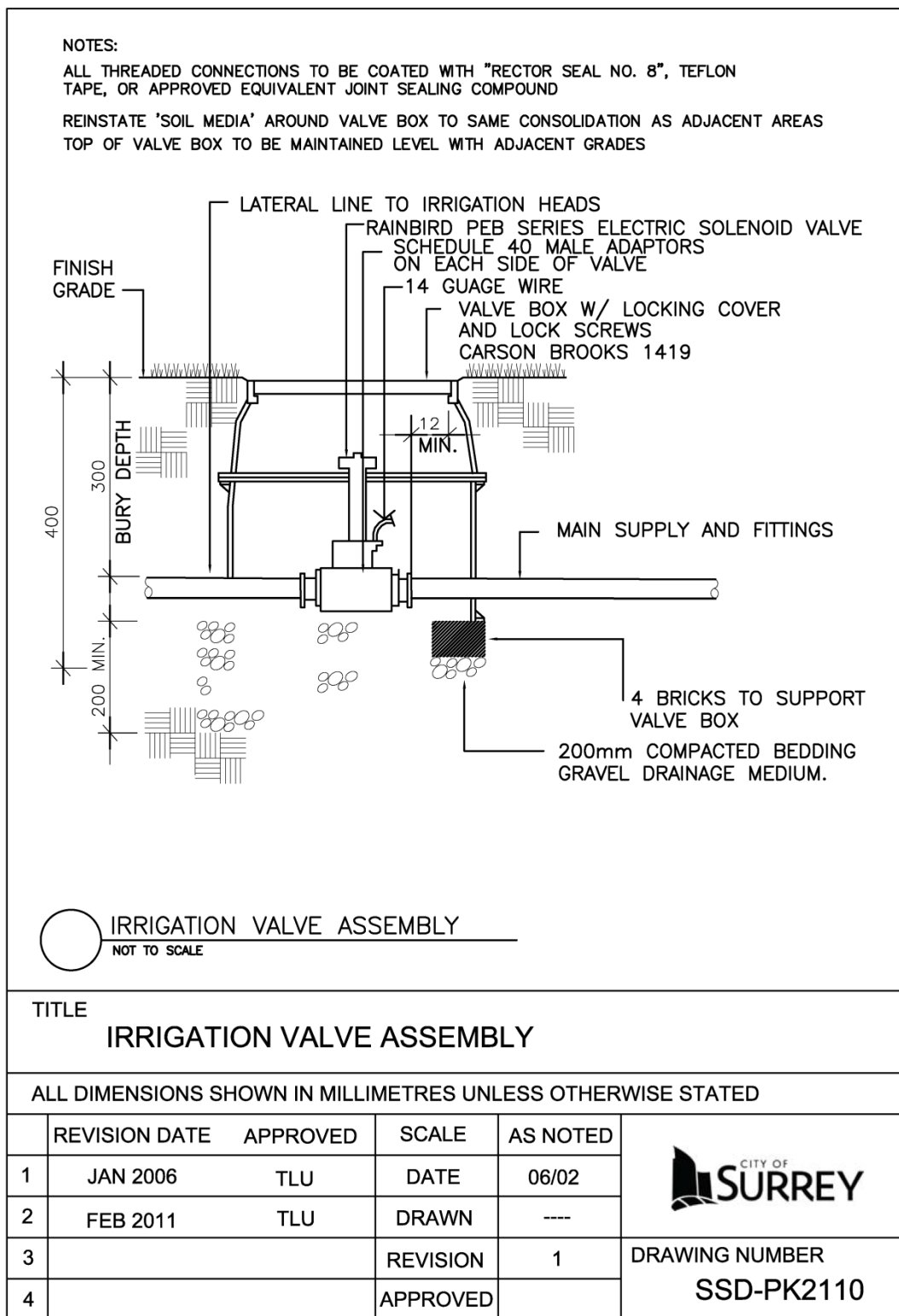
TITLE

IRRIGATION CHAMBER WITHOUT BOOSTER PUMP

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

	REVISION DATE	APPROVED	SCALE	AS NOTED	 DRAWING NUMBER SSD-PK2091
1	JAN 2006	TLU	DATE	06/02	
2	FEB 2011	TLU	DRAWN	----	
3			REVISION	2	
4			APPROVED		

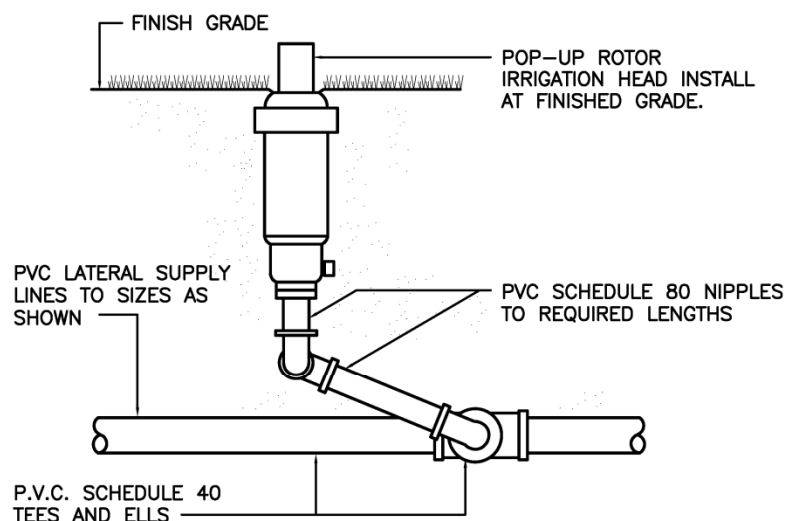
DETAILS
Spring 2011



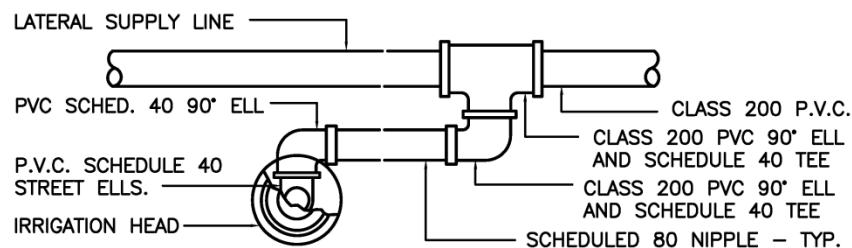
NOTES:

ALL THREADED CONNECTIONS TO BE COATED WITH NO. 8 TEFLON TAPE

USE W/P GEL TYPE CONNECTORS



SIDE ELEVATION




PLAN VIEW

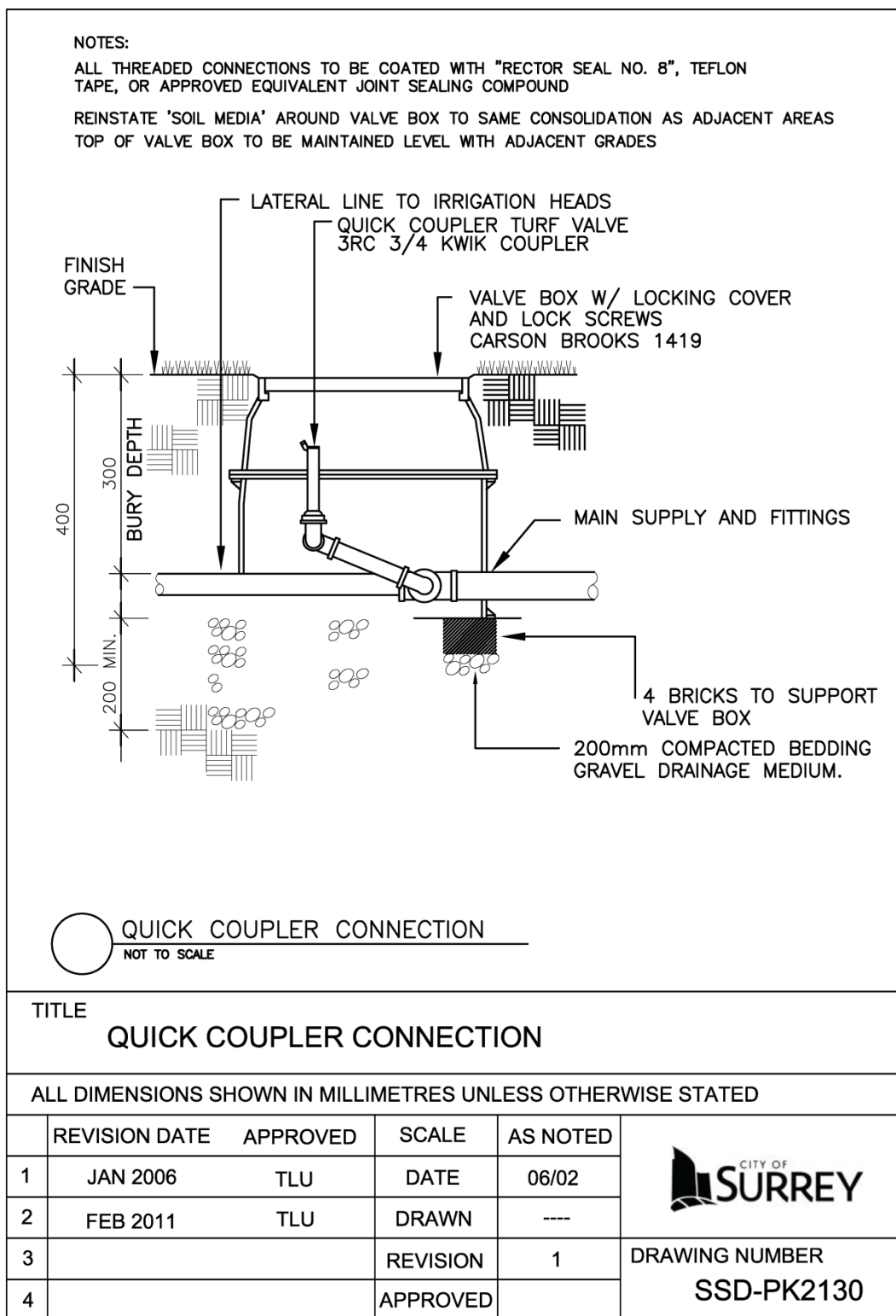


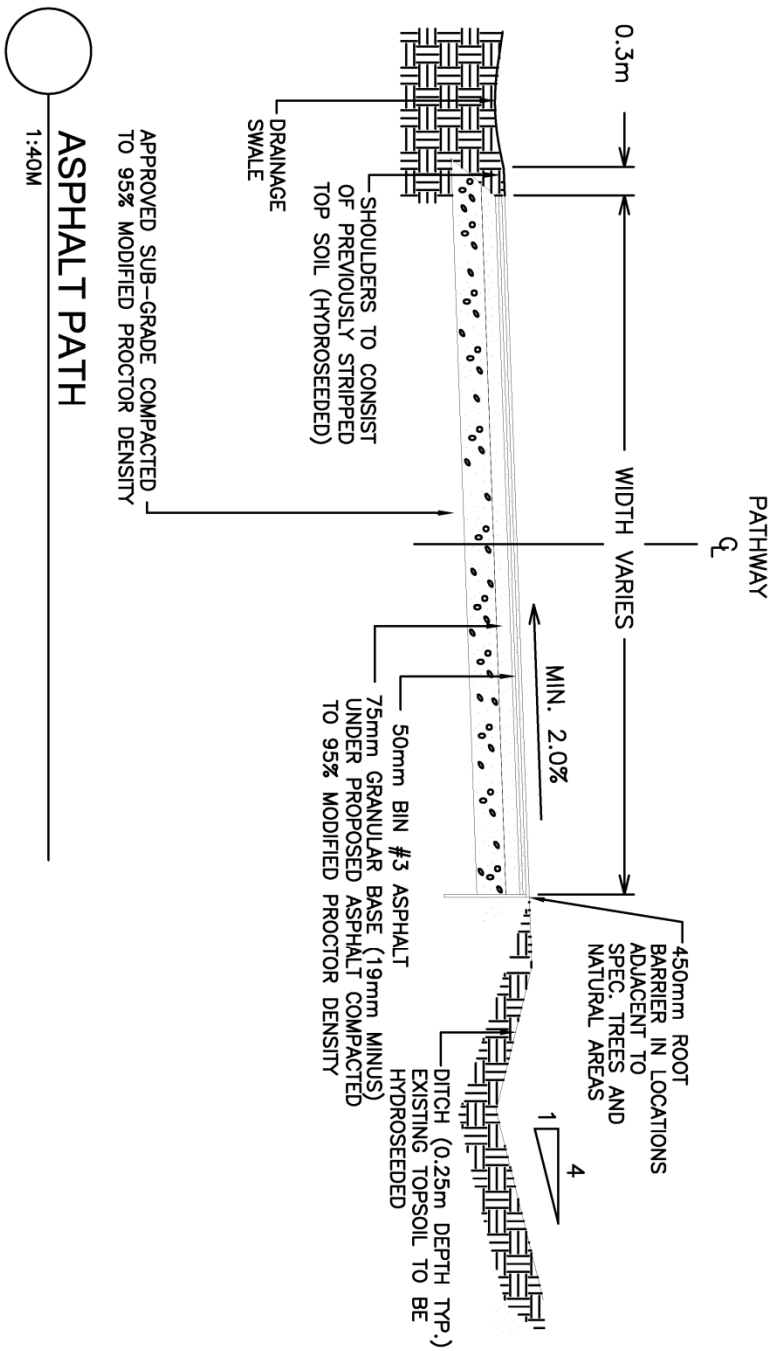
TITLE

SWING JOINT RISE ASSEMBLY

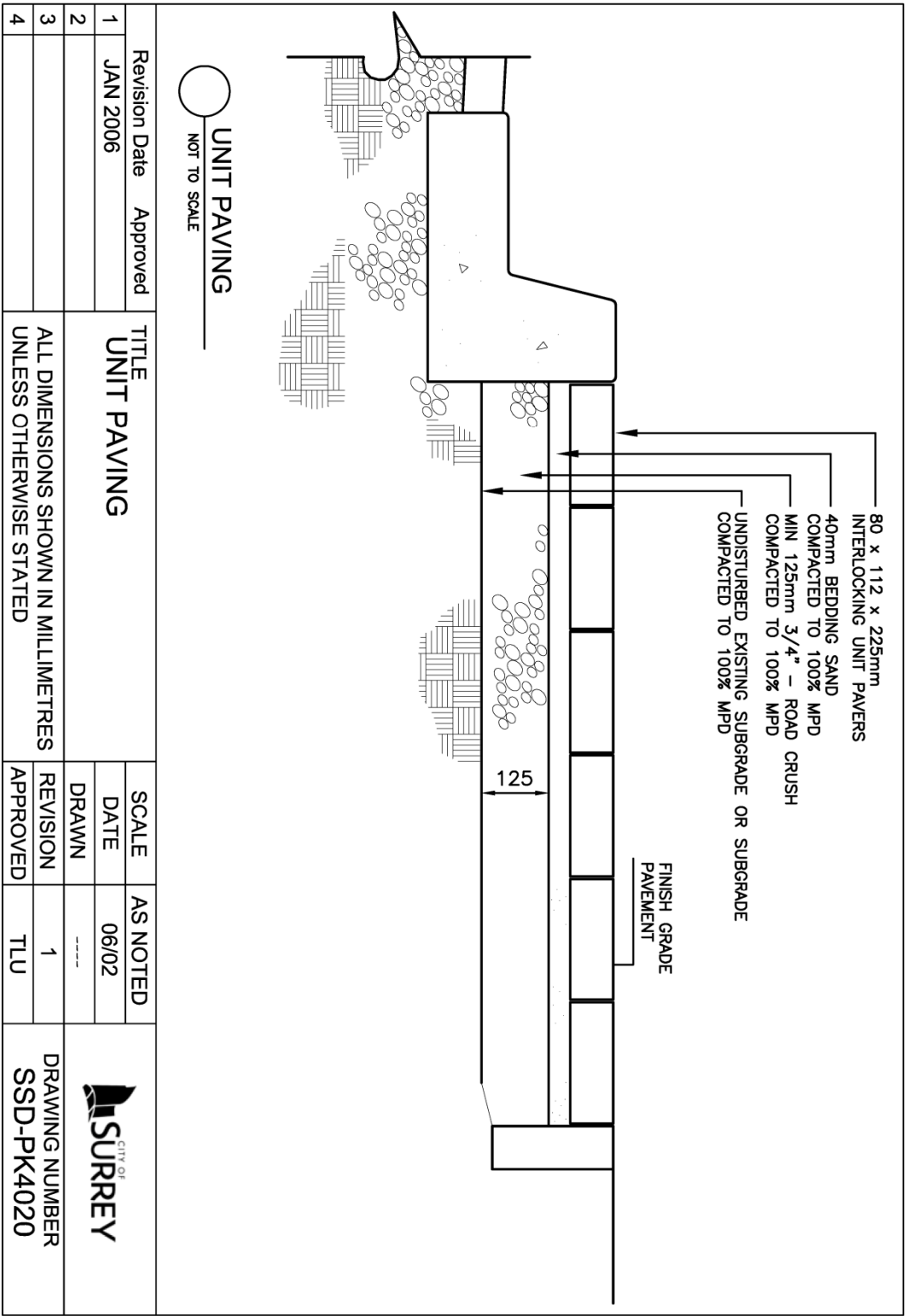
ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

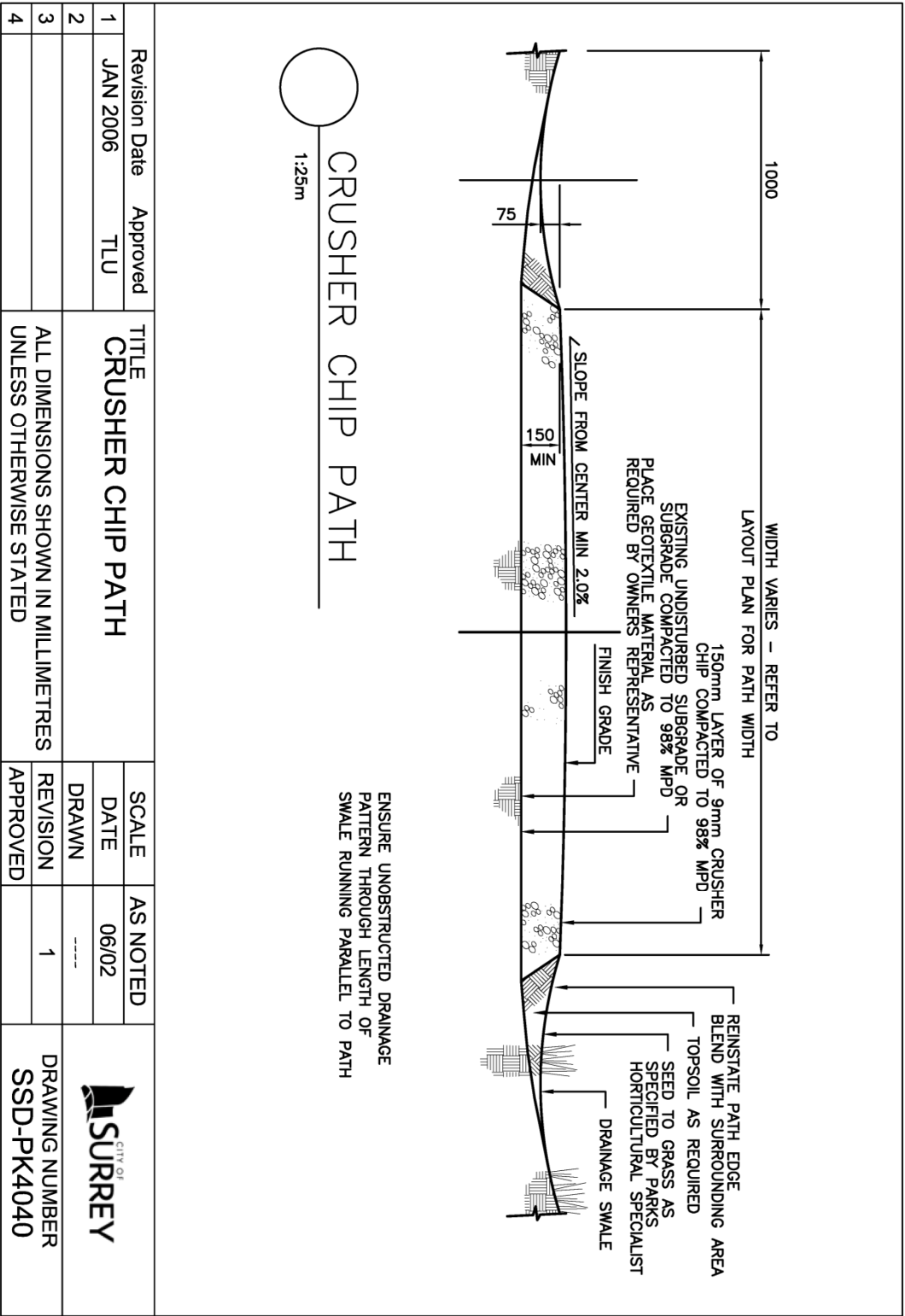
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1	JAN 2006	TLU	DATE	06/02		
2			DRAWN	----		
3			REVISION	1		
4			APPROVED			

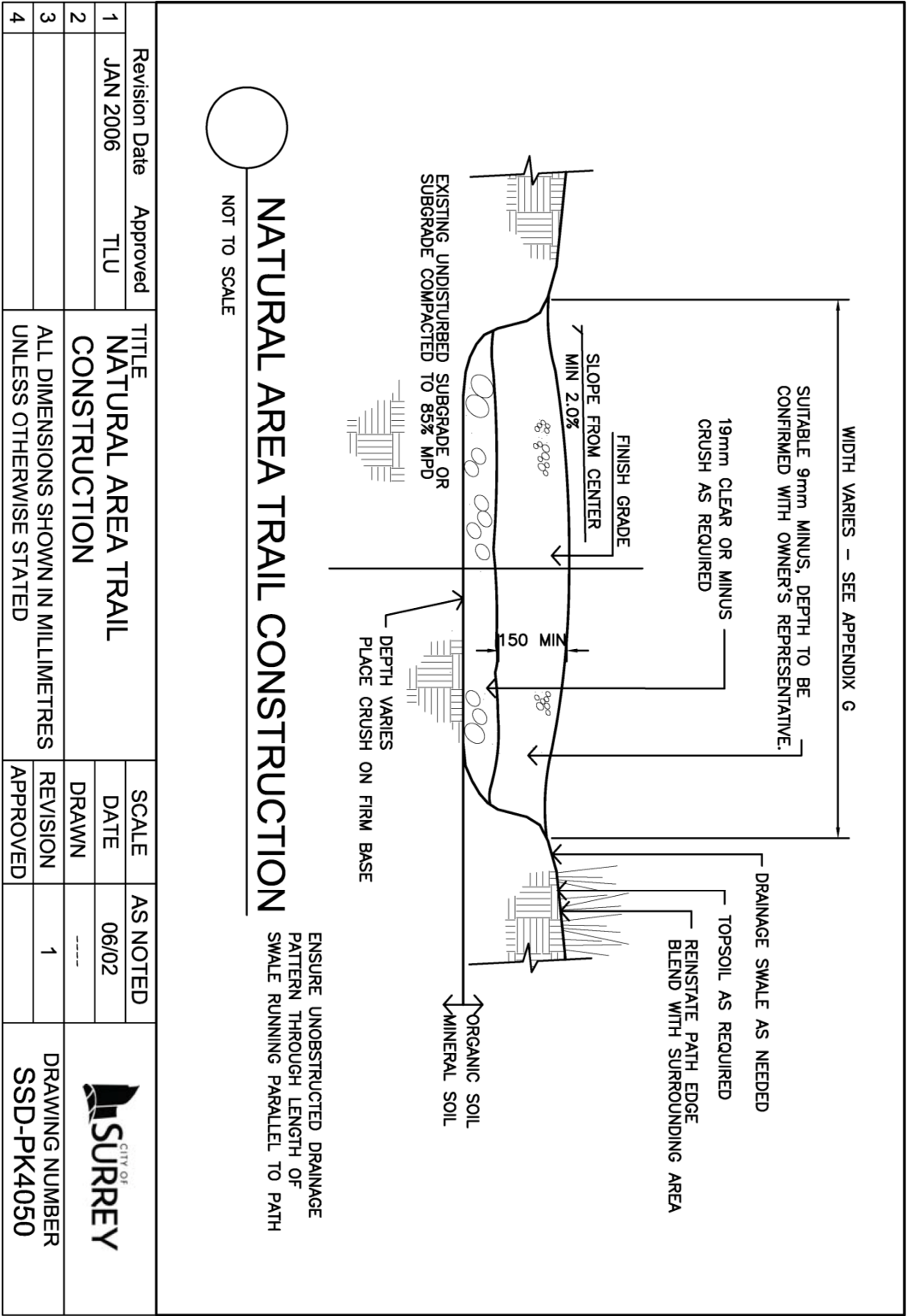




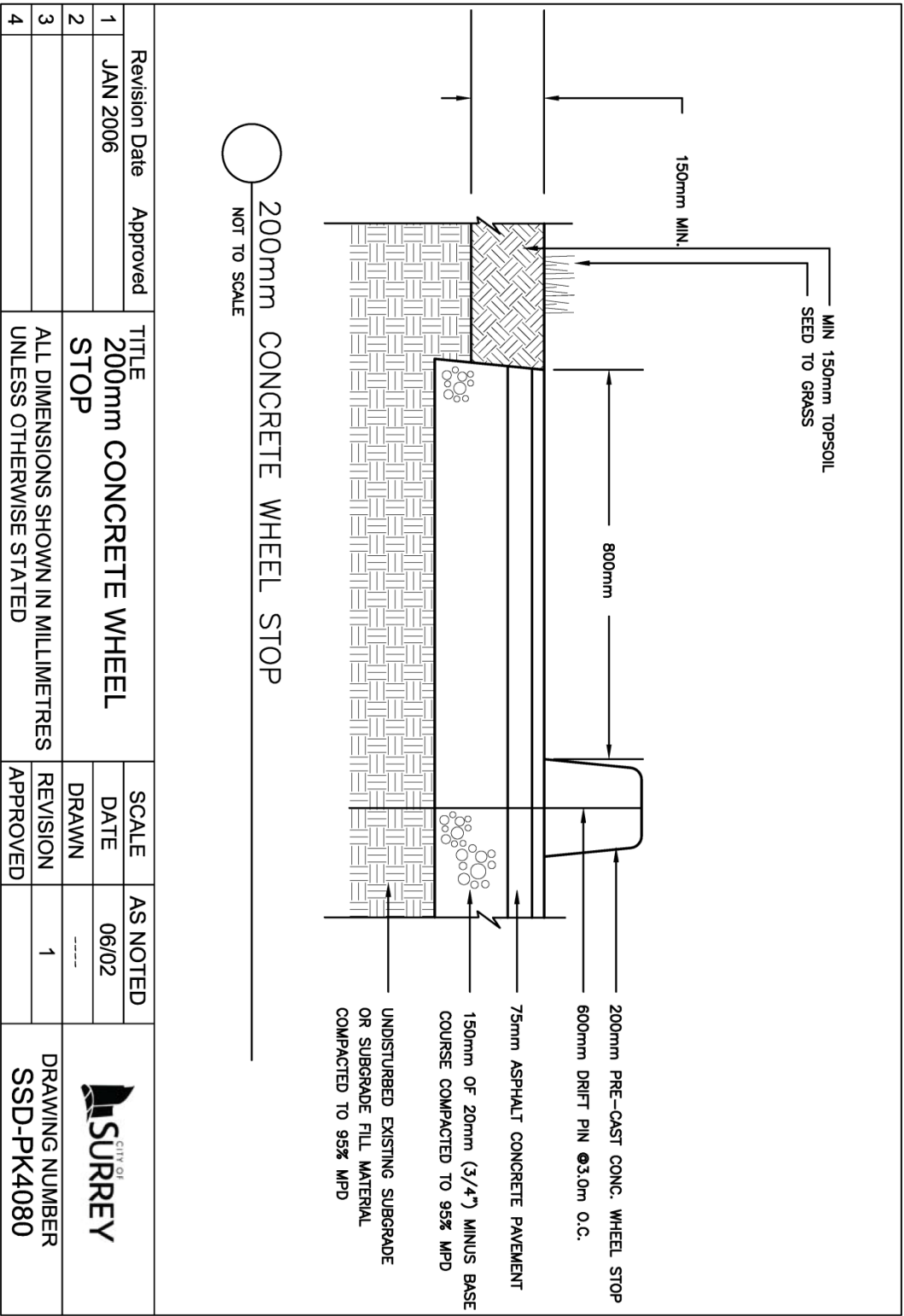
Revision Date		Approved	TITLE		SCALE		AS NOTED	 DRAWING NUMBER SSD-PK4010
1	JAN 2006	TLU	ASPHALT PATH		DATE	06/02		
2	APRIL 2009	TLU			DRAWN			
3					REVISION	1		
4			ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED		APPROVED			

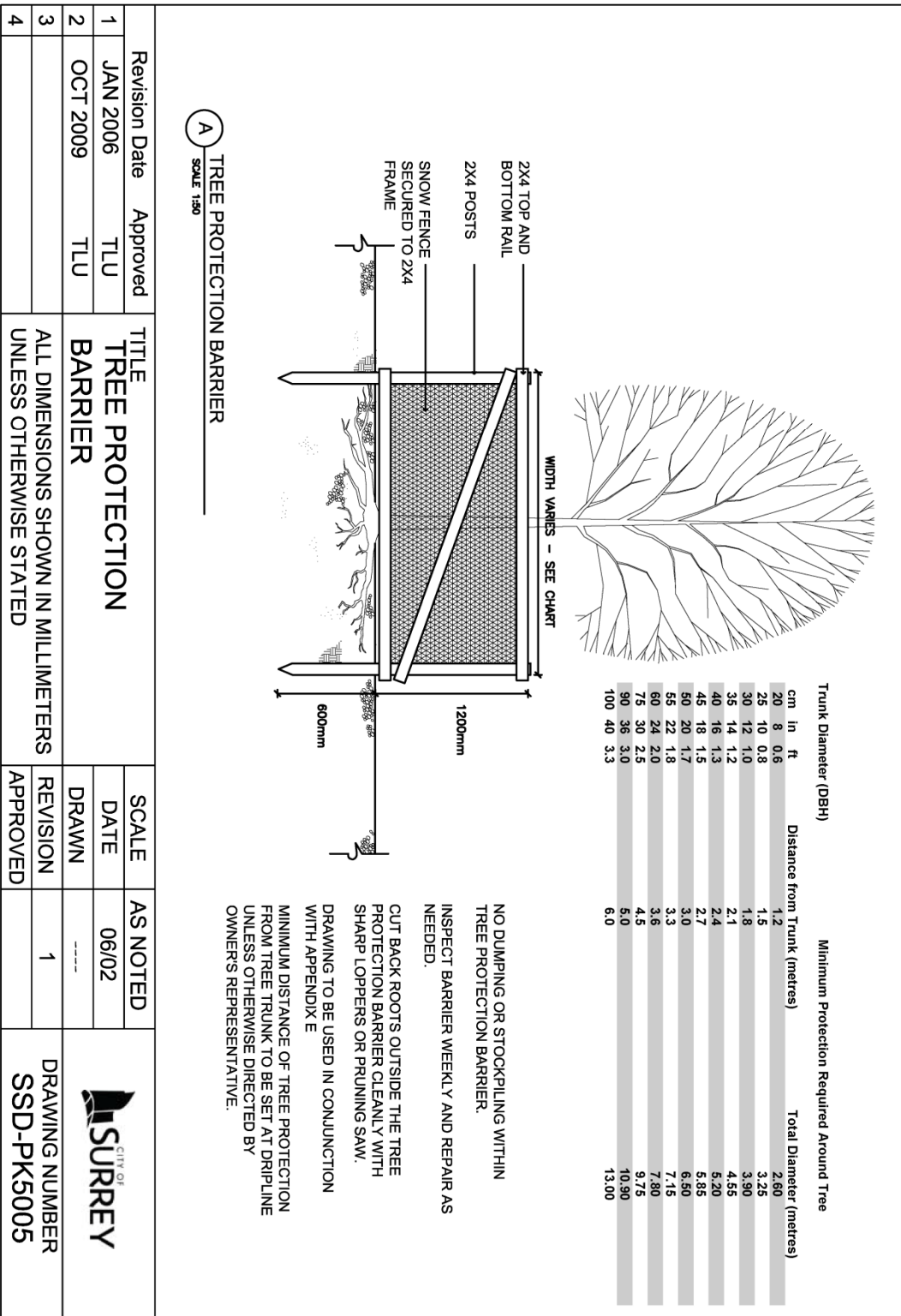


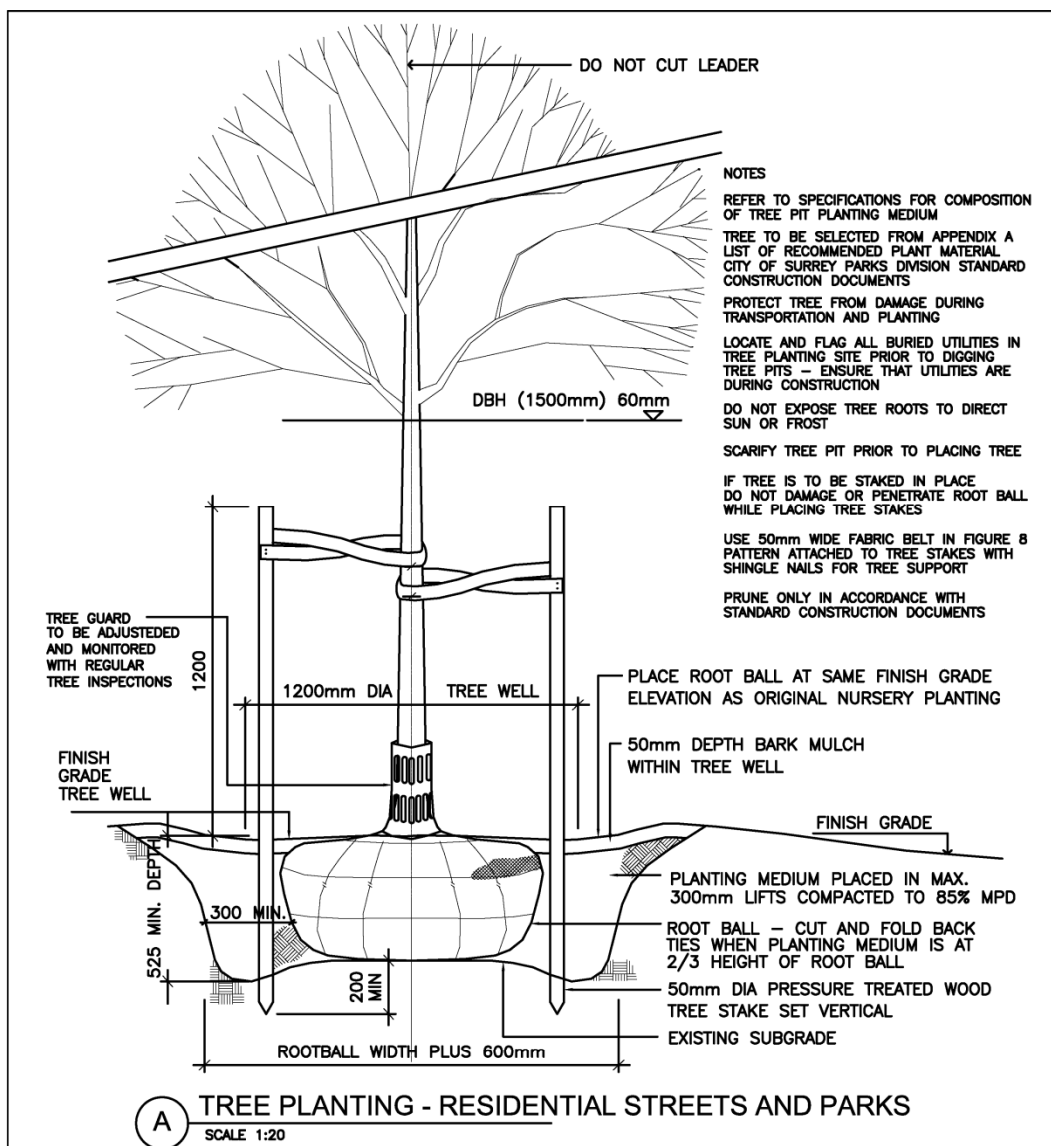











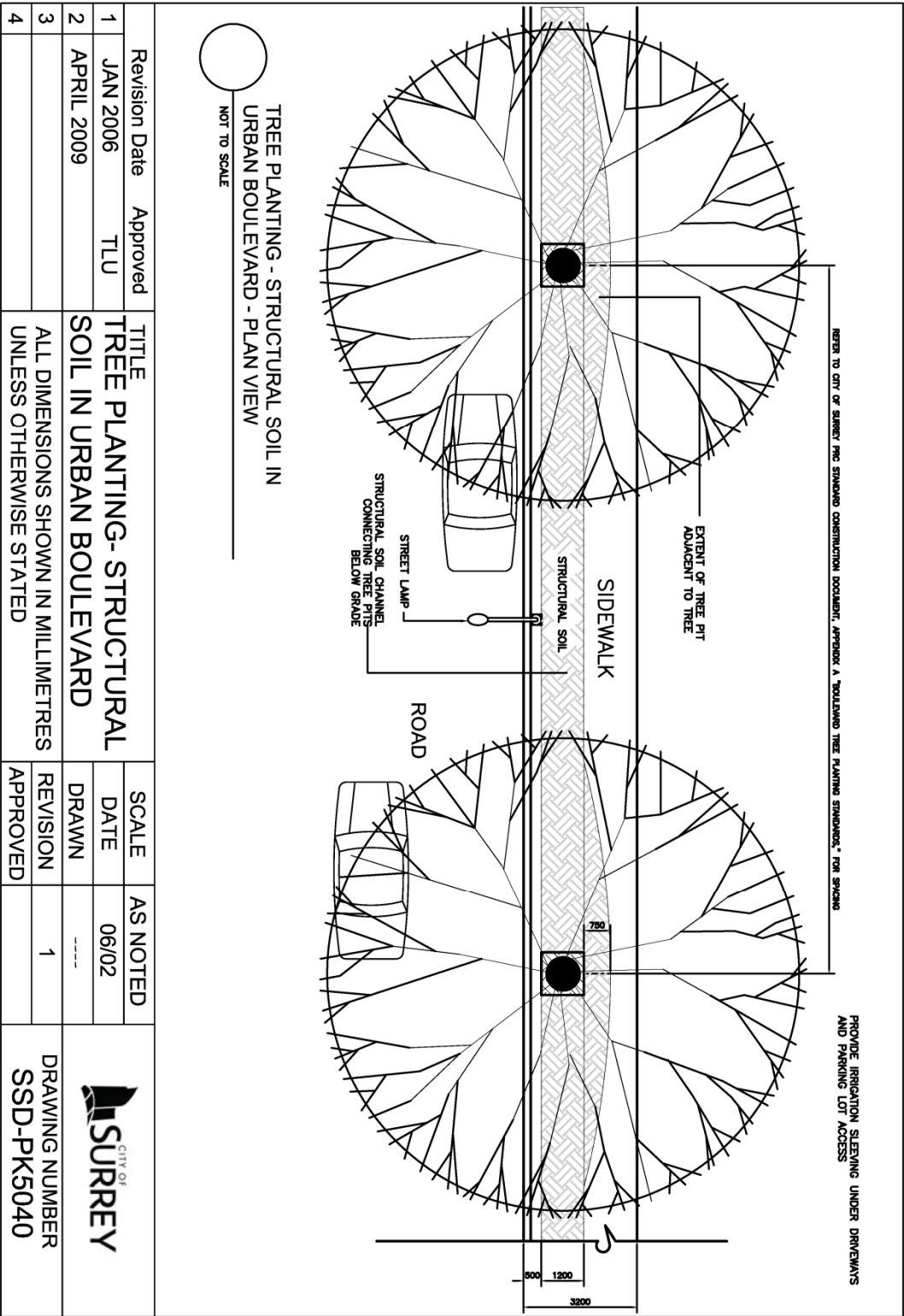


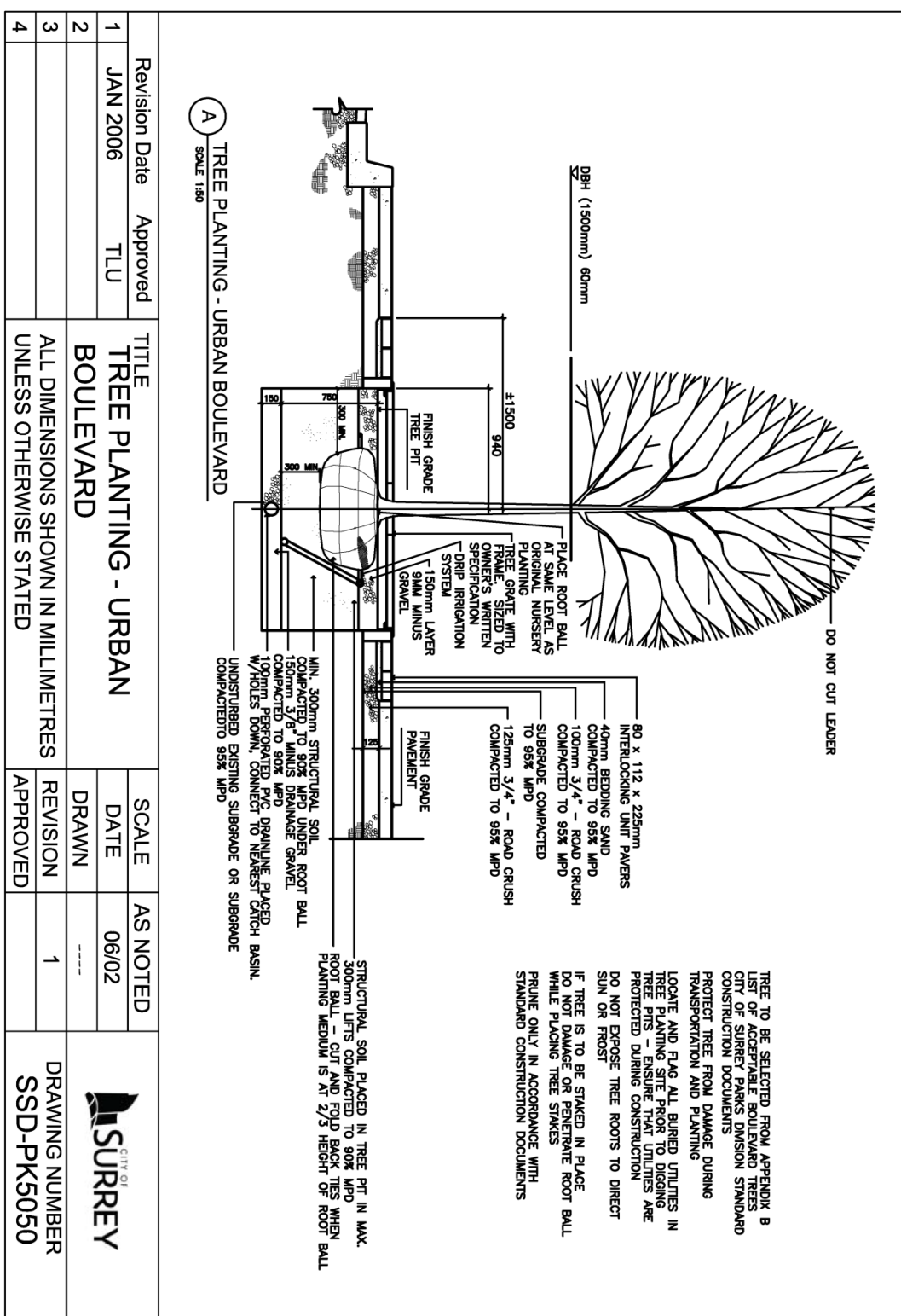
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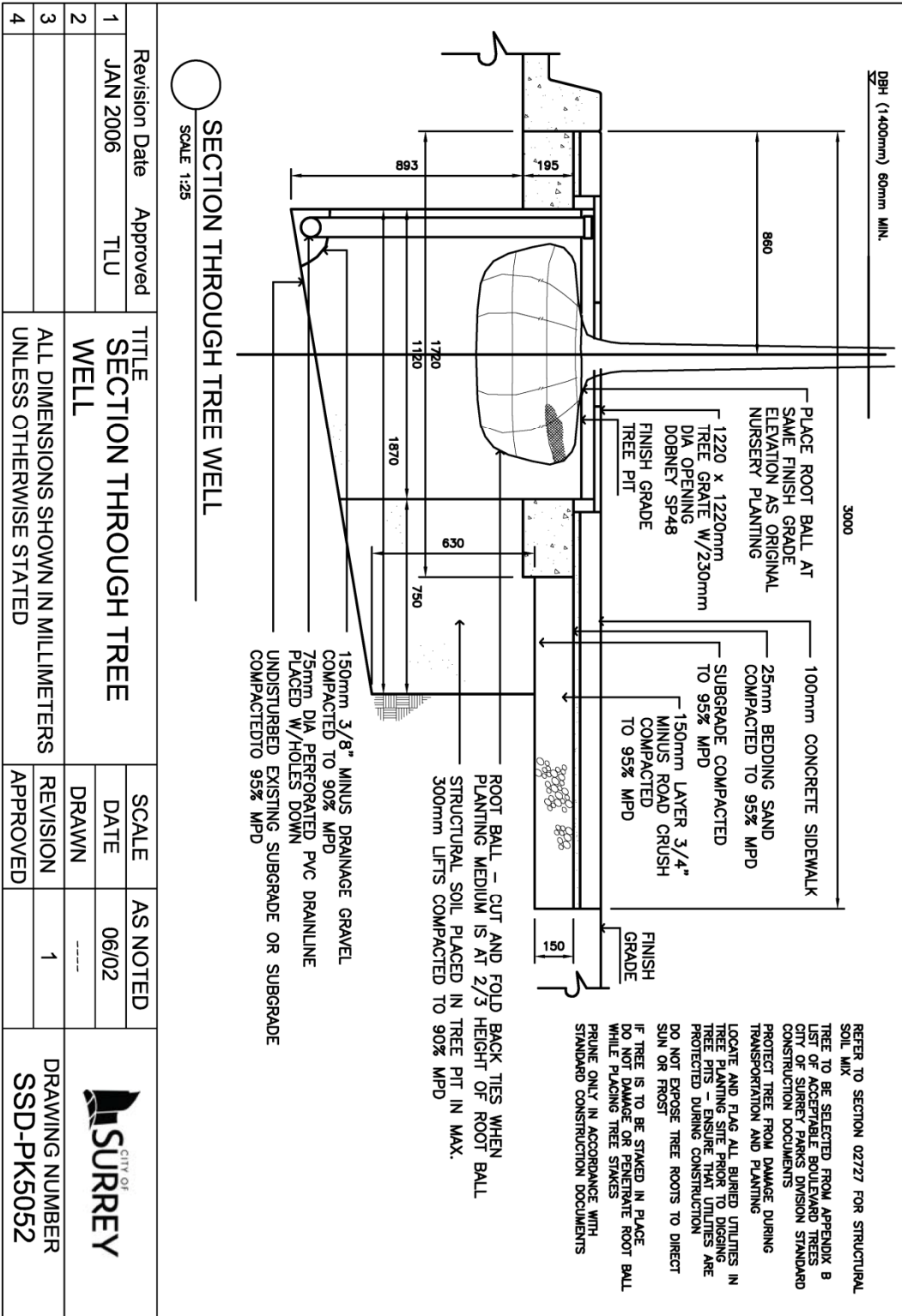
TREE PLANTING - RESIDENTIAL STREETS AND PARKS

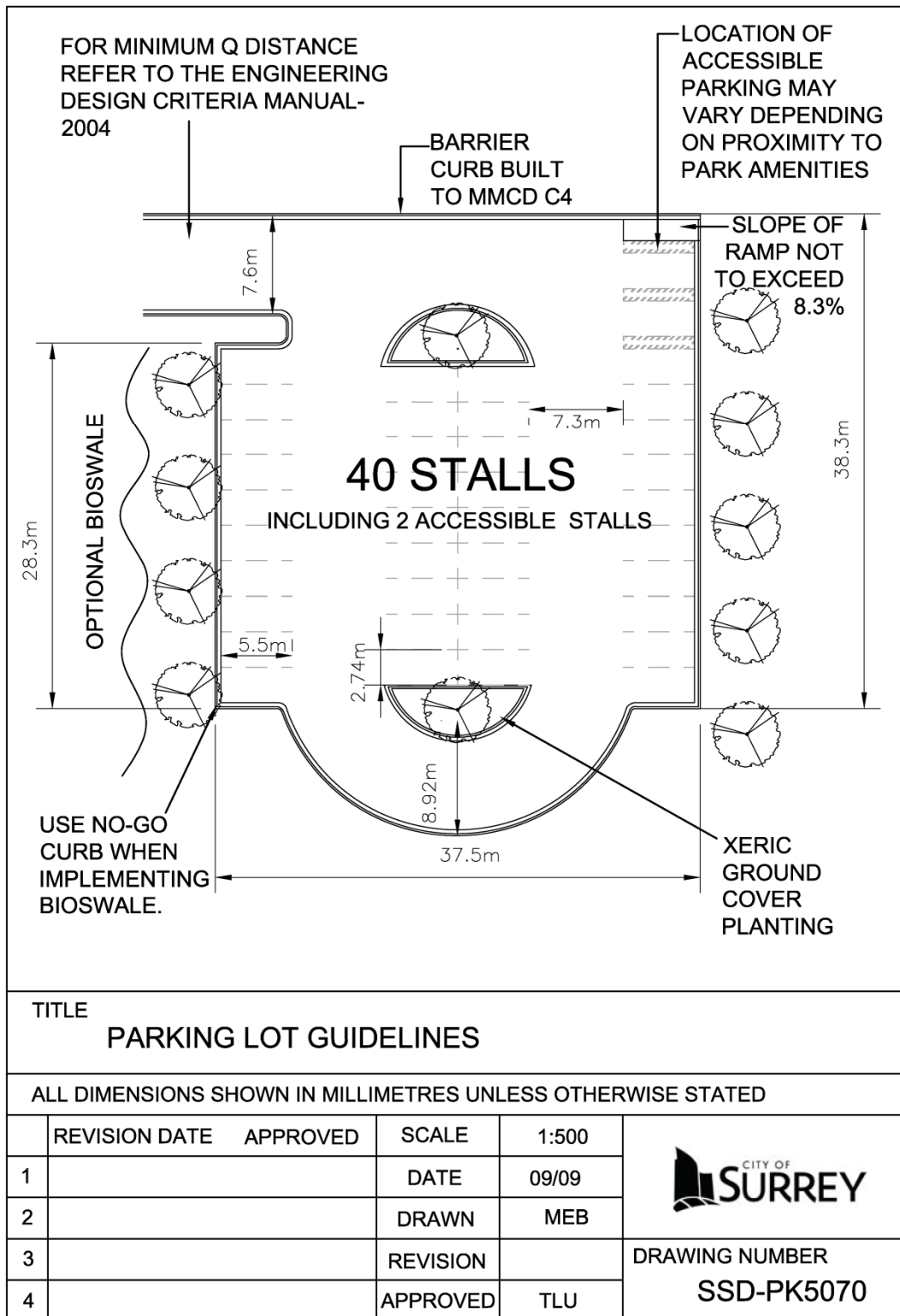
ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

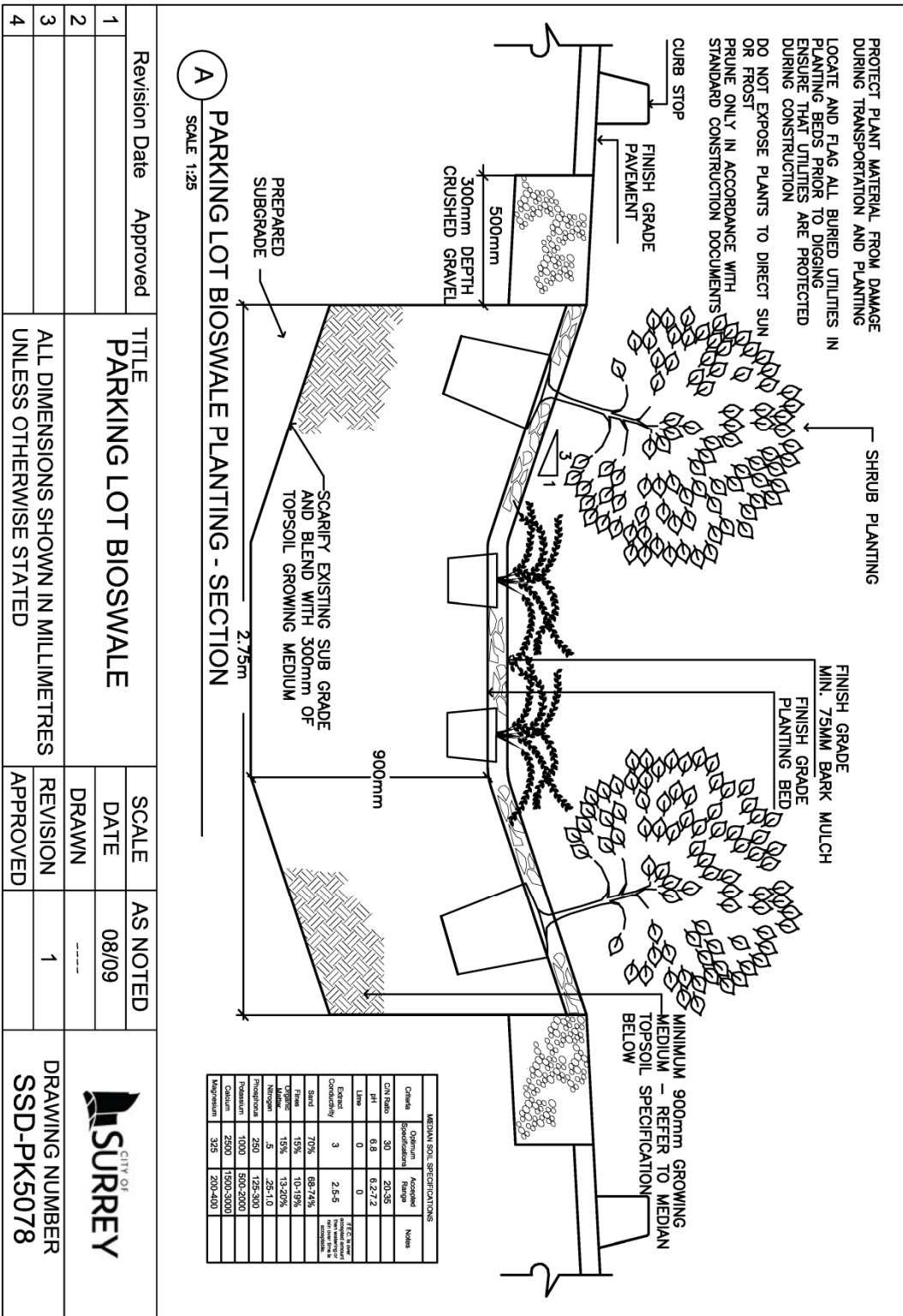
	REVISION DATE	APPROVED	SCALE	AS NOTED	
1	JAN 2006	TLU	DATE	06/02	
2	OCT 2009	TLU	DRAWN	----	
3			REVISION	1	
4			APPROVED		DRAWING NUMBER SSD-PK5010

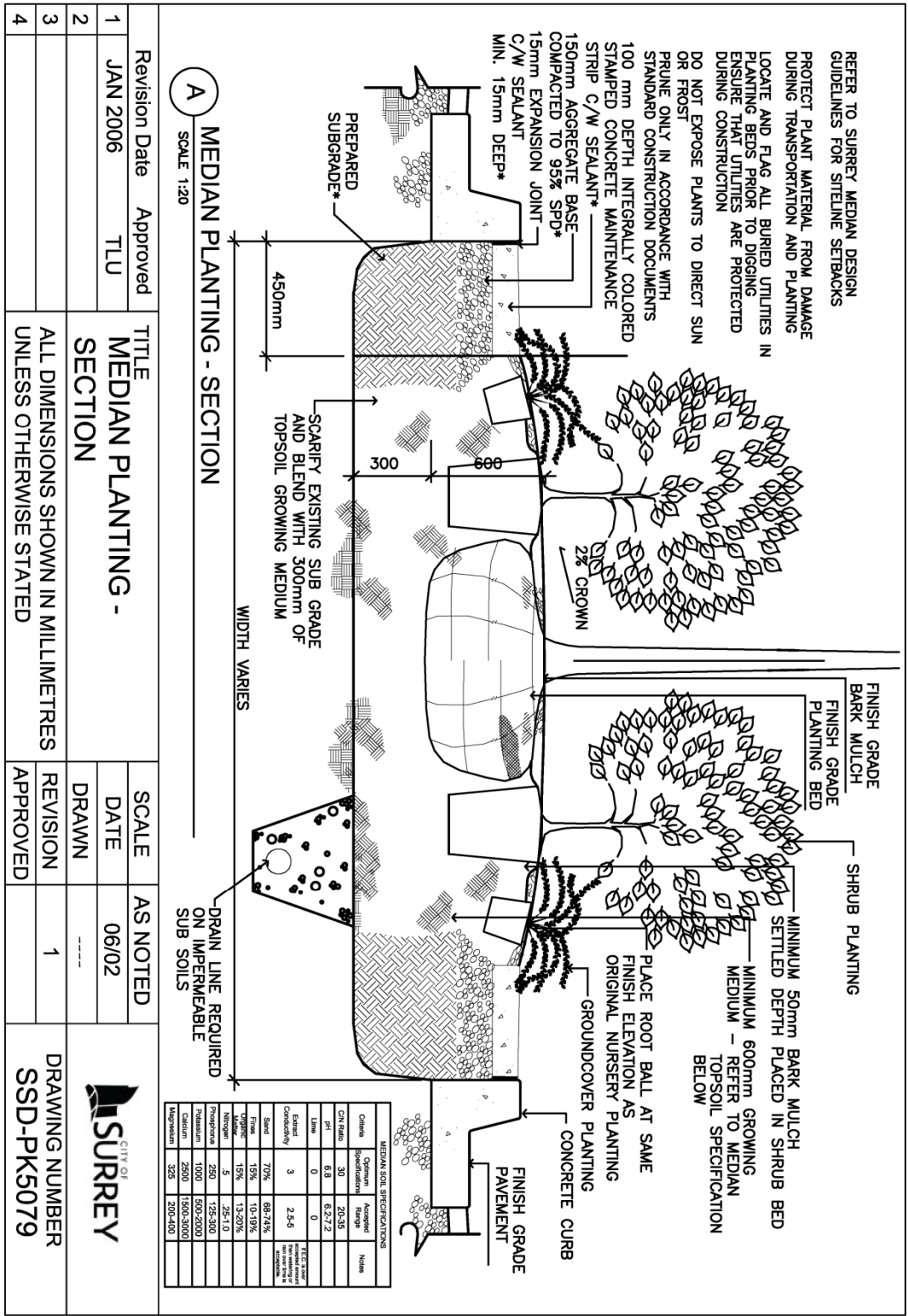


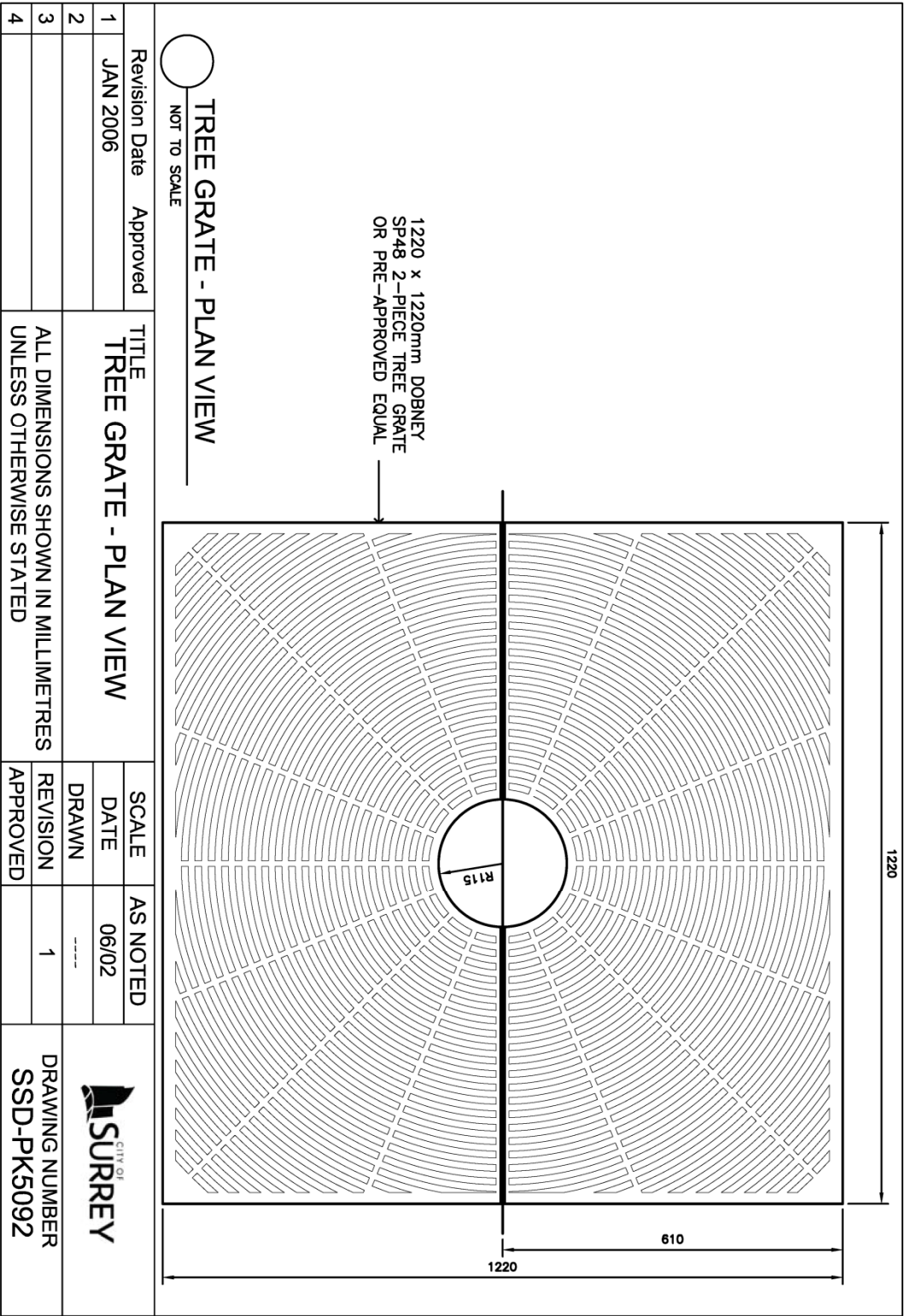


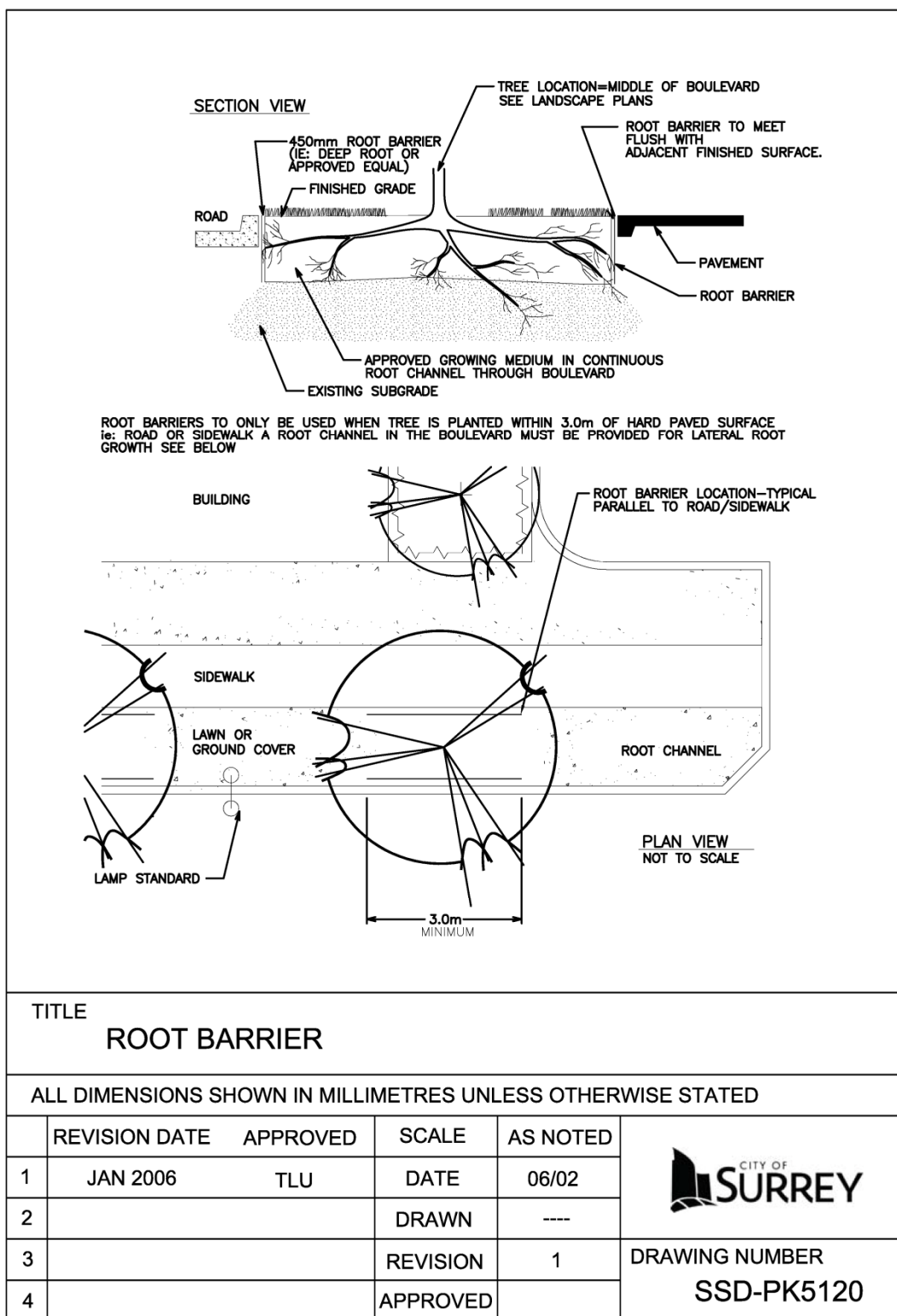


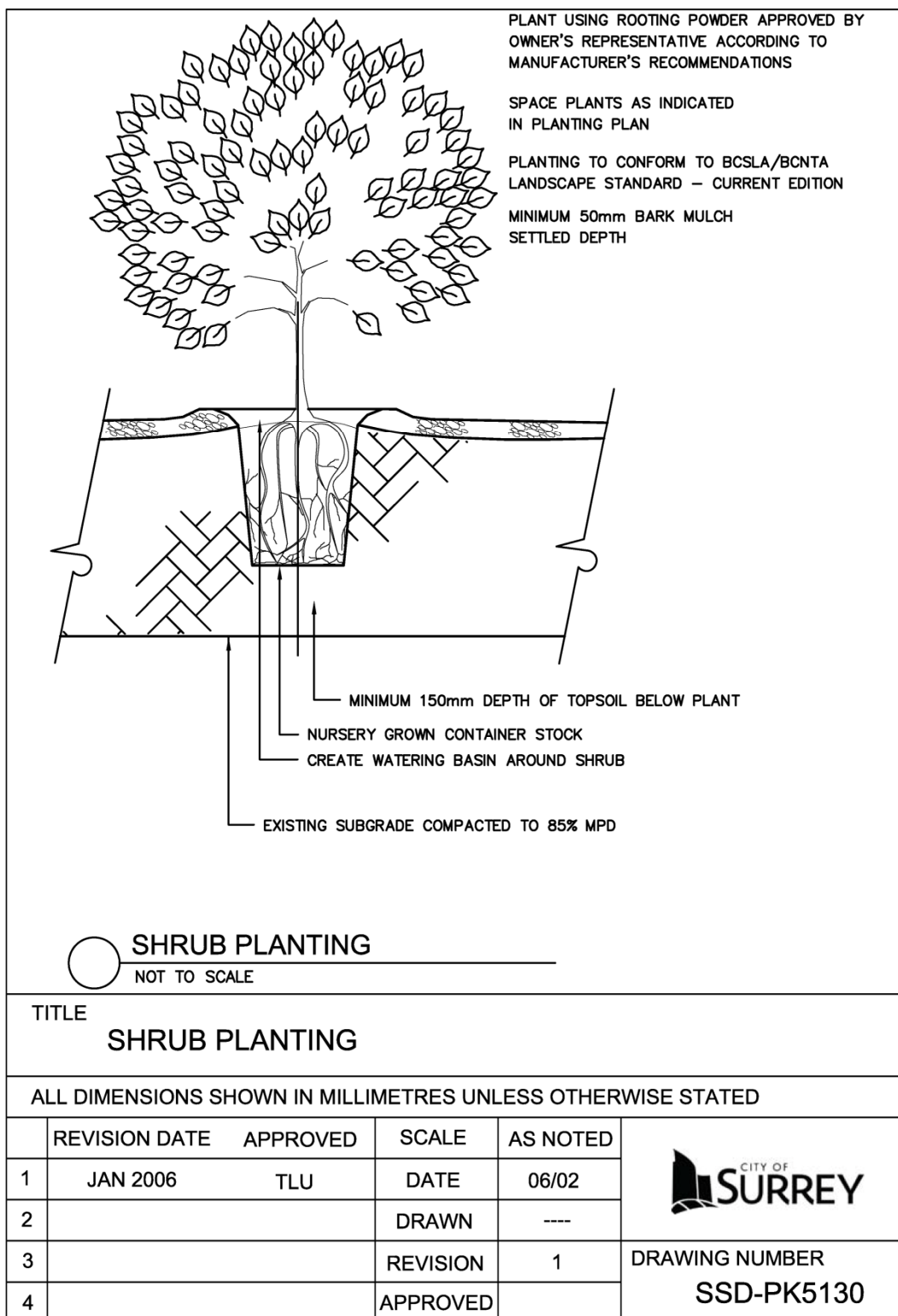


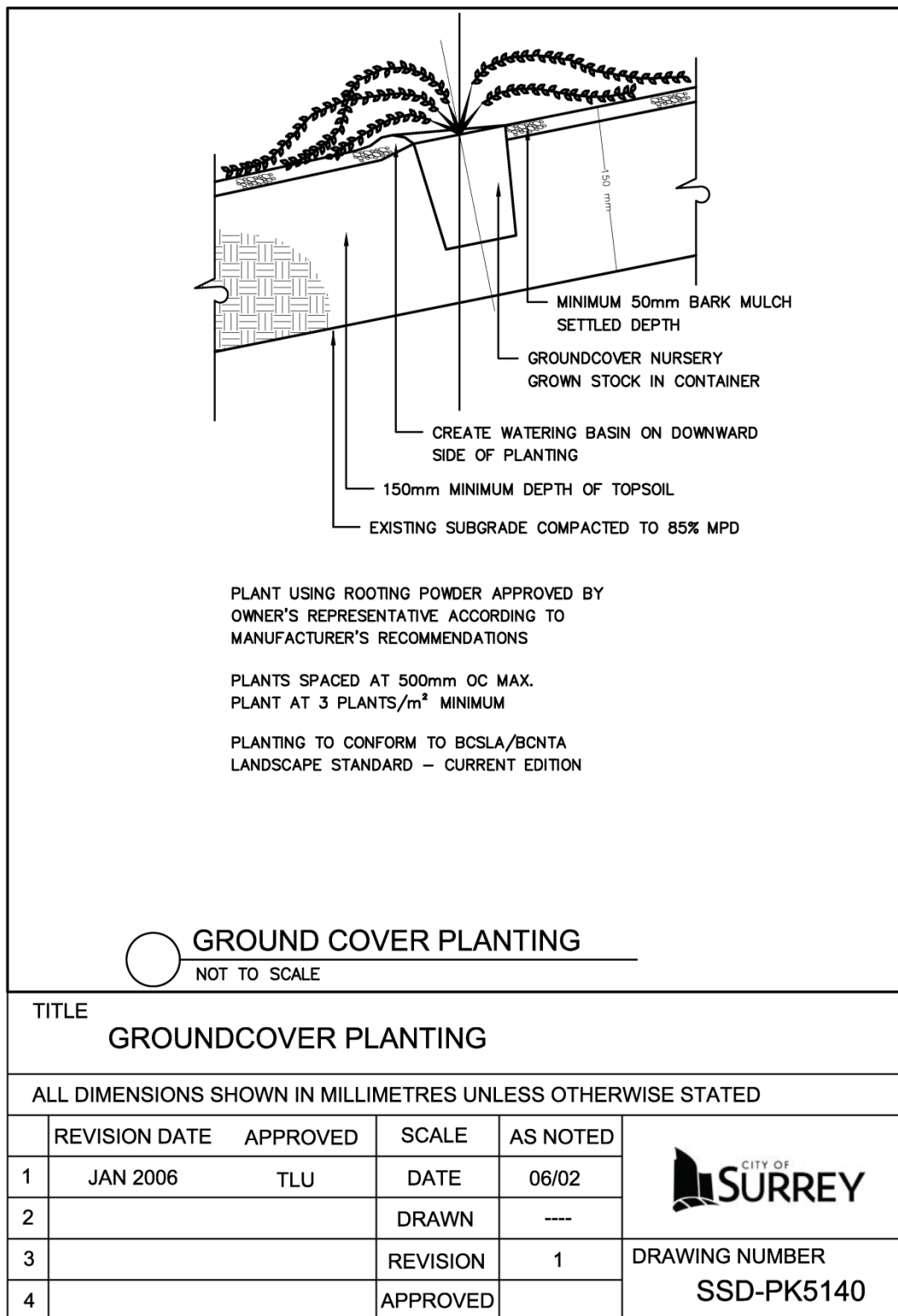


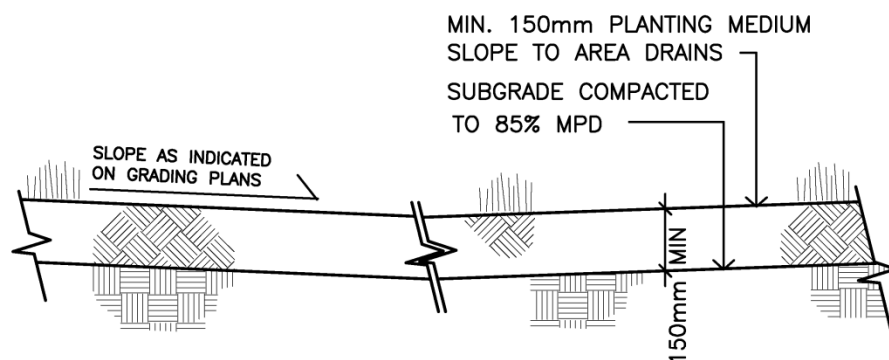












NOTES:

ALL LAWN AREAS TO BE GRADED TO AN EVEN FALL TO NEAREST DRAIN OR SWALE

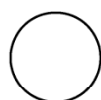
PREPARE SEED BED BY ROLLING AND GRADING TO A SMOOTH EVEN SURFACE

BROADCAST APPROVED GRASS SEED MIX MECHANICALLY FROM TWO DIRECTIONS AT A RATE OF 2.5kg PER 100m² SURFACE AREA

BROADCAST APPROVED NITROGEN FERTILIZER MECHANICALLY FROM TWO DIRECTIONS TO MANUFACTURERS RECOMMENDATIONS

ROLL SEED AND FERTILIZER WITH A 100kg ROLLER, RAKE LIGHTLY FROM TWO DIRECTIONS AND ROLL AGAIN

SPRINKLE LIGHTLY WITH WATER UNTIL SATURATED




GRASS AREA – SEEDED

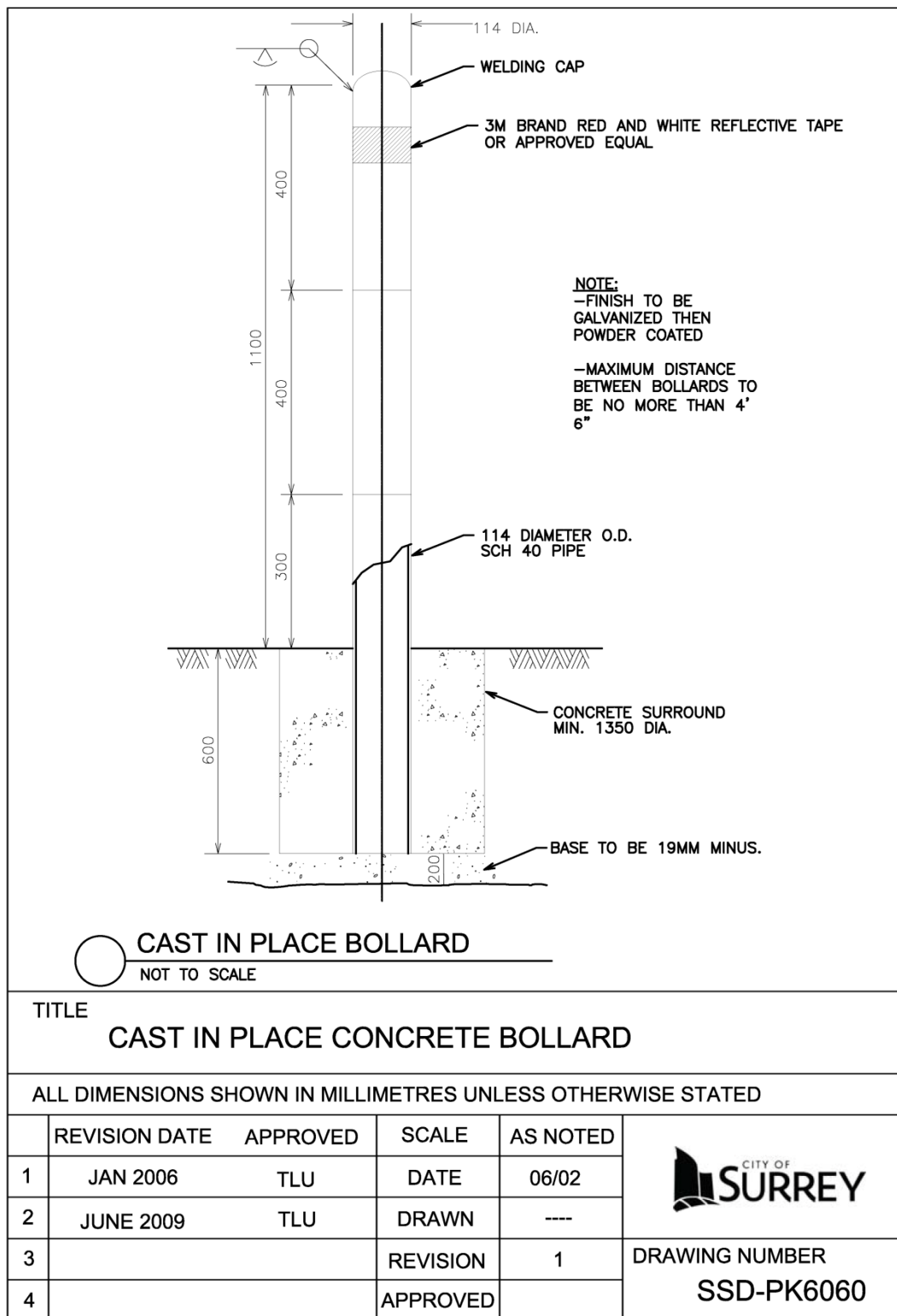
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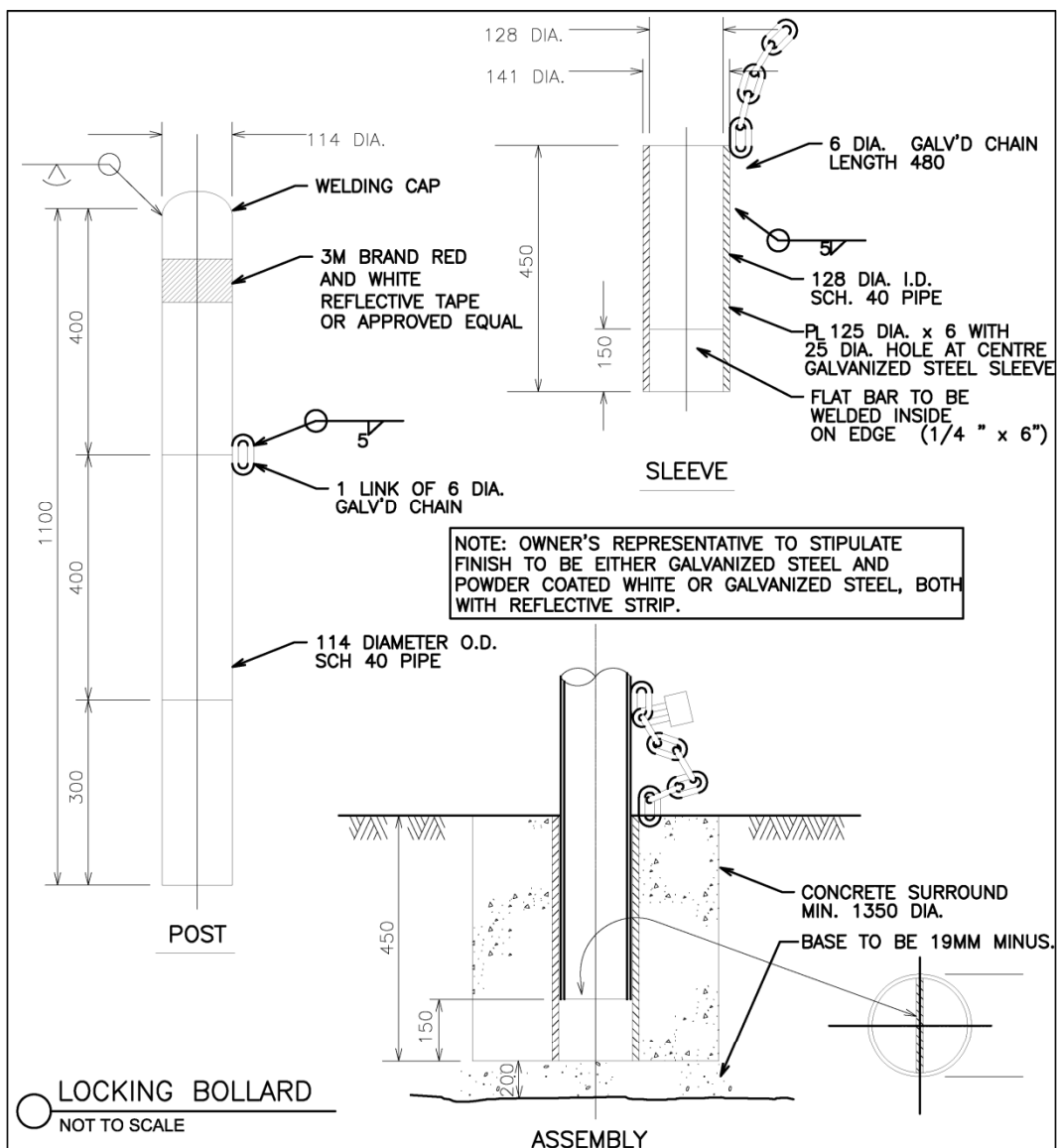
TITLE

GRASS AREA - SEEDED

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

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1				DATE	06/02	
2				DRAWN	----	
3				REVISION	1	
4				APPROVED	TLU	




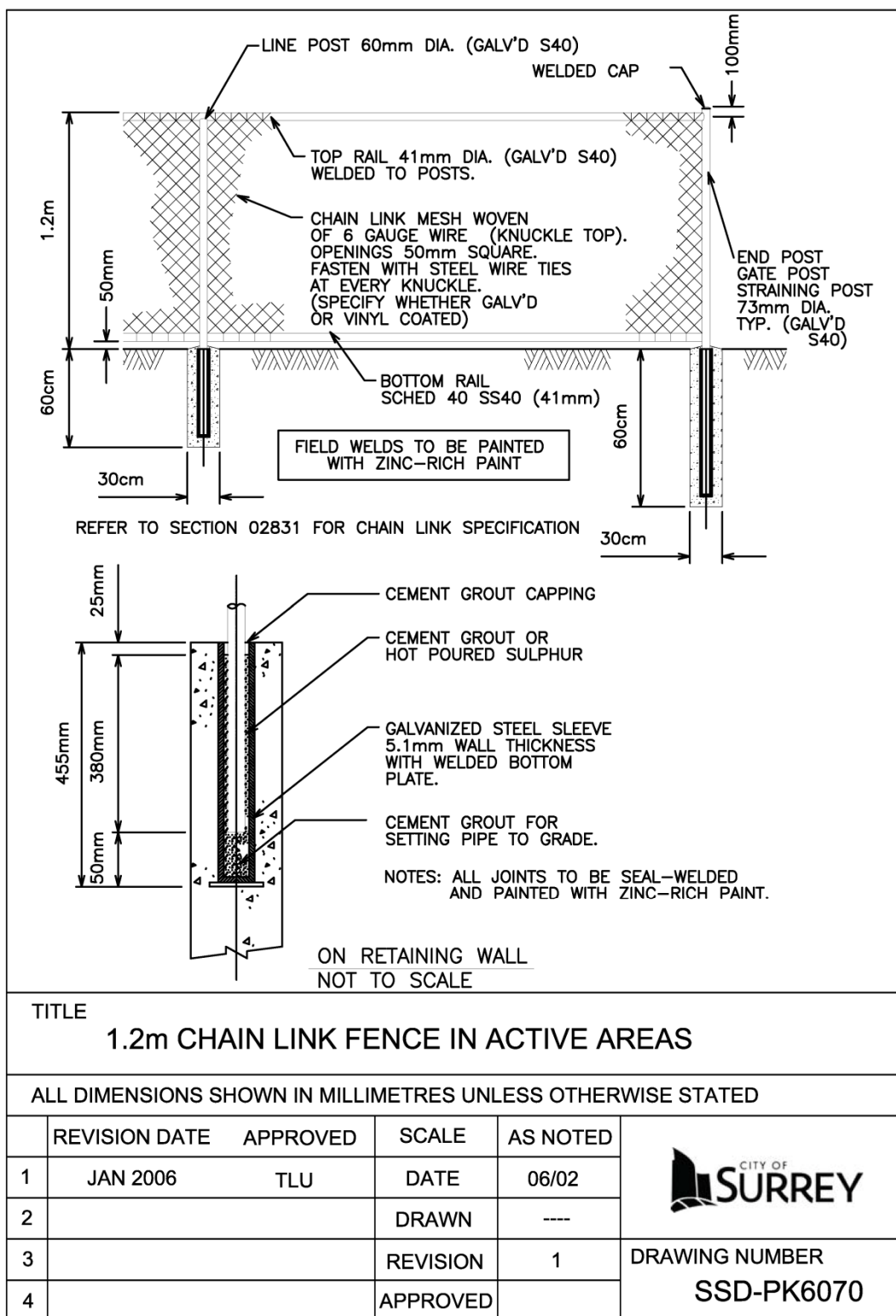


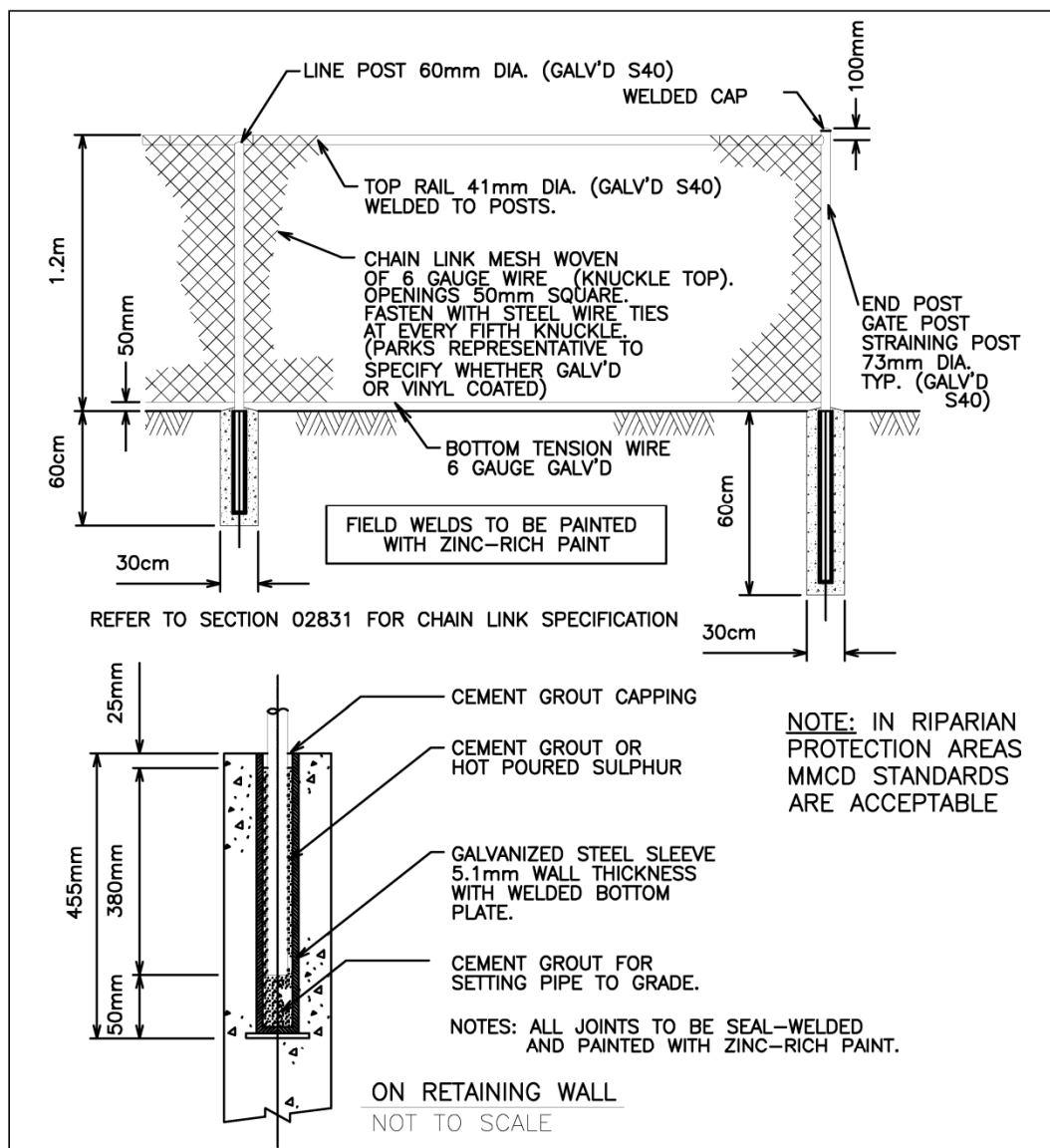
TITLE

LOCKING BOLLARD

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

	REVISION DATE	APPROVED	SCALE	AS NOTED	 DRAWING NUMBER SSD-PK6061
1	JAN 2006	TLU	DATE	06/02	
2	JUNE 2009	TLU	DRAWN	---	
3			REVISION	2	
4			APPROVED		




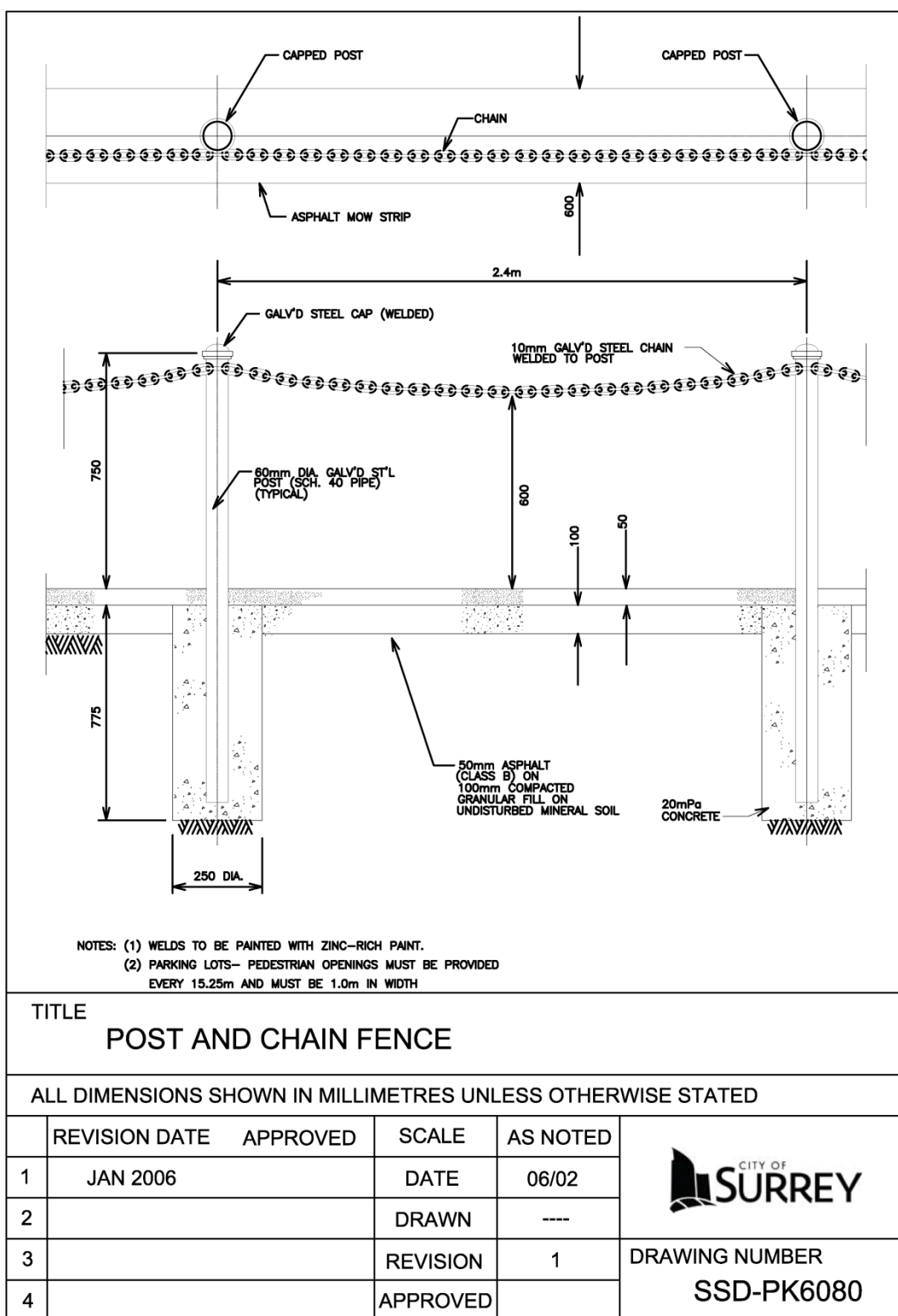


TITLE

1.2m CHAIN LINK FENCE IN PASSIVE AREA

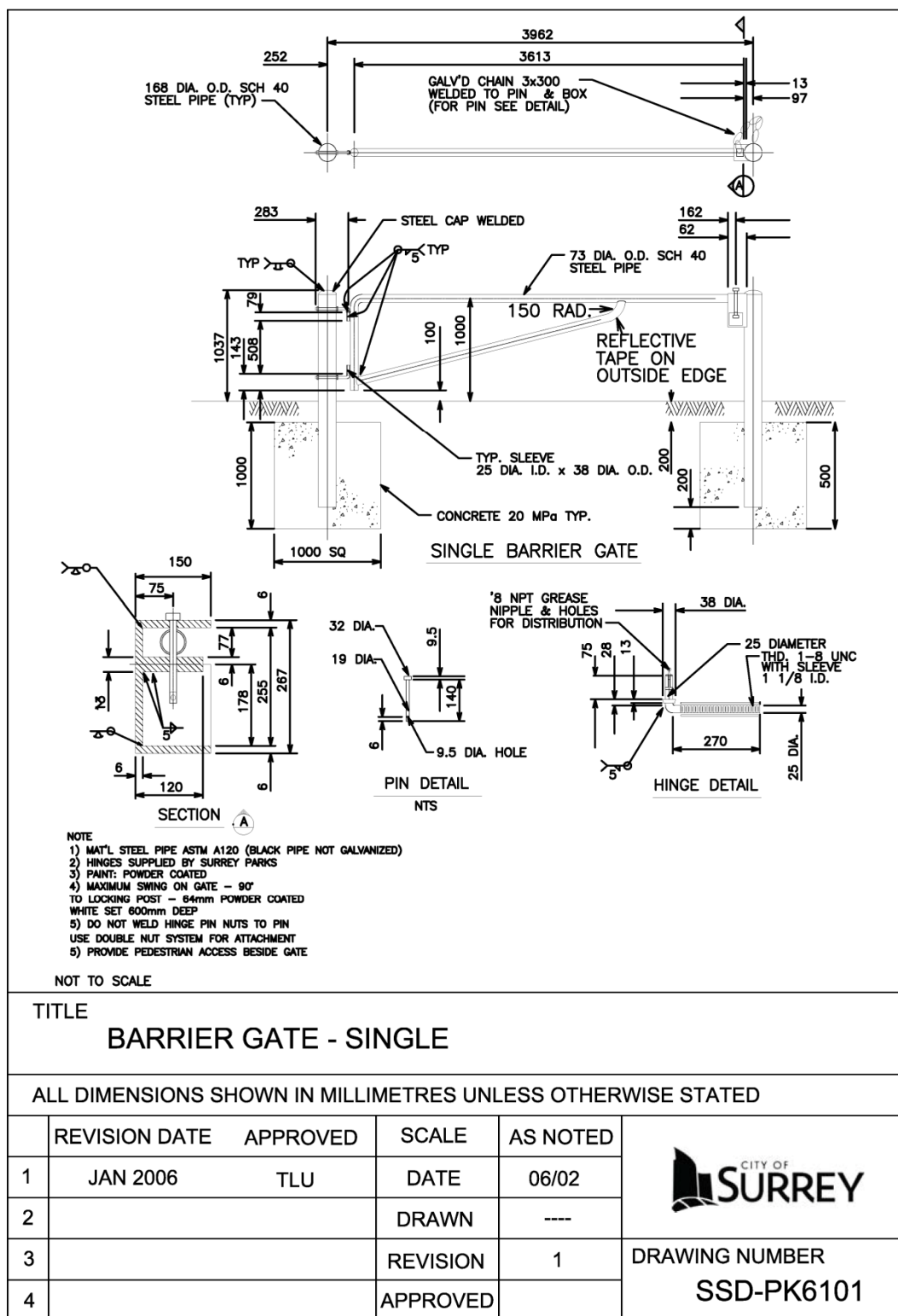
ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

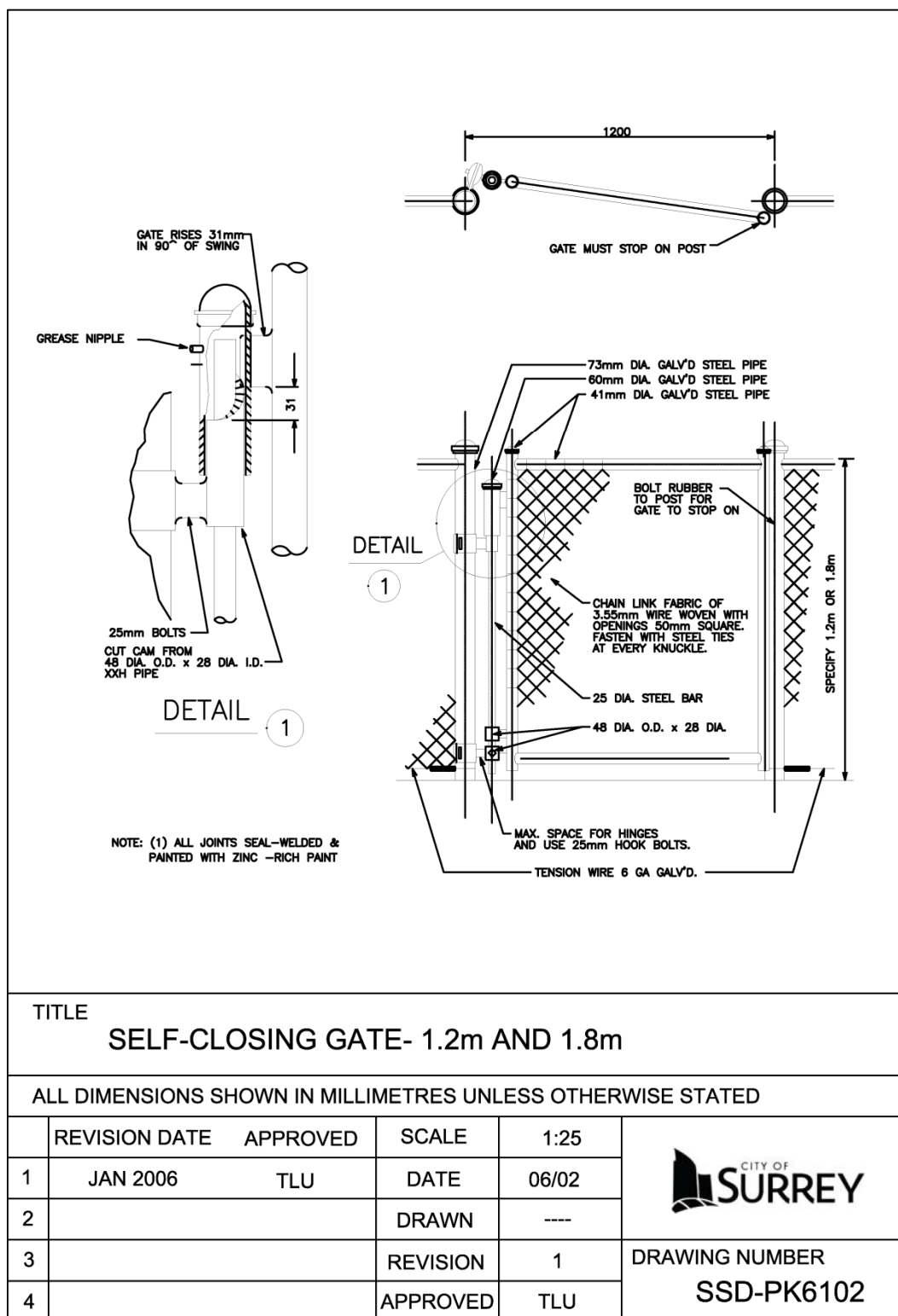
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2	MAY 2009	TLU	DRAWN	----	
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4			APPROVED	TLU	

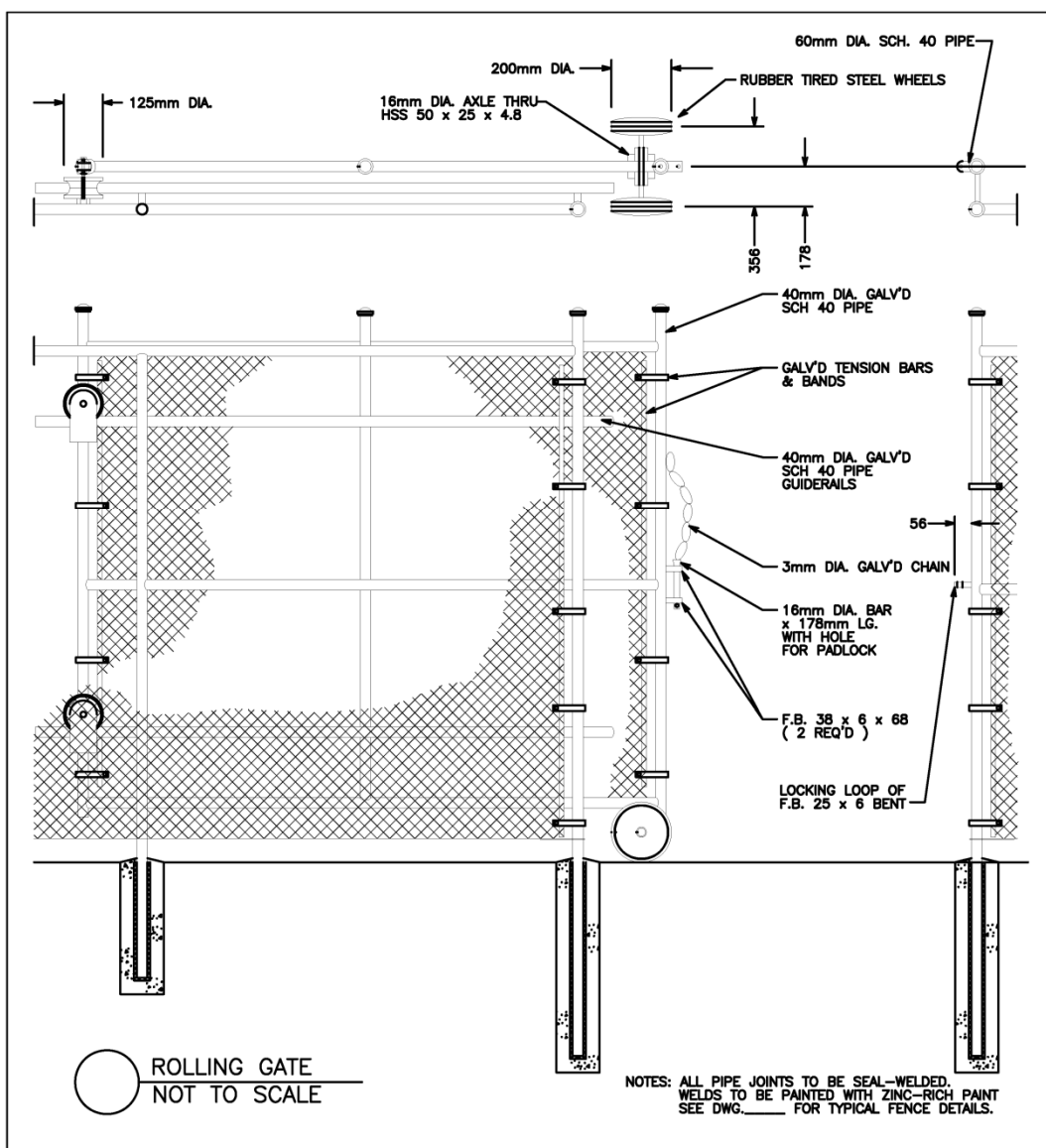




DETAILS
Spring 2011






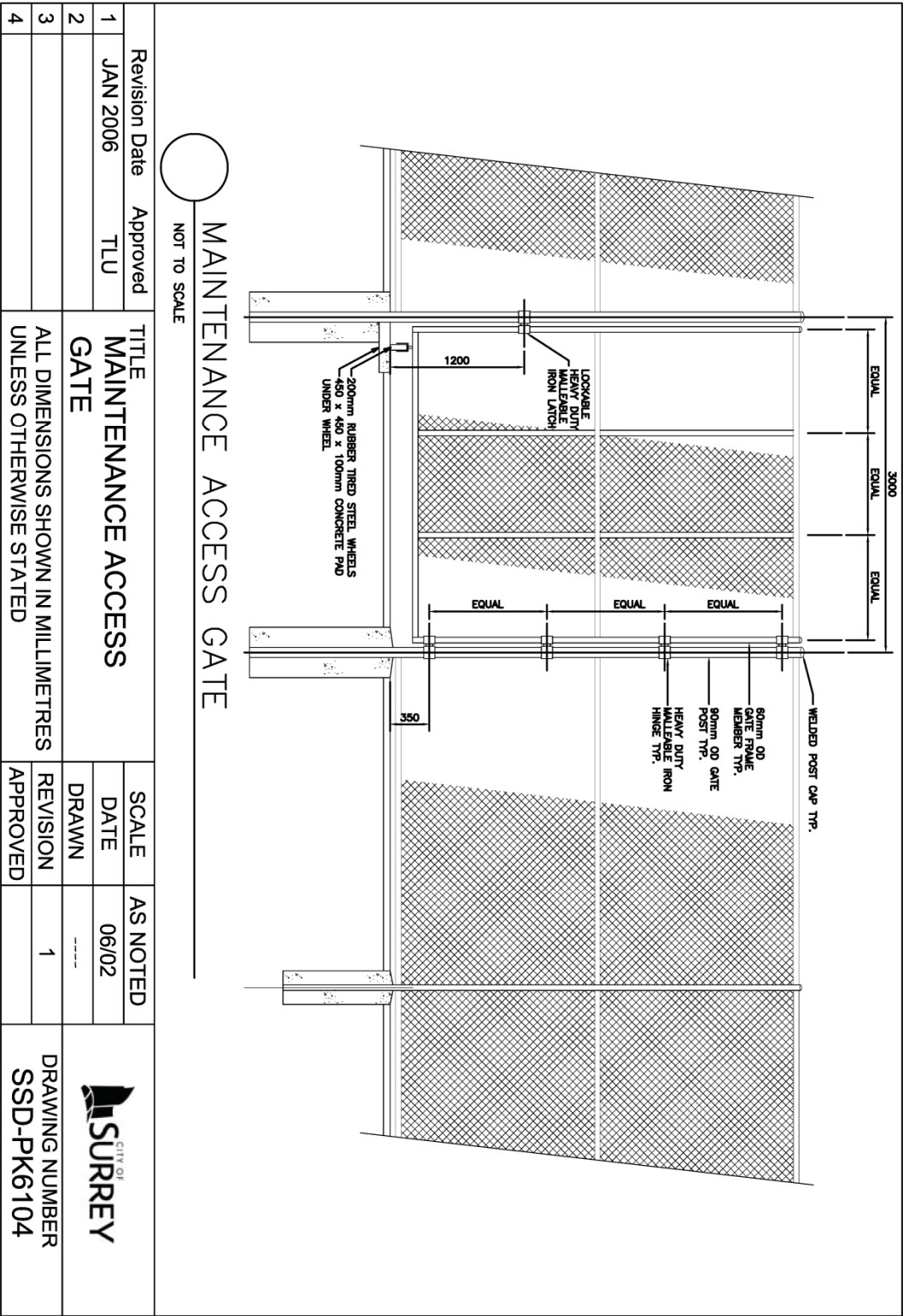


TITLE

ROLLING GATE

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

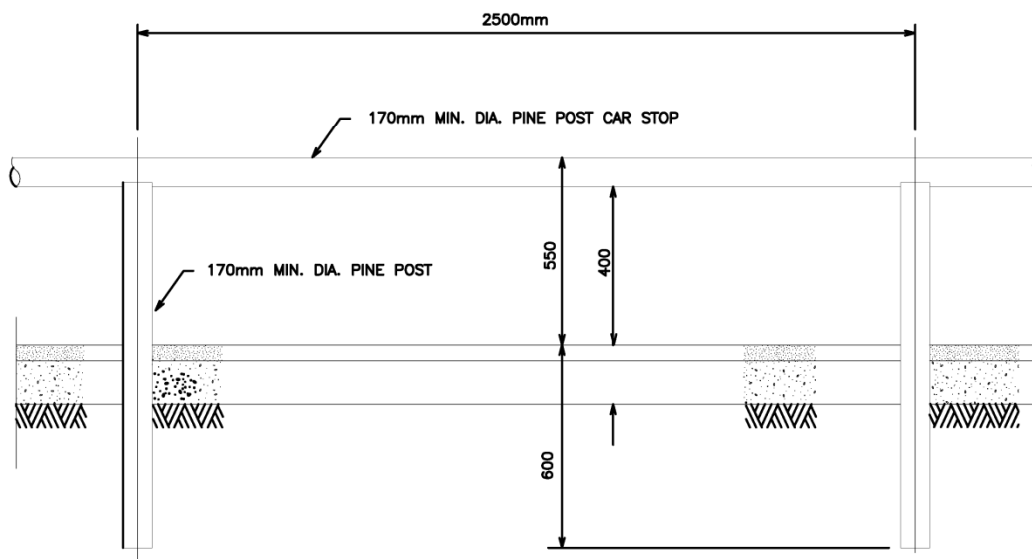
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1	JAN 2006	TLU	DATE	06/02	
2			DRAWN	GLA	
3			REVISION	1	
4			APPROVED		



CAR STOP SPECIFICATIONS

170mm MIN. DIAMETER MACHINE-PEELED PINE RAILS AND POSTS, PRESSURE TREATED WITH ACQ TO .4. POSTS SHALL BE SPACED 2.5m AND INSTALLED TO A MINIMUM DEPTH OF 0.6m. POSTS SHALL BE SECURED FIRMLY IN THE GROUND. SPACE BETWEEN GROUND AND BOTTOM OF RAIL SHALL BE 400mm. 250mm LONG GALVANIZED SPIKES SHALL BE USED TO ATTACH RAILS TO POSTS.


ALL WORK SHALL BE PERFORMED BY PERSONS SKILLED IN THE FENCING TRADE AND IN STRICT ACCORDANCE WITH THE BEST STANDARD TRADE PRACTICE.

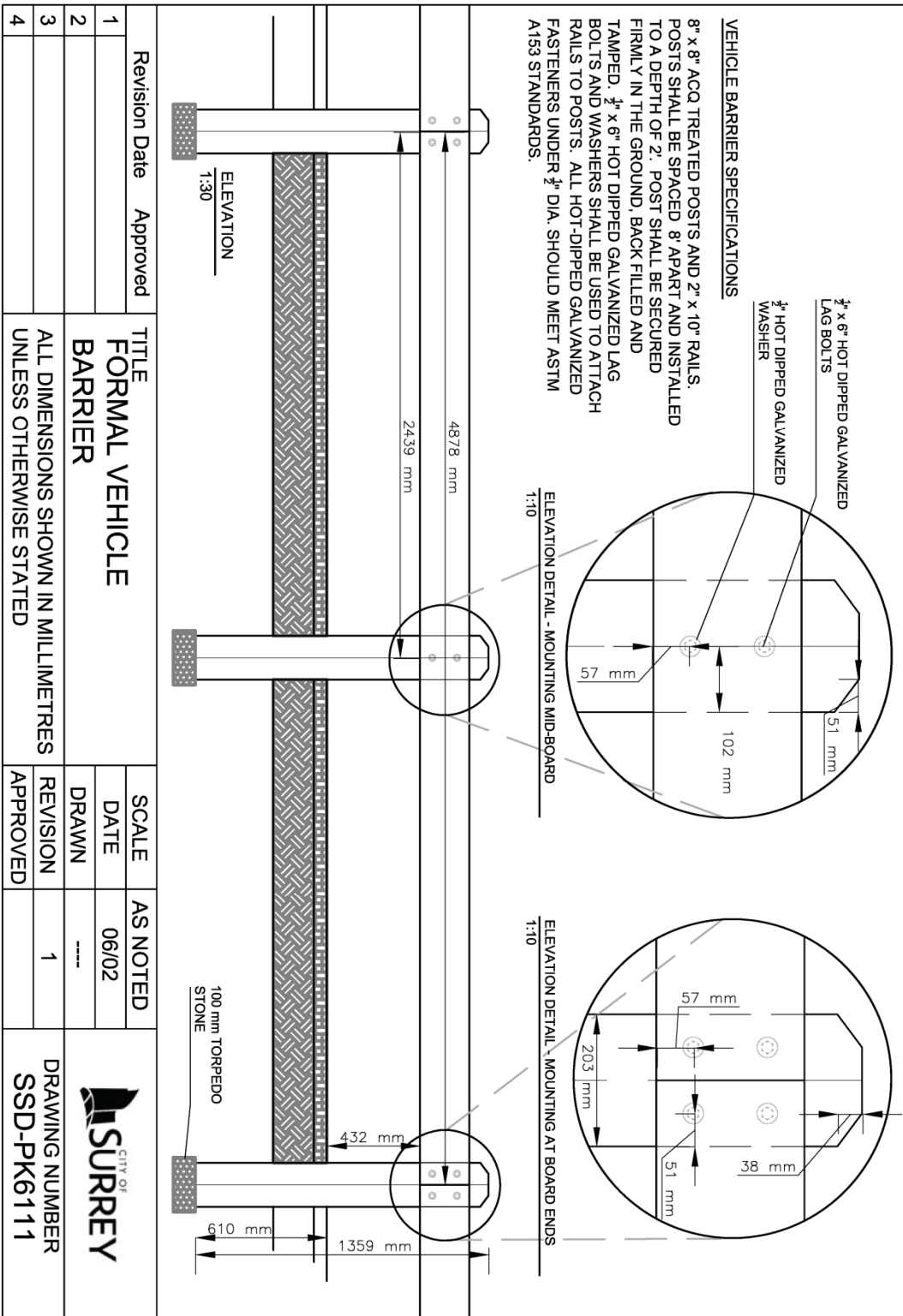


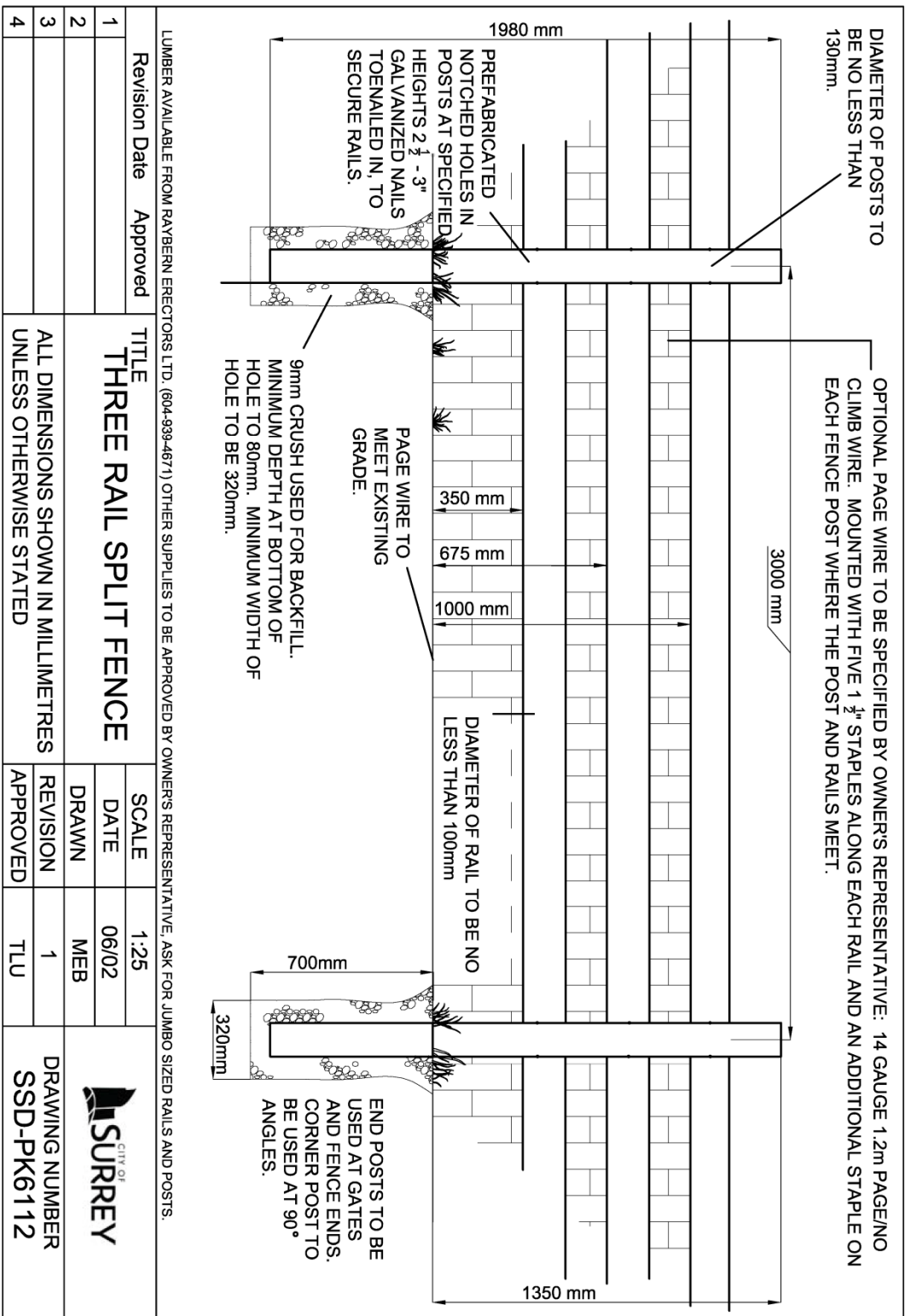
○ ELEVATION
NOT TO SCALE

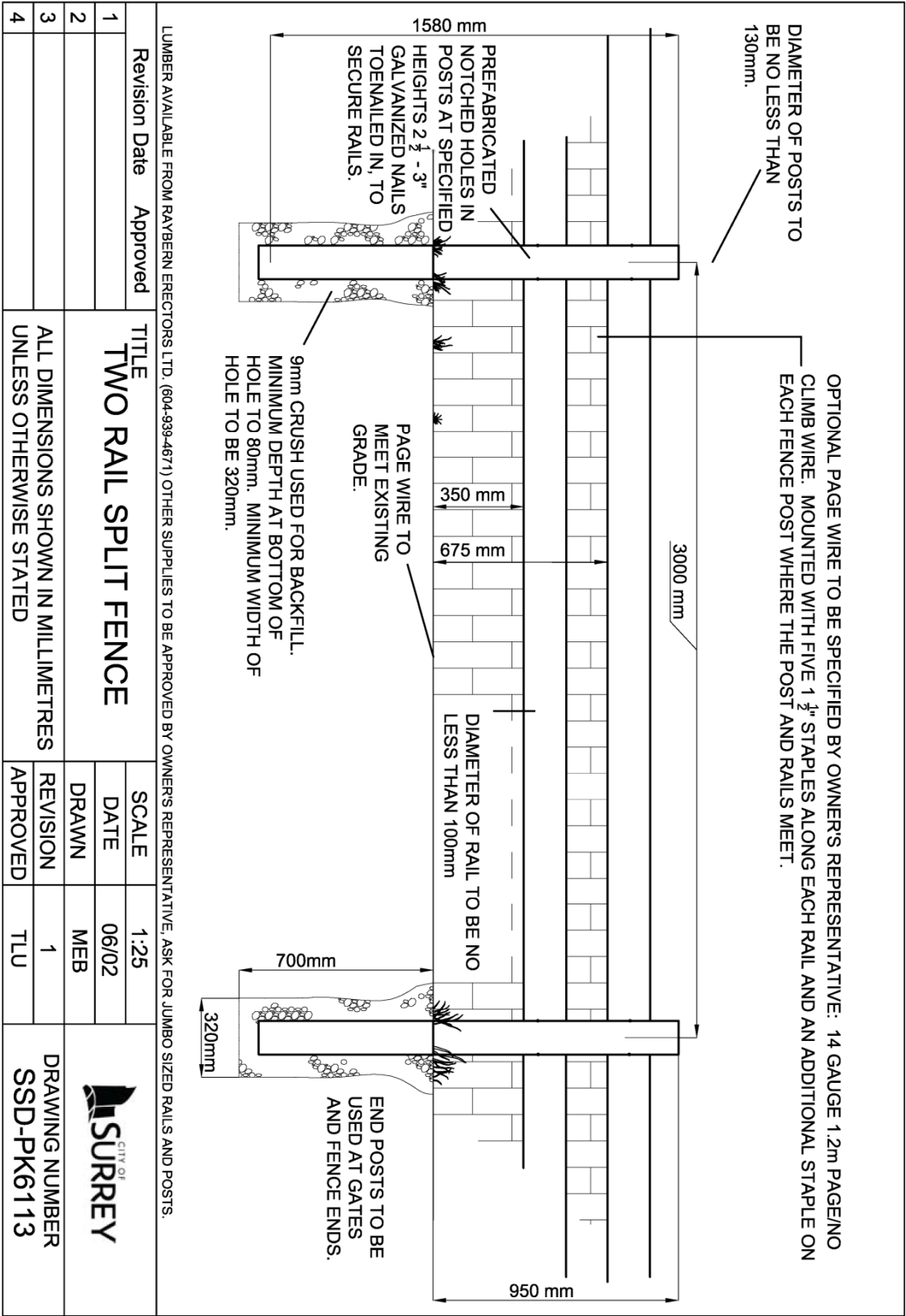
TITLE
LOG RAIL VEHICLE BARRIER

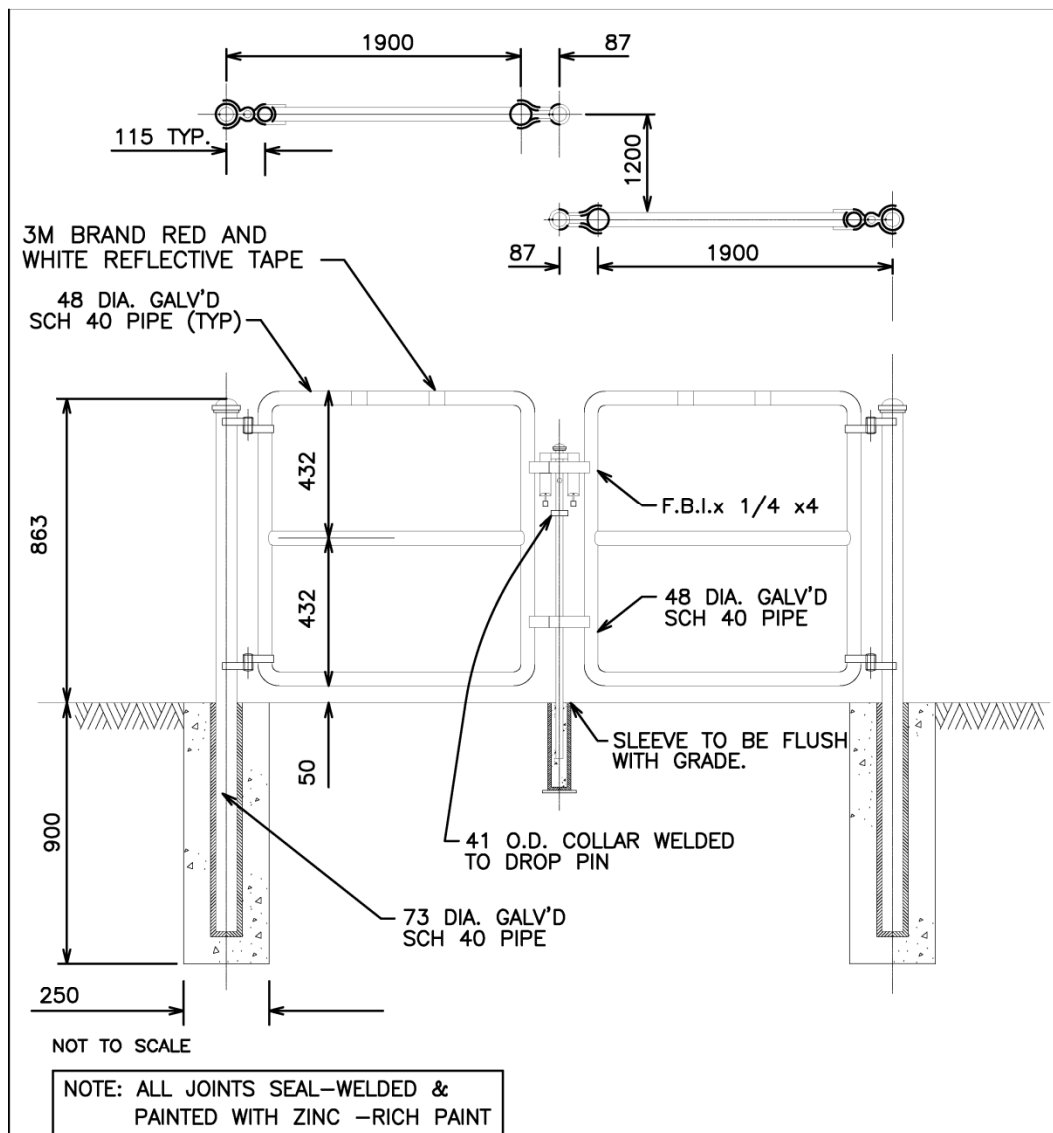
ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

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1	JAN 2006	TLU	DATE	06/02	
2			DRAWN	----	
3			REVISION	1	
4			APPROVED	TLU	










TITLE

BICYCLE BAFFLE

ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED

	REVISION DATE	APPROVED	SCALE	AS NOTED	 DRAWING NUMBER SSD-PK6120
1	JAN 2006		DATE	06/02	
2			DRAWN	----	
3			REVISION	1	
4			APPROVED		



