



The Corporation of the City of Courtenay

Bylaw No. 3200

A bylaw to regulate and require the provision of works and services in connection with the development of land.

WHEREAS Council is empowered under section 506 of the *Local Government Act* to regulate and require the provision of works and services, and prescribe standards for such works and services;

WHEREAS Council is empowered under section 506.03 of the *Local Government Act* to require the provision of works and services as a condition of approval of a subdivision or issuance of a building permit;

WHEREAS Council is empowered under section 509 of the *Local Government Act* to accept a deposit and enter into a servicing agreement in lieu of requiring the provision of works and services; and

WHEREAS Council intends to exercise the foregoing powers in connection with the development of land;

NOW THEREFORE BE IT RESOLVED THAT the Council of the Corporation of the City of Courtenay, in open meeting assembled, enacts as follows:

PART 1 INTERPRETATION

- 1.1 This Bylaw shall be cited as “Subdivision and Development Servicing Bylaw No. 3200”.
- 1.2 In this bylaw,
 - (a) “**Building Bylaw**” means the City of Courtenay’s Building Bylaw No. 3114;
 - (b) “**Building Permit**” means a permit authorized under the Building Bylaw;
 - (c) “**Cash in Lieu of Servicing**” means the amount described in Part 7 of this bylaw;
 - (d) “**City**” means the Corporation of the City of Courtenay;
 - (e) “**Council**” means the Council of the Corporation of the City of Courtenay;
 - (f) “**Developer**” means the owner of land, or appointed agent for the owner, in respect of which an application for Subdivision or a Building Permit has been made;
 - (g) “**Development**” means Subdivision of land or an activity for which a permit is required under the Building Bylaw;
 - (h) “**Director of Development Services**” means the person with authority delegated by Council to approve servicing for Subdivisions by the City of Courtenay, or a designate;
 - (i) “**Excess or Extended Services**” has the meaning provided in the Local Government Act;
 - (j) “**Land Title Act**” means Land Title Act, RSBC 1996, c 250;
 - (k) “**Local Government Act**” means Local Government Act, RSBC 2015, c 1;
 - (l) “**MMCD**” means the Master Municipal Construction Documents, 2019 Edition, published by the Master Municipal Construction Documents Association, and any updates and revisions thereto;
 - (m) “**MMCD Design Guidelines**” means Design Guidelines 2022 published by the Master Municipal Construction Documents Association, and any updates and revisions thereto;
 - (n) “**Qualified Professional**” means a professional engineer who is registered or licensed to practice in British Columbia under the provisions of the *Professional Governance Act*, who is responsible for the design, construction, supervision and certification of all

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Works and Services on behalf of the Developer;

- (o) **“Servicing Security”** has the meaning provided in Part 6 of this bylaw.;
 - (p) **“Subdivision”** means a subdivision of land including the adjustment of existing parcel boundaries;
 - (q) **“Substantially Complete”**, in relation to any Works and Services, means the stage of construction when the combined value of deficiencies plus the value of incomplete work, as indicated in a deficiency list complete with a monetary value associated with each deficiency or incomplete work is less than the sum of the following, in reference to the total cost of the work:
 - (i) 3% of the first \$500,000.00;
 - (ii) 2% of the next \$500,000.00; and
 - (iii) 1% of the remaining cost;
 - (r) **“Works and Services”** has the meaning provided in Part 4 of this bylaw; and
 - (s) **“Works and Services Agreement”** has the meaning provided in Part 6 of this bylaw.
- 1.3 Every reference to a statute or bylaw shall be deemed to be a reference to the said statute or building code as amended or replaced from time to time.

PART 2 PURPOSE

- 2.1 The purpose of this bylaw is to promote the provision of works and services that are designed and constructed to certain standards prescribed herein to lands developed in the City of Courtenay.

PART 3 WORKS AND SERVICES AS CONDITION OF DEVELOPMENT

- 3.1 As a condition of issuance by the City of the approval of a Subdivision or a Building Permit, the Developer shall meet one of the following conditions:
- (a) the Developer has provided the Works and Services set out in Part 4 of this bylaw;
 - (b) the Developer has deposited the Servicing Security and has entered into a Works and Services Agreement with the City set out in Part 6 of this bylaw;
 - (c) the Developer has paid Cash in Lieu of Servicing set out in Part 7 of this bylaw. The determination that accepting Cash in Lieu of Servicing is in the public interest shall be made by the Director of Development Services, and should such determination be made, the Developer must meet this condition.

The Director of Development Services may waive all of the above conditions in relation to the approval of a Subdivision or a Building Permit if (i) the Developer is a charitable, philanthropic or other not for profit corporation, and (ii) the Development is intended exclusively for a purpose that is directly related to the purposes of the City.

- 3.2 The Director of Development Services is authorized to permit a Developer to meet the requirement of Section 3.1 through a combination of two or more conditions prescribed there.
- 3.3 Section 3.1 shall not apply:
- (a) in relation to a Building Permit authorizing the construction of a single residential dwelling or a duplex dwelling, whether or not the dwelling contains a secondary suite (the meaning of relevant terms in this paragraph to be interpreted in accordance with the City’s Zoning Bylaw No. 2500, 2007); and

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- (b) in relation to underground wiring, conduit and vaults, in the case of any Subdivision resulting in the creation of fewer than 2 additional parcels in an area zoned for single-family residential use only, where the electrical and telephone services abutting the parcel being subdivided and all immediately abutting parcels are above-ground.

PART 4 WORKS AND SERVICES REQUIREMENTS

- 4.1 The following works and services shall be provided in relation to a Development, to the extent directly attributable to the Development ("**Works and Services**"):
 - (a) highways, sidewalks, boulevards, boulevard crossings, street lighting, transit bays or underground wiring;
 - (b) amenities, including benches, bollards, bicycle parking facilities, directional signage, parklets, street lamps, street signs, transit shelters or waste disposal and recycling containers;
 - (c) transportation infrastructure that supports walking, bicycling, public transit or other alternative forms of transportation, including traffic calming measures;
 - (d) sustainable design features that provide for energy and water conservation, reduction of greenhouse gas emissions and climate resilience;
 - (e) any other thing, or classes of things, prescribed by provincial regulation; or
 - (f) Excess or Extended Services, as determined by the Director of Development Services.
- 4.2 The City will not impose a requirement under Section 4.1 in respect of a subdivision under the *Strata Property Act*.
- 4.3 The Works and Services must be located:
 - (a) in relation to a Subdivision, on that portion of the highway immediately adjacent to the land being subdivided, up to the centre line of the highway; and
 - (b) in relation to a Building Permit, on each parcel for which such permit is sought and on that portion of the highway immediately adjacent to such parcel, up to the centre line of the highway.
- 4.4 The Works and Services must be provided:
 - (a) at the cost of the Developer; and
 - (b) to the standards set out in Part 5 of this bylaw.
- 4.5 If the Director of Development Services determines that Excess or Extended Services are required in relation to the Development, the following shall apply:
 - (a) The Developer may submit documentation certified by a Qualified Professional demonstrating that Excess or Extended Services are not required because of capacity available in the existing infrastructure. If such documentation is to the reasonable satisfaction of the Director of Development Services, the requirement shall be waived subject to approval by Council.
 - (b) If no documentation or insufficient documentation is provided under paragraph (a), the Director of Development Services shall require the Developer to bear the cost of Excess or Extended Services. All such costs shall be paid upfront by the Developer and may be recovered from the City under the latecomer scheme provided in section 508 of the *Local Government Act*.

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PART 5 TECHNICAL STANDARDS FOR WORKS AND SERVICES

- 5.1 The design capacity of Works and Services shall be established in accordance with the following (the documents to have priority in the order that they are listed):
- (a) Supplementary Design Guidelines provided in Schedule 1; and
 - (b) MMCD Design Guidelines.
- 5.2 All Works and Services shall be detailed and constructed in accordance with the following (the documents to have priority in the order that they are listed):
- (a) Supplementary Construction Specifications provided in Schedule 2;
 - (b) Division 01, 03, 26, and 31 to 34 of the Master Municipal Specifications of MMCD including any relevant definitions in the Master Municipal General Conditions of the same document (or the equivalent sections of the version applicable at the time of construction);
 - (c) Supplementary Standard Detailed Drawings provided in Schedule 3;
 - (d) Standards for Sanitary Lift Stations provided in Schedule 4, if applicable; and
 - (e) Standard Detail Drawings of MMCD.
- 5.3 The Director of Development Services is authorized to vary the requirements of Section 5.1 and Section 5.2 through consultation with the City's subject matter expert(s) if the Developer submits documentation certified by a Qualified Professional reasonably demonstrating that:
- (a) Works and Services already exist which are likely to meet the applicable standards;
 - (b) it would be unnecessary or unreasonable to impose the applicable standards in view of the particular physical circumstances of the Development; or
 - (c) a proposed innovative design or construction methodology meets or exceeds the intent of Section 5.1 and Section 5.2 as determined by the Director of Development Services.
- 5.4 Works and Services must be designed by a Qualified Professional in accordance with this bylaw, other City bylaws, provincial and federal statutes and regulations, and commonly accepted standards in the design of facilities similar to the Works and Services. The Developer shall submit it to the City:
- (a) at the time of application for Subdivision or a Building Permit, a written commitment to engage a Qualified Professional in relation to design and field review of Works and Services; and
 - (b) as a condition of the City's acceptance of plans or acceptance of any Works and Services, a written assurance issued by a Qualified Professional that the design or construction (as the case may be) of the Works and Services complies with the technical standards set out herein.
- 5.5 The Director of Development Services is authorized to issue the forms for the commitments and assurances set out in section 5.4.

PART 6 SERVICING SECURITY AND WORKS AND SERVICES AGREEMENTS

- 6.1 Pursuant to section 509 of the Local Government Act, the Developer may, as an alternative to providing the Works and Services as a condition of issuance by the City of the approval of a Subdivision or a Building Permit:

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- (a) deposit the Servicing Security with the City; and
 - (b) enter into a Works and Services Agreement with the City.
- 6.2 The Servicing Security shall be established and updated as follows.
- (a) The Developer shall submit to the City a cost estimate including the following:
 - (i) a Class B/Class 3 cost estimate for construction of the Works and Services; and
 - (ii) a cost estimate of all design and permitting activities in relation to the Works and Services.
 - (b) Upon the Director of Development Services being reasonably satisfied that a cost estimate meets the foregoing requirements, the Director of Development Services shall issue written approval of the same. An amount equal to 125% of the total amount of the cost estimate so approved by the Director of Development Services shall constitute the “**Servicing Security**”.
- 6.3 The Servicing Security must be deposited in one of the following forms:
- (a) cashier’s cheque; or
 - (b) unconditional, irrevocable and automatically renewing letter of credit drawn on a chartered bank or credit union.
- 6.4 The Developer shall forfeit the Servicing Security to the City if the Developer fails to Substantially Complete the Works and Services by the date specified in the Works and Services Agreement.
- 6.5 The Director of Development Services is authorized to prescribe a form of agreement between the City and the Developer containing the following provisions (“**Works and Services Agreement**”):
- (a) scope of Works and Services;
 - (b) commitment by the Developer to Substantially Complete the Works and Services by a specified date and, if it fails to do so, forfeit the Servicing Security to the City;
 - (c) establishment of a warranty period within which the Developer shall be obligated to repair or replace the Works and Services containing defects or deficiencies;
 - (d) third party liability insurance in an amount and form reasonably acceptable to the Director of Development Services;
 - (e) indemnification of the City against third-party liability arising from causes within the Developer’s control;
 - (f) if applicable, grant of a statutory right of way to the City pursuant to Section 218 of the Land Title Act over the Development in relation to the Works and Services; and
 - (g) other terms that are consistent with Section 509 of the Local Government Act and are customarily included in similar agreements in British Columbia.
- 6.6 Works and Services Agreements shall be drafted in a form that is registrable under Section 219 and, if applicable, Section 218 of the Land Title Act against title to the land on which Development is proposed and each Works and Services Agreement shall, upon execution, be registered in the Land Title Office.
- 6.7 If applicable, the Developer shall submit to the City an indemnification letter from BC Housing prior to commencing construction of Works and Services.

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PART 7 CASH IN LIEU OF PROVIDING WORKS AND SERVICES

- 7.1 If the Director of Development Services determines, based on engineering and economic factors, that it is in the public interest for the Works and Services to be constructed at a later time or concurrently with the construction or alteration of Works and Services serving other lands, then Cash in Lieu of Servicing must be paid as a condition for approval of a Subdivision or a Building Permit.
- 7.2 The amount of Cash in Lieu of Servicing shall be equal to 100% of the total amount of the cost estimate approved by the Director of Development Services after following the process as that set out to establish the Servicing Security in Section 6.2.

PART 8 BYLAW ADMINISTRATION

- 8.1 Where this bylaw requires or permits the Director of Development Services to take an act or make a determination, the Director of Development Services shall be deemed to possess the delegated powers of the Council to take such an act or make such a determination.

PART 9 OFFENCE

- 9.1 Every person who:
- (a) violates a provision of this bylaw;
 - (b) permits, suffers or allows any act to be done in violation of any provision of this bylaw; and
 - (c) neglects to do anything required to be done under any provision of this bylaw,
- commits an offence and on summary conviction by a court of competent jurisdiction, the person is subject to a fine of not more than \$50,000.00, or a term of imprisonment not exceeding three months, or both, in addition to the costs of prosecution. Each day during which a violation, contravention or breach of this bylaw continues is deemed to be a separate offence.

PART 10 GENERAL

- 10.1 The following schedules are attached to and form part of this bylaw:
- (a) Schedule 1 – Supplementary Design Guidelines
 - (b) Schedule 2 – Supplementary Construction Specifications
 - (c) Schedule 3 – Supplementary Standard Detail Drawings
 - (d) Schedule 4 – Standards for Sanitary Lift Stations
- 10.2 Subdivision and Development Servicing Bylaw No 3190, as amended, is hereby repealed.

Read a first time this 17th day of September, 2025.

Read a second time this 17th day of September, 2025.

Read a third time this 17th day of September, 2025.

Adopted this 1st day of October, 2025.

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Mayor Bob Wells

Corporate Officer Adriana Proton



CITY OF
COURTENAY



SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 3200

SEPT 2025

SUPPLEMENTARY DESIGN GUIDELINES

This schedule contains supplementary design guidelines to be applied in conjunction with the Design Guideline Manual of the Master Municipal Construction Documents, dated 2014, both of which shall apply to all Works and Services constructed within the City of Courtenay.

Supplementary Design Guidelines contained within this Schedule supplement or supersede the Master Municipal Construction Document (MMCD). Where the City of Courtenay Supplementary Design Guidelines are in conflict with the MMCD, the City of Courtenay Supplementary Design Guidelines shall take precedence.

Section number and clause numbers in the City of Courtenay Supplementary Design Guidelines coincide with the MMCD numbering protocol.

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1.0 GENERAL DESIGN CONSIDERATIONS

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| 1.2 Independent Utilities | Add Section
1.2.1 | Design for location and relocation of Canada Post Mailbox shall be coordinated with Canada Post. |
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2.0 WATER DISTRIBUTION

2.2 Metering

Replace Section

For all single family residential homes without fire sprinklers the water meter setter size shall be 25mm except in the case where there is a demonstrated need for a larger meter. All other meters must be sized in accordance with AWWA M22 and form contained in Appendix A. It should be noted that this methodology is based on the fixture value method and not the fixture unit method employed in the BC Building Code for piping within buildings.

The maximum operating range for a water meter shall be less than 80% of the maximum instantaneous flow capacity as outlined by the meter manufacturer, with a maximum pressure loss of 48 kPa at the design flow rate. The size selection must not compromise the operating range or the long term life of the meter and must ensure that pressures supplied to property are appropriate for the intended use.

For developments that are proposed to be phased, the meter chamber and piping must be sized for the meter required for the ultimate buildout of the development. However, the initial meter installed must also be sized to accurately capture the range of flows for the first phase.

The Qualified Professional must ensure the meter selection and installation requirements are appropriate for the designed application.

A Qualified Professional must provide detailed sealed drawings and shop drawings of the installation and relevant calculations, to demonstrate the appropriateness of the sizing of the meter, for approval prior to installing the chamber.

2.3 Per Capita Demand

Replace Section

In the absence of reliable water consumption records, the following per capita demands shall be applied to future residential development:

- ADD: 635 L/c/d
- Peak Day: 2100 L/c/d
- Peak Hour: 3000 L/c/d

2.9	Minimum Pipe Diameter	Delete	Service Connections: 19mm
		Replace with	Service Connections: 25mm
2.14	Valves	Delete	<ul style="list-style-type: none"> The valves shall be the same diameter as the watermain up to 300mm diameter The main line valves on mains 350 mm and 400 mm diameter may be smaller by one (10 size with the use of proper reducers The main line valves on mains 450 mm diameter and larger may be smaller by two (2) sizes with the use of proper reducers
		Replace with	<ul style="list-style-type: none"> The main line valves on mains of all sizes shall be of the same nominal diameter as the watermain.
2.15	Hydrants	Add Bullet	<ul style="list-style-type: none"> STORZ connection must face the road or cul-de-sac at 90 degrees.
2.18	Air Valves	Replace Section	<p>Combination air valves must be installed at the summits of all mains of 200 mm diameter and larger, except as follows:</p> <ul style="list-style-type: none"> Where the difference in elevation between the summit and valley is less than 600 mm. Where it can be shown that air pockets will be carried by typical flows. Where active service connections are suitably located to dissipate trapped air.

Typical air valve sizes, subject to design analysis, are as follows (Table 2.18)

Table 2.18 Typical Air Valve sizes

Watermain Size	Valve Size
200 mm to 300 mm	25 mm
350 mm to 600 mm	50 mm
Larger than 600 mm	Special Design

Air Valves located in a flood plain shall be of a manual permanent blow type

2.21	Service Connections	Add to Section	Every legal lot and each unit of residential duplex must be provided with a separate service connection.
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2.25.2 Design Features Replace Section

General requirements for pressure reducing stations shall be as follows:

- Include a dual Pressure Reduction Valve (PRV) arrangement with separate domestic and fire flow PRV's.
 - Epoxy coated valve bodies both inside and out.
 - Fire flow PRV must be equipped with a position indicator (limit switch).
 - Domestic flow PRV must be equipped with position indicator and insertion flow meter.
 - Filters shall be provided on all valve control piping.
 - All piloting shall be set to fail close.
- Include a surge/high pressure relief valve with stainless steel mesh dechlorination basket (capable of housing a minimum of 8 – 65mm dechlorination pucks).
- Pressure relief valves and surge relief valves to include anti-cavitation trim where recommended by the manufacturer based on site specific differential pressures.
- Each PRV and surge relief valve must be provided with isolating valves such that individual components can be removed for repair and each component can be operated independently.
- Pressure gauges and pressure transducers complete with snubbers and isolating valves must be included to register both upstream and downstream pressure.
- All piping and fittings, including control piping, must be stainless steel;
- Grooved couplings must be included to assist in disassembly of piping as required.
- All equipment and controls must be mounted in an above ground secure, lockable cabinet, on a concrete foundation. The cabinet shall be as follows:
 - Include two separate compartments, including one for the electrical controls and another for the mechanical piping and valves. All compartments must be heated, lighted and the controls enclosure must be ventilated.
 - Include removable roof hatch above the Mechanical compartment.

- Fabricated from powder coated aluminum.
- Include a rubber gasket between the aluminum kiosk and the concrete to prevent water leakage into the kiosk.
- The PRV station include 8 hours of uninterruptible power (UPS) and a user control interface (HMI).
- The PRV station must be integrated with the City's SCADA system via ethernet or cellular telephone connection to monitor at a minimum:
 - PRV valve position.
 - Utility failure.
 - Access intrusion.
 - Limits switches.
 - High pressure relief.
 - Flow data.

3.0 SANITARY SEWERS

3.2 Per Capita Flow	Replace Section	In the absence of sanitary sewer flow records, sanitary sewer system design should be based on an average daily dry weather flow (ADWF) of 360 litres per day per capita (L/d/c).
3.8 Flow Velocities	Delete	<ul style="list-style-type: none"> ▪ Force mains: 0.75 m/s
	Replace with	<ul style="list-style-type: none"> ▪ Force mains: 0.9 m/s
3.10 Minimum Pipe Diameter	Replace Section	<p>The minimum pipe diameter is 200mm.</p> <p>Sewers must be designed to satisfy the following parameters:</p> <ul style="list-style-type: none"> ▪ 200mm diameter and less: $d/D < 0.5$. ▪ 250mm diameter: $d/D < 0.7$. ▪ 300mm diameter and greater: $d/D < 0.8$.
3.12 Curved Sewers	Replace Section	<p>On straight roads, sanitary sewers shall be installed in straight runs such that sewer mains and manholes are entirely under the road pavement and no closer than 1m to the curb. Curvilinear sewers are permitted on horizontal curves and shall have a constant offset from property line. The radius of curve shall not exceed 50% of the manufacturer’s recommended maximum and shall not be less than 60m. The minimum grade shall be 1% and each joint shall be located by survey. Manholes are to be installed at the beginning and end of horizontal curve sections. Curvilinear sewers are not permitted on vertical curves</p> <p>The minimum design velocity design velocity in curved sewers is 0.9 m/s.</p>
3.14.1 Locations	Replace Section	<p>Manholes are required at the following locations:</p> <ul style="list-style-type: none"> ▪ Every change of pipe size. ▪ Every change in grade. ▪ Every change in direction. ▪ Every pipe intersection except for 100 mm and 150 mm service connections and junctions with trunk sewers 900 mm diameter and larger. ▪ Every future pipe intersection.

- 150 m maximum spacing for pipe diameters up to 450 mm.
- 300 m maximum spacing for pipe diameter of 450 mm and larger.
- Every beginning and end of horizontal curves.

3.14.2 Hydraulic Details Replace Table 3.14

Table 3.14 Drop Structures

Invert Difference	Structure
Up to 0.25 m	Inside Ramp
0.25 to 0.90 m	Outside Ramp
Greater than 0.90 m	Outside Drop*
*Inside drop structures are not permitted	

Delete Sentence If a manhole drop cannot be avoided, an inside drop pipe is required.

3.16.3 Grade Delete

- 100 mm diameter pipe: 1.50%

Replace with

- 100mm diameter pipe: 2% min.

3.16.4 Details Replace Section

Use standard wye fittings for connections to new mains. For connections to existing mains, strap on saddle and insertable tees are permitted.

The service connection centreline must not be below the sewer main centreline.

Residential service connections are not to be connected to manholes. All wye connections to be a minimum of 1.0 m downstream from manhole.

Inspection chambers are required on residential connections. Control manholes are required on industrial connections and commercial connections. Inspection manholes are required on service connections 200mm diameter and larger. Connections exceeding 30 m in length will be treated as mains.

3.18 Pump Stations Replace Section

Replace this section with the document “Standards for Sanitary Lift Stations”, provided in Schedule 4.

4.0 STORMWATER MANAGEMENT

4.1.1 Drainage Planning Add Section 4.1.1 The Developer shall prepare such plans prior to approval of the development applications. Such plans shall provide an in-depth review of stormwater opportunities and constraints on a specific watershed, and take into consideration the potential impacts and remediation measures for the affected watercourses.

Submission requirements for Developers are in accordance with 2014 MMCD Design Guideline Manual Stormwater Management Section 4.2: Stormwater Control Plan.

4.1.2 Master Drainage Plan Add Section 4.1.2 The Master Drainage Plan (MDP), Watershed Plan (WP) or Integrated Stormwater Management Plan (ISMP) proposes an optimum drainage servicing strategy that meets the ultimate land use in the watershed. If a City MDP is not available, developments with a cumulative phased development area greater than 5 hectares are required to provide an acceptable MDP. The proposed MDP must address all identified constraints and provide the following information as required:

- Conceptual schemes for storm drainage servicing including trunk storm sewers, catchment detention ponds, minor and major flow routes, and erosion protection.
- Department of Fisheries & Oceans and BC Ministry of Forests, Lands, Natural Resource Operations and & Rural Development review.
- Hydrological and hydraulic model of pre-development and ultimate development condition.
- Bio-inventory of creeks and watercourses.
- Hydrogeological Impact Assessment (in areas where DFO and MOE jointly require its consideration).
- Inventory of watercourses and trunk drainage facilities.
- Sizes and performance requirements of catchment detention areas.
- Priority of MDP recommendations.

4.3.1 The Minor System	Replace Section	Consists of pipes, gutters, catch basins, driveway culverts, open channels, watercourses and stormwater management “best management practices” (BMPs) designed to capture, convey, treat or modify flows up to and including the 1 in 10 year return period storm event.
4.3.2 The Major System	Replace Section	Consists of surface flow paths, roadways culverts, watercourses, and stormwater management facilities designed to capture, convey, treat or modify larger flows up to and including the 1 in 100 year return period storm event. If required to accommodate low building elevations, and if approved, a piped minor system may be enlarged or supplemented to accommodate major flows.
4.3.3 Stormwater Detention Release Rates	Add Section 4.3.3	All stormwater detention facilities shall be designed to limit post-development peak flows to equal to the corresponding pre-development peak flows for the 1 in 2, 1 in 5, 1 in 10 and 1 in 25 year return period storm events. Overland escape routes must be provided to account for greater storms up to 1 in 100 year return period in a manner which does not result in flooding of any properties. Design rainfall intensities have been increased by 15% as indicated in Section 4.4. The total volume of runoff generated during storms can also have a significant impact on receiving watercourses. To the extent possible, the total runoff generated from storms should be minimized through the application of site adaptive planning and the use of source controls. Site adaptive planning focuses on limiting total imperviousness at development sites and preserving natural features such as wetlands, forests and native soils. Source controls focus on reducing volume by retaining or enhancing opportunities for infiltration and evapotranspiration on development sites. Discharge shall be controlled such that the downstream watercourses receiving outflow from detention facilities are protected from surcharge and erosion. Where stability cannot be maintained, measures to avoid or mitigate erosion shall be proposed.

4.4 Runoff Analysis Delete Bullet

- Hydrograph Method: Applicable for all areas larger than 10 hectares, more hydrologically complex catchments, and where stormwater management systems require more than basic conveyances. The computer program proposed for use is subject to approval by the local authority. The program should be selected to suit the complexity of the watershed and the hydrologic processes that need to be considered (e.g. detention, groundwater recharge and infiltration, evapotranspiration, continuous simulation, etc.) The most widely used programs (or software packages) are those that are SWMM based, however are constantly evolving, it is inappropriate for this guide document to state or endorse any particular ones.

Replace with

- Hydrograph Method: Applicable for complex systems involving multiple catchments with highly variable land use conditions, where flow attenuation features are involved (eg. detention pond, constructed wetland), or for gross areas exceeding 10 hectares. Computer models shall be based on the U.S. Environmental Protection Agency’s SWMM software.

Add Bullet

- Mass Balance: Volumetric based computations may be used to supplement flow analysis for the design of water quality treatment BMPs and BMPs intended for stormwater detention.

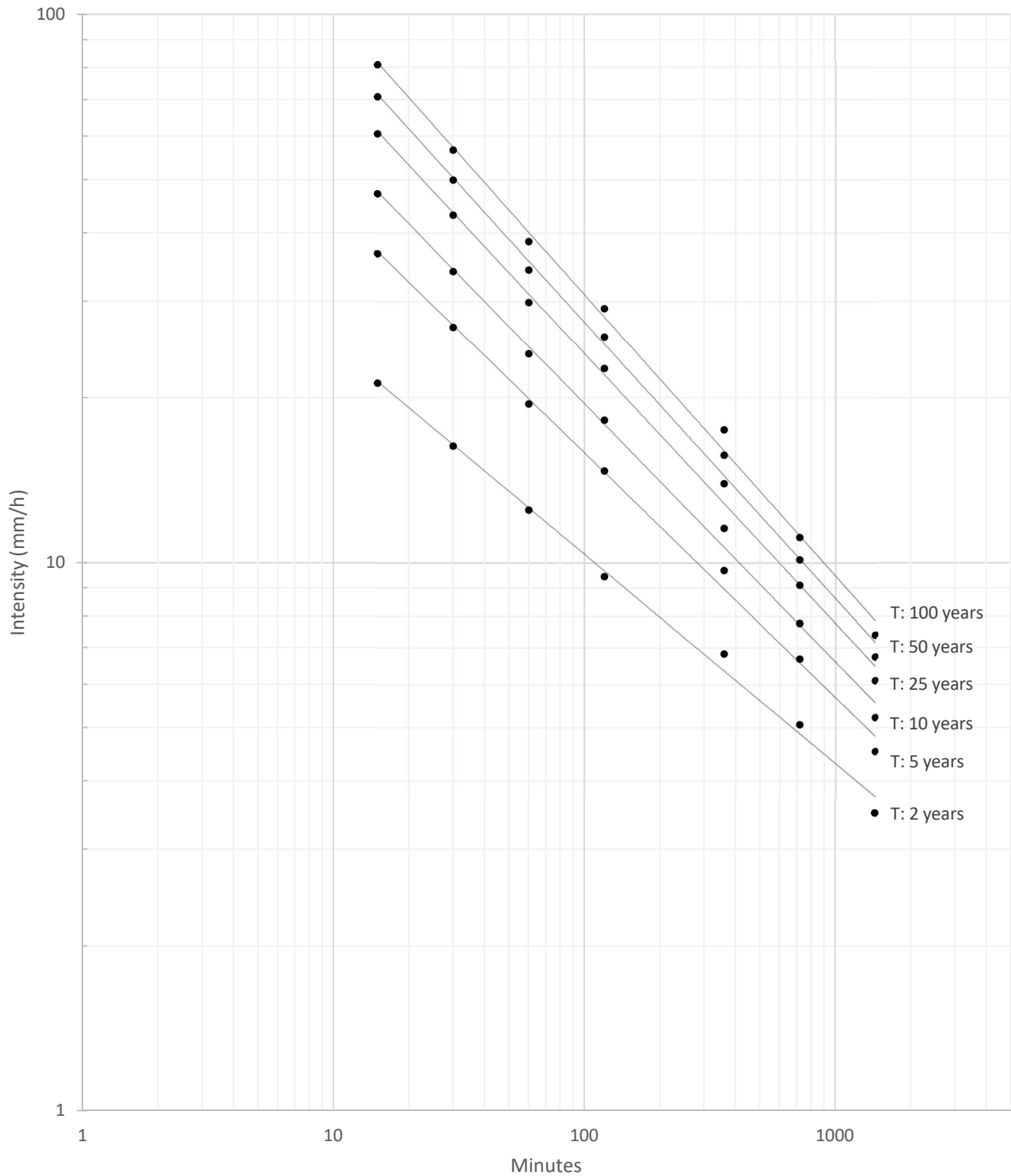
Add to Section

Computer stormwater models shall utilize the 10 and 100 year return period design storm hyetographs provided in Table 4.4.2. These hyetographs have been derived using the Modified Chicago Distribution for a 24 hour storm duration. The hyetographs have also been adjusted to reflect a 15% increase in rainfall intensities.

Note: Performance of the drainage systems may be under the influence of ocean levels and pump stations, and therefore may surcharge under certain conditions. Aside from the runoff analysis method

applied, hydraulic grade lines shall be indicated in design drawings and associated system performance shall consider governing downstream hydraulic boundary conditions.

**Figure 4.4: Intensity Duration Frequency Curves – Courtenay Puntledge BCHP ID: 1021990
15% Increase from Historical Intensities (mm/hr)
Years of Record: 1964-1995 (35 Years)**



**Table 4.4.1: IDF Curve Intensity Table Summary
 15% Increase from Historical Intensities (mm/hr)**

Time		Return Frequency					
Minutes	Hours	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
15	0.25	21.3	36.7	47.2	60.7	70.8	80.9
30	0.5	16.3	26.9	34.1	43.1	49.9	56.7
60	1	12.5	19.5	24.1	29.9	34.3	38.6
120	2	9.5	14.7	18.2	22.6	25.9	29.1
360	6	6.8	9.7	11.6	14.0	15.7	17.5
720	12	5.1	6.7	7.8	9.1	10.1	11.1
1440	24	3.5	4.5	5.2	6.1	6.8	7.4

Note: 15 and 30 minute durations have been extrapolated from historical IDF Curve

Table 4.4.2: Interpolation Equation of IDF Curve – Historical Data
 $R = A * T^B$ where: R = Rainfall (mm/hr), A and B = Coefficients, based on return period

Parameters	Return Frequency					
	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	11.0	17.5	21.9	27.3	31.4	35.5
B	-0.386	-0.452	-0.477	-0.499	-0.511	-0.521

Note: Coefficients are based on Historical Data - 15% must be added to resulting intensities

**Table 4.4.3: Modified Chicago Distribution – 24 Hr Design Storm Data (10 Minute Increment)
 15% Increase from Historical Intensities (mm/hr)
 Years of Record: 1964-1995 (35 Years)**

Time (min)	Return Frequency				
	2 year	5 year	10 year	25 Year	100 year
0	2.29	2.64	2.91	3.24	3.76
10	2.31	2.66	2.94	3.28	3.80
20	2.33	2.69	2.98	3.32	3.85
30	2.35	2.72	3.01	3.36	3.90
40	2.38	2.76	3.05	3.40	3.95
50	2.40	2.79	3.09	3.45	4.01
60	2.43	2.82	3.13	3.49	4.07
70	2.45	2.86	3.17	3.54	4.12
80	2.48	2.90	3.21	3.59	4.19
90	2.51	2.93	3.26	3.65	4.25
100	2.54	2.97	3.30	3.70	4.32
110	2.57	3.02	3.35	3.76	4.39
120	2.60	3.06	3.40	3.82	4.46
130	2.63	3.11	3.46	3.88	4.54
140	2.67	3.15	3.52	3.95	4.62
150	2.70	3.21	3.58	4.02	4.71
160	2.74	3.26	3.64	4.10	4.80
170	2.78	3.32	3.71	4.17	4.89
180	2.83	3.38	3.78	4.26	5.00
190	2.87	3.44	3.85	4.35	5.11
200	2.92	3.51	3.93	4.44	5.22
210	2.97	3.58	4.02	4.54	5.35
220	3.03	3.66	4.11	4.65	5.48
230	3.08	3.74	4.21	4.77	5.62
240	3.15	3.83	4.31	4.89	5.78
250	3.21	3.92	4.43	5.03	5.94
260	3.29	4.03	4.55	5.18	6.13
270	3.37	4.14	4.69	5.34	6.33
280	3.45	4.27	4.84	5.52	6.55
290	3.55	4.41	5.00	5.71	6.79
300	3.65	4.56	5.19	5.93	7.07
310	3.77	4.73	5.39	6.18	7.38
320	3.90	4.93	5.63	6.46	7.73
330	4.05	5.15	5.90	6.79	8.13
340	4.23	5.41	6.21	7.17	8.61
350	4.43	5.72	6.59	7.62	9.18
360	4.68	6.09	7.04	8.17	9.87
370	4.98	6.56	7.61	8.86	10.74
380	5.37	7.16	8.34	9.76	11.88
390	5.89	7.98	9.36	11.00	13.47
400	6.66	9.22	10.90	12.90	15.90
410	8.00	11.43	13.68	16.37	20.39
420	11.84	18.14	22.30	27.33	34.86
430	25.10	44.93	58.80	76.25	103.14
440	12.39	19.06	23.47	28.80	36.78
450	9.84	14.55	17.65	21.37	26.93
460	8.54	12.33	14.82	17.79	22.24
470	7.71	10.93	13.05	15.57	19.35
480	7.11	9.94	11.80	14.02	17.34

Time (min)	Return Frequency				
	2 year	5 year	10 year	25 Year	100 year
490	6.65	9.19	10.86	12.86	15.84
500	6.28	8.60	10.12	11.94	14.67
510	5.97	8.11	9.52	11.20	13.72
520	5.72	7.70	9.02	10.58	12.93
530	5.49	7.35	8.59	10.06	12.26
540	5.30	7.05	8.22	9.60	11.68
550	5.13	6.79	7.89	9.20	11.17
560	4.98	6.55	7.60	8.85	10.73
570	4.84	6.34	7.34	8.54	10.33
580	4.72	6.15	7.11	8.25	9.97
590	4.60	5.98	6.90	8.00	9.65
600	4.50	5.82	6.71	7.76	9.35
610	4.40	5.67	6.53	7.55	9.08
620	4.31	5.54	6.36	7.35	8.84
630	4.23	5.41	6.21	7.17	8.61
640	4.15	5.29	6.07	7.00	8.39
650	4.08	5.19	5.94	6.84	8.19
660	4.01	5.08	5.82	6.69	8.01
670	3.94	4.99	5.70	6.55	7.84
680	3.88	4.90	5.59	6.42	7.67
690	3.83	4.81	5.49	6.30	7.52
700	3.77	4.73	5.39	6.18	7.37
710	3.72	4.66	5.30	6.07	7.24
720	3.67	4.58	5.22	5.97	7.11
730	3.62	4.51	5.13	5.87	6.99
740	3.58	4.45	5.05	5.77	6.87
750	3.53	4.39	4.98	5.68	6.76
760	3.49	4.33	4.91	5.60	6.65
770	3.45	4.27	4.84	5.52	6.55
780	3.42	4.21	4.77	5.44	6.45
790	3.38	4.16	4.71	5.36	6.36
800	3.34	4.11	4.65	5.29	6.27
810	3.31	4.06	4.59	5.22	6.18
820	3.28	4.01	4.53	5.15	6.10
830	3.25	3.97	4.48	5.09	6.02
840	3.21	3.92	4.43	5.03	5.94
850	3.18	3.88	4.38	4.97	5.87
860	3.16	3.84	4.33	4.91	5.80
870	3.13	3.80	4.28	4.85	5.73
880	3.10	3.76	4.24	4.80	5.66
890	3.08	3.73	4.19	4.75	5.60
900	3.05	3.69	4.15	4.70	5.54
910	3.03	3.66	4.11	4.65	5.48
920	3.00	3.62	4.07	4.60	5.42
930	2.98	3.59	4.03	4.56	5.36
940	2.96	3.56	3.99	4.51	5.31
950	2.93	3.53	3.96	4.47	5.26
960	2.91	3.50	3.92	4.43	5.20
970	2.89	3.47	3.89	4.39	5.15

Time (min)	Return Frequency				
	2 year	5 year	10 year	25 Year	100 year
980	2.87	3.44	3.85	4.35	5.10
990	2.85	3.41	3.82	4.31	5.06
1000	2.83	3.38	3.79	4.27	5.01
1010	2.81	3.36	3.76	4.23	4.97
1020	2.80	3.33	3.73	4.20	4.92
1030	2.78	3.31	3.70	4.16	4.88
1040	2.76	3.28	3.67	4.13	4.84
1050	2.74	3.26	3.64	4.10	4.80
1060	2.73	3.24	3.61	4.06	4.76
1070	2.71	3.21	3.58	4.03	4.72
1080	2.69	3.19	3.56	4.00	4.68
1090	2.68	3.17	3.53	3.97	4.64
1100	2.66	3.15	3.51	3.94	4.61
1110	2.65	3.13	3.48	3.91	4.57
1120	2.63	3.11	3.46	3.88	4.54
1130	2.62	3.09	3.44	3.86	4.51
1140	2.60	3.07	3.41	3.83	4.47
1150	2.59	3.05	3.39	3.80	4.44
1160	2.58	3.03	3.37	3.78	4.41
1170	2.56	3.01	3.35	3.75	4.38
1180	2.55	2.99	3.32	3.73	4.35
1190	2.54	2.97	3.30	3.70	4.32
1200	2.52	2.96	3.28	3.68	4.29
1210	2.51	2.94	3.26	3.65	4.26
1220	2.50	2.92	3.24	3.63	4.23
1230	2.49	2.91	3.22	3.61	4.20
1240	2.47	2.89	3.21	3.59	4.18
1250	2.46	2.87	3.19	3.56	4.15
1260	2.45	2.86	3.17	3.54	4.12
1270	2.44	2.84	3.15	3.52	4.10
1280	2.43	2.83	3.13	3.50	4.07
1290	2.42	2.81	3.12	3.48	4.05
1300	2.41	2.80	3.10	3.46	4.03
1310	2.40	2.78	3.08	3.44	4.00
1320	2.39	2.77	3.06	3.42	3.98
1330	2.38	2.76	3.05	3.40	3.95
1340	2.37	2.74	3.03	3.38	3.93
1350	2.36	2.73	3.02	3.37	3.91
1360	2.35	2.72	3.00	3.35	3.89
1370	2.34	2.70	2.99	3.33	3.87
1380	2.33	2.69	2.97	3.31	3.84
1390	2.32	2.68	2.96	3.29	3.82
1400	2.31	2.66	2.94	3.28	3.80
1410	2.30	2.65	2.93	3.26	3.78
1420	2.29	2.64	2.91	3.25	3.76
1430	2.28	2.63	2.90	3.23	3.74
1440	0.00	0.00	0.00	0.00	0.00

4.9.6 Minimum Pipe Diameter	Replace Section	▪ Storm Sewer	250 mm
		▪ Culvert:	
		-Crossing Roads	450 mm
		-Crossing Driveways	300 mm
		▪ Catch Basin Leads	200 mm
		▪ Service Connections:	
-Residential	150 mm		
-Commercial/industrial	150 mm		

Downstream pipe sizes are not to be reduced unless the downstream pipe is 600 mm diameter or larger and increased grade provides adequate capacity. Detailed hydraulic analysis is required. That maximum reduction is two pipe sizes.

4.9.8 Curved Sewers	Replace Section	On straight roads, storm sewers shall be installed in straight runs such that sewer mains and manholes are entirely under the road pavement and no closer than 1m to the curb. Curvilinear sewers are permitted on horizontal curves and shall have a constant offset from property line. The radius of curve shall not exceed 50% of the manufacturer’s recommended maximum and shall not be less than 60m. The minimum grade shall be 1% and each joint shall be located by survey. Manholes are to be installed at the beginning and end of horizontal curve sections. Curvilinear sewers are not permitted on vertical curves
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The minimum design velocity in curved sewers is 0.9 m/s.

Sewers larger than 600 mm diameter may include deflections formed by mitred bends to a maximum mitre of 45°.

4.9.10 Pipe Joints	Replace Section	All pipe joints shall be gasketed and water tight.
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4.9.14 Service Connections	Delete	▪ Details
		Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles or, if approved, insertable tees.
		Service connections may be permitted into manholes if:

- The connection is not oriented against the flow in the main.
- Manhole hydraulic requirements are met.

Replace with

- Details

Use standard wye fittings for connections to new PVC and HDPE mains. For connections to existing PVC and HDPE mains, strap on saddle and insertable tees are permitted. For connections to new or existing concrete mains, a cored tee is required.

The service connection centreline must not be below the sewer main centreline.

No services shall be directly connected to manholes, all wye connections must be a minimum of 1.0 m downstream from manholes.

4.10.3 Surface Flow Capacity

Add to Section

Surface swale shall only traverse three lots downstream before directing into a surface inlet. The swale shall be included in an across lot drainage easement.

4.11.2 Underground Storage

Add to Section

Other detention facilities such as underground storage will be considered for approval at the discretion of the City.

4.11.3 Dry Detention Ponds

Add to Section

Design Details for Dry Ponds

Dry ponds are an effective method of stormwater quantity control, and are typically not intended as water quality improvement facilities. Dry ponds may be constructed in areas where it is not feasible to include a wet pond due to topography or site plan constraints. Generally, dry ponds are used to control larger, less frequent flows while allowing smaller flows to pass through uncontrolled. A sedimentation forebay is required upstream of dry ponds to promote settlement of suspended solids.

a) Land Dedication Requirements

Dry ponds to be operated by the City of Courtenay are to be located on public property, which is to

encompass all lands subject to inundation from the 24 hour 1 in 25 year return period design high water level and shall encompass all maintenance access roads as outlined in Section i) below.

If the slope integrity may be jeopardized by cutting or filling of priority lots, a restrictive covenant will be placed on lots abutting the dry pond to control lot development so as not to compromise design requirements at the HWL. This is to ensure an adequate freeboard is maintained.

b) Minimum Pond Size

The City discourages the proliferation of large numbers of small ponds, with the resultant higher maintenance cost and lower efficiency impact. The storage size is determined on the basis of outflow control requirements as presented in this document.

c) Frequency of Operation

All dry ponds shall be off-line storage areas designed to temporarily detain excess runoff and thereby reduce the peak outflow rates to the connected downstream system. These facilities may be subject to prolonged inundation during winter due to the rainfall pattern in Courtenay.

d) Drain Time

Ponds shall be generally designed to completely drain within 40 hours of reaching maximum water surface level, but in no case longer than 72 hours.

e) Side Slopes

Side slopes subject to inundation upon filling of the dry pond shall have a maximum slope of 4 (horizontal) to 1 (vertical) within public property. A freeboard allowance of 0.6 m is required for all dry ponds.

f) Depth of Ponding

The maximum live storage limit in a dry pond is for 3.0 m for the 1 in 25-year return period storm event and

1.5 m for the 1 in 10-year event, as measured from the invert elevation of the outlet pipe.

g) Bottom Grading and Drainage

The dry pond shall be graded to properly drain all areas after its operation. The dry pond bottom shall have a minimum slope of 0.5% and a slope of 0.7% or greater is recommended where feasible. Lateral slopes for the pond bottom shall be 0.5% or greater. French drains or similar means may be required where it is anticipated that these slopes will not properly drain the dry pond bottom, or where dictated by multiple use or other special considerations.

h) Safety Provisions at Inlets and Outlets

All inlet and outlet structures associated with dry ponds shall have grates provided over their openings to restrict access. A maximum clear bar spacing of 0.150 m shall be used for gratings. Grated outlet structures, are to be designed with a hydraulic capacity of at least twice the required capacity to allow for possible plugging. Further, the arrangement of the structures and the location of the grating shall be such that the velocity of the flow passing through the grating will not exceed 1.0 m/s.

Appropriate fencing and guard-rails are to be provided to restrict access and reduce the hazard presented by structure head and wing walls.

i) Maintenance Access Requirements

A minimum 4.0 m wide, all-weather vehicle access shall be constructed from a public road to the inlet, sediment sump, outlet, emergency overflow and other works requiring maintenance. The maximum grade of the access shall be 8%. The surface shall be finished with gravel topped with path chip, geogrid, or rigid grass suitable for all weather maintenance truck access. A vehicle access route shall also be provided to the edge of all stormwater management ponds suitable to carry maintenance vehicles. This access shall also extend to the pond static (normal) water level. The access surface shall include a 1.0 m buffer from top of pond and an additional 1.0 m from edge of

access road to the edge of dedicated lands, and shall be accessible from and extend to a public road right-of-way. Sharp bends in this access route are to be avoided. Vehicle turning movements must accommodate a tandem axle 60,000lb flush truck and tandem axle dump truck.

j) Landscaping

Landscaping plans shall be submitted as part of the Engineering Drawings for dry ponds, and the completion of landscaping will be considered part of the improvement construction. The minimum requirement for landscaping of dry ponds shall be the establishment of grass cover. Preference should be given to use of native plant materials and, in no case, should non-native, aggressive (“invasive”) plant materials be used.

k) Sediment Control

Use of storm ponds for sediment control is acceptable during construction of the first phase of a development, and must be remediated prior to acceptance of the Works and Services by the City of Courtenay. The City may accept the use of storm ponds for sediment control for multiple phases of a development if the appropriate maintenance agreement is established and the appropriate security is provided by the developer. The required security is 125% of the estimated remediation cost.

l) Operation and Maintenance Manual

Three copies of an operation and maintenance manual shall be submitted when the facility is completed and transferred to the Municipality and include:

- Record drawings of the completed facility.
- Brief description of the facility operation including design flows, design depths, and schematic diagrams of the inlet and outlet structures, connections, controls, valves, bypass, overflows, etc.
- List of manufacturer's operation, service and repair instructions and parts lists.

- Volume-stage-discharge relationships of all control structures.
- General maintenance requirements and emergency procedures.
- Copies of senior government environmental approvals if applicable.

4.11.4 Wet Detention Ponds

Add to Section

Design Details for Wet Ponds

Wet ponds are well suited for both quality and quantity control of stormwater runoff. Wet ponds incorporate a permanent pool which rises in response to rainfall events. Extended storage durations and strategic planting in the active storage zone can further improve water quality. Sedimentation forebays should still be incorporated upstream of wet ponds for preliminary settlement of larger suspended solids.

a) Land Dedication Requirements

Wet ponds to be operated by the City of Courtenay are to be located on Public property which is to encompass all lands subject to inundation from the 24 hour 1 in 25 year return period design high water level plus the edge treatment. This designation will also apply to all rights-of-way for access to and protection of inlet and outlet sewers and flow control facilities, maintenance access routes to the pond, and to a certain proportion of the lands fronting on the pond, from the upper edge of the area containing the edge treatment to the limit of the water's edge when the water surface is at the design high water elevation.

A restrictive covenant and/or a limit for the Minimum Building Elevation (MBE) will be placed upon those lots abutting the pond to guide lot development that design requirements of the stormwater storage facility are not compromised and that an adequate freeboard is maintained.

b) Minimum Pond Size

The City discourages the proliferation of large numbers of small ponds, with the resultant higher

maintenance cost and lower efficiency impact. The storage size is determined on the basis of outflow control requirements as presented in this document.

c) Drain Time

Ponds shall be generally designed to drain to normal water surface level within 40 hours of reaching maximum water surface level, but in no case longer than 72 hours.

d) Side Slopes

Areas covered by water, from the design high water level down to the normal water level shall have a maximum slope of 7 (horizontal) and 1 (vertical) and extend at a maximum slope of 7:1 (H:V), from normal water level to a depth of 0.43 m (i.e., a distance of 3 m horizontally into the pond for safety needs). Steeper side slopes, up to 4:1 (H:V), may be considered for areas separated from the public by a Concrete Rail Fence. A slope of 4:1 (H:V) shall be used from the 0.43 m depth point (below normal water level) to the pond bottom.

e) Minimum Depth

The minimum depth from normal water level to pond bottom (beyond the side slope area) shall be 1.5 m. The maximum live storage limit in a wet pond is for 3.0 m for the 1 in 25-year return period storm event and 1.5 m for the 1 in 10-year event, as measured from the invert elevation of the outlet pipe. A freeboard allowance of 0.6 m is required for all wet ponds.

f) Pond Bottom Material

For areas where the ground water table is below the Normal Water Level (NWL), the pond bottom and side slopes are to be composed of impervious material with a suitably low permeability (e.g. with a permeability coefficient in the order of 1×10^{-6} cm/s).

For areas where the groundwater table is expected to be near or above the NWL, the pond bottom may be of a pervious material as dictated by geotechnical considerations.

g) Circulation Requirements

Narrow and/or dead bay areas where floating debris may accumulate are to be excluded at the design stage. Inlets and outlets should be located with consideration of the need to maximize detention time and circulation within the pond water body.

h) Inlet and Outlet Requirements

▪ Submergence of Inlets and Outlets

Inlet and outlet pipe inverts are to be a minimum 0.1 m above the pond bottom. Forebays are to be constructed on pond bottom to accommodate extra depth requirements for placing inlet/outlet structures, as required.

▪ Provision for Free Outfall from Inlets to Ponds

Where feasible, the invert elevation at the first manhole upstream from the pond in a minor system or the connecting or interconnecting pipe system, shall be at or above the normal water level of the pond to avoid deposition of sediments in the inlet pipe. To avoid backwater effects on the upstream sewers leading to the pond, the invert of the inlet sewer at the first manhole upstream from the pond shall be at or above the pond level for the 1 in 10-year return period storm event. A drop structure upstream from the pond will generally be required to achieve this. "Inlet" and "outlet" control calculations are required to verify the mode of operation of the pond inlets. In cases where grades set limits on the above, special maintenance needs, such as periodic flushing/cleaning must be identified.

▪ Provisions for Water Level Measurements

To permit direct measurement of water level in the pond, a manhole is to be provided hydraulically connected to the pond such that the level of water in the manhole will mimic the pond water surface level.

- Provisions for Lowering the Pond Level

The provision of the means to drain the pond completely by gravity drainage is desirable. Where a gravity drain is not feasible, provisions are to be made in association with the outlet works or otherwise, so that mobile pumping equipment may be installed and used to drain the pond.

- i) Sediment Removal Provisions

The pond design shall include an approved sedimentation removal process for control of heavy solids, which may be washed to the pond during the construction period associated with the development of the contributing drainage catchment.

Sediment basins shall be provided at all inlet locations for continued use after completion of the subdivision development. Stormwater storage/detention ponds shall not take the place of a development's sediment control storage basin.

- j) Pond Edge Treatment

Edge treatment or shore protection is required and shall be compatible with the adjacent land use. The treatment used shall meet criteria for low maintenance, safety and habitat requirements. The edge treatment is to cover ground surfaces exposed or covered by water during a pond level fluctuation to 0.3 m below or above the normal water elevation, and shall be adequate to prevent erosion of the pond edge due to wave action. The typical acceptable edge treatment shall be, but is not limited to, a 250 mm deep layer of well graded washed rock with a 75 mm minimum size or alternatively appropriate edge vegetation.

- k) Maintenance Access Requirements

A minimum 4.0 m wide, all-weather vehicle access shall be constructed from a public road to the inlet, sediment sump, outlet, emergency overflow and other works requiring maintenance. The maximum grade of the access shall be 8%. The surface shall be finished

with gravel topped with path chip, geogrid, or rigid grass suitable for all weather maintenance truck access. A vehicle access route shall also be provided to the edge of all stormwater management ponds suitable to carry maintenance vehicles. This access shall also extend to the pond static (normal) water level. The access surface shall include a 1.0 m buffer from top of pond and an additional 1.0 m from edge of access road to the edge of dedicated lands, and shall be accessible from and extend to a public road right-of-way. Sharp bends in this access route are to be avoided. Vehicle turning movements must accommodate a tandem axle 60,000lb flush truck and tandem axle dump truck.

l) Landscaping Requirements

Landscaping plans for areas bounding the pond shall be submitted as part of the Engineering Drawings. Landscaping of all proposed public lands included for purposes of the pond and of all proposed lands dedicated to the City for storm ponds on proposed private property, including all areas from the pond edge treatment to the limit of inundation when the pond is filled to the design high water level, is to be part of the pond construction requirement. The minimum requirement for landscaping shall be the establishment of grass cover. Native plant materials must be used.

m) Sediment Control

Use of storm ponds for sediment control is acceptable during construction of the first phase of a development, and must be remediated prior to acceptance of the Works and Services by the City of Courtenay. The City may accept the use of storm ponds for sediment control for multiple phases of a development if the appropriate maintenance agreement is established and the appropriate security is provided by the developer. The required security is 125% of the estimated remediation cost.

n) Operation and Maintenance Manual

Three copies of an operation and maintenance manual shall be submitted when the facility is completed and transferred to the Municipality and include:

- Record drawings of the completed facility.
- Brief description of the facility operation including design flows, design depths, and schematic diagrams of the inlet and outlet structures, connections, controls, valves, bypass, overflows, etc.
- List of manufacturer's operation, service and repair instructions and parts lists.
- Volume-stage-discharge relationships of all control structures.
- General maintenance requirements and emergency procedures.
- Copies of senior government environmental approvals if applicable.

4.11.5 Subsurface Disposal / Infiltration Systems

Delete

- May be located on-site or off-site

Replace With

- Must be located on-site

4.11.8 Oil and Grit Separators

Replace Section

Oil and Grit Separators are required for sites with parking for 11 or more vehicles. Oil and Grit Separators must be in compliance with Building Bylaw 2323 and Storm Sewer Bylaw 1402, as amended. The maximum hydraulic loading rate (HLR) will be 27 L/s/m². At the target HLR, the unit will be capable of settling coarse particles of D₅₀ > 0.115mm at 5 °C and specific gravity of 2.65, and capturing free oil droplets of D₅₀ > 0.465mm at 5 °C and assuming a specific gravity of 0.88 for a “typical” motor oil. The target effluent shall meet a TSS removal rate of 85%.

4.11.10 Alternate Design Standards

Add Section 4.11.10

The application of Sustainability Considerations, as described in Section 8.0 of the MMCD Design Guidelines 2014, as well as the Province’s “Stormwater Planning: A Guide for British Columbia” (May 2002), will be considered on a case by case basis by the City where practical.

**4.12 Erosion and
Sediment Control
(ESC)**

Add to Section

Project specific ESC plans shall be prepared by a Qualified Professional and included with engineering drawing submissions. ESC plans are to include, at minimum:

- ESC plan drawing clearly indicating types and locations of BMP installations
- Notes describing any BMP phasing, inspection and documentation requirements, and good housekeeping practices
- Detail drawings of BMPs with specific material and installation requirements

5.0 ROADS

5.3 Cross-Section Elements Replace Section Refer to the Courtenay Supplementary Standard Drawings for typical road cross sections for each road classifications. Typical road cross sections are to be applied where identified in the Official Community Plan – Bylaw No. 2387, Road Network – Map No. 3. Design speeds of the typical road sections are provided in Table 5.4 below.

5.4.2 Vertical Curves Replace Table 5.4 Replace Table 5.4 as follows:

Table 5.4 Alignment Standards

Classification	Design Speed (km/h)	Min. Radius (m)	Grade (%)		K-Value				Minimum Sight Distance (m)	
					Crest Curves		Sag Curves			
			Min	Max	Min.	Desir.	Min.	Desir.	Stopping	Decision
Arterial Road Section: B	60	120	0.5	8	10	13	8	9	95-235	95-235
Collector Road Section: Urban – P	50	85	0.5	10	6	7	5	6	75-200	75-200
Collector Road Section: Urban – B	50	85	0.5	10	6	7	5	6	75-200	75-200
Collector Road Section: Residential – C	50	85	0.5	10	6	7	5	6	75-200	75-200
Collector Road Section: Residential – B	50	85	0.5	10	6	7	5	6	75-200	75-200
Collector Road Section: Residential	50	85	0.5	10	6	7	5	6	75-200	75-200
Collector Road Section: Rural	60	120	0.5	10	10	13	8	9	95-235	95-235
Local Road Section	50	35	0.5	12	6	7	5	6	75-200	75-200
Lane	30	25	1.0	12	2	4	2	4	45	-
Driveway Multi-Family	30	-	0.5	12	2	4	2	4	45	-
Driveway Single Family	-	-	0.5	15	-	-	-	-	-	-
Emergency Access ⁸	30	12	1.0	15	2	4	2	4	45	-
Pedestrian Ramps	-	-	1.0	8.3 ⁶	-	-	-	-	-	-

5.7 Railway Grade Crossings Replace Section Locations and details of railway grade crossings are subject to requirements included in the latest edition of the Transportation Canada Grade Crossing Standards.

Railway crossing signs and pavement marking shall be in accordance with Transportation Canada Grade Crossing Standards.

5.8	Traffic Control Devices	Replace Section	Traffic control devices, signs, and pavement marking must be in accordance with the Manual of Uniform Traffic Control Devices for Canada. Pavement markings shall be thermoplastic and should be installed within 7 days of the final pavement lift on a clean and dry surface.
5.9	Culs-De-Sac	Delete	The maximum road length for a cul-de-sac, as measured from the edge of the intersecting through road to the centre of the cul-de-sac bulb, is 200m
		Replace with	The maximum road length for a cul-de-sac, as measured from the edge of the intersecting through road to the centre of the cul-de-sac bulb, is 300m
5.9.1	Temporary Turnaround	Add Section 5.9.1	Where a road terminates and there is future access to lands beyond; a turnaround shall be provided in a form acceptable to the City, and may be located on private property if protected by a right-of-way and covenant registered in favour of the City. The turnaround shall be signed as a 'fire access' with no parking allowed. The right-of-way and covenant shall be discharged when the road connection is completed.
5.10.1	Traffic Barriers at Temporary Cul-De-Sac and Turnarounds	Add Section 5.10.1	A concrete barrier shall be located at the end of a temporary cul-de-sac and turnarounds.
5.11.1	Sidewalk	Replace Section	Sidewalk location and width shall be as per Courtenay Standard Detail Drawings for typical road cross sections for different road classifications. Minimum cross fall for sidewalk shall be 2% towards the gutter, except at driveway letdowns.
5.11.2	Pedestrian Crossings	Replace Section	The warrant for pedestrian crossings must be considered as part of a broader analysis process which should include an understanding of existing site conditions, pedestrian and traffic volumes, and pedestrian accessibility. This can be evaluated utilizing TAC Pedestrian Crossing Control Guide.

The pedestrian crossing width can range from a minimum of 2.5 m to as wide as 4.0 m. (TAC Design Guidelines, Section 2.3.14.1). The pavement marking and signage configuration for crossings must be designed in accordance with TAC.

Wheel chair ramps from sidewalks, medians and traffic islands to crosswalks must be provided at intersections and multiuse pathways. Locations and details of ramps and related pedestrian safety features must be in accordance with local bylaws and the TAC Geometric Design Guide.

Sidewalks, crosswalks, and pedestrian facilities must be designed in accordance with the following guidelines:

- TAC Geometric Design Guideline, 1999 (Section 2.2.6, Section 2.3.14, Section 3.3)
- TAC – Pedestrian Crossing Control Manual, 2012
- Pedestrian Crossing Control Manual for British Columbia, Second Edition, 1994
 BC Ministry of Transportation – Manual of Standard Traffic Signs & Pavement Markings

5.14.4 Driveway Grades	Delete Sentence	For the first 10 m on private property, the maximum driveway grade is 15% if accessing a local or collector road.
	Replace with	For the first 10 m on private property, the maximum driveway grade is 12% if accessing a local or collector road.
5.14.8 Driveway Surface	Add Section 5.14.8	New or altered driveways shall be concrete or asphalt within the road right-of-way.
5.15.3 Signs and Poles	Delete Sentence	Use of minimum clearance should be justified by safety appurtenances such as poles with break-away or frangible bases or sign poles of light weight fabrication.
5.15.4 Trees	Replace Section	Provide 1 boulevard tree per single residential or duplex dwelling lot where required. For all other developments provide 1 boulevard tree per 15-22m of lot frontage and/or flankage.
		Boulevard trees are required on the same side of the street as sidewalks and are not required on rural roads.

Boulevard trees are to be located where there is a minimum space of 1.5m between the sidewalk and back of curb. Horizontal clearance from edge of driveway, curb return or above ground utility to tree trunk is 2.5m. Boulevard trees are to be located no closer than 6m from the adjacent street right of way at intersections.

Boulevard trees are to be a minimum of 3cm caliper.

The cost for each boulevard tree shall be \$800.00. The cost includes the price of the tree, installation that may include root barriers, maintenance and replacement if the tree does not survive.

The Developer shall provide a boulevard tree layout plan showing the location and number of trees and the location of utilities, prepared by a Qualified Professional to the satisfaction of the Development Engineer.

5.16	Underground Utility Locations	Replace Section	Underground utility locations within a road right-of-way will vary with the road cross section. Refer to the Courtenay Supplementary Standard Drawings for the general location of underground utilities and minimum separation requirements within the various cross sections.
5.17.3	Pavement Alternatives	Replace Section	Pavement structure design must be based on site specific recommendations provided by a Qualified Professional and shall include the minimum pavement structure identified in the City of Courtenay Supplementary Standard Detail Drawing for the relevant road classification.
5.21	Street Parking	Replace Section	Refer to the Courtenay Standard Drawings for parking configuration for different road classifications.
5.22	Retaining Walls	Add Section 5.22	Retaining wall shall be a maximum of 2.4 m in height. Where larger retaining walls heights are required, they must be constructed as a stepped wall. The step must have a minimum width of 1.8 meters or 75% of the height of the highest adjacent wall.

6.0 ROADWAY LIGHTING

6.1	General	Add to Section	Relevant publications of the Illuminating Society of North America (IESNA) including RP-8-14
6.2.2	Standards and Guidelines	Add to Section	IESNA – Illuminating Engineering Society of North America IDA – International Dark-Sky Association
6.5.1	Light Sources and Luminaires	Delete	Light sources shall be LED, Induction, High Pressure Sodium or Pulse Start Metal Halide. The selection process shall be based on a review of energy efficiency, cost/benefit (installation and operational) and optical performance which shall be undertaken in consultation with the jurisdiction that will own and operate the lighting.
		Replace with	Light sources shall only be LED. The selection process shall be undertaken in consultation with the City of Courtenay and will only include luminaire manufacturers listed in the current version of the City’s Approved Product List. All streetlights shall include flat lenses. If BC Hydro lease lights are used, they shall meet BC Hydro requirements.
6.7	Sidewalk Lighting	Delete	Sidewalk lighting levels for various pedestrian activity levels are defined in Figure 6.3, Sidewalk Illuminance Table below.
		Replace with	Sidewalk lighting levels for various pedestrian activity levels are defined in Figure 6.7, Sidewalk Illuminance Table below.
6.8	Intersection Lighting	Delete	Intersection lighting levels for various street types and pedestrian activity levels are defined in the Intersection Horizontal Illuminance Table 6.4 below.
		Replace with	Intersection lighting levels for various street types and pedestrian activity levels are defined in Figure 6.8 Horizontal Illuminance Table below.
6.9	Crosswalk Lighting	Delete	This can be achieved by placing poles in advance of the crosswalk (see Figure below) to create high levels of

			vertical illumination thus improving driver visibility of pedestrians.
		Replace with	This can be achieved by placing poles in advance of the crosswalk (see Figure 6.5 below) to create high levels of vertical illumination thus improving driver visibility of pedestrians.
6.13 Poles	Delete		For rural roads, if approved by the local authority and the power company, lights may be installed on power poles.
		Replace with	Luminaires may be installed on power poles, if approved by the City and BC Hydro.
6.14 Pole Foundations	Delete		Where soil conditions are in question a geotechnical engineer must be consulted to define the suitability of the base for the given soil's condition.
		Replace with	Where standard MMCD foundations are not suitable for site soil conditions, custom foundations will be required, and shall be designed, signed and sealed by a Qualified Professional registered as a Professional Engineer in the province of British Columbia.
6.15 Luminaires	Delete		<ul style="list-style-type: none"> ▪ Colour temperature shall not exceed 4500 kelvin.
		Replace with	<ul style="list-style-type: none"> ▪ LED luminaire colour temperature shall not exceed 3000 kelvin.
6.16 Power Supply and Distribution	Delete		Lighting system shall be fed via a service base or pole mounted cabinet which shall contain panel boards, breakers, lighting contactor(s) and photocell bypass switch as per MMCD Standard Specifications and Drawings.
		Replace with	Lighting system shall be fed via a pad mount or pole mount cabinet which shall contain panel boards, breakers, lighting contactor(s) and bypass switch as per MMCD Standard Detail Drawings and Specifications.
		Delete	Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals; however, some utility power providers may require metered services.

	Replace with	Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals unless metering is required by BC Hydro.
	Delete	Services are to be “Underground Dip” type as shown on the MMCD Standard Specifications and Drawings unless otherwise accepted by the local Municipality/City
	Replace with	Services are to be “Underground Dip” type as shown on the MMCD Standard Specifications and Drawings or overhead drops, as specified on the design drawings.
6.17.4 Drawing Requirements	Add to Section	<ul style="list-style-type: none">▪ Design submissions for City approval shall include relevant load calculators for signal and sign poles as well as other relevant engineering calculations and design drawings▪ Record drawings submissions shall include 3 - ½ size paper copy sets of drawings as well as pdf and AutoCAD electronic files of drawings
	Delete	Design drawings shall be submitted for approval along with signed and sealed computer lighting calculations.

7.0 TRAFFIC SIGNALS

7.3.1 Codes, Rules and Regulations Add to Section

- BC Motor Vehicle Act, Motor Vehicle Act Regulations, Division 23

7.4 Signal Heads Replace Figure 7.4.2 Replace Figure 7.4.2 as follows:

Table 7.4.2 Signal Head Sizes

Signal Head Type	Area Classification Lens Size and Shape
Primary	300 mm round
Secondary and Auxiliary	300 mm round
	300 mm round
Pedestrian	Combination walk/don't walk indication 300 mm square

7.8 Signal Pre-Emption Add to Section The City utilizes siren actuated emergency pre-emption equipment. Pre-emption equipment to be located 1 m right of the left most signal head.

7.9 Audible Pedestrian Signals Add to Section The City utilizes Accessible Pedestrian Signals.

7.11 Detection Methods Replace Section Traffic detection for signal actuation is accomplished by:

- Vehicle detector loops (induction)
- A vehicle detector loop is a coil of wire buried in the road surface. The coil detects the presence of a vehicle by the change in electrical induction. This change is sensed by the detector module in the traffic control cabinet. Detector loop details are indicated in the MMCD Standard Detail Drawings.

7.15 Poles and Foundations Add to Section Where standard MMCD foundations are not suitable for site soil conditions, custom foundations will be required, and shall be designed, signed and sealed by a Qualified Professional registered as a Professional Engineer in the province of British Columbia

7.18 Power Supply and Distribution Add to Section Traffic signal systems shall be fed via a pad mount or pole mount cabinet which shall contain panel boards, breakers, lighting contactor(s) and bypass switch as per MMCD Standard Detail Drawings and Specifications

			<p>Power is generally supplied by the utility through an un-metered service when servicing only streetlights and traffic signals unless metering is required by BC Hydro.</p> <p>Services are to be “Underground Dip” type as shown on the MMCD Standard Detail Drawings and Specifications or overhead drops, as specified on the design drawings.</p>
7.19	Uninterruptible Power Supplies (UPS’s)	Delete	<p>UPS’s are required where traffic signals are interconnected by grade crossing warning systems as per Transport Canada. UPS’s shall be considered where power outages are a concern or the intersection is in a high collision or a high risk area.</p>
		Replace with	<p>Uninterruptible power supplies shall be utilized at all new traffic signal installations.</p>
7.21	Drawing Requirements	Add bullets	<ul style="list-style-type: none">▪ Design submissions for City approval shall include relevant load calculators for signal and sign poles as well as other relevant engineering calculations and design drawings▪ Record drawings submissions shall include 3 - ½ size paper copy sets of drawings as well as pdf and AutoCAD electronic files of drawings



CONSTRUCTION SUPPLEMENTARY SPECIFICATIONS

This schedule contains supplementary specifications to be applied in conjunction with the Specifications of the Master Municipal Construction Documents, dated 2009, both of which shall apply to all Works and Services constructed within the City of Courtenay.

Supplementary Specifications contained within this Schedule supplement or supersede the Master Municipal Construction Document (MMCD). Where the City of Courtenay Supplementary Specifications are in conflict with the MMCD, the City of Courtenay Supplementary Specifications shall take precedence.

Section number and clause numbers in the City of Courtenay Supplementary Specifications coincide with the MMCD numbering protocol.

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MMCD Section 01 55 00S TRAFFIC CONTROL, VEHICLE ACCESS AND PARKING

1.0 GENERAL

Add 1.0.6

The Contractor is responsible for all temporary traffic control required to complete the Work. The Contractor will be responsible to provide a Traffic Management Plan (TMP) for review and acceptance by the City (10) ten working days prior to any travel lane closures taking place. TMP is to be prepared by a qualified professional.

The TMP shall outline the approach to traffic management, show recognition and minimization of risks indicates signing locations, identify Traffic Control Persons (TCP) stations, show lane shifting and proposed closures.

The TMP is to be revised and resubmitted as required during the progress of the work



MMCD Section 01 57 01S

ENVIRONMENTAL PROTECTION

1.0 GENERAL

1.2 Temporary Erosion and Sediment Controls

Add 1.2.1.4

An Erosion & Sediment Control (ESC) Plan must be prepared by a Certified Professional in Erosion and Sediment Control. The ESC Plan is to be reviewed by the City prior to the start of construction. Protection of the site and watercourses to which it drains, directly or indirectly, against erosion and siltation must be maintained in accordance with the ESC Plan until the *Works* are completed or as directed by the *Contract Administrator*.

The *Contractor* is responsible for all damage that may be caused by water backing up or flowing over, through from or along any part of the *Work* or otherwise resulting from their operations.

Add 1.2.1.5

Keep existing culverts, drains, ditches and watercourses affected by the *Work* clear of excavated material at all times. When it is necessary to remove or alter any existing drainage structure, provide suitable alternative measures for handling the drainage. Adequately support culverts and drainpipes across trenches to prevent displacement and interference with the proper flow of water due to trench settlement.

Add 1.2.1.6

Sweep streets, and clean catch basins, manhole sumps, detention tanks, and maintain siltation controls as often as the *Contract Administrator* deems necessary.

Add 1.2.1.7

Follow all Federal and Provincial regulations and guidelines respecting protection of fish, fish habitat, and watercourses.

1.4 Environmental Protection

Add 1.4.3.5

Immediately contain and clean up any leaks and spills of prohibited materials at the *Place of Work*.



MMCD Section 26 56 01S

ROADWAY LIGHTING

2.0 PRODUCTS

2.1	General	Delete 2.1.2 and replace with the following	All products supplied to be new, in accordance with Contract Documents. All products are to meet Canadian Electrical Code requirements and be certified by either CSA, ULC, or Intertek Testing Systems (Warnock Hersey) and be supplied with the certifier's label.
2.8	Conductors and Cables	Delete 2.8.1 and replace with the following	Single Conductors: 600V, conductor size (AWG) as noted on contract drawings, stranded copper or aluminum type with RW90 polyethylene insulation, to conform to CSA C22.2 No. 38, 90 °C and colour coded per CEC.
		Add 2.8.5	<p>Minimum conductor size to be as follows, unless specified otherwise on Contract Drawings:</p> <ul style="list-style-type: none"> .1 No 8 AWG copper or No 6 AWG aluminum for feeder conductors in conduit. .2 No 8 AWG copper or No 6 AWG aluminum for bond conductors in conduit. .3 No 12 AWG copper for luminaire conductors in poles.
2.14	Luminaires	Delete 2.14.1 and replace with the following	LED luminaires shall be listed on the current edition of the City of Courtenay Approved Products list.
		Delete 2.14.2	
		Delete 2.14.5 and replace with the following	<p>Decorative luminaires to have:</p> <ul style="list-style-type: none"> .1 Vandal resistant features .2 Photo-control receptacle .3 Powder coat finish .4 Quick disconnect terminations
2.19	Service Panels	Add 2.19.1	Type 40A 120/240V, 60A 120/240V roadway lighting and 100A 120/240V combination roadway lighting / traffic signal, per Contract Drawings to include items listed within the Section 34 41 13 - Traffic Signals - 2.11.2 and Standard Detail Drawing E7.1 to E7.9



3.0 EXECUTION

3.3	Concrete Bases	Add 3.3.7	All concrete bases shall be pre-cast concrete only, unless noted on Contract Drawings or directed by the Contract Administrator.
3.4	Junction Boxes and Vaults	Add 3.4.5	All junction boxes shall be provided with RPVC bars to support electrical connections and fuse holders. The RPVC bars shall be attached into the junction box side walls with the electrical connections/fuse holders tie-wrapped in place and installed in the up-right position.
3.5	Underground Conduit	Add 3.5.6	Conduits shall be blown out with compressed air, from both ends if necessary, then swabbed with the appropriate size mandrel to remove stones, dirt, water and other material which may have entered during installation.
		Add 3.5.7	Conduit shall not be bent in the field. Only factory bends will be accepted.
3.8	Wiring	Delete 3.8.11 and replace with the following	Bond all luminaires and receptacles with No. 12 RW90 copper green conductor, and steel junction box lids with No. 8 RW90 copper green conductor.
		Add 3.8.12	Aluminum conductors shall be spliced with H-Tap compression connections or equivalent. Spliced connections shall be completed using an anti-oxidant compound complete with split bolt connector. Spliced connections shall be wrapped with self-fusing rubberized tape and then completely covered with PVC tape.
3.13	Pole Finish Application	Delete 3.13 and replace with the following	.1 Pole finish: Hot dip galvanized or powder coat .2 Power coat colour to be confirmed with City



MMCD Section 31 05 17S AGGREGATES AND GRANULAR MATERIALS

2.0 PRODUCTS

2.11 Recycled Aggregate Material Delete 2.11.1 and replace with the following Aggregates containing recycled material may be utilized if approved by the Contract Administrator. A maximum of 25% recycled aggregate may be used in sub-base gravel, and a maximum of 15% recycled aggregate is permitted in base gravel. In addition to meeting all other conditions of this specification, recycled material should not reduce the quality of construction achievable with quarried materials. Recycled material shall consist only of aggregates, crushed portland cement concrete, or asphalt that is free of impurities.

2.13 Path Chip Add Clause 2.13.1: To be crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing		
9.5mm			100
4.75mm	80	-	100
2.36mm	40	-	60
1.18mm	20	-	40
0.6mm	10	-	30
0.3mm	8	-	20
0.15mm	5	-	15
0.075mm	3	-	10



MMCD Section 33 11 01S

WATERWORKS

1.0 GENERAL

1.7 Scheduling of Work Delete 1.7.5 and replace with the following Notify Contract Administrator, fire department and City of Courtenay Public Works Office of any planned or accidental interruption of water supply. After hours phone number to be identified at the project initiation meeting.

2.0 PRODUCTS

2.1 General Delete 2.1.1 and replace with the following Pipe material as shown on Contract Drawings, excluding main pipe within chambers or structures, which shall be stainless steel, and leads to fire hydrants which shall be PVC.

2.2 Mainline Pipe, Joints and Fittings Delete 2.2.4.8.1 and replace with the following Flange gaskets to be manufactured from black natural rubber 3.175mm thick.

Delete 2.2.4.14.1.8 and replace with the following Tapping machine must have provision for pressure testing.

2.3 Valves and Valve Boxes Delete 2.3.6.2 and replace with the following Valve box riser to be 150mm diameter PVC C900.

2.5 Service Connections, Pipe, Joints and Fittings Delete 2.5.5 and replace with the following Copper tubing joints to be compression type suitable for 1100 kPa working pressure.

2.6 Hydrants Delete 2.6.1.6.3 and replace with the following Pump nozzle shall be "quick connect" STORZ type.

Delete 2.6.2 and replace with the following Colour: As specified in the approved products list



3.0 EXECUTION

3.17	General Procedure Flushing, Testing, and Disinfection	Add 3.17.7	Contractor shall record locations of installed testing point locations as per paragraph 1.7.2.2 under Section 01 33 01 Project Record Documents.
3.18	Cleaning and Preliminary Flushing	Delete 3.18.2 and replace with the following	Isolation of existing water system where required will be performed by the City. Do not operate any existing valves.
3.23	Connection to Existing Mains	Delete 3.23.1 and replace with the following	Connections to the existing waterworks system will be made by the City or by the Contractor under supervision of the City. Contractor to make all necessary scheduling arrangements with the City to prevent construction delays.
		Add 3.23.2	Isolation of existing water system where required will be performed by the City. The Contractor shall not operate any existing valves.
		Add 3.23.3	The contractor is to schedule a "pre-construction" meeting to occur a minimum of one (1) week prior to connection to the existing waterworks system. This meeting will include, at minimum, the Contractor, Contract Administrator, and City of Courtenay Public Works in attendance. The purpose of this meeting is to review all pre-connection documentation, public notifications, and works to be completed by both the Contractor and City of Courtenay.



MMCD Section 33 30 01S

SANITARY SEWERS

1.0 GENERAL

1.1	Related Work	Add the following to 1.1	.5 CCTV Inspection of Pipelines Section 33 01 30.1
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2.0 PRODUCTS

2.3	Service Connections	Delete 2.3.8.2
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3.0 EXECUTION

3.8	Connections to Existing Mainline Pipes	Delete 3.8.3 and replace with the following	Connection to existing PVC mainline sewers to be as shown on Contract Documents or approved by Contract Administrator. Coring of pipe to be done with the proper size and type of coring bit. Use saddle for connections more than two sizes smaller than mainline. For less than two sizes, manufactured wye shall be used.
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3.18	Video Inspection	Add the following to 3.18.1	The Contractor shall complete CCTV video inspection prior to completing paving works and again prior to the expiry of the maintenance period. CCTV Video inspection shall be completed for all gravity mains including service connections.
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MMCD Section 33 40 01S

STORM SEWERS

2.0 PRODUCTS

2.6	Service Connections	Delete 2.6.1 and replace with the following	Storm sewer service connections to be 150 mm minimum diameter; maximum diameter as specified on Contract Drawings
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3.0 EXECUTION

3.12	Inspection and Testing	Add 3.12.4	The Contractor shall complete CCTV video inspection prior to completing paving works and again prior to the expiry of the maintenance period. CCTV Video inspection shall be completed for all gravity mains including service connections.
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MMCD Section 33 44 01S

MANHOLES AND CATCHBASINS

1.0 GENERAL

- | | | | |
|-----|--------------|-----------|--|
| 1.1 | Related Work | Add 1.1.6 | Hot Mix Asphalt Concrete Pavement Section 32 12 16 |
| | | Add 1.1.7 | Portland Cement Concrete Pavement Section 32 13 13 |

3.0 EXECUTION

- | | | | |
|-----|----------------------|--|--|
| 3.3 | Manhole Installation | Delete 3.3.15 and replace with the following | Install drop structures where required to Standard Detail Drawings S3. Inside drop structure shall not be permitted. |
|-----|----------------------|--|--|



MMCD Section 34 41 13S

TRAFFIC SIGNALS

2.0 PRODUCTS

2.1	General	Delete 2.1.2 and replace with the following	All products supplied to be new, in accordance with Contract Documents. All products are to meet Canadian Electrical Code requirements and be certified by either CSA, ULC, or Intertek Testing Systems (Warnock Hersey) and be supplied with the certifier's label.
2.16	Traffic and Pedestrian Signals	Delete 2.16.2 and replace with the following	Yellow as indicated on the contract drawings, complete with 50 mm wide ASTM VI retro-reflective tape around the outer edge.
2.20	Audible Signals	Delete 2.20.1 and replace with the following	The City utilizes APS audible signals which are specified in the current edition of the City's Approved Product list.
2.22	Luminaires	Delete 2.22.1 and replace with the following Delete 2.22.2 Delete 2.22.5 and replace with the following	LED luminaires are specified in the current edition of the City's Approved Products list. Decorative luminaires to have: 1. Vandal resistant features 2. Photo-control receptacle 3. Powder coat finish 4. Quick disconnect terminations
2.27	Video Detection System	Delete 2.27	
3.0 EXECUTION			
3.3	Concrete Bases	Add 3.3.7	All concrete bases shall be pre-cast concrete only, unless noted on Contract Drawings or directed by the Contract Administrator.
3.4	Junction Boxes and Vaults	Add 3.4.5	All junction boxes shall be provided with RPVC bars to support electrical connections and fuse holders. The RPVC bars shall be attached into the junction box side walls with the electrical connections/fuse holders tie-wrapped in place and installed in the up-right position.



3.5	Underground Conduit	Add 3.5.6	Conduits shall be blown out with compressed air, from both ends if necessary, then swabbed with the appropriate size mandrel to remove stones, dirt, water and other material which may have entered during installation.
		Add 3.5.7	All conduits entering traffic controller cabinets shall be sealed with "Duct Seal".
		Add 3.5.8	Conduit shall not be bent in the field. Only factory bends will be accepted.
3.7	Traffic and Pedestrian Signal Head Mounting	Delete 3.7.4 and replace with the following	Completely cover all traffic and pedestrian signal heads with dark coloured pre-manufactured signal cover bags from the time they are installed until system startup.
3.16	Traffic Controller	Add 3.16.8	Traffic cabinet interior shall be kept dry during inclement weather.
3.22	Pole Finish Application	Delete 3.22.1 and replace with the following	Pole finish: Hot dip galvanized or powder coat. Powder coat colour to be confirmed with the City

SUPPLEMENTARY STANDARD DETAIL DRAWINGS

This schedule contains supplementary standard detail drawings to be applied in conjunction with the Standard Detail Drawings of the Master Municipal Construction Documents, dated 2009, both of which shall apply to all Works and Services constructed within the City of Courtenay.

Supplementary Standard Detail Drawings contained within this Schedule supplement or supersede the Master Municipal Construction Document (MMCD). Where the City of Courtenay Supplementary Standard Detail Drawings are in conflict with the MMCD, the City of Courtenay Supplementary Standard Detail Drawings shall take precedence.

Drawing numbers in the City of Courtenay Supplementary Standard Detail Drawings coincide with the MMCD numbering protocol.

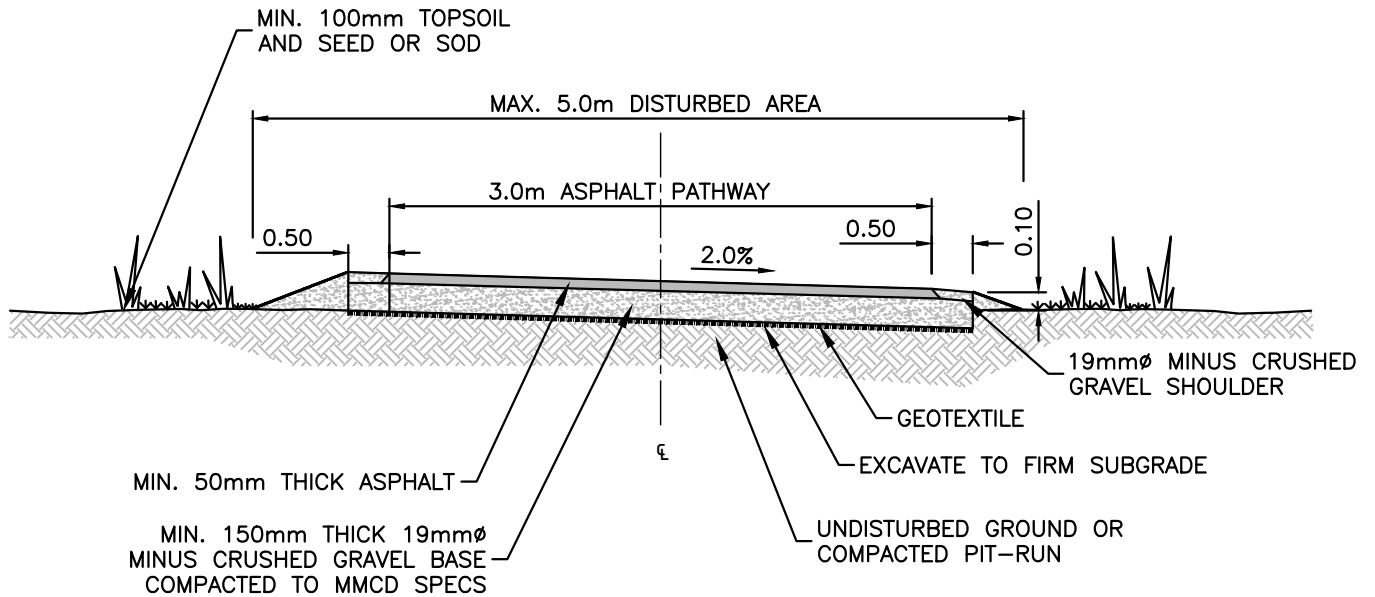
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CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. GRAVEL DEPTH TO SUIT GROUND CONDITIONS.
2. 150 ϕ DR-28 PVC DRAIN TO BE INSTALLED WHERE REQUIRED.
3. MATERIALS AND CONSTRUCTION TO MEET CURRENT CITY OF COURTENAY SPECIFICATIONS.
4. THE CONTRACTOR IS RESPONSIBLE FOR EROSION AND SEDIMENT CONTROLS AS REQUIRED TO COMPLETE THE WORK. THE CONTRACTOR IS TO SUPPLY A "SEDIMENT & EROSION CONTROL PLAN" FOR REVIEW BY THE CITY PRIOR TO CONSTRUCTION.
5. ALL MATERIALS TO BE SUPPLIED & CONSTRUCTED AS PER THE MOST RECENT VERSION OF THE MASTER MUNICIPAL CONTRACT DOCUMENTS (MMCD).
6. IF ACCESS REQUIRED BY CITY PUBLIC WORKS, PATHWAY MUST INCLUDE A MINIMUM UNOBSTRUCTED ACCESS OF 4.0m.
7. WHERE PATHWAY INTERSECTS WITH CITY ROAD OR SIDEWALK, THE FIRST 5.0m IS TO BE CONSTRUCTED OF CONCRETE COMPLETE WITH REMOVABLE BOLLARD PER DETAIL CSSD C12. SEE DETAIL CSSD C10 FOR DETAILS.

NOVEMBER, 2017



ALTERNATIVE DESIGN STANDARD 1
MULTI-USE PATH

DRAWING NUMBER

CSSD A1

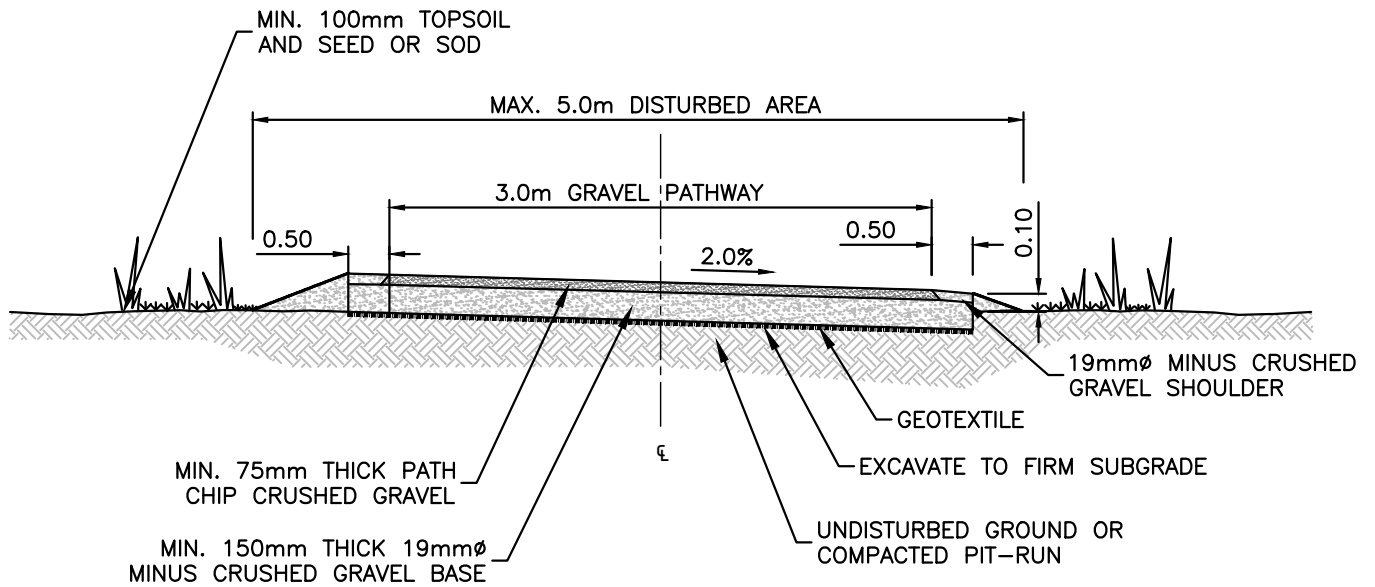
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. GRAVEL DEPTH TO SUIT GROUND CONDITIONS.
2. 150 \emptyset DR-28 PVC DRAIN TO BE INSTALLED WHERE REQUIRED.
3. MATERIALS AND CONSTRUCTION TO MEET CURRENT CITY OF COURTENAY SPECIFICATIONS.
4. THE CONTRACTOR IS RESPONSIBLE FOR EROSION AND SEDIMENT CONTROLS AS REQUIRED TO COMPLETE THE WORK. THE CONTRACTOR IS TO SUPPLY A "SEDIMENT & EROSION CONTROL PLAN" FOR REVIEW BY THE CITY PRIOR TO CONSTRUCTION.
5. ALL MATERIALS TO BE SUPPLIED & CONSTRUCTED AS PER THE MOST RECENT VERSION OF THE MASTER MUNICIPAL CONTRACT DOCUMENTS (MMCD).
6. WHERE PATHWAY INTERSECTS WITH CITY ROAD OR SIDEWALK, THE FIRST 5.0m IS TO BE CONSTRUCTED OF CONCRETE COMPLETE WITH REMOVABLE BOLLARD PER DETAIL CSSD C12. SEE DETAIL CSSD C10 FOR DETAILS.
7. TRAIL WIDTH MAY BE REDUCED TO 1.5m IN RIPARIAN AREAS, BUT NOT WHERE REQUIRED FOR MAINTENANCE ACCESS.

NOVEMBER, 2017



ALTERNATIVE DESIGN STANDARD 2
GRAVEL TRAIL

DRAWING NUMBER

CSSD A2

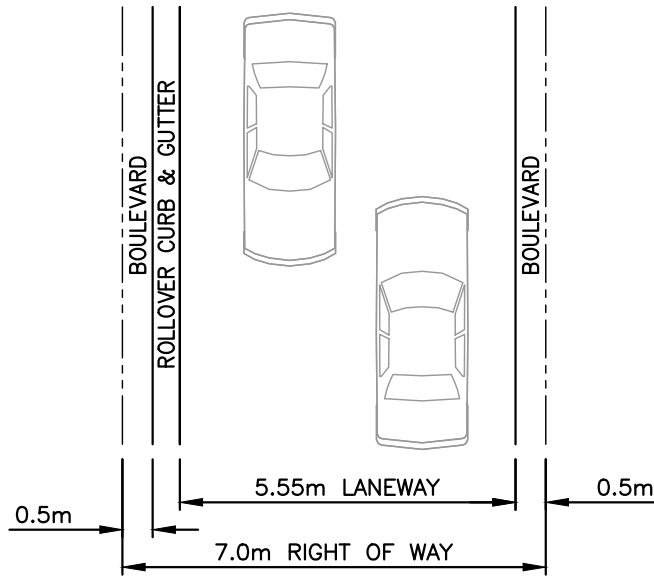
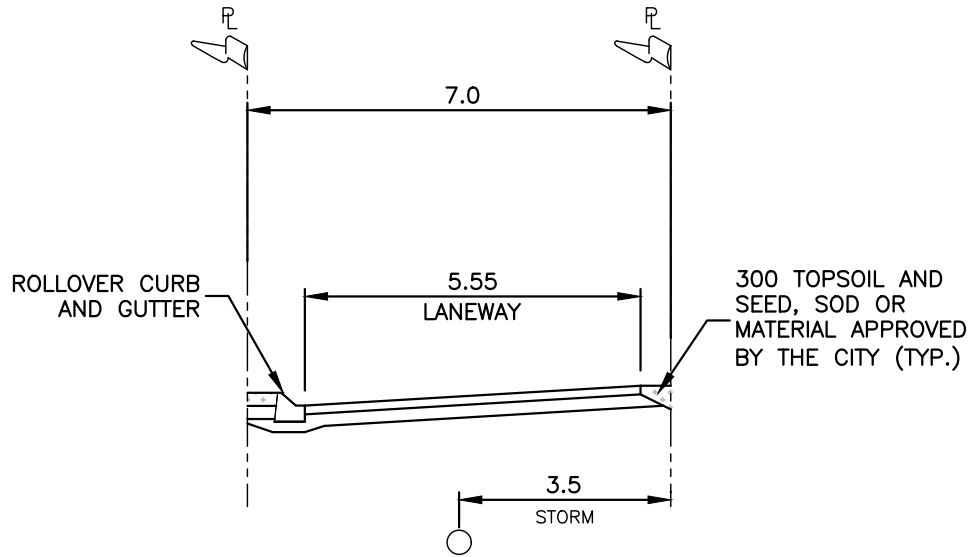
REVISION NUMBER

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SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOVEMBER, 2017



ALTERNATIVE DESIGN STANDARD 3
LANE

DRAWING NUMBER

CSSD A3

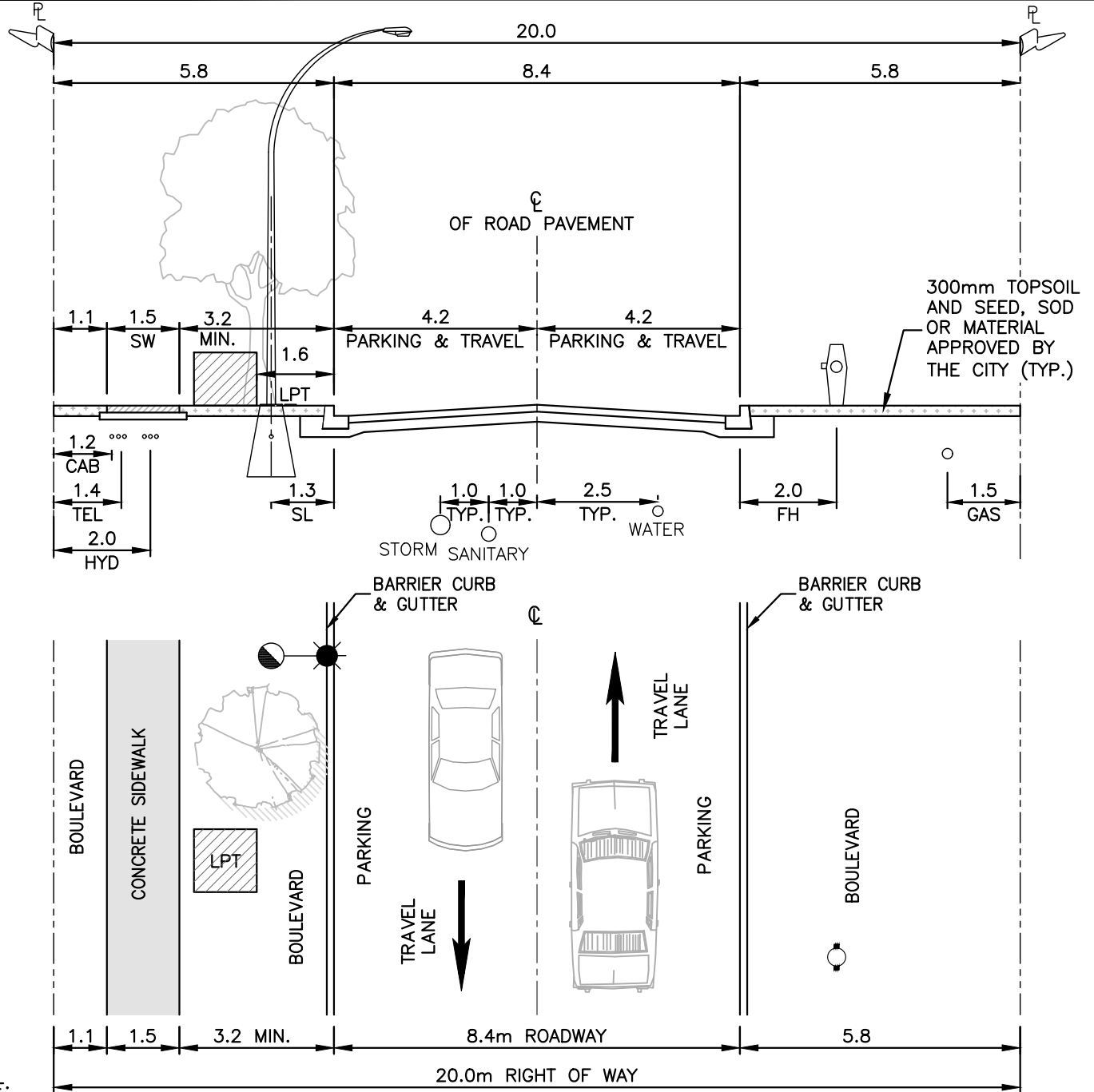
REVISION NUMBER

0

SCALE

N.T.S.

**CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING**



NOTE:

1. PAVEMENT MARKINGS NOT REQUIRED FOR THE CENTRE LINES, INTERSECTION APPROACHES AND FOG LINES.
2. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
3. THE STRUCTURAL ROAD ELEMENTS SHOWN ARE MINIMUM REQUIREMENTS. ROAD STRUCTURE TO BE DESIGNED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.
4. SIDEWALK TO BE LOCATED ON NORTH OR WEST SIDE OF ROAD.
5. HYDRO SERVICE BOX TO INCLUDE A STORM SEWER SERVICE CONNECTION AS PER CSSD S8. INSPECTION CHAMBER TO BE LOCATED 300mm FROM SERVICE BOX.
6. TREES TO BE CENTRED IN BOULEVARDS.

LOCAL ROAD SECTION

DRAWING NUMBER

CSSD L1

REVISION NUMBER

0

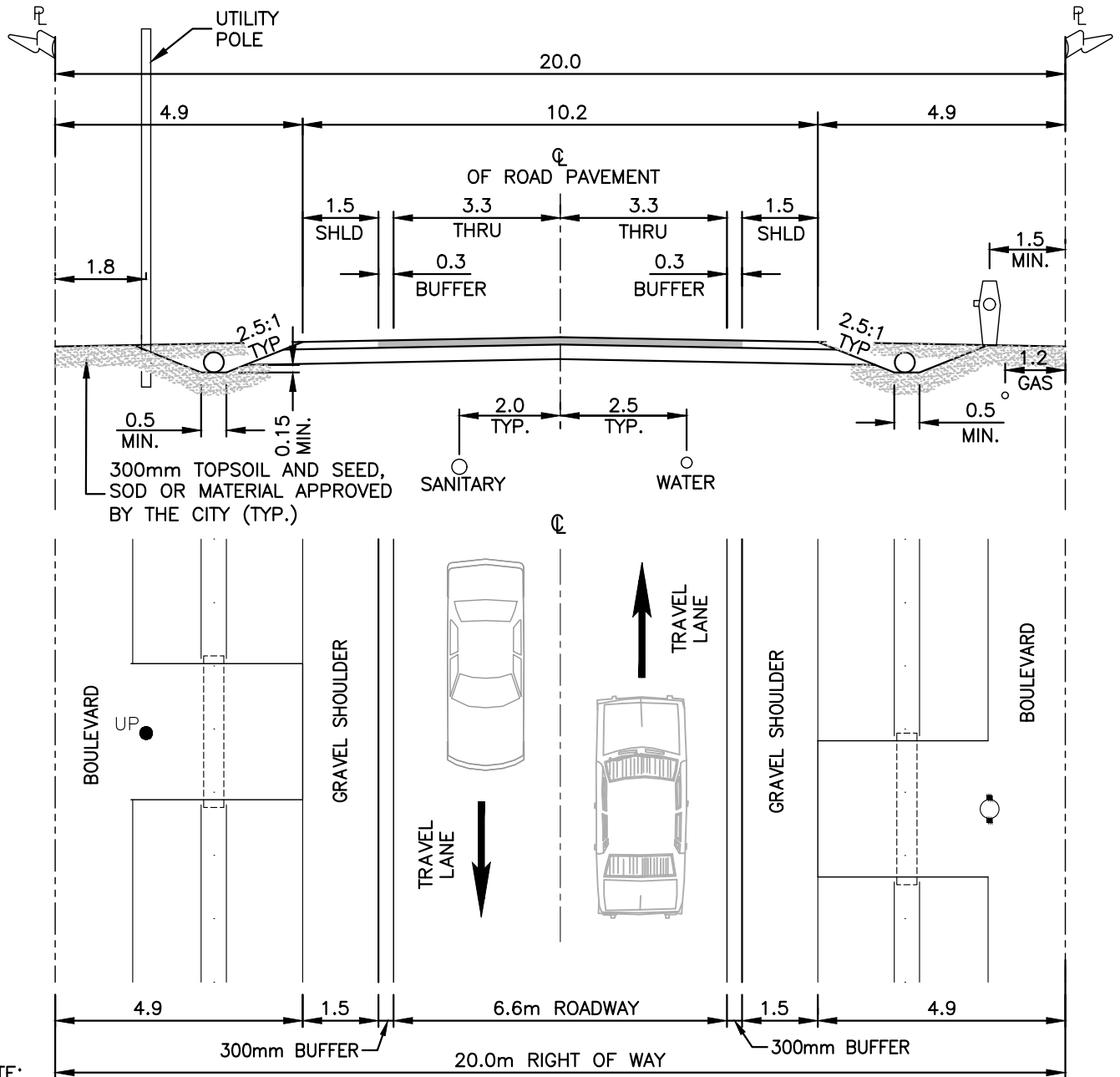
SCALE

N.T.S.

NOVEMBER, 2017



CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. DESIGNATED BIKE ROUTE TO HAVE 1.5m PAVED AND 0.5m GRAVEL SHOULDER ON BOTH SIDES.
2. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE AND FOG LINES TO TAC STANDARD.
3. 3.0m LONG CULVERT CROSSING TO BE INSTALLED IN FRONT OF HYDRANT (C/W HEADWALLS), SIZED APPROPRIATELY FOR DRAINAGE FLOWS (MIN. 300mm).
4. REQUIREMENT FOR ROADSIDE BARRIER TO BE DETERMINED AS PER TAC WARRANT.
5. ADDITIONAL 0.75m ASPHALT WIDTH TO BE ADDED TO SHOULDER WIDTH IF ROADSIDE BARRIER IS REQUIRED.
6. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
7. IF UTILITY POLE LOCATED WITHIN DITCH PROFILE, 3.0m LONG CULVERT TO BE INSTALLED IN FRONT OF UTILITY POLE.

COLLECTOR ROAD SECTION RURAL

DRAWING NUMBER

CSSD CRu

REVISION NUMBER

0

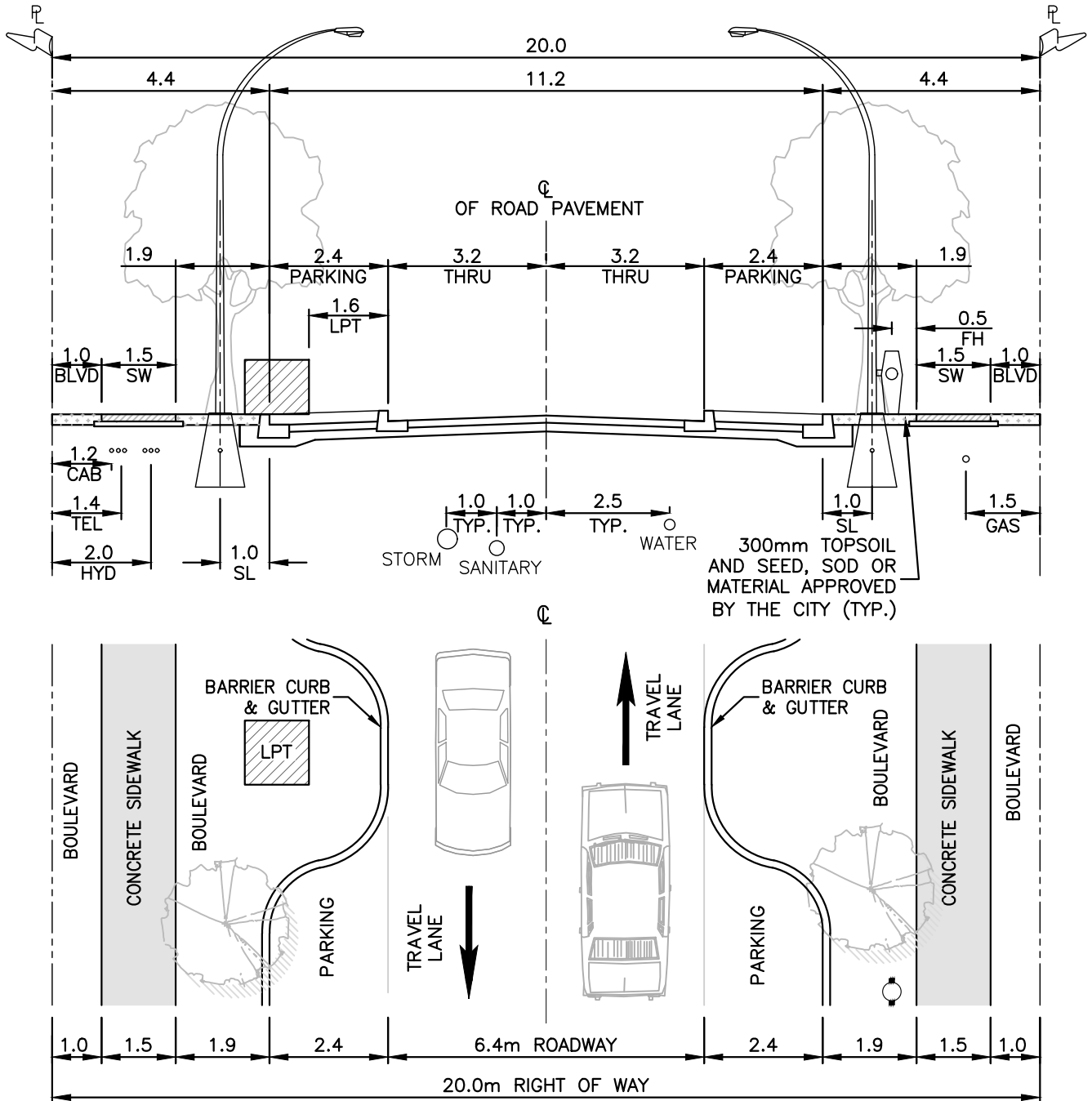
SCALE

N.T.S.

NOVEMBER, 2017



CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, LANE LINE, AND TRANSVERSE ROAD MARKINGS TO TAC STANDARD.
2. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
3. BULB OUTS TO BE LOCATED AT LPTS, CROSSWALKS AND INTERSECTIONS TO DELINEATE PARKING POCKETS.
4. HYDRO SERVICE BOX TO INCLUDE A STORM SEWER SERVICE CONNECTION AS PER CSSD S8. INSPECTION CHAMBER TO BE LOCATED 300mm FROM SERVICE BOX.
5. TREES TO BE CENTRED IN BOULEVARDS.

COLLECTOR ROAD SECTION RESIDENTIAL

DRAWING NUMBER

CSSD CR_e

REVISION NUMBER

0

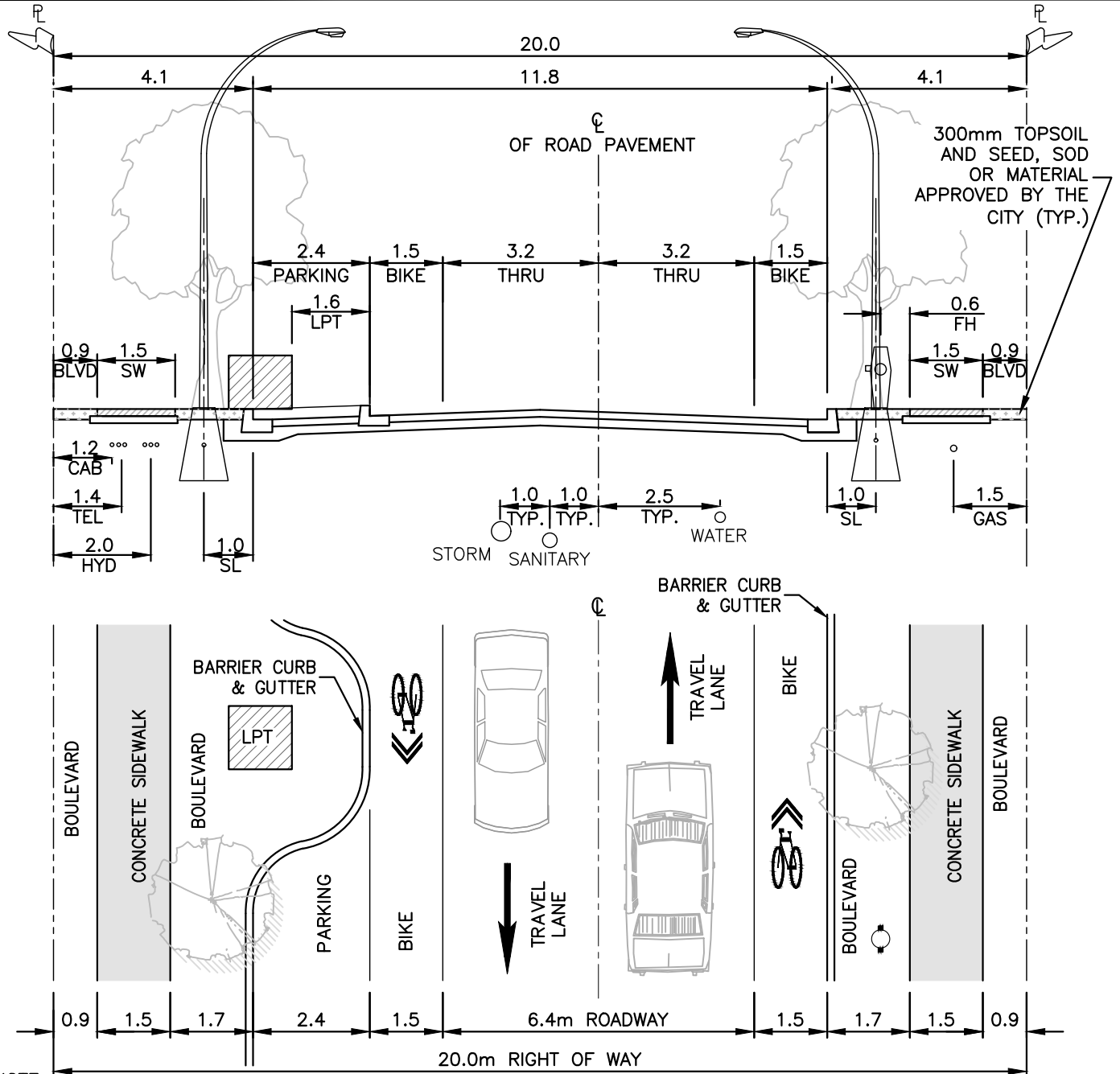
SCALE

N.T.S.

NOVEMBER, 2017



CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, LANE LINES, BIKE LANES AND ALL TRANSVERSE MARKINGS TO TAC STANDARD.
2. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
3. BULB OUTS TO BE LOCATED AT LPTS, CROSSWALKS AND INTERSECTIONS TO DELINEATE PARKING POCKETS.
4. PARKING PROVISION TO BE ON NORTH OR WEST SIDE OF ROAD.
5. HYDRO SERVICE BOX TO INCLUDE A STORM SEWER SERVICE CONNECTION AS PER CSSD S8. INSPECTION CHAMBER TO BE LOCATED 300mm FROM SERVICE BOX.
6. TREES TO BE CENTRED IN BOULEVARDS.

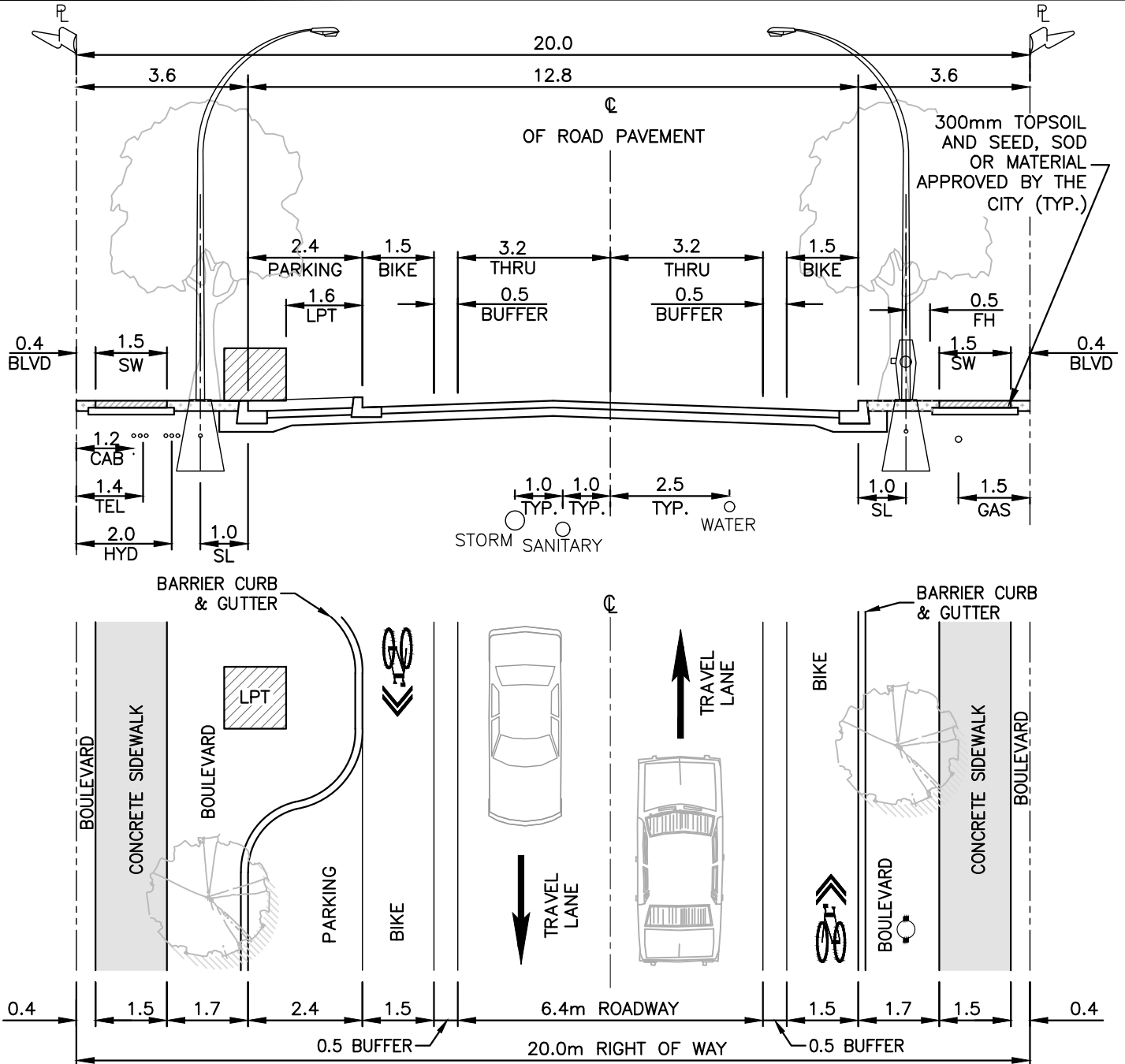
NOVEMBER, 2017



COLLECTOR ROAD SECTION
RESIDENTIAL – B

DRAWING NUMBER	CSSD CRB
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, LANE LINES, BIKE LANES, AND TRANSVERSE ROAD MARKINGS TO TAC STANDARD.
2. BIKE LANE BUFFER TO BE HATCHED / GORE TO TAC STANDARD.
3. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
4. BULB OUTS TO BE LOCATED AT LPTS, CROSSWALKS AND INTERSECTIONS TO DELINEATE PARKING POCKET.
5. HYDRO SERVICE BOX TO INCLUDE A STORM SEWER SERVICE CONNECTION AS PER CSSD S8. INSPECTION CHAMBER TO BE LOCATED 300mm FROM SERVICE BOX.
6. TREES TO BE CENTRED IN BOULEVARDS.

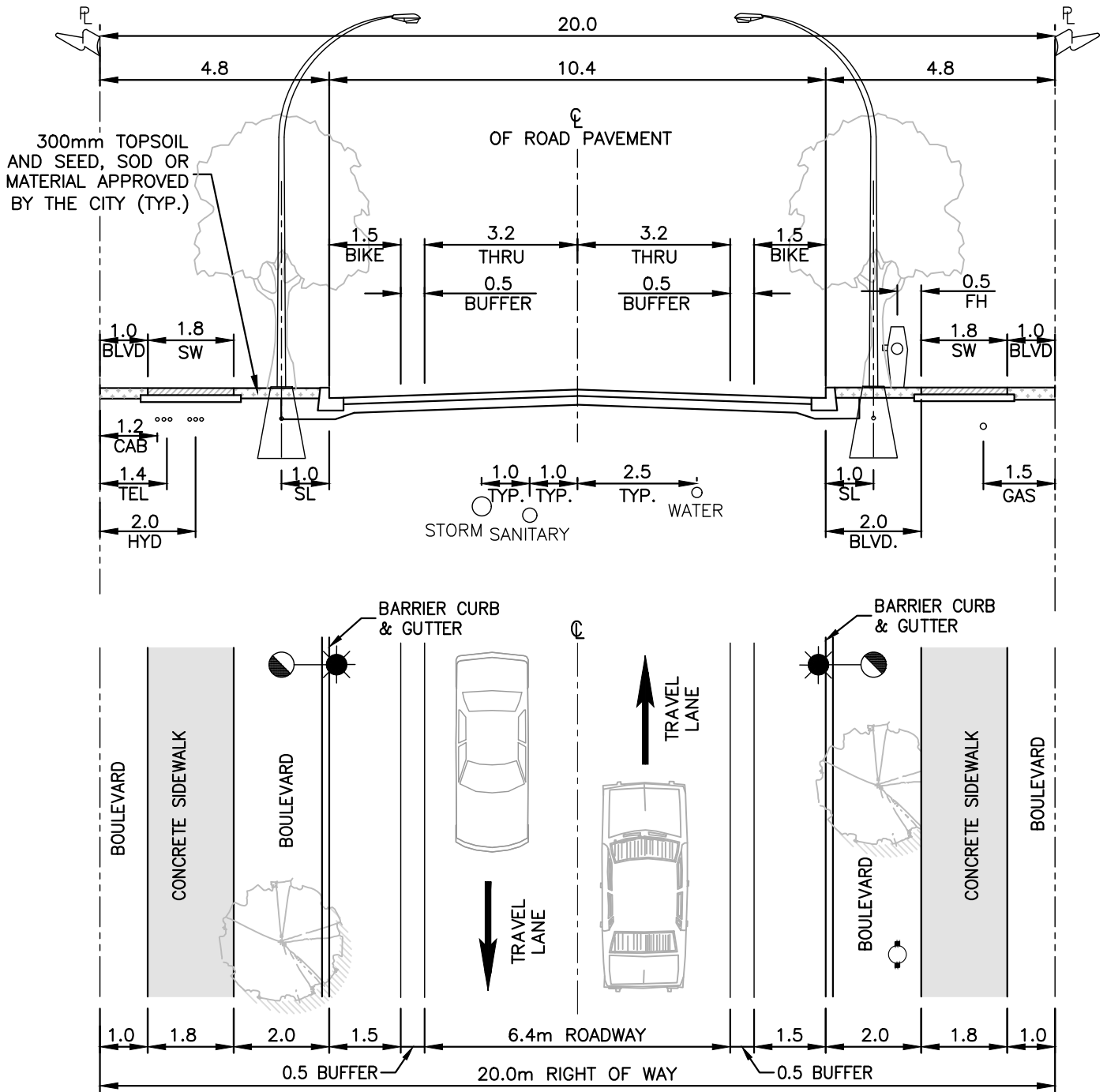
NOVEMBER, 2017



COLLECTOR ROAD SECTION RESIDENTIAL - C

DRAWING NUMBER	CSSD CRC
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, BIKE LANES AND TRANSVERSE ROAD MARKINGS TO TAC STANDARD.
2. BIKE LANE BUFFER TO BE HATCHED / GORE TO TAC STANDARD.
3. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
4. THIS ROAD SECTION ASSUMES NO HYDRO LOADS OR LPT.
5. TREES TO BE CENTRED IN BOULEVARDS.

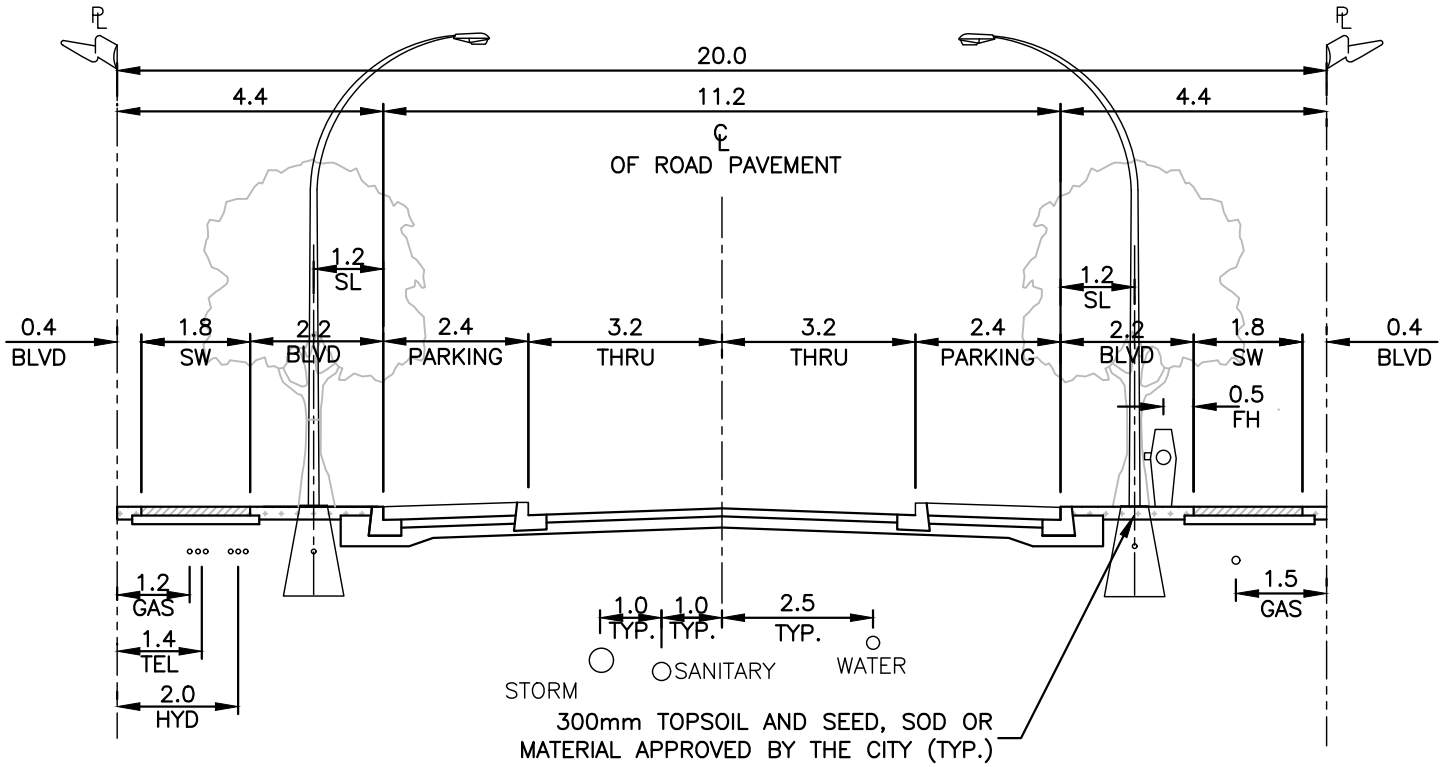
NOVEMBER, 2017



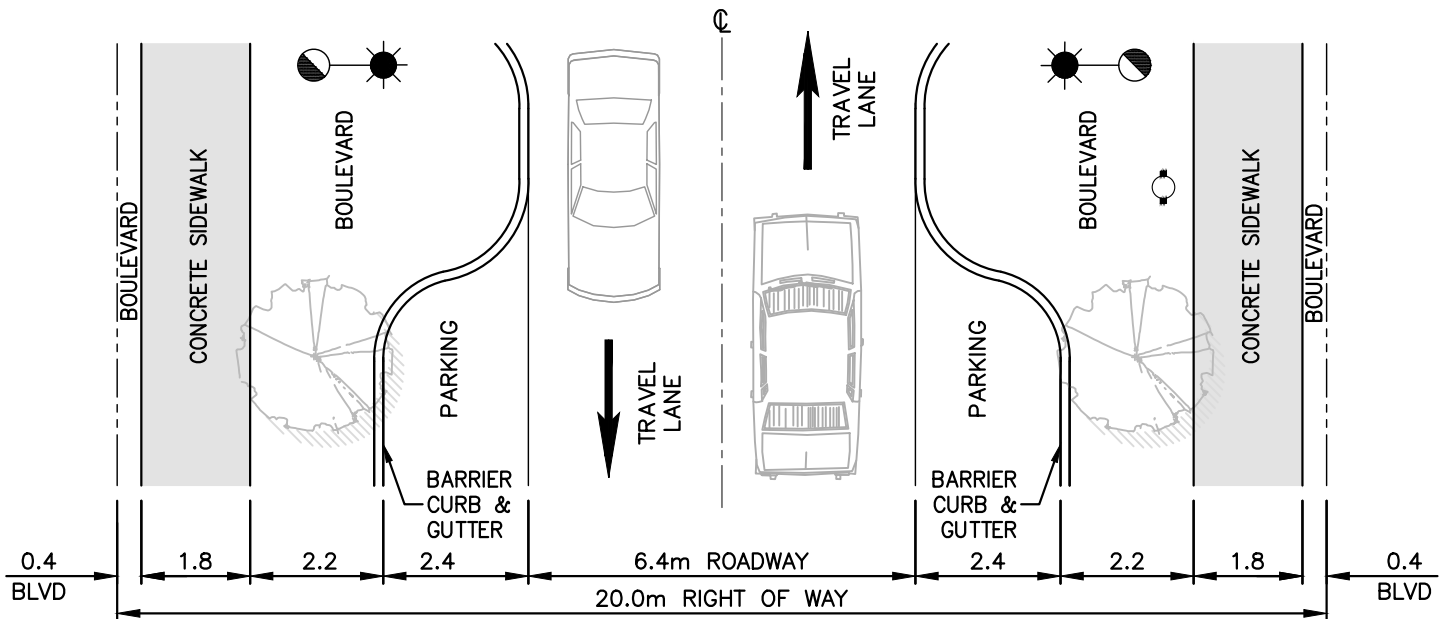
COLLECTOR ROAD SECTION URBAN – B

DRAWING NUMBER	CSSD CUB
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



300mm TOPSOIL AND SEED, SOD OR MATERIAL APPROVED BY THE CITY (TYP.)



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, BIKE LANES AND TRANSVERSE ROAD MARKINGS TO TAC STANDARD.
2. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
3. THIS ROAD SECTION ASSUMES NO HYDRO LOADS OR LPT.
4. BULB OUTS TO BE LOCATED AT INTERSECTIONS.
5. TREES TO BE CENTRED IN BOULEVARDS.

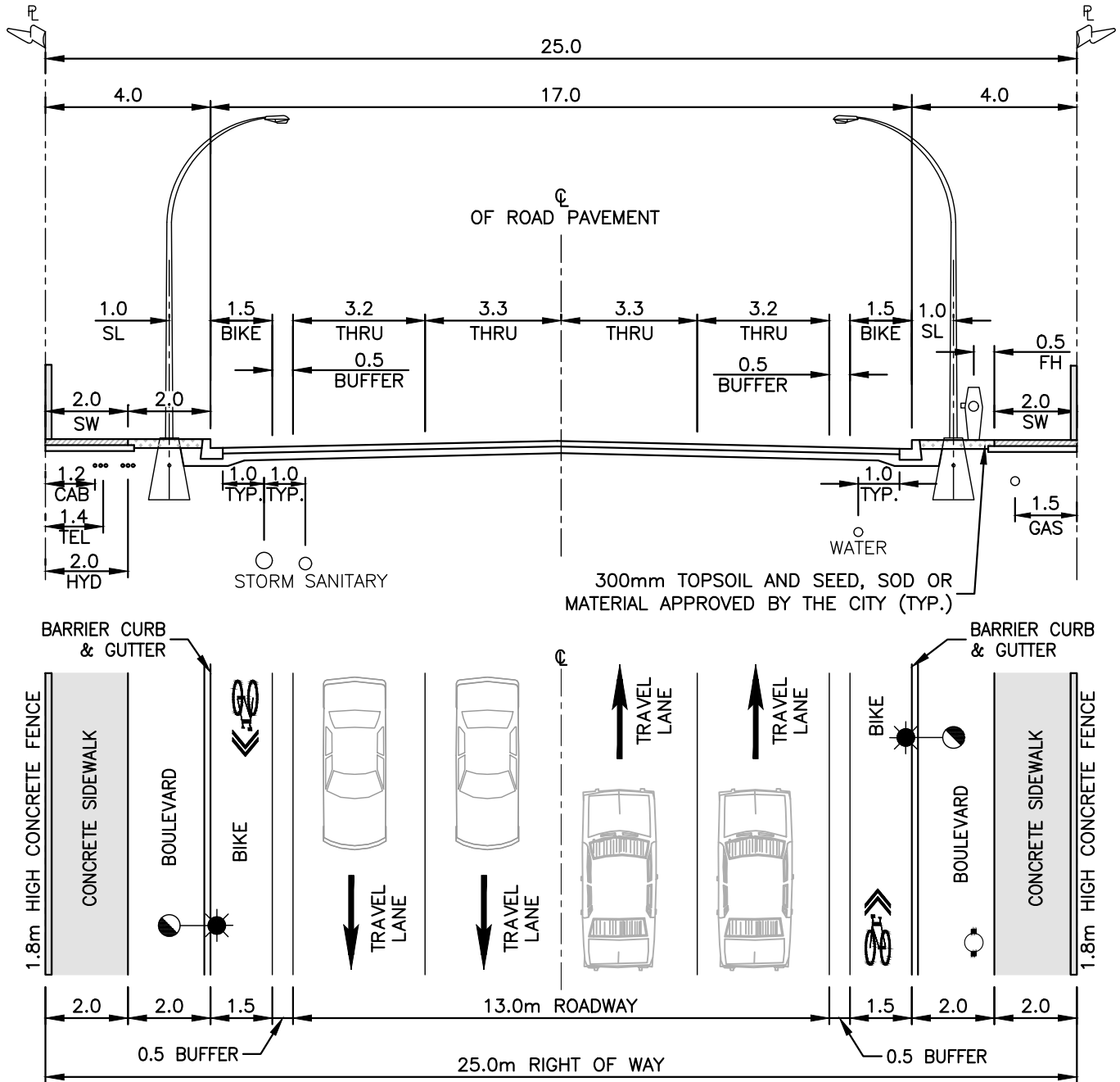
NOVEMBER, 2017



COLLECTOR ROAD SECTION URBAN - P

DRAWING NUMBER	CSSD CUP
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PAVEMENT MARKINGS TO INCLUDE: CENTRE LINE, THRU LANES, BIKE LANES AND TRANSVERSE ROAD MARKINGS TO TAC STANDARD.
2. BIKE LANE BUFFER TO BE HATCHED / GORE TO TAC STANDARD.
3. 3rd PARTY UTILITY DESIGN TO BE PROVIDED BY THE RESPECTIVE UTILITIES.
4. HYDRO SERVICE BOX TO INCLUDE A STORM SEWER SERVICE CONNECTION AS PER CSSD S8. INSPECTION CHAMBER TO BE LOCATED 300mm FROM SERVICE BOX.

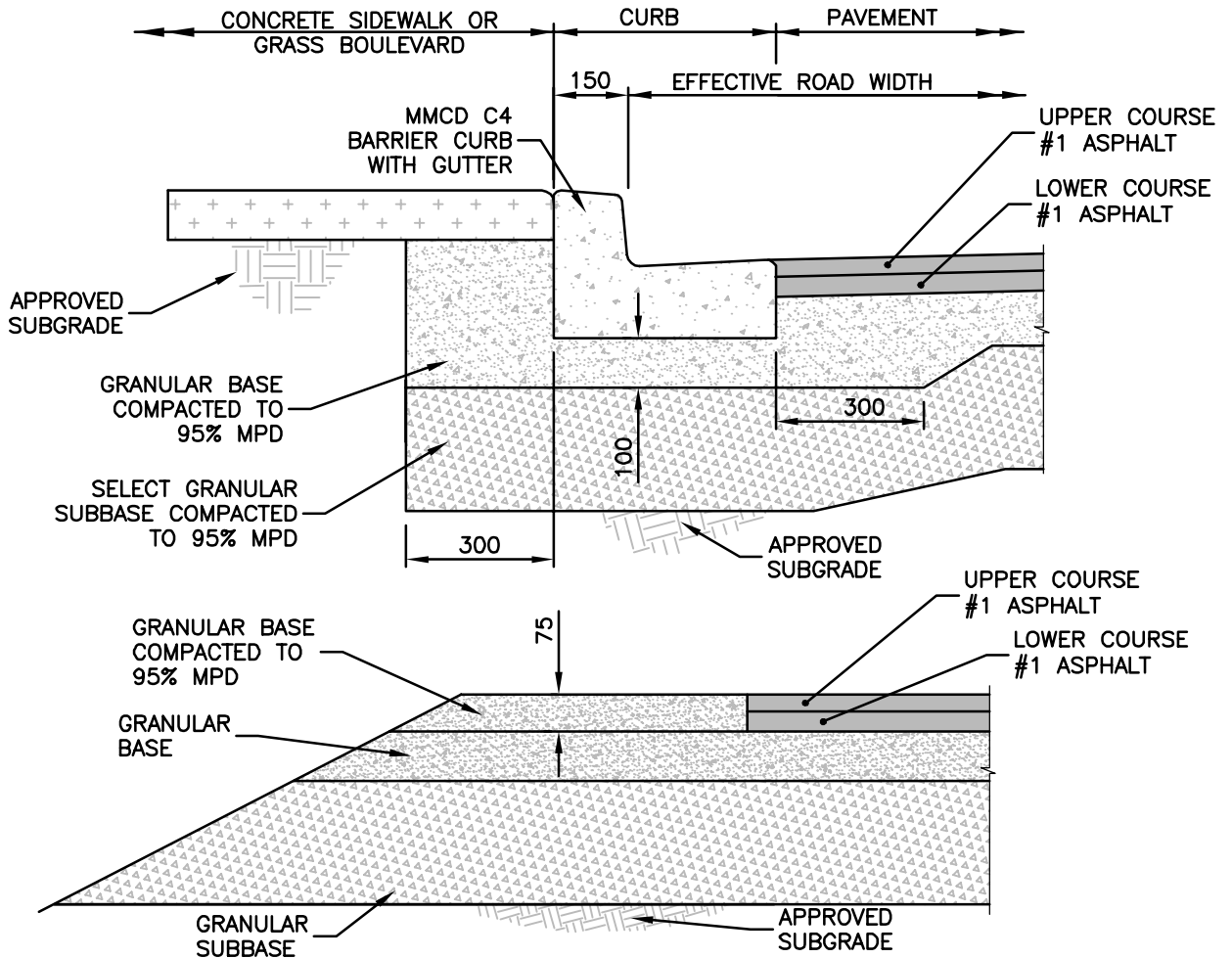
NOVEMBER, 2017



ARTERIAL ROAD SECTION B

DRAWING NUMBER	CSSD AB
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



STANDARD DETAIL	ROAD CLASSIFICATION	UPPER COURSE #1 ASPHALT	LOWER COURSE #1 ASPHALT
CSSD L1	LOCAL ROAD SECTION	50	
CSSD CRu	COLLECTOR ROAD SECTION: RURAL	35	40
CSSD CRe	COLLECTOR ROAD SECTION: RESIDENTIAL	35	40
CSSD CRB	COLLECTOR ROAD SECTION: RESIDENTIAL - B	35	40
CSSD CRC	COLLECTOR ROAD SECTION: RESIDENTIAL - C	50	50
CSSD CUB	COLLECTOR ROAD SECTION: URBAN - B	35	40
CSSD CUC	COLLECTOR ROAD SECTION: URBAN - C	50	50
CSSD CUP	COLLECTOR ROAD SECTION: URBAN - P	50	50
CSSD AB	ARTERIAL ROAD SECTION: B	50	50
CSSD A3	ALTERNATIVE DESIGN STANDARD 3: LANE	50	N/A

NOTE:

1. THE STRUCTURAL ROAD ELEMENTS SHOWN ARE MINIMUM REQUIREMENTS. ROAD STRUCTURE TO BE DESIGNED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.

MARCH, 2017



MINIMUM PAVEMENT STRUCTURE REQUIREMENTS

DRAWING NUMBER

CSSD R2

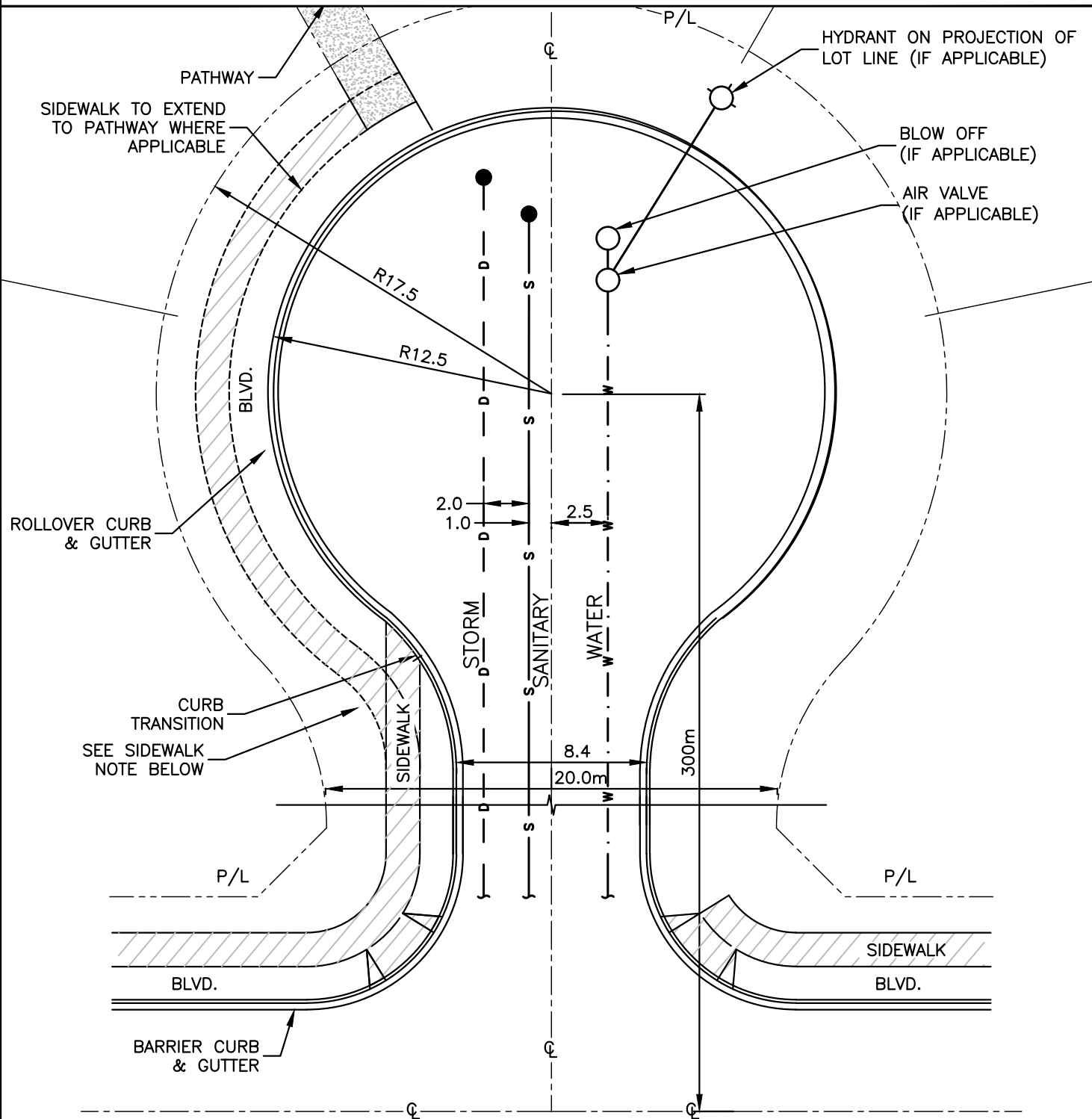
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. CUL-DE-SAC HAVING MORE THAN 10 LOTS INCLUDING THE CORNER LOTS TO BE PROVIDED WITH A SIDEWALK.
2. THE MAXIMUM PERMITTED PROFILE GRADE ON THE TURNAROUND OF A CUL-DE-SAC IS 6%.

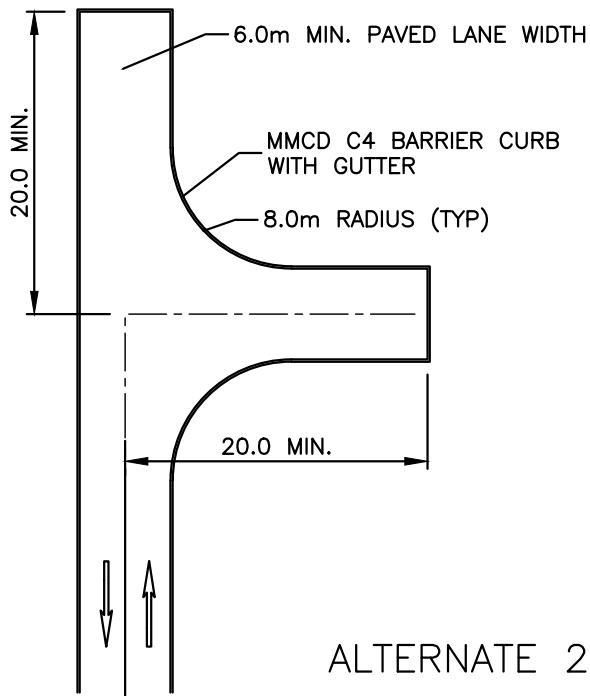
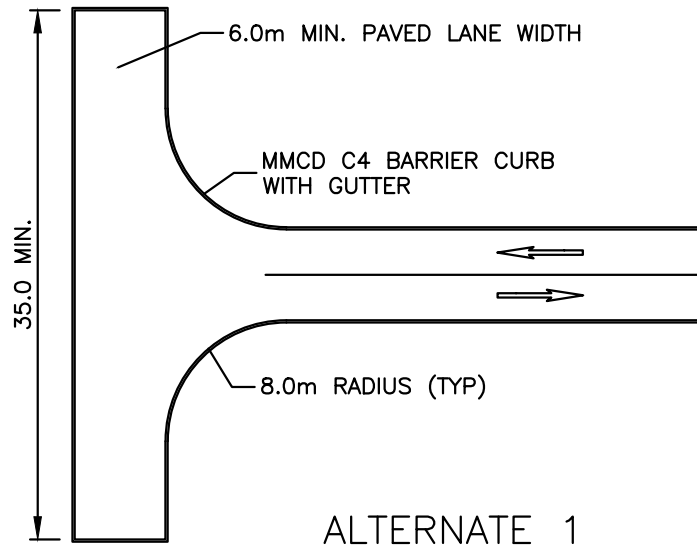
NOVEMBER, 2017



CUL-DE-SAC

DRAWING NUMBER	CSSD R3
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. ALL DIMENSIONS ARE REQUIRED MINIMUMS

NOVEMBER, 2017



HAMMERHEAD TURNAROUND
 (PRIVATE ROADS)

DRAWING NUMBER

CSSD R4

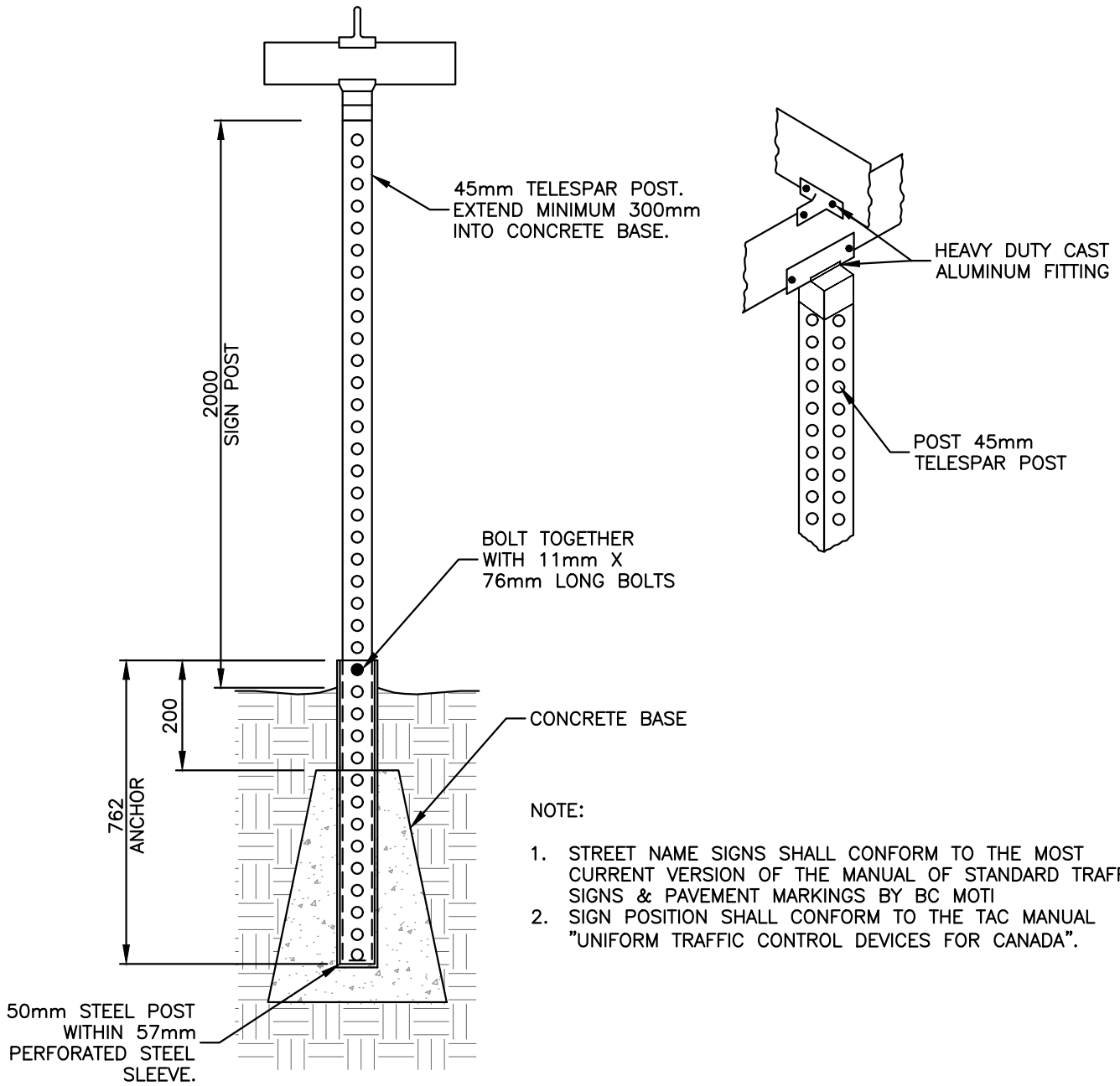
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
 SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. STREET NAME SIGNS SHALL CONFORM TO THE MOST CURRENT VERSION OF THE MANUAL OF STANDARD TRAFFIC SIGNS & PAVEMENT MARKINGS BY BC MOTI
2. SIGN POSITION SHALL CONFORM TO THE TAC MANUAL "UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA".

NOVEMBER, 2017



STREET NAME SIGN AND BASE DETAIL

DRAWING NUMBER

CSSD R5

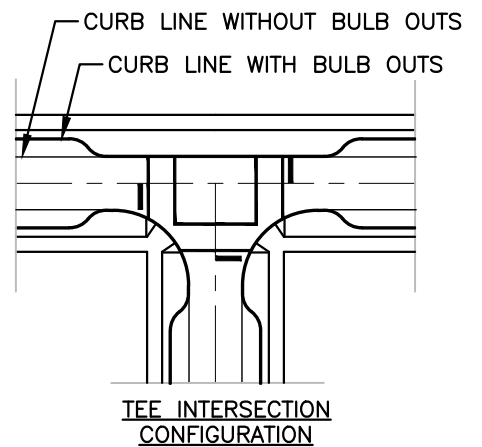
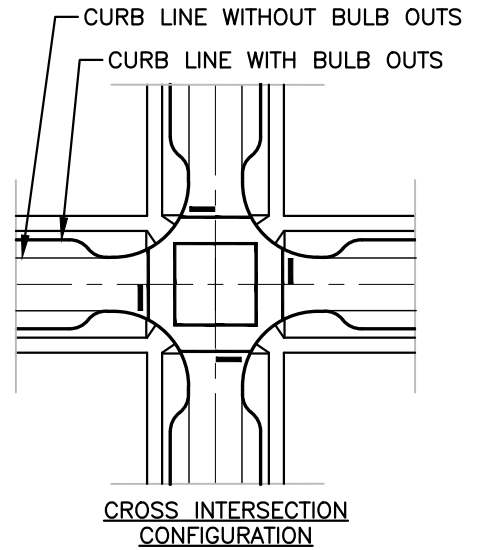
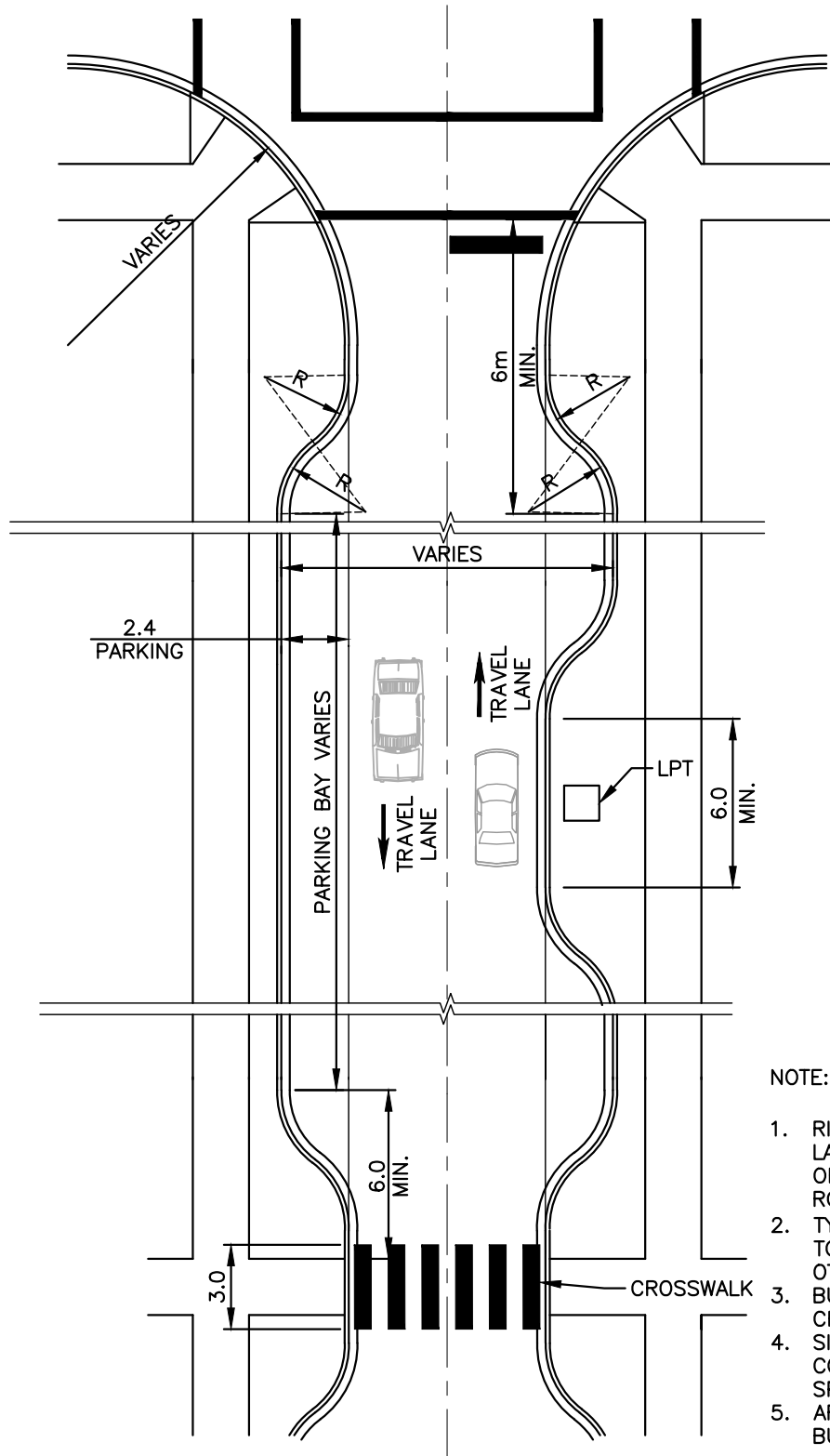
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
 SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. RIGHT OF WAY WIDTHS, NUMBER OF LANES AND INCLUSION OF BIKE LANES OR BUFFERS VARIES AS PER SPECIFIED ROAD CLASSIFICATION.
2. TYPICAL PARKING BAY FLARE RADII "R" TO BE 3.0m UNLESS SPECIFIED OTHERWISE.
3. BULB-OUT LENGTHS AT MID-BLOCK CROSSWALKS VARIES AS REQUIRED.
4. SIDEWALK & BOULEVARD WIDTHS AND CONFIGURATION VARIES AS PER SPECIFIED ROAD CLASSIFICATION.
5. ARTERIAL ROADWAYS SHALL NOT HAVE BULB OUTS.

TYPICAL BULB OUT
 LOCATION AND DETAILS

DRAWING NUMBER

CSSD R6

REVISION NUMBER

0

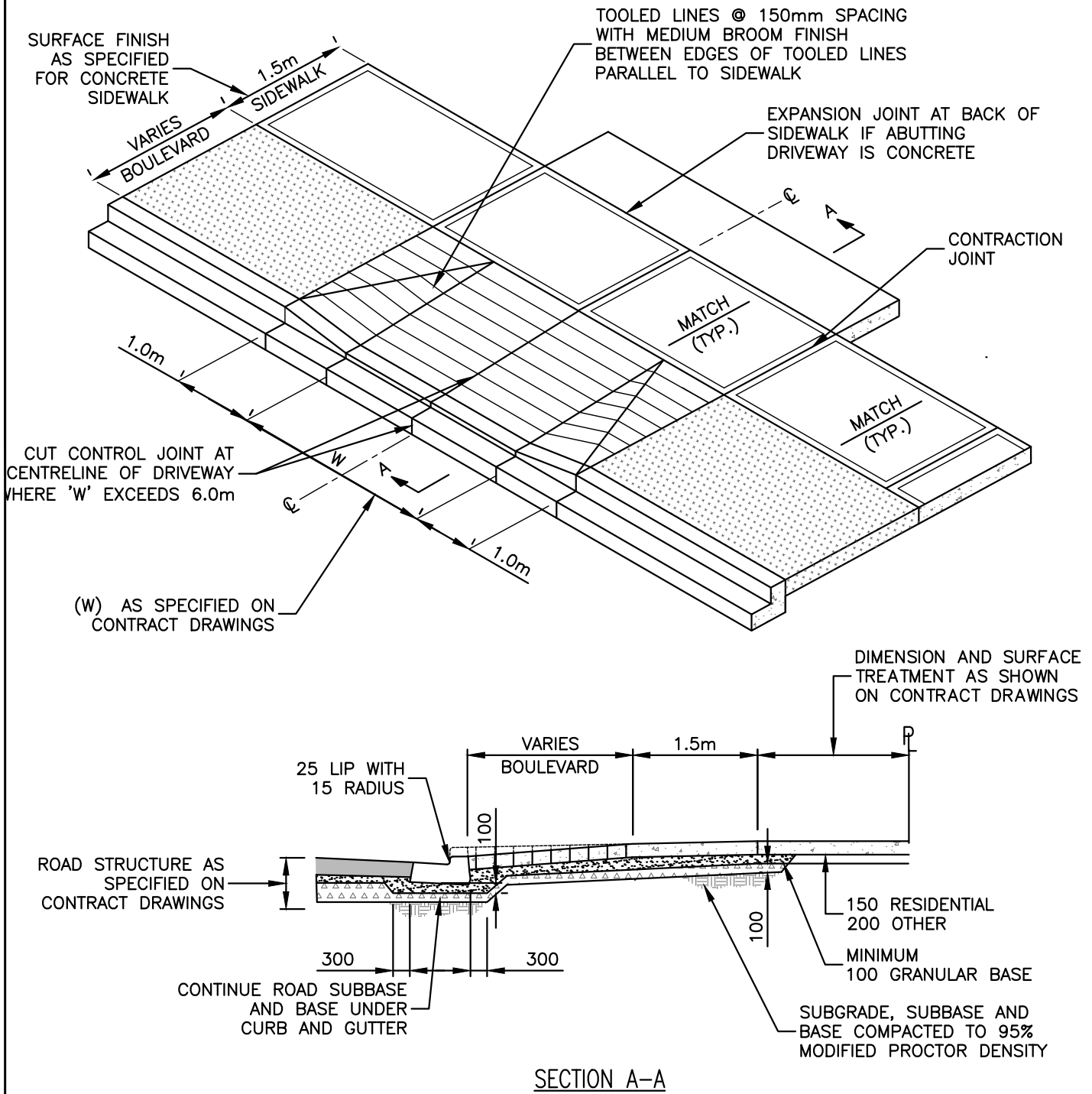
SCALE

N.T.S.

NOVEMBER, 2017



CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. DRIVEWAYS ORIENTATED AT 90° TO CURB, UNLESS SPECIFIED OTHERWISE ON CONTRACT DRAWINGS.

NOVEMBER, 2017



DRIVEWAY CROSSING FOR BARRIER CURBS TYPE 2

DRAWING NUMBER

CSSD C7b

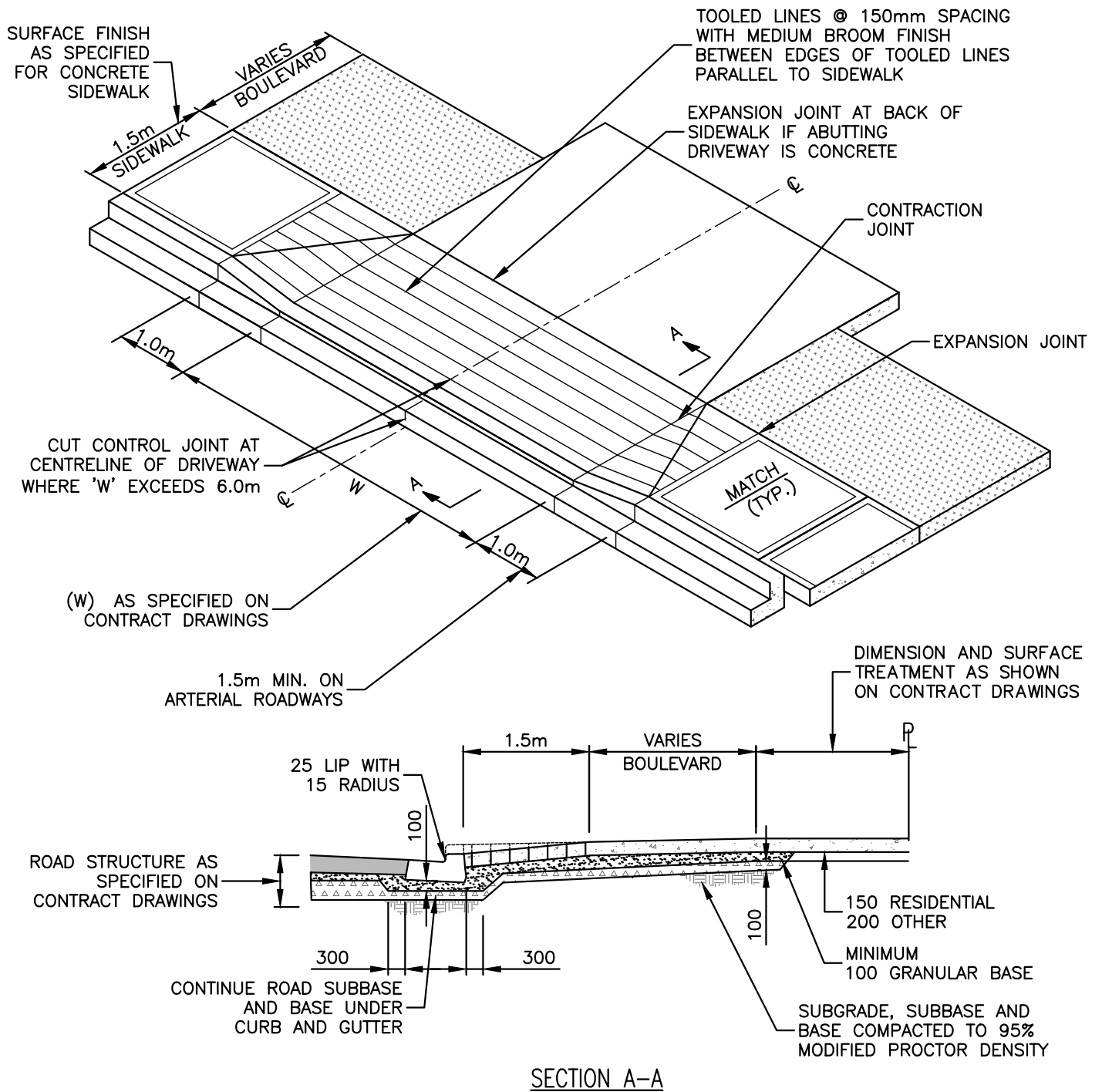
REVISION NUMBER

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SCALE

N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. DRIVEWAYS ORIENTATED AT 90° TO CURB, UNLESS SPECIFIED OTHERWISE ON CONTRACT DRAWINGS.

NOVEMBER, 2017



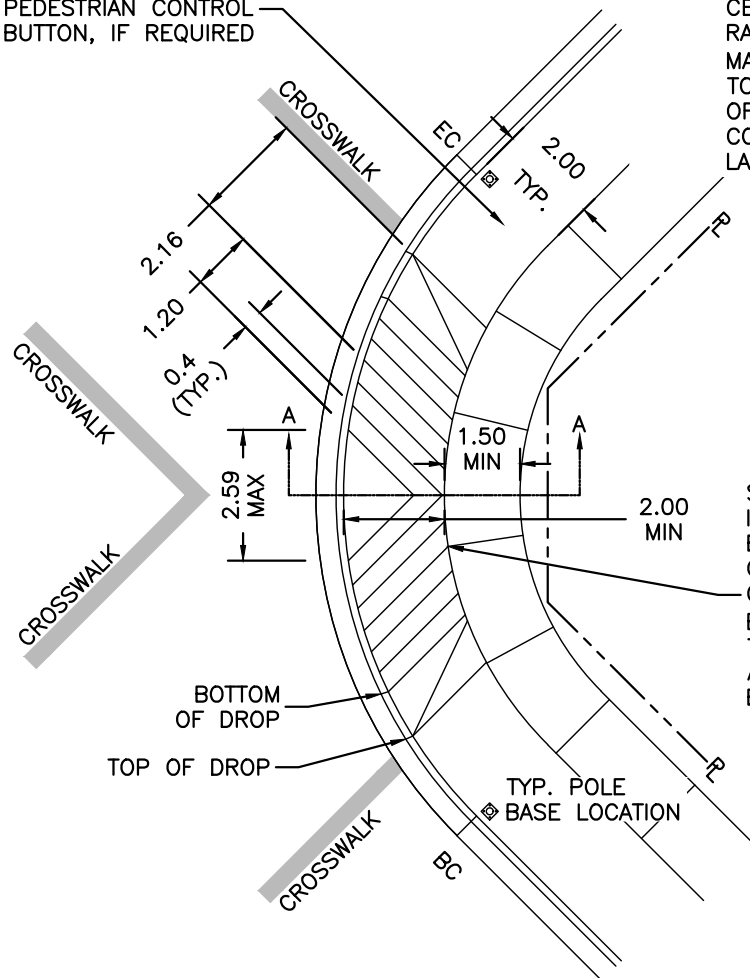
DRIVEWAY CROSSING FOR BARRIER CURBS TYPE 3

DRAWING NUMBER	CSSD C7c
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING

CONCRETE AREA FOR PEDESTRIAN CONTROL BUTTON, IF REQUIRED

NOTE: STANDARD RAMP LENGTH: 2.0m AT CENTRE OF RAMP. RECOMMENDED RAMP SLOPE: 7.1% ± 1.2%. MAX. SLOPE 8.3% (12H:1V) WHERE TOPOGRAPHY PERMITS. ADJUST LENGTH OF RAMP AS REQUIRED WHEN SITE CONDITIONS DO NOT PERMIT TYPICAL LAYOUT.



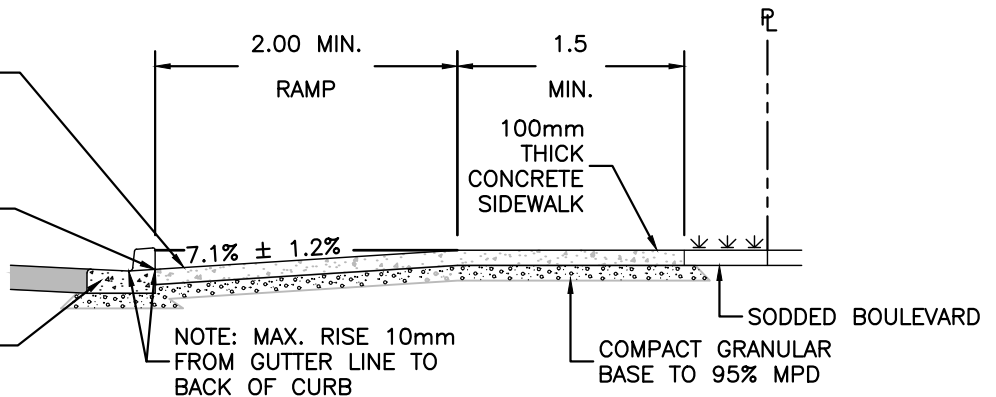
SCORE LINES MUST LINE UP IN DIRECTION OF TRAVEL AND BE PARALLEL WITH THE CROSSING OR MARKED CROSSWALK. SCORE LINES TO BE 40cm APART. USE 3/8" TROWEL. TROWEL EDGE TO BE AS FLUSH AS POSSIBLE WITH BROOM FINISH.

SINGLE RAMP

RAMP SHALL BE UNIFORM THICKNESS OF 100mm FROM TOP OF LIP TO TOP OF SIDEWALK

TRANSITION FROM CURB TO RAMP SHALL BE FLUSH

BARRIER CURB & GUTTER



SECTION A-A CURB RAMP

**WHEELCHAIR RAMP FOR SIDEWALK,
 INFILL AND BARRIER CURBS**

DRAWING NUMBER

CSSD C8a

REVISION NUMBER

0

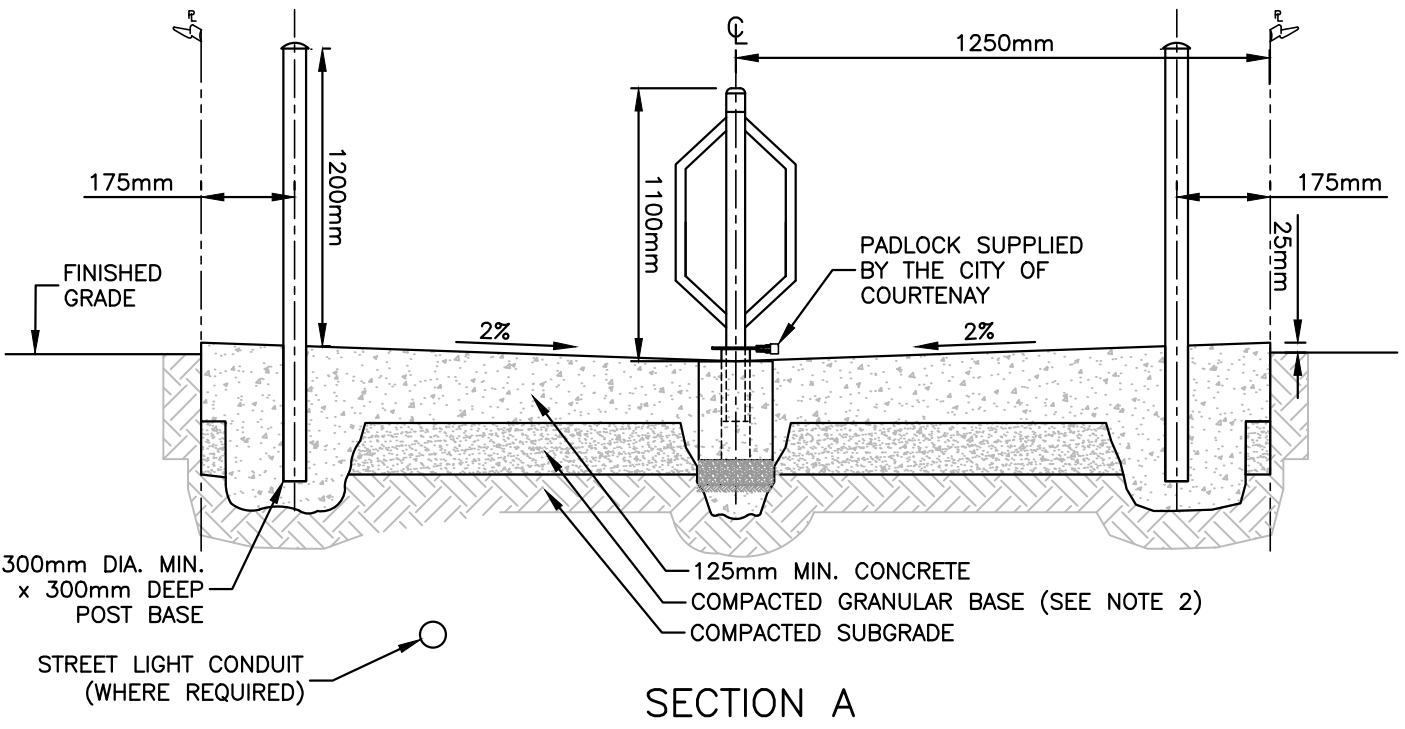
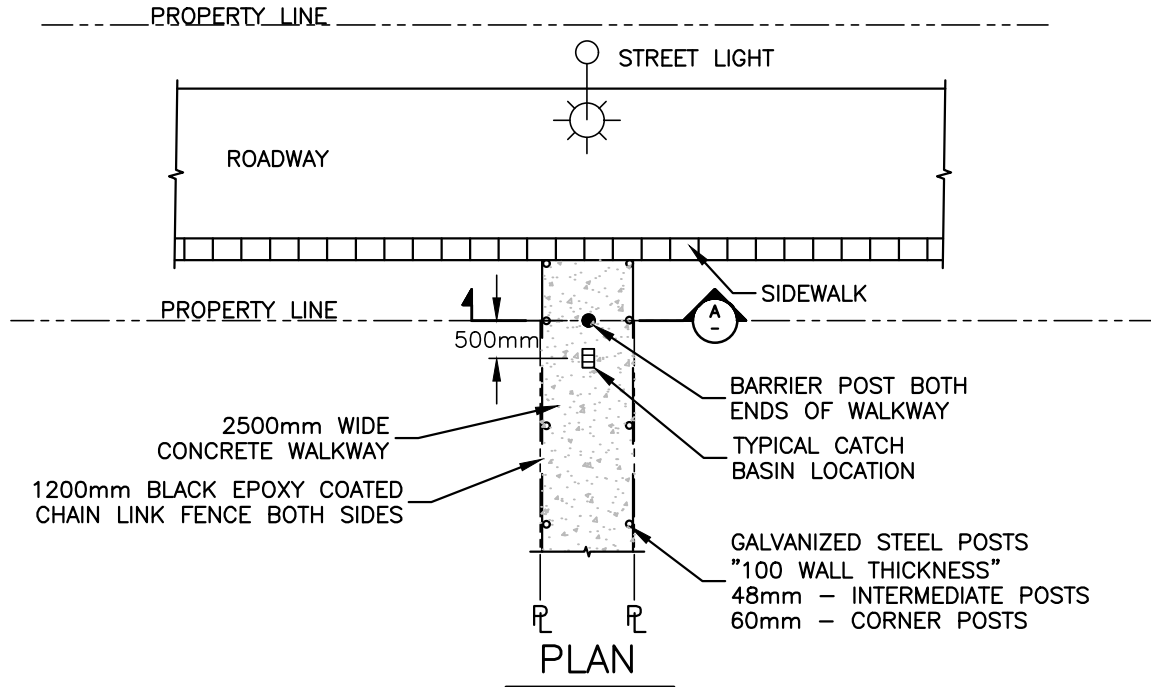
SCALE

N.T.S.

NOVEMBER, 2017



**CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING**



NOTE:

1. THE STRUCTURAL WALKWAY ELEMENTS SHOWN ARE MINIMUM REQUIREMENTS. WALKWAY STRUCTURE TO BE DESIGNED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.
2. CONCRETE THICKNESS TO BE 150mm MINIMUM WHEN WALKWAY USED TO ACCESS UTILITIES. GRANULAR BASE THICKNESS TO BE DETERMINED BY QUALIFIED GEOTECHNICAL ENGINEER.

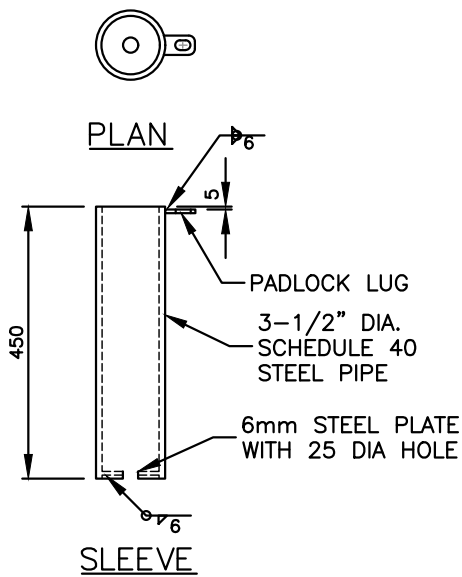
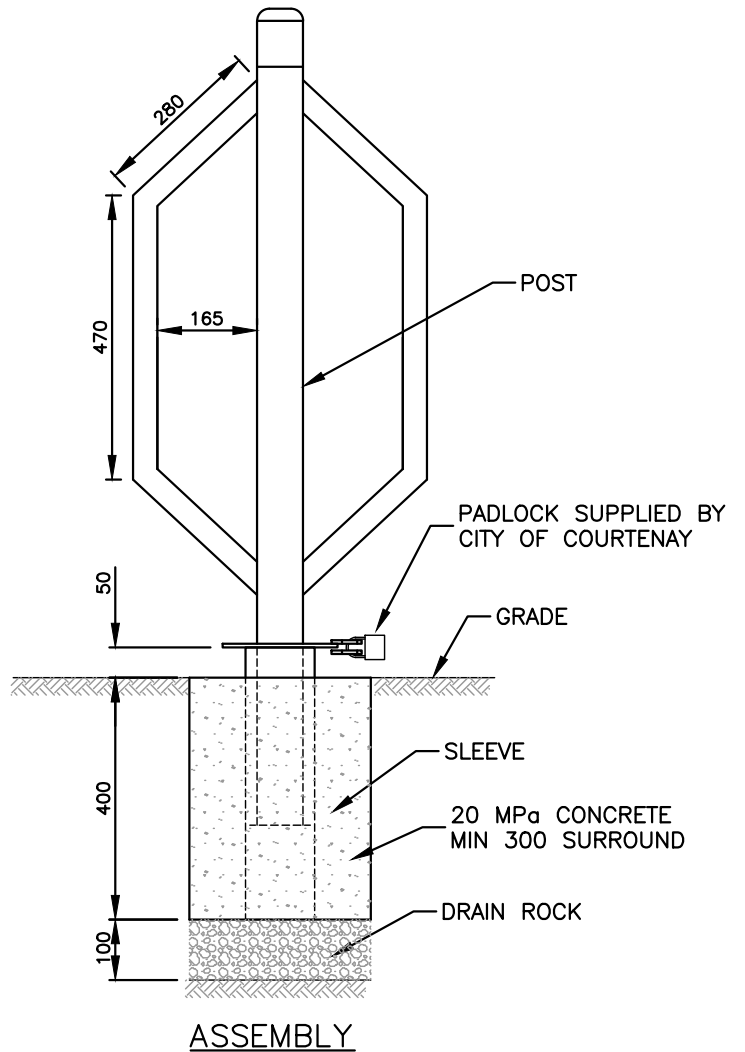
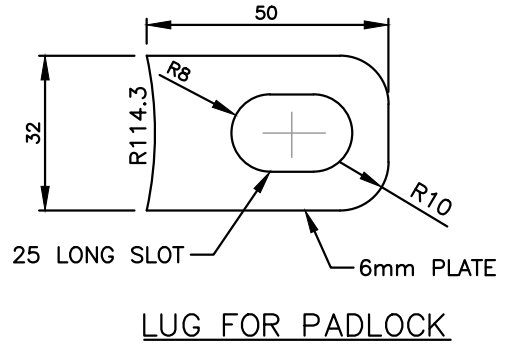
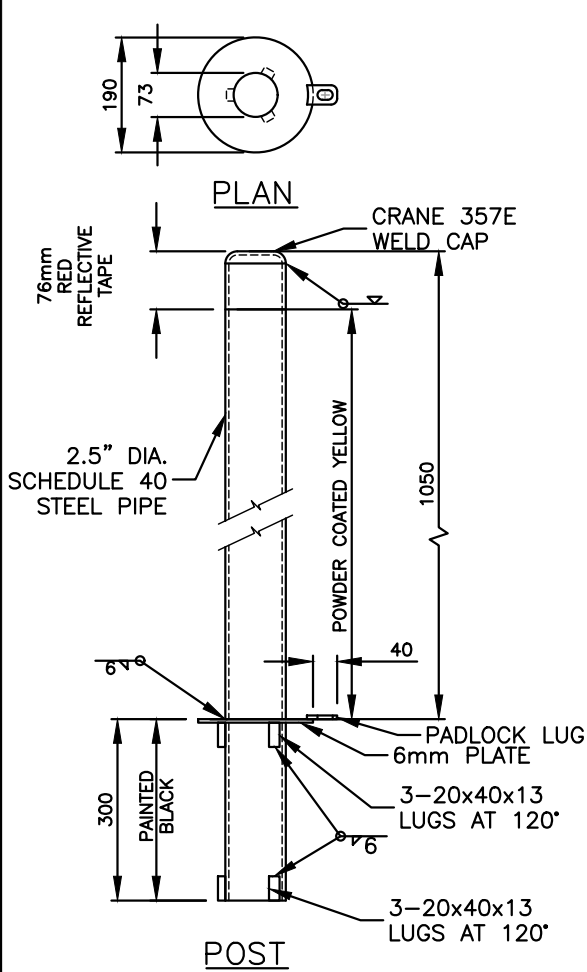
FEBRUARY, 2016



CONCRETE WALKWAY

DRAWING NUMBER	CSSD C10
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. FOR USE ON MULTI-USE PATHWAYS AND TRAILS WHEN NECESSARY TO PREVENT VEHICLE ACCESS.
2. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

NOVEMBER, 2017



REMOVABLE BOLLARD

DRAWING NUMBER

CSSD C12

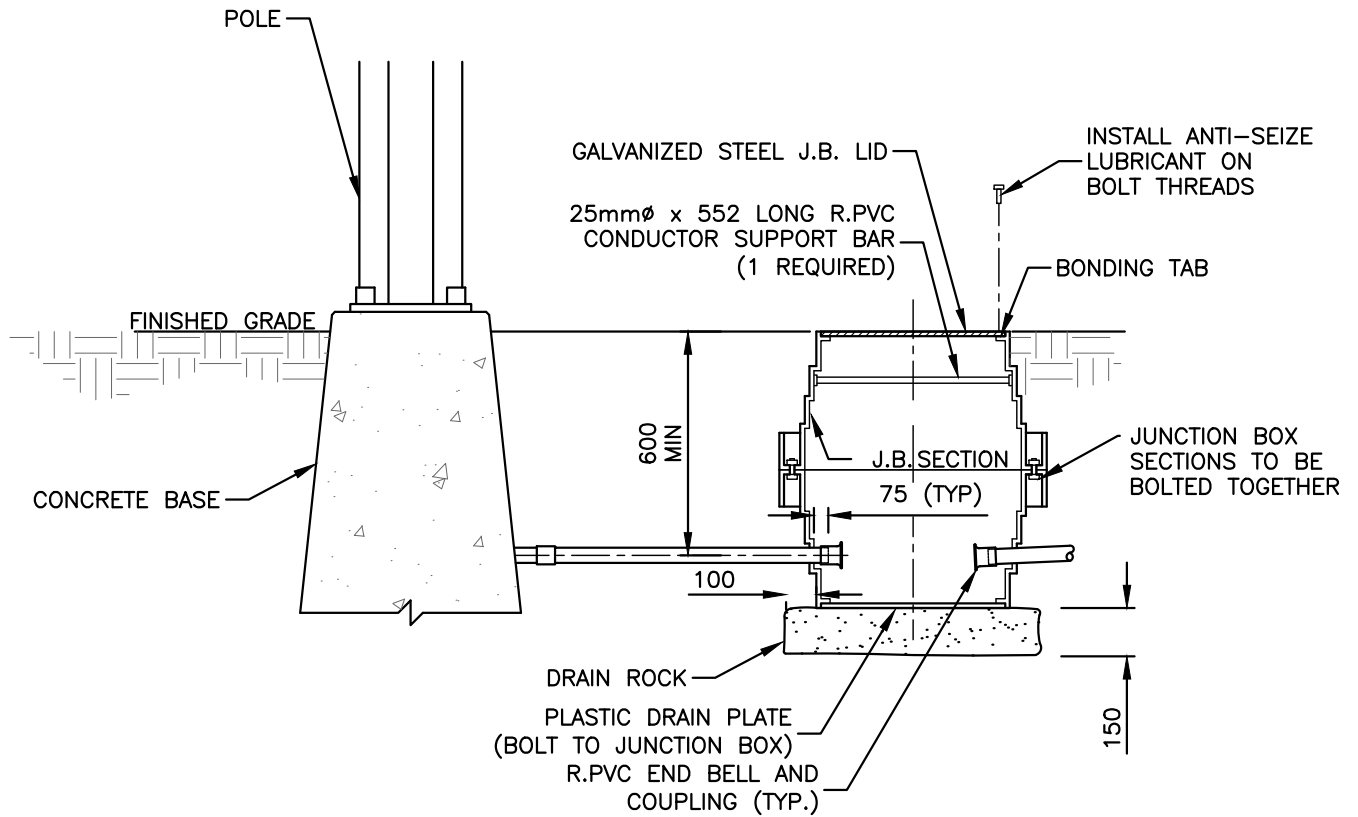
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



JUNCTION BOX
 TWO J.B. SECTIONS
 ONE STEEL LID
 ONE DRAIN PLATE

NOTE:

1. REFER TO CONTRACT DRAWINGS, SECTION 34 41 13 FOR DETAILED SPECIFICATIONS.
2. BOLT DOWN LID ON BOX BEFORE BACKFILLING, TAMPING & PAVING OPERATIONS.
3. INSTALL TOP OF JUNCTION BOX FLUSH WITH FINISHED GRADE.
4. ALL CONDUITS SHALL DRAIN TO J.B.'S
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

NOVEMBER, 2017



ROUND PLASTIC JUNCTION BOXES

DRAWING NUMBER

CSSD E2.1

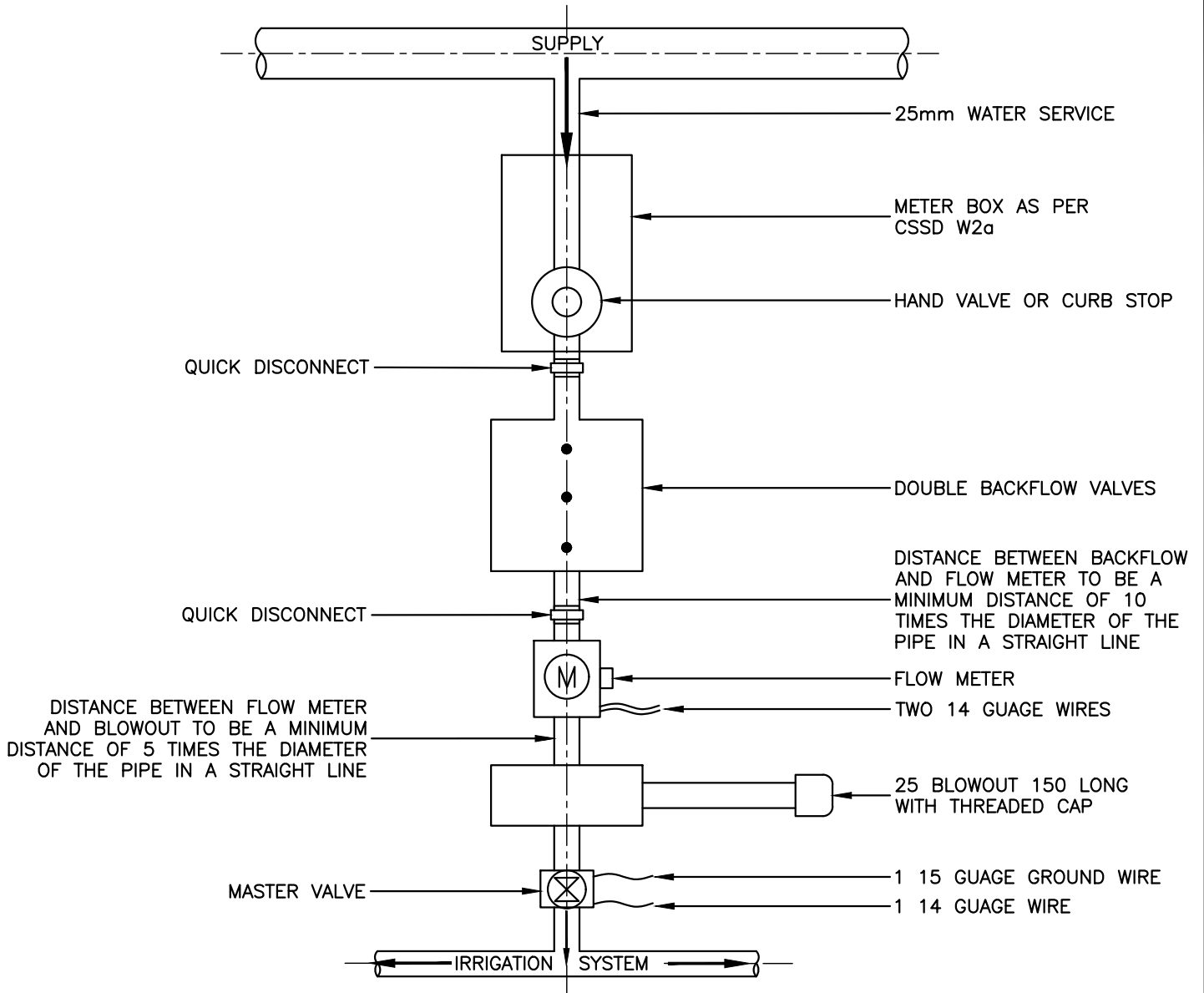
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. 25X150 RISER WITH THREADED CAP FOR BLOWOUT.
2. BACKFLOW VALVE DOUBLE CHECK.
3. (760X450X450) RECTANGULAR BOX.
4. TWO QUICK DISCONNECT COUPLERS FOR BACKFLOW REMOVAL.
5. 14 GAUGE T.W.U. WIRE FOR CONNECTION TO CONTROLLER.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.

NOVEMBER, 2017



IRRIGATION CONNECTION

DRAWING NUMBER

CSSD 11

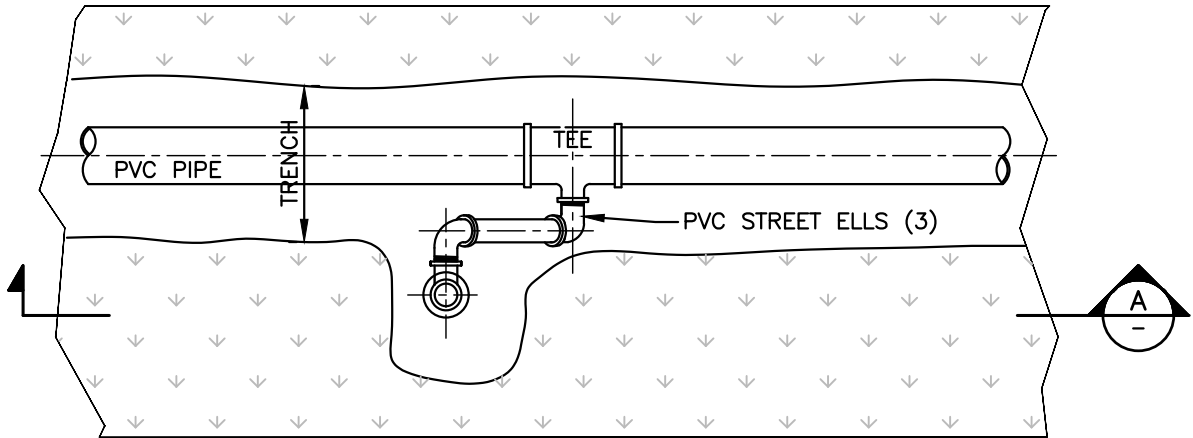
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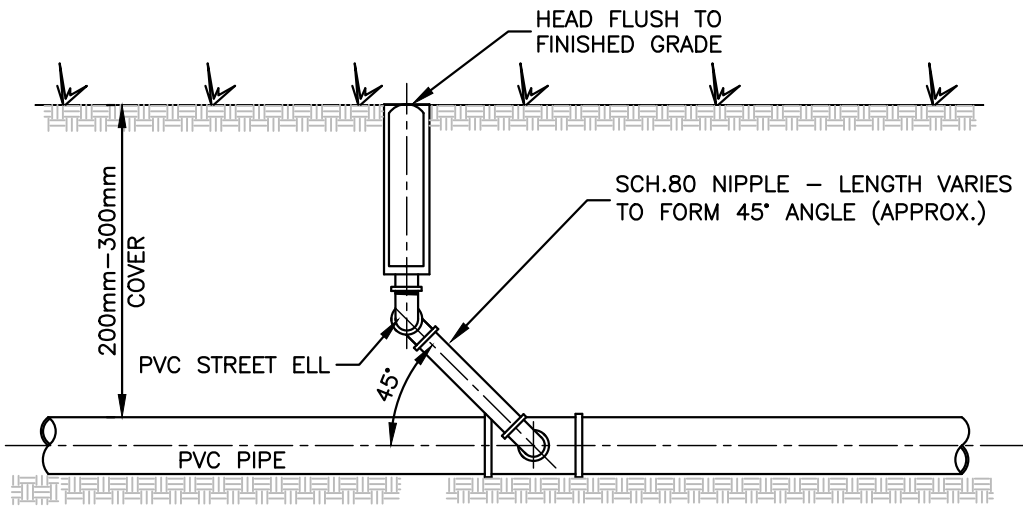
SCALE

N.T.S.

CITY OF COURTENAY
 SUPPLEMENTARY STANDARD DETAIL DRAWING



PLAN



SECTION A

NOTE:

1. USE TEFLON TAPE ON ALL MALE THREADED ENDS

NOVEMBER, 2017



IRRIGATION SWING JOINT

DRAWING NUMBER

CSSD 12

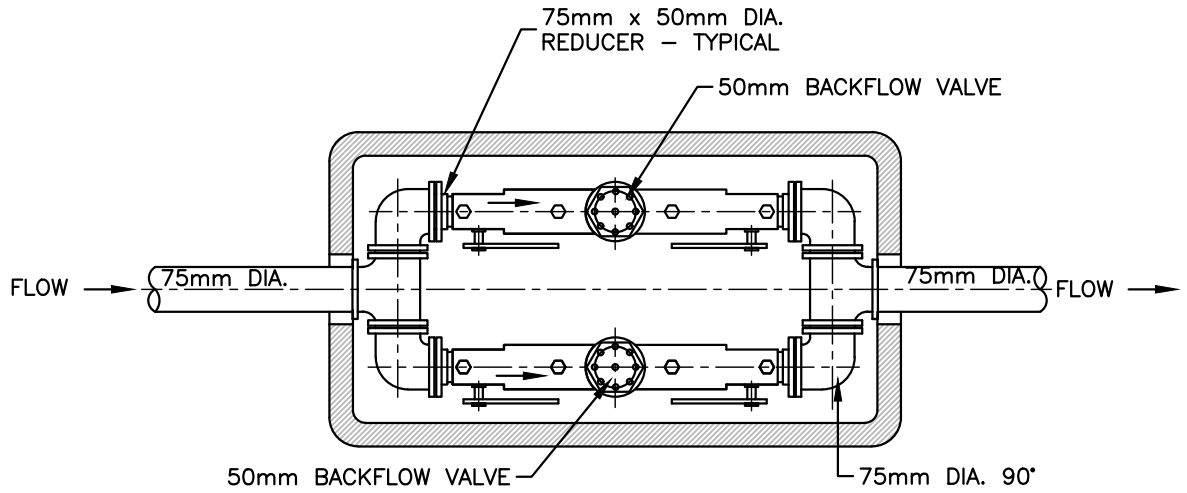
REVISION NUMBER

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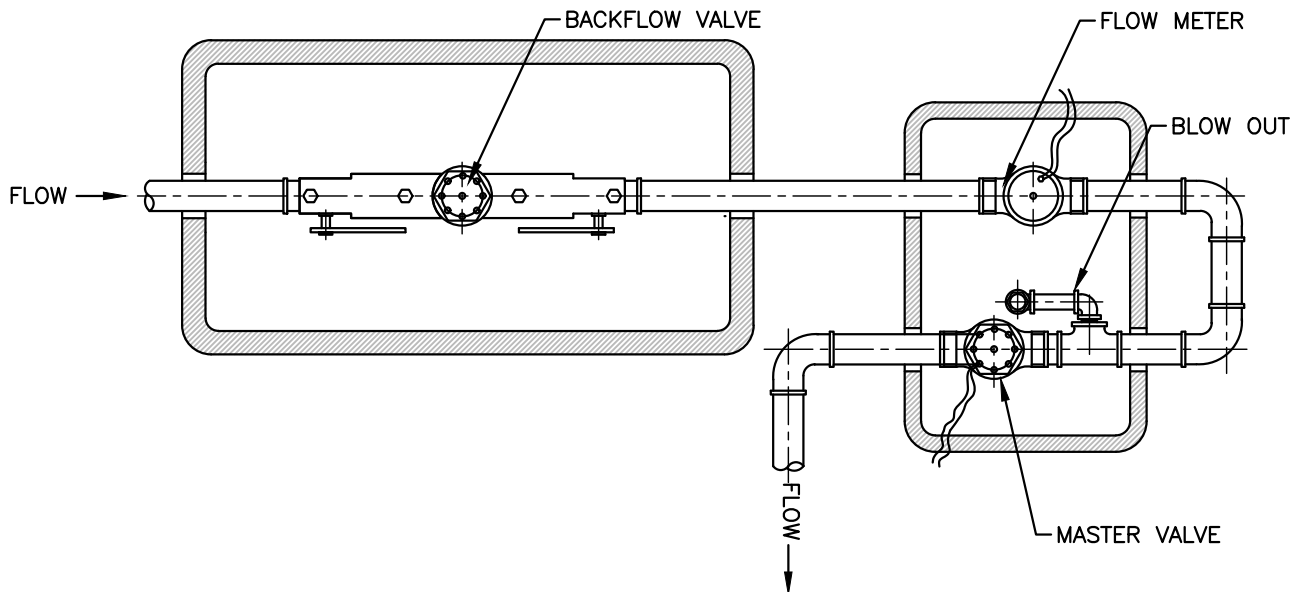
SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



TYPICAL LARGE LINE/TWIN BACKFLOW VALVES



TYPICAL MASTER VALVE/FLOW METER

NOTE:

1. FLOW METER TO HAVE 10x PIPE DIA. BEFORE AND 5x PIPE DIA. AFTER, OF UNRESTRICTED STRAIGHT PIPE (OF THE SAME DIAMETER, NO FITTINGS) EACH SIDE OF METER.
2. FLOW METER TO BE DISASSEMBLED PRIOR TO GLUING OF PIPE.

NOVEMBER, 2017



TYPICAL INSTALLATIONS
 LARGE LINE / TWIN BACKFLOW VALVES
 MASTER VALVE / FLOW METER

DRAWING NUMBER

CSSD 13

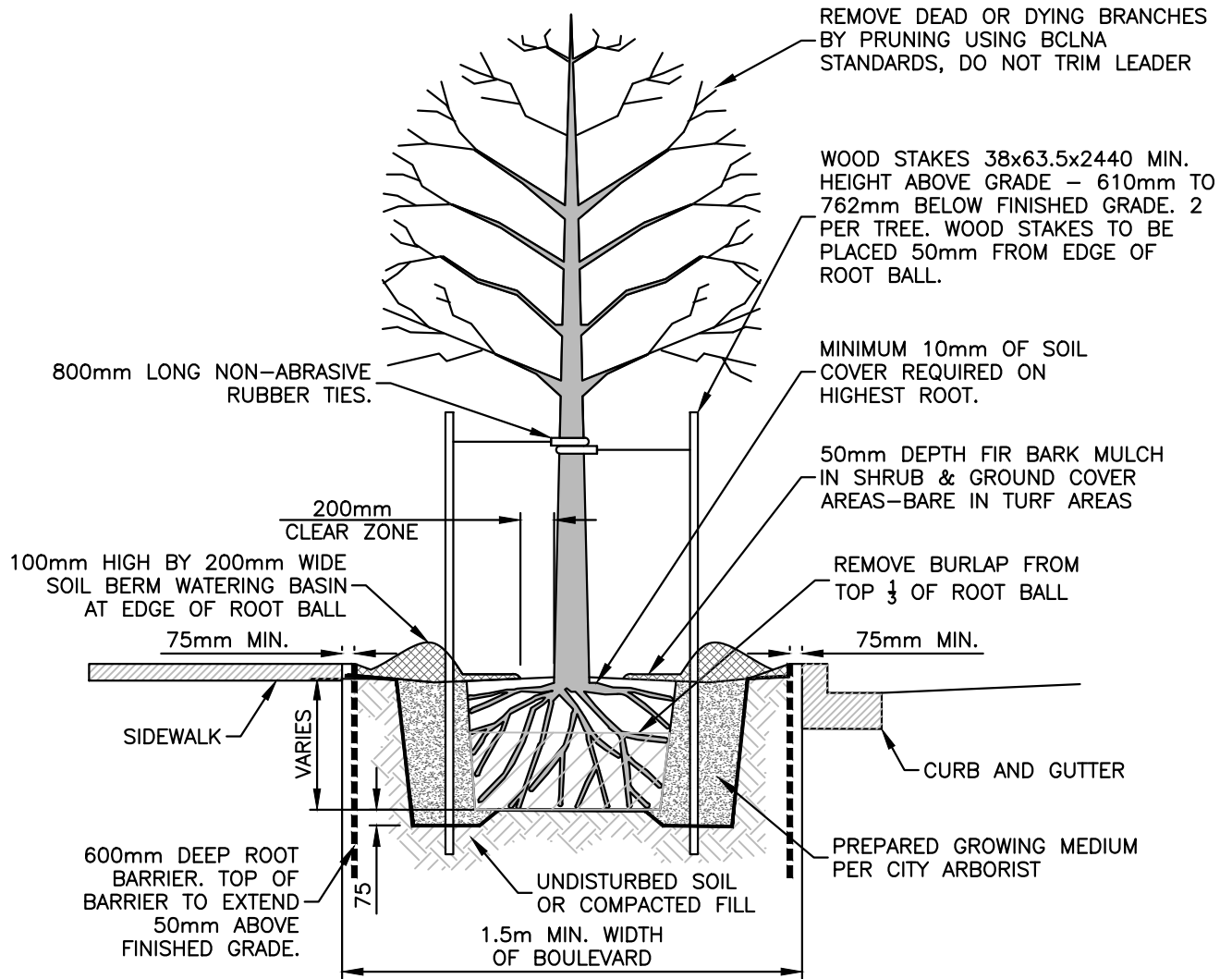
REVISION NUMBER

0

SCALE

N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PLACE TREE & BACKFILL 50mm ABOVE GRADE TO ALLOW FOR SETTLEMENT.
2. ROOT BARRIERS SHALL BE INSTALLED WHEN ROOT BALL IS LOCATED WITHIN 2.44m OF PAVEMENT.
3. ROOT BARRIERS TO EXTEND 2.44m IN BOTH DIRECTIONS FROM TREE CENTRE LINE.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.

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**TREE PLANTING
AND STAKING**

DRAWING NUMBER

CSSD P1

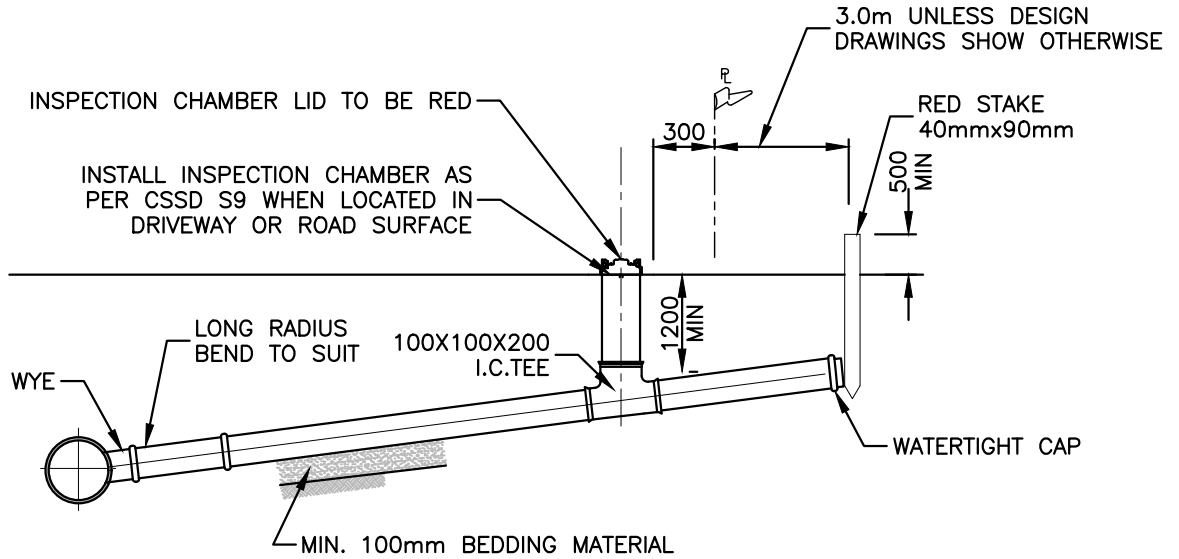
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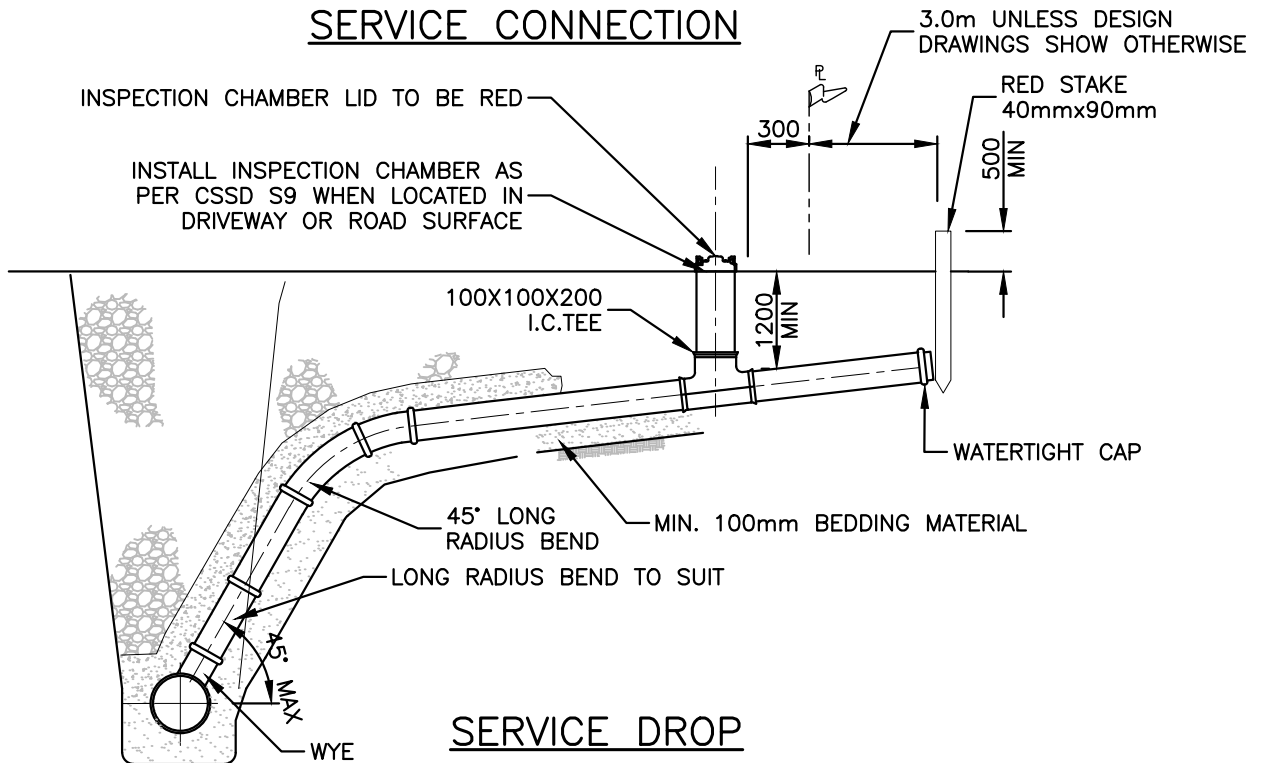
SCALE

N.T.S.

**CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING**



SERVICE CONNECTION



SERVICE DROP

NOTE:

1. SERVICE CONNECTIONS TO BE LONG LENGTHS OF PVC WITH AS FEW JOINTS AS POSSIBLE.
2. FOR LARGER SERVICE CONNECTIONS, REFER TO CONTRACT DRAWINGS
3. SANITARY SERVICE TO HAVE A MINIMUM GRADE OF 2%.
4. THE CONTRACTOR IS TO VIDEO INSPECT ALL SANITARY SERVICE CONNECTIONS. THE VIDEO MUST BE REVIEWED AND ACCEPTED BY THE ENGINEER OF RECORD PRIOR TO COMMENCEMENT OF ASPHALT PAVING.
5. BEDDING AND BACKFILL AS PER MMCD DRAWING G4.

NOVEMBER, 2017



**SANITARY SEWER SERVICE CONNECTION
100mm RESIDENTIAL SANITARY**

DRAWING NUMBER

CSSD S7

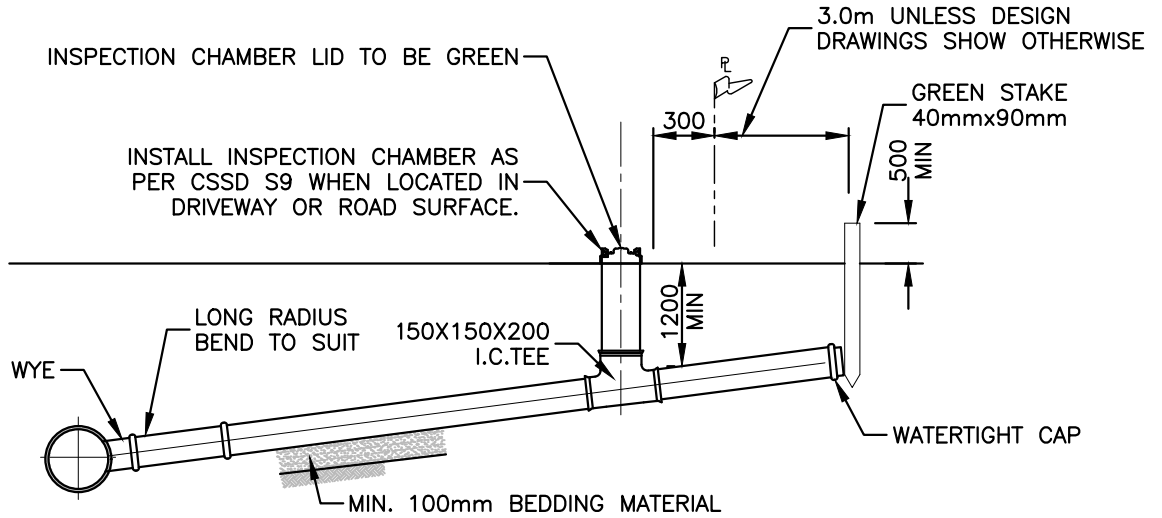
REVISION NUMBER

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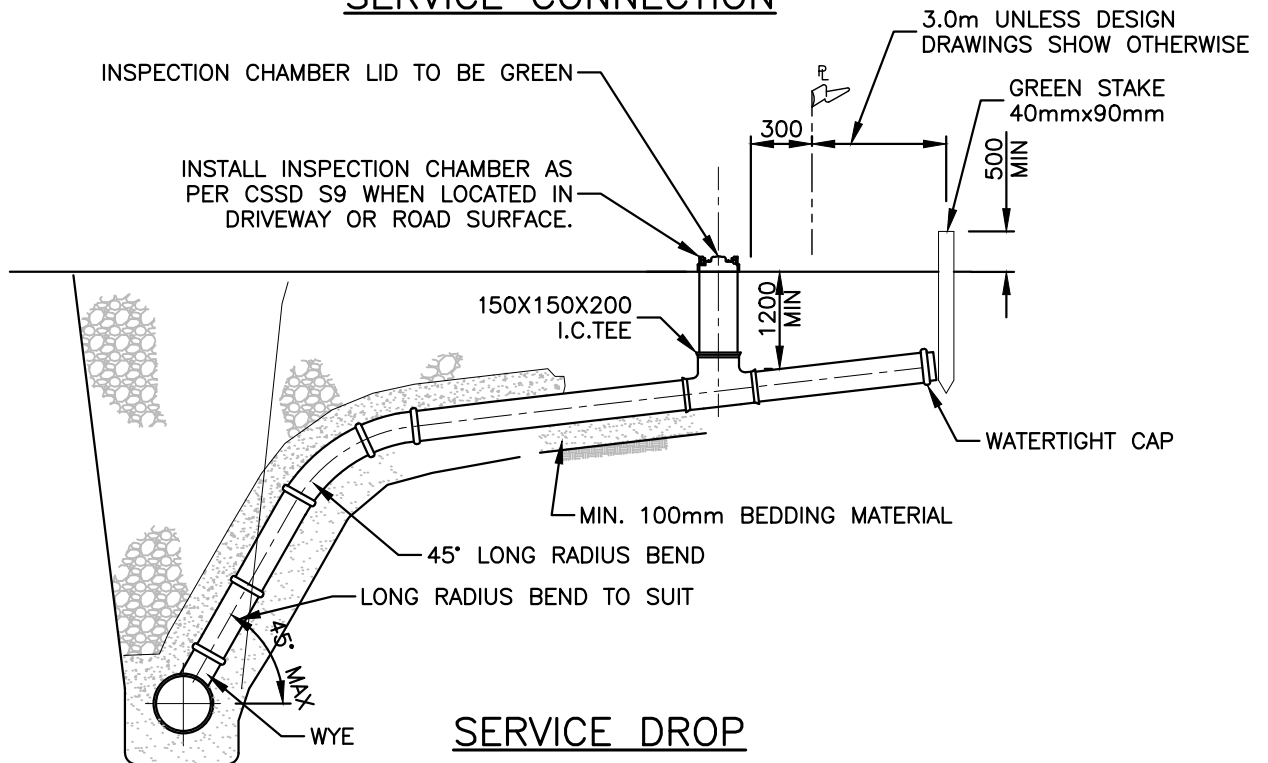
SCALE

N.T.S.

**CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING**



SERVICE CONNECTION



SERVICE DROP

NOTE:

1. CONCRETE STORM SEWER PIPES TO BE PROVIDED WITH SUPPLIER INSTALLED PVC STUB.
2. SERVICE CONNECTIONS TO BE LONG LENGTHS OF PVC WITH AS FEW JOINTS AS POSSIBLE.
3. STORM SERVICE TO HAVE MINIMUM GRADE OF 2%.
4. MINIMUM SIZE OF SERVICE CONNECTION: 150mm.
5. THE CONTRACTOR IS TO VIDEO INSPECT ALL STORM SERVICE CONNECTIONS. THE VIDEO MUST BE REVIEWED AND ACCEPTED BY THE ENGINEER OF RECORD PRIOR TO COMMENCEMENT OF ASPHALT PAVING.
6. BEDDING AND BACKFILL AS PER MMCD DRAWING G4.

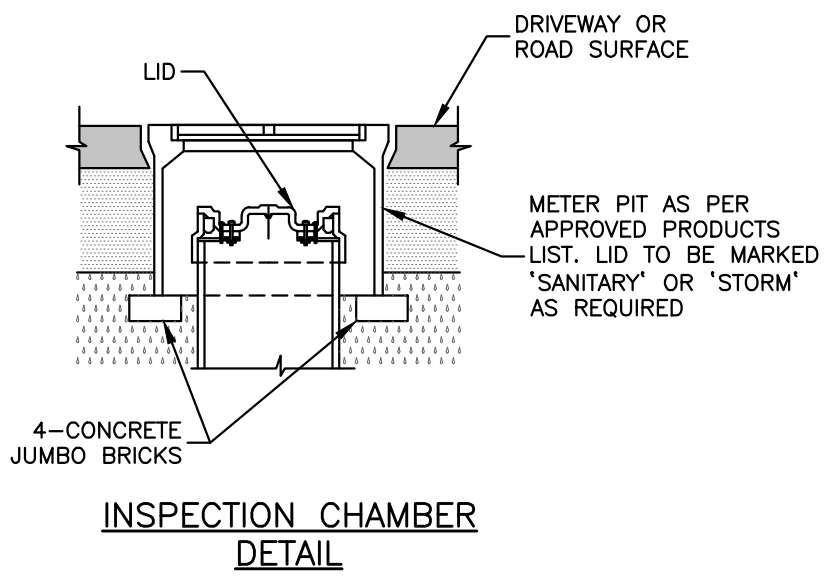
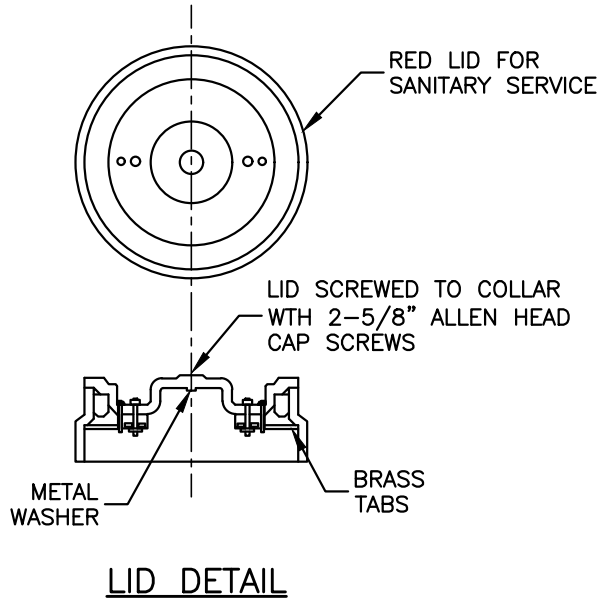
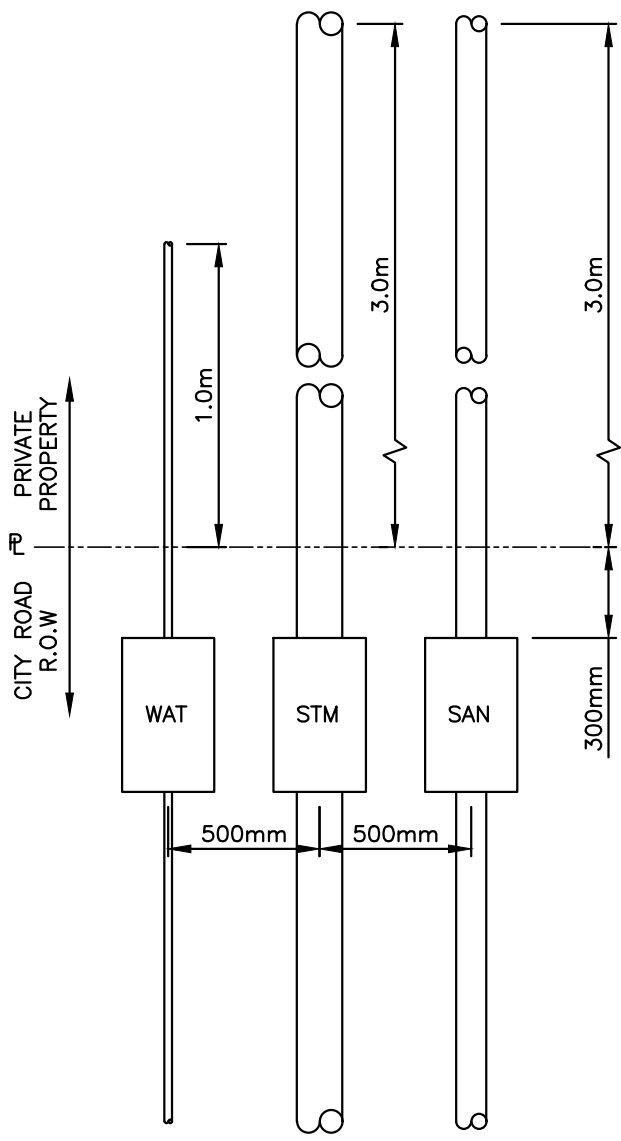
NOVEMBER, 2017



**STORM SEWER SERVICE CONNECTION
150mm RESIDENTIAL STORM**

DRAWING NUMBER	CSSD S8
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. REFER TO DRAWING CSSD S7 AND CSSD S8 FOR INSTALLATION REQUIREMENTS.
2. INSPECTION CHAMBER TO BE APPROVED MANUFACTURED FITTING.
3. REFER TO CONTRACT DRAWINGS FOR SITE SPECIFIC DIMENSIONS. REFER TO SECTION 33 30 01 FOR DETAILED SPECIFICATIONS.
4. SANITARY AND STORM SERVICES TO BE EXTENDED 3.0m INTO PROPERTY UNLESS DRAWINGS SHOW OTHERWISE.
5. SERVICES TO BE LOCATED A DISTANCE OF $\frac{1}{3}$ THE LOT WIDTH FROM THE PROPERTY LINE ON THE OPPOSITE SIDE AS THE DRIVEWAY.

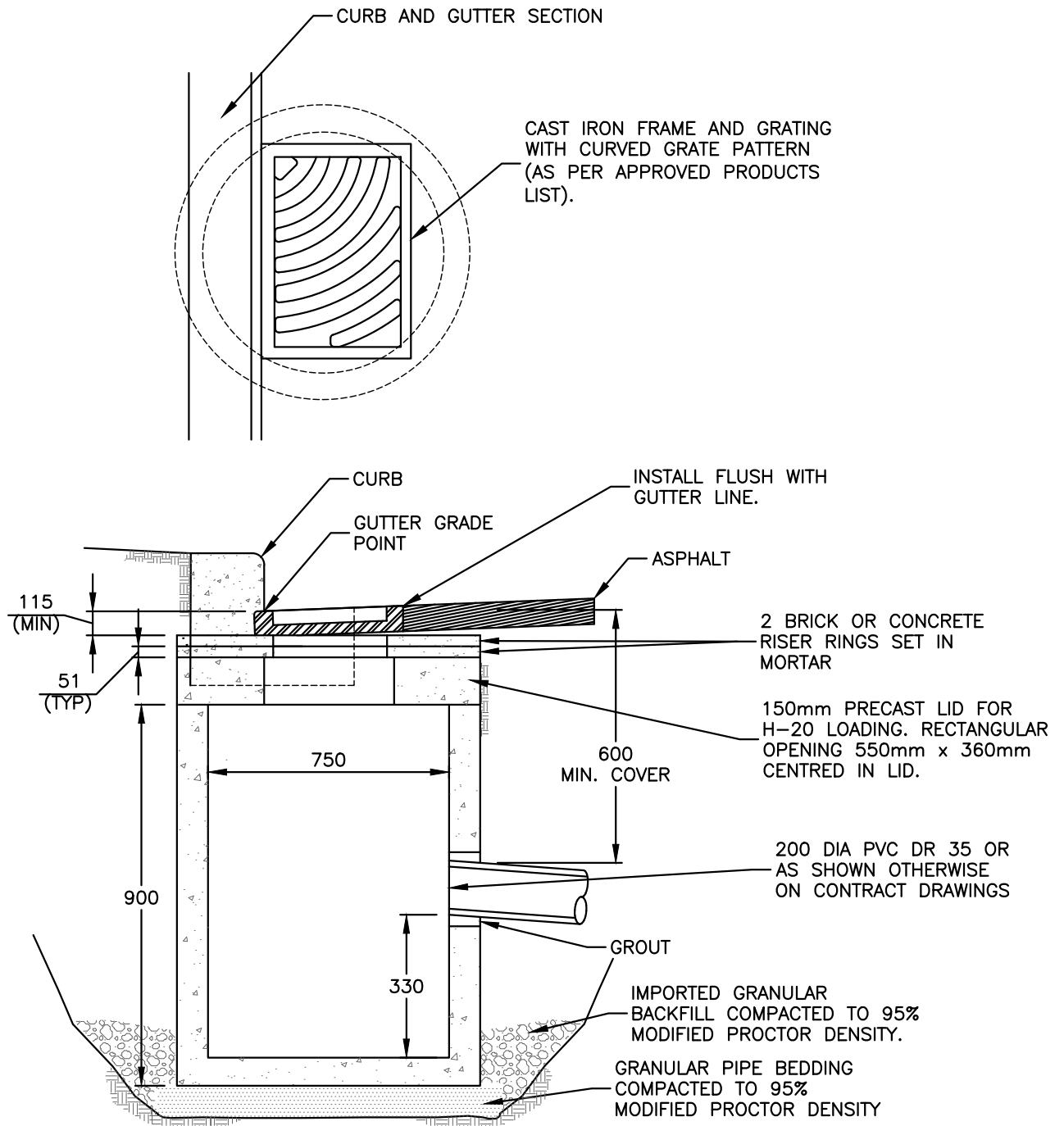
FEBRUARY, 2016



**INSPECTION CHAMBER FOR SANITARY AND STORM
 SEWER CONNECTIONS**

DRAWING NUMBER	CSSD S9
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. PRECAST UNITS c/w BASE AND H-20 RATING, APPROVED BY CONTRACT ADMINISTRATOR, ARE ACCEPTABLE.
2. REFER TO CONTRACT DRAWINGS, SECTION 33 44 01 FOR DETAILED SPECIFICATIONS.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.

NOVEMBER, 2017



TOP INLET CATCH BASIN

DRAWING NUMBER

CSSD S11

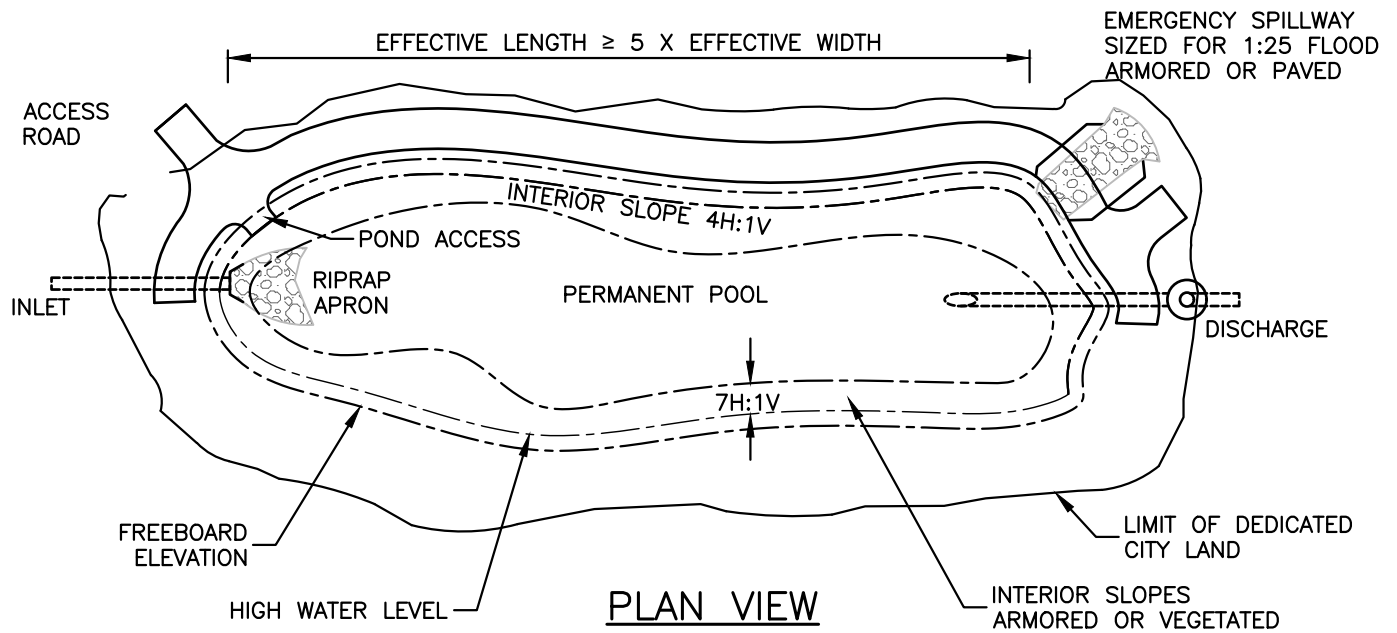
REVISION NUMBER

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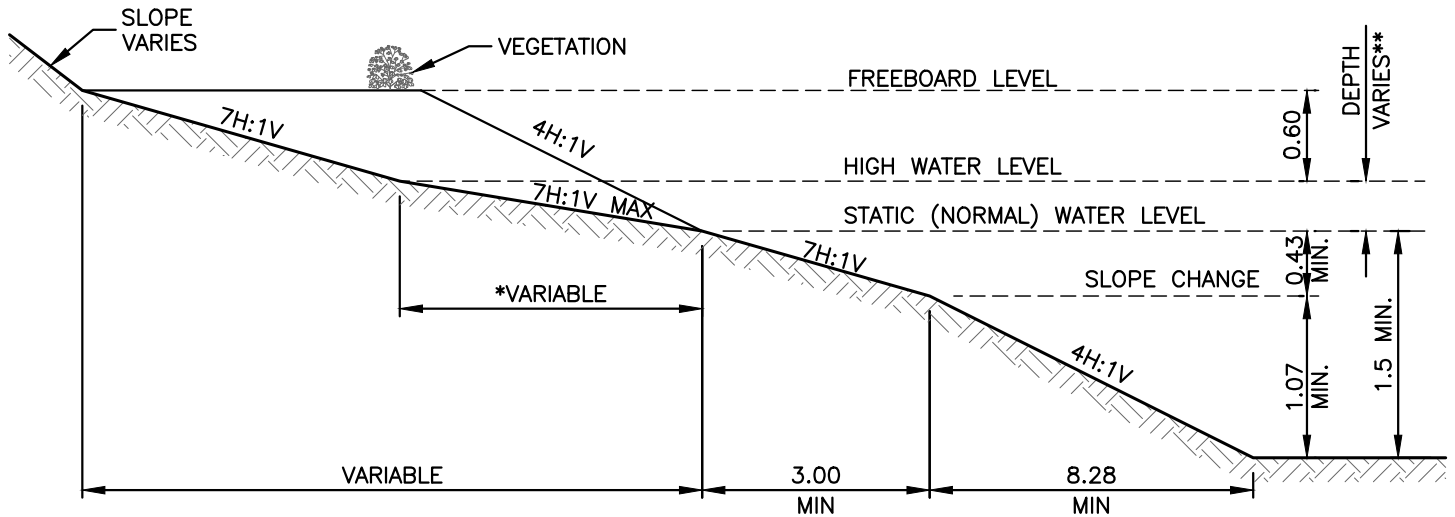
SCALE

N.T.S.

**CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING**



PLAN VIEW



SECTION VIEW

NOTE:

1. *MAXIMUM SIDE SLOPES OF 4:1 (H:V) MAY BE USED PROVIDED ADEQUATE VEGETATION IS USED TO PREVENT ACCESS, OR FOR DRY POND SIDE SLOPES.
2. **MAXIMUM 1.5m FOR ≤ 10 YEAR LEVEL AND 3.0m FOR THE 25 YEAR LEVEL.
3. PERMANENT POOL BOTTOM SHALL INCLUDE FULL WIDTH BAFFLES TO DEVELOP SEDIMENTATION BASINS IF APPLICABLE.
4. DEPTHS ABOVE WET POND STATIC (NORMAL) WATER LEVEL SHALL ALSO APPLY TO DRY PONDS.
5. ALL DIMENSIONS ARE IN METRES.

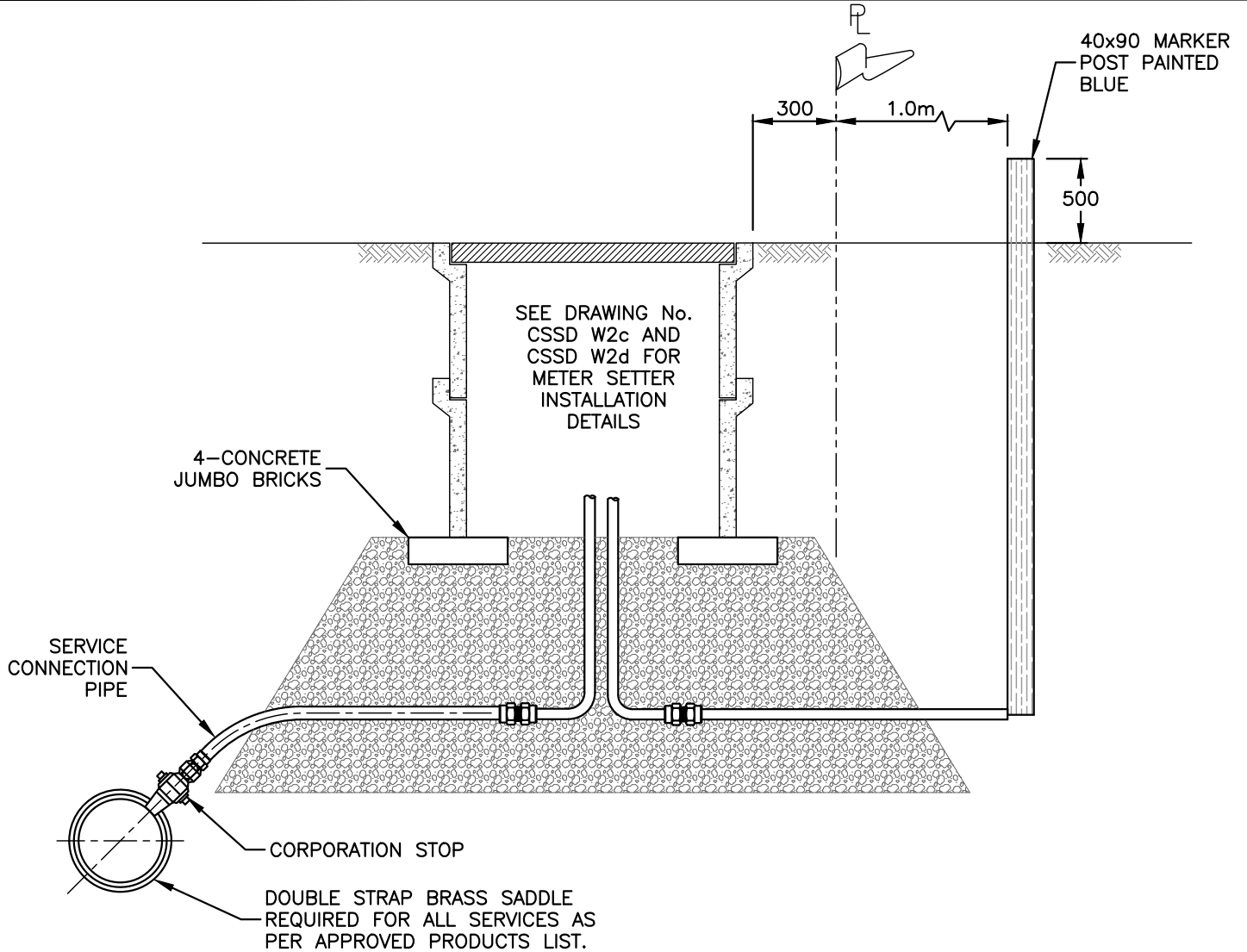
NOVEMBER, 2017



**WET DETENTION POND
PLAN AND SECTION**

DRAWING NUMBER	CSSD S16
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
 SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. THIS DETAIL FOR SERVICES 25 TO 50mm ONLY.
2. PVC SADDLES TO SECTION 33 11 01.
3. INSTALL SERVICE PIPE WITH "GOOSE NECK" IN HORIZONTAL POSITION.
4. REFER TO CONTRACT DRAWINGS, SECTION 33 11 01 FOR DETAILED SPECIFICATIONS.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

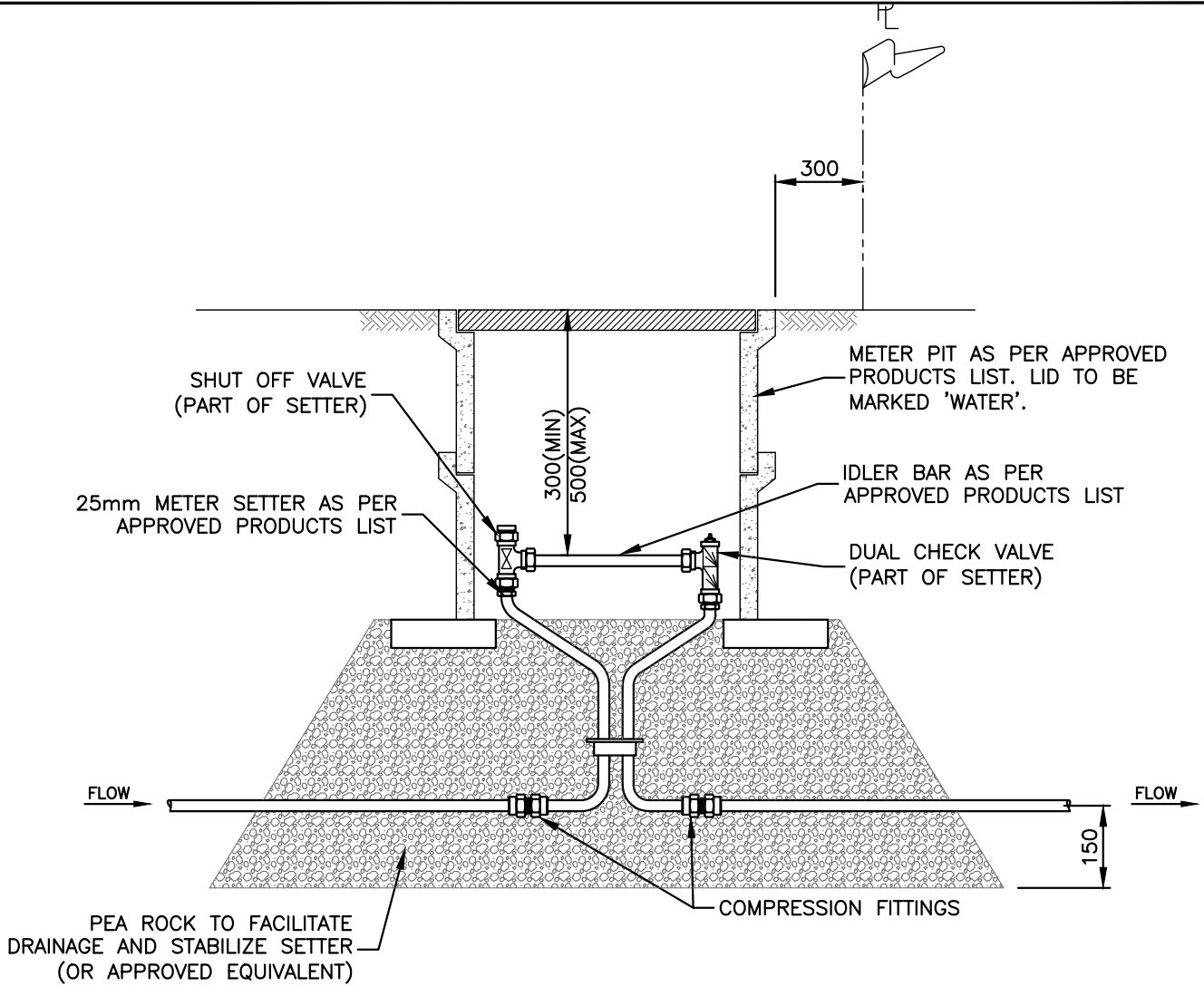
NOVEMBER, 2017



WATER SERVICE CONNECTION
 SERVICE BOX

DRAWING NUMBER	CSSD W2a
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. METER BOX TO BE INSTALLED AS PART OF THE INITIAL SERVICE INSTALLATION.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.
3. REFER TO CONTRACT DRAWINGS, SECTION 33 11 01 FOR DETAILED SPECIFICATIONS.

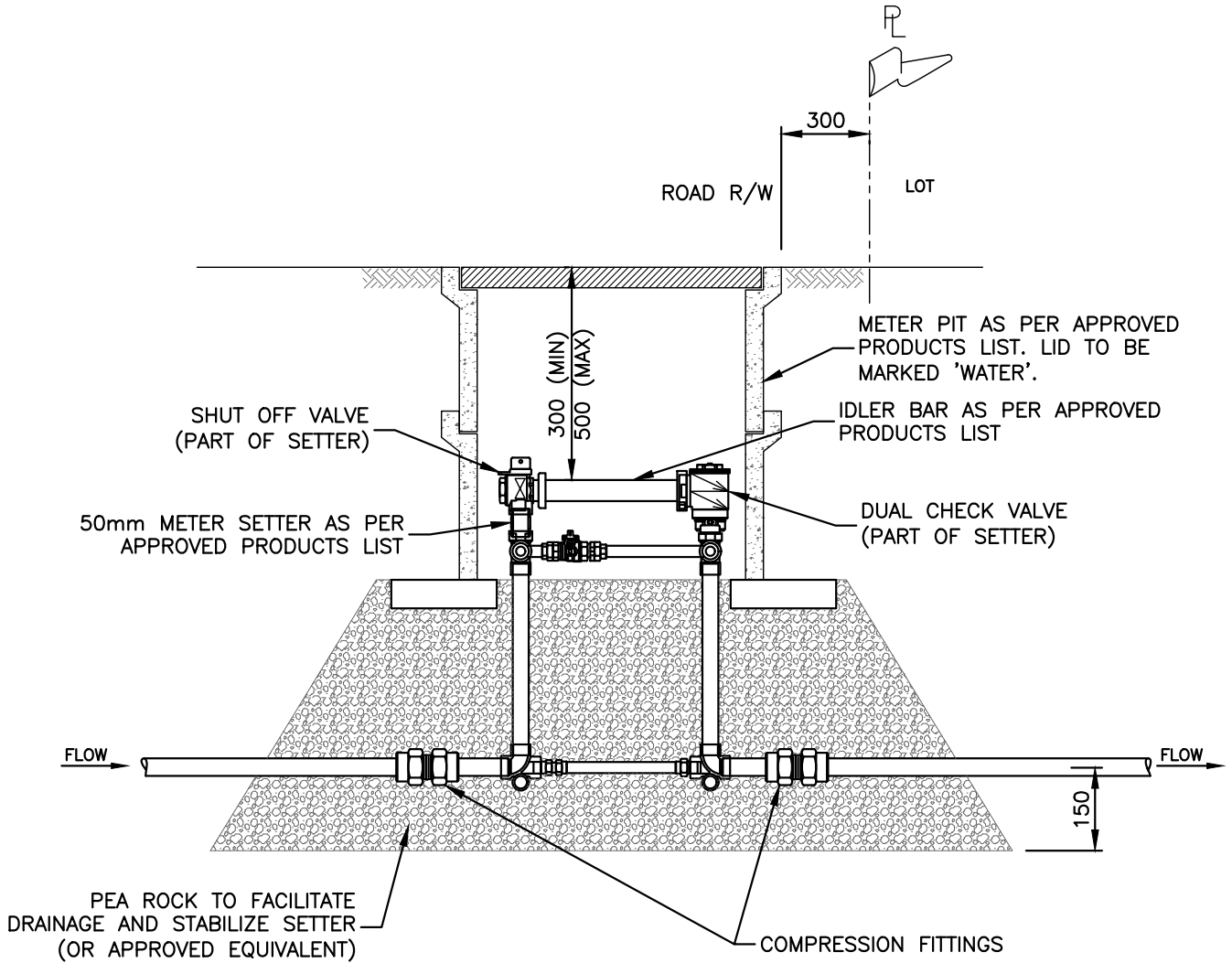
NOVEMBER, 2017



WATER METER SETTER INSTALLATION
FOR 25mm SERVICE CONNECTION

DRAWING NUMBER	CSSD W2c
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NOTE:

1. METER BOX TO BE INSTALLED AS PART OF THE INITIAL SERVICE INSTALLATION.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.
3. REFER TO CONTRACT DRAWINGS, SECTION 33 11 01 FOR DETAILED SPECIFICATIONS.

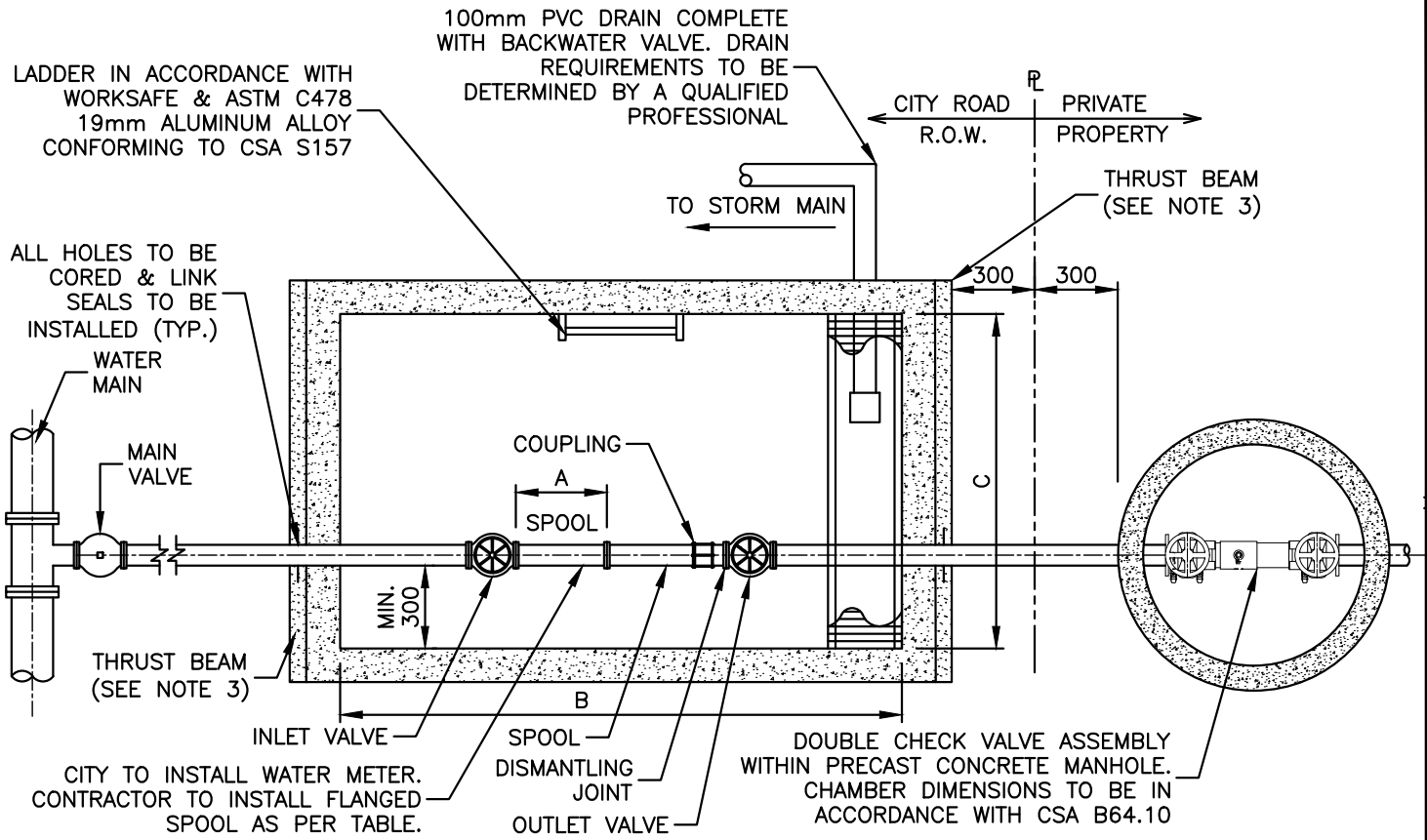
NOVEMBER, 2017



WATER METER SETTER INSTALLATION
FOR 50mm SERVICE CONNECTION

DRAWING NUMBER	CSSD W2d
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



WATER METER DIMENSIONS SPOOL LENGTH			
METER SIZE	A (mm)	B (mm)	C (mm)
75mm (3")	304.8	2060	1254
100mm (4")	355.6	2060	1254
150mm (6")	457.2	2060	1254
200mm (8")	508.0	TO BE DESIGNED BY A QUALIFIED PROFESSIONAL	
250mm (10")	450.0		

NOTES:

1. THIS DRAWING TO BE REVIEWED IN CONJUNCTION WITH THE CITY OF SUPPLEMENTARY DESIGN GUIDELINES AND SUPPLEMENTARY SPECIFICATIONS.
2. HATCH COVER TO BE DUAL DOOR. H20 OCCASIONAL (STATIC LOADING – NOT FOR DYNAMIC TRAFFIC) LOAD RATED LOCKABLE ALUMINUM LID C/W SPRING ASSISTED HATCH AND LOCK OPEN ARMS. HATCHES TO BE TROUGH FRAME WITH DRAIN DIRECTED TO SUMP.
3. PIPE ANCHORING/RETRAIANT TO BE DESIGNED BY APPLICANT'S ENGINEER.
4. ALL DIMENSIONS ARE IN MILLIMETRES.
5. METER CHAMBER FLOOR TO SLOPE TOWARD DRAIN.
6. 2121.5 PRE-CAST CONCRETE VAULT TO BE USED UP TO AND INCLUDING 150mm METER SIZE.

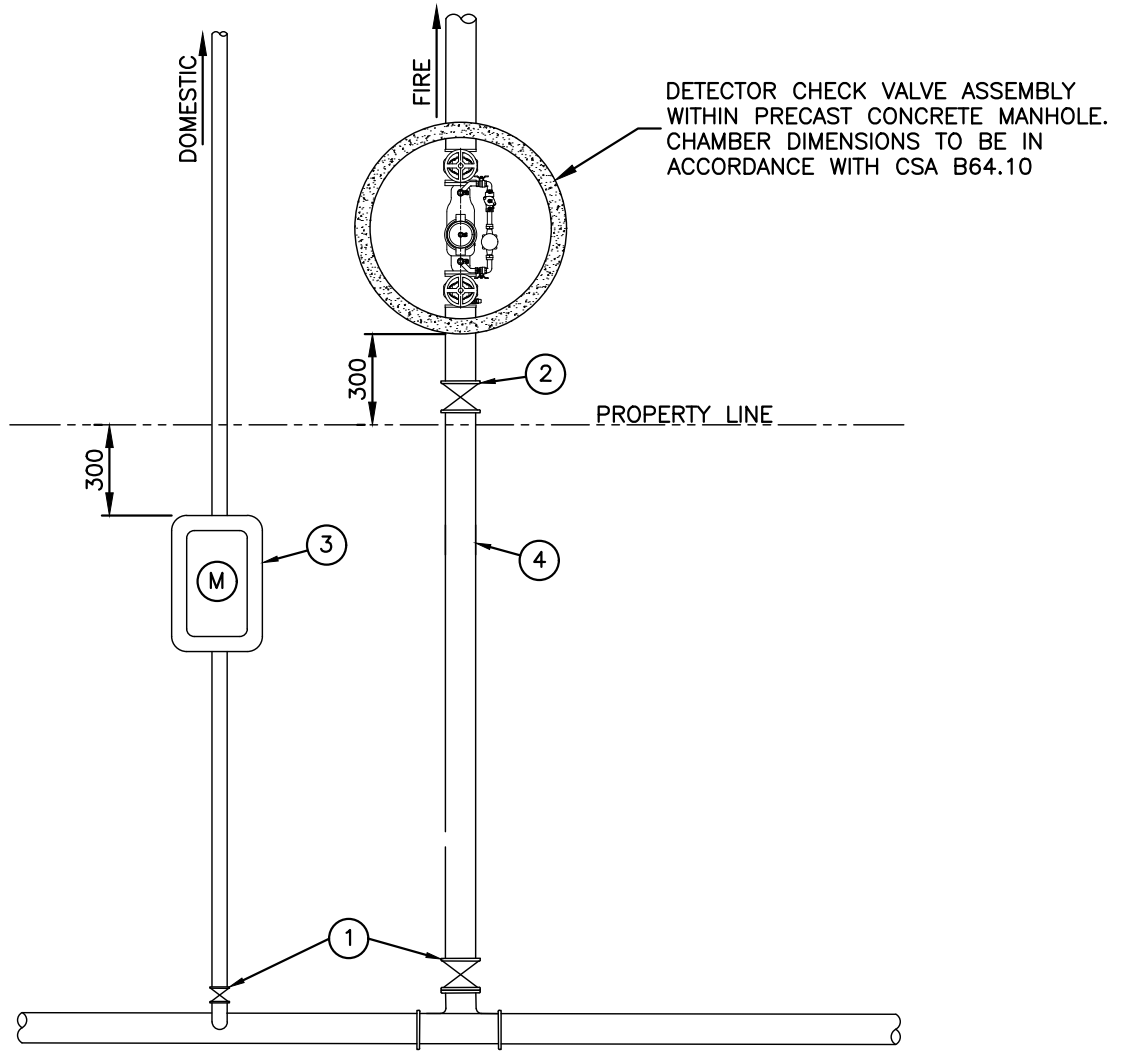
NOVEMBER, 2017



DOMESTIC WATER METER INSTALLATION FOR GREATER THAN 50mm SERVICE

DRAWING NUMBER	CSSD W2e
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY
SUPPLEMENTARY STANDARD DETAIL DRAWING



NO	NAME
1	CORPORATION STOP, 25 ϕ -50 ϕ GATE VALVE, OVER 50 ϕ
2	CURB STOP, 25 ϕ -50 ϕ (IN METER BOX) GATE VALVE, OVER 50 ϕ
3	DOMESTIC SERVICE, 25 ϕ -50 ϕ FOR MORE DETAIL SEE DRAWINGS - CSSD W2a - CSSD W2c - CSSD W2d SERVICES GREATER THAN 50 ϕ FOR MORE DETAIL SEE DRAWING - CSSD W2e
4	FIRE LINE SERVICE (SIZE VARIES)

NOTE:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN
2. REFER TO CONTRACT DRAWINGS AND SECTION 33 11 01 FOR DETAILED SPECIFICATIONS.
3. INSTALL THRUST BLOCKING AS REQUIRED.
4. SEPARATE DOMESTIC AND FIRE CONNECTION MAY BE PERMITTED IF APPROVED BY THE CITY.

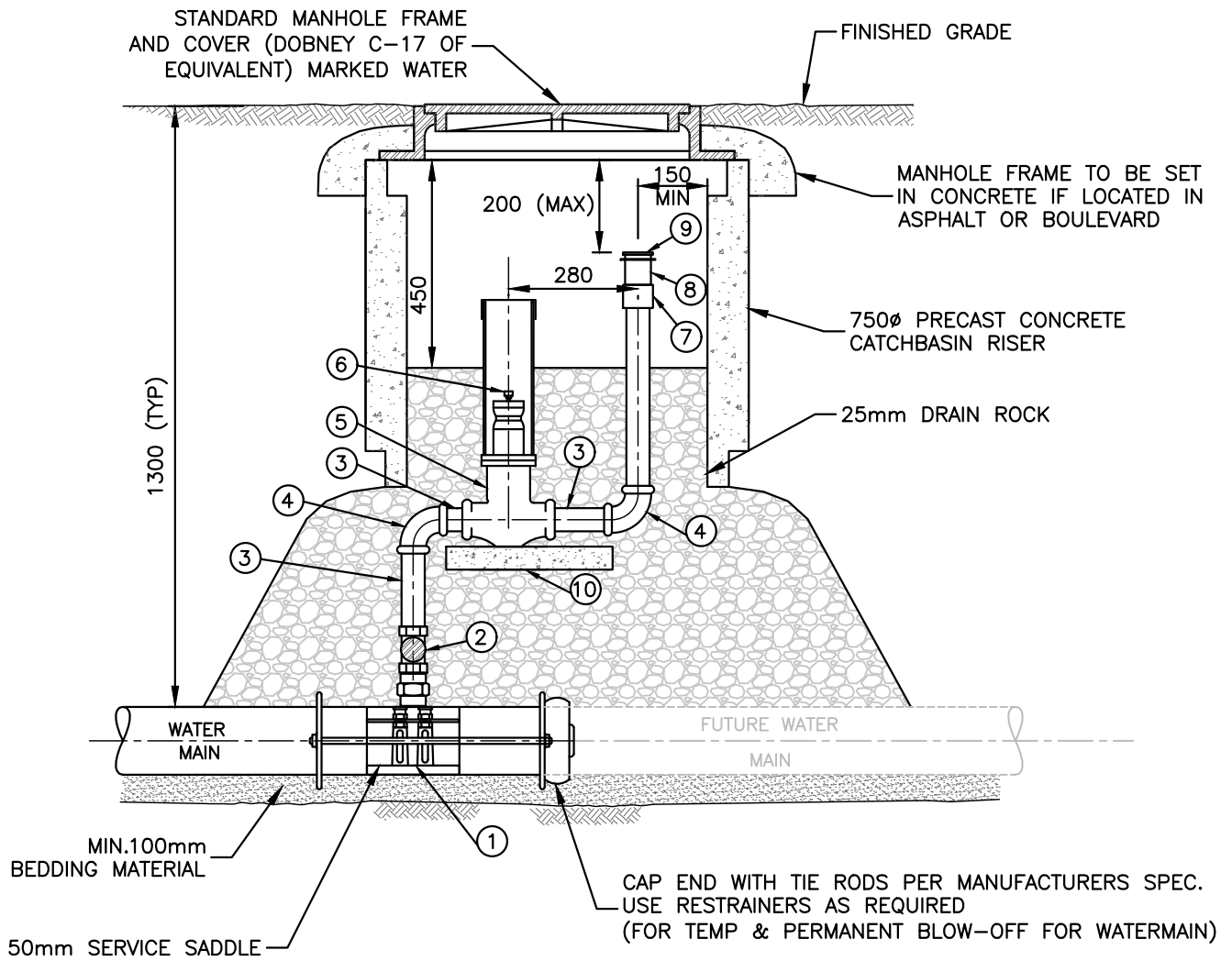
NOVEMBER, 2017



**FIRE / DOMESTIC WATER
 SERVICE PIPING LAYOUT**

DRAWING NUMBER	CSSD W2f
REVISION NUMBER	0
SCALE	N.T.S.

CITY OF COURTENAY SUPPLEMENTARY STANDARD DETAIL DRAWING



MATERIALS LIST	
ITEM	DESCRIPTION
1	50mm SERVICE SADDLE TAPPED AT PIPE CROWN
2	50mm GATE VALVE
3	50mm SS SPOOL PIECE
4	50mm SS 90° BEND

5	50mm CURB STOP WITH DRAIN
6	50mm SQUARE NUT
7	65mmx50mm BUSHING
8	65mmx65mm ADAPTOR
9	65mm QUICK CONNECT BRASS CAP
10	450x450x50 PRECAST CONCRETE PAD

NOTE:

- FOR INSTALLATIONS SHOWN ON CONTRACT DRAWINGS WHERE WATER TABLE (AT SEASONAL HIGH) IS ABOVE BASE OF DRAIN ROCK, REMOVE 4mm DRAIN HOLE AND AND SUBSTITUTE GRANULAR PIPE BEDDING FOR DRAIN ROCK. (COMPACT PIPE BEDDING TO 95% MODIFIED PROCTOR DENSITY).
- REFER TO MMCD DRAWING W1 FOR THRUST BLOCK DETAILS.
- REFER TO CONTRACT DRAWINGS, SECTION 33 11 01 FOR DETAILED SPECIFICATIONS.

NOVEMBER, 2017



TEMPORARY AND PERMANENT BLOW-OFF FOR WATERMAIN

DRAWING NUMBER	CSSD W8
REVISION NUMBER	0
SCALE	N.T.S.



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INTRODUCTION

The use of sanitary lift stations is generally discouraged and the City must approve any proposal for a lift station prior to submission of any engineered drawings for a lift station. Lift stations are considered a "special case" and are to be designed by a qualified professional. The following will form the general design requirements for duplex lift stations categorized as small to mid-sized lift stations. For stations larger than 50 l/s, or that require more than two pumps, authorization must be obtained from the City on a case by case basis, and the following standards may not fully apply.

Unless documentation provided by the City of Courtenay along with a specific request for tender or request for proposal states specifically that a provision set forth has been waived, all provisions are to be satisfied.

The requirements set forth in these standards are minimum requirements that shall be applied universally by all parties performing services for and/or providing equipment to the City of Courtenay. This includes, but is not limited to, all component parts that may form part of package systems.

This document is part of a series of standards and as such should not be viewed in isolation of all other City of Courtenay associated standards which may modify and/or clarify the requirements set forth within this document.

The City of Courtenay may, on a case-by-case basis, and at the City's sole discretion, approve deviations from these standards.

INTENT OF THE STANDARDS

The Design Criteria are intended to provide direction to the Applicant and their Engineer on the elements required to be considered in the design of sanitary lift stations. It is intended to be used in conjunction with the MMCD Design Guideline Manual and the City of Courtenay Subdivision and Development Servicing Bylaw Schedule 1.

The Supplementary Specifications are intended to provide direction to the Applicant and their Engineer on the specifications that must be incorporated into building servicing contracts for the installation of new sanitary lift stations. The Supplementary Specifications are to be used in conjunction with the City of Courtenay Subdivision and Development Services Bylaw Schedule 2 and Schedule 3 and the Master Municipal Construction Document (MMCD).



SANITARY LIFT STATION DESIGN CRITERIA

1.0 GENERAL SPECIFICATIONS

1.1 Pumps

- (a) All sanitary lift stations shall be designed with a minimum of two pumps, each capable of handling the Peak Wet Weather Flows independent of the other. The pump that is furthest away from the inlet shall be supplied with a 4901 flush valve.
- (b) Each pump must be:
- capable of passing solids up to 75 mm in size;
 - equipped with hour meters;
 - easily removed for maintenance;
 - constructed to operate on a voltage based on HP rating as shown on the table below:

Pump Size	Approved Voltages
Less than 5HP	Single phase 240V / Three phase 208V
5HP – 10HP	Three phase 208V / Three phase 600V
Larger than 10 HP	Three phase 600V

- (c) Motor cables, power cables, etc. shall be continuous from the lift station to the kiosk. Cables are not to be spliced. Only one power cable is allowed in one conduit.

1.2 Kiosk

All auxiliary equipment and control panels shall be mounted in a secure lockable kiosk adjacent to the station. The kiosk shall be located not less than 1.2 metres and not more than 3 metres from the station lid, with the controls section of the kiosk facing the wet well and facing north (where practical to do so.). The kiosk shall be founded on a concrete foundation, and should be made from powder coated aluminum, with a standard green finish. All kiosks shall be supplied with a rubber gasket between the aluminum kiosk and the concrete to prevent water leakage into the kiosk.

The electrical Kiosk shall be CSA Type 3R rated and fabricated from marine grade aluminum in accordance with the following Ministry of Transportation and Infrastructure Kiosk Specifications:

- General Material Requirements: 402.3.1
- Connecting Hardware 402.3.2
- Fabrication Mechanical Requirements, General Requirements 402.4.1
- Welding 402.4.2
- Door Gaskets 402.4.4
- Kiosk Environmental Requirements, General 402.4.8.1
- Kiosk Fan and Heater Thermostat 402.4.8.5
- Kiosk Finish 402.6
- Electrical Kiosk shall be powder coated "Fence Post Green".



- Plan Pouch 402.9

The kiosk shall be fabricated with sufficient bracing to form a structure capable of withstanding transportation, wind, snow and ice loading. The kiosk manufacturer is responsible for obtaining structural and seismic certification from a professional engineer registered with Engineers and Geoscientists BC. Structural certification shall include recommendations for fastening methods.

The kiosk shall contain separate compartments for:

- pump control;
- service entrance and distribution; and
- fan and duct section, complete with isolated cable junction chamber vented to the atmosphere.

The kiosk shall be designed to contain:

- all control and telemetry equipment within the pump control compartment;
- an electrical service entrance that is complete with required appurtenances and components shall be arranged in a manner acceptable to B.C. Hydro;
- all power distribution equipment in the service entrance and distribution section, with exception to a 120/240 or 120/208V electrical panel which shall be mounted within the pump control compartment;
- an extra 120 volt receptacle within the pump control and service entrance/distribution sections;
- an automatic transfer switch in the service entrance and distribution section;
- a manual transfer switch in the service entrance and distribution section;
- a receptacle for mobile backup generator on the exterior of the kiosk;
- intrusion and fault alarm keypad and panel, keypad to be accessible, with equipment mounted within the pump control compartment;
- exterior lighting mounted to an overhead pole capable of illuminating the area around the tank lid to WorksafeBC required standards;
- a heater within each of the pump control and service entrance/distribution sections; and
- a digital clock.

The fan and duct section shall be isolated from the pump control and service entrance/distribution sections by means of a continuous weld.

1.3 Piping/Valve Chamber

All piping within the wet well shall be stainless steel or approved equivalent, and all stations shall feature an external separate valve chamber for valves and flow measurement equipment. The valve chamber can be either fiberglass or pre-cast concrete with suitable lockable lids with lift assist mechanisms as required.

Each pump discharge shall have a ball check valve or lever type swing check valve.



Each pump discharge shall have a plug valve installed downstream of the check valves.

Drain to be provided at floor elevation and floor to be sloped to convey inflow of water or sewage toward drain inlet. The drain shall include a backwater valve and p-trap to prevent sewage and gas from entering the piping/valve chamber.

1.4 Ventilation

Ventilation at each station is to be by forced air using a fixed speed fan that runs continuously. The minimum ventilation rate is to be 12 air changes per hour or higher if required for safety considerations. The fan shall be located in the kiosk and be sealed to the inlet blower line. The blower shall indicate failure on the control panel.

Each station shall have a minimum of one vent stack, and shall have odour control installed. As a minimum, the vent stack shall be equipped with an activated carbon filter capable of conveying the required air flow rate without excessive pressure loss: Calgon SweetVent or equal.

1.5 Lift Station Tank

The lift station tank to be of fiberglass construction.

Wet wells shall be designed with the following features:

- Include a benched bottom to direct all solids into the pump suction;
- Include surface access with a lockable, waterproof fiberglass or aluminum cover. Access hatches must include hydraulic assist and safe hatch;
- Provide access that is 200 mm to 500 mm above the finished grade to prevent vehicles from riding overtop of the structure;
- Contain aluminum (or fiberglass) ladder mounted so it does not interfere with the removal and installation of the pumps, etc. The ladder shall be designed to extend and lock least 1.0 metre above the tank access. Ladders mounts to be structurally sufficient to prevent puncturing of the tank wall, where mechanical fasteners are to be used, the wall shall be reinforced to provide sufficient capacity for the type and size of fastener. Integrated fiberglass ladders shall be fixed mounted to the fiberglass wall with appropriate reinforcing of the fiberglass as specified by the manufacturer;
- Contain a platform above the high water level float to permit wet well access wherever the total depth from ground level to wet well floor exceeds 2.4 metres;
- Include 1 base and davit complete with hand operated winch capable of lifting the pumps clear of the lift station (as per the City's Approved Products List);
- Include 1 base and davit for confined space entry. (as per the City's Approved Products List);
- Contain explosion proof lighting capable of illuminating the interior of the tank.

1.6 Equipment

All equipment must be CSA Approved and Work Safe BC compliant.



1.7 Emergency Backup Generator

All sewage lift stations shall be equipped with an emergency backup generator unless otherwise approved by the City. The generator transfer switch shall be of the automatic type. The generator shall be diesel fueled unless otherwise approved by the City. Diesel fuel tanks shall be base tanks integrated into generator unit by OEM, shall include double wall containment, and shall be sized to run the generator for at least 24 hrs continuously at 100% load. The concrete base to install the generator shall be provided with a spill containment structure to capture any spillage. The generator shall have a 1.2m clearance all around, and it shall be provided with a noise control package. Noise Control Package Specification for Generator shall be residential rated. Sound attenuation includes enclosure and exhaust muffler package. Sound attenuation system performance shall result in measured sound levels not to exceed 65 dB @ 10.7 metres. Design Engineer shall perform a load analysis with the sequence of motor starting in order to know the motor starting loads and the motor running loads. Such electric load calculations must be done in kVA units to account additional loads due to low power factor. The generator shall have a motor starting kVA capacity to limit the voltage dip to no more than 15% for any motor starting conditions. Such generator load analysis must be included in the engineering report. The generator manufacturer must be pre-approved by the City prior to design of the backup system.

The generator shall also come equipped with a permanently-mounted resistive load bank, with a full load that equals +/- 80% of the generator unit's full load capacity. The load bank shall also include the following specifications:

- Duty Cycle: Rated for continuous operation.
- Load Steps: 5, 10, 10, 25, 50, 100 KW
- Cooling System: integral with generator cooling system
- Sound dampening: integral with generator muffling system
- Operator Controls: Control Panel housed in a NEMA-type wall mount enclosure including:
 - Main Power ON/OFF Switch, Power ON Indicator, and Master Load ON/OFF Switch.
 - Load selection shall be provided by individual industrial lever-type toggle switches for on/off application of resistive load segments, one provided for each load step.
 - Auto Load Dump Circuit: A remote load dump circuit is provided as part of the load bank control circuit.
- Provisions shall be provided to trip the load bank off-line from a normally closed set of auxiliary contacts from an automatic transfer switch or other device. In the event of a utility failure, all load is removed.

Automatic Load Controller: Automatic Load step controller that maintains a minimum load on the generator set. The controller shall monitor the connected downstream loads and will automatically add or subtract load steps in response to overall load changes as to maintain a minimum load level on the generator set.



1.8 Warranty

All lift station components shall be warranted in accordance with the manufacturer’s warranty, and such warranty shall be explicitly stated in a warranty statement (section) provided with the Operations and Maintenance Manuals submitted upon acceptance of the Lift Station by the City.

1.9 Water Connection

A 50 mm water service connection for cleaning purposes must be provided at the site. The service must include a dry standpipe and appropriate cross-connection control devices located in an above ground heated lockable cabinet. The connection shall also include an on/off ball valve and a 38mm quick connect cam-lock fitting. Cross-connection control devices must be designed to be compliant with CSA standard B64.10-11 (Selection and Installation of Backflow Preventers/Maintenance and Field Testing of Backflow Preventers). RP backflow device shall be located in an above ground kiosk.

1.10 Site Fencing

1.8m black epoxy coated perimeter fencing is to be provided.

2.0 LIFT STATION ELECTRICAL DESIGN STANDARDS

2.1 Standard Lift Station Electrical Specification

All lift stations shall include at a minimum the following features and capabilities:

Manual pump controls	It shall be possible to set each pump into manual (Hand) mode. When in the manual mode the control of the pump shall be independent of (and unaffected by) the actions (or absence) of the controller or fail-safe pump control relays.
Motor type and starting	All pumps 10hp or larger require soft starting devices or are to be speed controlled via Variable Frequency Drives.
Controller	The station controller shall conform to the City of Courtenay Approved Products List.
Float Switches	Each station shall be supplied with a high level and low level float switch. These shall be either an ITT Flygt float level tree type (mercury) or an acceptable alternative as Approved by the City and CSA certified. Guides must be used for all float levels. The low level float is to be set at a level just above the pump intake. The high level float is to be set at a level no higher than the obvert of the lowest inlet pipe.



Fail Safe Operation	The high level float shall trigger operation of pumps, the operation of which shall be independent of the main station controller. The pump operation shall be wired to cease on either activation of the low level float or time-out of a timer relay. During normal operation the high level float will not be activated.
Level monitoring	Wet well levels shall be monitored using an ultrasonic sensor or pressure transducer connected as an analog input to the control unit. This level is to be used for pump control and shall be reported to the central monitoring station.
Programmable operation	Pump start and stop levels are to be programmable and set through the local pump controller HMI and via SCADA.
Pump supervision	Pumps shall be monitored, as a minimum, for stator over temperature faults, seal leakage and over current condition.
Flow rate	Flow rate data is to be reported by flow monitoring device.
Intrusion alarm for kiosk or building	Access to the electrical controls is to be monitored by a contact switch, and an alarm condition shall be generated when the contact is broken.
Receptacle for plug in of standby generator	Each station, including those which include local generator, shall be equipped with a receptacle for plug-in of City standby generator, mounted on the exterior of the building or kiosk within a lockable NEMA-4X enclosure (padlock provided by the City).
Alarms	<p>The following alarms shall be generated and reported by the alarm system by way of a dedicated telephone connection. The alarms shall also be connected to the lift station controller to allow for annunciation through the City's SCADA system</p> <ul style="list-style-type: none">• Intrusion Alarm• Loss of Power• High level alarm• Low level alarm• Pump monitoring alarms (leakage, high temperature)• Generator Faults (if generator installed)• Breaker tripped• Float switch failure
UPS backup for controller and communications system	A UPS standby power system is required. The UPS must provide power to the controller for at least one hour in the event of a power outage.

2.2 User Interface

The user interface in a typical lift system consists of manual controls for emergency and maintenance purposes, and an electronic interface directly to the controller.



Manual Controls

The operator interface at this level shall be kept to a minimum. Auto/Off/Manual selectors for each pump are to be provided. These controls shall function independently of the controller. When in placed in manual mode the appropriate pump shall start. When placed in the Off condition the pump shall not start regardless of input from the controller. In Auto mode the pump is controlled by the controller. Pump run time meters shall be installed for each pump.

Status lamps are required as follows:

- One lamp indicating kiosk power
- One status lamp for each pump indicating pump run condition
- One status lamp for each pump indicating a failure condition

Controller Interface

Each station shall also include a station control Human-Machine-Interface (HMI), mounted in the door of the control cabinet. This control keypad is used to view and reset alarm status, and to configure the operation of the station. The HMI shall conform to the City of Courtenay Approved Products List, and shall integrate directly with the station controller.

2.3 VFD Station Supplementary Specification

All lift stations involving VFDs shall include the features and capabilities outlined above plus the following features and capabilities:

VFD	A solid state variable frequency drive, sized for the motors associated with the project, with inline load filters. Xylem ACS550 or similar.
VFD Manual Mode	The VFD shall be programmed to run the pump at an appropriate default speed in manual mode (when started).
VFD controller connection	Connection to the VFD is by analog output from the controller.
VFD output monitoring	The controller shall monitor and make use of the speed output, and current outputs of each VFD. These shall be made available to the monitoring system.

2.4 Entry and Alarm Test Mode

Each pumping station panel will have a key lock access to the control cabinet. A momentary spring-to-centre rotary selector switch shall be provided to switch to select between Test & Normal mode of operation. In Test mode the system shall behave as follows:

When momentarily switched to the "Test" position all normal alarms from the station will be acknowledged and disabled for 30 minutes, and a local "Test Mode" pilot light will illuminate.



In addition, a test alarm shall be triggered which will be treated as a low priority alarm at the SCADA system.

The station controller begins a phased monitoring of the situation, as described in the following table.

Phase	Description	
1	The input is activated by the test mode selector switch. Result: Work time begins (25 minutes).	
2	The input has been activated longer than the Work time. Result: Common alarm outputs are activated. Warning time begins. (5 minutes)	
3	Personnel acknowledge their presence within the Warning time. Result: Work time is restarted. Common alarm outputs are set to passive.	No acknowledge is received within the Warning time. Result: Personnel alarm is generated.
4	The selector switch is momentarily placed in the "Normal" position, or the kiosk/station door is closed. Result: "Test Mode" pilot light extinguishes and station alarming returns to normal.	

3.0 CITY SCADA SYSTEM

City of Courtenay sewage pumping stations are to be compatible with a central monitoring system, planned for some future date. This section is provided to explain the requirements on all new lift stations in order to ensure compatibility with the planned SCADA system.

Key features of the planned SCADA system are planned to include:

- real time information regarding the status of stations throughout the municipality in order to efficiently respond to faults and other issues as they arise;
- limited remote control capability of the stations, which in certain cases may avoid the need for a site visit;
- historical information and other data that will assist with proactive maintenance activities; and
- historical information and other data that can be used to make informed decisions guiding future infrastructure development.



4.0 COMMUNICATIONS BETWEEN SCADA AND LIFT STATION

Stations constructed pre SCADA system shall support the future installation of communications equipment. Sufficient space is to be provided in the kiosk for a lockable louvred/ventilated box that will contain transmitter/receiver and networking equipment. In addition, a 100mm underground communications conduit shall be stubbed out from the kiosk/building foundation to allow for a future installation of antenna.



CONSTRUCTION SUPPLEMENTARY SPECIFICATIONS

- 1.0 GENERAL .1 This section refers to those portions of the Work that are unique to the supply and installation of prefabricated submersible sewage lift stations. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- 1.1 Related Work .1 Electrical Division 26
.2 Concrete Reinforcement Section 03 20 01
.3 Cast-in-Place Concrete Section 03 30 53
.4 Aggregates and Granular Materials Section 31 05 17
.5 Excavating, Trenching, and Backfilling Section 31 23 01
.6 Sanitary Sewers Section 33 30 01
.7 Sewage Force mains Section 33 34 01
- 1.2 Shop Drawing and Data Sheets .1 Before fabrication, the supplier shall submit shop drawings to the City for review. The submission shall include data sheets for all equipment to be ordered, along with a full drawing package for the electrical kiosk (external kiosk, internal layouts, wiring and controls diagrams)
.2 Lift station structural drawings, stamped by a Professional Engineer registered in British Columbia, shall be provided for the fibreglass wet well, the reinforced concrete base, the electrical kiosk enclosure and the anchoring systems for the generator, electrical kiosk and wet well.
- 1.3 Requests for Approved Equals .1 Any requests for approved equal shall contain sufficient documentation regarding the service organization which is available to back up the tendered pumping units. In particular, the service organization shall:
 - have been in existence a sufficient length of time to have established a reputation which can be backed up with references;
 - have a number of qualified employees whose major commitment is to carry out service calls; and
 - have a well-equipped local maintenance shop.
.2 The Contractor shall also be prepared to demonstrate the availability of commonly required spare parts. If these are not kept in stock locally, the anticipated delivery period must be clearly indicated in the Form of Tender.



- 1.4 Commissioning Plan .1 A commissioning plan should be provided to the City for review 2 weeks in advance of the scheduled commissioning.
- 2.0 PRODUCTS
- 2.1 Structure .1 Chamber:
- .1 The main chamber shall contain the pumps and associated equipment and shall be a vertical cylinder.
 - .2 The shell shall be constructed of Fibreglass Reinforced Plastic (FRP) and shall provide sufficient rigidity to resist deflection during installation and to resist pump loads and vibrations.
 - .3 The main chamber shall be reinforced with external reinforcing rings.
 - .4 Four (4) lifting "eyes" adequate for the entire weight of the completed station, including all installed equipment, shall be provided.
 - .5 Where inflow, discharge and ventilation lines, pass through the tank wall, the wall shall be reinforced.
 - .6 The connecting flanges shall be ANSI B-16.1, Class 125, unless shown otherwise on drawings.
 - .7 Color of the fibreglass interior shall be sanitary white. The exterior shall be dark green.
 - .8 Hold down lugs, complete with hold down bolts, shall be provided with sufficient strength to anchor the lift station to the reinforced concrete base, preventing flotation.
 - .9 The wet well shall be smooth and free of projections and pockets which could impede flow and collect sediment.
 - .10 An aluminum access ladder shall be provided as per Work Safe BC requirements. After installation of the complete lift station, all equipment shall be capable of servicing from the upper chamber.
 - .11 Electrical connection points shall be provided for the pump motors, light, and float conduits.



.2 Physical Properties of FRP Fabrication:

.1 The material of all tanks shipped shall meet the following minimum requirements:

<u>Property at 73° F.</u>	<u>ASTM Test</u>	<u>Value</u>
Tensile Strength	D638	8,000 - 16,000 psi
Compressive Strength	D695	14,000 - 27,000 psi
Flexural Strength	D790	16,000 - 30,000 psi
Flexural Modulus	D790	1.0 x 10 ⁶ psi
Hardness (average)	D790	Barcol 40

.2 Fiberglass tank to be helically filament wound utilizing chemically inert ISO resins. The laminate shall contain at least 60% and not over 70% glass by weight. All FRP work shall meet or exceed the following standards:

C.G.S.B.	41-GP-22
A.S.T.M.	3299 and 2563-2.4
A.S.T.M.	D883-69

.3 The maximum load rating permitted on the top of the tank must be posted on a plaque on the inside of the lid. The plaque must clearly visible when the lid is open.

.3 Construction

.1 Laminates shall be dense, without voids, dry spots, foreign inclusions, air bubbles, pinholes, or delamination and shall not be cracked or crazed. Such deficiencies shall be removed by grinding and replaced with hand laid matt and roving exceeding the amount removed. The fabricated unit shall have a smooth white inner surface and shall have a dimensional tolerance of plus or minus 6mm from design dimensions.

.2 Bonded joints shall be made by wrapping with strips of fibreglass mat soaked in resin. The wrap material shall be at least as thick as the heaviest plastic section joined, and it shall extend to either side of the joint a sufficient distance to make the joint at least as strong as the pieces joined. Interior joints shall be coloured white to match the interior surfaces; exterior joints shall be of the same colour as the exterior surface.



- .3 The inside surfaces of bonded joints shall be sealed with one layer of mat and then coated with resin to a minimum of 2.5mm thick.
- .4 All exposed interior and exterior surfaces shall have sufficient resin coating 0.51mm minimum thickness, to avoid exposure of glass fibres.
- .5 To prevent "flowing" of the final resin coat, it shall be bonded by using "Veil" glass fibre.
- .6 All cut edges and drilled holes shall be coated with resin so that no glass fibres are exposed and voids filled.
- .7 Structural elements having edges exposed shall be reinforced with chopped strand glass mat.
- .8 The minimum tank wall thickness shall be 16mm and shall be externally reinforced to resist soil, bearing, hydraulic, and handling loads, both internal and external. Wall thickness to be increased as required to resist loading.
- .9 The resin used shall be a commercial grade and shall be evaluated by test of previous service to be acceptable for use in domestic sewage applications and suitable for installation underground throughout Canada.
- .10 Ultraviolet light inhibitors to be used on all external surface in accordance with resin manufacturer's instructions.

2.2 Submersible Sewage Pumps .1

Pumps to be equipped with ANSI discharge flange. Pumps shall be a centrifugal, submersible, non-clog, bottom suction, capable of passing a 76mm solid. Pumps and motors shall incorporate the following:

Impeller: Cast iron.

Volute/Motor Frame: Cast iron, close coupled to seal chamber. Volute to be equipped with quick discharge nozzle to provide an automatic rapid and leakproof gravity lock type connection or disconnection from the fixed elbow. Sliding guide brackets to slide along guide rails.

Shaft: Stainless Steel.

Seals: Double mechanical seals (tungsten carbide to carbide upper and tungsten carbide to tungsten carbide lower).



Bearings: Anti-friction suitable for a minimum bearing life of 50,000 hours B10 life under operating conditions.

Fluid Operating Temp.: 0°C to 20°C.

Fluid Specific Gravity: 1.0

Fluid Type: Domestic Sewage

Fasteners: Stainless Steel (ASTM TYPE 316).

- .2 Motors shall be CSA approved submersible squirrel cage induction type with Class F insulation and non-hydroscopic windings. Service factor shall be 1.0. Use EEMAC Design B. If higher starting torque is required for the equipment loading, use EEMAC Design C.

Pump motors shall come equipped with means of communicating seal leaks and over-temperature conditions.

- .3 Power cables shall be factory-sealed into the motors and flush valve. They shall be of a type of construction acceptable to the electrical inspector. Cables shall be of sufficient length to reach the Control Kiosk without splices.

Power cables shall be equipped with a disconnect switch located inside the wet well, complete with lockout. Disconnect switches to be Meltric Decontactors or approved equal.

- .4 The pump motor nameplates shall be mounted in the Kiosk or Panel.

- .5 Pumps shall be painted with epoxy and equipped with sacrificial zinc anodes to provide corrosion protection.

- .6 Pump P2 to be equipped with Flygt Model 4901 Mix Flush Valve or approved equal.

- .7 Contractor shall supply the following spare equipment:

- one (1) impeller
- one (1) spare pump

2.3 Fixed Discharge Connection

- .1 Fixed discharge elbow, quick disconnect type, with steel soleplate, lower guide rail holder and drilled for anchor bolts.



2.4	Lifting Chains	.1	Lifting chains to be Grade 80 Accoloy A8 material, rated with a working load of 1900 kg and shall be NAR approved for overhead lifting, finish to be galvanized. Chain length to be sufficient to connect between pump and chain hoist.
2.5	Guide Rail Assembly	.1	Schedule 40 galvanized steel pipe c/w upper guide bar holder.
		.2	All fittings and connectors to be galvanized.
2.6	Ventilation Duct Work & Fan	.1	Inlet duct shall be provided for air blown into the lift station and a vent shall release exhaust air.
2.7	Lighting Fixture	.1	The wet well light shall be an explosion-proof, wall-mounted, LED fixture suitable for Class 1 locations, complete with globe and guard, RAB Type EB 123 or equal. Switch by General Contractor.
2.8	External Piping	.1	As per the Contract Drawings.
2.9	Internal Piping	.1	Sewage piping shall be stainless steel.
2.10	Plug Valves	.1	Plug Valve, c/w lever. Flanges to ANSI B-16.1, Class 125.
2.11	Check Valves	.1	Ball check valve. Flanges to ANSI B-16.1, Class 125.
2.12	Level Regulators	.1	Provide five ENM-10 Flygt level regulators to stop both pumps, start lead pump, start standby pump, high level alarm, low level alarm for 24 volt operation, each with sufficient cable suitable for the installation.
		.2	Provide one aluminum liquid level hanger, with wall bracket mount and flat switch conductor hooks for excess cable. Hanger shall also provide threaded strain-relief squeeze connectors for each level regulator.
2.13	Bolts	.1	All bolts, including those for the check valve and plug valve, shall be ASTM Type 316 Stainless Steel.
2.14	Access Covers	.1	Access covers shall be designed to allow removal of the pumps from the stations without removing or damaging other equipment.
		.2	Each cover shall be hinged and include hydraulic assist for easy opening with less than 225 N lifting force and shall be provided with a padlock hasp with a box enclosure to prevent vandalizing of the lock.



- .3 A brass padlock shall will be installed by the City at the developer's cost.
- .4 Each cover shall be provided with a positive means of locking open.
- .5 Safe-Hatch (or approved equal) shall be included to provide fall through protection.
- 2.15 Air Release Valve .1 Air release valve to be 50mm diameter NPT inlet, cast iron body, bronze mechanism and seat, stainless steel lever pins and float, designed for sewage, rated at 1MPa. Provide shut-off valve and back flushing facilities including blow-off valves and 3 metre long back flush hose. Equip valve and hose with quick disconnect couplings.
- 2.16 Floor Gratings .1 Fibreglass or Borden Type B aluminium Size No. 6 suitable for a bearing load of 5 kN/m², or 200 kg plus dead weight of one pump whichever is greater.
- 2.17 Miscellaneous Metals .1 Aluminium: to ASTM 655.
.2 conforming to CSA G40.2-M1977; Type W with yield strength of 300 MPa, shop primed.
.3 stainless steel ASTM Type A316 Stainless Steel unless otherwise noted.
.4 Miscellaneous metalwork, including brackets, nuts and bolts, cables, turnbuckles, and eye bolts shall be stainless steel or aluminium. Sharp edges and weld splatter shall be removed prior to installation.
- 2.18 Pressure Gauge .1 GIC #6211, liquid 100 mm diameter pressure gauge c/w snubber and isolating valve.
- 2.19 Hydrostatic Tests .1 Pressure piping within the FRP wet well and valve chamber shall be hydrostatically tested to a pressure no less than 1.5 x the shut off pressure of the lift station pumps. The test pressure shall be held for a period of not less than two (2) hours, with no leakage permitted.

Sewage forcemains external to the lift station shall be tested in accordance with Section 33 34 01 – Sewage Forcemains.

Should any test disclose leakage greater than that specified above, the Supplier shall locate and repair the defect and retest



			the section to ensure that the leakage is within the allowable limits.
2.20	Concrete Base and Anchoring System	.1	The reinforced concrete wet well base and anchoring system shall be designed to prevent uplift of the fibreglass lift station assuming that the surrounding soil is flooded to finished ground elevation and that the station is empty. A minimum safety factor of 1.5 against uplift shall be used in the design of the base and anchoring system.
2.21	Power Supply and Controls	.1	As per Division 26.
3.0	EXECUTION		
3.1	Excavation and Backfilling	.1	To requirements of Section 31 23 01 Excavation, Trenching and Backfilling.
		.2	Start backfilling only after the concrete has acquired a suitable degree of strength and only after obtaining written permission from the Contract Administrator. No backfilling of walls shall take place before the slabs have been cast and have reached a minimum of 75% design strength.
		.3	Use only the approved portion of the excavated material and other approved imported granular fill.
		.4	Deposit backfill in layers not exceeding 150mm thickness, and compact to obtain 95% of Standard Proctor Density or otherwise indicated on the Contract Documents.
		.5	Keep heavy compacting equipment away from structure by at least 1.5 metres. This portion shall be compacted using hand operated tampers.
		.6	Make all fills and embankments to elevations, contours, and slopes shown on the drawings.
		.7	Grade top layer carefully to smooth regular surface, with a minimum thickness of 100mm of topsoil, when indicated on the drawings.
		.8	Allow for any settlement which may occur in order that the finished fills or embankments will be to the final grades as shown on the drawings.



- .9 Excavate and remove all materials whatever their nature and condition to depths and dimensions necessary for the construction of the structure and piping to the limits shown on the drawings.
- .10 Furnish all equipment for construction, temporary supports including shoring, bracing, cribs, coffer dams, etc. and for de-watering.
- .11 Install and operate an adequate de-watering system for construction of the structures in the dry.
- .12 All equipment used for de-watering and excavation shall be of a suitable and rugged type to assure continuous operation.
- .13 Make special provisions to relieve the water pressure and prevent flotation or damage to parts of the works in case of accidental stoppage of de-watering equipment.
- .14 Where over excavation is required, fill with specified sub-base or lean concrete unless otherwise indicated in the Contract Documents.
- .15 Stockpile excavated granular material meeting backfill specification designated by the Contract Administrator. Save for re-use.
- .16 Notify the Contract Administrator for inspection and approval after the excavation is completed.
- .17 Do not place any concrete until the Contract Administrator has approved the depth of excavation and the character of the foundation material.
- 3.2 External Piping .1 To requirements of Sections 31 23 01 - Excavating, Trenching and Backfilling, Section 33 30 01 - Sanitary Sewers, and Section 33 34 01 - Sewage Forcemains.
- 3.3 Concrete Work .1 To Section 03 30 53 - Cast-in-Place Concrete and Section 03 20 01 - Concrete Reinforcement.
- 3.4 Electrical .1 To Division 26.
- 3.5 Piping Installation .1 Pipe shall be adequately supported on adjustable pipe saddle supports or from pie hangers or brackets during construction and completion to prevent abnormal stresses being imposed on items of equipment such as pump flanges.



- .2 Valves shall be installed in accordance with the manufacturer's recommendations.
 - .3 Before installing bolted connections, pipe ends, and gaskets shall be absolutely clean. Gaskets shall be lubricated with soapy water and bolts with thread lubricant. Bolts shall be tightened progressively by the crossover method and not in rotation around the joint. Bolts shall be torqued to the manufacturer's requirements. Wrenches used for tightening bolts shall be in good condition and properly sized to prevent rounding of nuts and bolt heads.
 - .4 During all stages of construction, piping shall be protected from damage from any cause. Openings in the piping system shall be securely covered, capped, or plugged to prevent collection of dirt, debris, or other extraneous matter during the entire construction.
 - .5 Damaged work shall be removed and replaced with new material to the satisfaction of the City.
- 3.6 Pumps and Accessories
- .1 Locate discharge elbows on the sump floor at exact locations required so that guide rails which connect from them to the access frame will be in perfect alignment.
 - .2 Firmly anchor discharge elbows to the floor at their proper location.
 - .3 Install guide rails.
 - .4 Lower pumps on guide rail system until contact is made with discharge elbows. Ensure that system functions to give leaktight connection.
- 3.7 Start-Up
- .1 Lift station shall be completed, including work of other sections, before start-up.
 - .2 Start-up of equipment to take place in the presence of a trained representative of the Equipment Supplier and City. Copies of final operating and maintenance manuals shall be provided to the City at least two (2) weeks in advance of start-up.
 - .3 Set level and align all equipment to the complete satisfaction of the City.
 - .4 Carefully check the operation and controls of the equipment.



- .5 Notify the City when the operation and controls of the equipment are satisfactory.
- .6 Provide the necessary facilities for the City to check the operation of the equipment.
- .7 The Contractor shall make provisions for adequate supply of water to the wet well and forcemain for testing purposes. Testing will include checking performance of all pumps, floats, and controls. At minimum the following tests will be conducted.
 - .1 Pump Condition - i.e. pump body, impeller running free, quick disconnect connection, cable connections, gaskets and oil level.
 - .2 Wet Well Condition - i.e. pump sliding free on guide rails, pump cable with sufficient slack, floats suitably positioned and will not snarl, no cable splices or junction box in the wet well, well clean.
 - .3 Control Panel Condition - i.e. components including motor overloads correctly rated for the pumps. Record over-load settings on schematic, date and sign.
 - .4 Start-Up Operation - i.e. supply voltage suitable, pump rotation correct, operation of pumps - by float switches - HOA selectors - lead pump selector - overloads isolate associated control, alarm float.
 - .5 Pump Load Checks - ie. load current on all phases for single and parallel pump operation, supply voltage under load. Confirm pumping rate and operating head.
 - .6 Alarm panel test to confirm all zones are correctly configured and operational.
- .8 Liaise with the Contract Administrator to ensure that the Design Engineer, the City, the Contractor, and the Equipment Supplier are present for the start-up and testing program.
- .9 The City will not take over operation and maintenance of any equipment until the work of all related sections has been completed in the area in which the equipment is located and all equipment has operated in its intended manner to the satisfaction of the City.



- .10 Cost of any temporary power costs for the start-up procedure shall be the responsibility of the Contractor.
- 3.8 Protection
 - .1 Protect the work and material of all other sections from damage and make good all damage thus caused, to the satisfaction of the City.
 - .2 Be responsible for work and equipment until finally inspected, tested, and accepted, protect work against theft, injury, or damage, and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers and plugs during construction to prevent entry of obstructing materials.
- 3.9 Cleaning
 - .1 Any dirt rubbish, or grease on walls, floors, or fixtures for which the Contractor is responsible must be removed and the premises left in first class condition in every respect.
 - .2 De-water station wet well and remove all dirt and grit from bottom of station.
- 3.10 Maintenance Manuals
 - .1 Supply three copies of hard backed bound manuals with all the information required for maintenance, operation, parts catalogue and lubrication.

The following information shall be included in the manual:

- .1 Table of contents.
- .2 As constructed shop drawings.
- .3 Equipment, layout drawings.
- .4 Electrical, control, and alarm wiring diagrams.
- .5 Normal and emergency operating instructions for all equipment.
- .6 Maintenance instructions for all equipment.
- .7 Safe work procedure for confined space entry into the wet well and valve chamber (to be prepared by a Qualified Professional).
- .8 Equipment data sheets.
- .9 Certified head/capacity curves for pumps.
- .10 Equipment part lists.
- .2 Each section shall be separated from the preceding section with a plasticized divider with a tab denoting contents of the section.
- .3 Review all of these instructions with the City representatives before the commencement of the maintenance period.



General catalogues will not be accepted and bulletins must deal specifically with the equipment provided.