MEMORANDUM OF UNDERSTANDING

REGARDING

FAIRWINDS LAKES DISTRICT AND SCHOONER COVE IMPLEMENTATION MATTERS

THIS MEMORANDUM OF UNDERSTANDING is entered into this 23th day of July, 2014.
BETWEEN:

BCIMC REALTY CORPORATION
("**BCIMC**")

AND:

3536696 CANADA INC.
("**3536696**")

(BCIMC and 3536696 are collectively the "**Owner**")

AND:

REGIONAL DISTRICT OF NANAIMO

(the "**Regional District**")

(collectively, referred to as the "**Parties**")

WHEREAS:

A. This Memorandum of Understanding describes presently anticipated future steps and processes regarding various matters that could be expected to arise in the event of the adoption by the Regional District of:

(a) three amending bylaws to the Regional District's Land Use and Subdivision Bylaw, and

(b) a Phased Development Agreement authorization bylaw,

that have been applied for by the **Owner** in connection with the **Owner's** Fairwinds Project, as outlined in the Recitals to the proposed Phased Development Agreement ("**PDA**");

Qualifications

B. By entering into this Memorandum of Understanding, the parties are not making, and do not intend to imply, any form of commitment regarding the future steps and processes spoken to, but rather are simply seeking to distill and summarize their present thinking in light of existing **Regional District** policy, and the extensive technical work and analysis performed to date;

C. The **Regional District** and the **Owner** acknowledge and agree that:

(a) a public hearing process is a prerequisite to Regional Board adoption of the amending bylaws and of the PDA authorization bylaw, and those bylaws accordingly may or may not be adopted by the Regional Board, and, even if adopted, may or may not be altered prior to adoption;

(b) some of the other matters referred to in this Memorandum of Understanding are subject to decisions by the Regional Board (such as services to be provided, service areas, local service taxes, development cost charges), and are also subject to various forms of public process, and hence the decisions the Regional Board may make regarding those matters cannot be anticipated;

(c) others of the matters referred to are subject to the jurisdiction of third parties (such as the Approving Officer, the Ministry of Transportation and Infrastructure, the Ministry of Environment, or the Ministry of Community, Sport and Cultural Development), which may also be exercised in a variety of ways, that at present cannot be anticipated; and

(d) this Memorandum of Understanding accordingly does not, and is not intended to, in any way limit the discretion of the Regional Board regarding such matters.

(collectively, the "**Qualifications**")

Context

D. At the same time, the **Regional District** and the **Owner** consider that this Memorandum of Understanding is useful given that:

(a) the **Regional District** has adopted a number of Bylaws following substantial public processes and that set Regional District policy related to the Fairwinds Project, which Bylaws include:

(i) the Regional District of Nanaimo's Regional Growth Strategy Bylaw ("**RGS**");

(ii) the Nanoose Bay Official Community Plan Bylaw ("**OCP**"); and

(iii) the Lakes District Neighbourhood Plan Bylaw; and

(iv) the Schooner Cove Neighbourhood Plan Bylaw;

(b) the policies contained within those Bylaws are important to advancing many of the **Regional District's** sustainability goals;

(c) the Neighbourhood Plans contemplate zoning amendment bylaws and a **PDA** for the Fairwinds Project, and various of the other matters referred to in this Memorandum of

Understanding as well as the provision by the Owner of substantial park land, park improvements, and other amenities;

(d) the presently anticipated future steps and processes set out in this Memorandum of Understanding reflect the kinds of possible future steps and processes that one would in the normal course anticipate in order to advance the implementation of **RGS, OCP** and Neighbourhood Plans, and the **Regional District's** sustainability goals, in the context of the Fairwinds property that is the subject of the Owner's applications;

(e) in order for the Fairwinds Project to successfully proceed, a number of practical considerations must be accounted for, including:

(i) constraints on immediately available water supply;

(ii) constraints on sewage treatment capacity;

(iii) the fact the **Regional District** does not presently provide a storm drainage service and stormwater systems within road rights-of-way fall within the jurisdiction of the MoTI;

(iv) the fact the proposed road system is within the jurisdiction of the Ministry of Transportation and Infrastructure;

(v) the fact the Approving Officer with jurisdiction over subdivision is not a **Regional District** official, but rather a Provincial official; and

(vi) the substantial investment the **Owner** would need to make at an early stage to address transportation and other infrastructure requirements, if the Fairwinds Project is to proceed;

(f) the **Owner** and **Regional District** and their staff and consultants have undertaken substantial analysis from a planning, engineering and environmental perspective in determining how the **RGS**, **OCP**, Neighbourhood Plans, and other **Regional District** policies applicable to the Fairwinds Project, can best be advanced;

(g) the **Owner** has entered into this Memorandum of Understanding because it wishes to ensure that appropriate forethought has been given to possible future steps and processes, in light of the practical considerations noted above and the substantial level of investment that it would need to make during the early stages of development, in the event the Fairwinds Project proceeds, **while wholly acknowledging and accepting the Qualifications**; and

(h) the **Regional District** has entered into this Memorandum of Understanding because it wishes to provide the **Owner** and the public with a degree of clarity regarding presently

anticipated future steps and processes, and also wishes to ensure that appropriate forethought has been given to possible future steps and processes, and the broader implications the Fairwinds Project would entail, **again all subject to the Qualifications**.

(collectively, the "**Context**").

NOW THEREFORE, THE **PARTIES** AGREE AS FOLLOWS:

A. Effect of this Memorandum of Understanding

1. The **Parties** agree that this Memorandum of Understanding, and each of the terms set out hereinafter:

   (a) are nothing more than a record of presently anticipated future steps and processes, including, in some instances, indications of the policy directions that **Regional District** staff and the **Owner** are recommending based on existing Regional District policies and the planning, engineering, environmental and other technical and related analysis that has taken place; and

   (b) **are in each and every instance subject to the Qualifications, and are not in any way legally binding on either of the Parties**.

B. Overview, Definitions and Schedules

B.1 Overview

2. This Memorandum of Understanding deals with the following topics:

   (a) integrated stormwater management (Part C);

   (b) transportation (part D);

   (c) water supply (Part E);

   (d) sanitary sewage (Part F); and

   (e) parks (Part G).

B.2 Definitions

3. The provisions hereof utilize the terms defined below:

   (a) **Approving Officer:** the Provincial Approving Officer;

(b) **DCC**: development cost charge;

(c) **ERWS**: Phase 1 of the Englishman River Water System, being a proposed new intake and filtration on/adjacent to Englishman River, as well as associated storage infrastructure (planned as aquifer storage and recovery) to supply water to Parksville and the Regional District, including Electoral Area E. A fundamental component of the ERWS is the present Arrowsmith Water Service, which consists of the existing Arrowsmith Lake dam, licensed storage capacity in Arrowsmith Lake, and Englishman River intake;

(d) **Fairwinds Project:** the development of the Owner's lands in keeping with the Neighbourhood Plans, and does not include completed homes or other developable land within the existing Fairwinds neighbourhood;

(e) **Infrastructure Phasing Plans:** the Infrastructure Phasing Plans that are included as schedules to the **PDA**;

(f) **Integrated Stormwater Management Plan** or **ISMP:** as defined in the PDA;

(g) **KWL**: Kerr Wood Leidal, Professional Engineers;

(h) **Lakes District**: the Lakes District land that is the subject of the Lakes District Neighbourhood Plan (Regional District Bylaw 1400.05), as defined in the **PDA**;

(i) **MoCSCD**: BC Ministry of Community, Sport and Cultural Development;

(j) **MoE:** BC Ministry of Environment;

(k) **MoTI**: BC Ministry of Transportation & Infrastructure;

(l) **MoTI Preliminary Commentary**: the preliminary commentary provided by the **MoTI** to the **Owner** under heading D hereof, as outlined in April 30 and July 10 2013 letters, which commentary was provided in the context of the:

(i) '**Schooner Cove Parkway Design Package**';

(ii) '**Project-Specific Street Standards**';

(iii) **Fairwinds Lakes District Project Specific Design Sheets** dated October ♦, 2013; and

(iv) **ISMP**

referenced in the **Schedules**;

(m) **NBPWS**: Nanoose Bay Peninsula Water System, operated by the Regional District;

(n) **NBPCC**: Nanoose Bay Pollution Control Centre, being the sewage treatment plant, operated by the **Regional District**;

(o) **Neighbourhood Plan**: either the Schooner Cove Neighbourhood Plan or the Lakes District Neighbourhood Plan, both of which form part of the Nanoose Bay Official Community Plan;

(p) **1997 Development Agreement**: an agreement entered into between the **Regional District** and Fairwinds Development Corporation dated January 27, 1997;

(q) **Owner**: 3536696 Canada Inc., bcIMC Realty Corporation or affiliate companies;

(r) **Owner's Land**: the Lakes District land and the Schooner Cove land;

(s) **PLA**: Preliminary Layout Approval by the Approving Officer;

(t) **Regional District:** Regional District of Nanaimo, being the local government of Nanoose Bay Electoral Area E;

(u) **RVC**: The Fairwinds Rural Village Centre area, formerly the Fairwinds & Schooner Cove Urban Containment Boundary areas (collectively), per the **RGS**, which comprises the areas covered by the Lakes District, Schooner Cove and existing Fairwinds neighbourhoods;

(v) **SA**: Service Area;

(w) **Schooner Cove**: the Schooner Cove land that is the subject of the Schooner Cove Neighbourhood Plan (Regional District Bylaw 1400.04), as defined in the **PDA**;

(x) **Subdivision Servicing Standards**: the area specific subdivision servicing provisions related to the **Fairwinds Project**, such as are contained within an amendment bylaw applied for by the **Owner** that is presently in process;

(y) **TIS:** Transportation Impact Study, included as a technical appendix to the Neighbourhood Plans;

(z) **VIHA**: Vancouver Island Health Authority;

(aa) **Wallbrook**: The site located at 1610 & 1634 Northwest Bay Road, including 4 groundwater wells thereon (FCR 2-07 (Well tag No. 16523), FCR 3-08 (Well tag No. 25682), FCR 4-08 (Well tag No. 25685) and (FCR 5-08 (Well tag No. 25683)) all currently owned by the **Owner**, but excluding the Wallbrook 1 (formerly Madrona 7) well which was previously dedicated to Regional District;

(bb) **Water DCC Bylaw**: a Development Cost Charge Bylaw for water as contemplated herein;

(cc) **Zoning Amendments**: the zoning amendment bylaws for the Lakes District and Schooner Cove that have been applied for by the **Owner** and that are presently in process.

B.3 Schedules

4. The provisions hereof also utilize the following schedules, which are appended hereto:

Schedule 1 **Integrated Stormwater Management Plan (ISMP)** - Lakes District and Schooner Cove – Refer to Schedule "DD" of the PDA

Schedule 2 **Schooner Cove Parkway Design Package**:

(a) Schooner Cove Drive Alignment Plan and Vertical Profiles
(b) Cedar Creek Bridge Crossing
(c) Schooner Cove Drive Cross Sections

Schedule 3 **Project-Specific Street Standards**

Schedule 4 **Lakes District and Schooner Cove Project Specific Design Sheets** (MoTI format) dated November 25, 2013

Schedule 5 **Density & Sewer Service Records** (for completed development within the Fairwinds **RVC**)

Schedule 6 **Servicing Standards** – Project-Specific Standards to:

(a) Community Sanitary Sewer System Standards (Schedule 4D1, to the bylaw amendment presently in process)
(b) Community Water System Standards (Schedule 4C1, to the bylaw amendment presently in process)
(c) Community Streetlighting System Standards (amended draft Regional District Bylaw 500 Schedule ♦)
(d) Template Agreements:
- Appendix 1 Subdivision and Servicing Agreement
- Appendix 2 Maintenance Agreement
- Appendix 3 Latecomer Agreement
- Appendix 4 Transfer Agreement
- Appendix 5 Fire Hydrant Use Permit
- Appendix 6 Fire Hydrant Certification Form
- Appendix 7 Approved Products List – Public Water Systems

Schedule 7 **Other Nanoose Water Works**: [table listing offsite infrastructure works set out in the draft **NBPWS** DCC Report by Koers & Associates dated May 14 2012, other than treatment of the **Claudet** wells]

Schedule 8 Analysis of **NBPWS** Water Supply Needs to Buildout by Koers & Associates dated July 3, 2013

Schedule 9 Wallbrook Groundwater Well Approval Process

C. INTEGRATED STORMWATER MANAGEMENT

5. The **Owner** and **Regional District** staff are generally supportive of the approach set out in paragraphs 6 through 8 hereof, as regards the following aspects of storm drainage:

(a) storm drainage works, and timing of construction (C.1); and

(b) the funding of operation and maintenance (C.2).

C.1 Integrated Stormwater Management Plan & Construction of Storm Drainage Works

NP references: LD 4.3.3(a), SC 4.3(a)

6. Storm drainage works are anticipated to include, inter alia, rainwater creeks (both natural and man made), regional raingardens and controlled storage, and regional wetlands.

C.2 Financing of Stormwater Operating costs and Other On-going Costs – SA.

NP references: LD 4.3.3(e)

7. The **Regional District** anticipates establishing a stormwater service in the **Lakes District** area, and providing a stormwater service.

8. The **Owner** (which owns more than the requisite 50% of the lands having more than 50% of the assessed value) and the Regional District anticipate establishing a **SA** to fund the operating costs and repair and replacement of the storm drainage system (including mains and ponds) on the lands comprising the **Owner's Land.** The Owner intends to petition the **Regional District** board to establish such on the following basis:

(a) charges to be based on a flat rate (equal amount per parcel) parcel tax (to reflect that the operational costs only arise when a phase proceeds, and only arise regarding the phases that have proceeded);

(b) the **SA** for the operating and maintenance costs of the stormwater regime may be combined with and form part of the same **SA** as that for transportation works referred to at paragraph 14 hereof; and

(c) to assist the **Regional District** in estimating such operating and maintenance costs, the **Owner** shall provide operation and maintenance (repair and replacement) cost estimates.

D. TRANSPORTATION

9. The **Owner** and **Regional District** staff are generally supportive of the approach set out in paragraphs 12 through 19 hereof, as regards the following aspects of transportation infrastructure:

   (a) road works and timing of construction (D.1);

   (b) funding of operation and maintenance (D.2);

   (c) **MoTI** policy (D.3); and

   (d) Parking (D.4).

10. The approach set out under headings D.1 to D.3 below reflect the **Context** and also the technical analysis undertaken by the **Owner** and reviewed by the **Regional District**, and previous submissions by the **Regional District** to the **MoTI** and **MoCSCD**.

11. The approach set out under headings D.1 to D.3 also reflects:

   (a) the **MoTI Preliminary Commentary**, provided with regard to:

      (i) the **SC Parkway Design Package**;

      (ii) the **Project-Specific Street Standards**;

      (iii) the **Lakes District and Schooner Cove Project Specific Design Sheets**; and

      (iv) the **ISMP**;

   (b) confirmation by the **MoTI** dated August 28, 2013 that it will accept, operate, repair and replace sidewalks within the portion of the area comprising the **Owner's Land** which are to be within the **MoTI** right of way; and

   (c) indications provided upon review by the **MoTI** and **Regional District** that the **Regional District** will manage, with the approval of MoTI, the following elements located within the **MoTI** right of way:

      (i) street trees, rain gardens/ponds & other landscaping within boulevards & islands;

      (ii) street lighting;

      (iii) signage (other than **MoTI** signage or **Owner's** signage); and

pipes/conduits located beneath the road carriageway (i.e. water, sanitary, and stormwater); and

(d) preliminary confirmation by the **Regional District** of the proposed funding of **Regional District** operating and management costs by way of **SA**(s).

D.1 Road Improvements & Construction
NP references: LD 4.1.1(a), SC 4.1.1(a)

(1) Schooner Cove Parkway

12. The **Parties** presently anticipate that the **Owner** will construct Schooner Cove Parkway on a phased basis as generally outlined in the **Schooner Cove Parkway Design Package** including:

(a) rough-in of the Schooner Cove Parkway road alignment, including Cedar Creek ravine crossing;

(b) establishment of a Statutory Right of Way in favor of **MoTI**, prior to (or contracted to be built upon) "Subdivision" as defined in the **PDA**, on the basis that the roughed-in road will only be used for construction traffic and that the road will be privately maintained; and

(c) completion of construction, and dedication for public use, as each Sub-Phase proceeds, as generally shown on the **Infrastructure Phasing Plans.**

(2) Onsite Improvements

13. The **Parties** presently anticipate that the **Owner** will construct all on site road improvements (including, but not limited to, the completion of Schooner Cove Parkway), and will construct and dedicate all collector roads, local roads, lanes and emergency roads on a phased basis as generally shown on the **Infrastructure Phasing Plans,** to the standards referenced in the **MoTI Preliminary Commentary**, and including the accompanying **ISMP** works.

D.2 Financing of Operating and Other On-going Costs for 'Behind the Curb' Elements within Road RoW
NP references: LD 4.1.1(h), SC 4.1.1(g)

14. The **Owner** (which owns more than the requisite 50% of the lands having more than 50% of the assessed value) and **Regional District**, anticipate establishing a **SA** (or agreeing to amend an existing **SA**) to fund the operating costs and repair and replacement of the street lighting, boulevard, street trees and landscaping in the area comprising the **Owner's Land.** The Owner intends to petition the Regional District board to establish such on the following basis:

(a) charges to be based on a flat rate (equal amount per parcel) parcel tax (to reflect that the operational cost only arises when a phase proceeds (and has only arisen regarding the phases that have proceeded); and

(b) the **SA** for the operation of such transportation elements may be combined with and form part of the same **SA** as that for storm drainage works referred to at paragraph 9 hereof.

15. In acknowledgement of the letter dated August 28, 2103 from Minister Stone confirming MoTI's commitment regarding sidewalks, the **SA** will not apply to the operation, repair and replacement of sidewalks within the portion of the area comprising the **Owner's Land** which is to be within the **MoTI** right of way, per the **MoTI** advice in the **MoTI Preliminary Commentary** that it will be responsible for same.

D.3 MoTI policy

16. The **Owner** and **Regional District** will seek to have the **MoTI** more formally adopt

(a) the **SC Parkway Design Package**;

(b) the **Project-Specific Street Standards**;

(c) the **Lakes District and Schooner Cove Project Specific Design Sheets**; and

(d) a program for storm water management in accordance with the goals, objectives and performance criteria of the **ISMP**;

as **MoTI** policy, as regards the **Owner's Land**, to enable the consideration of subdivision applications by the **Approving Officer** to occur in light of such policy. The **Regional District** will seek to enter into an implementation agreement pursuant to section. 868 of Part 25 of the *Local Government Act* with **MoTI** to support the formal application of 17 (a-c) by MoTI and the **Approving Officer**, when considering subdivision in the **Lakes District** and **Schooner Cove** as outlined in the **Neighbourhood Plans**.

(NP references: LD 4.1.1(c), SC 4.1.1(c))

17. The **Owner** and the **Regional District** will support the application of the following in submissions made to the **Approving Officer** as regards subdivision applications related to the **Owner's Land**:

(a) the **SC Parkway Design Package**;

(b) the **Project-Specific Street Standards**; and

(c) the **Lakes District and Schooner Cove Project Specific Design Sheets**;

18. The **Owner** will seek **MoTI** approval of the Fairwinds **RVC** area as a designated low speed vehicle (LSV) area. *(NP references: LD 4.1.1(m), SC 4.1.1(h))*

D.4 Parking Requirements – Potential Future Reductions.
NP references: LD 4.1.1(g), LD 4.2(a), SC 4.1.1(f)

19. The **Parties** presently anticipate that, to encourage the successful implementation of **Neighbourhood Plan** initiatives relating to alternative forms of transportation (including low speed vehicles, public transit, car-sharing cooperatives, etc.), the **Regional District** may consider reduced parking requirements (ratios and types of stalls) for future commercial developments where it can be demonstrated through a shared use parking study that there is 'surplus parking' in completed developments. In particular, for commercial uses:

(a) the extent of any 'surplus parking' will be determined by a parking usage survey of completed and occupied development projects within the **Neighbourhood Plan** areas, conducted by a qualified professional; and

(b) such surveys will be undertaken during peak periods of a typical week (50th percentile of annual usage), and will consider parking space occupancy, usage/turnover, accumulation patterns, and other characteristics.

Further, in the event that the Owner submits a development permit for Schooner Cove Phase 1 (the Village) having a commercial floor area of less than 2,325msq, the Regional District would reconsider CD45-MU off-street parking requirements for commercial uses on the basis of a revised shared-use parking study submitted by the Owner. *NP reference SC 4.2.(a)*

E. <u>WATER</u>

20. The **Owner** and **Regional District** staff are generally supportive of the approach set out in paragraphs 22 through 25 hereof as regards the following aspects of water infrastructure:

(a) water supply sources and offsite infrastructure (E.1); and

(b) review of criteria (E.2)

21. The approach has been arrived at in light of the **Context** and the following additional considerations, and others:

(a) the **NBPWS** will require, in order to service both existing residents and new development, source water additions from both the **ERWS** surface water (which is projected to be operational in 2016, but not before), and additional ground water from wells;

(b) the cost to the **NBPWS** of the **ERWS** Phase 1 is presently estimated to be $9.75 million, being **NBPWS**' 26% share of the total $37.5 million estimated cost for the **ERWS** (2011 $). The ERWS has presently secured senior government funding of $1.3 million, of which $338,000 (26%) is to be applied to offset the total **NBPWS** share of **ERWS** costs;

(c) the **Regional District** has preliminarily determined that the allocation of the capital costs of the **ERWS** between existing users and new development is to:

(i) reflect that additional source water (i.e. in addition to those sources currently online as of July 2013) is, to a significant extent, required to provide adequate supply to existing **NBPWS** water users;

(ii) have a time horizon for both capital expenditures and the projected population growth from new development, for the purposes of **DCC** calculations, of 20 years; and

(iii) be informed by the Professional engineering analysis of **NBPWS** water supply needs to buildout, undertaken by Koers and Associates dated July 3, 2013 (Schedule 8);

(d) the **Parties** acknowledge that preliminary costs identified are Class D estimates, and that the scope of work, legislation, and costs may change;

(e) the **Fairwinds Project** comprises roughly 87% of the proposed new development dwelling units in Nanoose Bay, nearly all of which is located within the **NBPWS**;

(f) **Regional District** policy B.1.21 provides that water supply is to be identified at the point of zoning; and

(g) the **Owner** is obligated, as a precondition to subdivision approval, to secure a water supply for the subdivision that meets the applicable water quantity and water quality standards.

E.1 Water Supply Sources & Offsite Infrastructure
NP references: LD 4.3.1(a), SC 4.3.2(a), LD 4.3.1(c), SC 4.3.2(c)

(1) ERWS

22. The **Regional District** has preliminarily indicated that in order to:

(a) facilitate **Regional District** achieving the objectives of its Regional Growth Strategy, and the implementation of the **Neighbourhood Plans**;

(b) better serve the residents of the Regional District and Electoral Area E; and

(c) encourage the up-front expenditures by the **Owner** that the Development requires,

it proposes to construct additional works for the **NBPWS** community water system.

(2) Development Cost Charges

23. The **Parties** intend to work towards a proposal to amend the **Regional District's** existing Bulk Water Development Cost Charge Bylaw (1998), related to the Arrowsmith Water Service portion of the **NBPWS,** and to merge that bylaw with a new **DCC** bylaw for the **NBPWS** area in accordance with the Provincial DCC Best Practices Guide, with consideration to the following points:

(a) there would be a single DCC bylaw for all water infrastructure within the NBPWS area;

(b) the bylaw would include the cost of the following capital works:

(i) **ERWS** Phase 1, as a source addition, with a capacity to provide water to at least 2,200 new single detached units (or other equivalent having equivalent water demand), at the standards provided for in **Community Water System Standards** sections 2.1.1 and 2.1.2;

(ii) the **Other Nanoose Water Works**; and

(iii) all of the **Wallbrook** ground water wells, as source additions, provided they meet the standards noted at subpoint (d) below;

(c) the allocation of at least 34% of the costs of the **ERWS**, and 82% of **Other Nanoose Water Works** would be to 'existing users', and not to 'new development' as recommended in the Koers report referenced at section 22(c)(iii);

(d) a **DCC** apportionment to 'new development' based on unit type, to reflect the relative number of persons per household for various land uses, as set out section 2.1.1 of the **Community Water System Standards**;

(e) upon the construction and dedication of each **Wallbrook** ground water well by the **Owner**, the **Owner** would be entitled, further to section 935(3)(d) of the *Local Government Act* to:

(i) cash reimbursement to the **Owner** from the **DCC** funds collected to the date of dedication, of

– the interest in land to be transferred to the **Regional District** in connection with such well at fair market value; and

– the cost of the improvements including all required treatment works in accordance with the **DCC** capital budget (as opposed to actual costs), which budget is expected to be based upon cost estimates for costs to complete and actual costs for completed works; and

(ii) to the extent the **DCC** funds collected to the date of dedication are inadequate to provide for such cash reimbursement, the **Owner** would be provided with **DCC** credits against **DCCs** payable, to the full amount that had not yet been reimbursed, with such **DCC** credits continuing to be available to the **Owner** in respect of the entire **Fairwinds Project** until the full amount calculated as set out above is recovered by the **Owner**;

(f) upon the construction and dedication by the **Owner** of any of the **Other Nanoose Water Works,** the **Owner** would be entitled, further to section 935(3)(d) of the *Local Government Act,* to cash reimbursement and DCC credits on the same basis.

In furtherance of the foregoing, **Regional District** staff have brought forward to the Regional Board in November, 2013 a proposal to amend the **Regional District's** existing Bulk Water Development Cost Charge Bylaw (1998).

(3) Ground Water Additions, including Quantity and Quality Standards

24. The **Parties** presently anticipate that the **Owner** will diligently pursue the addition of the **Wallbrook** wells first (in accordance with the Wallbrook Groundwater Well Approval Process set out in Schedule 9), but if any of those wells should prove not to meet the **Community Water System Standards**, or if all the **Wallbrook** wells have been dedicated to **Regional District** and **ERWS** water is not yet available to service new development, then the **Owner** may acquire, make up and dedicate other additional ground water wells in compliance with **Community Water System Standards** or as the **Regional District** may otherwise agree with respect to any surplus wells it owns.

E.2 Review of criteria

25. The **Parties** presently anticipate that, in order to assist the assessment of sustainability outcomes and conservation measures, the **Regional District** will measure, record and review actual water usage data by land use type, and available population per household data, to enable it to consider the potential for future reductions to water supply ratios due to conservation measures to be utilized in the **Subdivision Servicing Standards**. (*NP references: LD 6.1(c)).*

F. SANITARY SEWER

26. The **Owner** and **Regional District** staff are generally supportive of the approach set out in paragraphs 28 through 33 hereof as regards the following aspects of sanitary sewer infrastructure:

(a) sewage treatment plant upgrade, expansion and replacement;

(b) on-site sanitary sewage works; and

(c) review of criteria.

27. The approach has been arrived at in light of the **Context**, and the following additional considerations, and others:

(a) the **MoE** requires the **Regional District** to upgrade the level of treatment at the **NBPCC** to standards set out in the Municipal Wastewater Regulation. The mechanism for planning and implementing this upgrade is the **Regional District**'s Liquid Waste Management Plan ("**LWMP**"). Authority to discharge wastewater effluent to the environment is through the **LWMP**;

(b) the **Regional District** is in the process of amending its **LWMP**. Specific decisions related to future treatment at **NBPCC** are dependent upon the outcome of the current **LWMP** amendment process. The **LWMP** amendment must be approved by the **MoE**, and timing is therefore subject to Provincial priorities;

(c) the **Regional District** intends to submit a **LWMP** amendment in early 2014, which, with regard to **NBPCC**, will reflect a phased approach to the upgrading of the existing capacity to secondary treatment, and the expansion of service capacity to accommodate planned growth per the **OCP**, and any Regional Board approved expansions to the service area, as follows:

(i) "Upgrading" refers to upgrading of the current design capacity of 1250 residential units-to secondary treatment, by replacing the existing primary treatment plant with a new facility, which will be capable of accepting/integrating with future expansions. The existing plant capacity is comprised (as at the current date) of existing users (832 subdivided residential units), and pre-purchased capacity (by the **Owner** under the **1997 Development Agreement**) of 470 residential units; and

(ii) "Expansion" refers to the construction of additional secondary treatment plant module(s) to accommodate the connections beyond the Phase 1 capacity derived from, first, newly subdivided units within the existing service area, and, second, any unit additions resulting from any extension of the service area, if/as

approved by the Regional Board. Depending on the pace of development and economies of scale, Expansion may:

- occur before Upgrading (in which case such may serve to accelerate the Provincial requirement for Upgrading), occur concurrent with Upgrading, or occur after Upgrading; and
- may be completed in more than one subphase at different points in time;

(d) there are currently no provincial or federal funding sources available to assist with funding upgrades at the **NBPCC**;

(e) the **NBPCC** currently has a designed hydraulic capacity of approximately 1,250 residential units and provides advanced primary treatment that does not meet current Municipal Wastewater Regulation Standards. The **MoE** has the authority, through the **LWMP** process, to limit the number of units that may lawfully tie into the existing facility; and

(f) the **Owner** is obligated, as a precondition to subdivision approval, to secure a mechanism for dealing with sanitary waste, and hence, given the limits on the present **NBPCC**, the maximum development capacity of the **Owner's Land** is approximately 470 residential units under the **1997 Development Agreement**.

F.1 Sewage Treatment Plant Upgrade and Expansion
NP references: LD 4.3.4(a), SC 4.3.4(a)

(1) Upgrade of Existing NBPCC

28. The **Parties** presently anticipate that the **Regional District** will pursue an upgrade of the existing **NBPCC** facility to secondary treatment standards, as identified through the **LWMP** amendment process.

(2) Expansion of NBPCC

29. The **Parties** presently anticipate that the **Owner** will:

(a) first utilize the remaining capacity of the **NBPCC**, to the extent it is available; and

(b) if, by the time the **Owner** proposes to submit a subdivision application for which capacity at the **NBPCC** is no longer or not yet available, the **Regional District** agrees that the **Owner** may proceed on the following basis, subject to the requirements of the **MoE**:

(i) treatment of the sewage associated with the subdivision application by way of an appropriate engineering solution funded by the **Owner** to expand capacity at the **NBPCC** site;

(ii) treated effluent to be disposed to the **Regional District** outfall (ie – blended with existing treated effluent if needed); and

(iii) a DCC reimbursement regime similar further to section 935(3)(d) of the *Local Government Act*, and in accordance with the Provincial DCC Best Practices Guide.

30. The **Parties** presently anticipate that engineering, construction, and operation of **Owner** funded expansion(s) will be carried out by the **Regional District.** The **Owner** and **Regional District** will use their best efforts to secure **MoE** approval for Expansion referred to in paragraph 30, if such an approval is needed. The **Owner** may request an independent review of such engineering and the **Regional District** will consider same.

(3) 1997 Development Agreement

31. The **Parties** presently anticipate acknowledging the **1997 Development Agreement** by way of a new or amended agreement related to the **NBPCC**, and agree to apply it as follows:

(a) identity of **Owner** as 3536696 Canada Inc. and bcIMC Realty Corporation;

(b) service area lands to include **Lakes District** and **Schooner Cove** and other lands within the Fairwinds **RVC** area;

(c) statistics for completed development to date as per **Density & Sewer Service Records**, noting that the current total sewage connections within the **RVC** is 832 residential units and commercial equivalents, including 52 residential units provided by **Regional District** to third parties (the Regional District-Utilized Capacity), which the **Regional District** confirms would be reflected on a go-forward basis by providing the **Owner** with a total of 470 residential units from the current **NBPCC,** insofar as the **Regional District** can lawfully provide same;

(d) the **Schooner Cove** Hotel & Schooner House Condominiums are now serviced by **Regional District** community sewer, and the **Schooner Cove** treatment plant and outfall is no longer operational;

(e) the "Schedule B Lands" are no longer contemplated; and

(f) the "Schedule F" criteria for deciding when to commence **NBPCC** expansion based on actual sewage flows will be updated such that the Anticipated Maximum Annual Rate of Housing Occupancy equals 100 single family units (or equivalent sewage flows.

F.2 On Site Sanitary Sewer Works

32. Notwithstanding the **Community Sanitary Sewer Standards**, the **Regional District** agrees that the **Owner** may construct individual home lift pumps in the locations shown on the **Infrastructure Phasing Plan**.

F.3 Review of criteria
NP references: LD 6.1(c)

33. The **Regional District** anticipates measuring, recording and reviewing actual sewage flow data and available population per household data, so that it may consider reductions to the sanitary capacity calculations for each housing/commercial unit type due to conservation measures.

G. PARKS

34. The **Owner** and **Regional District** staff are generally supportive of the approach set out in paragraphs 35 and 36 hereof as regards the following aspects of parks:

(a) wildlife underpasses; and

(b) section 46 of the **PDA**.

35. The **Owner** will design and construct wildlife road underpasses as required to comply with applicable Provincial and Federal regulations, and per recommendations of an Registered Professional Biologist. *NP reference LD 4.1.1(f)*

36. If park land is diminished per section 46 of the **PDA**, the **Parties** will seek to mitigate environmental impact in a manner that is mutually acceptable.

H. DOCKS

37. In addition to the boat access dock contemplated in the **PDA,** the **Owner** may wish to construct two additional docks, with wood or plastic decking, in the locations shown on the Lakes District Park Improvements Phasing Plan which is Schedule "E" to the **PDA**. If the **Owner** wishes to proceed with one or both such docks, the **Regional District** will consider granting the necessary license(s) on similar terms to those contemplated in the **PDA**.

I. PROJECT SIGNAGE

38. If requested by the **Owner,** the **Regional District** will consider allowing development permit variances to Regional District Bylaw 993 to allow project signage, having a height of approximately six metres and width of approximately four metres, to be located within setback areas.

J. DESIGNATED CONTACTS

39. Each **Party** designates the following contact person in connection with further steps to be taken in connection with the implementation of this Memorandum of Understanding, provided that either **Party** may update its contact by providing notice in writing to the other **Party's** contact person:

(a) The **Owner**

Bentall Kennedy (Canada) LP
Attention: Russell Tibbles,
Vice President, Development & Operations, Fairwinds
Telephone: 250-339-1777
e-Mail: rtibbles@bentallkennedy.com

(b) The **Regional District**

Regional District of Nanaimo
Attention: Geoff Garbutt,
General Manager, Strategic & Community Development
Telephone: 250-390-4111 Ext. 6500
e-Mail: ggarbutt@rdn.bc.ca

BCIMC REALTY CORPORATION

Per: _____
(Authorized Signatory)

Per: _____
(Authorized Signatory)

Dated: Jul 17, 2014

3536696 CANADA INC.

Per: _____
(Authorized Signatory)

Per: _____
(Authorized Signatory)

Dated: Jul 17, 2014

REGIONAL DISTRICT OF NANAIMO

Per: _____
(Authorized Signatory) Joe Stanhope, Chairperson

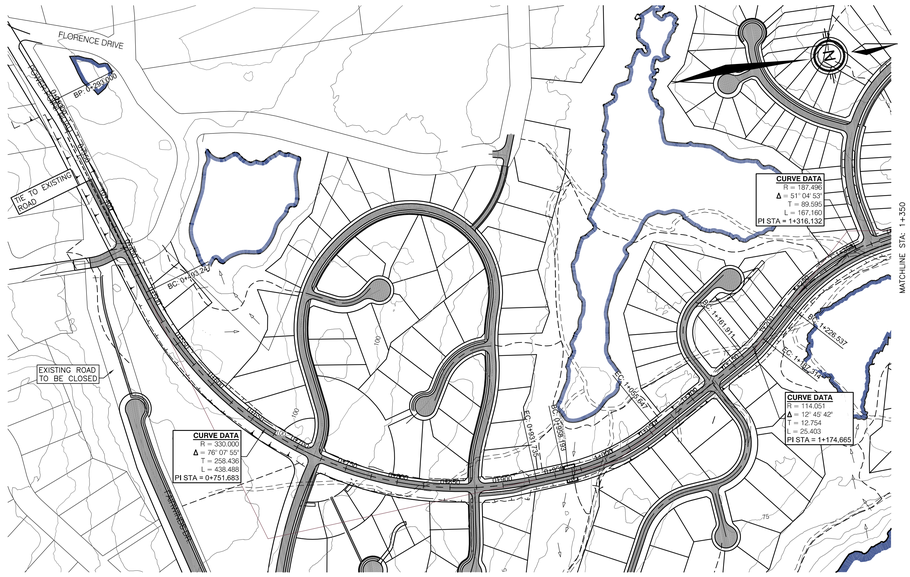
Per: _____
(Authorized Signatory) Corporate Officer

Dated: July 23, 2014

Schedule 1: Integrated Stormwater Management Plan (ISMP) - Lakes District and Schooner Cove

- *Refer to Schedule "DD" of the PDA*

Schedule 2: Schooner Cove Parkway Design Package



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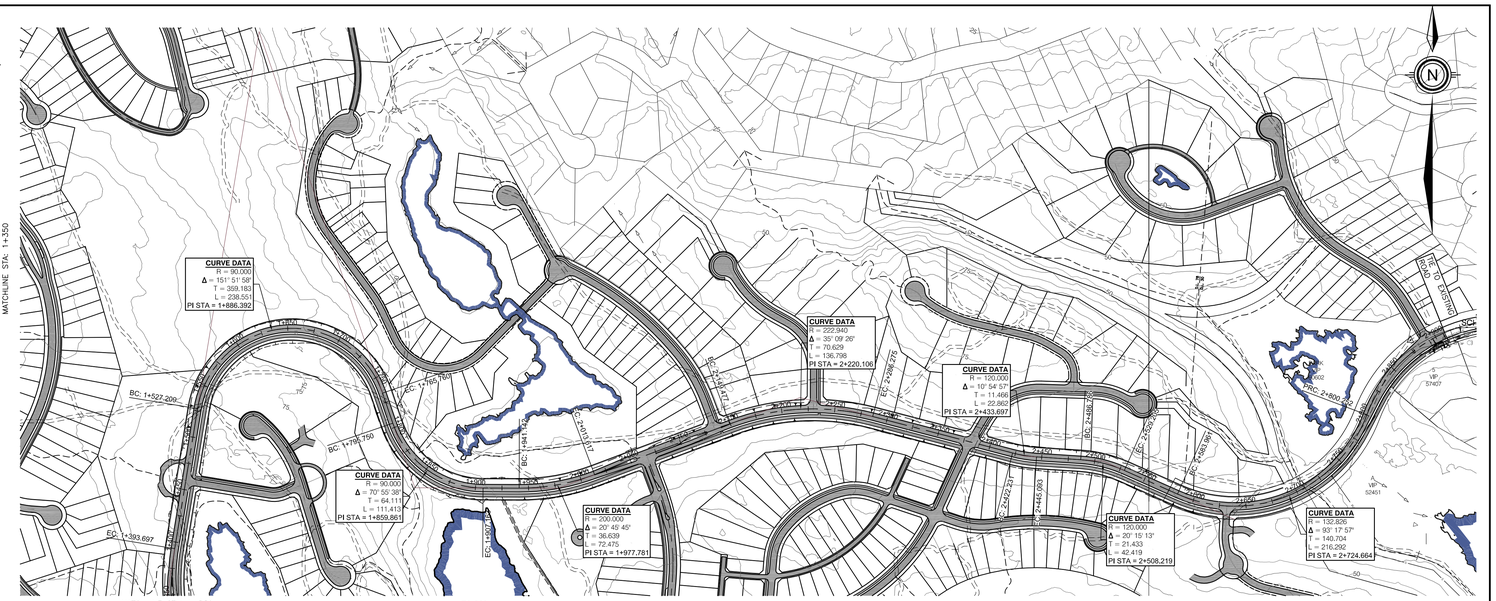

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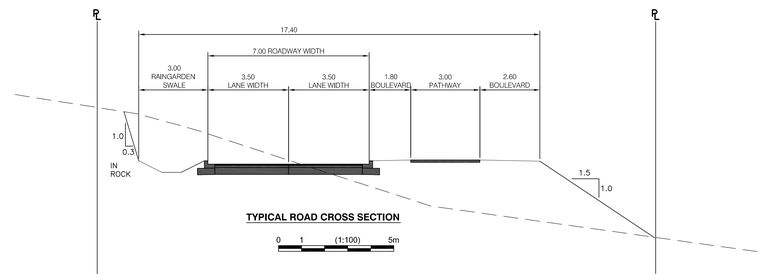

TYPICAL ROAD CROSS SECTION

0 1 (1:100) 5m

PROFILE

0 20 (1:2,500) 100m

ISSUED INFORMATION	Issued for	Issue	Date	Issued By
	Reference			
	Approvals			
	Tender			
	Permits			
	Construction			
	Record Drawings			

REVISION INFORMATION	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision
	0					

Rev. No.	Date	Designed	Drawn	Checked	Description of Revision

Seal

KERR WOOD LEIDAL associates limited
CONSULTING ENGINEERS

FAIRWINDS DEVELOPMENT
SCHOONER COVE DRIVE
PRELIMINARY DESIGN
PLAN / PROFILE

KWL Project No. 2964.001 Scale 1:2500

Sheet 1 of 1 Rev. No. 0

FIG 3.1 Drawing Number

Client: BENTALL KENNEDY, FAIRWINDS

SIZE A1 FULL SIZE: THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE

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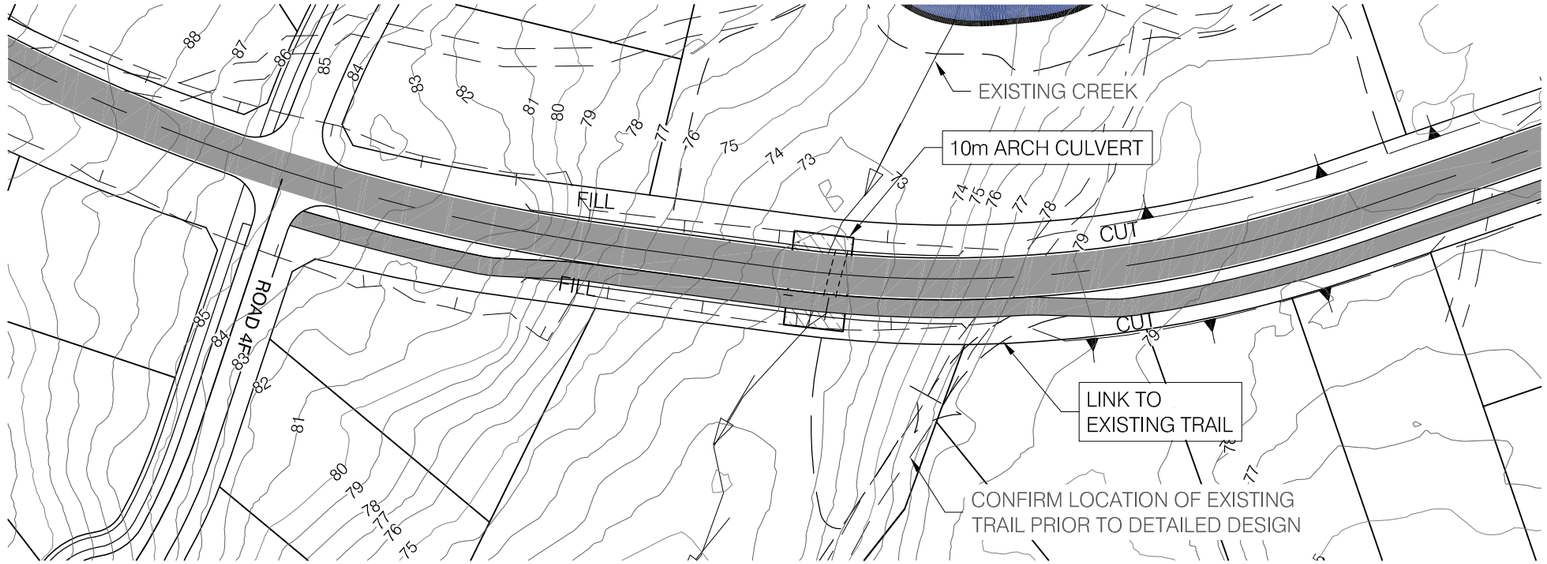

PLAN

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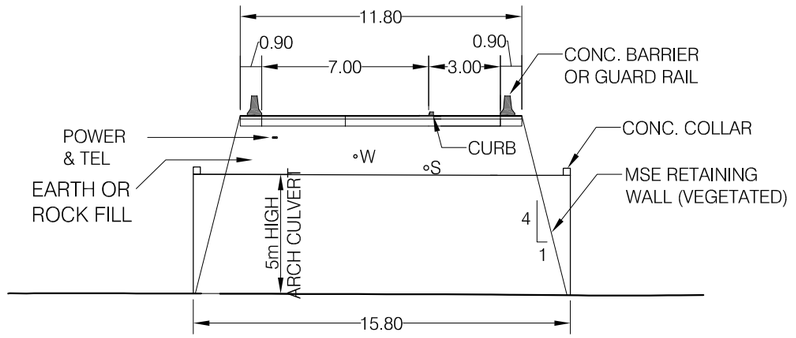

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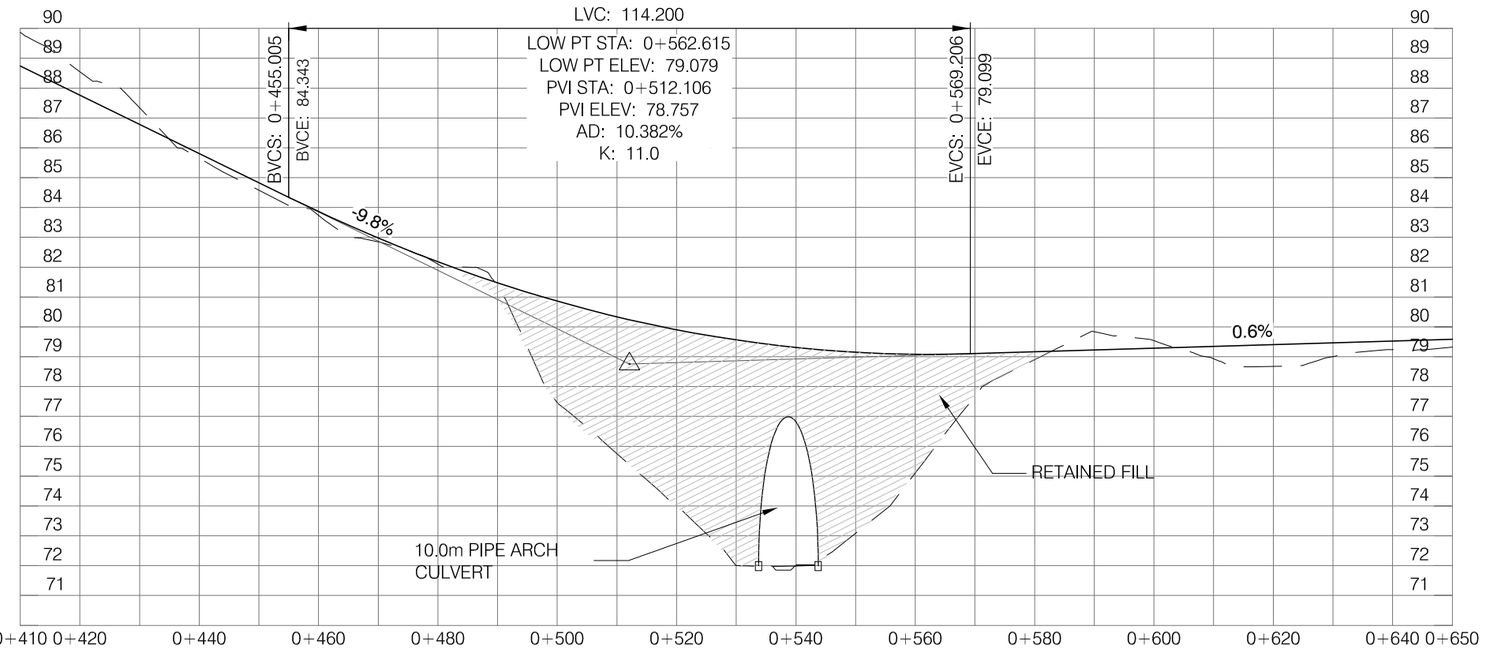

PROFILE

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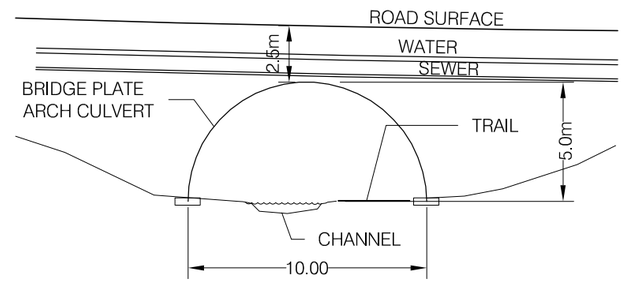
0 1 (V 1:100) 5m



TYPICAL CULVERT SECTION

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KERR WOOD LEIDAL
consulting engineers

JUNE 22, 2012

THE LAKES DISTRICT
BRIDGE CULVERT OPTION
FIGURE 2.4
Client: FAIRWINDS

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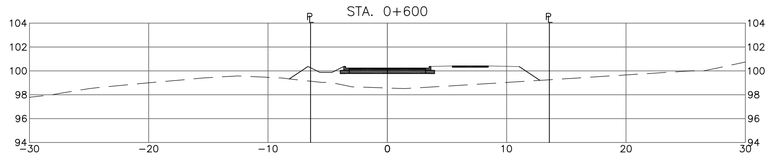

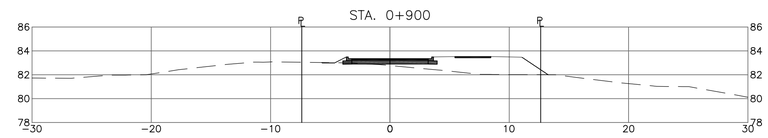

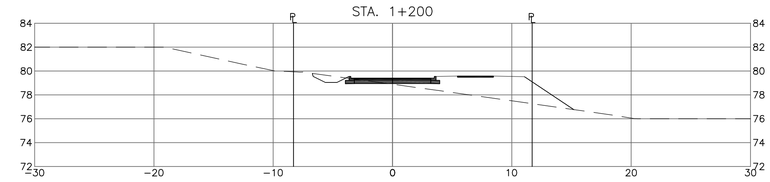

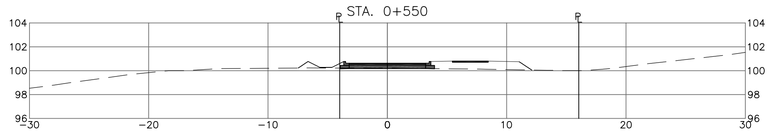

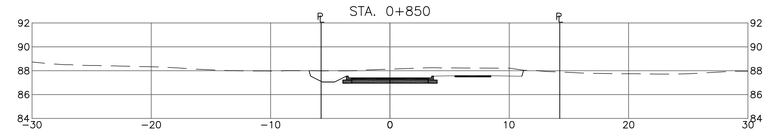

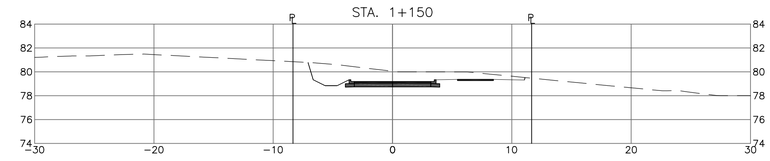

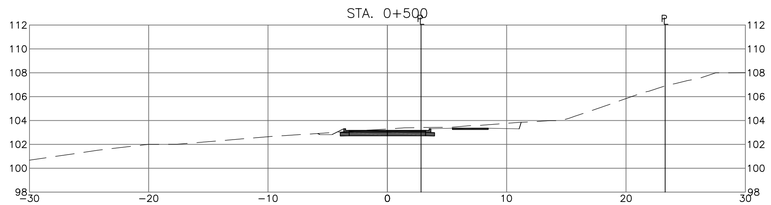

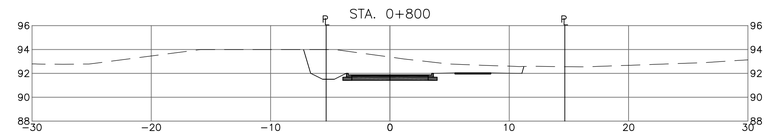

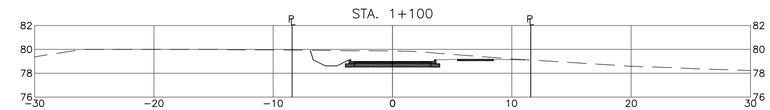

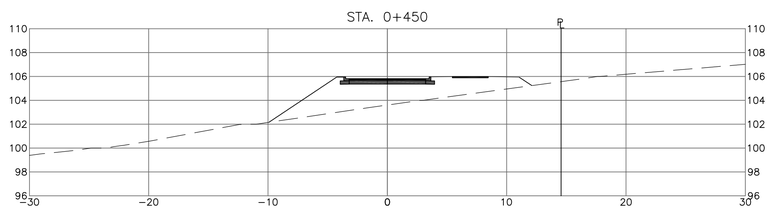

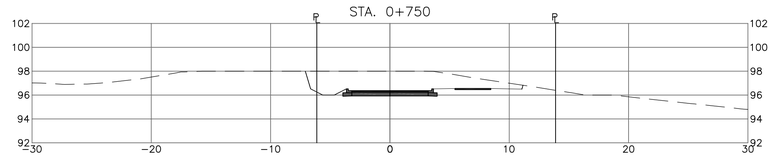

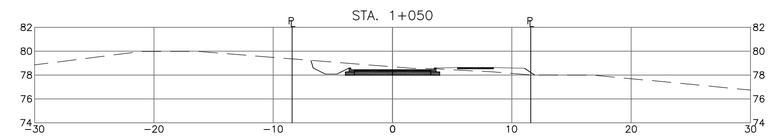

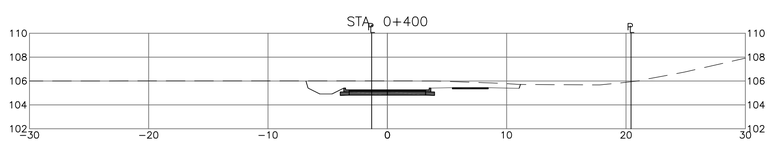

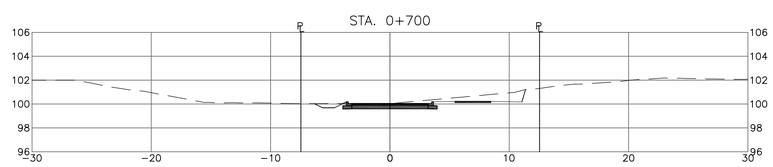

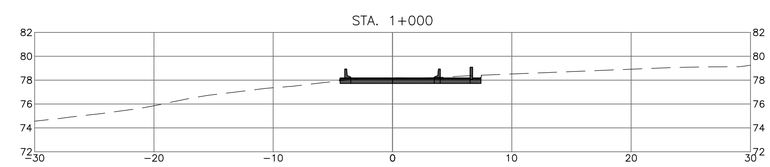

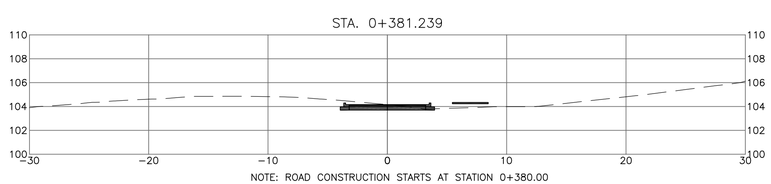

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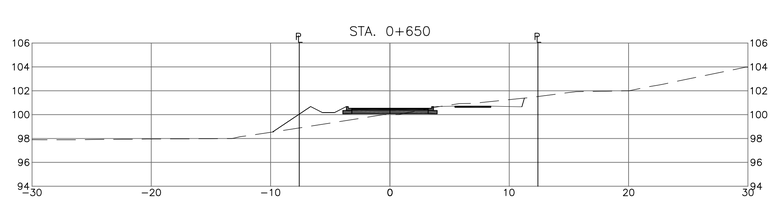

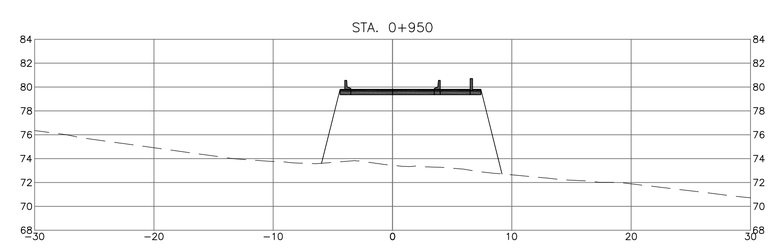

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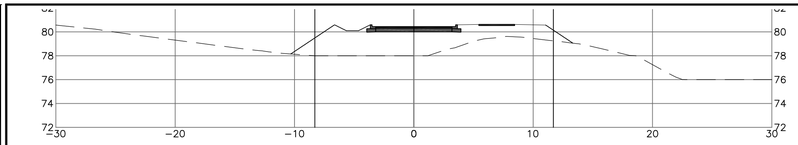
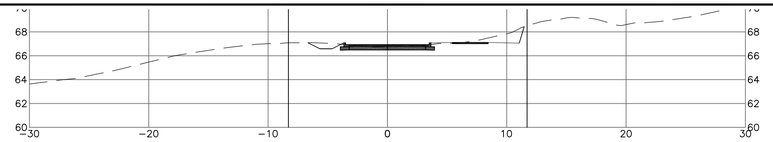
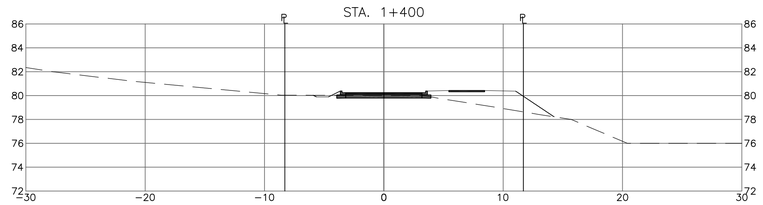
consulting engineers

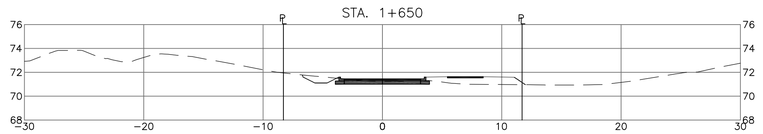
SCHOONER DRIVE COVE CROSS SECTIONS
FIGURE XS1

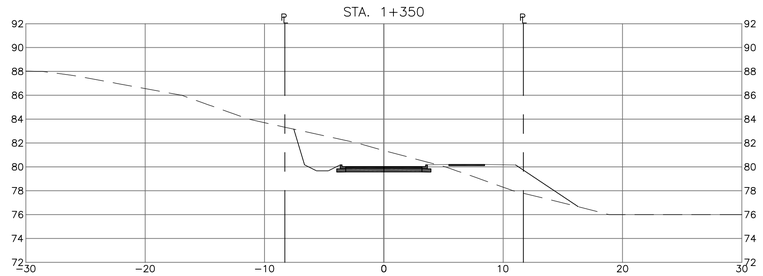
Client: BENTALL KENNEDY, FAIRWINDS

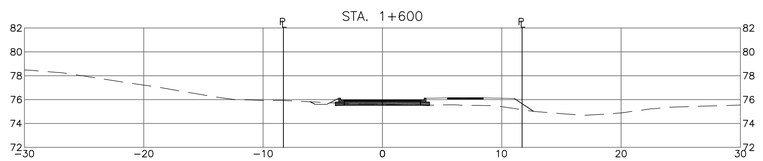


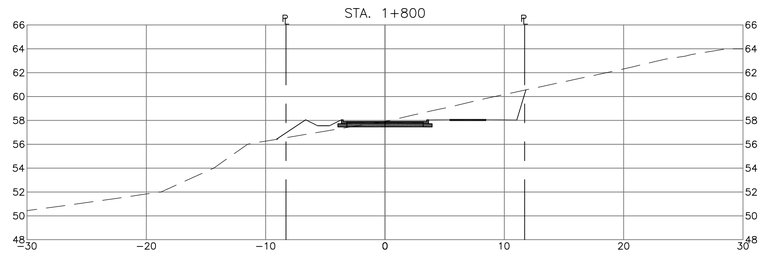


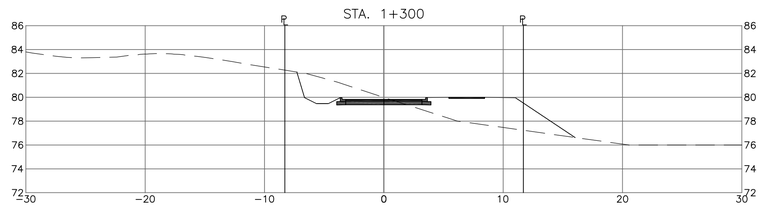


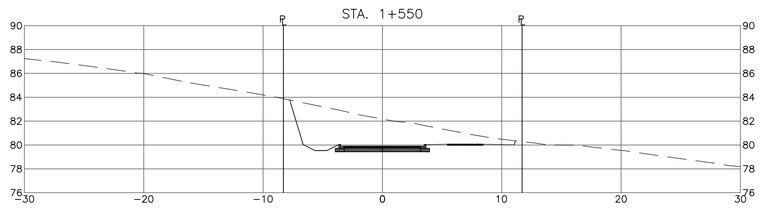


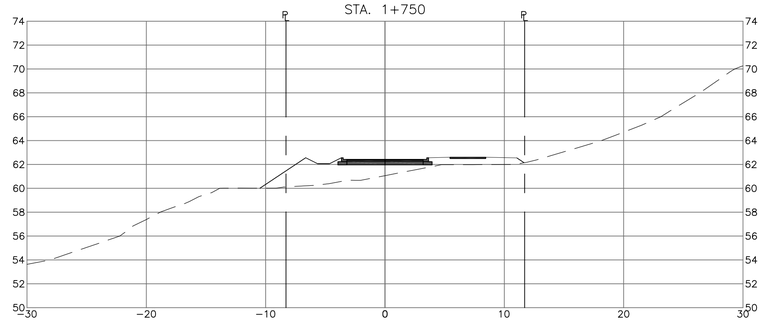


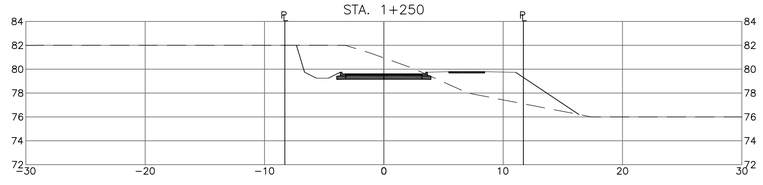


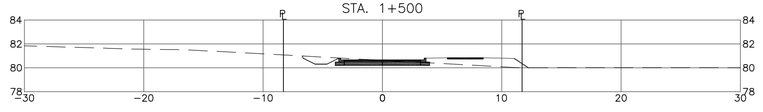












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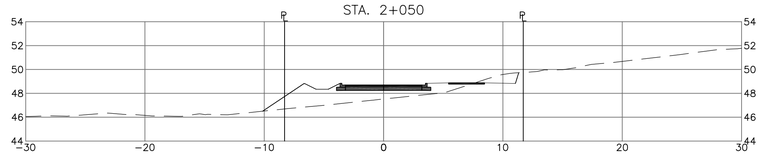
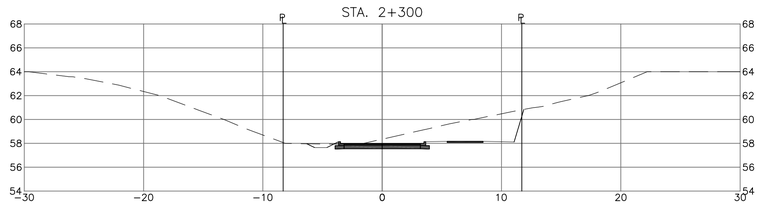
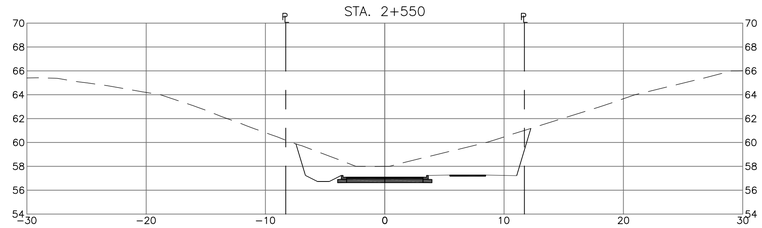
consulting engineers

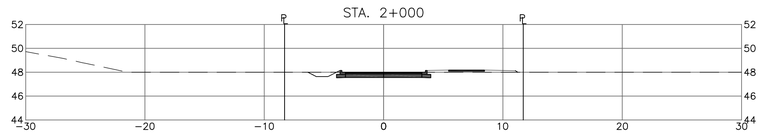
SCHOONER DRIVE COVE CROSS SECTIONS
FIGURE XS2

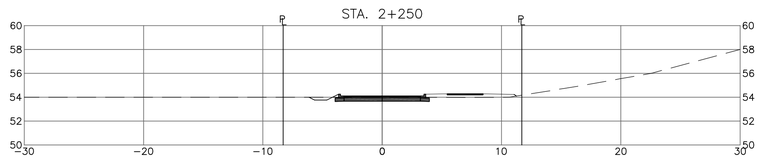
Client: FAIRWINDS

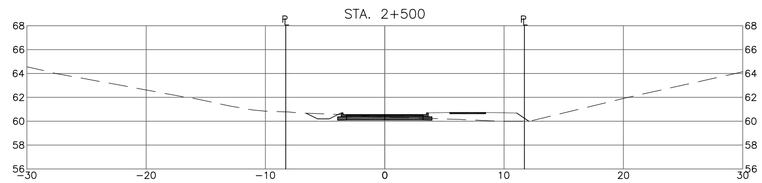


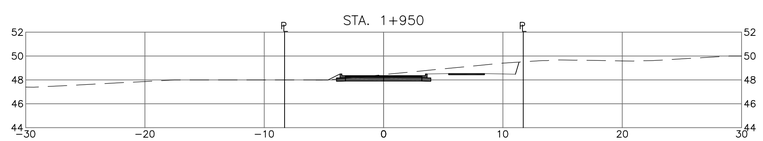


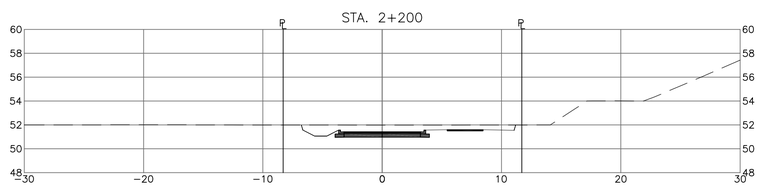


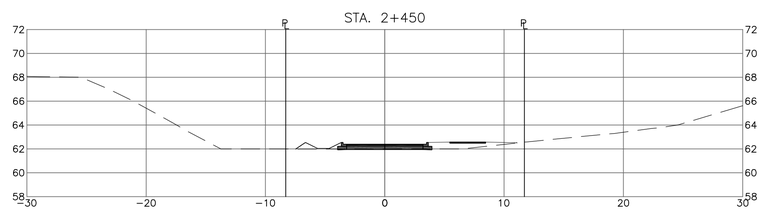


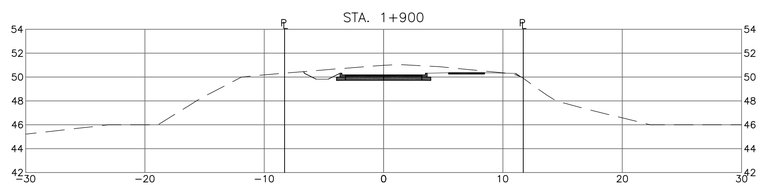


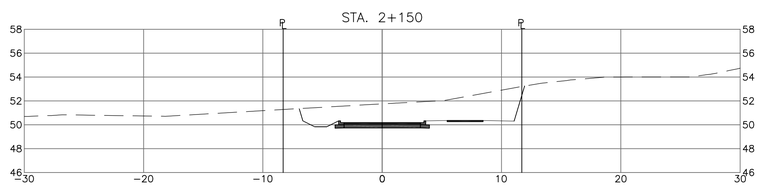


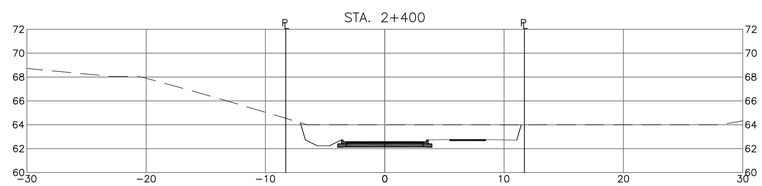


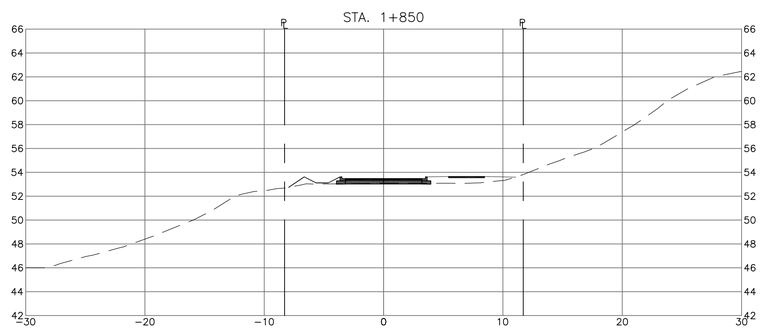


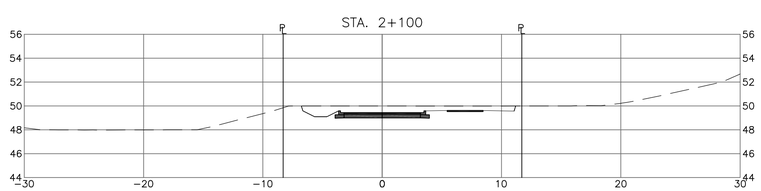


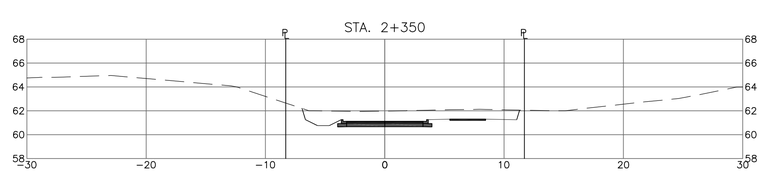












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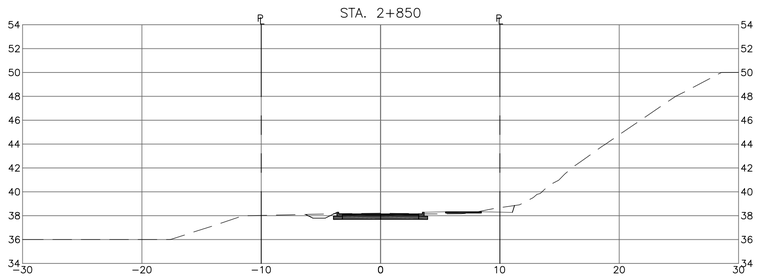
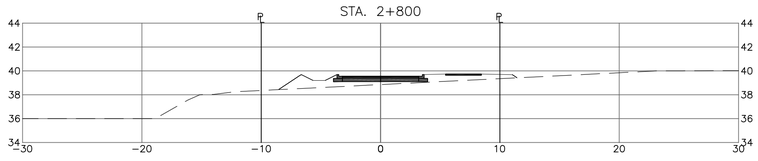
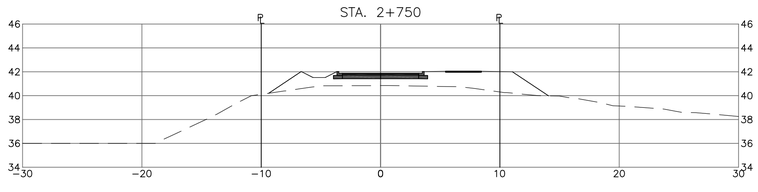
consulting engineers

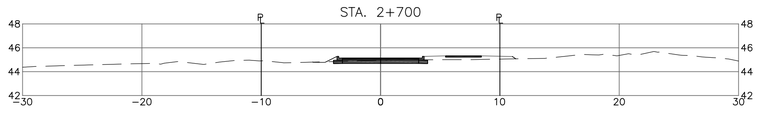
SCHOONER DRIVE COVE CROSS SECTIONS
FIGURE XS3

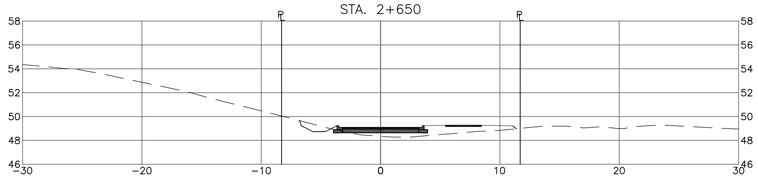
Client: FAIRWINDS

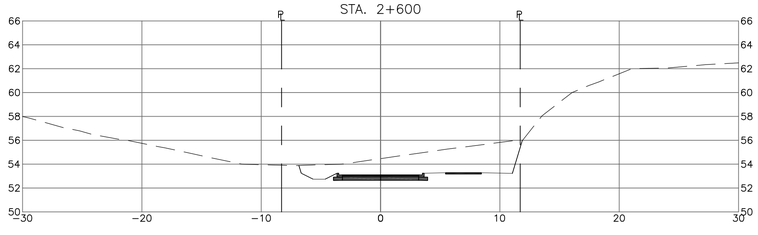


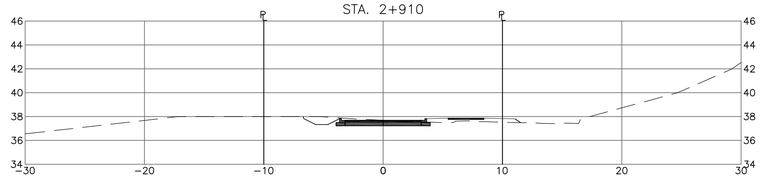


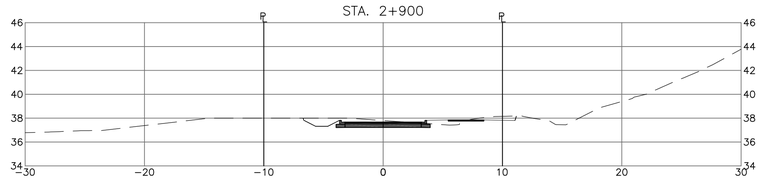


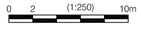












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consulting engineers

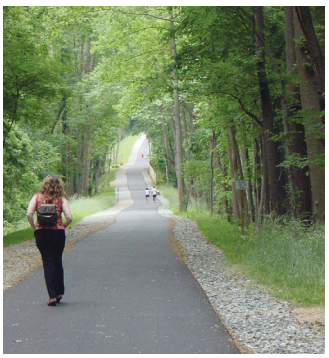
SCHOONER DRIVE COVE CROSS SECTIONS
FIGURE XS4

Client: FAIRWINDS

Schedule 3: Project Specific Street Standards

Lakes District and Schooner Cove

Project Specific Street Standards


August | 2012

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The Lakes District Neighbourhood Plan Area within OCP-designated Fairwinds Urban Containment Boundary
Fairwinds Urban Containment Boundary
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Provincial Lands
Bluefin Bay
Dolphin Beach
Strait of Georgia
Nankivell Point
Schooner Cove
WATER LOT 105
Dolphin Lake
Dolphin Bay
Enos Lake
Fairwinds Golf Club
Brickyard Bay
SCALE 1:12500
0 50 150 250

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1.0 Introduction to Fairwinds

As the undeveloped lands within the Fairwinds and Schooner Cove Urban Containment Boundaries (UCB), the Lakes District and Schooner Cove have undergone comprehensive re-examination and re-design in order to update the 25-year old master plan created in 1983. All aspects of community planning, from land use and transportation, to civic infrastructure and servicing, have been evaluated, and opportunities to apply Best Management Practices identified.

During the Regional District of Nanaimo (RDN) public process leading to adoption of Neighbourhood Plans for the Lakes District and Schooner Cove an opportunity to adopt Project Specific Street Standards based on hillside topography and urban residential uses was identified. In collaboration with the Ministry of Transportation and Infrastructure (MoTI), the proposed Project Specific Street Standards are designed to realize significant and tangible improvements in the safety, efficiency and efficacy of new road networks within the urban hillside neighbourhoods.

The following chapters contain:

- an evaluation of current street standards which guide road construction within the Fairwinds and Schooner Cove UCB;
- a rationale for revisiting current street design standards for hillside environments, including Fairwinds;
- a proposed set of Project Specific Street Standards, including a street hierarchy and cross sections, applicable to new streets within the neighbourhoods; and,
- design considerations related to the Ministry of Transportation and Infrastructure's (MoTI) Section 1400.

Beyond physical design criteria, Project Specific Street Standards target operational efficiencies with particular attention to capital investment (i.e. new roads) and long-term operating costs, including management and contract maintenance. In addition, the development of Project Specific Street Standards represents an innovative and measurable means to address Provincial policy objectives with respect to greenhouse gas emissions reduction and climate change.

Hillside road design should respond to challenging topography by reducing road platforms and associated cut and fills.

Trees and sidewalks comprise essential components of attractive and pedestrian oriented neighbourhoods.

landscaping and green stormwater management can be incorporated into the Standards.

2.0 Re-evaluating Current Practice and Future Growth at Fairwinds

Streetscapes within Fairwinds do not reflect the vision and desired form of the neighbourhood.

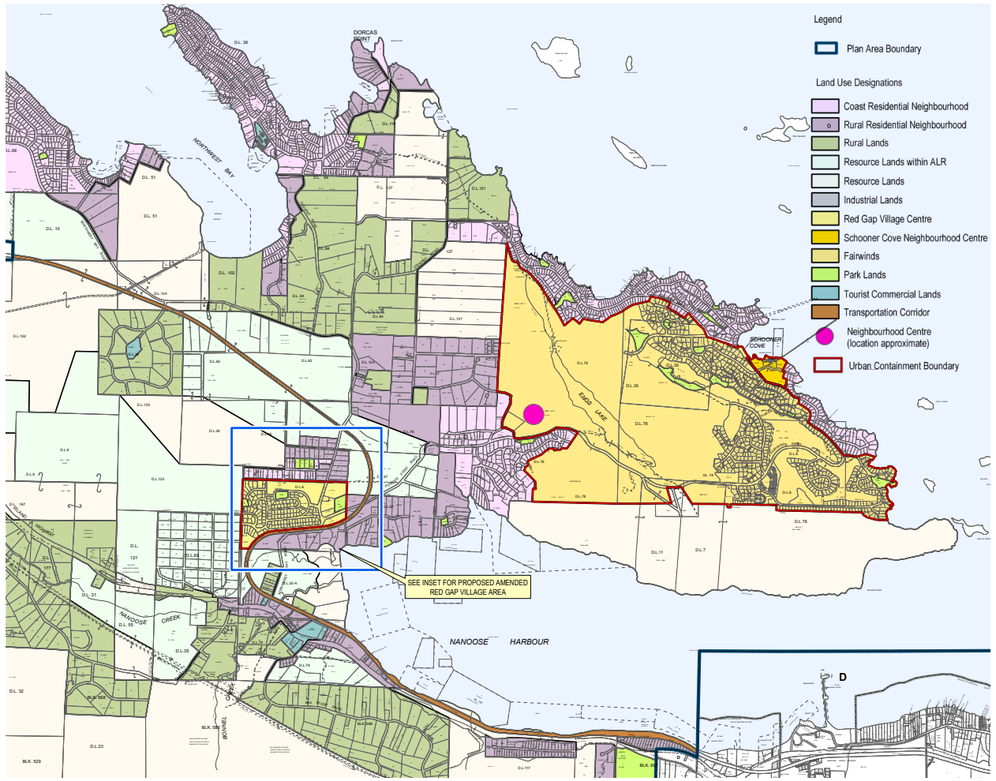
Reduced street widths, mature landscaping and separated pedestrian facilities contribute to an attractive neighbourhood.

The identification of the Lakes District and Schooner Cove as designated growth areas within the Regional District of Nanaimo's (RDN) *Regional Growth Strategy*, and the Nanoose Bay *Official Community Plan* (OCP), provides an opportunity for thoughtful land use planning which accommodates new growth while maintaining the distinct qualities that continue to define Fairwinds as a desirable place to live. The Project Specific Street Standards represent a critical component in planning for future growth and development within Fairwinds and Schooner Cove Urban Containment Boundaries.

Through the recent adoption of Neighbourhood Plans for the Lakes District and Schooner Cove, the RDN has developed a technically rigorous, socially responsible and ecologically sustaining plans for the designated growth areas. The proposed Project Specific Street Standards, a deliberately designed street hierarchy tailored to the hillside topography and urban, compact forms of development, reflect the implementation of the Neighbourhood Plans. Project Specific Street Standards for the neighbourhoods contribute to:

- **Improved Driver and Pedestrian Safety** through reduction of design speed and greater "fit" of street alignments to existing landform;
- **Reductions to Construction and Maintenance Costs** through minimizing road platform widths and associated cut & fill;
- **Minimized Visual and Environmental Impact** on hillsides and landscapes;
- **Improved Water Quality** through the reduction of impervious surfaces and minimizing stormwater discharge; and,
- **Improved Neighbourhood Experience** through the development of a human scaled and pedestrian friendly streetscape, including separation of pedestrian facilities.

Excerpt from Nanoose Bay Official Community Plan
Land Use Designations & Urban Containment Boundary



Both Fairwinds and Schooner Cove are designated growth areas within the RDN's Regional Growth Strategy, and the Nanoose Bay OCP (shown above). In concentrating future growth within these designated areas, the RDN aims to support the development of more complete and livable communities. Street design is a key component of community design; through these Standards, street networks and cross sections promote a compact and pedestrian oriented urban neighbourhood.

Single family homes are integrated into the hillside topography.

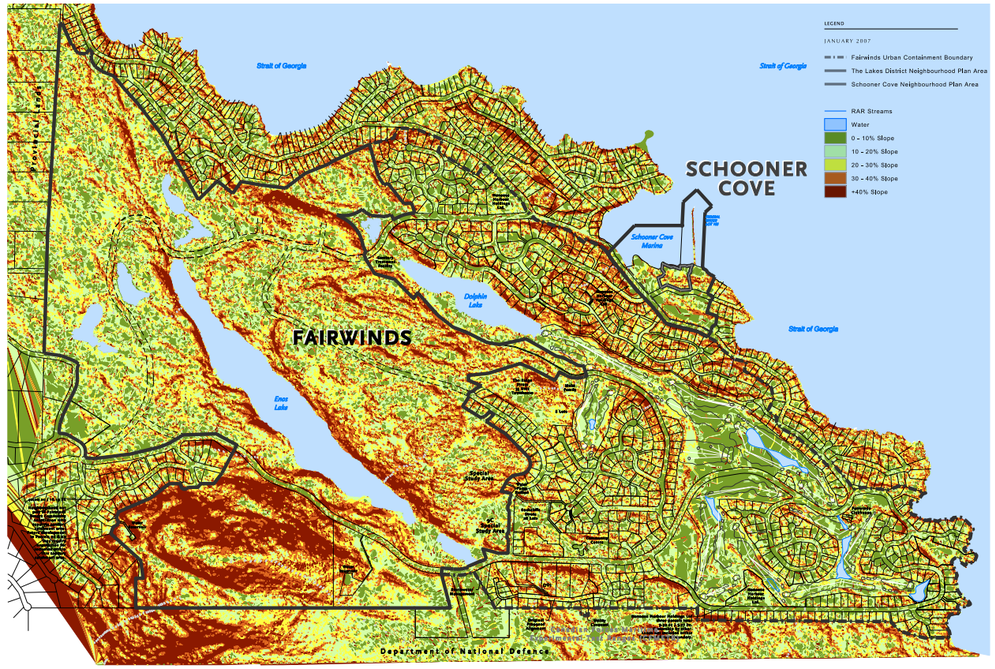
With sensitive design, townhomes can be integrated into the natural landscape.

As planners, designers and engineers, we are often tasked with the simple challenge of “making things work.” In the context of community development, the due diligence required to minimize risk and optimize success begins with two fundamental inventories: a careful catalogue of biophysical constraints, including geotechnical, environmental and landform analysis; and a comprehensive physical program for the future neighbourhood. The greatest challenge, however, lies in finding ways to make the two fit.

The Lakes District and Schooner Cove Neighbourhood Plan areas are characterized by complex terrain and potentially fragmented development nodes. While significant portions of the lands are developable, the hillside environment presents significant physical constraints to access, street layouts and overall neighbourhood design.

In addition to the complexity of the terrain, the development program (as directed by the OCP Bylaw #1400, Schedules B and C Neighbourhood Plans) highlights a greater need to consider the effect of street design on the development of more compact, pedestrian-friendly and sustainable communities. Through the adoption of Project Specific Street Standards for the Lakes District and Schooner Cove, site adaptive strategies targeting other sustainability goals, such as stormwater management, alternative transportation and energy use, have also be addressed.

At the neighbourhood scale, streets provide the single-most critical linkage, and defining experience,between the surrounding landscape and the built program. Within the Lakes District and Schooner Cove, Project Specific Street Standards will ensure that the development program fits the varied topography while addressing the MoTI’s mandate to facilitate, “safe, efficient, and effective movement of people and goods.”



While a large portion of Fairwinds is constrained by fragmented development areas and steep slopes in excess of 30% , the gentler terrain can accommodate significant development. To facilitate development within this challenging context, Project Specific Street Standards guide street design in a manner that is both sensitive to the natural landscape and compatible with the existing neighbourhood character.

4.0 Section 1400 as Applied to Fairwinds Today

Fairwinds collector roads are overbuilt for the density of the community.

Wide local streets in Fairwinds are not scaled for pedestrians or cyclists.

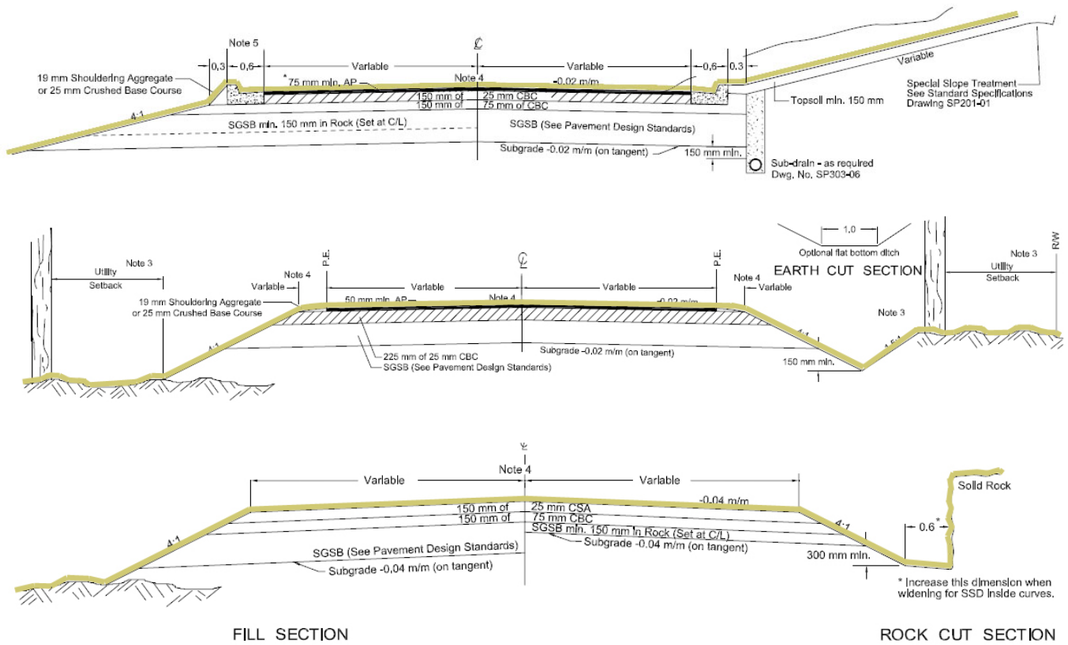
The existing neighbourhood at Fairwinds is generally composed of low density single family (RS-1) residential land uses organized along Fairwinds Drive and Dolphin Drive. Roughly 45% of the lands within the Fairwinds Urban Containment Boundary (UCB) are developed to take advantage of views to the Strait of Georgia and the Fairwinds Golf Course.

Efforts to minimize development impacts have focused on constructing low-density housing in the areas most easily accessed, but have overlooked street design as a means to support low impact neighbourhood design. Intended for rural contexts, the application of Section 1400 Standards is inconsistent with the urban context of the Fairwinds and Schooner Cove Urban Containment Boundary designation.

Within Fairwinds, Section 1400 Standards have resulted in streets which are generally overbuilt for the ultimate density of the residential neighbourhoods. Pedestrians, cyclists and other alternative modes of transportation have been subsequently discouraged due to high traffic speeds and a lack of safe, designated travel routes.

Additionally, specific design standards contained within Section 1400, including turn radii, road widths and maximum grades, limit the ability of street design to respond to the hillside topography which characterizes the majority of the site. Finally, further review of MoTI Standards indicate opportunities to achieve Provincial Greenhouse Gas reduction goals and improve local environmental conditions.

The following sections illustrate and provide an analysis of MoTI Section 1400 street standards for urban collector and local roads, as applied within the Fairwinds UCB.



Collector

Rural (Fig.1420.F)		Urban (Fig.1420.H)		
Top Width	Paved Width	Top Width	Paved Width	Parking
10.0	8.0	10.0	8.2	one side
1.0 gravel shoulder		0.6 curb plus 0.3 gravel shoulder		

Local

Rural (Fig.1420.G)		Urban (Fig.1420.H and I)		
Top Width	Paved Width	Top Width	Paved Width	Parking
8.0	7.0	11.8	10.0	both sides
		10.0	8.2	one side
0.5 gravel shoulder		0.6 curb plus 0.3 gravel shoulder		

Technical cross-sections translate Section 1400 standards to current as-built conditions within the Fairwinds UCB.

Fairwinds collector roads, shown in the two photos above, swell to 12.7m of paved width and are overscaled for the public realm.

Local streets in Fairwinds, shown in the two photos above, result in 10.3 of uninterrupted impervious surface.

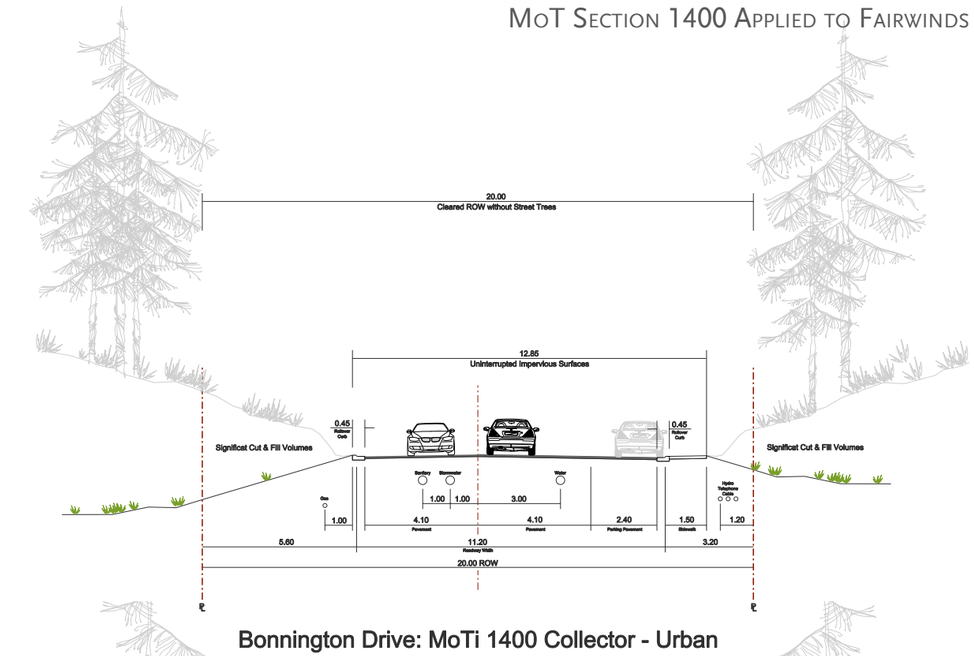
4.1 Fairwinds Road Network

Application of Section 1400 Standards to Fairwinds' collector streets, which provide `*for traffic movement between arterials and local streets with some direct access to adjacent property*` (MoTI) assumes a 60 km/h design speed and results in an 8.8m (~28'10.5") wide paved road on Fairwinds and Dolphin Drives. Where designated parking pullouts occur, asphalt surfacing swells to 11.2m (~36' 9"). When sidewalks are located adjacent to the carriageway, the extent of uninterrupted impervious surface extends an additional 1.5m to a total width of 12.7m (41'8").

The application of Section 1400 standards to Fairwinds' Local streets, which are `*primarily for access to residences, businesses, or other abutting property*` assumes a 30 km/h design speed, yet utilizes the same typical cross sectional design as the collector streets, resulting in an 8.8m (~28'10.5") wide roadway. With the addition of sidewalks adjacent to the curb and carriageway, the extent of uninterrupted impervious surface extends an additional 1.5m to a total width of 10.3m(33'9").

The resulting neighbourhood experience within Fairwinds – illustrated at right – is that of streets over-scaled to the community, its pedestrian-oriented program and local traffic volumes. Furthermore, the street design criteria, as governed by high design speeds, result in horizontal and vertical alignments that are at odds with the varied topography and conducive to speeding.

Equally important are the implications to capital investment, including road building, as well as long term management and maintenance of over-sized infrastructure. When combined with decreased pedestrian safety, increased stormwater runoff and potential impacts to freshwater quality, there is a clear need to consider Project Specific Street Standards within the Fairwinds and Schooner Cove Urban Containment Boundaries.



Bonnington Drive: MoTi 1400 Collector - Urban

Beldon Place: MoTi 1400 Local - Urban

5.0 Project Specific Standards: Responding to an Identified Need

Well designed hillside streets respond to the natural landscape, highlight views and contribute to a pedestrian friendly public realm.

Reduced widths and turn radii allow responsiveness to topography.

Through the development of its Section 1500 Standards, the Ministry of Transportation and Infrastructure has demonstrated leadership and innovation in the development of alternative standards for use in specific situations where existing standards are not suited to the project or to its landscape.

Similarly, the Project Specific Street Standards respond to the need to address implications of steep slope environments, dedicated pedestrian uses, on-street parking and uninterrupted impervious surfaces.

Key similarities between the MoT's Section 1500 and the proposed Project Specific Street Standards include:

- Reduced carriageway width;
- Provision for on-street parking;
- Dedicated pedestrian corridor; and,
- Reduced right-of-way width.

The benefits of Project Specific Street Standards are shared by the Fairwinds community, the Ministry of Transportation and the Regional District of Nanaimo, including: lower design speeds; improved safety; reduced right-of-ways and paved surfaces; improved environmental function and reduced GHG emissions; decreased capital and maintenance costs; and a greener, cleaner and more sustainable community.

6.0 Proposed Project Specific Street Standards

The Project Specific Street Standards represent site tailored specifications for a Parkway Collector and Minor Collector streets, as well as neighbourhood Local Streets within the Lakes District and Schooner Cove neighbourhoods. Design speeds are reduced from 60km/h to 50km/h for the Schooner Cove Parkway. For the Minor Collector and Local streets, MoTI's design speed of 30km/h remains applicable.

With the reduction in design speed for collector streets, the Project Specific Street Standards allow for a maximum grade of 10% for parkway and collector roads (12% permitted where necessary due to topographic constraints), and maximum of 12% for local streets. Additional modifications include:

- Right-of-way;
- Carriageway width;
- Parking;
- Shoulders & curbs;
- Sidewalks;
- Stormwater management;
- Utility corridors; and,
- Street lighting.

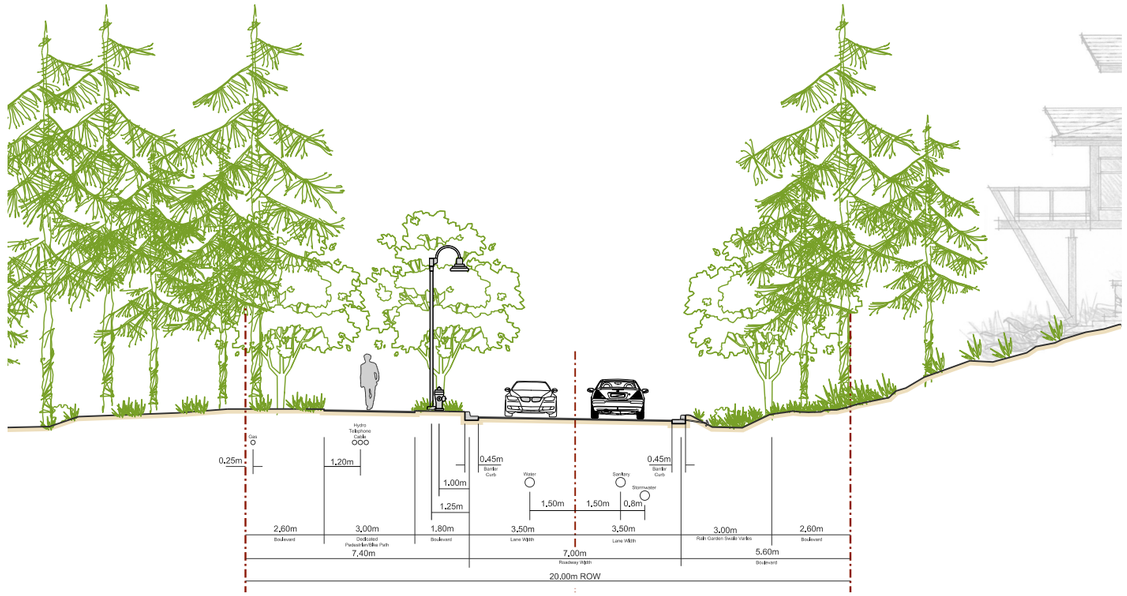
The proposed Project Specific Street Standards address program elements outside the vehicular carriageway based on adjacent land uses and program, including "above the curb" uses, such as pedestrian circulation, stormwater management infrastructure, and on-street parking. The following pages highlight specifications within the Project Specific Standards as a means of comparison with MoTI's Section 1400 standards.

The proposed Project Specific Street Standards allow for stormater management systems, such as raingardens, within the Right-of-Way.

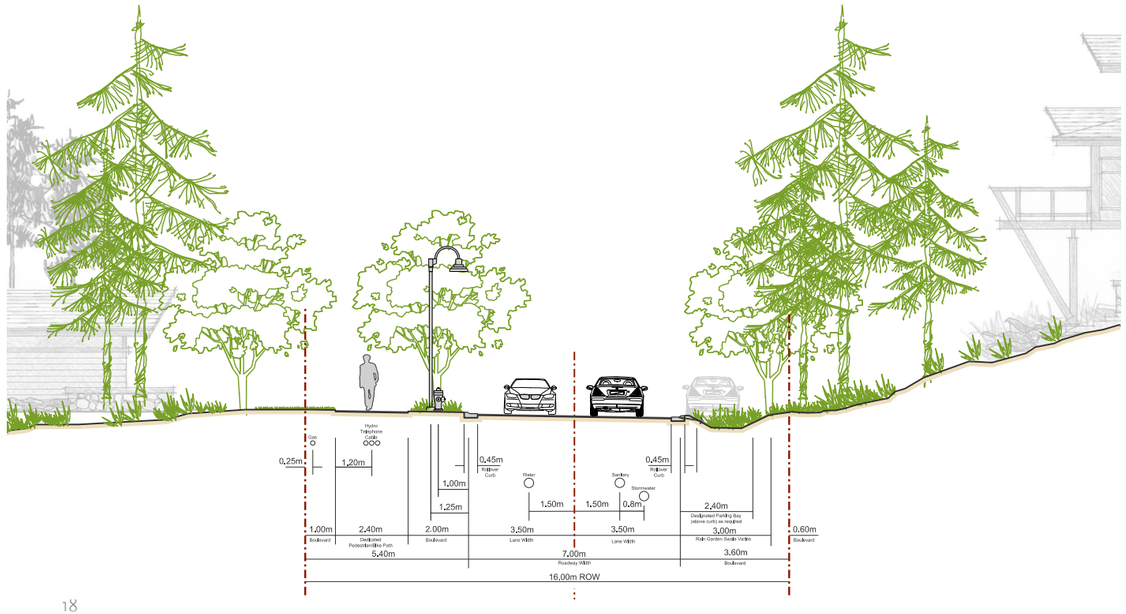
Within the proposed Standards, elements such as street lighting and utilities are incorporated into the Right-of-Way.

Curbs and curb cuts are addressed within the Standards in order to delineate road edge, ensure efficient access and direct stormwater run-off.

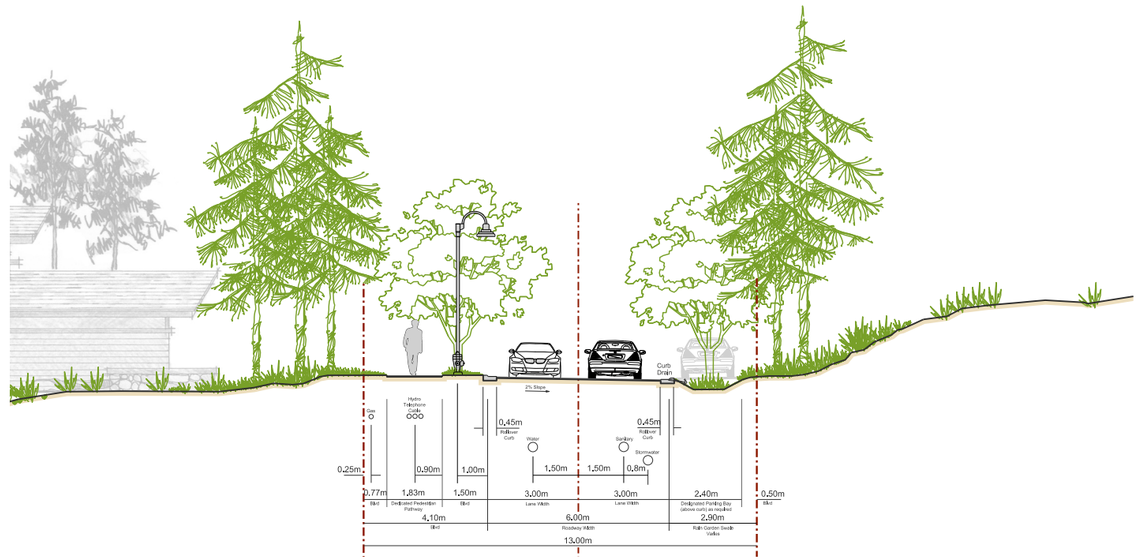
PARKWAY COLLECTOR STREET



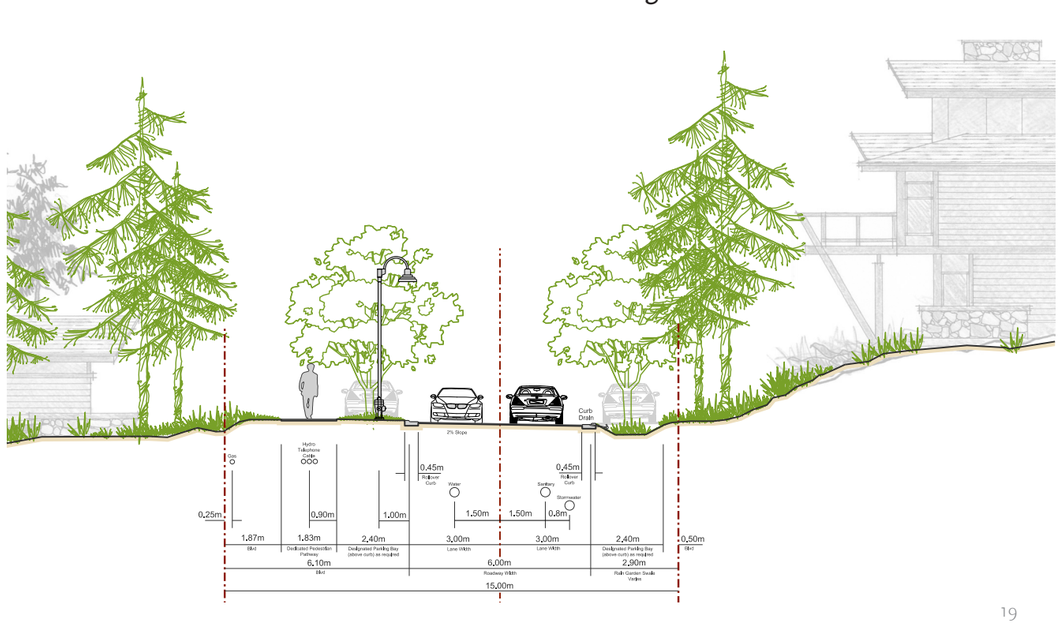
MINOR COLLECTOR STREET



NEIGHBOURHOOD LOCAL - Single Fronting



NEIGHBOURHOOD LOCAL - Double Fronting



Reduced street Right-of-Ways provide access within fragemented terrain, while minimizing visible cut and fills.

Utilities are accomodated within the landscaped portion of the Right-of-Way

Right-of-Way accomodates parking within pull-out bays adjacent the carriageway.

6.1 STREET RIGHT-OF-WAY

The street right-of-way (ROW) width is largely determined by the ultimate program of the designated roadway. In the Project Specific Street Standards, right-of-way width is intentionally limited to reduce the impact of development, such as cut and fill slopes and development servicing in hillside environments, while ensuring that a safe and effective roadway is maintained for both motorized vehicles and pedestrians.

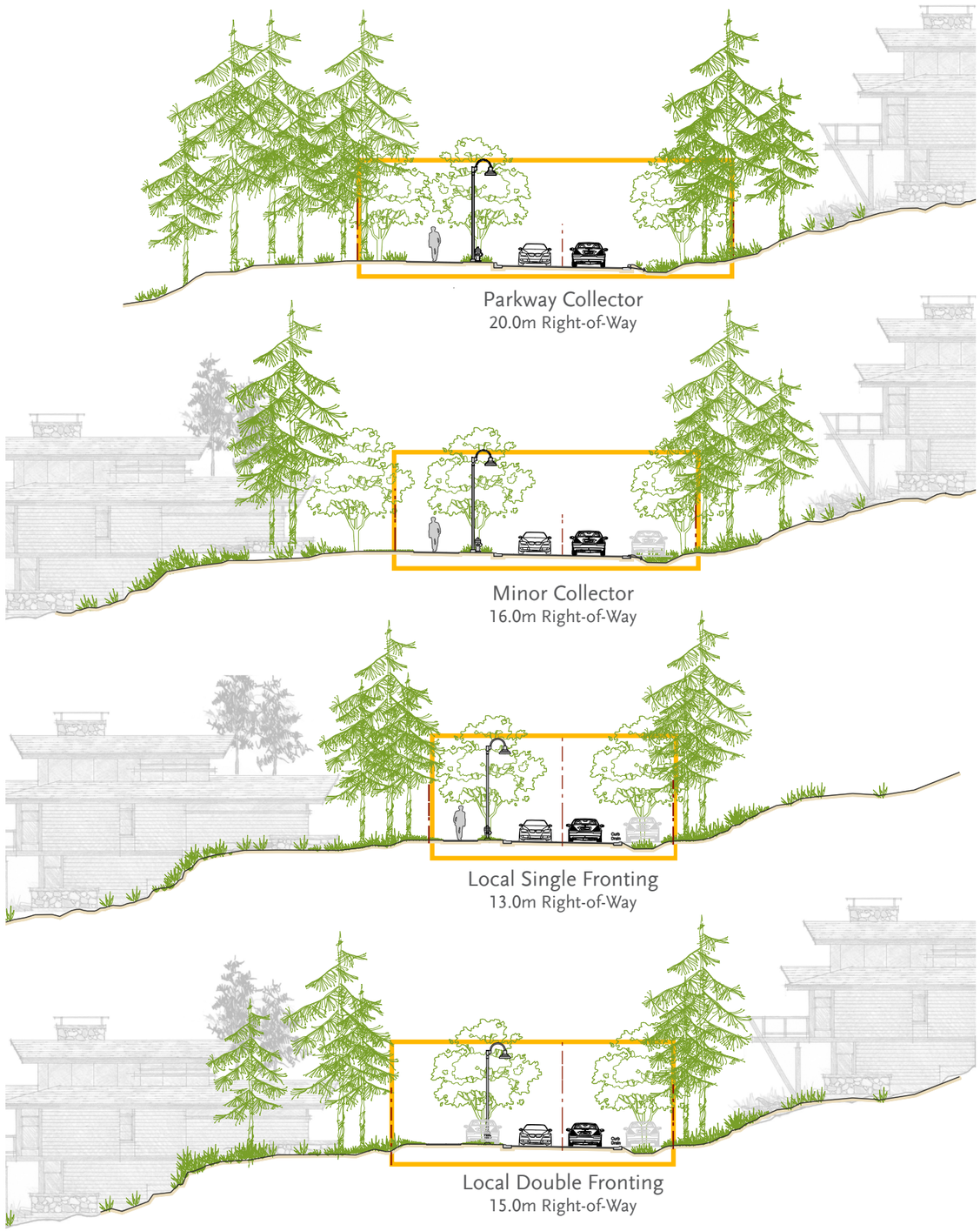
Proposed Typical Street ROW widths:

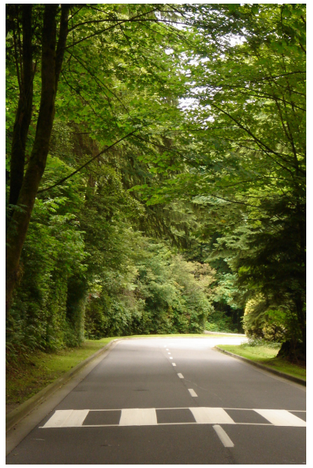
Parkway Collector:	20.0m
Minor Collector:	16.0m
Local - Single Fronting Condition:	13.0m
Local - Double Fronting Condtion:	15.0m

Conditional Design Variations:

Conditional ROW requirements are based on carriageway width (determined by street type and design speed) as well as required “above the curb” street elements, such as on-street parking requirements. Variations to the typical right-of-way conditions may include:

- Street classification based on neighbourhood design/land use program and density;
- Divided streets (i.e. central boulevard designs);
- Residential fronting conditions (double or single fronting);
- Single or double-sided on-street parking;
- Pedestrian network;
- Utility corridor and stormwater management; and
- Cut and fill slope extents.





Narrow carriageway widths reduce development and visual impact.

Reduced streets widths enable responsiveness to the hillside topography and compliment neighbourhood design.

6.2 CARRIAGEWAY WIDTH

Carriageway widths for the Project Specific Street Standards are reduced to reflect slower design speeds for the Parkway (50km/h), Minor Collector (30 km/h) and Local street (30 km/h).

Community Parkway and Minor Collector widths:
For both the Parkway and Minor Collector streets, a 7.0m carriageway width is applied. The Parkway does not accommodate parking, while the design for Minor Collector allows for limited on-street parking "above the curb" in designated areas.

Community Parkway and Minor Collector street design assumes no direct access to development; although properties may have legal frontage along collector streets, access will occur via local streets and shared driveways only.

Neighbourhood Local Widths:
Neighbourhood Local streets are characterized by a carriageway width of 6.0m. Local streets are designed to service up to 100 units, allow for limited on-street "above the curb" parking, and assume single and double fronting development conditions.

Carriageway widths are proposed based on the comprehensive land use masterplan adopted in the Lakes District and Schooner Bay Neighbourhood Plans, and substantiated in the Traffic Impact Study.

Parking pads provide parking outside the carriageway may be surfaced with permeable material to reduce stormwater run-off.

Parking pads adjacent the carriageway reduced the total paved surface.

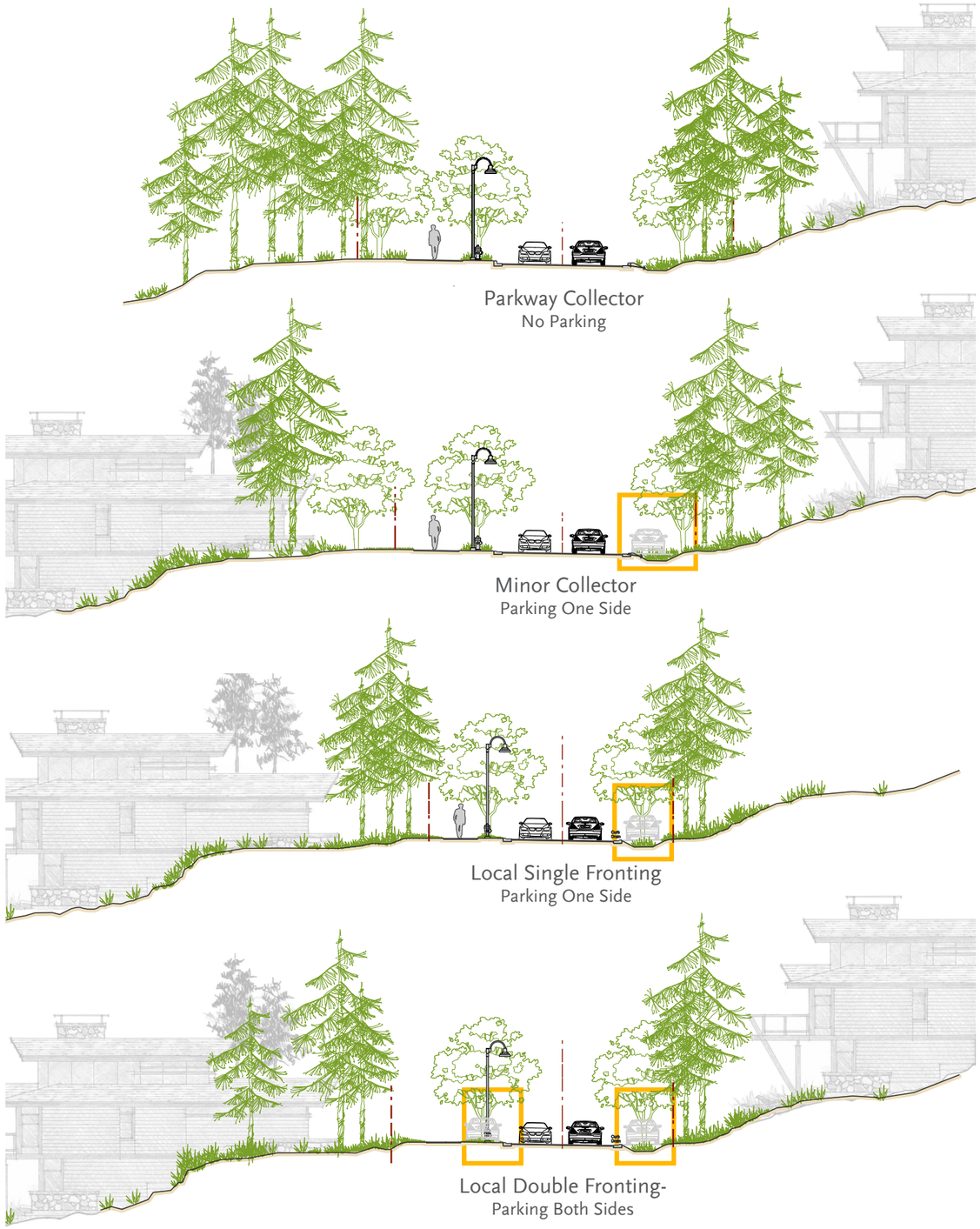
6.3 PARKING

The Project Specific Street Standards address parking within the right-of-way through designated parking areas or parking pads located “above the curb,” adjacent to the carriageway. Parking is also accommodated on private driveways through the zoning specification of 6.0m minimum building setback from the back of curb or sidewalk.

Parking pads are located above the street’s rollover curb and are further delineated from the carriageway through the use of distinct surfacing materials.

Conditional Design Variations:

- Single or double fronting “above the curb” on-street parking, depending on adjacent land use such as residential density and parking requirements;
- Parking pads surfaced with permeable materials, such as pavers, can serve as stormwater infiltration and/or storage galleries linked to the stormwater and raingarden system; and,
- Designated parking pads provide additional space for snow storage during road clearing and maintenance during winter months.



Curbs delineate street edge while allowing driveway and sidewalk access without curb cuts.

Curb cuts can be used to direct stormwater flow towards raingardens.

Where on-street parking is not permitted, panel curbs and gravel or unpaved surfaces may be used to reduce impermeability.

6.4 SHOULDERS and CURBS

The Project Specific Street Standards specify barrier curbs for the Parkway Collector, with rollover curbs for Minor Collector and Local streets in order to maintain a clearly delineated street edge for safety and maintenance considerations, while allowing driveway access to the carriageway without requiring a curb cut.

Conditional Design Variations:

- In areas constrained by steep slopes (where maximum grades reach and/or exceed 10%) barrier curbs may be preferrable in order to address safety concerns;

- Where applicable, rollover curbs may be fitted with designated “curb cuts” as a means to facilitate stormwater diversion to raingarden infiltration systems; and,

- In areas where on-street parking is not required, panel curbs and gravel shoulders may be used to further reduce the concentration of stormwater flows while maintaining a green streetscape.

Residential sidewalk using concrete and brick surfacing. Road setback provides a buffer to enhance the pedestrian experience. Utilities are placed within the buffer.

Street setbacks and landscape buffering contribute to a safe pedestrian oriented streetscape.

6.5 SIDEWALKS

In addition to planning and design considerations for the automobile, the Project Specific Street Standards carefully integrate pedestrians, cyclists, and other forms of alternative transportation within the context of complete neighbourhood design.

Sidewalks are generally located on the side of the street fronted by development or dedicated park as a means of providing direct access to neighbourhood destinations. Local streets require a minimum 1.5m boulevards between sidewalks and the back of curb as a means to reduce the extent of contiguous impermeable surfaces, and to provide a safety buffer between pedestrians and vehicle traffic.

The Parkway and Minor Collector street standards include provisions for a 3.0m (10ft) and 2.4m (8ft) respectively multi-use shared pathway to accommodate pedestrians, cyclists and personal mobility vehicles (PMVs) as a dedicated route for alternative transportation within the neighbourhood.

Alternatively, the Project Specific Street Standards specify a 1.83m (6ft) wide sidewalk to accommodate pedestrians in lower traffic volume areas serviced by Local streets.

Permeable surfaces, can be used for parking pads to reduce stormwater run-off and maximize infiltration.

Parking pads adjacent the carriageway are surfaced with permeable materials and linked to raingarden systems.

Raingardens adjacent the street absorb and filter stormwater while contributing to the streetscape aesthetic and pedestrian experience.

6.6 STORMWATER MANAGEMENT

The Project Specific Street Standards address stormwater quality and quantity through implementing Best Management Practices in the form of green infrastructure incorporated into the street right-of-way cross section.

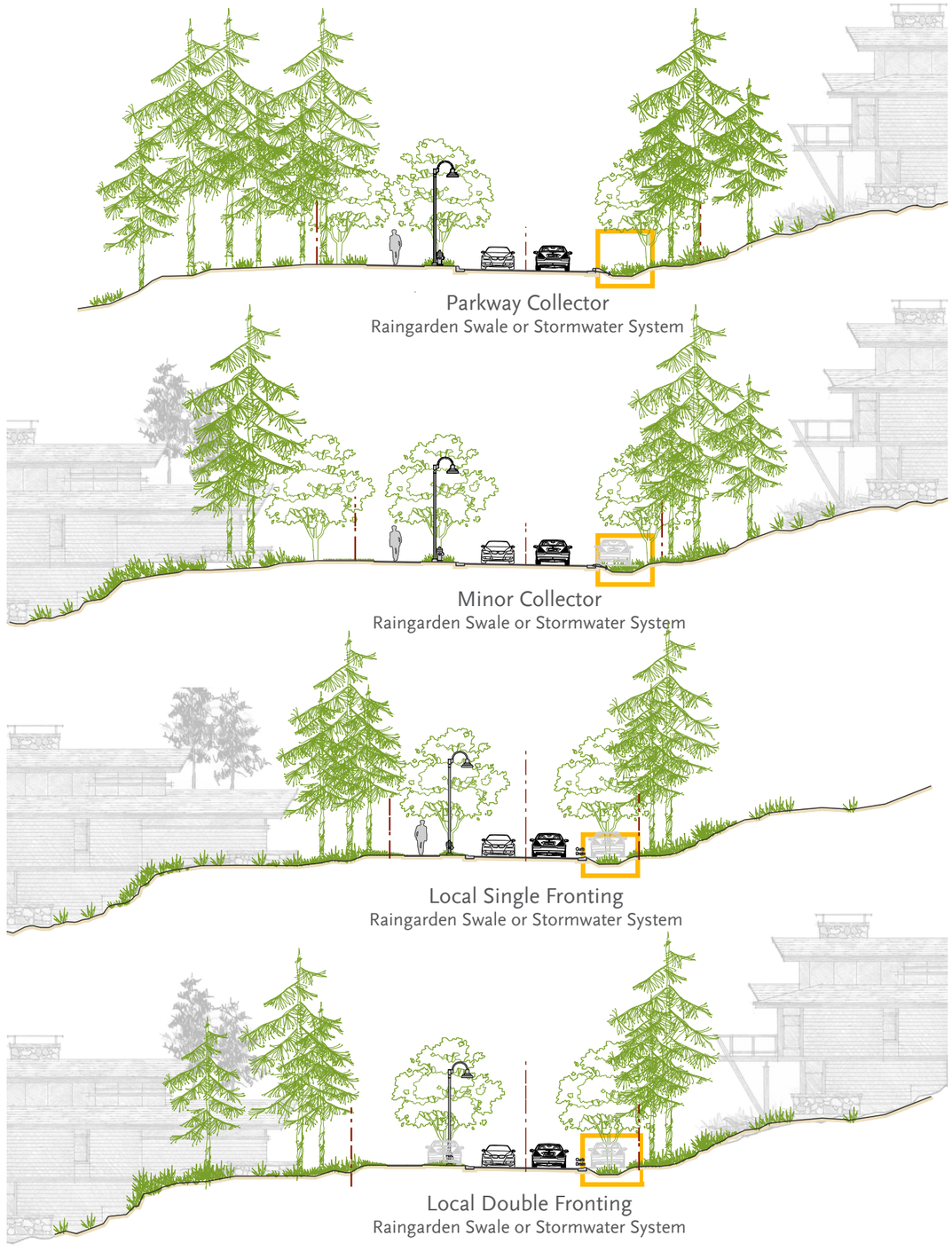
In combination with conventional piped systems, infiltration galleries and raingarden swales form a linear feature along proposed streets as a means of capture runoff closest to its source, reduce runoff volume and rate of flow, and expedite stormwater infiltration into permeable soils and/or constructed detention facilities.

Beyond the public road right-of-way, detention facilties may be located to receive stormwater flows that exceed the raingarden's natural ability to absorb runoff generated by large storm events.

Conditional Design Variations:

- Parking pad surfaces with permeable materials can serve as stormwater infiltration/storage galleries and are linked to the larger raingarden system;

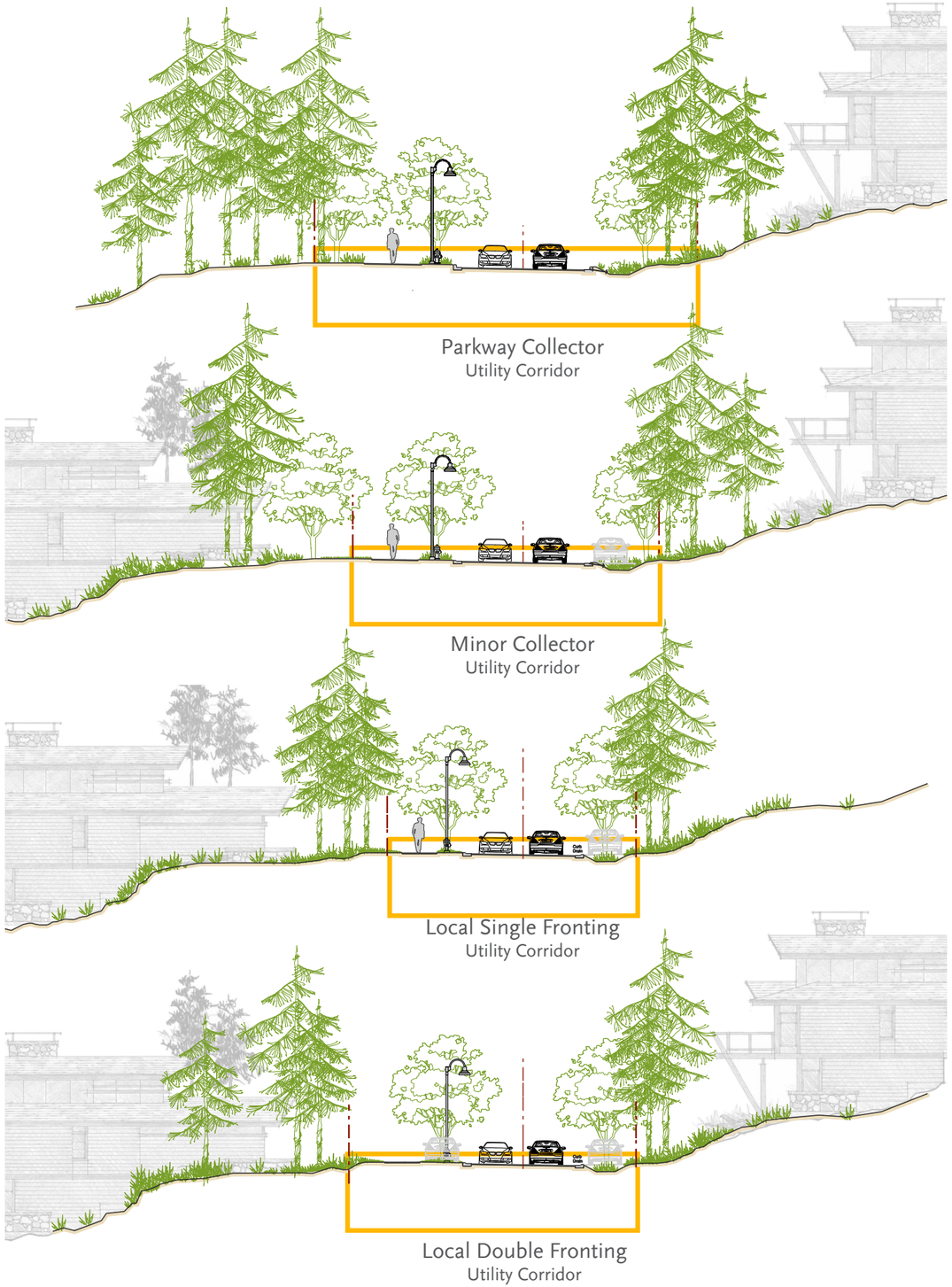
- Right-of-ways through developable areas of steeper terrain may require conventional piped stormwater systems, located under the carriageway;



6.7 UTILITY CORRIDORS

Utility corridors within the Project Specific Street Standards refer specifically to shallow services within the right-of-way located outside the carriageway. All sanitary sewer, piped stormwater and potable water are located below the carriageway to protect against freezing during winter months.

To maximize the right-of-way available, shallow services, including hydro, telephone, cable and/or fibre-optic, are located beneath the sidewalk or pedestrian pathway system. For ease of maintenance and repair, gas servicing lines, where applicable, are located within 25cm of the road ROW parallel to property lines.



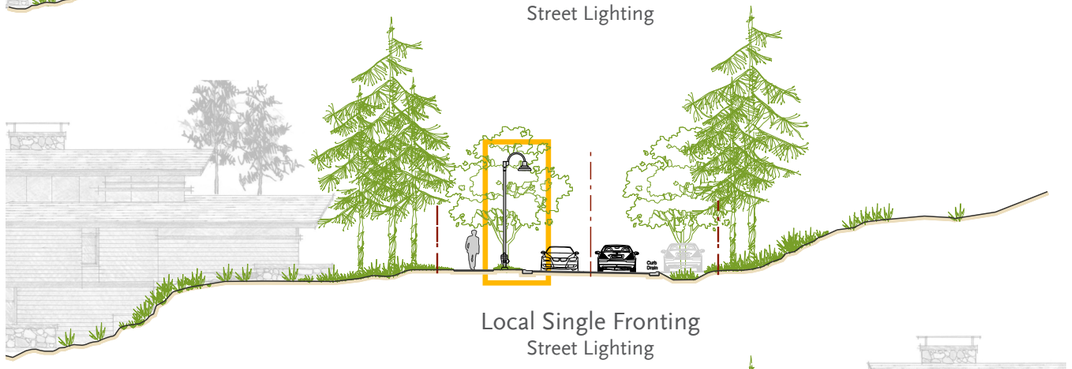
6.8 LIGHTING

Street lighting, when desired and/or required, is located within the utility corridor at the approximate midpoint of the boulevard seperating vehicular and pedestrian circulation.

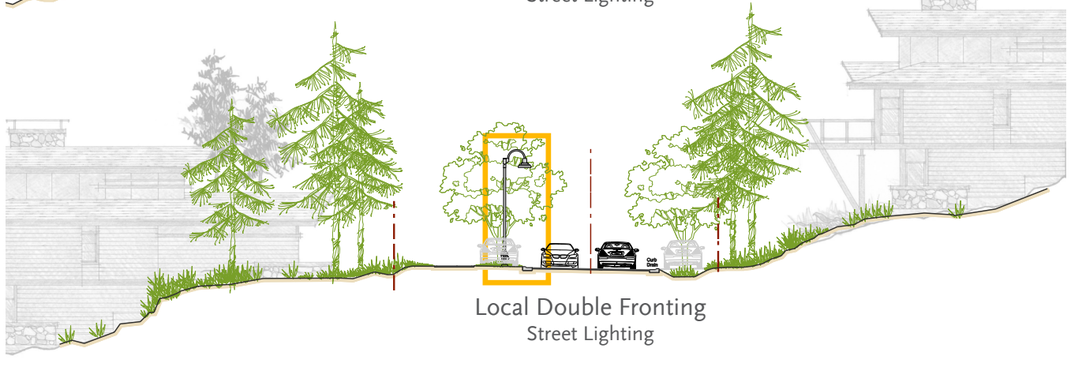
All lighting relates to a human scale and conforms to Dark Sky lighting principles, including the strict use of cut-off luminaries, as a means of maintaining the rural character of the community.

Parkway Collector
Street Lighting

Minor Collector
Street Lighting



Local Single Fronting
Street Lighting



Local Double Fronting
Street Lighting

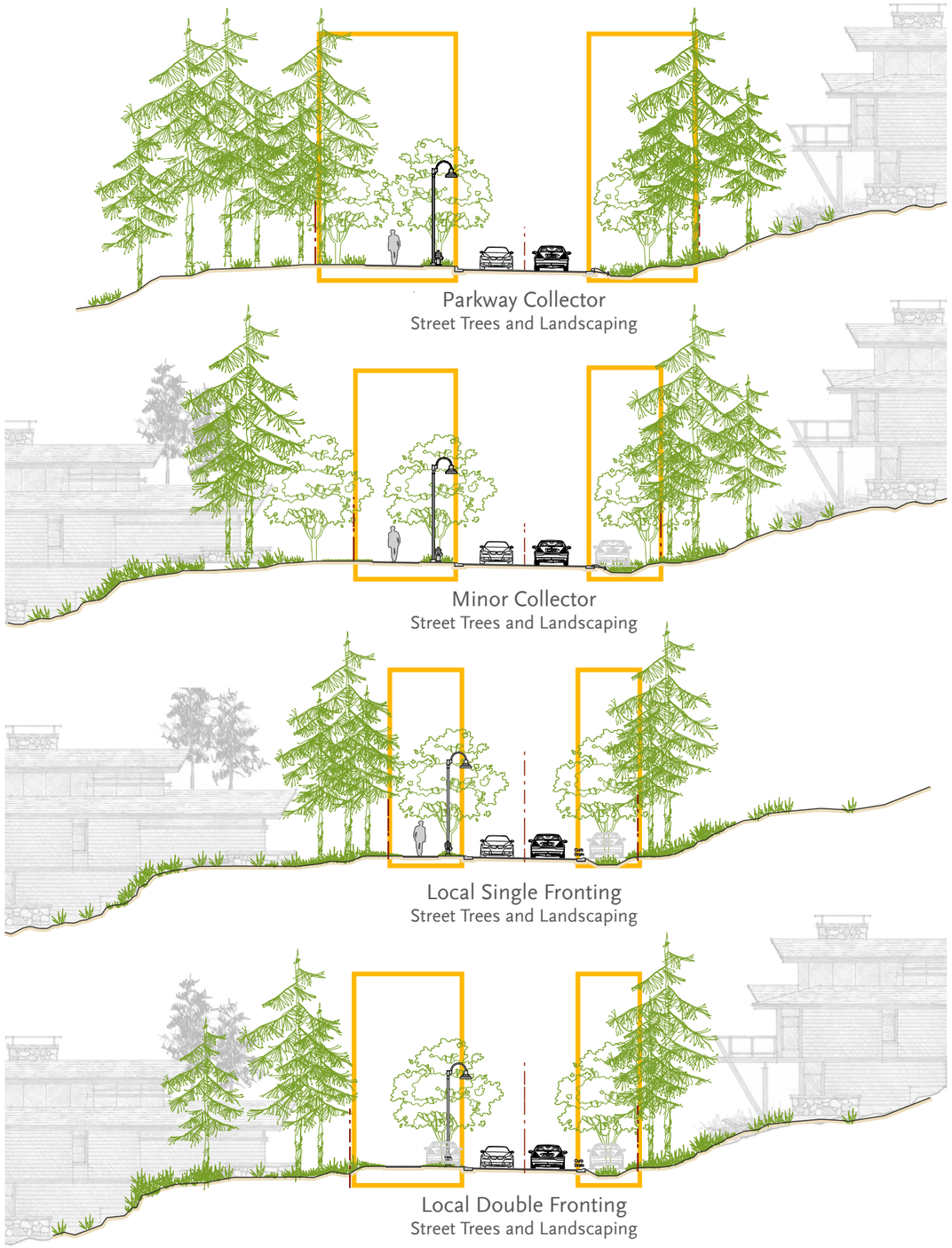
6.9 STREET TREES and LANDSCAPING

Street trees and landscaping perform important roles within the streetscape with numerous environmental and aesthetic benefits, as well as serving as physical buffers between land uses, pedestrians and vehicles. For traffic safety, vegetation must be balanced with safe clearance requirements and sight lines. Trees on the street provide dappled light to walk and ride through, they rustle in the wind and they display the passing of the seasons. Trees modify the microclimate – on hot sunny days the street is cool and on rainy days there is a relatively dry place to walk. Trees also foster a sense of comfort and safety for drivers and pedestrians by creating an edge between the sidewalk and the moving traffic. Street trees contribute to the livability of a street.

Street trees also create a distinctly urban feel in a neighbourhood – boulevards lined with trees create a very strong linear pattern. In areas such as Schooner Cove and the Lakes District, natural landscape will remain prominent. While in some instances, such as along the Parkway Collector, street trees are appropriate; in other areas a more natural approach is desired.

Streets that have a tighter “fit” to the natural landscape will not be required to incorporate street trees. For Local Streets and private streets, street trees are considered optional. The planting of stands of native trees and vegetation is encouraged in these areas to contribute some of the elements of livability that would otherwise be missed with the elimination of formal street lined tree plantings. No trees or shrubs shall be planted within the vertical or horizontal clearance zones as specified in the Lakes District Trail Standards or the Schooner Cove Pathway Standards, and the following guidelines apply:

- Plant masses should not be planted where they impede visibility along the road;
- Native replanting should be used in natural areas for restoration and screening;
- Changes in drainage patterns should be minimized;
- Trees planted near roads or trails should not damage surfaces or bases;
- Root barriers along the road should be used to prevent roots from growing under hard surfaces; and,
- Plantings may be used for privacy screening, road softening and enhanced aesthetics adjacent the roadway. However, tall and/or dense plantings should be avoided for safety and security reasons.



7.0 Greenhouse Gas Reduction & Local Environmental Objectives

Project Specific Street Standards represent an innovative and measurable means to address Provincial policy objectives with respect to greenhouse gas (GHG) emissions reduction and climate change, as well as to address the community's environmental goals as reflected in the Official Community Plan (OCP).

According to the *BC Climate Action Plan- June 2008* "transportation is the leading contributor to GHG emissions". Reduced street ROWs and carriageway widths, along with reduced traffic speeds and road building disturbance reflected in the Project Specific Street Standards is directly related to the reduction of overall GHG emissions and improvements to the local environment.

Reduced Kilometers Driven

One target of GHG reduction is to change travel behaviour, including reducing total kilometers driven. Through improving the experience and convenience of alternative modes of transportation, fewer residents will choose to drive for short trips, thereby reducing overall GHG emissions. Within these Standards, specific improvements to non-motorized modes of travel include improving safety through reducing traffic speeds, accommodating pedestrians within buffered networks of sidewalks and pathways on every street, and providing for cycling and non-motorized modes within higher volume roads.

Maximizing Use of Materials

Project Specific Street Standards seek to minimize process by-products, raw material use, and waste in road construction. The use of asphalt, a petroleum derivative, is minimized through reducing right-of-ways and paved widths to shrink overall GHG emissions, as well as cost of materials, long-term maintenance and repairs to road surfacing.

Landscaping and GHG Capture

Serving as a physical buffer to traffic and an improvement to streetscape aesthetics, street trees and landscaping also capture GHG, improve local air quality, and reduce erosion of top soil. Reduction of right-of-way widths minimizes natural landscape disturbance, while the Standards encourage re-vegetation within boulevards.

Stormwater Management

By reducing overall pavement widths, minimizing impervious surfaces, and using Best Management Practices in stormwater management, the Standards improve local environmental conditions through increased infiltration, reduced stormwater runoff and decreased impact downstream on wetlands, rivers, lakes, oceans.

Reduced Footprint

Minimizing the extent of disturbance through better fitting the terrain reduces the physical, visual and environmental impacts of the development footprint resulting in narrower road widths and increased permeable surfaces.

Together, Project Specific Street Standards implement improvements to the existing road standards at Fairwinds, including reduced GHG emissions in accordance with the Climate Action Plan, and improvements to the local environment.

8.0 Upholding the MoTI Mandate: Addressing Liability & Responsibility

The Project Specific Street Standards have been developed in collaboration with the Ministry of Transportation and Infrastructure (MoTI). The Project Specific Street Standard proposed for public roads will require that MoTI assume responsibility for long term maintenance and that MoTI be satisfied with the performance and safety of all public roads.

The Project Specific Street Standards are intended to be adopted for the Lakes District and Schooner Cove neighbourhoods in conjunction with the RDN Local Service Area Bylaws to fund and administrate the maintenance and operation of street facilities (back of curb features and infrastructure) in addition to those typically financed and managed by MoTI.

9.0 Technical Standards Summary

As policy-makers, planners, designers and engineers of the built environment, it falls within our individual and collective responsibilities to carefully consider the long-term implications of our decision making. Our charge has continually expanded to address the evermore challenging and complex demands presented by our growing impact on the world.

As we continue to develop our respective expertise in the exploration and implementation of sustainable community planning and design, we recognize the need for collaboration and innovation. Arguably, the most obvious case for such an approach is presented in the planning and design of our everyday streetscapes.

In the context of design standards for streets, while we have mastered many of the technical constraints inherent in the design and implementation of safe and efficient transportation systems, the 'rules of the game' have become more sophisticated. Expectations have expanded to demand that the design of streets consider a full spectrum of planning and design objectives, including implications to fundamental social interaction, ecological health and long-term fiscal responsibility.

The development of Project Specific Street Standards revisits our existing assumptions surrounding street design, re-examines the role of streets in the public realm, and proposes an alternative set of design standards as a means to deliberately address the many impacts–positive and negative–that streets have on our communities.

Project Specific Street Standards are summarized and quantified in the following Design Summary, completed by InterCAD, including the fundamental engineering design criteria governing horizontal and vertical road alignments, and reflect the street hierarchy and classification adopted within the Lakes District and Schooner Cove Neighbourhood Plans.

Project Specific Street Standards for the Lakes District and Schooner Cove the following four types: Parkway Collector, Minor Collector and Local Street(both single and double fronting conditions.

Project Specific Street Standards Summary

Street Conditions		Street Section Specification							
Street Types	Max Units Served	Design Speeds (km/h)	Max. Grade	ROW (m)	Carriageway (m)	Parking	Curb & Gutter	Sidewalks(m)	Street Trees
Parkway Collector	2000	50 (40)[1]	10 (12)[2]	20[3]	7[3]	none	barrier curb	3	required
Minor Collector	600	30	10 (12)[2]	16	7	optional one side[4]	rollover curb	2.4	required
Local Street (Single Fronted)	100	30	12	13	6	required one side[4]	rollover curb	1.83	required
Local Street (Double Fronted	100	30	12	15	6	required both sides[4]	rollover curb	1.83	required

[1] Minimum permitted design speed reduction, where necessary due to topographic constraints, and approved by the local municipality
[2] maximum grade permitted where necessary due to topographic constraints and as approved by the local municipality.
[3] Where required, ROW and street widths will be increased at major intersections to provide for separate turning lanes.
[4] all parking shall be managed on-site or within small parking pullouts, as required.

Alignment Design Criteria Summary

1. Horizontal Curve Radii

Criteria	50 km/h	40 km/h	30 km/h
Roadway Crossfall			
normal crown (-2%)	105m	55m	30m
2% superelevation	90m	50m	25m
4% superelevation	80m	45m	20m
6% superelevation	-	-	-
Through Intersections	120m	75m	-

2. Superelevation

Criteria	50 km/h	40 km/h	30 km/h
Maximum Superelevation	4%	4%	4%
Maximum Superelevation at Intersections	4%	4%	4%

3. Superelevation Transition Lengths

Criteria	50 km/h	40 km/h	30 km/h
Transition Lengths (2 / 4-lane roadways)			
normal crown to +2%	22m / 34m	20m	20m
normal crown to +4%	33m / 50m	30m	30m
normal crown to +6%	-	-	-
Min Tangent Length between reversing curves			
2% superelevation (2 / 4-lane roadways)	13m / 20m	12m	12m
4% superelevation	26m / 40m	24m	24m
6% superelevation	-	-	-

1 Values for transition lengths include tangent runout applied at the same rate as superelevation runoff.
2 60% of superelevation runoff occurs on the tangent approach and 40% on the curve, resulting in a minimum length of tangent between reversing curves of 120% of the superelevation runoff length.

Alignment Design Criteria Summary

4. Gradients

Criteria	50 km/h	40 km/h	30 km/h
Minimum Grade	0.5%	0.5%	0.5%
Maximum Grades			
on horizontal tangents	11%	12%	12%
on minimum radius horizontal curves [1]	10%	10%	10%
Grades Through Intersections			
Through condition approach grade	8%	8%	-
approach distance for through road [2]	5m	0m	-
Stop condition approach grade	5%	6%	6%
approach distance for stopping road [2]	15m	5m	5m

1 Applies where radius is less than 1.5 times minimum allowable radius.
2 Minimum distance back from the gutter line that the specified grade may not be exce
3 15m approaching a Collector Road / 5m approaching a Local Road.

5. Vertical Curve K Values

Criteria	50 km/h	40 km/h	30 km/h
Minimum Crest	7	4	2
Minimum Sag	7	4	2
Crest / Sag on approach to stop condition	3	2	2

K values listed assume that new roadways will be illuminated

6. Stopping Sight Distances

Criteria		50 km/h	40 km/h	30 km/h
Down grades:	12%	78	52	34
	9%	73	50	32
	6%	69	48	31
	3%	66	46	30
	0%	63	45	30
Up grades:	3%	61	44	29
	6%	59	42	29
	9%	57	41	28
	12%	56	40	28

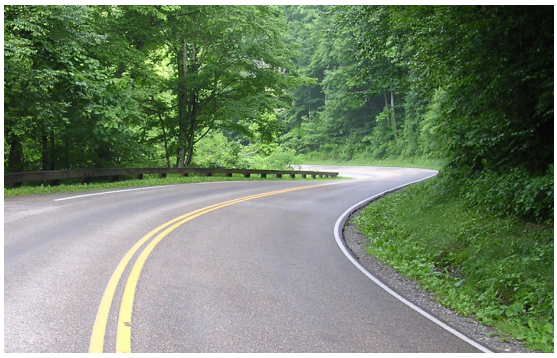
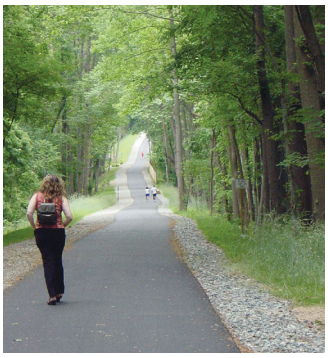
7. Decision Sight Distance

Minimum decision sight distance for 50 km/h: 75m - 145m

1. Note that decision sight distance applies only to multi-lane roads at intersections.
2. The range of values recognizes the variation in complexity that occurs at various sites. For less complex situations, value towards the lower end of the range are appropriate and for more complexity, values at the upper end are used.

Lakes District and Schooner Cove

Project Specific Street Standards


August | 2012

EKISTICS

Schedule 5: Density & Sewer Service Records

Fairwinds Neighbourhood Planning Process
Density & Sewer Service Records
27-May-13

A	B	C	D	E

Phase	Name	Unit Type	Residential Dwelling Units: Fairwinds UCB	Schooner Cove UCB	Total	Sewer Connections (resi unit equiv): Sewer Connections - Units/Serviced Lots Served	FREM WWTP Account Portion	Completed Units (Homes)	Notes
Completed Development to Date (subdivided phases consisting of multiple properties, each having a water connection)									
								As at 31-Dec-11	
FREM Residential:									
Phase 1A	Andover	SF	60					49	
Phase 1B	Dolphin	SF	22					19	
Phase 2A	Evanshire	SF	58					51	
Phase 2*	Glen Eagle	MF	40			40		40	
Phase 3A	Carmichael	SF	82					59	2 units from Plan excluded because non-residential
Phase 3B	Cambridge	SF	34					28	
Phase 4A	Redden	SF	66					47	excl NHH Lot 1
Phase 4B	Huntington	SF	52					40	2 add'tl units due to subdivisions subsequent to initial development, excl NHH Lot 51 &
Phase 4C	Rockhampton	SF	33					29	
Phase 5	Schooner Ridge	SF	86					62	
Phase 6	Brickyard Bay / Andover Road	SF	55					46	excl NHH Lot 56
Phase 7C	Arbutus Hill / Granville Road	SF	26					21	
Phase 7B*	The Hollies	MF	7			7		7	
Phase 7A*	Observation Point	MF	22			22		22	
Phase 9B	Bonnington Heights	SF	42					16	
Phase 9B-4	Rockcliffe	SF	26					15	
Phase 9A	Carmichael	SF	8					7	
Phase 11A	Bonnington Ridge	SF	8					1	
Subtotal			727		727	727	727	558	77%
FREM Non-Residential:									
Schooner Cove Hotel - Est amount for Marina Operation*		Hot		-		*5*			
Fairwinds Centre*		Amen	-			*12*			
Fairwinds GC Clubhouse*		Golf	-			*12*			
Fairwinds GC Maintenance*		Golf	-			*4*			
DND*			-			20			Sewer connections provided by FREM to DND, per letter dated June 5, 1995.
Subtotal			-	-	-	53	53	53	
Third Parties:									
Schooner House*				49		49			Sewer connections provided by RDN, to be credited to FREM
Various Residences (Dolphin Drive)						3			Sewer connections provided by RDN, to be credited to FREM
Subtotal			-	49	49	52		52	CONNECTIONS TO RDN's ACCOUNT
Total			**727**	**49**	**776**	**832**	**780**	**663**	

***Note**: Single utility connection serving multiple units.*
***FREM**: Fairwinds Real Estate Management Inc.*

Schedule 6: Servicing Standards

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

SCHEDULE 4 D 1

2013 LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

REGIONAL DISTRICT OF NANAIMO

LAKES DISTRICT AND SCHOONER COVE

2013 COMMUNITY SEWER SYSTEM STANDARDS

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APPENDICES

1. GENERAL

1.1. Requirement

The RDN will require a "Subdivision Servicing Agreement" to be completed for any new sewer system or existing system extension, unless otherwise agreed to in writing by the RDN.

Sewage collection and conveyance systems shall be designed, installed, extended, tested and maintained in accordance with the following regulations and standards.

The sewer standards for design and construction of the sewer within the Lakes District and the Schooner Cove Community Sewer Standards Area are to be governed by Regional District of Nanaimo Land Use and Subdivision Bylaw No. 500, 1987, and particularly by this Schedule 4D1.

It is the intention of the RDN to enter into a phased development agreement under section 905.1 of the *Local Government Act* with the property owner of the lands within the Lakes District Comprehensive Development Zone CD44 and the Schooner Cove Comprehensive Development CD45 that will specify changes to specified subdivision servicing bylaw provisions that would not apply to the development contemplated under that agreement, unless agreed to in writing by the developer.

1.2. Design

The engineering design of the sewage collection and conveyance systems shall be carried out by, and the preparation of drawings and specifications shall be sealed by a Professional Civil Engineer registered in the Province of British Columbia, and shall conform to these Standards.

1.3. Definitions

ADWF means average Dry Weather Flow

AWWF means average Wet Weather Flow

B.O.D means quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in 5 days at 20˚C expressed in mg/l.

Collection facility means A facility used for the collection and conveyance of sanitary sewage.

Comminuted Garbage means the wastes from the preparation, cooking and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than 6mm in any dimension

Design Flow means peak sewage flow plus peak storm water infiltration.

Direct Service Area means land and improvements directly served by the proposed facility.

Engineer means the Manager of Engineering Services for the Regional District of Nanaimo, or the person designated by the General Manager of Regional and Community Utilites.

Engineer of Record means a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of BC who is responsible for the construction drawings and documents. The Engineer of Record will be the engineer that signs and seals the record drawings and the certification of installed works.

Facilities means sewers, sewage treatment and disposal plants, pumping stations and other works necessary thereto, and outlets for carrying off, treating and disposing of sewage, and includes any and all works, structures, lands, conveniences, incidental to and necessary for a sewerage system.

Garbage means solid wastes from domestic and commercial preparation cooking and dispensing of food, and from the handling, storage and sale of produce.

Industrial Waste means liquid waste from industrial manufacturing processes trade or business, as distinct from sanitary sewage.

Lateral Sewer *means* sewer serving more than a single subdivided parcel

LPCPD means litres per capita per day

l/s means litres per second

mg/l means milligrams per litre

MPa means megapascals (1000 kPa)

Member Municipality or Member means a municipality or improvement district within the Regional District of Nanaimo.

M^3/ha means cubic metres per hectare

M^3pd means cubic metres per day

PDWF means Peak Dry Weather Flow

pH means the logarithm of the reciprocal of the weight of hydrogen ions in grams per litre of solution

ppm means parts per million

Peaking Factor (PF) means the Ratio of peak dry weather flow to the average dry weather flow.

Regional District means in this document the Regional District shall refer to the Regional District of Nanaimo.

Sanitary Sewage means sewage having a quality substantially equal to that of normal domestic sewage

Sanitary Sewer means a sewer which carries sewage and to which storm, surface and ground water are not intentionally admitted

Service Connection means a sewer connection a subdivided lot to the lateral sewer

Sewage Treatment Plant means an arrangement of structures and devices used for treating sewage

Stormwater Infiltration means the infiltration of groundwater or inflow of stormwater through leaks and connections into the system

Suspended Solids means solids that either float on the surface of, or are in suspension in water, sewage or other liquids, and which are removable by laboratory filtering

Tributary Area means all land in the service area tributary to the proposed facility

1.4. Application

All applications shall be made in the following steps:

1. Feasibility Review

All proposed construction of sewage collection and conveyance facilities shall be submitted to the Regional District for a feasibility review prior to commencement of any detailed design or construction. Such requests shall include a plan of the proposed construction and the area it will serve. The applicable feasibility review fee, in accordance with RDN Bylaw No. 1259.03 or most recent amendment, and the Letter of Assurance shall also be submitted at this time.

The Regional District will review the proposal, and reply in writing indicating the District's decision regarding acceptance or rejection, and/or the necessary amendments required.

2. Detailed Design

The detailed design and specifications shall be submitted in duplicate to the Regional District for Design Stage Approval (DSA) prior to construction. Attached to the submission shall be a Certification of Design. The applicable engineering review fee, in accordance with RDN Bylaw No. 1259.03 or most recent amendment, shall also be submitted at this time, along with the Design Professional Engineer's certified cost estimate for the works upon which the fee amount is based. *The final determination of the DSA fee shall be determined upon completion of the project and final certification of the construction costs by the Design Professional.*

The detailed plans will be returned either approved or with a request for re-submission. Re-submission will be carried out until the Regional District

approves the detailed plans and specifications, and issues Design Stage Approval (DSA).

The designer shall submit the RDN approved plans to the Provincial Ministry of Transportation & Infrastructure and Vancouver Island Health Authority for approval permits. Receipt and submission of these permits to the RDN shall also be a prerequisite to the start of construction. Approval permits from other applicable agencies as required shall also be obtained.

2.1. Drawings and Specifications

All design drawings shall be ISO A1 size, 594 mm in depth and 841 mm in width the following information shall be supplied

1. **Location Plan** - showing the location of the proposed work. This may appear on the same sheet as the Key Plan.

2. **Key Plan** - showing a plan of the proposed work at a suitable scale such that the whole works are shown on one drawing, usually 1:5000, 1:2000 or 1:1000. The Key Plan shall show a general outline of the works, area covered and sheet numbers of the plan/profile drawings, and a legend showing existing and proposed works.

3. **Plans/Profiles -** showing detailed design of the proposed works.

   Plans shall be drawn at a scale of 1:500 or 1:250, showing the location of the pipe centre line, pipe size and type and off-set from property line, manholes, services, trench details, trench dam details and all related appurtenances in relation to road, easement and adjacent property and lot lines. Existing or proposed underground utilities are to be indicated on the plan in addition to the extent of work required in making connection to existing sewer main. Location of service connections are to be shown. Connections not conforming to the standard offset require a distance from an iron pin or lot line.

   Profiles shall be drawn at a horizontal scale of 1:500 and a vertical scale of 1:50 if more suited to specific conditions. The profile shall show the line of the existing and finished road grade on centreline, the invert of the pipe, location of manholes, and location of storm and water utilities. Where vertical curves are used, the invert elevation shall be shown at the beginning and end of the curves.

4. **Specifications** - shall be prepared to further define materials of construction and shall specify methods of construction and workmanship.

5. **Record Drawings** - shall be prepared by correcting drawings on completion of construction in order to reflect "record drawing" conditions for permanent records. The location of all individual lot sewer service connections shall be clearly shown with distance from the nearest manhole to the service wye. The drawings shall be signed and sealed by the Professional Civil Engineer, and shall be

accompanied by a Certification of Installed Works. Final record drawings shall consist of:

(a) Two (2) full-size paper sets;
(b) One (1) full size 3 mil Mylar set;
(c) 2 – 11" X 17" paper sets or 2 A3 half-size paper sets, as agreed by the RDN; and
(d) Digital copies: one (1) as AutoCAD or Civil 3D file as applicable to the current software, and one (1) as TIFF files.

1.6. Variations from Standards

Where the applicant wishes to vary from these standards he shall submit a written request with adequate supporting data to the Regional District for review.

The Regional District shall make the final decision in writing as to the standard requirements which shall apply.

1.7. Permits

The applicant shall be responsible for obtaining all necessary approvals and permits required prior to commencing construction of the sewer system.

1.8. New Service Areas

Where a sewer system is to be constructed by an applicant within an area previously unserviced by a community sewer system, the design and construction for the system shall comply with the requirements of these standards, unless otherwise agreed to in writing by the Regional District.

1.9. Existing Service Areas

Where a sewer system is to be constructed by an applicant within the existing or extended boundaries of an area already being served by a community sewer system, the design and construction of the system shall comply with the requirements of these standards.

1.10. Inspection

The Manager of Engineering Services of the Regional District or his appointed deputies shall be allowed access and provided adequate facilities for access to any part of the works at all times for the purpose of inspection.

Any connections to or interruption of any existing system will only be permitted be under the direct supervision of the Regional District. Adequate notice to the Regional District of any such interruption to service shall be provided in order that attendance by Regional District personnel can be arranged.

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2. DESIGN

2.1. Sewage Flows

Sanitary sewer systems shall be designed using the following formula to accommodate peak sewage flows and peak inflow & infiltration.

AWWF=PDWF +I&I

Storm water connections shall not be made to the sanitary sewer system.

2.2. Design Population

Design contributory populations shall be calculated in accordance with the Regional District of Nanaimo's population predictions or with the ultimate planned development in the tributary area, whichever is greater.

The following densities shall be used for housing types listed below:

Housing Unit	Persons per unit	Notes
Single Family / detached house	2.2	Based on 2011 census for Nanoose: 5674 persons / 2,587 housing units. Nanoose is predominately single family (>90% of dwellings)
Townhouse (attached, semi-detached) unit	1.9	Based on 2011 census for City of Nanaimo, City of Victoria
Apartment / condominium unit	1.4	Based on 2011 census for City of Nanaimo, City of Victoria
Secondary suite (carriage house)	1.1	50% of single family, consistent with draft zoning bylaw
Seniors living unit	1.1	Per CWPC Senior`s Housing Group

Where units are not known the following should be used:

.1	Dwelling unit	30 pph
.2	Multi dwelling unit development	125 pph
.3	Commercial Equivalent of	50 pph
.4	Industrial Equivalent of	50 pph
.5	Institutional	50 pph

pph = persons per hectare

2.3. Sewage Flow Calculation

Average dry weather flow (ADWF) shall be established by multiplying the design population by an average daily sewage flow of 300 Litres per capita per day.

Peak dry weather flow (PDWF) shall be established by multiplying the ADWF by the peaking factor (PF) which obtained from the following formula.

$$PF=6.75*Population^{-0.11}$$

Peak dry weather flow can also be obtained using the graph contained in the standard drawing S-21.

For new developments, where water conservation measures are mandatory (such as low flow toilets), the sewage flow may be reduced by 10% from that obtained from this table.

Design sewage flows may be varied by the Regional District, where suitable metered flow record is available, or for developments utilizing wastewater (grey water) re-use onsite.

Peak inflow and infiltration (I&I) shall be calculated using:

.1 12 m^3/ha for Existing development areas
.2 10 m^3/ha for New development areas
.3 The peak inflow and infiltration may be varied by the Regional District where suitable metered records for design storm events of maximum infiltration period of the year are available.

Design sewage rates of flow shall be computed by adding peak sewage flow to peak inflow and infiltration design allowances.

Sanitary sewage design calculations shall be prepared and submitted on a drawing showing the sanitary sewer tributary area as part of the detailed design drawings. If the sanitary sewer calculations are completed using modeling software the results of the software shall be displayed on the detailed design drawings. Use of modeling software shall be approved by the Regional District.

2.4. Sewage Characteristics

1. Sewage quality criteria shall be as follows:

Sewage Quantity (ADWF) in the Direct Service Area	Constituent	Average Normal
<50m^3/day	BOD -5 day 20˚ C Suspended Solids pH Temperature	1000mg/l 800mg/l 4-10.5 79˚ C
50m3/day to 450 m3/day	BOD -5 day 20˚ C Suspended Solids pH Temperature	400mg/l 300mg/l 5-9.5 66˚ C
>450 m3/day	BOD -5 day 20˚ C Suspended Solids pH Temperature	200mg/l 200mg/l 5.5-9.0 54˚ C

2. Regulations governing the quality of wastes acceptable for admission to The Regional District of Nanaimo shall be followed and can be found in Bylaw 1225.

3. Where the existing industrial and/or commercial developments will be connected to the sewer system, the District may require that flow sampling be carried out to determine the design loadings; re-treatment of wastewater prior to discharge to the Regional District's facilities may be required.

2.5. Hydraulics

1. All facilities shall be designed to convey peak sewage flow plus peak I&I calculated as set out in section 2.3 sewage flow calculation.

2. Sewers shall be designed to carry the calculated design flow at a minimum velocity of 0.6 m/s.

3. When carrying design flow the maximum pipe depth of flow shall not exceed the following:

(a) <250mm ¾ pipe diameter

(b) 300mm to 450mm ¾ pipe diameter

(c) >500mm Full pipe diameter

4. Service connections shall be designed with a minimum velocity of 0.9m/s.

5. Forcemains shall be designed with a minimum velocity of 0.6m/s.
6. Manning's Roughness Coefficient of 0.013 shall be used for design sewers and service connections. Manning's Roughness Coefficient of 0.015 shall be used for forcemains and outfalls.
7. Manholes shall be designed to incorporate a minimum elevation differential of 30mm wherever a horizontal deflection exceeding 45 degrees occurs and 5mm where it is straight run. These elevation differentials are in addition to the normal grade of the lateral sewer.
8. Pumping stations and treatment disposal works shall be designed to process peak sewage flow plus peak I&I calculated as set out in section sewage flows section of these standards. Bypassing of works to disposal shall not be allowed except under emergency conditions.

2.6. Piping

1. Lateral Sewers

No lateral sewer shall be less than 200mm in diameter, unless the sewer is the final section of a lateral that cannot be extended, in that case, under the approval of the RDN a pipe 150mm in diameter may be used providing that it meets the hydraulic needs of the sanitary sewer.

2. Service connections

Service connections shall be minimum 100mm in diameter. Service connections serving more than one dwelling unit shall be minimum 150mm in diameter or sized in accordance with design flows and available grades.

No service connection shall exceed 15m in length measured horizontally between the lateral sewer and the property line without the approval of the Regional District. If a service greater than 15m is approved by the Regional District, a cleanout facility must be provided as shown on the standard detail drawing for service connection.

Water service and sewer services in a common trench shall be in accordance with the requirements of the Vancouver Island Health Authority.

3. Depths

Depths of all sewers shall be such that all basements in the area the sewer is intended to serve can be drained by gravity. Lift stations from individual homes will be acceptable as depicted generally in the Lakes District Infrastructure Phasing Drawing appended to this addendum. There may be other areas that will be serviced by individual lift stations subject to the Approval of the RDN.

Minimum cover on services shall be 0.75m.

Where minimum cover cannot be provided, an explanation of the reasons shall be submitted to the RDN with the proposed method of protecting the pipe.

Excessively deep service inspection assemblies should be avoided. Where standpipes are more that 1.8m in depth, the standpipes shall be constructed in two or more sections, each having a length not exceeding 1.8m.

4. Curved Sewers

Wherever possible, curved alignment shall be avoided.

Horizontal curves may be permitted where the configuration of the right of way permits curvature at a constant offset, where the velocity in the pipe exceeds 1m/s and where grades of 1% or greater are available. Tracer wire is required on all sewers with horizontal curves.

Vertical curves may be permitted where excessive depths or rock cuts are to be avoided or energy dissipation is needed.

Radius of curvature for PVC sewers to 250mm diameter shall be uniform throughout the curves by bending pipe barrel plus joint deflection to 2 degrees maximum and shall not be less than 60m or the manufacturer's minimum pipe radius, whichever provides a greater radius of curvature. PVC pipes 300mm diameter shall be deflected only at pipe joints to 2.5 degrees maximum, and 350mm diameter and larger pipes at pipe joints to 1.5 degree maximum. Miter bends are not to be used unless approved by the RDN.

Horizontal curves will be permitted for the gravity sewer along the eastern side of Enos Lake and in the park areas where sewers are approved. Curves radii are to be at or larger than manufacturers specifications. Vertical grades are to be chosen such that velocities must be equal to or exceed 1m/s (for max day flows at full build out).

Compound horizontal curves are not permitted between manholes.

Horizontal and vertical may be permitted in the same run.

Concrete pipe shall not be curved horizontally or vertically.

5. Manholes

In general the distance between manholes shall not exceed 150m, unless approved by the RDN. If approved by the RDN the maximum distance between manholes my be increased to 250m.

Manholes shall be located at grade and alignment changes, at lateral size changes, at the upstream end of all lateral sewers, at the junctions of all lateral, at regular spacing not exceeding the maximum allowable, sewers and at service connections larger than 150mm in size.

Cleanouts may be substituted for manholes at the upstream end of lateral sewers where no further extension of the sewer main is anticipated.

Where the difference between the incoming and outgoing invert exceeds 600mm, a drop manhole shall be used. See the standard detail drawings for drop manhole details. Differences between 150mm and 600mm should be avoided. Inside drop manholes with a minimum barrel size of 1200mm as shown in drawing the standard detail drawings, may be permitted for new construction of drops between 900mm and 2000mm and upon the approval of the RDN.

Manholes shall be constructed in a manner that prevents water from infiltrating into the manhole.

Where cast in place manholes are proposed, an explanation of the reasons shall be submitted to the RDN with the proposed design and construction method. Only ready mix concrete, 20 Mpa at 28 days shall be used.

Manholes shall be located so that the manhole covers are not located in the wheel paths of vehicles, in gutter lines, curbs or sidewalks.

Manholes located in untraveled areas shall have a 1m asphalt apron which slopes away from the manhole rims at 2%.

A watertight manhole frame and cover shall be required for all sewer manholes located in areas which flooding can occur.

Precast manhole bases shall be sized according to the following table

Pipe Size (mm) (Nominal)	Depth of Manhole (m) (Top of Cover to Inv.)	Barrel Size (mm) (Inside Diameter)
150-375	**0 - 5.9**	**1050**
150-375	**6-9**	**1200**
150-600	**9 or deeper**	**1500**
400-600	**0-8.9**	**1200**
675 – 1050	**All depths**	**1500**

6. Manhole Platforms

Manhole platforms are generally not required. Design of manholes shall consider use of appropriate safety equipment.

A cage, well or ladder safety device shall be provided where the length of climb is greater than 6 metres.

If platforms are necessary, ladders shall meet the following requirements:

(a) The ladder shall consist of multiple sections.
(b) Each section shall be horizontally offset from adjacent sections.
(c) A landing platform shall be provided within the length of climb.
(d) Refer to the Standard Drawings for manhole platform details.

7. Location of Sewers

Wherever possible, sewers shall be located on the high side of the street where only the high side is served by the lateral and on the low side of the street where both sides are served by the lateral. Wherever possible the sewer shall be located on the opposite side from the watermain and at a constant offset from the property line or paved roadway.

Sanitary lateral sewers shall be located at least 3.0m horizontally and 0.45m vertically from water pipes unless approved by the Vancouver Island Health Authority and all joints are suitably coated and wrapped.

Sanitary sewer mains may be installed in a common trench with storm sewers provided the minimum outside pipe separation is 300mm.

8. Utilities in Private Lands

The design of utilities shall avoid crossing private lands as much as possible.

Utilities crossing private lands shall generally be offset a minimum 1.5 metres from the property boundary unless otherwise approved by the Regional District.

Appurtenances such as manholes, valves ect. shall not be located on property boundaries.

Utilities shall not cross private lands in such a manner that they render the property unusable and generally be located beyond the normal building envelope allowed by zoning. Special considerations must be given to ensure the location of the utility crossing minimizes the limitation on the future use of the property.

The minimum width of the right of way shall be 3m for single pipes and 4.5m for two pipes installed in a common trench.

9. Siphons

Where a siphon (i.e. inverted sewer, depressed sewer) is required to carry flow under an obstruction such as a stream, the following criteria shall be applied to the design:

(a) All siphons shall be multiple pipe structures.
(b) A cleansing velocity of 0.6 to 0.9 m/s shall be reached at least once a day in the primary pipe even during the first years of operation.
(c) The total system shall be sized to accommodate the ultimate design peak flow.
(d) A 1200mm diameter manhole shall be provided on both ends of the siphon.
(e) Each manhole on the siphon shall be provided on both ends of the siphon.
(f) There shall be no high points in the siphon between manholes.
(g) There shall be no acute bends in the siphon.
(h) There shall be no change of pipe diameter between manholes.
(i) The primary pipe shall be minimum 200mm in diameter wherever possible.
(j) All siphons shall have a separate debris sump manhole upstream of the siphon. The debris sump shall be designed to allow easy access for maintenance and cleaning and shall be suitably vented.

2.7. Pumping Stations

This section applies to all municipal owned and operated sanitary sewer pumping stations. Properties serviced by individual sewer pumps shall be connected to the municipal sewer system by a gravity service connection from the property line to the municipal sewer system.

This section is intended as a guide for general requirements for a pumping station. All pumping station designs shall be developed using good engineering practice with the input of the Regional District of Nanaimo.

Sanitary sewer pump stations shall only be permitted at locations where gravity connections from an existing or proposed trunk sewer cannot be provided.

1. General Design Criteria

Pump station size and configuration shall accommodate ultimate sewage flows.

Pumping stations shall be designed and constructed using materials recognized for quality in the sanitary sewer industry.

Pumping stations shall be fully automatic in normal operation, and fully compatible with the Regional District of Nanaimo's telemetry system. Specifics of SCADA systems shall be coordinated with the Regional District of Nanaimo during the pre-design stage.

All stations shall have a wet well capacity providing not more than 12 hours of storage at minimum design flows and a frequency of pump start –up of not less than 5 minutes at peak flows.

No overflow of sewage shall be permitted. Pumping stations shall have emergency backup systems to prevent sewage overflows during a mechanical or electrical failure.

4 complete (3 paper and 1 digital) sets of operational instructions, maintenance manuals, emergency procedures, parts lists, as-built engineering drawings, shall be submitted to the Regional District of Nanaimo upon completion of the pump station.

Current and future service requirements shall be evaluated with the electrical and phone utility companies.

Buildings shall have gutters on all four sides of the roof.

Pump station buildings shall be BC Hydro green in colour.

2. Pumps and Equipment

As a minimum, pumping stations shall be equipped with alternating duplex pumping units. One pump shall be equipped with a flush valve.

Duplex pump arrangements shall be designed for each pump providing 100 percent standby at peak flow.

Individual pump motors shall be equipped with hour meters and pump run indicator lights.

All pumping units to be grinder or vortex pumps capable of handling a 75mm solid, without clogging.

All piping and valves shall have a minimum of 100mm diameter.

Minimum pump run time shall not be less that 2.5 minutes or as recommended by pump manufacturer; whichever is greater.

Each sewer pump shall be provided with its own individual pipe connection to the wet well.

A concentric increaser shall be provided on the pump discharge followed by a check and gate valve.

Check valves on discharge lines shall be ball type.

The desirable velocity at the discharge point at maximum pump discharge is from 1.8 to 2.5 metres per second.

3. Controls

Stations shall be equipped with high and low level alarm, security alarm, power fail alarm and general alarm (for motor overload, temperature, and moisture alarms if so equipped.) Also, a level transducer probe and data logger, suitable to the Regional District, shall be installed in the wet well.

Manual operation of all pumps by push-button control shall be possible for checking the operation and for drawing down the wet well. Manual operation shall bypass the low water cutout but not the low water alarm.

Wiring for the control panel shall be underground from the hydro pole to the control panel kiosk.

Alarms shall have audio & visual alerts at the pumpstation.

Stations with submersible pumps shall have the motor starters and controls located in a factory assembled free-standing unit control centre located at ground level on a concrete pad.

Stations with non-submersible pumps, shall have the pump motors and controls located in a ventilated, heated, lighted and dehumidified area.

Name plates, approved by the Regional District, shall be supplied on the pump's control enclosure components and other operating components to indicate to the operator the purpose of the component or the operating routine applying to the component.

An isolation switch for each pump shall be located within sight of a service man working inside. Switches shall function by breaking the pump control circuit, thereby isolating the main power at the control panel.

Relays are to be used in conjunction with level controls.

An electrical panel heater and thermostat shall be installed inside all control panels.

The control panel kiosk shall be aluminum.

The control panel shall include an extra 110 volt, 10 amp, duplex receptacle, complete with cover, for operation of small electric tools. It shall be separately fused within the control panel.

4. Standby Power

The onsite provision of a standby power generator will be decided on a site specific basis by the Regional District . If the Regional District decides that permanent standby power facilities are not needed for the specific pump station, the pump station shall be equipped with a generator receptacle matching the Regional District style.

5. Pumping Station Chamber

The control panel and non-submersible pump motors shall be located in one above-ground enclosure unless otherwise approved by the Regional District.

The below grade chamber shall be reinforced concrete construction or as approved by the Regional District.

Concrete pump chambers shall have a 1 to 1 slope benching around the base perimeter.

Exterior concrete walls shall be tar-coated to prevent leakage.

The chamber above grade shall be designed to harmonize with the surroundings, shall be of fireproof construction and have no windows.

Chamber access shall be in accordance with the latest WorkSafe BC Regulations.

Equipment guards and rails for floor openings shall be provided.

Independent mechanical ventilation shall be provided by explosion proof exhaust fans for the dry and wet chambers where applicable. If the ventilation system is intermittent rather than continuous, the electrical switches shall be interconnected with the station lighting system. Ventilation interconnected with the station lighting system shall have sufficient capacity to exchange the total volume of air inside the station with fresh air within 3 minutes. All vents lines shall have screened openings to prevent the entrance of rock or other foreign matter. Air flow in fans shall be fresh air to wet well with second vent out for discharge.

Dry well stations shall include a sump and sump pump for the interior of the dry well with discharge above the top water line in the wet well.

The entrance to the station shall be waterproof and supplied with a lockable door complete with security alarm.

Where the entire station is underground, the entrance shall not be more than one metre above the surrounding finished grade.

6. Sitework and Lighting

A 25mm water service connection, complete with an approved backflow prevention device, shall be provided in the station designed in accordance with the AWWA Cross-Connection Control Manual.

The pumping station and appurtenances shall be within a porous paved surface or approved gravel which provides for the turning movements. A minimum turning grade of 12.8 metres, shall be used to determine turning movements. A minimum of 3.65 metres in width is required for access to all equipment. Approved landscape screening shall be provided.

Storm drainage from the site shall be self-contained.

Adequate protection shall be provided to prevent vandalism and vehicular damage and to protect public safety. Requirements may include fencing, non-mountable curbs and/or traffic bollards.

High pressure sodium, dark sky compliant, lighting shall be provided unless other wise approved by the Regional District. Backup lighting connected to the standby power supply shall be provided in case of a power failure.

7. Forcemains

All forcemains shall be designed so that the minimum velocity is 0.6m/s and a detention time not exceeding 12 hours during ADWF.

Forcemains shall be designed without high points unless otherwise approved by the RDN. If approved, an air-relief valve shall be provided at high points in the line, meeting RDN requirements.

Thrust blocks shall be provided at all bends as required.

Cleanouts (blowdowns) shall be supplied at all low points of forcemain.

Flushouts shall be located at the terminus end of all pressure sewer mains leading to manholes or pump stations.

3. CONSTRUCTION

3.1. General

1. Access Roads

Temporary roads shall be constructed as required for access to the working areas. Adequate drainage facilities in the form of ditches, culverts, or other conduits shall be installed as found necessary to maintain these roads. In the construction of access roads, existing drainage facilities, natural or otherwise, shall not be disturbed to the detriment of properties outside the working area and such facilities shall, unless otherwise provided elsewhere in the specifications, be restored to their original condition on completion of the work.

2. Sanitary Facilities

Clean, sanitary latrine accommodations shall be provided and shall be located and maintained in accordance with the regulations of VIHA.

3. Special Tools, Operating Manuals, Shop Drawings

With each piece of mechanical and electrical equipment or machinery having wearing parts and requiring periodical repair and adjustment, all special tools, wrenches, and accessories required for removing worn part, making adjustments, and carrying out maintenance shall be supplied. All gauges, indicators, and lubricating devices necessary for the proper operation of the equipment shall be furnished.

With each piece of equipment, 4 sets of operating manuals and as-constructed shop drawings shall be supplied. The manuals shall provide the manufacturer's recommended maintenance schedules with the grades of lubricants required, and instructions as to how the equipment may be taken apart for periodical inspection and replacement.

4. Blasting

Blasting will be permitted only after securing the approval of the applicable authorities. Blasting will not be carried out without first verifying that insurance covers any loss of life or damage that may result from this work. The Regional District, in granting approval for blasting, does not in any way assume responsibility for injury, loss of life, or damage that result there from, and such approval shall not be construed as approval of the methods employed in blasting, the sole responsibility therefore being that of the applicant.

5. Site Maintenance and Clean Up

The working area shall be maintained in an orderly manner and shall not be encumbered with equipment, materials, or debris.

Clean up shall be a continuing process from the start of the work to final acceptance of the project. Property on which work is in progress shall at all times be kept free from accumulations of waste materials or rubbish. Accumulations of waste materials, which might constitute a fire hazard, shall not be permitted. Spillage from hauling vehicles on traveled public or private roads shall be promptly cleaned up. On completion of construction, all temporary structures, rubbish, and waste materials resulting from the operations, shall be removed.

6. Erosion and Sediment Control

An Erosion and Sediment Control Plan shall be submitted for review and approval seven days prior to the pre-construction meeting. The Erosion and Sediment Control Plan shall describe the proposed methodology to minimize potential impact on the surrounding environment. The Erosion and Sediment Control Plan shall indicate how the Contractor plans to control sediment discharges from the project and what measures will be put in place to prevent damage to aquatic habitat located downstream.

The work shall be carried in compliance with the submitted and approved Erosion and Sediment Control Plan and all other environmental laws affecting the work and with the recommendations contained in the most recent edition of the "Land and Development guidelines for the Protection of Aquatic Habitat" published jointly by the Ministry of Land, Water, and Air Protection and Fisheries and Oceans Canada.

For the erosion and sediment control plan, 'environmental laws' means all statutes, regulations, orders, and bylaws relating in any way to the natural environment or its ecosystems, public or occupational health, transportation, storage or handling of contaminants or hazardous materials.

3.2. Existing Structures and Utility Works

1. Scope

Existing structures shall be interpreted as being all existing pipes, ducts, ditches, or other works forming a part of sewerage, drainage, water, telephone, electrical, gas, or other utility system, as well as sidewalks, curbs, poles, fences, buildings, and other man-made things that may be encountered during construction.

2. Material Supply

Unless otherwise specified, materials supplied for replacement of existing structures shall be at least equal to those being replaced.

3. Location of Structures

Drawings or descriptions, verbal or otherwise, of existing structures or their location that are supplied by the Regional District are intended only as an aid to locating these structures. Measurements and location of the existing underground structures shown on the drawings are not guaranteed to be accurate, and must be verified prior to proceeding with construction.

4. Protection of Structures

Unless authorization from the Regional District is received for their removal, underground and surface structures encountered during construction shall be protected from damage. In the event of damage resulting from the construction operation, structures shall be repaired or replaced to a condition, which is at least the equivalent of that which existed prior to construction.

5. Emergency Situations

In emergency situations resulting from the construction operation, where life or property are endangered, the applicant shall immediately take whatever action is possible to eliminate the danger, and shall also notify the Regional District of the situation.

6. Access Maintained

Existing hydrants, valves or control pit covers, valve boxes, curb stop boxes, fire or police call boxes, and all other utility controls, warning systems, and appurtenances thereof shall not be made inaccessible at any time by the construction work. Bridges, walks, or other temporary facilities shall be provided as may be necessary to ensure that these controls or warning systems are free for use in their normal manner at all times during construction.

7. Curtailment of Utility Service

Where existing utilities such as water, sewer, electricity, telephone, and gas are serving the public, work shall be planned and executed such that there is no curtailment of service provided by these utilities without prior receipt of approval of the authorities responsible for provision and maintenance of these utilities. The applicant shall obtain the above approvals from the recognized authorities controlling these utilities. If approval for such disruption of utility service is not granted, it may be possible to establish temporary facilities to provide continuous utility service during the course of construction. Such temporary facilities shall only be implemented after receiving the approval of the utility authority.

If approval is received to temporarily shut off an existing utility, individual users of the utility shall be notified at least one hour prior to the time of shut-off.

8. Support of Structures

Existing structures shall be protected against damage from settlement by means of timber support of compaction of backfill as required. Where necessary, timber support shall remain in place following backfill of excavations.

Backfill which is placed under or adjacent to the existing structures, which have been undermined during excavation, shall be compacted in a manner which will prevent damage of the structure from settlement. Such backfill shall be of approved granular material suitable for compaction.

On existing piping, this material shall extend horizontally a minimum distance of 600 mm on both sides of the pipe at a level 300 mm above the pipe, and shall slope down from this point at 1-1/2 horizontal to 1 vertical to meet the bottom of the excavation.

9. Drainage Facilities

Existing culverts, enclosed drains, flumes and ditches, and other drainage structures affected by the work but left in place shall be kept clear of excavated material at all times during construction. When it is necessary to temporarily remove an existing drainage structure, suitable temporary ditches or other approved means of handling the drainage shall be provided during construction.

3.3. Clearing

Prior to clearing, the exact limits of the areas on which clearing may take place and whether or not there are restrictions placed on clearing which would result in leaving certain trees, structures, or other existing items in place shall be ascertained.

Prior to trenching, the right-of-way shall be cleared of all standing or fallen brush, timber, stumps, or other debris, which may obstruct the construction operation, damage the completed installation, or detract from the appearance of the site on completion of construction. This material shall be burned or otherwise disposed of to the satisfaction of the Regional District.

The restrictions of all authorities established to control burning in the area shall be complied with. If burning cannot be done on the clearing site, the material shall be hauled to an approved location for burning or disposal. Burning permits, as required, shall be obtained by the applicant.

3.4. Trench Alignment and Depth

Following clearing and prior to excavation of the trench, the location at which the pipe shall be installed shall be established by setting appropriate survey control. As a minimum this shall include marking of the manholes and any horizontal or vertical curves in the pipe, with suitable elevation data provided. A laser should typically be used to maintain grade during pipelaying, and for all grades of 2% or less.

Where pipe is to be installed to a predetermined grade, a cut sheet will be provided showing the depth of the pipe invert relative to the grade stake elevation at the respective locations along the pipeline.

The trench shall be excavated so that pipe can be laid to the established alignment and depth, with allowance made for specified trench wall clearances and bedding as shown in the standard drawings of this Schedule for various conditions, or otherwise required.

All trenching and excavations shall be carried out in the manner recommended by the Workers' Compensation Board of British Columbia, or as may be necessary to protect life, property, and structures adjacent to the work and the work itself.

3.5. Trench Backfill

Trench backfill shall be carried out as shown in the standard drawings of this Schedule for various conditions.

3.6. Pipe Bedding

1. Granular material for pipe bedding within the pipe zone shall be sand or clean gravel or crushed rock, evenly graded from coarse to fine, and conforming the following specifications and gradations limits:
2. The standard trench section is shown in the standard drawings of this Schedule for various conditions. The nominal minimum depth of cover shall be 1.5 m in traveled areas and 1.0 m in untraveled areas unless otherwise permitted by the Regional District. Water mains shall be located not less than 3 m centre-to-centre from all sanitary lines, unless otherwise permitted by the Regional District and the Vancouver Island Health Authority.

3. Bedding material shall conform to the following gradation limits:

Gradation Limits

(Percent by Weight Passing)

Sieve Designation	Type 1	Type 2
19.0 mm	100	90-100
12.5 mm		65-85
9.5 mm	85-100	50-75
4.750 mm	70-100	25-50
2.36 mm		10-35
1.18 mm	20-65	
0.850 mm		5-20
0.6 mm	0-45	
0.425 mm		0-15
0.18 mm		0-8
0.15 mm	0-10	
0.075 mm	0-5	0-5

4. Type 1 is the standard acceptable bedding material. Type 2 shall be used where specified by the design engineer to meet special design loading. Dry sieve analysis shall be carried out in checking material gradation.

5. Other acceptable bedding materials, for use only where shown on the construction drawings or as approved by the Engineer, are drain rock, pea gravel or native material. In rock, pipe zone shall have filter fabric between rock and bedding material. Filter fabric shall be non-woven, minimum grade Armtec 200 or equivalent.

6. The bedding material shall cover the full width of the trench bottom and have a minimum depth of 100 mm on completion of compaction. In rock excavation the minimum depth of bedding below the pipe shall be 150 mm after completion of compaction.

7. Bedding material shall be compacted in maximum 150 mm lifts to 95% of Modified Proctor Density (ASTM D1557). Side tamping shall be carried out with bedding material placed to the pipe springline, to provide haunch support.

8. Bedding material shall be placed in such a manner that the pipe is evenly supported throughout its length by the pipe bedding material.

9. Placement and compaction of the bedding material shall not damage or displace the pipe.

10. Bedding material shall be leveled across the full width of the trench to an elevation of 300 mm above the crown of the pipe.

3.7. Repairs

Any system approved and built to these standards which requires maintenance work, shall be repaired with materials and construction methods conforming to the specifications contained herein.

3.8. Pipes and Fittings

The size and type of the pipe to be used are to be shown on the design drawings.

Only the pipe types listed in this section shall be used for lateral sanitary sewers or services.

Pipe shall be installed in strict accordance with all of the manufacturer's recommended practice.

All products used shall conform to the Regional District of Nanaimo's Approved Product List.

1. <u>Polyvinyl Chloride (PVC) Pipe, Lateral Sewers</u>

(a) PVC pipe shall be DR 35.

(b) Pipe and fittings shall be manufactured to the following standards:

- 100mm to 375mm ASTM D3034 and CSA B182.2
- 450mm to 675mm ASTM F679 and CSA B182.2

(c) All PVC sanitary gravity main pipes should be green in colour.

(d) Sanitary sewer main pipe, fittings and service connections shall be joined with a rubber gasket or other preformed, factory manufactured gasket or approved material designed for use with the specified pipe. Solvent connected joints and fittings will not be permitted.

2. <u>Polyvinyl Chloride (PVC) Pipe, Service Pipes & Fittings</u>

(a) PVC pipe of 100 mm pipe diameter shall be DR 28.

(b) Services larger than 100mm shall be as specified the same as lateral sewers.

(c) All sanitary services 100mm in diameter shall be white.

(d) Service connections to be PVC mainline pipe shall be made with PVC fittings manufactured to ASTM D3034, CSA 182.1 and CSA 182.2.

(e) The use of saddles instead of manufactured wye fittings shall require approval of the RDN.

3. <u>Polyvinyl Chloride (PVC) Pipe, Pressure Pipe</u>

(a) Pipe shall be white in colour.

(b) Pipe and fittings shall be manufactured to the following standards:

- 100mm to 300mm AWWA C900 and CSA B137.3
- 350mm to 900mm AWWA C905 and CSA B137.3

(c) Pipe shall be compatible with mechanical and push-on joint fittings and valves without the use of special adapters.

(d) Pipe shall include push-on integrally thickened bell and spigot type joints conforming to ASTM D313.9 with single elastomeric gasket conforming to ASTM F477.

4. <u>High Density Polyethylene (HDPE) Pipe (Smooth Profile)</u>

(a) Pipe shall conform to CGSB 41-GP-25M. Pipe material shall conform to ASTM D1248 Type III, Class C, Category 5, Grade PE 35-10

(b) Minimum Acceptable pipe class shall be DR 26 with a hydrostatic design stress of 10MPa.

(c) HDPE pipe used for pressurised applications shall be a minimum pipe class of DR21.

(d) All pipe shall bear the pipe series designation and manufacturers name.

(e) Fittings for HDPE, if required, shall be detailed and manufactured by the pipe manufacturer. Mitre bends shall be fibreglass reinforced. Fittings shall have a pressure rating at least equal to that of the pipe it is being joined.

(f) Pipe may be deflected up to the manufacturer's recommended minimum radius. Deflected pipe may be used instead of manufactured or mitred bends.

(g) Joints shall be by thermal butt-fusion and constructed in accordance with the manufacturers specifications.

(h) Flange joints shall be used to join long sections of butt joined pipe or as shown on the design drawings.

(i) Flanges for HDPE pipe shall be slip-on type installed in conjunction with stub ends supplied by the pipe manufacturer. The flanges shall be class 150 meeting ANSI B16.5 drilling dimensions. Flanges shall be carbon steel.

(j) All flanged joints shall be separated by a neoprene gasket bonded to one of the flange faces. Neoprene for flange gaskets shall be 3mm thick with holes drilled fro flange bolts and size equal to flange diameter.

(k) Bolts and nuts for flanges shall be hot dipped galvanized.

(l) HDPE pipe shall only be used where approved by the RDN.

5. <u>Concrete Pipes</u>

(a) Concrete pipe should only be used for sewer mains larger than 450mm in diameter.

(b) Concrete pipe should be reinforced, ASTM C 76 Specification.

(c) Lifting holes in concrete pipe shall be plugged with prefabricated plugs in non-shrink grout or other plugs recommended by the pipe manufacturer.

(d) Concrete pipes shall have every joint grouted.

(e) Testing for concrete pipes shall be carried out hydraulically. Air testing will not be permitted.

6. <u>Ductile Iron Pipes (DI)</u>

(a) Ductile iron pipe may be used with the specific approval of the Regional District.

(b) Soil corrosion survey will be required, and suitable corrosion protection measures installed.

(c) Testing for ductile iron pipes shall be carried out hydraulically. Air testing will not be permitted.

3.9. Manholes

1. Manhole Sections

(a) Unless otherwise approved, all manhole sections shall be precast reinforced concrete in accordance with ASTM C478.

(b) All precast sections shall be complete with ladder rungs as the manhole steps section listed below.

(c) O-ring rubber gaskets shall be placed between Manhole sections. The O-ring rubber gaskets shall conform to ASTM C443.

(d) The inside surface of the precast barrel at the O-ring joints shall be filled with cement grout to a smooth finish.

(e) Precast manhole barrel sections shall be placed plumb.

2. Manhole Bases

(a) All manhole bases are to be precast unless otherwise approved.

(b) Manholes bases shall be constructed so that the first section of a precast base can be set plumb with a uniform bearing pressure throughout its circumference.

(c) Precast manhole bases shall be placed on 150mm thick base of 40mm drain rock.

(d) Precast manholes and Cast-in-place manhole bases shall conform to the applicable standard drawings.

(e) Cast in place manholes or connections to existing manholes shall utilize a rubber adaptor ring to seal the connection.

(f) If the material at the bottom of the trench is unsuitable for support, the bottom shall be over excavated to a firm base, and backfilled with base gravel and thoroughly compacted.

3. Manhole Tops

Manhole tops shall be flat slab, precast concrete. Tops shall be reinforced to meet H20 loading conditions. Precast tops shall conform to ASTM C478 with approved offset opening for frame and cover.

4. Manhole Covers and Frames

(a) Covers and frames shall be cast iron and certified to meet H20 loading requirements.

(b) Covers and frames shall conform to the standard drawings.

(c) Covers shall have "RDN SANITARY SEWER" permanently embossed on the cover.

(d) Utility chamber manhole frame and cover shall conform to the standard drawings.

(e) A watertight manhole frame and cover, if required shall conform to the standard drawings.

(f) Covers located in statutory rights-of-way shall be permanently embossed with the additional wording "DO NOT COVER".

(g) Frames shall be set on precast concrete grade rings to bring the cast iron manhole frame to grade as shown on the drawings.

(h) In unpaved areas, covers shall have a 1m circular 50mm thick asphalt apron sloping away from the manhole cover at a minimum grade of 2%.

(i) In paved areas covers shall not protrude above the finished pavement.

(j) In streets manhole covers shall not be placed in the wheel paths of vehicles.

5. Manhole Steps

(a) Steps shall conform to ASTM C478 for manhole steps, they shall be 19mm either hot dipped galvanized cold rolled steel or aluminum alloy.

(b) All steps shall be complete with approved polyethylene anchor insulating sleeves and installed in 25mm to 26 mm precast drilled holes in a manhole section.

(c) Distance between manholes steps shall be maximum 400 mm, with the first manhole step being a maximum 500mm from top of the manhole. Manhole steps shall conform with the most up to date Worksafe BC's standard *G13.2(1)(b) Ladders in manholes*.

(d) Manhole steps shall be installed 75mm into the manhole section wall.

6. Manhole Platforms

(a) Manhole platforms are generally not required. Design of manholes shall consider use of appropriate safety equipment.

(b) A cage, well or ladder safety device shall be provided where the length of climb is greater than 6 metres.

(c) If platforms are necessary, ladders shall meet the following requirements:

- The ladder shall consist of multiple sections.
- Each section shall be horizontally offset from adjacent sections.
- A landing platform shall be provided within the length of climb.
- Refer to the standard drawings for additional details.

7. Concrete for Manholes

(a) The compressive strength of concrete used shall not be less than 20 MPa at 28 days.

(b) All concrete shall contain an air entrainment agent to provide 4% to 6% air content.

3.10. Service Boxes

Service boxes for sanitary services shall be 305 mm x 508 mm Concrete boxes complete with cast iron lid. The lettering shall read "SEWER".

Service boxes shall not be installed, they shall be supplied to the Regional District of Nanaimo's works yard.

3.11. Service Connections

Service connection piping shall be as detailed elsewhere in this standard.

Each service shall have its own independent connection into the main sewer.

Service connections shall have a minimum grade of 2% unless otherwise directed by the Engineer.

Services shall be constructed in accordance with the standard drawings.

Minimum cover for services shall be 0.75m at property line.

In rock, the trench is to be excavated minimum 1m into the property.

Approved watertight caps suitably supported by sandbags to prevent leakage shall be installed on sewer services at the terminus of each service.

A 50 mm x 100 mm wood marker stake shall be placed at the end of the service connection. The stake shall be painted red with the depth to invert of service to the nearest 0.01m marked. The wood marker stake shall be a minimum 3m from the service box

4. TESTING AND INSPECTION

4.1. Written Reports

The applicant shall submit reports to the Regional District certified by a Professional Engineer of the tests and requirements specified herein.

4.2. Materials Testing

If, in the opinion of the Engineer, testing is required, the Engineer will arrange for a testing firm to carry out tests to determine whether the applicable standards and specifications have been met. Where initial testing indicates inadequacies additional testing may be required by the engineer.

The Contractor as directed by the engineer shall supply specimens or samples for testing.

The types of tests listed below may be required by the engineer unless in the opinion of the Engineer other testing is required.

Joints for sanitary sewer main pipe and fittings and service connection pipe fittings shall be capable of meeting the following exfiltration tests. The Engineer may require that

these tests be carried out by the contractor or his supplier prior to the acceptance of pipe on the project.

(a) Pipes in Proper Alignment:

Not fewer than 3, or more than 5, pipes selected from stock by the Engineer shall be assembled according to standard installation instructions issued by the manufacturer. With ends bulkheaded and restrained against internal pressure, the section shall be subjected to 70 kPa hydrostatic pressure. Pressure shall be maintained for a period of 24 hours. There shall be no leakage at the joints.

(b) Pipes in Maximum Deflected Position:

At least 2 of the joints of the assembly shall be deflected to the maximum amount recommended by the manufacturer. 35 kPa internal hydrostatic pressure shall then be applied to the test section and maintained for a period of 24 hours. Joints shall show no leakage.

(c) Pipes in Maximum Lateral Misalignment:

The test section shall be supported on blocks or otherwise so that one of the pipes is suspended freely between adjacent pipes and bears only on the jointing material. The suspended pipe shall then be loaded on the bell or coupling by a load equal to one-third of the ultimate 3-edge bearing strength required by the applicable ASTM specification, except that pipe having a laying length of more than 1.2 m shall be loaded no more than the amount computed for a 1.2 m length. While under this load, stressed joints shall show no leakage under 35 kPa internal hydrostatic pressure.

4.3. Leakage Testing of Gravity Sewers & Manholes

Leakage test shall be performed by the contractor on all sanitary sewers and service connections, manholes and appurtenances

1. <u>Type of Test</u>:

(a) Leakage testing on gravity sewers shall be tested with low pressure compressed air.

(b) Leakage tests on concrete, ductile iron and HDPE gravity sewers shall be ex-filtration water tests.

(c) Leakage tests on manholes shall be ex-filtration water tests

(d) Testing shall only be carried out after the pipe has been backfilled, and only on completed sections between manholes.

(e) All test results to be witnessed by the Engineer or the Engineer's Representative.

2. <u>Testing Equipment:</u>

The Contractor shall furnish all the necessary testing equipment, including suitable removable watertight plugs and test balls and shall perform the tests in

a manner satisfactory to the Engineer. Testing equipment must provide readily observable and reasonable accurate measurements of leakage under the specified conditions. The Contractor must comply with all Worksafe BC regulations covering the use of air testing, and ensure that safe working practices are used in the application of the test.

3. Leakage Testing with Water:

Ex-filtration Testing:

On an exfiltration test, the test section shall be sealed at the lower extremity by means of a watertight plug. The test section shall be filled with water such that a minimum hydrostatic head of 600 mm minimum head shall be maintained for a period of not less than one hour, and unless excess exfiltration requires further testing, not greater than 8 hours. Pressures in excess of 3 metres water are not recommended. Damage resulting to pipe as a result of testing shall be repaired by the Contractor at his own expense.

Manholes shall be tested for leakage by filling the chamber to the underside of the roof slab with water. Water level shall be rechecked following a minimum time period of four hours. No leakage shall be permitted in manholes.

In areas where the groundwater table is above the sewer invert level, the test shall be increased by a height equal to the distance from the sewer invert level to the water table elevations.

Ex-filtration test sections shall normally have a manhole at both extremities. If, however, sewer grades are such that a test section cannot be terminated at a manhole without placing excess pressure on the pipe or joints, apparatus shall be provided to enable testing without having manholes at the upper and lower ends of a test section.

Gravity sewers, service connections appurtenant structures thereon shall be constructed such that leakage, as evidenced by exfiltration tests, is less than that calculated using the following formula:

$$\text{Allowable leakage in litres} = \frac{HDL}{5200}$$

Where: H = duration of test in hours,

D = inside diameter of the pipe in millimetres, and

L = length of pipe in the test section in metres

The above leakage limit will constitute the total maximum allowable leakage of any test section of gravity sewer. Where service connections exist along the test section, the allowable leakage from service pipe calculated by the use of the above formula will be added to that of the main sewer to arrive at the total allowable leakage unless the elevation of the service connection pipe is greater than the maximum water elevation. No additional leakage allowance will be made for manholes existing along the test section.

The maximum allowable leakage for an ex-filtration test will be that calculated by the above formula regardless of the test head of water employed. Where a section of sewer is found to have leakage exceeding the allowable limit, replacement or repairs shall be made to reduce the amount of leakage to or below the allowable limit. Repaired sections shall be retested until they meet the allowable limit.

All point sources of leakage discovered during the leakage testing shall be made watertight by the Contractor to the satisfaction of the Engineer.

The Contractor shall dispose of the water used for testing in a manner approved by the Engineer.

4. <u>Leakage Testing With Air:</u>

On an air test, the section to be tested shall be plugged at each end and all service laterals, stubs and fittings properly capped or plugged.

Air shall be supplied to the test section slowly, filling the line to a constant pressure of 24.0 kilopascals (kPa). The air pressure inside the pipe shall not exceed 27.5 kPa except in the case where the groundwater level is above the sewer line being tested. In the event of the groundwater level being above the invert, the air test pressure must be increased by 1.0 kPa for each 100 mm of groundwater above the invert.

The air supply is throttled to maintain the internal pressure above 20.75 kPa for a minimum of 5 minutes to stabilize the temperature in the pipe. After stabilization, the air pressure is adjusted to 24.0 kPa, timing commences and the time required for the line pressure to drop to 17.25 kPa is noted.

If the time required to drop from 20.75 to 17.25 kPa is greater than allowable, the test section shall have passed.

For the air test the minimum time allowable is calculated from the following tables:

Time Requirements for Air Testing

PIPE SIZE	TIME	
(Millimetres)	Min.	Sec.
100	02	32
150	03	50
200	05	06
250	06	22
300	07	39

PIPE SIZE	TIME

(Millimetres)	Min.	Sec.
375	09	35
450	11	34
525	13	30
600	15	24

Where various pipe sizes are to undergo the air test, the average size shall be used.

5. <u>Testing of Forcemains</u>

Following final trench backfilling, leakage tests shall be performed on all installed piping.

Leakage tests shall be carried out between valved sections of the installation such that every valve in the system is tested for leakage in the shut-off position.

Leakage tests shall be performed in the following manner. The section to be tested shall be filled with water and all air expelled from the piping. It is recommended that the test section be filled with water for at least 24 hours prior to testing. By pumping water into the test section, the pressure within the piping shall be increased to 0.7 MPa, or 1-1/2 times the system operating pressure at the point of test, whichever is the greater. This pressure shall be maintained constantly in the pipe throughout the duration of the test by the addition of make-up water. The duration of the test section to maintain the specified pressure over the period of test shall be considered to be the leakage.

Piping will not be accepted until the leakage is less than the maximum allowable leakage determined from the following formula:

L = ND x the square root of P in which:

L = the allowable leakage in litres per hour,

N = the number of joints in the test section,

D = the nominal diameter of the pipe in millimetre,

P = the average test pressure during the leakage test in megapascals.

Should any test disclose leakage greater than that specified above, the defect shall be located and repaired, and the section shall be retested to ensure that the leakage is within the allowable limits.

4.4. Cleaning and Flushing

On completion of sewer pipe installation, the pipes shall be cleaned to the satisfaction of the Engineer and the Regional District of Nanaimo.

Sewer lines shall be cleaned and flushed prior to video inspection.

Material displaced from flushing sewer lines shall be collected with a vacuum truck at a downstream manhole. Under no circumstances shall the material be flushed into the downstream system.

4.5. Video Inspection of Sewer Mains

All gravity sewers except services shall be video inspected to check alignment, grade, and condition of the sewer pipe.

1. Video inspections shall be of the following quality:

(a) Camera lens shall be free of grease or other deleterious matter to ensure optimal clarity.

(b) Videos shall be free of steaming and fogging encountered during the inspection.

(c) The camera shall pan to the service connections and pause for at least five seconds.

(d) Illumination depth of field shall be no less than 3 joints for standard joint and spigot pipe types to allow for pipe deflection assessments (9m). No dark circle shall be visible in the middle of this depth of field viewing area.

2. The inspections submission shall include:

(a) A pipe condition report including code descriptions used for describing the condition of the pipe.

(b) Video shall be submitted on a 4.7GB DVD.

The Engineer shall review all videos and certify that the pipe is installed in accordance with these standards and in accordance with the manufactures recommendations.

If directed by the Engineer, the contractor shall arrange for a re-inspection of the pipe at the contractors cost, for the warranty inspection one month prior to the end of the maintenance period.

Video inspection and pipe condition coding shall be undertaken only by personnel with current certification by a Regional District approved agency.

If video inspection does not meet the standards set out here, the contractor shall re-video and re-submit the video at their own cost.

4.6. Inspection

1. The Regional District of Nanaimo shall be given 48 hours notice of all tests.

5. TRANSFERRING THE SEWER SYSTEM TO THE RDN

5.1 Final Inspection by RDN

Prior to requesting a Final Inspection, the registered B.C. Professional Civil Engineer shall submit to the Regional District complete Record Documents, a completed letter Certification of Installed Works, all applicable inspection and test results (video inspection DVD's, leakage testing, etc.), and Certificate of Approval for electrical works (pump stations, wells, lighting, controls, etc.) The Final Inspection shall be arranged by the Professional Engineer on completion of the work. This shall be directed by the Professional Engineer in the presence of approved representatives of the Regional District and the installation Contractor. A complete list of deficiencies identified during the final inspection shall be prepared by the Professional Engineer. Once the deficiencies have been satisfactorily rectified, the Professional Engineer shall so notify the Regional District. The date of the Final Inspection will generally be regarded as the commencement of the guarantee period, unless significant deficiencies critical to the effective operation of the system are found at the inspection, at the discretion of the Regional District.

5.2 Preparation/Execution of Transfer Agreement by Developer

The Developer shall prepare and execute the Transfer Agreement for the works to the Regional District.

5.3 Preparation/Execution of Maintenance Agreement

The Developer shall guarantee the workmanship and the performance of the work as per the Maintenance Agreement, from the date of acceptance (generally the RDN final inspection date) for a period of two years. This shall be additionally secured by way of cash or an irrevocable letter of credit in the amount of 5% of the cost of construction as certified by a B.C. Professional Civil Engineer, or $10,000.00 (whichever is greater).

The RDN may reduce the length of the guarantee period and/or the amount of the security. The RDN may also require additional payment, or payout a credit as appropriate, related to an adjustment of the initial engineering fee to final construction cost values, in accordance with RDN Bylaw No. 1259.03 or most recent amendment. Any change to the guarantee period, security amount or the engineering fee is required to be in writing.

5.4 Preparation/Execution of Latecomer Agreement

Where a latecomer agreement may be applicable to a portion of the costs of the works, as agreed by the Regional District and any other applicable jurisdictions, the Developer shall pay all costs of both the Regional District and the Developer associated with the preparation, execution, and registration of the necessary Latecomer Agreement. The Regional District will assume any internal staff costs involved in planning, reviewing, approving, and administering the Latecomer Agreement preparation, and any administrative and financial costs involved during the effective time-period of the agreement. Based on current legislation, a Latecomer Agreement expires 10-years after its initial registration.

5.5 Letter of Acceptance of the Works by RDN

Following completion of all the foregoing requirements, the Regional District will issue the formal Letter of Acceptance of the Works.

The Regional District will also issue a written statement that the new works can be connected to the District's existing system. Such connection shall be undertaken by the applicant under the direct supervision of the District or by the District at a cost to the applicant.

REGIONAL DISTRICT OF NANAIMO

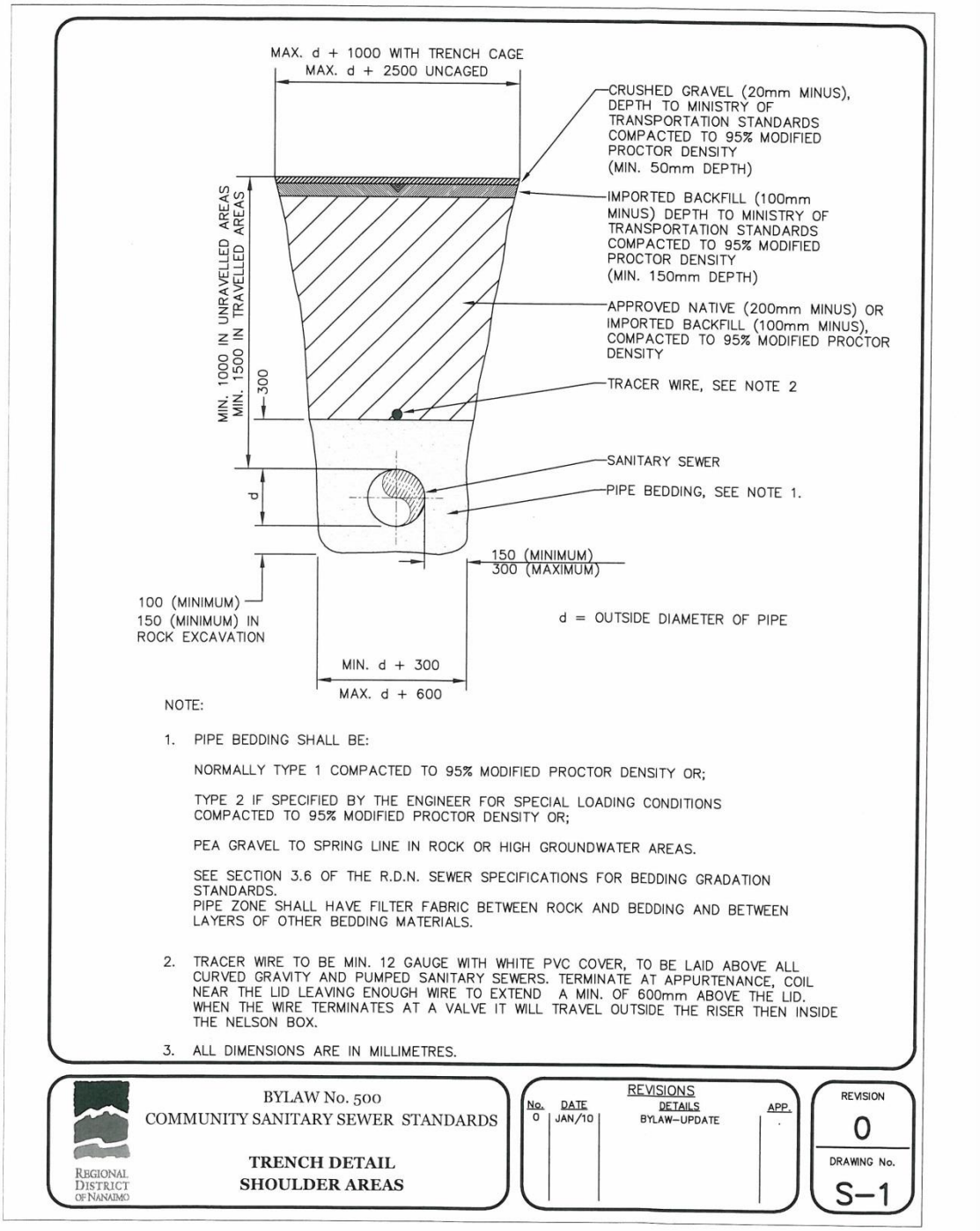
BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

APPENDIX 1

STANDARD DRAWINGS


MAX. d + 1000 WITH TRENCH CAGE
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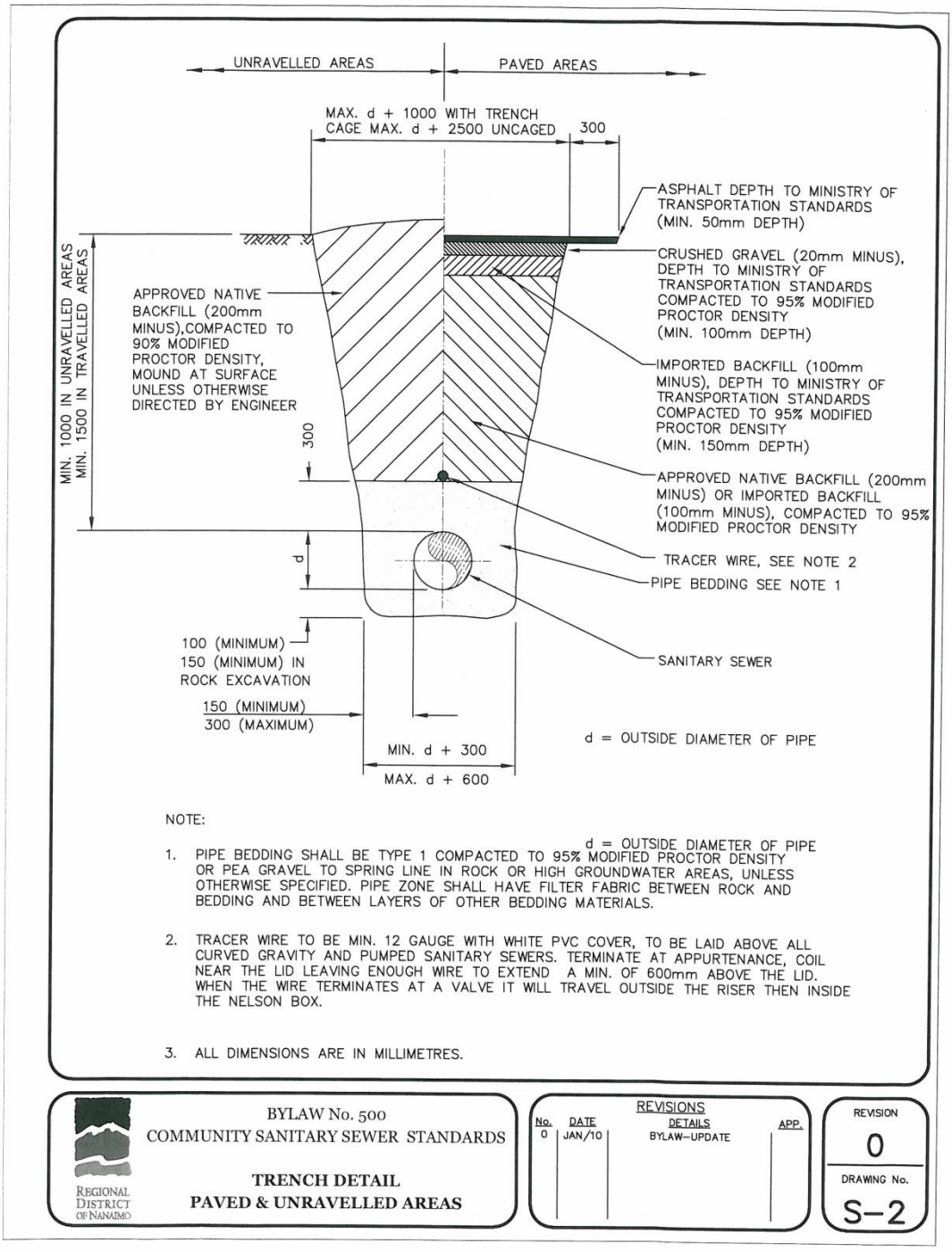
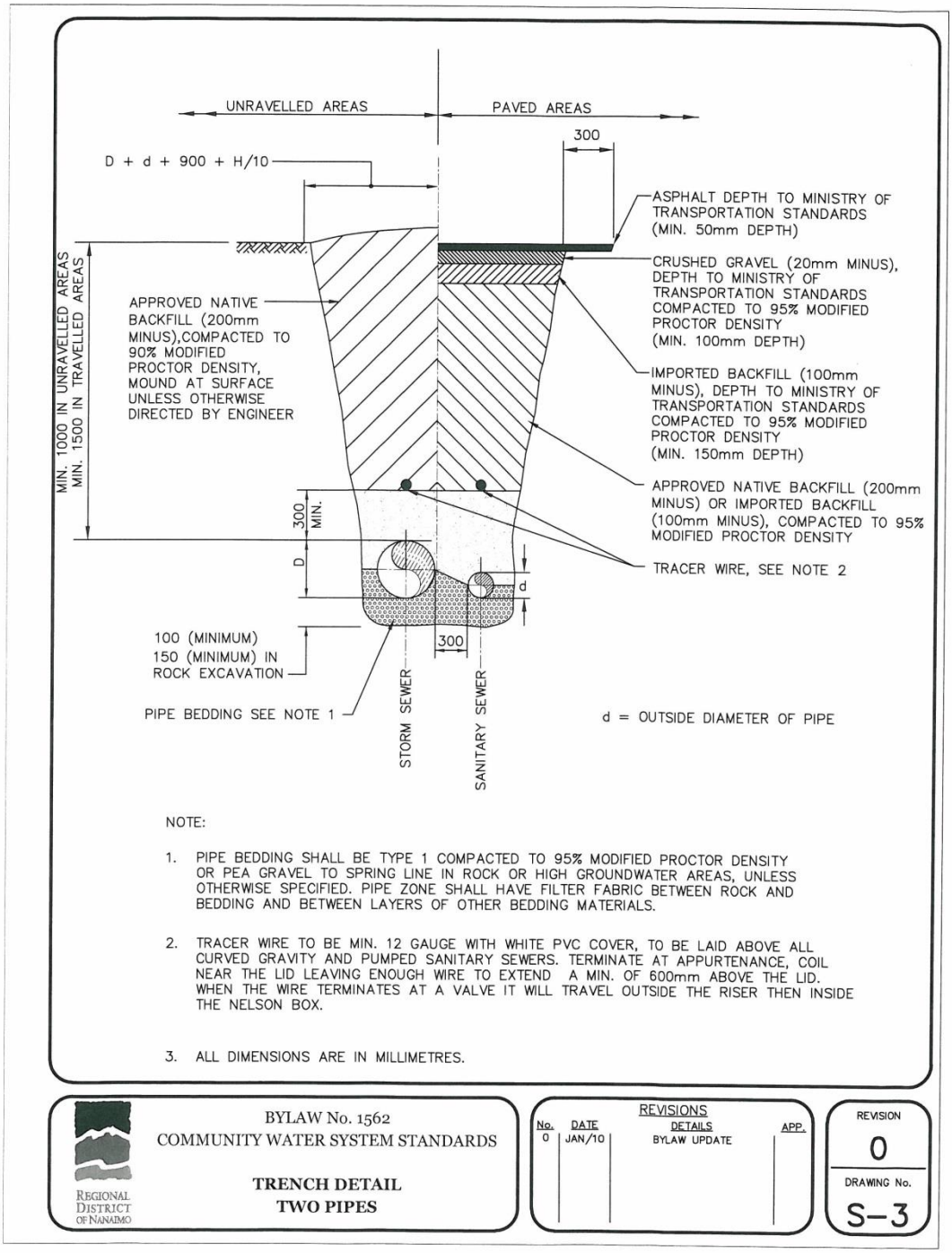
CRUSHED GRAVEL (20mm MINUS), DEPTH TO MINISTRY OF TRANSPORTATION STANDARDS COMPACTED TO 95% MODIFIED PROCTOR DENSITY (MIN. 50mm DEPTH)
IMPORTED BACKFILL (100mm MINUS) DEPTH TO MINISTRY OF TRANSPORTATION STANDARDS COMPACTED TO 95% MODIFIED PROCTOR DENSITY (MIN. 150mm DEPTH)
APPROVED NATIVE (200mm MINUS) OR IMPORTED BACKFILL (100mm MINUS), COMPACTED TO 95% MODIFIED PROCTOR DENSITY
TRACER WIRE, SEE NOTE 2
SANITARY SEWER
PIPE BEDDING, SEE NOTE 1.
MIN. 1000 IN UNRAVELLED AREAS
MIN. 1500 IN TRAVELLED AREAS
300
d
150 (MINIMUM)
300 (MAXIMUM)
100 (MINIMUM)
150 (MINIMUM) IN ROCK EXCAVATION
d = OUTSIDE DIAMETER OF PIPE
MIN. d + 300
MAX. d + 600
NOTE:
1. PIPE BEDDING SHALL BE:
NORMALLY TYPE 1 COMPACTED TO 95% MODIFIED PROCTOR DENSITY OR;
TYPE 2 IF SPECIFIED BY THE ENGINEER FOR SPECIAL LOADING CONDITIONS COMPACTED TO 95% MODIFIED PROCTOR DENSITY OR;
PEA GRAVEL TO SPRING LINE IN ROCK OR HIGH GROUNDWATER AREAS.
SEE SECTION 3.6 OF THE R.D.N. SEWER SPECIFICATIONS FOR BEDDING GRADATION STANDARDS.
PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING AND BETWEEN LAYERS OF OTHER BEDDING MATERIALS.
2. TRACER WIRE TO BE MIN. 12 GAUGE WITH WHITE PVC COVER, TO BE LAID ABOVE ALL CURVED GRAVITY AND PUMPED SANITARY SEWERS. TERMINATE AT APPURTENANCE, COIL NEAR THE LID LEAVING ENOUGH WIRE TO EXTEND A MIN. OF 600mm ABOVE THE LID. WHEN THE WIRE TERMINATES AT A VALVE IT WILL TRAVEL OUTSIDE THE RISER THEN INSIDE THE NELSON BOX.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
TRENCH DETAIL
SHOULDER AREAS
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
DRAWING No. S–1


UNRAVELLED AREAS
PAVED AREAS
MAX. d + 1000 WITH TRENCH CAGE MAX. d + 2500 UNCAGED
300
ASPHALT DEPTH TO MINISTRY OF TRANSPORTATION STANDARDS (MIN. 50mm DEPTH)
CRUSHED GRAVEL (20mm MINUS), DEPTH TO MINISTRY OF TRANSPORTATION STANDARDS COMPACTED TO 95% MODIFIED PROCTOR DENSITY (MIN. 100mm DEPTH)
IMPORTED BACKFILL (100mm MINUS), DEPTH TO MINISTRY OF TRANSPORTATION STANDARDS COMPACTED TO 95% MODIFIED PROCTOR DENSITY (MIN. 150mm DEPTH)
APPROVED NATIVE BACKFILL (200mm MINUS) OR IMPORTED BACKFILL (100mm MINUS), COMPACTED TO 95% MODIFIED PROCTOR DENSITY
TRACER WIRE, SEE NOTE 2
PIPE BEDDING SEE NOTE 1
SANITARY SEWER
APPROVED NATIVE BACKFILL (200mm MINUS),COMPACTED TO 90% MODIFIED PROCTOR DENSITY, MOUND AT SURFACE UNLESS OTHERWISE DIRECTED BY ENGINEER
MIN. 1000 IN UNRAVELLED AREAS
MIN. 1500 IN TRAVELLED AREAS
300
d
100 (MINIMUM)
150 (MINIMUM) IN ROCK EXCAVATION
150 (MINIMUM)
300 (MAXIMUM)
MIN. d + 300
MAX. d + 600
d = OUTSIDE DIAMETER OF PIPE
NOTE:
d = OUTSIDE DIAMETER OF PIPE
1. PIPE BEDDING SHALL BE TYPE 1 COMPACTED TO 95% MODIFIED PROCTOR DENSITY OR PEA GRAVEL TO SPRING LINE IN ROCK OR HIGH GROUNDWATER AREAS, UNLESS OTHERWISE SPECIFIED. PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING AND BETWEEN LAYERS OF OTHER BEDDING MATERIALS.
2. TRACER WIRE TO BE MIN. 12 GAUGE WITH WHITE PVC COVER, TO BE LAID ABOVE ALL CURVED GRAVITY AND PUMPED SANITARY SEWERS. TERMINATE AT APPURTENANCE, COIL NEAR THE LID LEAVING ENOUGH WIRE TO EXTEND A MIN. OF 600mm ABOVE THE LID. WHEN THE WIRE TERMINATES AT A VALVE IT WILL TRAVEL OUTSIDE THE RISER THEN INSIDE THE NELSON BOX.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
TRENCH DETAIL
PAVED & UNRAVELLED AREAS
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
DRAWING No. S–2



NOTE:

1. PIPE BEDDING SHALL BE TYPE 1 COMPACTED TO 95% MODIFIED PROCTOR DENSITY OR PEA GRAVEL TO SPRING LINE IN ROCK OR HIGH GROUNDWATER AREAS, UNLESS OTHERWISE SPECIFIED. PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING AND BETWEEN LAYERS OF OTHER BEDDING MATERIALS.
2. TRACER WIRE TO BE MIN. 12 GAUGE WITH WHITE PVC COVER, TO BE LAID ABOVE ALL CURVED GRAVITY AND PUMPED SANITARY SEWERS. TERMINATE AT APPURTENANCE, COIL NEAR THE LID LEAVING ENOUGH WIRE TO EXTEND A MIN. OF 600mm ABOVE THE LID. WHEN THE WIRE TERMINATES AT A VALVE IT WILL TRAVEL OUTSIDE THE RISER THEN INSIDE THE NELSON BOX.
3. ALL DIMENSIONS ARE IN MILLIMETRES.

REGIONAL DISTRICT OF NANAIMO

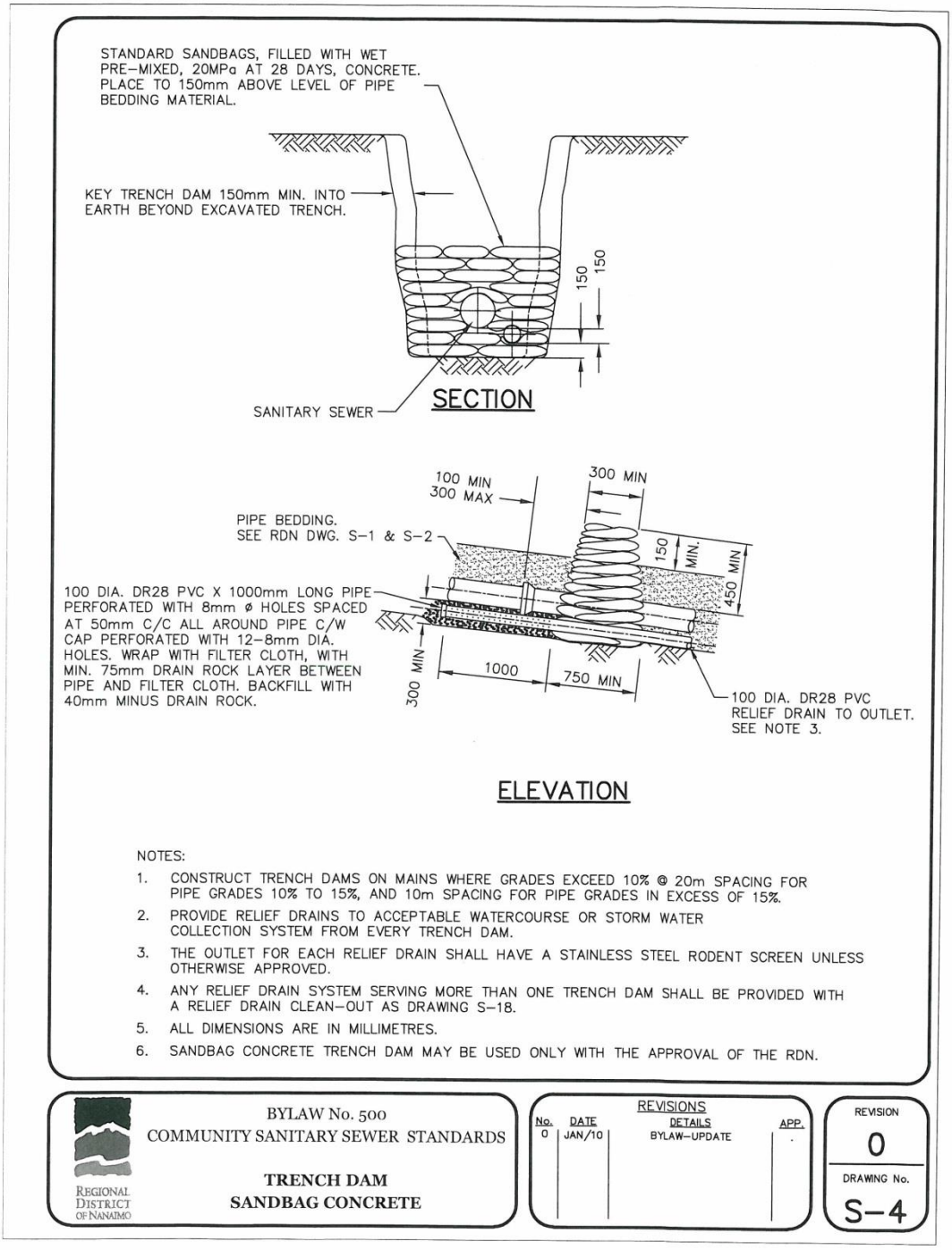
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

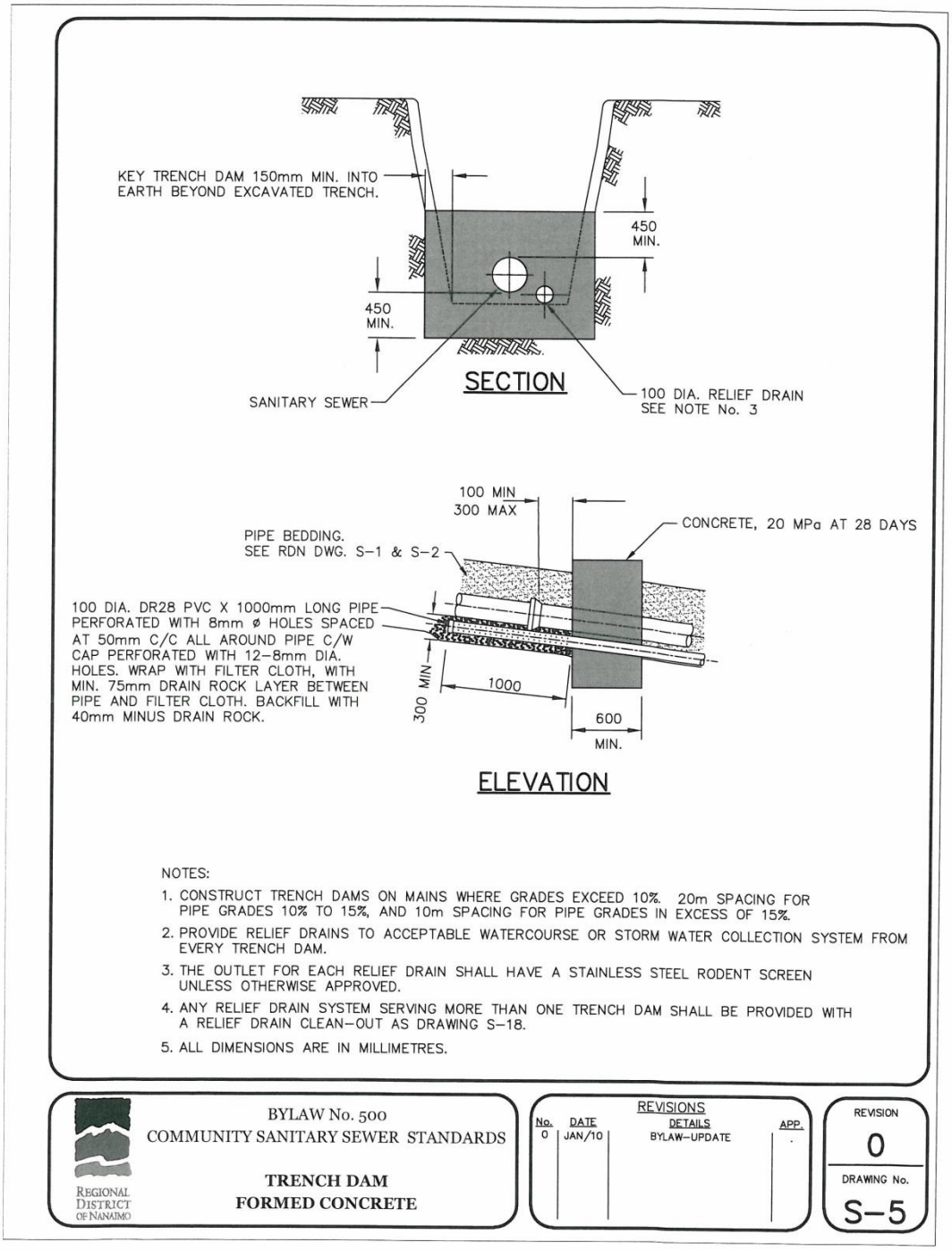
TRENCH DETAIL
TWO PIPES

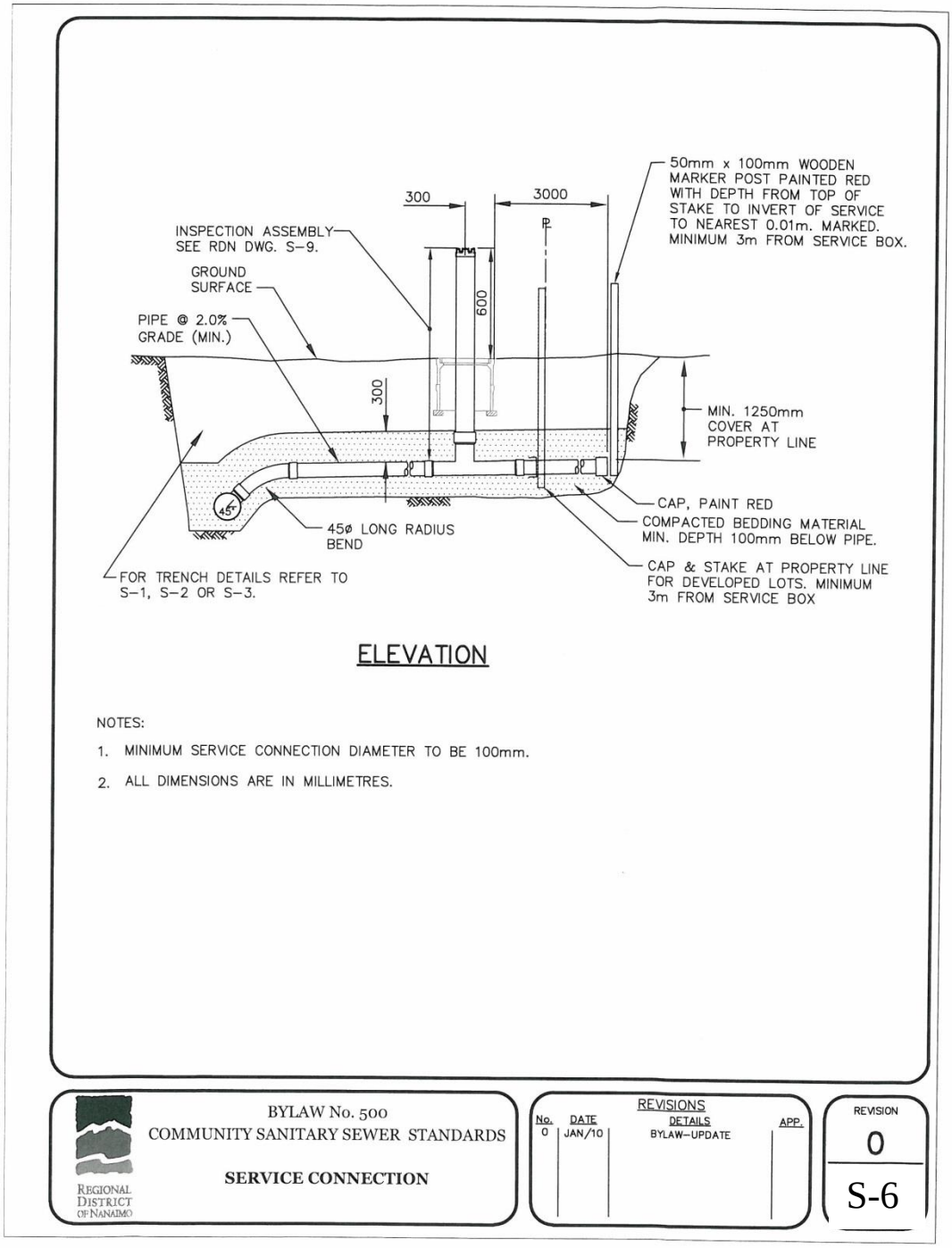
REVISIONS			
No.	DATE	DETAILS	APP.
0	JAN/10	BYLAW UPDATE	

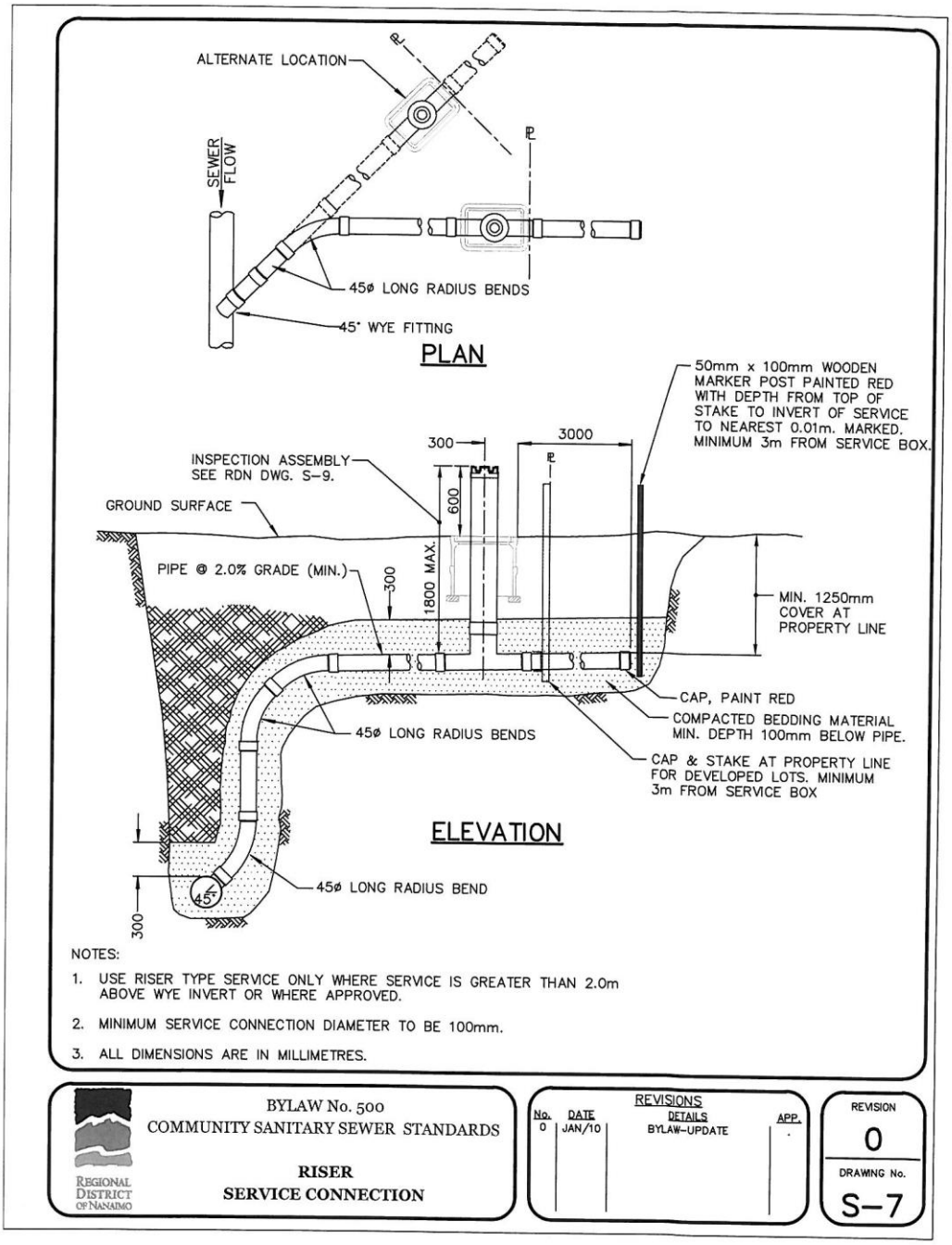
REVISION 0

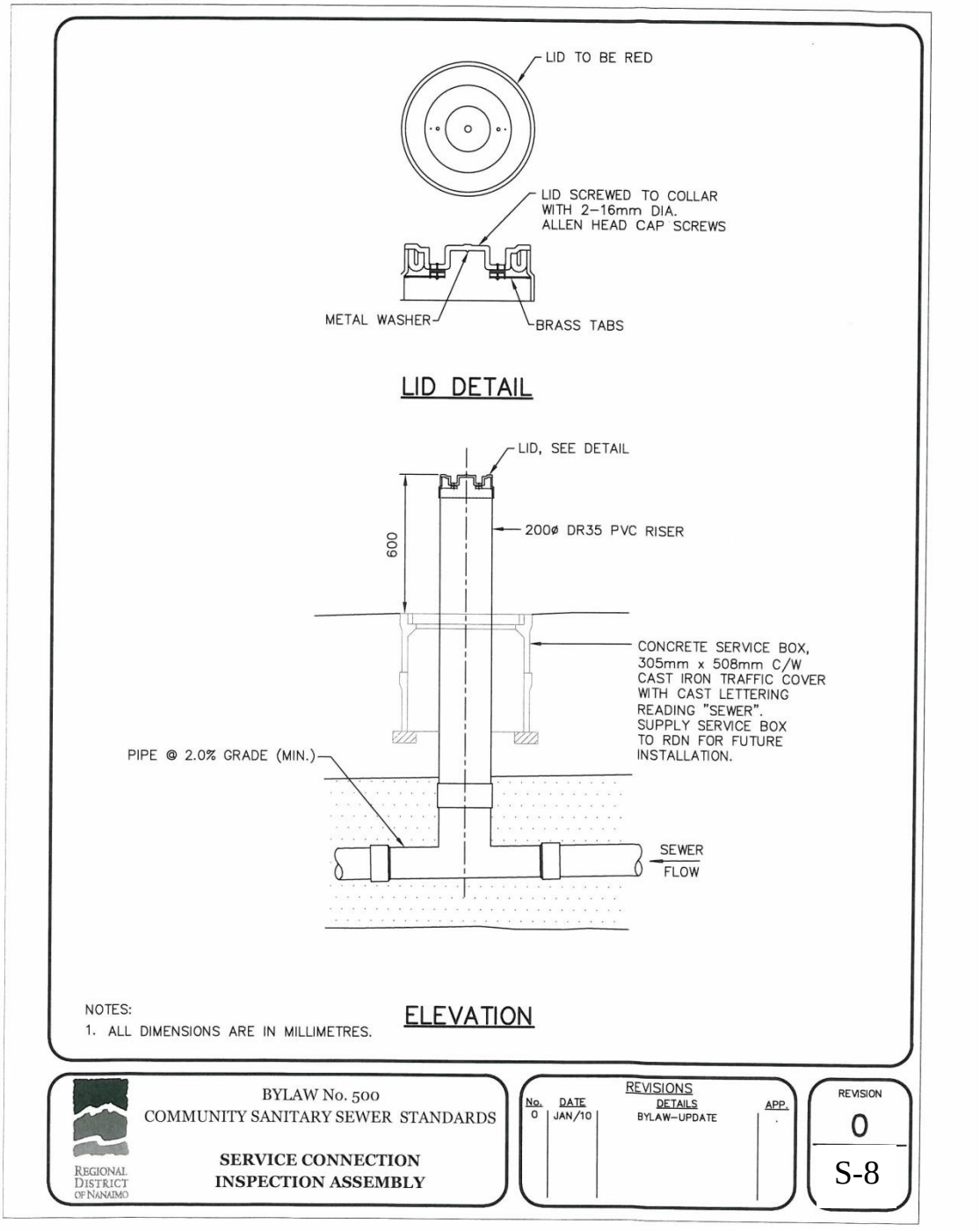
DRAWING No. S-3

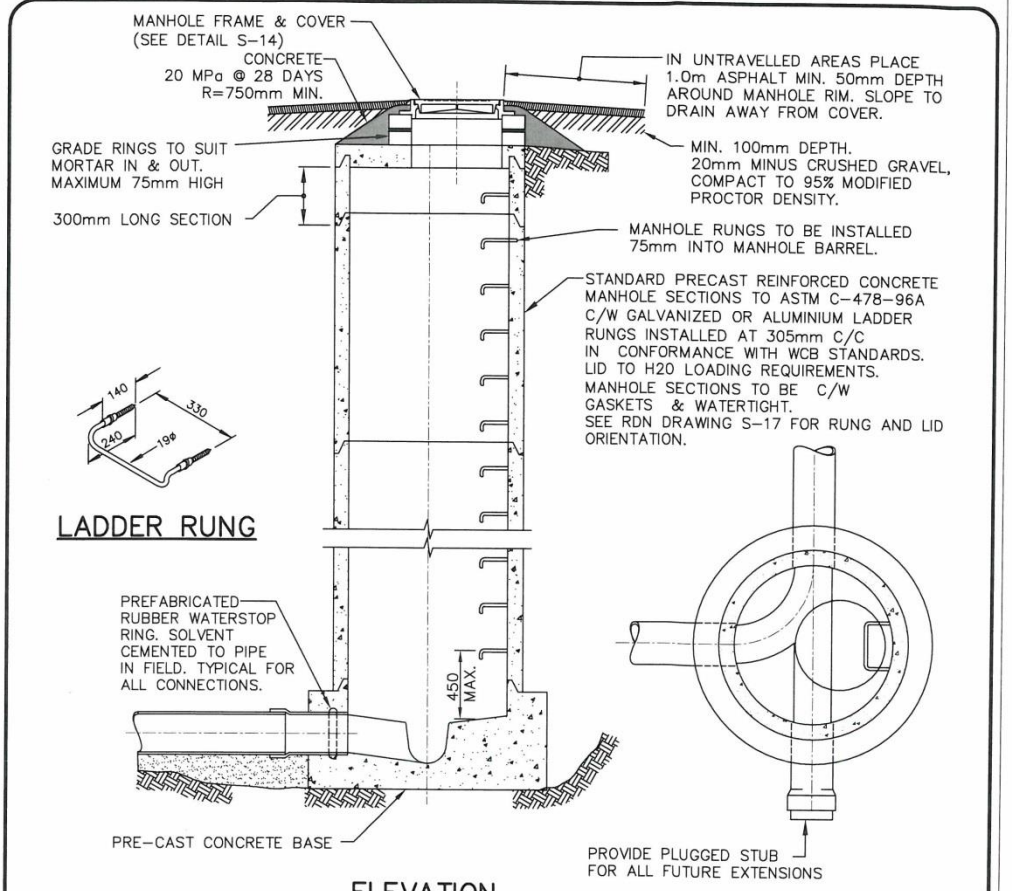

STANDARD SANDBAGS, FILLED WITH WET PRE–MIXED, 20MPa AT 28 DAYS, CONCRETE. PLACE TO 150mm ABOVE LEVEL OF PIPE BEDDING MATERIAL.
KEY TRENCH DAM 150mm MIN. INTO EARTH BEYOND EXCAVATED TRENCH.
150
150
SANITARY SEWER
SECTION
100 MIN
300 MAX
300 MIN
PIPE BEDDING. SEE RDN DWG. S–1 & S–2
150
MIN.
450 MIN
100 DIA. DR28 PVC X 1000mm LONG PIPE PERFORATED WITH 8mm ø HOLES SPACED AT 50mm C/C ALL AROUND PIPE C/W CAP PERFORATED WITH 12–8mm DIA. HOLES. WRAP WITH FILTER CLOTH, WITH MIN. 75mm DRAIN ROCK LAYER BETWEEN PIPE AND FILTER CLOTH. BACKFILL WITH 40mm MINUS DRAIN ROCK.
300 MIN
1000
750 MIN
100 DIA. DR28 PVC RELIEF DRAIN TO OUTLET. SEE NOTE 3.
ELEVATION
NOTES:
1. CONSTRUCT TRENCH DAMS ON MAINS WHERE GRADES EXCEED 10% @ 20m SPACING FOR PIPE GRADES 10% TO 15%, AND 10m SPACING FOR PIPE GRADES IN EXCESS OF 15%.
2. PROVIDE RELIEF DRAINS TO ACCEPTABLE WATERCOURSE OR STORM WATER COLLECTION SYSTEM FROM EVERY TRENCH DAM.
3. THE OUTLET FOR EACH RELIEF DRAIN SHALL HAVE A STAINLESS STEEL RODENT SCREEN UNLESS OTHERWISE APPROVED.
4. ANY RELIEF DRAIN SYSTEM SERVING MORE THAN ONE TRENCH DAM SHALL BE PROVIDED WITH A RELIEF DRAIN CLEAN–OUT AS DRAWING S–18.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. SANDBAG CONCRETE TRENCH DAM MAY BE USED ONLY WITH THE APPROVAL OF THE RDN.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
TRENCH DAM
SANDBAG CONCRETE
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP. .
REVISION 0
DRAWING No. S–4

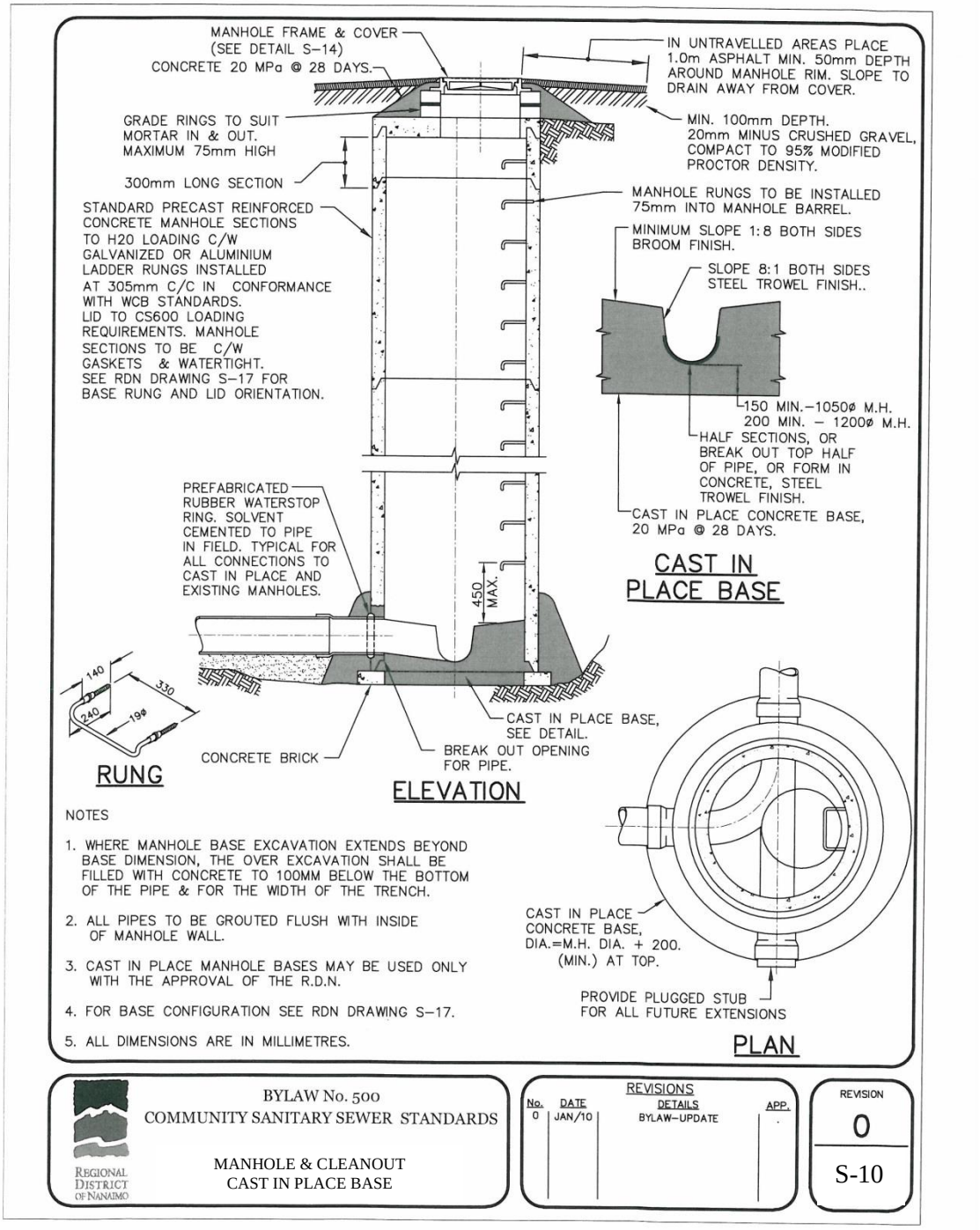

KEY TRENCH DAM 150mm MIN. INTO EARTH BEYOND EXCAVATED TRENCH.
450 MIN.
450 MIN.
SECTION
SANITARY SEWER
100 DIA. RELIEF DRAIN SEE NOTE No. 3
100 MIN 300 MAX
CONCRETE, 20 MPa AT 28 DAYS
PIPE BEDDING. SEE RDN DWG. S-1 & S-2
100 DIA. DR28 PVC X 1000mm LONG PIPE PERFORATED WITH 8mm ø HOLES SPACED AT 50mm C/C ALL AROUND PIPE C/W CAP PERFORATED WITH 12-8mm DIA. HOLES. WRAP WITH FILTER CLOTH, WITH MIN. 75mm DRAIN ROCK LAYER BETWEEN PIPE AND FILTER CLOTH. BACKFILL WITH 40mm MINUS DRAIN ROCK.
300 MIN
1000
600 MIN.
ELEVATION
NOTES:
1. CONSTRUCT TRENCH DAMS ON MAINS WHERE GRADES EXCEED 10%. 20m SPACING FOR PIPE GRADES 10% TO 15%, AND 10m SPACING FOR PIPE GRADES IN EXCESS OF 15%.
2. PROVIDE RELIEF DRAINS TO ACCEPTABLE WATERCOURSE OR STORM WATER COLLECTION SYSTEM FROM EVERY TRENCH DAM.
3. THE OUTLET FOR EACH RELIEF DRAIN SHALL HAVE A STAINLESS STEEL RODENT SCREEN UNLESS OTHERWISE APPROVED.
4. ANY RELIEF DRAIN SYSTEM SERVING MORE THAN ONE TRENCH DAM SHALL BE PROVIDED WITH A RELIEF DRAIN CLEAN-OUT AS DRAWING S-18.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
TRENCH DAM
FORMED CONCRETE
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW-UPDATE
APP. .
REVISION 0
DRAWING No. S-5


300
3000
50mm x 100mm WOODEN MARKER POST PAINTED RED WITH DEPTH FROM TOP OF STAKE TO INVERT OF SERVICE TO NEAREST 0.01m. MARKED. MINIMUM 3m FROM SERVICE BOX.
INSPECTION ASSEMBLY SEE RDN DWG. S-9.
GROUND SURFACE
PIPE @ 2.0% GRADE (MIN.)
600
300
MIN. 1250mm COVER AT PROPERTY LINE
45°
45ø LONG RADIUS BEND
CAP, PAINT RED
COMPACTED BEDDING MATERIAL MIN. DEPTH 100mm BELOW PIPE.
CAP & STAKE AT PROPERTY LINE FOR DEVELOPED LOTS. MINIMUM 3m FROM SERVICE BOX
FOR TRENCH DETAILS REFER TO S-1, S-2 OR S-3.
ELEVATION
NOTES:
1. MINIMUM SERVICE CONNECTION DIAMETER TO BE 100mm.
2. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
SERVICE CONNECTION
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-6


ALTERNATE LOCATION
SEWER FLOW
45ø LONG RADIUS BENDS
45° WYE FITTING
PLAN
50mm x 100mm WOODEN MARKER POST PAINTED RED WITH DEPTH FROM TOP OF STAKE TO INVERT OF SERVICE TO NEAREST 0.01m. MARKED. MINIMUM 3m FROM SERVICE BOX.
300
3000
INSPECTION ASSEMBLY SEE RDN DWG. S–9.
600
GROUND SURFACE
PIPE @ 2.0% GRADE (MIN.)
300
1800 MAX.
MIN. 1250mm COVER AT PROPERTY LINE
CAP, PAINT RED
COMPACTED BEDDING MATERIAL MIN. DEPTH 100mm BELOW PIPE.
45ø LONG RADIUS BENDS
CAP & STAKE AT PROPERTY LINE FOR DEVELOPED LOTS. MINIMUM 3m FROM SERVICE BOX
ELEVATION
45ø LONG RADIUS BEND
45°
300
NOTES:
1. USE RISER TYPE SERVICE ONLY WHERE SERVICE IS GREATER THAN 2.0m ABOVE WYE INVERT OR WHERE APPROVED.
2. MINIMUM SERVICE CONNECTION DIAMETER TO BE 100mm.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
RISER
SERVICE CONNECTION
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
DRAWING No. S–7


LID TO BE RED
LID SCREWED TO COLLAR WITH 2–16mm DIA. ALLEN HEAD CAP SCREWS
METAL WASHER
BRASS TABS
LID DETAIL
LID, SEE DETAIL
600
200ø DR35 PVC RISER
CONCRETE SERVICE BOX, 305mm x 508mm C/W CAST IRON TRAFFIC COVER WITH CAST LETTERING READING "SEWER". SUPPLY SERVICE BOX TO RDN FOR FUTURE INSTALLATION.
PIPE @ 2.0% GRADE (MIN.)
SEWER FLOW
ELEVATION
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
SERVICE CONNECTION INSPECTION ASSEMBLY
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-8


MANHOLE FRAME & COVER
(SEE DETAIL S–14)
CONCRETE
20 MPa @ 28 DAYS
R=750mm MIN.
IN UNTRAVELLED AREAS PLACE
1.0m ASPHALT MIN. 50mm DEPTH
AROUND MANHOLE RIM. SLOPE TO
DRAIN AWAY FROM COVER.
GRADE RINGS TO SUIT
MORTAR IN & OUT.
MAXIMUM 75mm HIGH
MIN. 100mm DEPTH.
20mm MINUS CRUSHED GRAVEL,
COMPACT TO 95% MODIFIED
PROCTOR DENSITY.
300mm LONG SECTION
MANHOLE RUNGS TO BE INSTALLED
75mm INTO MANHOLE BARREL.
STANDARD PRECAST REINFORCED CONCRETE
MANHOLE SECTIONS TO ASTM C–478–96A
C/W GALVANIZED OR ALUMINIUM LADDER
RUNGS INSTALLED AT 305mm C/C
IN CONFORMANCE WITH WCB STANDARDS.
LID TO H20 LOADING REQUIREMENTS.
MANHOLE SECTIONS TO BE C/W
GASKETS & WATERTIGHT.
SEE RDN DRAWING S–17 FOR RUNG AND LID
ORIENTATION.
140
330
240
19ø
LADDER RUNG
PREFABRICATED
RUBBER WATERSTOP
RING. SOLVENT
CEMENTED TO PIPE
IN FIELD. TYPICAL FOR
ALL CONNECTIONS.
450
MAX.
PRE–CAST CONCRETE BASE
PROVIDE PLUGGED STUB
FOR ALL FUTURE EXTENSIONS
ELEVATION
PLAN
NOTES
1. WHERE MANHOLE BASE EXCAVATION EXTENDS BEYOND BASE DIMENSION, THE OVER EXCAVATION SHALL BE FILLED WITH CONCRETE TO 100mm BELOW THE BOTTOM OF THE PIPE & FOR THE WIDTH OF THE TRENCH.
2. ALL PIPES TO BE GROUTED FLUSH WITH INSIDE OF MANHOLE WALL.
3. ALL MANHOLES TO HAVE PRE–CAST BASES UNLESS APPROVED BY THE R.D.N.
4. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
MANHOLE & CLEANOUT
PRECAST BASE
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-9


MANHOLE FRAME & COVER
(SEE DETAIL S–14)
CONCRETE 20 MPa @ 28 DAYS.
IN UNTRAVELLED AREAS PLACE
1.0m ASPHALT MIN. 50mm DEPTH
AROUND MANHOLE RIM. SLOPE TO
DRAIN AWAY FROM COVER.
GRADE RINGS TO SUIT
MORTAR IN & OUT.
MAXIMUM 75mm HIGH
MIN. 100mm DEPTH.
20mm MINUS CRUSHED GRAVEL,
COMPACT TO 95% MODIFIED
PROCTOR DENSITY.
300mm LONG SECTION
MANHOLE RUNGS TO BE INSTALLED
75mm INTO MANHOLE BARREL.
STANDARD PRECAST REINFORCED
CONCRETE MANHOLE SECTIONS
TO H20 LOADING C/W
GALVANIZED OR ALUMINIUM
LADDER RUNGS INSTALLED
AT 305mm C/C IN CONFORMANCE
WITH WCB STANDARDS.
LID TO CS600 LOADING
REQUIREMENTS. MANHOLE
SECTIONS TO BE C/W
GASKETS & WATERTIGHT.
SEE RDN DRAWING S–17 FOR
BASE RUNG AND LID ORIENTATION.
MINIMUM SLOPE 1:8 BOTH SIDES
BROOM FINISH.
SLOPE 8:1 BOTH SIDES
STEEL TROWEL FINISH..
150 MIN.–1050ø M.H.
200 MIN. – 1200ø M.H.
HALF SECTIONS, OR
BREAK OUT TOP HALF
OF PIPE, OR FORM IN
CONCRETE, STEEL
TROWEL FINISH.
CAST IN PLACE CONCRETE BASE,
20 MPa @ 28 DAYS.
CAST IN
PLACE BASE
PREFABRICATED
RUBBER WATERSTOP
RING. SOLVENT
CEMENTED TO PIPE
IN FIELD. TYPICAL FOR
ALL CONNECTIONS TO
CAST IN PLACE AND
EXISTING MANHOLES.
450
MAX.
140
330
240
19ø
RUNG
CONCRETE BRICK
CAST IN PLACE BASE,
SEE DETAIL.
BREAK OUT OPENING
FOR PIPE.
ELEVATION
CAST IN PLACE
CONCRETE BASE,
DIA.=M.H. DIA. + 200.
(MIN.) AT TOP.
PROVIDE PLUGGED STUB
FOR ALL FUTURE EXTENSIONS
PLAN
NOTES
1. WHERE MANHOLE BASE EXCAVATION EXTENDS BEYOND BASE DIMENSION, THE OVER EXCAVATION SHALL BE FILLED WITH CONCRETE TO 100MM BELOW THE BOTTOM OF THE PIPE & FOR THE WIDTH OF THE TRENCH.
2. ALL PIPES TO BE GROUTED FLUSH WITH INSIDE OF MANHOLE WALL.
3. CAST IN PLACE MANHOLE BASES MAY BE USED ONLY WITH THE APPROVAL OF THE R.D.N.
4. FOR BASE CONFIGURATION SEE RDN DRAWING S–17.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
MANHOLE & CLEANOUT
CAST IN PLACE BASE
REVISIONS
No. DATE DETAILS APP.
0 JAN/10 BYLAW–UPDATE .
REVISION
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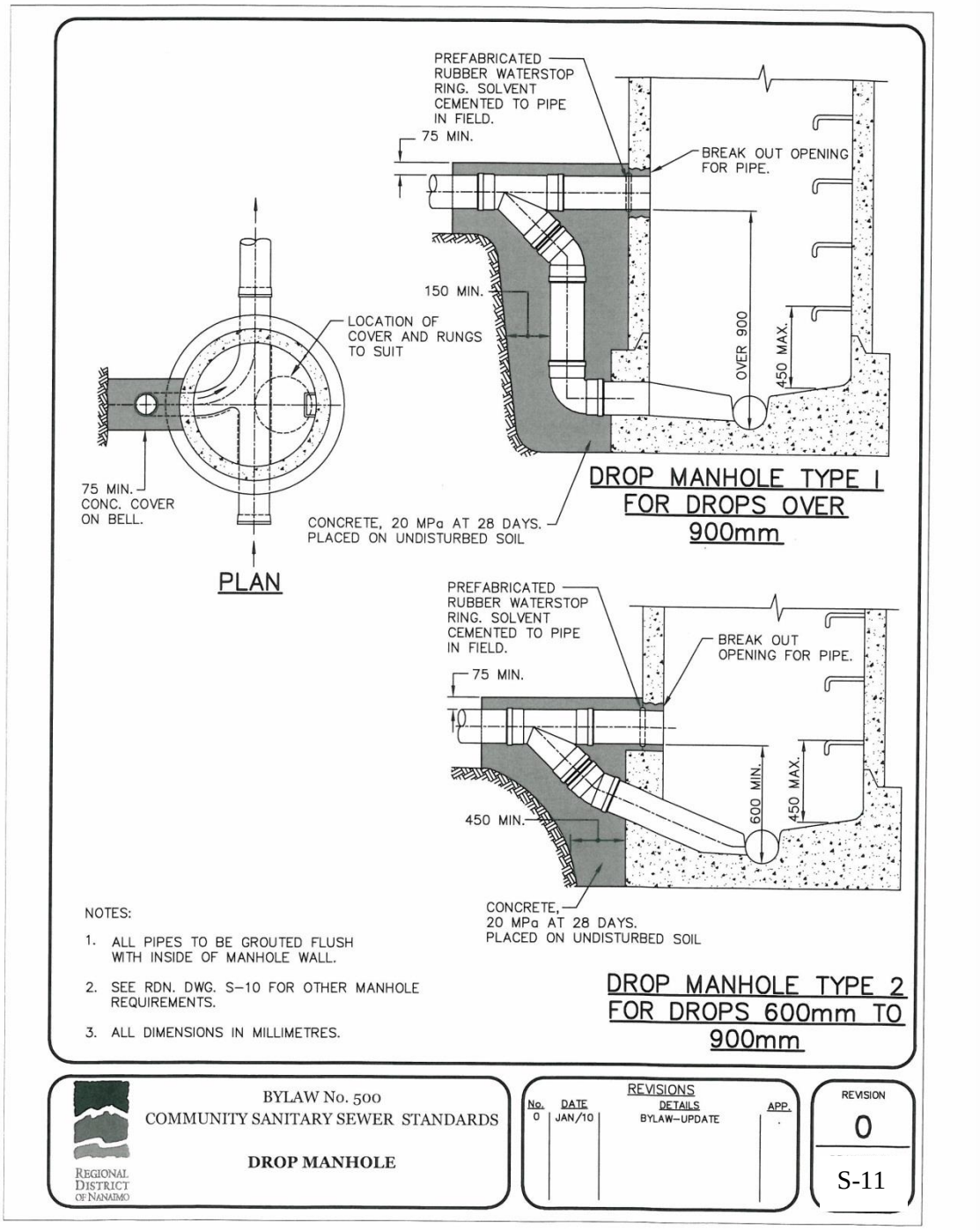
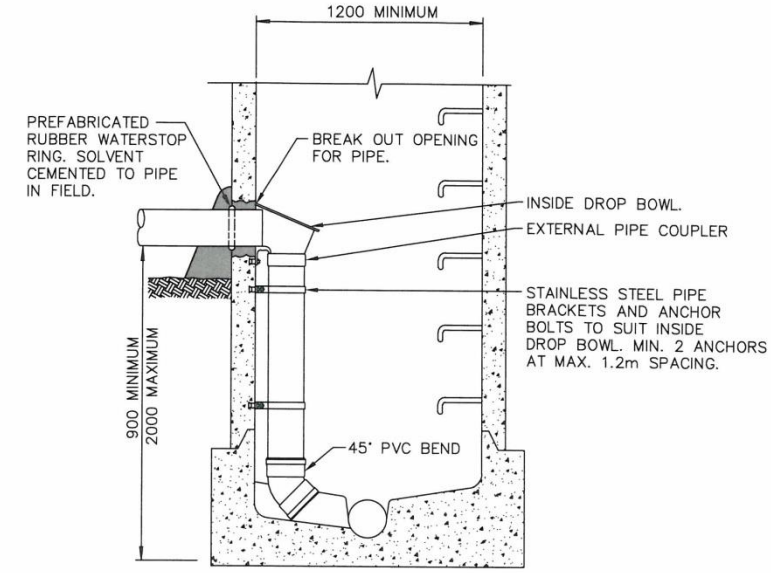
S-10


PREFABRICATED RUBBER WATERSTOP RING. SOLVENT CEMENTED TO PIPE IN FIELD.
75 MIN.
BREAK OUT OPENING FOR PIPE.
150 MIN.
LOCATION OF COVER AND RUNGS TO SUIT
OVER 900
450 MAX.
75 MIN. CONC. COVER ON BELL.
CONCRETE, 20 MPa AT 28 DAYS. PLACED ON UNDISTURBED SOIL
PLAN
DROP MANHOLE TYPE 1 FOR DROPS OVER 900mm
PREFABRICATED RUBBER WATERSTOP RING. SOLVENT CEMENTED TO PIPE IN FIELD.
BREAK OUT OPENING FOR PIPE.
75 MIN.
600 MIN.
450 MAX.
450 MIN.
CONCRETE, 20 MPa AT 28 DAYS. PLACED ON UNDISTURBED SOIL
NOTES:
1. ALL PIPES TO BE GROUTED FLUSH WITH INSIDE OF MANHOLE WALL.
2. SEE RDN. DWG. S–10 FOR OTHER MANHOLE REQUIREMENTS.
3. ALL DIMENSIONS IN MILLIMETRES.
DROP MANHOLE TYPE 2 FOR DROPS 600mm TO 900mm
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
DROP MANHOLE
REVISIONS
No. 0
DATE JAN./10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-11



DROP MANHOLE TYPE 3
FOR DROPS OVER 900mm

NOTES:

1. DROP MANHOLE TYPE 3 TO BE USED ONLY WITH THE WRITTEN PERMISSION OF THE RDN. APPROVAL WILL ONLY BE GRANTED FOR SITUATIONS WHERE MODIFICATIONS TO EXISTING MANHOLES ARE
2. PROPOSED.

   DROP PIPE TO BE DR28 PVC, DIA. TO SUIT INSIDE DROP BOWL.
3.

   THIS DRAWING SHOWS INSIDE DROP ONLY.
   SEE RDN DWG. S-10 FOR ALL OTHER DETAILS PERTAINING TO MANHOLE
4. REQUIREMENTS.

   ALL MOUNTING & BRACKET HARDWARE, (STRAPS & BOLTS) SHALL BE
5. STAINLESS STEEL

   ALL DIMENSIONS ARE IN MILLIMETRES.

REGIONAL DISTRICT OF NANAIMO

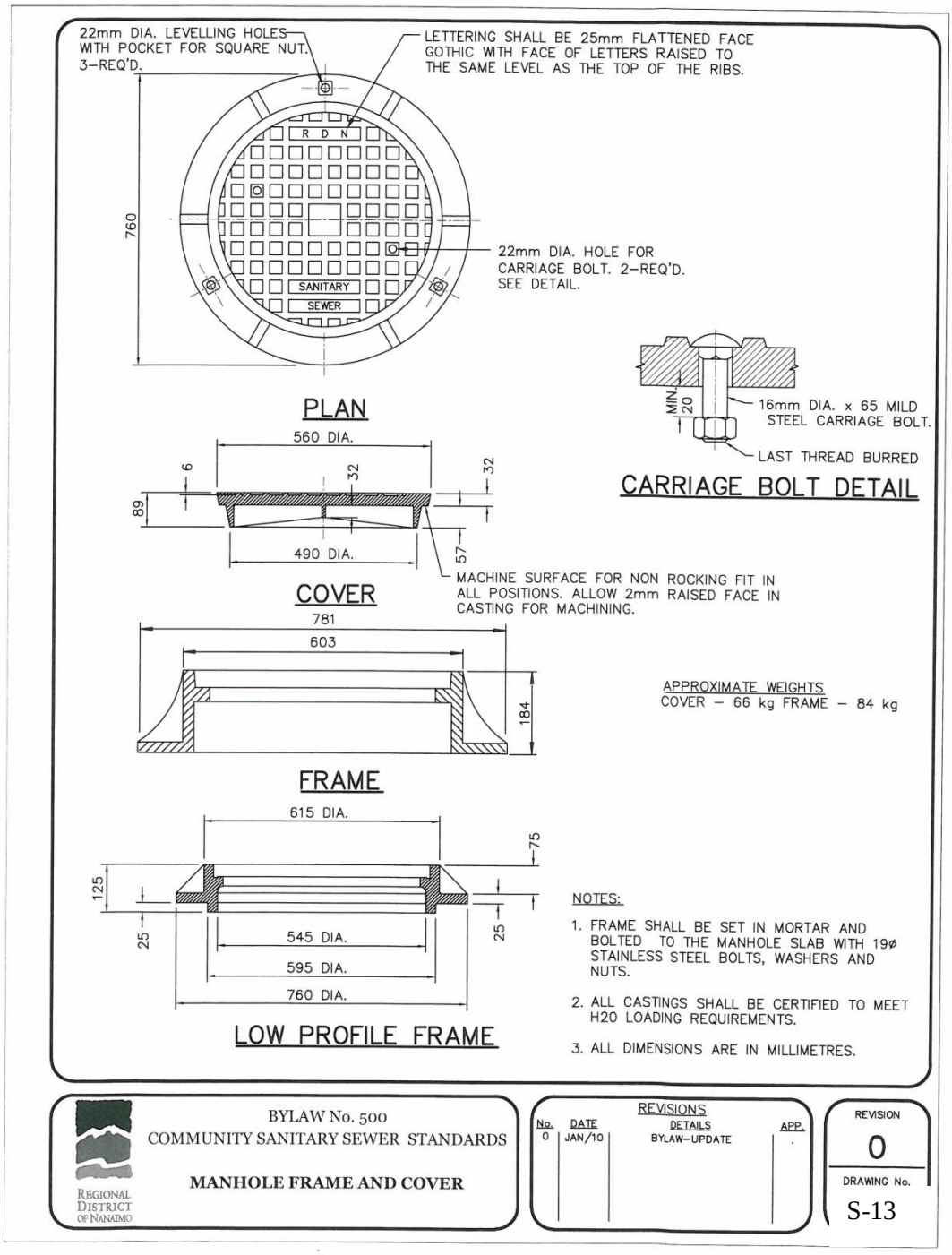
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS

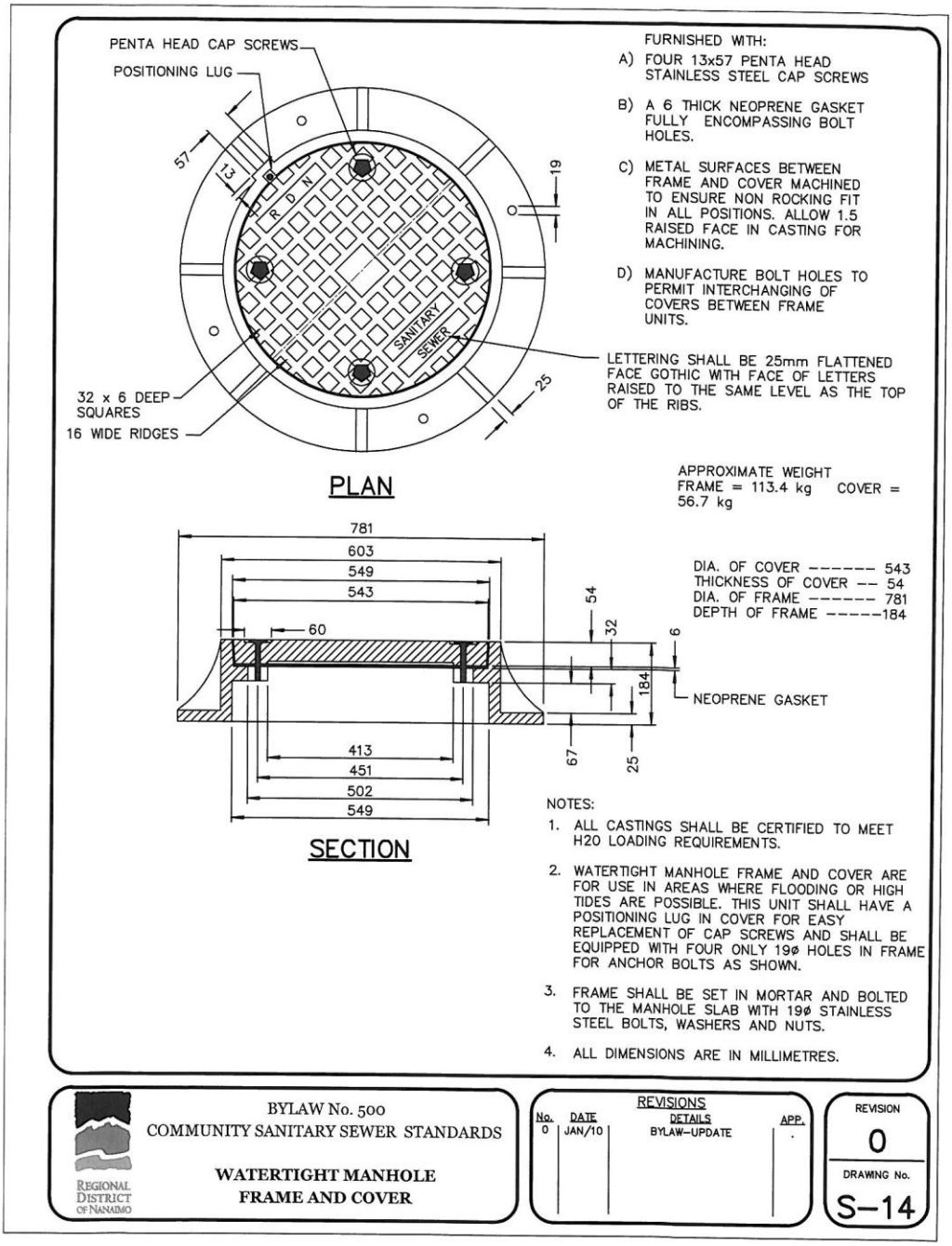
INSIDE DROP MANHOLE DETAILS

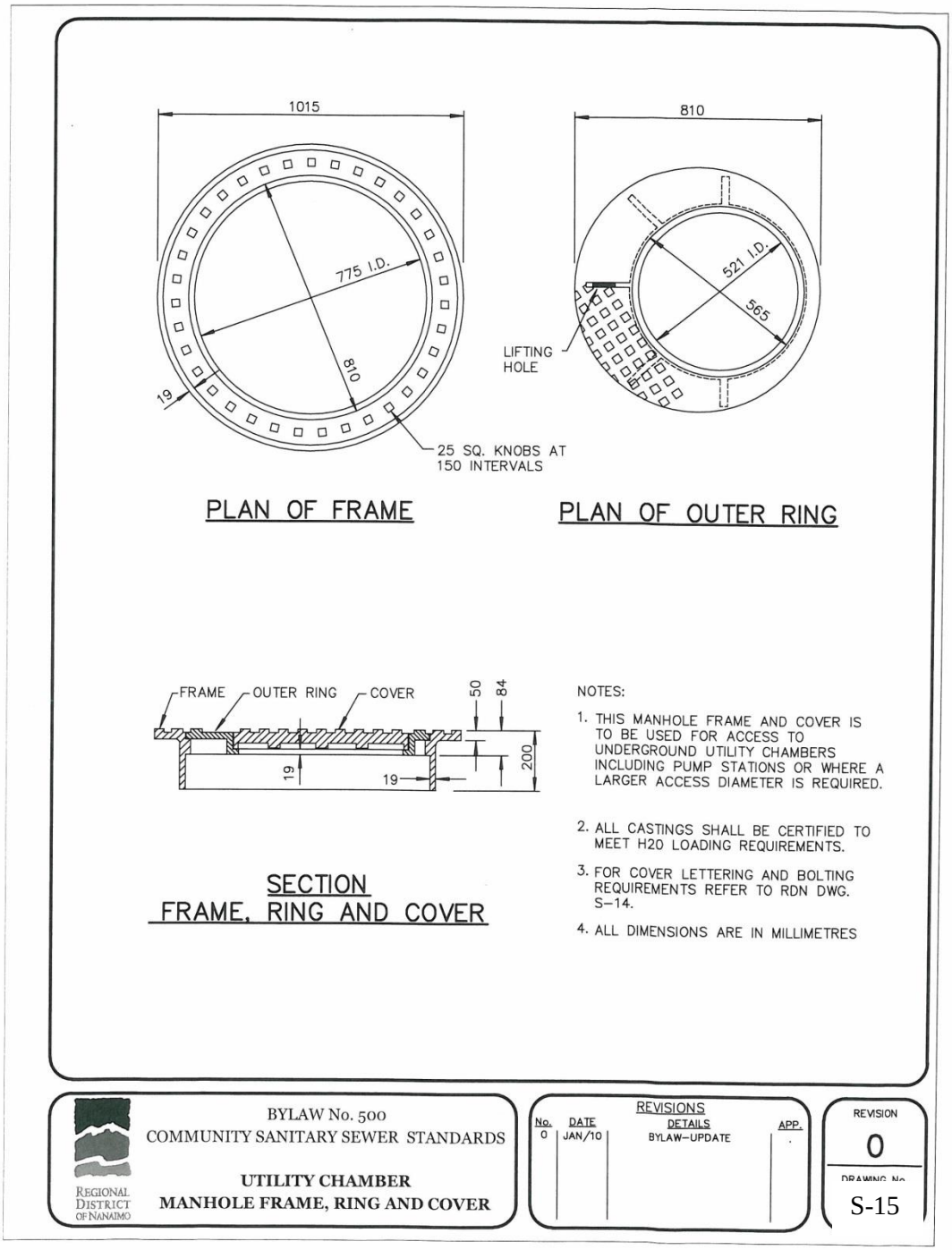
REVISIONS			
No.	DATE	DETAILS	APP.
0	JAN./10	BYLAW-UPDATE	

REVISION 0

S-12


22mm DIA. LEVELLING HOLES WITH POCKET FOR SQUARE NUT. 3–REQ'D.
LETTERING SHALL BE 25mm FLATTENED FACE GOTHIC WITH FACE OF LETTERS RAISED TO THE SAME LEVEL AS THE TOP OF THE RIBS.
R D N
SANITARY
SEWER
760
22mm DIA. HOLE FOR CARRIAGE BOLT. 2–REQ'D. SEE DETAIL.
PLAN
MIN. 20
16mm DIA. x 65 MILD STEEL CARRIAGE BOLT.
LAST THREAD BURRED
CARRIAGE BOLT DETAIL
560 DIA.
6
32
32
89
490 DIA.
57
MACHINE SURFACE FOR NON ROCKING FIT IN ALL POSITIONS. ALLOW 2mm RAISED FACE IN CASTING FOR MACHINING.
COVER
781
603
184
APPROXIMATE WEIGHTS
COVER – 66 kg FRAME – 84 kg
FRAME
615 DIA.
75
125
25
25
545 DIA.
595 DIA.
760 DIA.
LOW PROFILE FRAME
NOTES:
1. FRAME SHALL BE SET IN MORTAR AND BOLTED TO THE MANHOLE SLAB WITH 19ø STAINLESS STEEL BOLTS, WASHERS AND NUTS.
2. ALL CASTINGS SHALL BE CERTIFIED TO MEET H20 LOADING REQUIREMENTS.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
MANHOLE FRAME AND COVER
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP. .
REVISION 0
DRAWING No. S-13


PENTA HEAD CAP SCREWS
POSITIONING LUG
57
13
19
25
R D N
SANITARY
SEWER
32 x 6 DEEP SQUARES
16 WIDE RIDGES
PLAN
781
603
549
543
60
54
32
6
184
67
25
413
451
502
549
SECTION
NEOPRENE GASKET
FURNISHED WITH:
A) FOUR 13x57 PENTA HEAD STAINLESS STEEL CAP SCREWS
B) A 6 THICK NEOPRENE GASKET FULLY ENCOMPASSING BOLT HOLES.
C) METAL SURFACES BETWEEN FRAME AND COVER MACHINED TO ENSURE NON ROCKING FIT IN ALL POSITIONS. ALLOW 1.5 RAISED FACE IN CASTING FOR MACHINING.
D) MANUFACTURE BOLT HOLES TO PERMIT INTERCHANGING OF COVERS BETWEEN FRAME UNITS.
LETTERING SHALL BE 25mm FLATTENED FACE GOTHIC WITH FACE OF LETTERS RAISED TO THE SAME LEVEL AS THE TOP OF THE RIBS.
APPROXIMATE WEIGHT
FRAME = 113.4 kg COVER = 56.7 kg
DIA. OF COVER ------ 543
THICKNESS OF COVER -- 54
DIA. OF FRAME ------ 781
DEPTH OF FRAME -----184
NOTES:
1. ALL CASTINGS SHALL BE CERTIFIED TO MEET H20 LOADING REQUIREMENTS.
2. WATERTIGHT MANHOLE FRAME AND COVER ARE FOR USE IN AREAS WHERE FLOODING OR HIGH TIDES ARE POSSIBLE. THIS UNIT SHALL HAVE A POSITIONING LUG IN COVER FOR EASY REPLACEMENT OF CAP SCREWS AND SHALL BE EQUIPPED WITH FOUR ONLY 19ø HOLES IN FRAME FOR ANCHOR BOLTS AS SHOWN.
3. FRAME SHALL BE SET IN MORTAR AND BOLTED TO THE MANHOLE SLAB WITH 19ø STAINLESS STEEL BOLTS, WASHERS AND NUTS.
4. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
WATERTIGHT MANHOLE FRAME AND COVER
REVISIONS
No. 0 | DATE JAN/10 | DETAILS BYLAW–UPDATE | APP. .
REVISION 0
DRAWING No. S–14


1015
775 I.D.
810
19
25 SQ. KNOBS AT
150 INTERVALS
PLAN OF FRAME
810
521 I.D.
565
LIFTING
HOLE
PLAN OF OUTER RING
FRAME
OUTER RING
COVER
50
84
200
19
19
SECTION
FRAME, RING AND COVER
NOTES:
1. THIS MANHOLE FRAME AND COVER IS TO BE USED FOR ACCESS TO UNDERGROUND UTILITY CHAMBERS INCLUDING PUMP STATIONS OR WHERE A LARGER ACCESS DIAMETER IS REQUIRED.
2. ALL CASTINGS SHALL BE CERTIFIED TO MEET H20 LOADING REQUIREMENTS.
3. FOR COVER LETTERING AND BOLTING REQUIREMENTS REFER TO RDN DWG. S–14.
4. ALL DIMENSIONS ARE IN MILLIMETRES
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
UTILITY CHAMBER
MANHOLE FRAME, RING AND COVER
REVISIONS
No. DATE DETAILS APP.
0 JAN/10 BYLAW–UPDATE
REVISION
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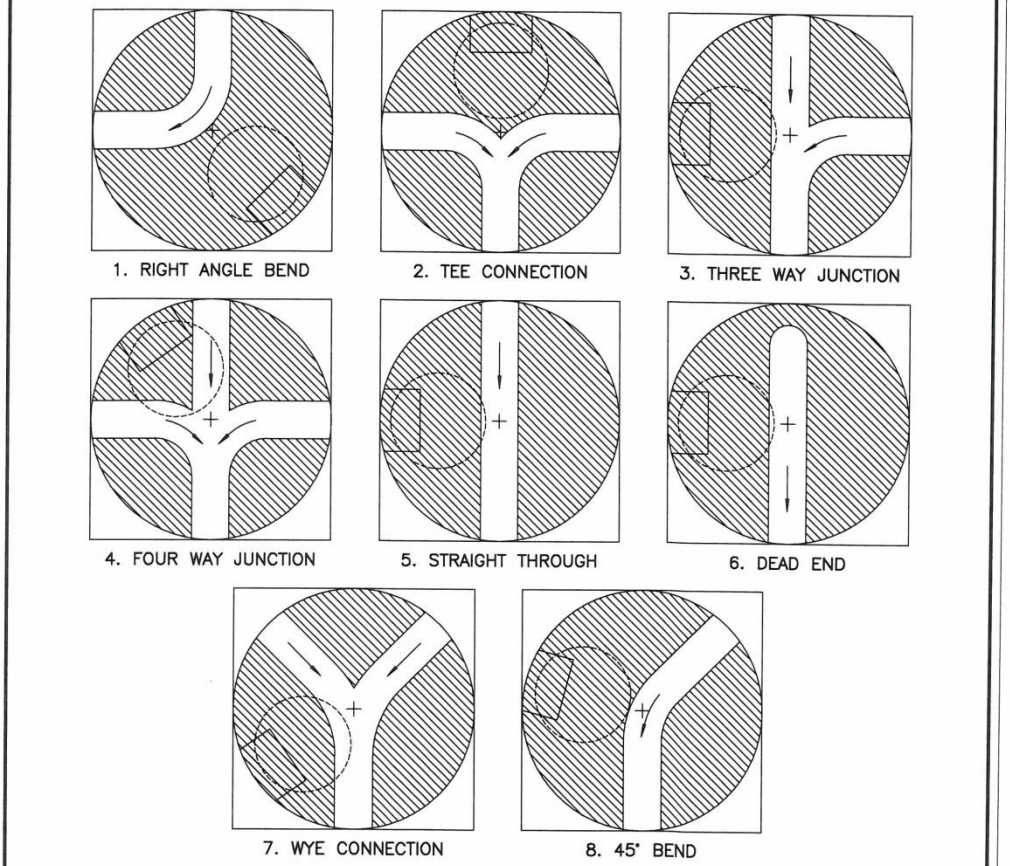
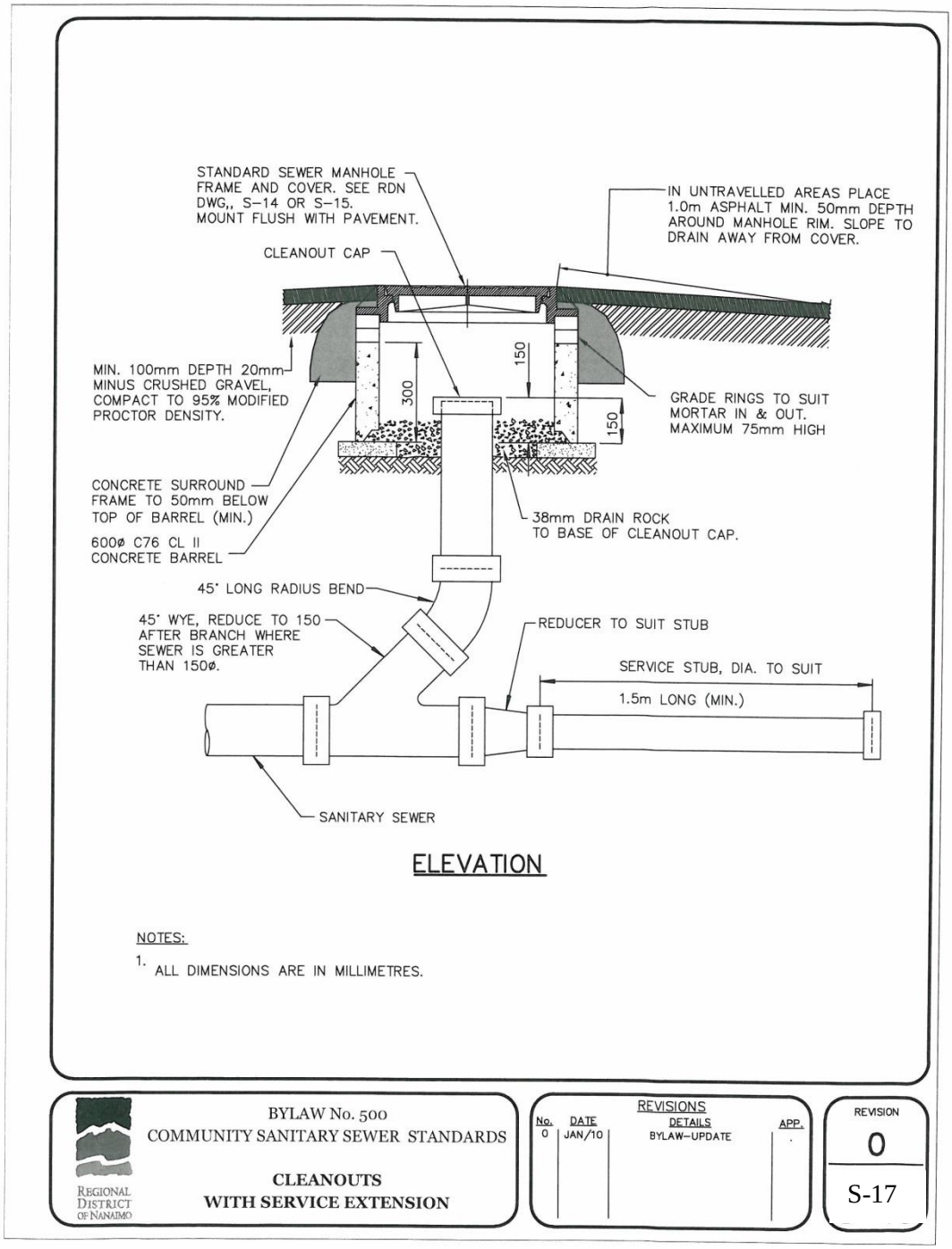
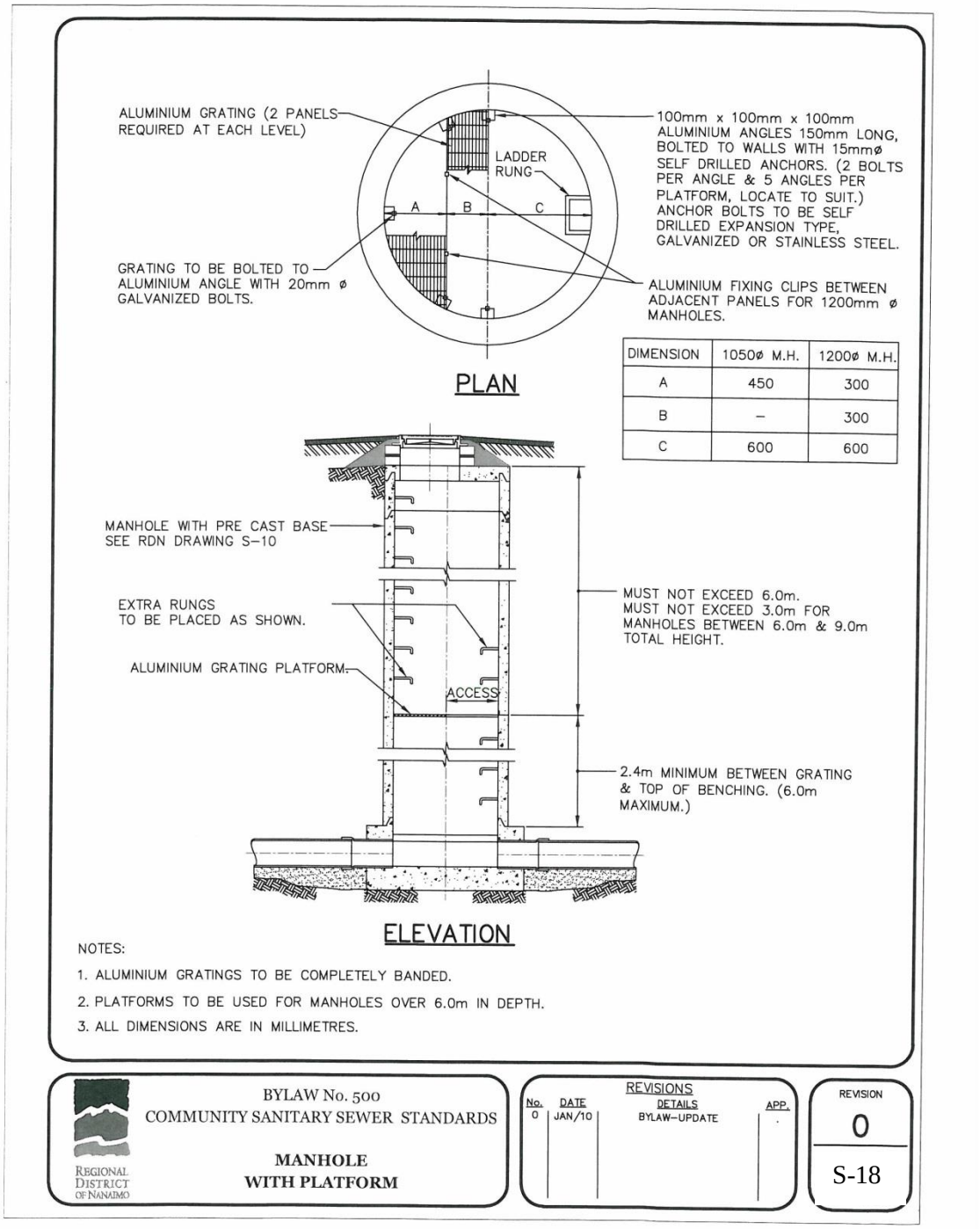
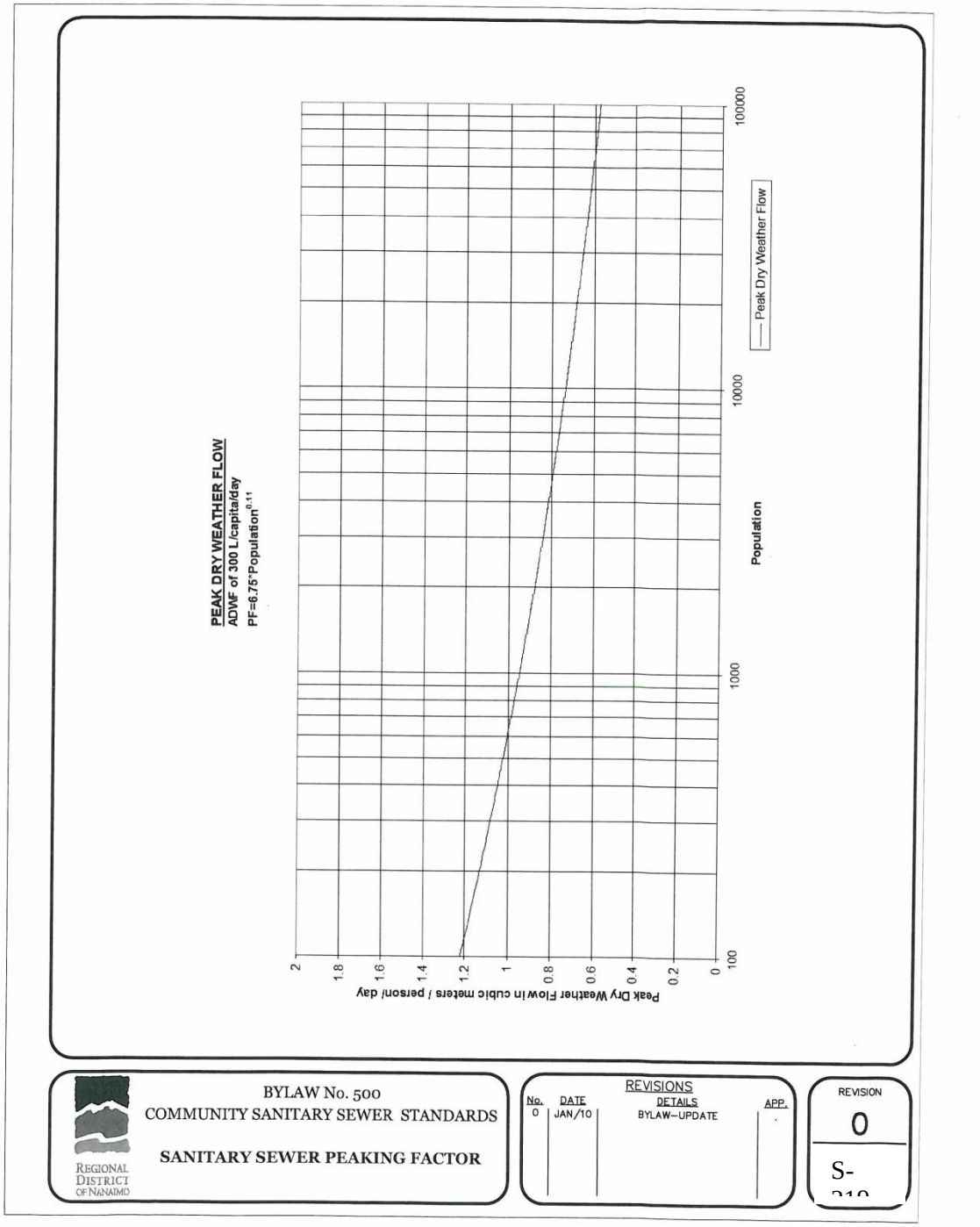
S-15


1. RIGHT ANGLE BEND
2. TEE CONNECTION
3. THREE WAY JUNCTION
4. FOUR WAY JUNCTION
5. STRAIGHT THROUGH
6. DEAD END
7. WYE CONNECTION
8. 45° BEND
NOTES
1. ALL CHANNELS SHALL BE FINISHED WITH A STEEL TROWEL. BENCHING (SHADED AREAS) SHALL BE BROOM FINISHED.
2. MANHOLE COVER OPENINGS AND RUNG LOCATIONS SHALL BE AS SHOWN UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
CAST IN PLACE
MANHOLE BENCHING
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-16


STANDARD SEWER MANHOLE FRAME AND COVER. SEE RDN DWG,, S–14 OR S–15. MOUNT FLUSH WITH PAVEMENT.
CLEANOUT CAP
IN UNTRAVELLED AREAS PLACE 1.0m ASPHALT MIN. 50mm DEPTH AROUND MANHOLE RIM. SLOPE TO DRAIN AWAY FROM COVER.
MIN. 100mm DEPTH 20mm MINUS CRUSHED GRAVEL, COMPACT TO 95% MODIFIED PROCTOR DENSITY.
300
150
150
GRADE RINGS TO SUIT MORTAR IN & OUT. MAXIMUM 75mm HIGH
CONCRETE SURROUND FRAME TO 50mm BELOW TOP OF BARREL (MIN.)
600ø C76 CL II CONCRETE BARREL
38mm DRAIN ROCK TO BASE OF CLEANOUT CAP.
45° LONG RADIUS BEND
45° WYE, REDUCE TO 150 AFTER BRANCH WHERE SEWER IS GREATER THAN 150ø.
REDUCER TO SUIT STUB
SERVICE STUB, DIA. TO SUIT
1.5m LONG (MIN.)
SANITARY SEWER
ELEVATION
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
CLEANOUTS
WITH SERVICE EXTENSION
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP.
REVISION 0
S-17


ALUMINIUM GRATING (2 PANELS REQUIRED AT EACH LEVEL)
LADDER RUNG
A
B
C
100mm x 100mm x 100mm ALUMINIUM ANGLES 150mm LONG, BOLTED TO WALLS WITH 15mmø SELF DRILLED ANCHORS. (2 BOLTS PER ANGLE & 5 ANGLES PER PLATFORM, LOCATE TO SUIT.) ANCHOR BOLTS TO BE SELF DRILLED EXPANSION TYPE, GALVANIZED OR STAINLESS STEEL.
GRATING TO BE BOLTED TO ALUMINIUM ANGLE WITH 20mm ø GALVANIZED BOLTS.
ALUMINIUM FIXING CLIPS BETWEEN ADJACENT PANELS FOR 1200mm ø MANHOLES.
PLAN
DIMENSION | 1050ø M.H. | 1200ø M.H.
A | 450 | 300
B | – | 300
C | 600 | 600
MANHOLE WITH PRE CAST BASE SEE RDN DRAWING S–10
EXTRA RUNGS TO BE PLACED AS SHOWN.
ALUMINIUM GRATING PLATFORM
ACCESS
MUST NOT EXCEED 6.0m. MUST NOT EXCEED 3.0m FOR MANHOLES BETWEEN 6.0m & 9.0m TOTAL HEIGHT.
2.4m MINIMUM BETWEEN GRATING & TOP OF BENCHING. (6.0m MAXIMUM.)
ELEVATION
NOTES:
1. ALUMINIUM GRATINGS TO BE COMPLETELY BANDED.
2. PLATFORMS TO BE USED FOR MANHOLES OVER 6.0m IN DEPTH.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
MANHOLE WITH PLATFORM
REVISIONS
No. | DATE | DETAILS | APP.
0 | JAN/10 | BYLAW–UPDATE |
REVISION 0
S-18


PEAK DRY WEATHER FLOW
ADWF of 300 L/capita/day
PF=6.75*Population^-0.11
Peak Dry Weather Flow in cubic meters / person/ day
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
100
1000
10000
100000
Population
Peak Dry Weather Flow
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
SANITARY SEWER PEAKING FACTOR
REGIONAL DISTRICT OF NANAIMO
REVISIONS
No. DATE DETAILS APP.
0 JAN/10 BYLAW–UPDATE
REVISION
0
S-

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

APPENDIX 2

LETTER OF ASSURANCE

REGIONAL DISTRICT OF NANAIMO

LETTER OF ASSURANCE

NOTE:

To be submitted at time of Feasibility Review

To: Manager of Engineering Services
Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo BC V9T 6N2

RE: _____
(Project)

Date: _____, 20__.

This will confirm that (Developer) has retained (Consultant) to provide, design, contract administration, inspection and as-constructed drawings for this project all in accordance with the current bylaws and standards of the Regional District and in accordance with good engineering practice.

_____
(Developer)

This confirms we have accepted this assignment on the above terms.

(Consultant)

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

APPENDIX 3

CERTIFICATE OF DESIGN

REGIONAL DISTRICT OF NANAIMO

CERTIFICATE OF DESIGN

I, _____, a Professional Engineer registered in the Province of British Columbia, hereby certify that the works as herein set out on the attached drawings entitled_____
_____
_____
have been designed in accordance with the Regional District of Nanaimo Bylaw 500 and/or in accordance with good engineering practice where such design is not covered by the Regional District Bylaw 500.

I have been retained to provide design, supervision, full-time inspection, as-built drawings, and final certification for this project by:

_____
(Name of Client)

I am satisfied that in the contractual mandate which exists between myself and my client, the terms of reference will permit me to render a level of supervision of the construction work which will allow me to put my name and seal to the "Certification of Installed Works" required by the Regional District of Nanaimo, a sample of which is attached to this document and initialed by me.

In the event that my client releases me from this project, or in the event that I find the terms of reference do not permit me to render a level of supervision of the construction work which will allow me to put my name and seal to the form of certification required by the Regional District of Nanaimo, I will notify the Regional District within twenty-four (24) hours verbally and follow it up with written confirmation and clarification.

Signed this _____ day of _____, 20____.

_____, P.Eng.

(signature)

_____
(name printed)

I understand that the "Certification of Installed Works" is to be completed in this format and submitted with the "as-constructed" drawings.

_____
(Engineer)

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

APPENDIX 4

CERTIFICATION OF INSTALLED WORKS

REGIONAL DISTRICT OF NANAIMO

CERTIFICATION OF INSTALLED WORKS

NOTE: To be completed in this format and submitted with the 'As-Built' drawings

Location of the Construction Site and Works: (Legal Description / Location)

_____

all within the Regional District of Nanaimo, British Columbia.

I, _____, a Registered Professional Engineer (Reg. No. _____) in the Province of British Columbia, hereby certify:

4. THAT the following construction tests were carried out to confirm that construction met the specifications required:

   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____

5. THAT I was able to monitor the construction and provide a level of supervision of the construction work sufficient to be able to confirm that the specifications in force and effect by the Regional District of Nanaimo and in the applicable design drawings for the said Works were generally met during the Construction Period; and

6. THAT the accompanying plans labeled:

   (i) _____
   (ii) _____
   (iii) _____

   accurately record the materials, grades, inverts, offsets and dimensions of the constructed work.

   DATED this _____ day of _____, 20 _____.

_____

Engineer (signature & seal)

Engineering Firm _____

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY SEWER SYSTEM STANDARDS

APPENDIX 5

STANDBY IRREVOCABLE LETTER OF CREDIT

[BANK LETTERHEAD]

Letter of Credit No.	_____	Amount:	_____
Applicant	_____	Initial Expiry Date:	_____
	_____	Beneficiary:	_____

For the account of _____
(Name of Customer)

up to an aggregate amount of _____ available on demand.

Pursuant to the request of our customer, we hereby establish and give you a Standby Irrevocable Letter of Credit in your favour in the above amount which may be drawn on by you at any time and from time to time, upon written demand for payment made upon us by you, which demand we shall honour without enquiring whether you have the right as between yourself and the said customer to make such demand, and without recognizing any claim of our said customer, or objection by it to payment by us.

This Letter of Credit relates to those Regional District of Nanaimo services and financial obligations set out in an Agreement between the customer and the Regional District of Nanaimo and briefly described as:

_____

The amount of this Letter of Credit may be reduced from time to time as advised by notice in writing to us by the Regional District of Nanaimo.

Partial or full drawings may be made.

This Letter of Credit shall expire at 3:00 p.m. on _____. This Letter of Credit will continue in force for a period of 1 year, but shall be subject to the condition hereinafter set forth.

It is a condition of the Letter of credit that it shall be deemed to be automatically extended without amendment from year to year from the present or any future expiration date hereof, unless at least 30 days prior to the present or any future expiration date, we notify you in writing by registered mail, that we elect not to consider this Letter of Credit to be renewable for any additional period. This Letter of Credit is subject to the Uniform Custom and Practice for Documentary Credits (1993 Revision) International Chamber of Commerce Publication No. 500.

DATED at _____, British Columbia, this _____ day of _____, 20___.

_____
(Name of Bank)

_____
(Address of Bank)

_____
PER:_____
(Authorized Signature)

Schedule '3' to accompany "Regional District of Nanaimo Land Use and Subdivision Amendment Bylaw No. 500.388,2013"

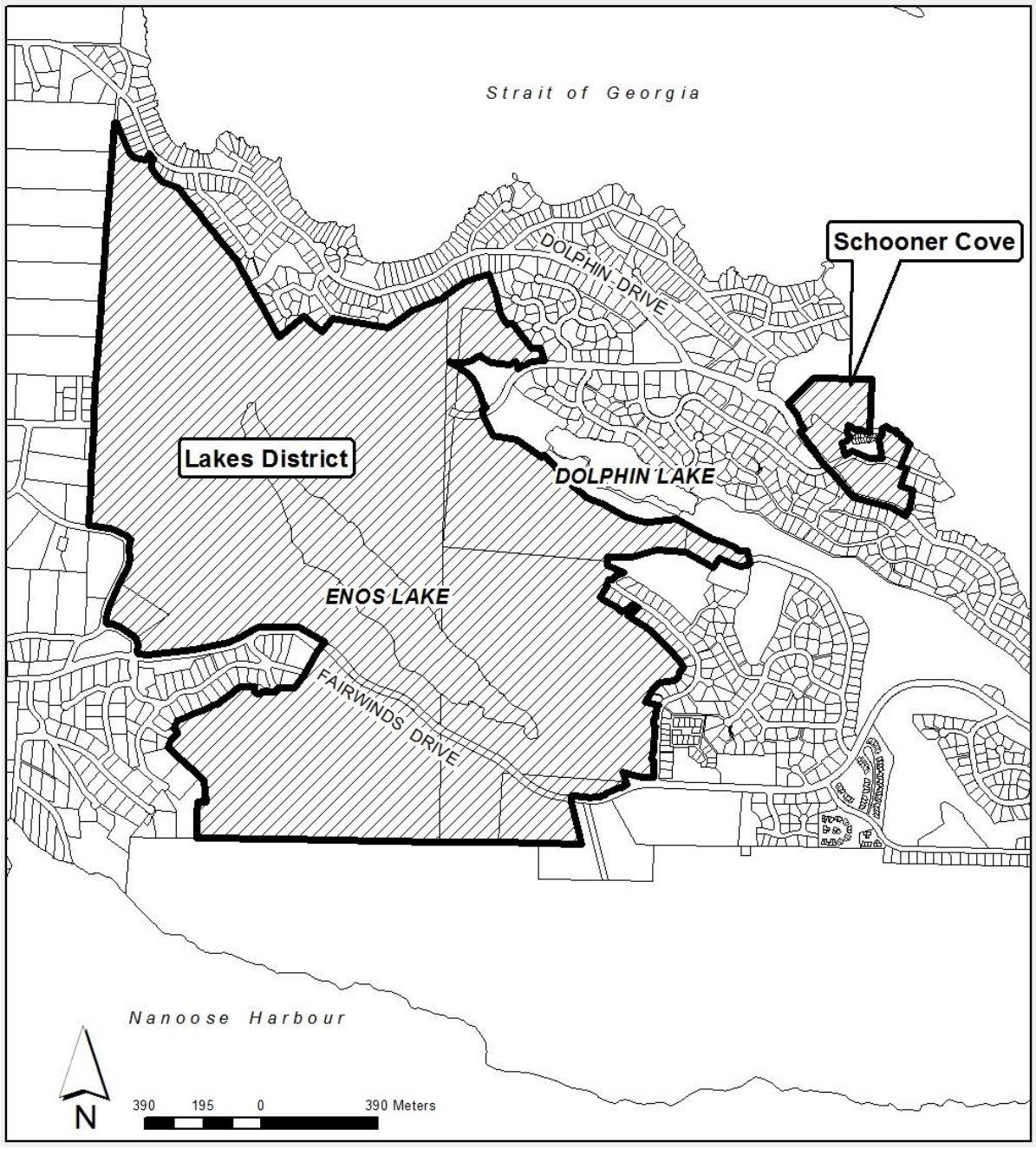
_____

Chairperson

_____

Corporate Officer

Schedule '3'
Lakes District and Schooner Cove Community Water and Sewer Standards Area



REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

SCHEDULE 4 C 1

2013 LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

SCHEDULE 4 C 1

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

TABLE OF CONTENTS

APPENDICES

1. GENERAL

1.1 Requirement

The water standards for design and construction of the water system within the Lakes District and the Schooner Cove Community Water Standards Area are to be governed by Regional District of Nanaimo Land Use and Subdivision Bylaw No. 500, 1987, and particular by this Schedule 4C1.

It is the intention of the RDN to enter into a phased development agreement under section 905.1 of the *Local Government Act* with the property owner of the lands within the Lakes District Comprehensive Development Zone CD44 and the Schooner Cove Comprehensive Development CD45 that will specify changes to specified subdivision servicing bylaw provisions that would not apply to the development contemplated under that agreement, unless agreed to in writing by the developer.

The RDN will require a Subdivision Service Agreement to be completed for any new water system or existing system extension, unless otherwise agreed to in writing by the RDN.

Water supply and distribution systems shall be designed, installed, extended, tested and maintained in accordance with the following standards and specifications.

1.2 Design

The engineering design of the water system shall be carried out by, and the preparation of drawings and specifications shall be sealed by a Professional Civil Engineer registered in the Province of British Columbia (the Design Professional), and shall conform to these Standards.

1.3 Definitions

Engineer means the Manager of Engineering Services for the Regional District of Nanaimo, or the person designated by the General Manager of Regional and Community Utilities.

Engineer of Record means a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of BC who is responsible for the construction drawings and documents. The Engineer of Record will be the engineer that signs and seals the record drawings and Certification of Installed Works.

Facilities means water lines, water treatment plants, pumping stations and other works necessary thereto, and for carrying potable water and includes any and all works, structures, lands, conveniences, incidental to and necessary for a water system.

Member Municipality or Member means a municipality or improvement district within the Regional District of Nanaimo.

Regional District means in the document the Regional District shall refer to the Regional District of Nanaimo.

1.4 Application

All applications shall be made in two steps as follows:

1. Feasibility Review

All proposed construction of water supply and distribution facilities shall be submitted to the Regional District for a feasibility review prior to commencement of any detailed design or

construction. Such requests shall include a plan of the proposed construction and the area it will serve. The applicable feasibility review fee, in accordance with RDN Bylaw No. 1259.03 or most recent amendment, and the Letter of Assurance shall also be submitted at this time.

The Regional District will review the proposal, and reply in writing indicating approval or listiing the necessary amendments required.

To be addressed but not limited to, are the following items:

a) source of water
b) initial plan of the works showing equipment/pipe sizes, materials etc.
c) number of properties and population served
d) alignments/offsets of pipes etc.
e) any flow and/or pressure concerns

2. Detailed Design

The detailed design and specifications shall be submitted in duplicate to the Regional District for Design Stage Approval (DSA) prior to construction and is valid for up to 180 days from the date of issue. Attached to the submission shall be a Certificate of Design. The applicable engineering review fee, in accordance with RDN Bylaw No. 1259.03 or most recent amendment, shall also be submitted at this time, along with the Design Professional's certified cost estimate for the works upon which the fee amount is based.

The detailed plans will be returned either approved or with a request for re-submission. Re-submission will be carried out until the Regional District approves the detailed plans and specifications, and issues Design Stage Approval (DSA).

The Design Professional shall submit the RDN approved plans to the Provincial Ministry of Transportation & Infrastructure and Vancouver Island Health Authority for any approval permits that may be required. Receipt and submission of these permits to the RDN shall also be a prerequisite to the start of construction. Approval permits from other applicable agencies as required shall also be obtained.

1.5 Drawings and Specifications

All design drawings shall be ISO A1 size, 594 mm in depth and 841 mm in width. The following information shall be supplied:

1. **Location Plan** - showing the location of the proposed work. This may appear on the same sheet as the Key Plan.

2. **Key Plan** - showing a plan of the proposed work at a suitable scale such that the whole works are shown on one drawing, usually 1:5000, 1:2000 or 1:1000. The Key Plan shall show a general outline of the works, area covered and sheet numbers of the plan/profile drawings, and a legend showing existing and proposed works.

3. **Plans/Profiles** - showing detailed design of the proposed works. Profiles of mains 200 mm in size and under are not required unless otherwise specified by the Regional District.

Plans shall be drawn at a scale of 1:500 (1:250 is also acceptable), showing the location of the pipe centreline, pipe size and type and off-set from property line, hydrants, valves, fittings and all related appurtenances in relation to road, easement and adjacent property and lot lines. Existing or proposed underground utilities are to be indicated on

the plan in addition to the extent of work required in making connection to existing water main. Location of service connections are to be shown. Connections not conforming to the standard offset require a distance from an iron pin or lot line. In general, water services shall be installed two in a trench at property corners, 1200 mm from the lot line, and alternate with hydro and telephone poles.

Profiles shall be drawn at a horizontal scale of 1:500 and a vertical scale of 1:50 if more suited to specific conditions. The profile shall show the line of the existing and finished road grade on centreline, the invert of the pipe, location of fittings and hydrants, and location of sanitary and storm utilities. Where the pipe is not to be laid at a constant depth below the finished grade, the invert elevation shall be shown at pipe deflections and vertical bends.

Drawings detailing plans and elevations shall be prepared for wells and wellheads, supply intake works, pump stations, major valve chambers, and storage reservoirs. Suitable standard scales shall be chosen, being either 1:50, 1:20, 1:10, or 1:5.

4. **Specifications** - shall be prepared to further define materials of construction and shall specify methods of construction and workmanship.

5. **Record Drawings** - shall be prepared by correcting drawings on completion of construction in order to reflect "as-built" conditions for permanent records. The location of all individual lot water service connections shall be clearly shown. The drawings shall be signed and sealed by the Professional Civil Engineer, and shall be accompanied by a Certification of Installed Works. Final record drawings shall consist of:

   a) 2 full-size paper sets;
   b) one full size 3 mil Mylar set;
   c) 2 – 11” X 17” paper sets or 2 A3 half-size paper sets, as agreed by the RDN; and
   d) digital copies, one as AutoCAD or Civil 3D file as applicable to the current software, and one as TIFF files.

1.6 Variations from Standards

Where the applicant wishes to vary from these standards he shall submit a written request with adequate supporting data to the Regional District for review.

The Regional District shall make the final decision in writing as to the standard requirements which shall apply.

1.7 Permits

The applicant shall be responsible for obtaining all necessary approvals and permits required prior to commencing construction of the water system.

1.8 New Service Areas

Where a water system is to be constructed by an applicant within an area previously unserviced by a community water system, the design and construction for the system shall comply with the requirements of these Standards, unless otherwise agreed to in writing by the Regional District.

1.9 Existing Service Areas

Where a water system is to be constructed by an applicant within the existing or extended boundaries of an area already being served by a community water system, the design and construction of the system shall comply with the requirements of these Standards, with the

understanding that Sections 2.5 and 2.6 may not apply and will be determined by the RDN according to the project and available existing source capacity and water quality.

1.10 Inspection

The Manager of Engineering Services of the Regional District or his appointed deputies shall be allowed access and provided adequate facilities for access to any part of the works at all times for the purpose of inspection.

Any connections to or interruption of any existing system will be under the direct supervision of the Regional District. Adequate notice to the Regional District of any such interruption to service shall be provided in order that attendance by Regional District personnel can be arranged.

The design engineer appointed by the Developer/Owner shall be employed during construction of the works to confirm the project is/has been constructed according to the design drawings and specifications. At the end of the project the engineer shall provide a Certification of Installed Works indicating the works were constructed according to the plans and specifications and meet all applicable codes / regulations / bylaws.

2. DESIGN

2.1 Water Demand

Water sources and primary supply mains shall be designed to supply the maximum day's demand, while distribution mains and booster pump stations must be sized to handle the peak hourly or fire flows. The volume of water in storage acts as a cushion between these differing flows.

The water distribution system shall be designed according to the following minimum demands:

1. Residential

Replacement Section 2.1.1 Water Demand - Residential

Housing Unit	Max Litres per Day per Person	Max Imperial Gallons per Day per Person	Persons Per Household	IGPM per Housing Unit
		(A)	(B)	(A/24/60XB)
Single-Family/detached house	1,168	250	2.2	0.38
Townhouse (attached, semi-detached) unit	914	200	1.9	0.26
Apartment / condominium unit	424	90	1.4	0.09
Secondary suite (carriage house)	424	90	1.1	0.07
Seniors Living unit	424	90	1.1	0.07

2. Commercial and Industrial

Water demands for developments involving commercial or industrial zoned lands shall be in accordance with good engineering practice as determined by the Design Professional and approved in writing by the Regional District.

Replacement Section 2.1.2 Water Demand - Commercial

Non-residential uses			
Commercial – Retail	480	105	Per 1000 sf leasable
Commercial – Office	640	140	Per 1000 sf leasable
Commercial – Restaurant	3500	770	Per 1000 sf leasable
Commercial – Pub	3500	770	Per 1000 sf leasable
Fitness Centre	490	105	Per 1000 sf leasable

3. Fire

Required fire flows shall be in accordance with the "Water Supply for Public Fire Protection - A Guide to Recommended Practice" as published by Public Fire Protection Survey Services, but in no case shall be less than 4.55 m^3/min (1000 igpm) for 90 minutes unless approved in writing by the Regional District.

2.2 Water Pressure

Minimum design distribution pressure in all areas at peak demand shall be 276 kPa (40 psi) at the property line. The design engineer shall indicate any building sites where the pressure at the main floor of the building is expected to be less than 207 kPa (30 psi). The developer is expected to file covenants of low pressure on properties where the pressure at the main floor of the building is expected to be less than 207 kPa. With the combination of maximum daily demand and the specified fire flow, the minimum residual water pressure at the fire hydrant shall be 138 kPa (20 psi), and at the highest point in the system shall not fall below 69 kPa (10 psi). Where these minimum design pressures cannot be maintained due to an increase in elevation or distance from the point of connection, a booster pump station and emergency storage shall be provided as part of the distribution system.

The maximum allowable distribution line pressure is 900 kPa (130.5 psi) except where individual connections are permitted directly from trunk mains and where special precautions are taken. Otherwise, where distribution pressures will exceed 900 kPa due to a drop in elevation, a pressure reducing station shall be installed as part of the distribution system. Where distribution pressures exceed 550 kPa (80 psi), occupants in the area shall be required to install individual pressure reducing valves. This valve shall be of an approved design and manufacture.

2.3 Design Population

Design populations used in calculating water demand for residential properties shall be computed in accordance with the population predictions based on the total number of residential units and persons per unit (ppu) as determined by the Regional District from census data or with the persons/hectare (in 2011 an average single family detached home has 2.2 ppu*) :

Multiple dwelling unit development	125 persons/hectare
Dwelling unit	30 persons/hectare (12.5 homes/hectare)

Exceptions to these design population densities may be varied by the Regional District of Nanaimo with Board Approval.

2.4 Hydraulic Network

Depending on the complexity and extent of the proposed distribution system, the Regional District may require a hydraulic network analysis showing maximum design flows and minimum design pressures. If this information is required, it will be stated by the RDN in writing at the time of the **Feasibility Review** and shall be submitted by the applicant with the detailed design application. The hydraulic network shall be designed to provide the maximum design flows at or above the minimum required pressures specified in this Standard.

2.5 Water Quality

1. Water supplied to domestic consumers shall be of a quality meeting the guidelines for microbiological, chemical, and physical parameters listed in the "latest edition" of the Guidelines for Canadian Drinking Water Quality prepared by the Federal-Provincial-Territorial Subcommittee on Drinking Water. All new water source quality shall have parameters equal to or less than the aesthetic objectives (AO) listed in these guidelines. If necessary, treatment of the source water to reduce iron and manganese below AO shall be provided. Exceptions to these parameters may be approved in writing by the Regional District of Nanaimo with Board Approval.

2. All surface water supplies shall be suitably treated and disinfected as per provincial requirements/regulations. Disinfection will normally be solely by chlorination using proportional solution feed, but other approved methods will be considered, including ultraviolet (UV) units, provided residual chlorination is included.

3. Groundwater sources may require chlorination, either at the discretion of the Vancouver Island Health Authority (VIHA), or by the RDN to suit operational requirements such as integrating a new source into an existing chlorinated system. Space shall, as a minimum, be provided for all chlorine storage and associated equipment.

2.6 Supply Sources

1. Groundwater Source

Where groundwater is to be the source of supply, a copy of the well driller's log shall be submitted, together with a copy of a well completion report by a Design Professional or a professional geoscientist registered in the Province of British Columbia (The Design Professional). All new wells shall be constructed in accordance with the Groundwater Protection Regulations, November 1, 2005, or their most recent amendment or replacement legislation.

Wells shall be cased with a minimum 200 mm (8 inch) diameter steel casing having a minimum stickup of 300 mm (12 inches) above the proposed final ground surface. The well shall be completed with stainless steel screen(s) selected following sieve analysis of aquifer material, and shall have a surface casing of a minimum 250 mm (10 inch) diameter surrounding the 200 mm well casing (unless otherwise approved in writing by

the RDN). The length of the surface casing shall be designed by The Design Professional and shall not be less than 3 meters (10 feet). A surface seal of at least 4.5 meters (15 feet) shall be installed as per the standard contained in the BC Ground Water Protection Regulation. The ground surface around the well head shall be graded to slope away from the well head at 2% grade or greater.

Any wells which encounter bedrock and source water from within rock, shall have well casing driven into the rock to establish a seal and have a surface annular seal placed to the depth at which bedrock is encountered or to a minimum depth of 4.5 meters (15 feet), whichever is less. All wells completed in bedrock must be equipped with PVC liner with threaded joints to allow for removal of the PVC for periodic well maintenance.

Modifications to well casing to allow for shallow subsurface connection, i.e., pitless adapter units, will require that the surface annular seal be re-established. All new wells shall be equipped with a 25 mm (1 inch) diameter PVC monitoring tube for the installation of a standard water level measuring device without danger of being stuck in the well.

The new well shall have a Well Identification Plate as issued by the BC Ministry of Environment attached to the well casing exposed at surface and clearly visible. Copies of all information for the well including the drillers log, pumping test data, analysis and written reports shall be submitted to the BC Ministry of Environment, VIHA and RDN.

The well completion report shall record results of well pumping tests which shall only occur during the late summer or early fall (August, September, October as this time is generally the lowest ground water levels of the year), and contain conclusions as to the capability of the source with the standard MOE 30%percent drawdown safety factor under conditions of zero surface recharge for 120 days (this figure may be reduced 100 days if authorized in writing by the RDN). All interference effects from adjacent constructed wells, on the assumption that they are all fully operational on a continuous basis over the same 120 day period, shall be allowed for in addition to the 30% drawdown safety factor.

No safety factor is required to be added to the interference drawdown allowance although a 15% reduction will be applied as per current RDN bylaws but this will be reviewed internally within the RDN. The Design Professional shall recommend a rated pumping capacity for the well and all wells which will be reviewed by the RDN. The hydrogeoligist may require specific pump rates for proper testing.

The Design Professional shall also assess if and what interference effects the new well will have on any adjacent operating RDN system wells. He shall provide an assessment of the effect in total litres per second of capacity reduction which those operating wells are anticipated to have over the 120 day zero surface recharge condition with the new well operating. The new well pump will be required to be sized to the full long term design capacity, but the allowable new supply applicable to support new development will be lowered by any such capacity reduction which it may have on operating RDN wells.

The well pumping test shall be run for 48 hours continuous pumping (72 hours in bedrock wells) at a pumping rate at or above the projected long-term pumping capacity of the well or until the water level stabilizes, whichever is the longest time. Adjacent constructed wells shall be monitored during the test pumping period, to allow The Design Professional to assess interference effects. Well recovery measurements shall also be carried out immediately on completion of the test pumping period and shall

continue until the well has recovered to at least 95% of its initial level (the RDN may reduce this recovery to 80% but this must be authorized in writing by the RDN). A minimum long-term well design capacity rating of 3.8 l/s (50 igpm) is required for any individual well. The minimum standards for pumping test and well capacity can only be altered in writing by the RDN, where under special circumstances wells meeting all quality guidelines and a capacity rating between 2.3 l/s and 3.8 l/s may be considered by the RDN for acceptance. Well testing procedures shall be in accordance with information provided by the BC Government. In no case shall the pumping test be of less time than it takes to produce a relatively stable water level in the well for an adequate period of time, as approved by The Design Professional.

The well completion report shall include a water balance for the aquifer, which accounts for seasonal recharge and withdrawals by users both directly up-gradient and down-gradient of the existing and proposed subdivision lots. All assumptions incorporated into the water balance calculations shall be stated in the report. The well completion report shall also include an assessment of any risk of flooding around the well and indicate what measures have been taken or will be taken to protect the well or wellhead from entry of flood debris or flood waters or physical damage due to flood debris, ice or erosion. Flood proofing shall be in accordance with the Drinking Water Protection regulation, Section 14 and the Ground Water Protection Regulation, Section 11.

The Regional District may require a more extensive quantitative and qualitative report by the Design Professional where unusual conditions or results occur. Further, the RDN may require the information provided by The Design Professional to be reviewed/scrutinized by a third party Design Professional appointed/retained by the RDN and paid for by the developer/well provider.

All new sources of water shall be approved by the Vancouver Island Health Authority (VIHA) and a “source approval” must be issued by VIHA prior to the source being connected to the Regional District of Nanaimo’s public water system. VIHA must also approve the well for service in writing. The connection of new properties requiring a new approved source of water shall not be permitted/approved by the RDN until the source is approved by VIHA. A wellhead protection (WHPR) report suitable to the RDN and in the format shown as “Minimum Requirements” shall also be submitted along with the information provided for source approval. Any requirements imposed by VIHA in the source approval shall be completed by the Developer, unless agreed to otherwise in writing by the RDN.

The RDN shall have legal control over a sanitary control area extending from the well head to a radius of 30 to 60 metres based on a wellhead protection report and to the satisfaction of both VIHA and RDN. RDN shall own the property as fee simple around the well head. The sanitary setback areas preferred form of legal control is fee simple ownership, particularly for the first 30 metres, however, if and to the extent that such is not feasible, this may also take the form of a sanitary control easement satisfactory to both VIHA and the RDN.

New sources shall also include provision of a suitable monitoring well that shall be designed and placed near the production well as recommended and designed by the Design Professional. The monitoring well shall be suitably completed and secured at the surface with a Model Solonist Gold (or other model if approved in writing by the RDN) electronic data logger placed at a suitable depth in the monitoring well.

2. Surface Water Source

The proposed use of surface water as a potable water supply source shall be approved by the Board before being considered. Any surface water source shall meet all provincial government regulations and guidelines for siting, for licensing and for treatment etc.

3. Source Pump Stations and Controls

Due to the individual requirements for source pump stations, a standard detail drawing is not provided in these Community Water System Standards. Prior to completing the preliminary design, the design engineer shall request samples of typical recent acceptable source pump stations, and confirm conceptual design requirements. This will be further reviewed, and requirements confirmed by the RDN at the feasibility design review stage.

Wellhead piping shall consist (as a minimum) of a wye strainer, turbine flow meter, air release valves, check valve, gate valve to throttle flows to recommended output with pressure gauges upstream and downstream and mating flanges with adapter coupling to allow installation of an orifice plate to fine-tune pump output, and a 50 mm (2 inch) diameter valved outlet with 62 mm (2.5 inch) diameter fire hose adapter for flushing purposes. A hose bib shall be provided to permit periodic water sampling. The wellhead building or enclosure shall be designed such that future access to the well is available for pump removal or well redevelopment. This shall normally be achieved by installing a pitless adapter on top of the well, protected from vandalism by installation in a non-confined space concrete chamber with spring-assisted aluminum cover and locking lid. A Model Solonist Gold (or other model if approved in writing by the RDN) electronic data logger shall be installed in the well, with data recording equipment and software. Access to install a well-line into the well for periodic manual monitoring of static and pumping levels in the well shall also be provided. Flow recording instrumentation is required. Surface source piping shall be similar in general concept to wellhead piping, modified as agreed with the RDN and to suit the special site circumstances.

The source pump station building shall be designed to provide adequate heating and insulation, lighting and ventilation. The size of the building shall be discussed and determined at the time of the feasibility review. The building shall be of concrete and block work construction, with two isolated rooms, each having separate access doors. One room shall house mechanical piping and electrical controls, and the second room chlorine injection equipment and liquid chemical storage with built-in spill containment. In special circumstances only, the RDN may approve the use of enclosures in lieu of a building, due to site space or access agreement limitations.

Each pump shall have a variable frequency drive combination motor starter with a motor circuit protector, a "hand-off-auto" selector switch, a green "pump run" pilot light, a red "pump failed" pilot light and an elapsed time meter.

Motor starters for submersible well pumps shall be equipped with quick-trip overload relays. Low level draw-down protection shall be provided utilizing electrodes suspended in the well. Restart of the pump shall be automatic when the water level in the well has recovered sufficiently; however, a red alarm light on the control panel shall require manual reset.

If the system consists of more than one pump, supplied from the same service, the control circuits shall be subdivided into branch circuits in such a manner as not to shut down the entire system if one pump circuit develops a fault. Also, time delays shall be provided to permit staggered re-start of the pumps after a power failure.

The pump control panel shall have protection against single-phasing and a red pilot light which will stay on until manually reset after a power failure.

If the system consists of more than one pump, an automatic alternator or manual lead pump selector switch shall be provided.

A single-pole, double-throw (SPDT) contact shall be provided for remote alarm purposes, which will be activated in the event of pump failure, motor overload, and power failure of low well level. Connection of alarm signal outputs to the RDN answering service or alarm centre shall be provided. An external alarm light may also be required for some installations.

Signal cables for pump control shall be directly buried, either alongside connecting pipelines or in a separate trench, wherever feasible. Cable warning tape shall be installed in the trench over signal cables.

For well sources on new systems where very little water-use occurs during the initial operation period until sufficient new users are connected, the RDN may require installation of an approved automatic flushing device, to help in maintaining water quality.

Supervisory control and data acquisition (SCADA) shall be provided from all data outputs to a central location within the new system, normally at the source pump station. The RDN will be responsible for connection of local data to a centralized system, and for any offsite programming requirements which may be required to integrate the new system into the overall water systems SCADA system.

The RDN may require emergency power back-up on all new water sources. This will be determined at time of feasibility review by analyzing system vulnerability.

2.7 Storage

1. Sizing

Reservoirs shall be sized to provide usable water storage volume to meet the fire flow requirements (Section 2.2.1.3) plus 20 percent of a maximum day's demand for the tributary area, and shall be of at least 365 cu. m (80,000 imperial gallons) capacity. The RDN may agree in writing to reduce the reservoir minimum size requirement.

2. Design

The materials and designs used for finished water storage structures shall provide stability and durability as well as protect the quality of the stored water. Unless one or more reservoirs in the same or higher pressure zone within the system are already operational, the reservoir is to be constructed with two independent cells. This is to allow maintenance of one cell to occur, while the second cell remains in service. During the feasibility review, the reservoir design, security features, dimensions, layout and material of construction shall be discussed and agreed with the RDN. Where practical, concrete reservoirs are preferred (although other materials of construction will be considered for acceptance) provided they are designed in accordance with the Building Regulations of British Columbia and amendments thereto. When topography and pressure zone conditions allow, an in-ground reservoir with a minimum 500 mm gravel and soil covering is preferred, for improved seasonal water quality. Steel structures shall

also follow the current AWWA Standards concerning steel tanks, standpipes, reservoirs, and elevated tanks wherever they are applicable.

The foundation may be designed either with the bottom at ground level, bearing on a slab or ring beam or on legs with the bottom in an elevated position.

Foundation design shall be in accordance with Building Regulations of British Columbia and amendments thereto. A foundation or soils investigations report shall be submitted, prepared by a Geotechnical Engineer registered in the Province of British Columbia.

In addition to the seismic requirements of the Building Regulations of British Columbia due account shall be taken of the effects of both convective and impulsive forces generated by ground motion. Sufficient clearance shall also be provided between high water level and roof soffit to allow for wave generation.

The reservoir structure shall be designed to safely withstand all construction and operating loads.

Reservoirs shall be totally enclosed with adequate ventilation, screened and weather protected. Vents shall project above the highest anticipated depth of snow on the roof.

Concrete reservoirs shall be provided with a roof access hatch served by internal and external ladders. Steel reservoirs shall be provided with a roof access hatch served by internal and external ladders and low level access manhole. Roof access hatches shall be of aluminum with spring-assisted opening, and shall be lockable. A roof mounted plate shall be installed alongside the roof access hatch, to suit mounting of the RDN mobile safety winch mechanism, used during internal access operations.

Access ladders, safety cages, and platforms shall comply with the requirements of the Worker's Compensation Board. Chain link and barbed wire fencing of the reservoir site will be required by the RDN, unless otherwise approved in writing by the RDN for specific site location and security conditions.

An altitude gauge shall be provided at an elevation of 1.2 m above the reservoir foundation.

Inlet piping is to discharge into the reservoir above TWL elevation. An approved outlet set 100 mm above the reservoir floor, a valved drain set at floor level, and an overflow pipe with bell-mouth entry set at 200 mm above normal reservoir top water level with 300 mm clearance from underside of roof shall be provided.

Alarms requiring manual reset shall be provided to indicate reservoir high or low level. In a water system consisting of well or booster pumps, these alarms shall be transmitted along buried signal cables to a central location. Controls may utilize probes or transmitters. Where the reservoir is supplied via pumped water, pump start-stop controls will be required. The RDN may require individual start-stop levels for each pump, or staggered pump start-stop on a timer basis.

The Regional District will require the installation of flow meters with flow data transmission and recording from the reservoir outlet. Level monitoring and recording from a level transducer at the reservoir base, or in a chamber immediately on the outlet pipe, shall also be provided.

2.8 Water Distribution Piping

1. Materials

Unless otherwise permitted, the following pipe materials shall be used for water distribution:

Material	Specifications
Steel Pipe	AWWA C200
Ductile Iron Pipe	AWWA C151
PVC Pipe	AWWA C900 - Class 150, DR 18 maximum

All pipe shall be delivered to site with end caps for shipping and storage. Steel pipe shall be coated and lined in accordance with AWWA C203. Ductile iron pipe shall be cement mortar lined in accordance with AWWA C104. Joints shall be rubber gasket in accordance with AWWA C111. Where corrosive soil conditions exist and metal pipe materials are proposed for use, a soil corrosion survey shall be undertaken by an approved professional. The Regional District may require special protection for the pipe. All pipes shall be designed for the maximum pressures and earth loading to which the pipe will be exposed, but in no case shall the design working plus safety factor pressure or class be less than that providing an AWWA standard rating of 1030 kPa (150 psi). Lesser pressure class pipe may only be used when specifically approved otherwise by the RDN for large installations, where no possibility of pressure surges or pressure zone changes occurring, in which cases Class 100 or better rating pipe would be considered.

2. General Layout

Numerous trunk lines and secondary feeders shall be installed throughout the system. These mains must be large enough to deliver consumption and fire flow demands for the district served, and shall be spaced not more than 900 m apart and looped.

Minor distributors and pipes of the gridiron system shall be a minimum of 150 mm in diameter in residential districts with 150 mm diameter cross mains at intervals not exceeding 180 m. Where no longer lengths of pipe are necessary, 200 mm diameter or larger intersecting main shall be used unless initial pressures are unusually high. 200 mm diameter pipe shall be used where dead ends or poor gridironing are likely to exist for a considerable period, or where the layout of the streets and the topography are not adapted to the above arrangement. Lines furnishing domestic supply only, and not serving hydrants, may be 100 mm diameter. Mains in cul-de-sacs shall be looped wherever feasible by connecting through specifically created rights-of-way or parkland, or by twinning pipe installation and looping pipe ends, for improved water quality. Where a water main ends in a dead end, or a valve is normally closed, a fire hydrant or below ground flushout shall be provided for flushing purposes. Temporary above ground flushouts may only be used on those mains intended to be extended in the near future.

In the high value districts, the minimum size shall be 200 mm diameter. Pipe of minimum 250 mm or 300 mm diameter is to be used on major and network highways and roads as identified in the Official Community Plans of the Regional District and for long lines not cross-connected.

2.9 Service Connections

Unless otherwise permitted, only the following materials may be used for service connections:

Material	Specifications
Polyethylene, PE 3406 - N	Potable Series 160 B.137.1
Plastic	ASTM D2666
Soft Copper, Type K	ASTM B88

In general, polyethylene shall be used for new services, except in special approved circumstances, and copper for replacement of existing old service piping by trenchless "pipe splitting" methods.

The minimum size of service connection is 19 mm diameter. Where the length of service between the main and anticipated building frontage exceeds 30 m, the service connection shall be minimum 25 mm diameter. Corporation and curb stops shall be of the same diameter as the service piping. In the larger sizes of service connection piping, the materials specified in Section 2.8 for water distribution may also be used.

Drawing W-7 of this Schedule shows the general arrangement for water service connections. The minimum size of service connection is 20 mm diameter.

Water service connection locations shall be co-ordinated with B.C. Hydro, TELUS (Telephone Company), and Shaw Cablesystems to avoid any conflict with poles (or proposed underground facilities and service conduits for underground utility installations) at the property lines of parcels. Similarly, conflict with Terasen (gas) services shall also be reviewed and avoided.

1. Corporation Stops

Corporation stops shall be in accordance the following supplementary data:

a) Full port ball valve.
b) Minimum 150 psi rating.
c) AWWA x compression.
d) Compression nut machined to bottom out on valve body shoulder.
e) Saddle clamps shall be used as specified by the manufacturer.

2. Curb Stops

Curb stops shall be in accordance with the following supplementary data:

a) Full port ball valve.
b) Minimum 150 psi rating.
c) Compression x meter swivel nut.
d) Compression nut machined to bottom out on valve body shoulder.
e) Integral locking.
f) Drain holes not permitted.
g) Set on main side of meter box to facilitate meter installation when required.
h) Curb stops shall initially be set in a 100 mm diameter PVC riser pipe, with the meter box to be installed by the RDN on final connection when the building is under construction, unless agreed otherwise. Concrete meter boxes with full support lip

and steel lid drilled for touch-read meter pad shall be provided to the RDN for this purpose.

2.10 Fire Hydrants

Hydrants shall be in accordance with AWWA C502, compression type, factory-painted yellow. The minimum hydrant size shall be 150 mm diameter. The minimum depth of bury shall be 1.2 m. There shall be a minimum of two 65 mm house outlets and one pumper outlet 117.5 mm P4.23, outside diameter male outlet complete with caps per hydrant. One of the outlets shall have an independent shut-off. Opening for both the main hydrant valve and independent shut-off shall be to the left (counter-clockwise). Outlet threads shall conform to the British Columbia Fire Hose Thread Specification. Main valve spindle and outlet nuts shall be standard pentagon shape. Main valve spindle: pentagon in 45 mm circle. Independent spindle: square 16 mm x 16 mm. Drain outlets are to be provided.

Drawings W-12 and W-13 of this Schedule show the general arrangement for the installation of hydrants. Connections shall not be less than 150 mm diameter. A gate valve will be provided on all connections between the hydrant and the main. Installations shall be in general accordance with AWWA M17. The hydrant shall be installed vertical, with the pumper nozzle perpendicular to the priority access road centreline. Mechanical joint thrust restrainers shall be used on all leads up to 6 m length. For longer hydrant leads, approved joint restrainers shall be used at each pipe joint, or alternatively a thrust block shall be installed behind the hydrant 'boot' in accordance with Drawing W-9.

Hydrant distribution shall be in general conformance with the aforementioned Standard of Municipal Fire Protection, but in all cases spacing shall be such that the maximum distance from a hydrant to the centre of any property measured along the centreline of the street and at right-angles to the property is 75 m. Hydrants will be set in 6 m from the corner at any intersection to facilitate future widening or other street works.

2.11 Valves

Unless otherwise permitted, only the following valves shall be installed in the distribution system:

1. Gate Valves

Gate valves shall be in accordance with Drawing W-8, AWWA C500 and the following supplementary data:

a) Gate valves shall have an iron body, brass mounted.
b) Valves shall be the same size as the pipe in which they are installed, up to and including 300 mm diameter. In mains over 300 mm diameter, valves may be butterfly type.
c) Valve ends shall be provided to fit the pipe.
d) The position of the in line valve shall be vertical.
e) Stem seals shall be O-ring.
f) Valves shall open to the left (counter-clockwise).
g) Gears will be required on valves 400 mm and larger. Gear cases shall be totally enclosed.
h) Bypasses will be provided on valves 500 mm in diameter and larger.
i) Valves shall have a 50 mm square operating nut.

2. Rubber Seated Butterfly Valves

Rubber seated butterfly valves shall be in accordance with AWWA C504 and the following specifications:

a) Valves shall be the same size as the pipe in which they are installed. Valves shall be of wafer style or short body flanged.
b) Valve ends shall suit the pipe.
c) Maximum nonshock shutoff pressure shall be suitable for 1030 kPa, bubble tight.
d) Valves shall be designed for the extreme maximum flows for both opening and closing.
e) Shaft seals shall be O-ring type.
f) Valve disks shall be ductile iron.
g) Valve operators shall be suitable for buried installation and equipped with a standard operating unit.
h) Valves shall open to the left (counter-clockwise).
i) Operators are to be located on the side of the valve with the operating spindle in the vertical position.

In general, valves shall be located at intersections and shall be so positioned that no more than 150 m for high value district and 250 m for other areas are isolated in the case of line repairs. In larger trunk and feeder mains where no interconnections are made, the spacing of valves should not exceed 500 m.

Approved joint restraint fittings shall be provided on all valves.

Where valves are located in the roadway, valve boxes shall be Nelson Type of cast iron and telescoping so the surface loads are not transmitted to the valve body of pipeline. A minimum of 200 mm of future adjustment shall be available on all valve boxes for future raising of grade, by locating the top of PVC riser a maximum of 100 mm below the completed asphalt apron grade at the time of initial installation. Cast iron hoods shall be provided on all gate valves 250 mm diameter or larger. In areas where there is no traffic, valve boxes may be as approved by the Regional District.

Valve markers shall be installed to indicate the location of all valves. These markers shall be constructed of 50 mm metal pipe painted sky blue and set in a concrete base. They shall extend 1 m above the ground surface. The markers shall be located 2 m from the property line opposite the valve and the distance to the valve is to be marked in black figures on a flattened upper portion of the marker.

2.12 Fittings

Fittings shall be designed for a minimum of 1030 kPa working pressure and shall be in accordance with AWWA C110. Ends shall be flanged or belled to suit pipe ends. Flanges shall conform in dimension and drilling to ASA B16.1, Class 125. Flange gaskets shall be of natural rubber and shall be 3mm thick with a layer of cotton on both sides. Approved joint restraints shall be used at all fittings, including restraining of a suitable length of pipe each side of the fitting, except at fire hydrant leads over 6 m with unrestrained pipe joints and at main dead-ends, where thrust blocks shall be provided as shown on Drawing W-9 of this Schedule. Thrust calculations for joint restraints shall be carried out in accordance with the manufacturer's specifications, and shown on the design drawings. Length of pipe to be restrained at each fitting shall be clearly shown on each applicable plan drawing, for the varying pipe sizes and fitting configuration.

2.13 Trenching and Backfill

The standard trench section is shown in Drawings W-1, W-2, and W-3 of this Schedule for various conditions. The nominal minimum depth of cover shall be 1.2 m but in no case shall it be less than 1.0 m unless otherwise permitted by the Regional District. Water mains shall be located not less than 3 m centre-to-centre from all sanitary and storm sewer lines, unless otherwise permitted by the Regional District and the Vancouver Island Health Authority.

1. Bedding material shall conform to the following gradation limits:

Gradation Limits

(Percent by Weight Passing)

Sieve Designation	Type 1	Type 2
19.0 mm	100	90-100
12.5 mm		65-85
9.5 mm	85-100	50-75
4.750 mm	70-100	25-50
2.36 mm		10-35
1.18 mm	20-65	
0.850 mm		5-20
0.6 mm	0-45	
0.425 mm		0-15
0.18 mm		0-8
0.15 mm	0-10	
0.075 mm	0-5	0-5

2. Type 1 is the standard acceptable bedding material. Type 2 shall be used where specified by the design engineer to meet special design loading. Dry sieve analysis shall be carried out in checking material gradation.

3. Other acceptable bedding materials, for use only where shown on the construction drawings or as approved by the Engineer, are drain rock, pea gravel or native material. In rock, pipe zone shall have filter fabric between rock and bedding material. Filter fabric shall be non-woven, minimum grade Armtec 200 or equivalent.

4. The bedding material shall cover the full width of the trench bottom and have a minimum depth of 100 mm on completion of compaction. In rock excavation the minimum depth of bedding below the pipe shall be 150 mm after completion of compaction.

5. Bedding material shall be compacted in maximum 150 mm lifts to 95% of Modified Proctor Density (ASTM D1557). Side tamping shall be carried out with bedding material placed to the pipe springline, to provide haunch support.

6. Bedding material shall be placed in such a manner that the pipe is evenly supported throughout its length by the pipe bedding material.

7. Placement and compaction of the bedding material shall not damage or displace the pipe.

8. Bedding material shall be leveled across the full width of the trench to an elevation of 300 mm above the crown of the pipe.

2.14 Pressure Reducing Stations

General requirements for pressure reducing stations shall be as follows:

1. A valved bypass shall be provided.

2. A surge relief valve shall be provided to release pressure in the event of a failure of the pressure reducing valve(s). The surge relief valve may be incorporated into the pressure reducing station or may be located at some other suitable location within the distribution system.

3. Pressure reducing valves shall be sized to provide adequate pressure control through all ranges of design flows. If necessary, two or more pressure reducing valves of varying sizes will be provided in the one station.

4. Each pressure reducing and surge relief valve will be provided with isolating valves and be installed so that individual components may be easily removed for repair or replacement.

5. The whole of the pressure reducing stations shall be enclosed in a reinforced concrete vault with a standard manhole cover and other opening large enough to remove the largest single piece of equipment in the station. Floor drains sloped at 2 percent shall be provided to keep the station dry at all times and shall not be directly connected to any sanitary sewer, or to a storm sewer without a backwater valve in the storm service connection. Drains to the surface are permissible if there is no risk of flooding. Otherwise, underground absorption pits or sump pumps will be required depending on site condition. A permanent access ladder shall be installed.

6. Pressure gauges complete with snubbers shall be installed to register both upstream and downstream pressure.

7. Adequate strainers with dual cartridge filters shall be supplied on the water used for controlling and regulating valves.

2.15 Booster Pump Stations

General requirements for booster pump stations shall be as follows:

1. A valved bypass shall be provided.

2. There shall be sufficient capacity so that, with the most important pump out of service, the station will be capable of supplying the maximum design flow.

3. It may be requested that provision be made to provide the maximum design flow during a power failure. Normally this will be accomplished by means of an elevated storage tank. Where this is not possible, emergency standby internal combustion engines shall be installed either for direct drive or electric generation.

4. Where design flows are such that starting and stopping surges will cause water hammer in the inlet or discharge lines, pump control valves or other pressure control devices shall be provided. Relief valves will also be required to protect against surges caused by power failure.

5. Pumps shall be controlled by automatic devices satisfactory to the Regional District. Flow and pressure measurement shall be provided where required. Flow recording may be required for some installations. Signal cable for pump control shall be directly buried, either alongside connecting pipelines or in a separate trench, wherever feasible. Cable warning tape shall be installed in the trench over signal cables.

6. Pumps shall normally be housed in above ground buildings, designed to provide adequate insulation, heating, lighting and ventilation.

7. Each pump shall have a combination motor starter with a motor circuit protector, a "hand-off-auto" selector switch, a green "pump run" pilot light, a red "pump failed" pilot light and an elapsed time meter.

If the system consists of more than one pump, supplied from the same service, the control circuits shall be subdivided into branch circuits in such a manner as not to shut down the entire system if one pump circuit develops a fault. Time delays shall be provided to permit staggered re-start of the pumps after a power failure.

The pump control panel shall have protection against single-phasing and a red pilot light which will stay on until manually reset after a power failure.

If the system consists of more than one pump, an automatic alternator or a manual lead pump selector switch shall be provided. Time delays or other means suitable to prevent hunting on momentary pressure surges shall be provided.

The pumps shall be shut down and stay locked in the event of motor high temperature or motor overload. The pumps shall also shut down on low suction pressure, however, re-start shall be automatic when the section pressure recovers, except that a red pilot light shall stay on until manually reset.

A single-pole, double-throw (SPDT) contact shall be provided for remote alarm purposes, which will be activated in the event of pump failure, motor high temperature, motor overload, low suction pressure, power failure or standby engine failure (if applicable). Connection of alarm signal outputs to the RDN answering service or alarm centre shall be provided. An external alarm light may also be required for some installations.

2.16 Water Meter Chambers

General requirements for meter chambers on services of 37 mm diameter and larger shall be as follows:

1. An approved meter and double check backflow preventer shall be provided. The meter shall be touch-read style, conforming to the standard meter manufacturer and reading system used by the RDN.

2. Meters shall be sized to meet the anticipated maximum demand required, while providing accurate metering throughout the flow range. Compound meters, or large and small meters installed in parallel, may be required to meet these requirements, particularly where fire flows are to be metered. Pressure loss and maximum velocities shall also be examined. For systems supporting in-building wet fire sprinkler systems, available pressures during flow conditions shall be examined, to ensure adequate operating pressure is maintained at the sprinkler heads.

3. The meter shall be installed in a chamber or chambers, which are of non-confined space access design. Large lids shall be spring-assisted opening, suitable to carry traffic loading unless the location is totally isolated from existing or future traffic, of aluminum construction when feasible.

4. If a sidewalk location is unavoidable for the meter chamber, the box shall be situated to maximize the unobstructed walking corridor.

5. The meter shall be installed in a horizontal plane.

6. A valved by-pass shall be provided for meters 50 mm diameter and larger, to avoid service shutdown during meter maintenance. For combination domestic and fire flow meters, the by-pass shall be sized for the largest flow rate. By-pass and isolation valves may be installed external to the meter chamber.

7. Meter box lid shall be suitable for mounting a touch pit read pad.

3. CONSTRUCTION

3.1 General

1. Access Roads

Temporary roads shall be constructed as required for access to the working areas. Adequate drainage facilities in the form of ditches, culverts, or other conduits shall be installed as found necessary to maintain these roads. In the construction of access roads, existing drainage facilities, natural or otherwise, shall not be disturbed to the detriment of properties outside the working area and such facilities shall, unless otherwise provided elsewhere in the specifications, be restored to their original condition on completion of the work.

2. Sanitary Facilities

Clean, sanitary latrine accommodations shall be provided and shall be located and maintained in accordance with the regulations of VIHA.

3. Special Tools, Operating Manuals, Shop Drawings

With each piece of mechanical and electrical equipment or machinery having wearing parts and requiring periodical repair and adjustment, all special tools, wrenches, and accessories required for removing worn part, making adjustments, and carrying out

maintenance shall be supplied. All gauges, indicators, and lubricating devices necessary for the proper operation of the equipment shall be furnished.

With each piece of equipment, four sets of operating manuals and as-constructed shop drawings shall be supplied. The manuals shall provide the manufacturer's recommended maintenance schedules with the grades of lubricants required, and instructions as to how the equipment may be taken apart for periodical inspection and replacement.

4. Blasting

Blasting will be permitted only after securing the approval of the applicable authorities. Blasting will not be carried out without first verifying that insurance covers any loss of life or damage that may result from this work. The Regional District, in granting approval for blasting, does not in any way assume responsibility for injury, loss of life, or damage that results there from, and such approval shall not be construed as approval of the methods employed in blasting, the sole responsibility therefore being that of the applicant.

5. Site Maintenance and Clean Up

The working area shall be maintained in an orderly manner and shall not be encumbered with equipment, materials, or debris.

Clean up shall be a continuing process from the start of the work to final acceptance of the project. Property on which work is in progress shall at all times be kept free from accumulations of waste materials or rubbish. Accumulations of waste materials, which might constitute a fire hazard, shall not be permitted. Spillage from hauling vehicles on traveled public or private roads shall be promptly cleaned up. On completion of construction, all temporary structures, rubbish, and waste materials resulting from the operations, shall be removed.

6. Erosion and Sediment Control

An Erosion and Sediment Control Plan shall be submitted for review and approval seven days prior to the pre-construction meeting. The Erosion and Sediment Control Plan shall describe the proposed methodology to minimize potential impact on the surrounding environment. The Erosion and Sediment Control Plan shall indicate how the Contractor plans to control sediment discharges from the project and what measures will be put in place to prevent damage to aquatic habitat located downstream.

The work shall be carried out in compliance with the submitted and approved Erosion and Sediment Control Plan and all other environmental laws affecting the work and with the recommendations contained in the most recent edition of the “Land and Development Guidelines for the Protection of Aquatic Habitat” published jointly the Ministry of Environment and Fisheries and Oceans Canada.

For the erosion and sediment control plan, ‘environmental laws’ means all statutes, regulations, orders, and bylaws relating in any way to the natural environment or its ecosystems, public or occupational health, transportation, storage or handling of contaminants or hazardous materials.

3.2 Existing Structures and Utility Works

1. Scope

Existing structures shall be interpreted as being all existing pipes, ducts, ditches, or other works forming a part of sewerage, drainage, water, telephone, electrical, gas, or

other utility system, as well as sidewalks, curbs, poles, fences, buildings, and other man-made things that may be encountered during construction.

2. Material Supply

Unless specified otherwise, materials supplied for replacement of existing structures shall be at least equal to those being replaced.

3. Location of Structures

Drawings or descriptions, verbal or otherwise, of existing structures or their location that are supplied by the Regional District are intended only as an aid to locating these structures. Measurements and location of the existing underground structures shown on the drawings are not guaranteed to be accurate, and must be verified prior to proceeding with construction.

4. Protection of Structures

Unless authorization from the Regional District is received for their removal, underground and surface structures encountered during construction shall be protected from damage. In the event of damage resulting from the construction operation, structures shall be repaired or replaced to a condition, which is at least the equivalent of that which existed prior to construction.

5. Emergency Situations

In emergency situations resulting from the construction operation, where life or property are endangered, the applicant shall immediately take whatever action is possible to eliminate the danger, and shall also notify the Regional District of the situation.

6. Access Maintained

Existing hydrants, valve or control pit covers, valve boxes, curb stop boxes, fire or police call boxes, and all other utility controls, warning systems, and appurtenances thereof shall not be constructed or made inaccessible at any time by the construction work. Bridges, walks, or other temporary facilities shall be provided as may be necessary to ensure that these controls or warning systems are free for use in their normal manner at all times during construction.

7. Curtailment of Utility Service

Where existing utilities such as water, sewer, electricity, telephone, and gas are serving the public, work shall be planned and executed such that there is no curtailment of service provided by these utilities without prior receipt of approval of the authorities responsible for provision and maintenance of these utilities. The applicant shall obtain the above approvals from the recognized authorities controlling these utilities. If approval for such disruption of utility service is not granted, it may be possible to establish temporary facilities to provide continuous utility service during the course of construction. Such temporary facilities shall only be implemented after receiving the approval of the utility authority.

If approval is received to temporarily shut off an existing utility, individual users of the utility shall be notified at least one hour prior to the time of shut-off.

If there is going to be a shut-off, the Fire Department shall be notified at least one hour prior to shut-off time.

8. Support of Structures

Existing structures shall be protected against damage from settlement by means of timber support of compaction of backfill as required. Where necessary, timber support shall remain in place following backfill of excavations.

Backfill which is placed under or adjacent to the existing structures, which have been undermined during excavation, shall be compacted in a manner which will prevent damage of the structure from settlement. Such backfill shall be of approved granular material suitable for compaction.

On existing piping, this material shall extend horizontally a minimum distance of 600 mm on both sides of the pipe at a level 300 mm above the pipe, and shall slope down from this point at 1-1/2 horizontal to 1 vertical to meet the bottom of the excavation.

9. Drainage Facilities

Existing culverts, enclosed drains, flumes and ditches, and other drainage structures affected by the work but left in place shall be kept clear of excavated material at all times during construction. When it is necessary to temporarily remove an existing drainage structure, suitable temporary ditches or other approved means of handling the drainage shall be provided during construction.

3.3 Clearing

Prior to clearing, the exact limits of the areas on which clearing may take place and whether or not there are restrictions placed on clearing which would result in leaving certain trees, structures, or other existing items in place shall be ascertained.

Prior to trenching, the right-of-way shall be cleared of all standing or fallen brush, timber, stumps, or other debris, which may obstruct the construction operation, damage the completed installation, or detract from the appearance of the site on completion of construction. This material shall be burned or otherwise disposed of to the satisfaction of the Regional District.

The restrictions of all authorities established to control burning in the area shall be complied with. If burning cannot be done on the clearing site, the material shall be hauled to an approved location for burning or disposal. Burning permits, as required, shall be obtained by the applicant.

3.4 Trench Alignment and Depth

Following clearing and prior to excavation of the trench, the location at which the pipe shall be installed shall be established by setting stakes at 20.0 m intervals along a line offset from the centre of the proposed pipeline.

Where pipe is to be installed to a predetermined grade, a cut sheet will be provided showing the depth of the pipe invert relative to the grade stake elevation at the respective locations along the pipeline.

The trench shall be excavated so that pipe can be laid to the established alignment and depth, with allowance made for specified trench wall clearances and bedding as shown in Drawings W-1, W-2, and W-3 of this Schedule for various conditions, or otherwise required.

All trenching and excavations shall be carried out in the manner recommended by the Workers' Compensation Board of British Columbia, or as may be necessary to protect life, property, and structures adjacent to the work and the work itself.

3.5 Pipe Installation

In general, and without limiting the clauses set out in this Standard, pipe shall be installed in accordance with the following specifications:

Ductile Iron Main	AWWA C600
Steel Mains	AWWA C603
PVC Mains	AWWA C900

3.6 Trench Backfill

Trench backfill shall be carried out as shown in Drawings W-1, W-2, and W-3 of this Schedule for various conditions.

3.7 Repairs

Any system approved and built to these standards which requires maintenance work, shall be repaired with materials and construction methods conforming to the specifications contained herein.

4. TESTING AND DISINFECTION

4.1 Written Reports

The applicant shall submit reports to the Regional District certified by a Design Professional of the tests and chlorination requirements specified herein.

4.2 Leakage Tests

Following final trench backfilling, leakage tests shall be performed on all installed piping.

Leakage tests shall be carried out between valved sections of the installation such that every valve in the system is tested for leakage in the shut-off position.

Leakage tests shall be performed in the following manner. The section to be tested shall be filled with water and all air expelled from the piping. It is recommended that the test section be filled with water for at least 24 hours prior to testing. By pumping water into the test section, the pressure within the piping shall be increased to 0.7 MPa, or 1-1/2 times the system operating pressure at the point of test, whichever is the greater. This pressure shall be maintained constantly in the pipe throughout the duration of the test by the addition of make-up water. The duration of the test section to maintain the specified pressure over the period of test shall be considered to be the leakage.

Piping will not be accepted until the leakage is less than the maximum allowable leakage determined from the following formula:

L = ND x the square root of P

in which L = the allowable leakage in litres per hour,

N = the number of joints in the test section,

D = the nominal diameter of the pipe in millimetre, and

P = the average test pressure during the leakage test in megapascals.

Should any test disclose leakage greater than that specified above, the defect shall be located and repaired, and the section shall be retested to ensure that the leakage is within the allowable limits.

4.3 Flushing

The pipe shall be cleaned of dirt and other foreign materials. The pipe shall be flushed at water velocities of 1.0 m/s, or as high a velocity as can be obtained from the available water sources. Flushing water shall be discharged to watercourses or ditches that have sufficient capacity to carry the flow. Measures shall be taken to avoid any damage to fish habitat or to fish and other aquatic life.

4.4 Chlorination

On completion of the flushing operation, main pipes and services shall be chlorinated. Chlorination procedures shall conform to AWWA C651.

On completion of chlorination, the entire piping system shall be thoroughly flushed of all highly chlorinated water and filled with normal system water at a slow rate to avoid stirring deposits from existing mains, sampled in accordance with VIHA, and following satisfactory test results left in a condition ready for use.

Water reservoirs and storage tanks shall be disinfected in accordance with AWWA C652, and wells in accordance with AWWA C654.

Chlorinated water shall be disposed of in such a way as to not cause harm or damage to fish, vegetation or aquatic life in bodies of water or water courses; all federal and provincial regulations and/or guidelines on disposing of chlorinated water to the environment shall be followed.

4.5 Inspection

The Regional District shall be given 48 hour notice of all tests and chlorination.

5. TRANSFERRING THE WATER SYSTEM TO THE RDN

5.1 Final Inspection by RDN

Prior to requesting a Final Inspection, the Design Professional shall submit to the Regional District complete Record Documents, a completed Certification of Installed Works, all applicable test results (chlorination, pressure, leakage, health, commissioning, etc.), and Certificate of Approval for electrical works (pump stations, wells, lighting, controls, etc.) The Final Inspection shall be arranged by the Design Professional on completion of the work. This shall be directed by the Design Professional in the presence of approved representatives of the Regional District and the installation Contractor. A complete list of deficiencies identified during the final inspection shall be prepared by the Design Professional. Once the deficiencies have been satisfactorily rectified, the Design Professional shall so notify the Regional District. The date of the Final Inspection will generally be regarded as the commencement of the guarantee period, unless significant deficiencies critical to the effective operation of the system are found at the inspection, at the discretion of the Regional District.

5.2 Preparation/Execution of Transfer Agreement by Developer

The Developer shall prepare and execute a Draft Transfer Agreement for the works and submit the document to the Regional District for review/comment. Once approved by the Regional District the Developer shall complete the document and execute it accordingly and submit to the Regional District for them to execute. The date of the Transfer Agreement shall be the date on which the Regional District executes the document.

5.3 Preparation/Execution of Maintenance Agreement

The Developer shall prepare and execute a Draft Maintenance Agreement for the works and submit the document to the Regional District for review/comment. Once approved by the Regional District the Developer shall complete the document and execute it accordingly and submit to the Regional District for them to execute.

The Developer shall guarantee the workmanship and the performance of the work as per the Maintenance Agreement, from the date of acceptance (generally the date on which the Regional District executes the Transfer Agreement) for a period of two years. This shall be additionally secured by way of cash or an irrevocable letter of credit suitable to the Regional District in the amount of 10% of the cost of construction as certified by the Design Professional or $10,000.00 (whichever is greater). There will be no interest paid on this security.

The RDN may reduce the length of the guarantee period and/or the amount of the security. The RDN may also require additional payment, or payout a credit as appropriate, related to an adjustment of the initial engineering fee to final construction cost values, in accordance with RDN Bylaw 1259.03 or most recent amendment. Any change to the guarantee period, security amount or the engineering fee is required to be in writing.

5.4 Preparation/Execution of Latecomer Agreement

Where a latecomer agreement may be applicable to a portion of the costs of the works, as agreed by the Regional District and any other applicable jurisdictions, the Developer shall pay all costs of both the Regional District and the Developer associated with the preparation, execution, and registration of the necessary Latecomer Agreement. The Regional District will assume any internal staff costs involved in planning, reviewing, approving, and administering the Latecomer Agreement preparation, and any administrative and financial costs involved

during the effective time-period of the agreement. Based on current legislation, a Latecomer Agreement expires 10 years after its initial registration.

5.5 Letter of Acceptance of the Works by RDN

Following completion of all the foregoing requirements, the Regional District will issue the formal Letter of Acceptance of the Works.

The Regional District will also issue a written statement that the new works can be connected to the District's existing system. Such connection shall be undertaken by the applicant under the direct supervision of the District or by the District at a cost to the applicant.

REGIONAL DISTRICT OF NANAIMO

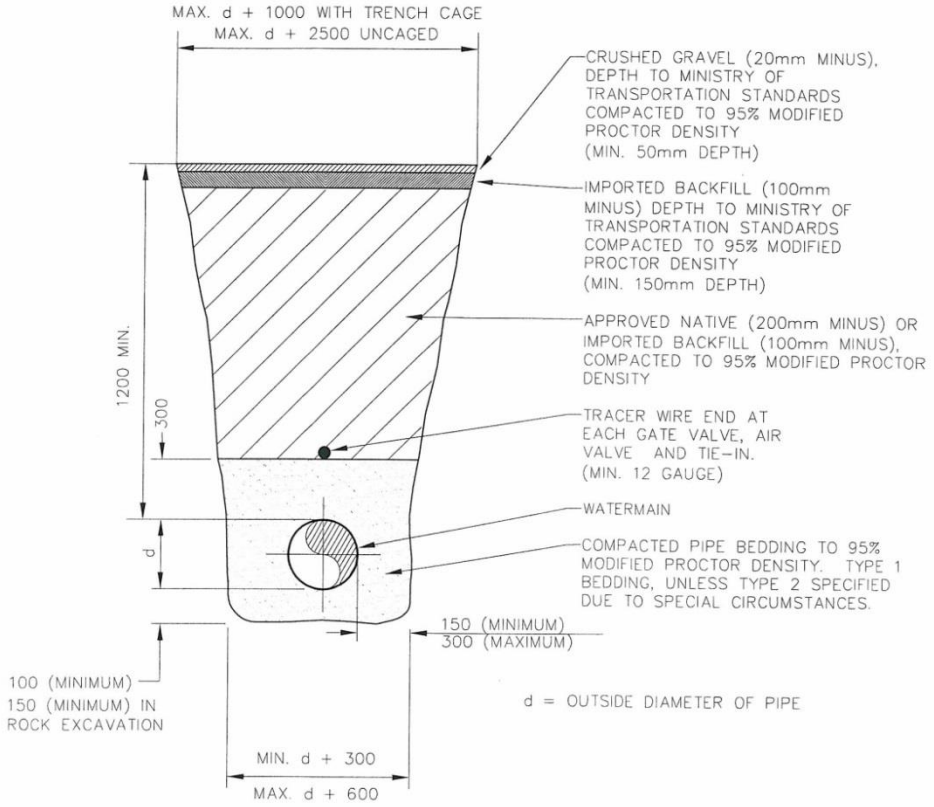
BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 1

STANDARD DRAWINGS



NOTE:

1. PIPE BEDDING SHALL BE TYPE 1 OR PEA GRAVEL, EXCEPT WHEN TYPE 2 IS SPECIFIED TO MEET SPECIAL DESIGN LOADING. IN ROCK, PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING. IN AREAS OF HIGH GROUNDWATER OR BLASTED ROCK EXCAVATION PEA GRAVEL MAY BE USED AT LEAST TO PIPE SPRING LINE, SEPARATED FROM OTHER TRENCH BACKFILL BY FILTER CLOTH.
2. TRACER WIRE (MIN. 12 GAUGE, WHITE PLASTIC COVER), TO TERMINATE IN AIR VALVE CHAMBER OR NELSON BOX. TRACER WIRE MUST BE ABLE TO EXTEND A MINIMUM OF 600mm ABOVE GROUND. AT VALVE BOX, WIRE TO BE OUTSIDE OF RISER PIPE, THEN INSIDE NELSON BOX. ALTERNATE TERMINATION LOCATIONS: BELOW-GRADE FLUSHOUT CHAMBER, METER CHAMBER, WATER METER BOX.
3. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

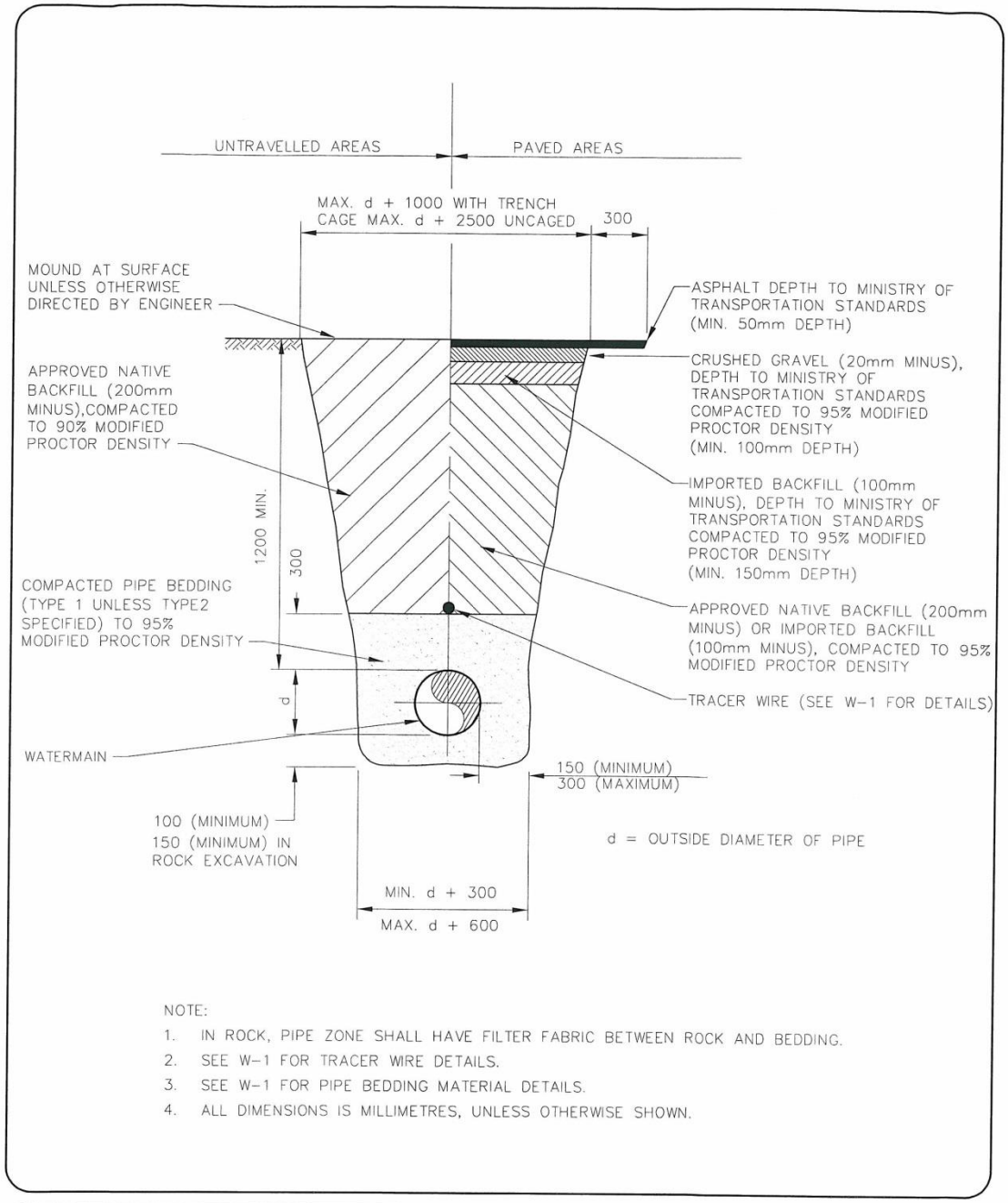
TRENCH DETAIL
SHOULDER AREAS

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W-1



NOTE:

1. IN ROCK, PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING.
2. SEE W-1 FOR TRACER WIRE DETAILS.
3. SEE W-1 FOR PIPE BEDDING MATERIAL DETAILS.
4. ALL DIMENSIONS IS MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

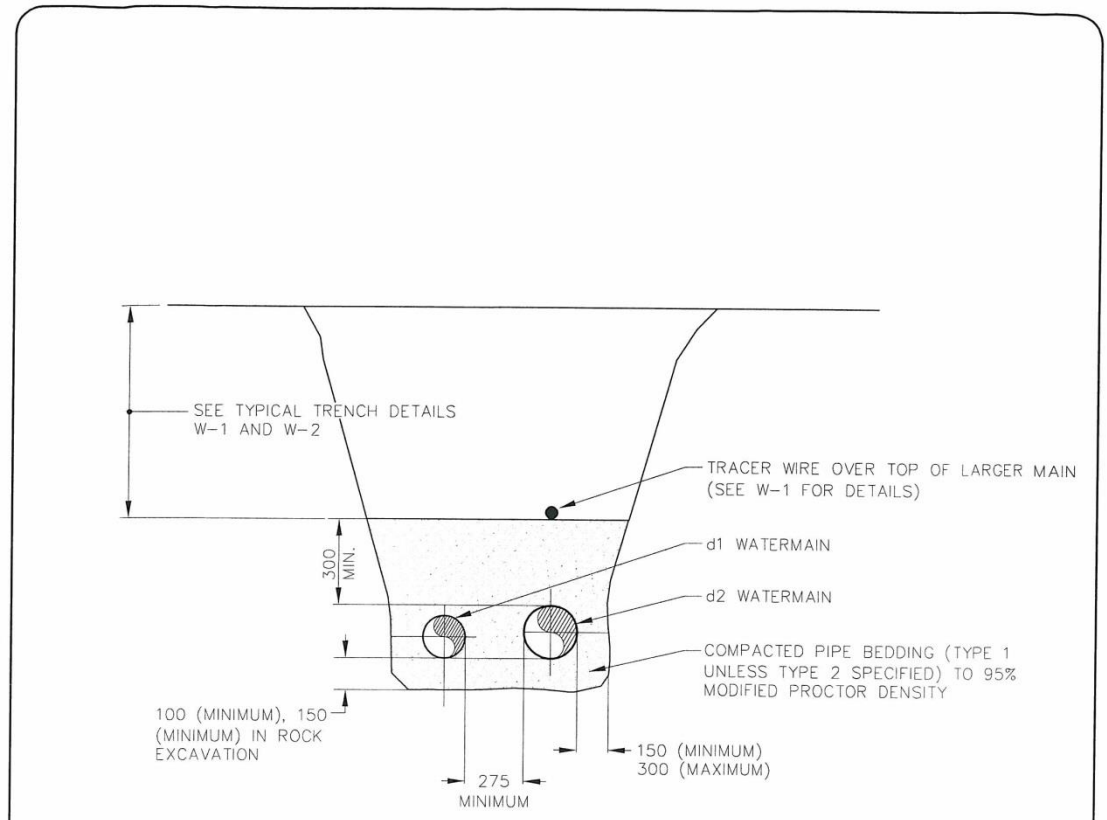
TRENCH DETAIL
PAVED & UNTRAVELLED AREAS

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W-2



NOTE:

1. IN ROCK, PIPE ZONE SHALL HAVE FILTER FABRIC BETWEEN ROCK AND BEDDING.
2. SEE W-1 FOR TRACER WIRE DETAILS.
3. SEE W-1 FOR PIPE BEDDING MATERIAL DETAILS.
4. ALL DIMENSIONS IS MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

TRENCH DETAIL
TWO PIPES

REVISIONS			
No.	DATE	DETAILS	APP.
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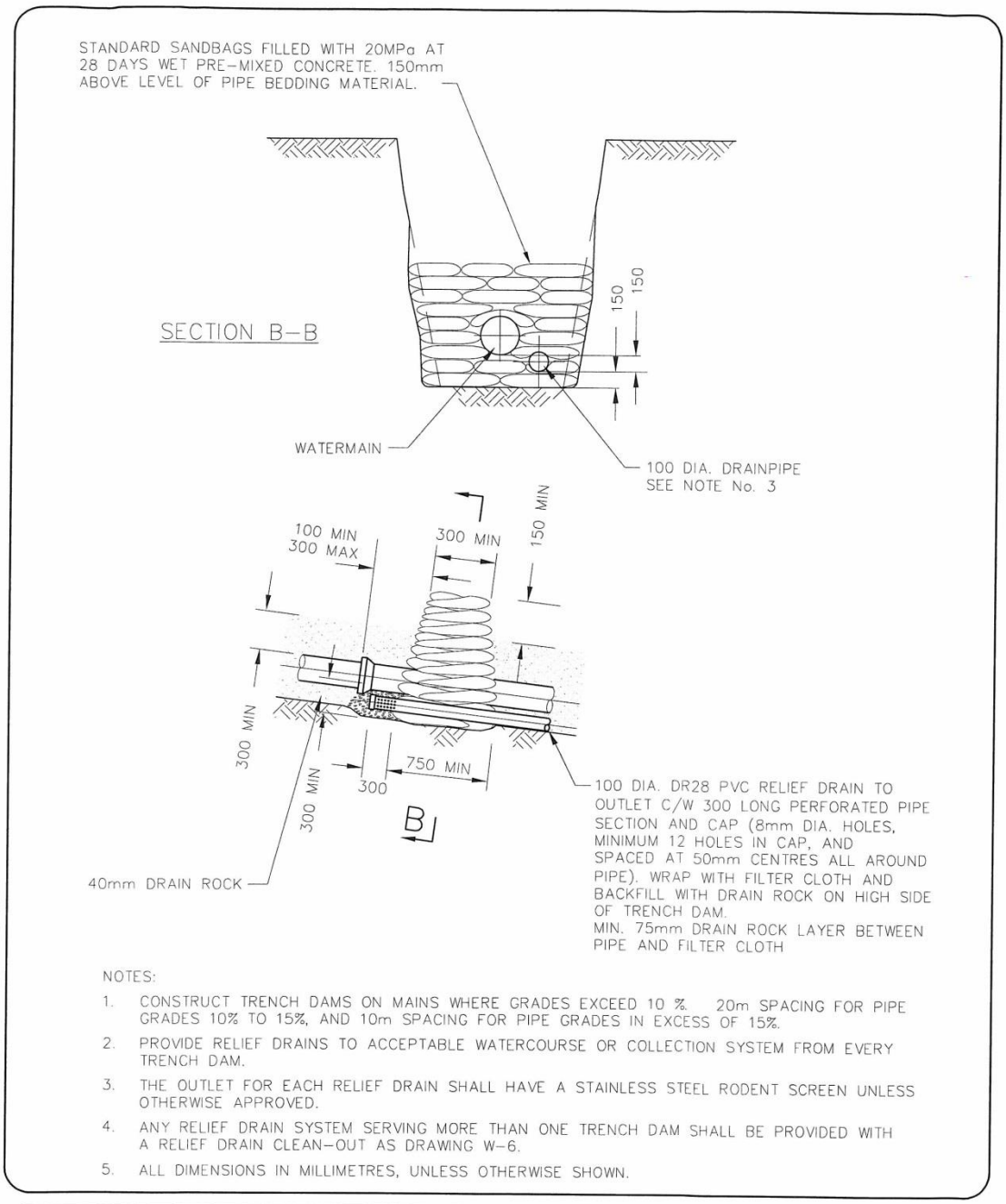
REVISION 0

DRAWING No. W-3



NOTES:

1. CONSTRUCT TRENCH DAMS ON MAINS WHERE GRADES EXCEED 10 %. 20m SPACING FOR PIPE GRADES 10% TO 15%, AND 10m SPACING FOR PIPE GRADES IN EXCESS OF 15%.
2. PROVIDE RELIEF DRAINS TO ACCEPTABLE WATERCOURSE OR COLLECTION SYSTEM FROM EVERY TRENCH DAM.
3. THE OUTLET FOR EACH RELIEF DRAIN SHALL HAVE A STAINLESS STEEL RODENT SCREEN UNLESS OTHERWISE APPROVED.
4. ANY RELIEF DRAIN SYSTEM SERVING MORE THAN ONE TRENCH DAM SHALL BE PROVIDED WITH A RELIEF DRAIN CLEAN-OUT AS DRAWING W-6.
5. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

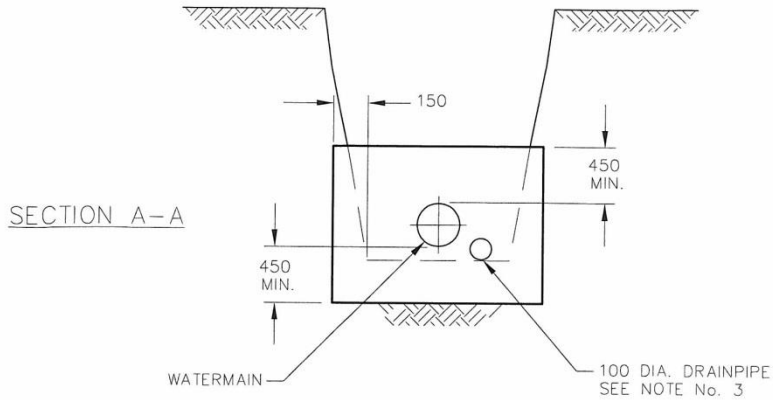
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

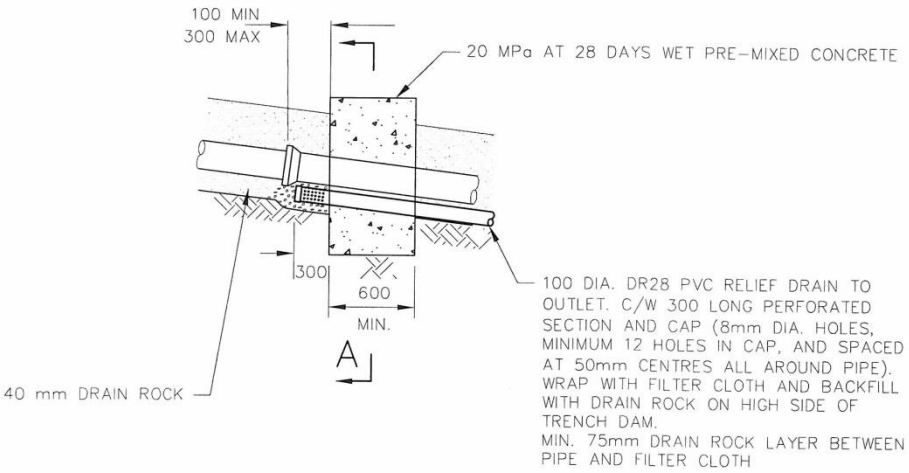
TRENCH DAM
SANDBAG CONCRETE TRENCH DAM

REVISIONS			
No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No W-4





NOTES:

1. CONSTRUCT TRENCH DAMS ON MAINS WHERE GRADES EXCEED 10%. 20m SPACING FOR PIPE GRADES 10% TO 15%, AND 10m SPACING FOR PIPE GRADES IN EXCESS OF 15%.
2. PROVIDE RELIEF DRAINS TO ACCEPTABLE WATERCOURSE OR COLLECTION SYSTEM FROM EVERY TRENCH DAM.
3. THE OUTLET FOR EACH RELIEF DRAIN SHALL HAVE A STAINLESS STEEL RODENT SCREEN UNLESS OTHERWISE APPROVED.
4. ANY RELIEF DRAIN SYSTEM SERVING MORE THAN ONE TRENCH DAM SHALL BE PROVIDED WITH A RELIEF DRAIN CLEAN–OUT AS DRAWING W–6.
5. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

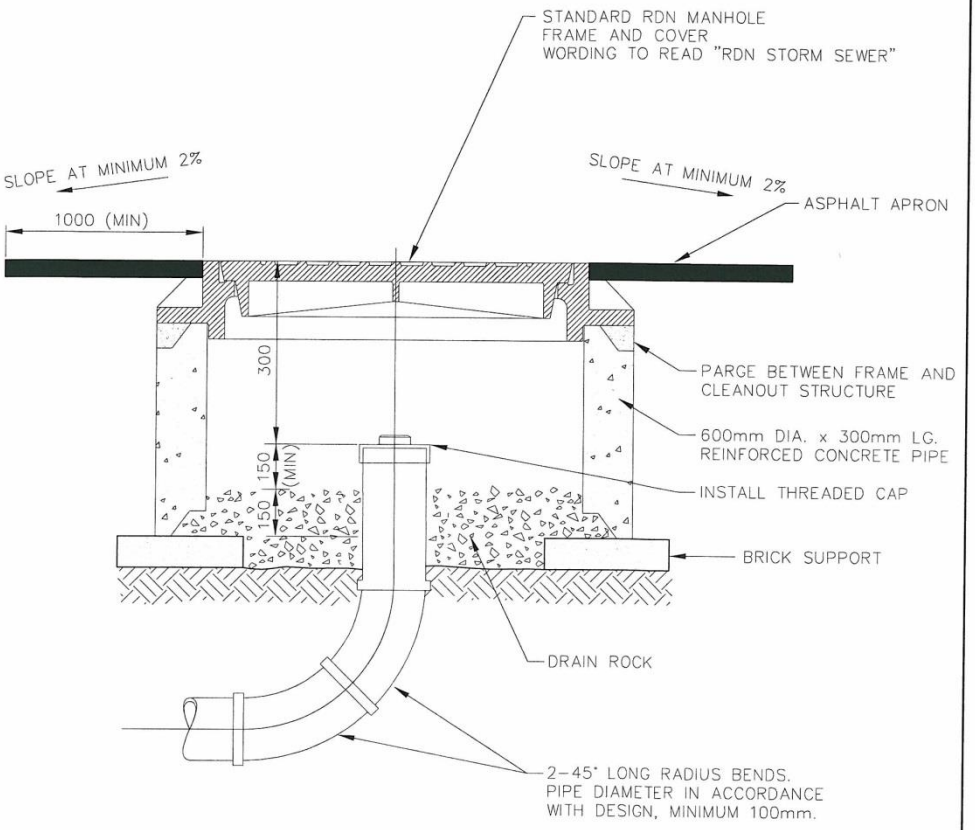
TRENCH DAM
FORMED CONCRETE TRENCH DAM

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–5



NOTES:

1. RELIEF DRAIN CLEAN-OUT TO BE PROVIDED ON UPSTREAM END OF ANY SYSTEM SERVICING MORE THAN ONE TRENCH DAM.
2. REFER TO DRAWINGS W-4 AND W-5 FOR TRENCH DAM DETAILS.
3. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

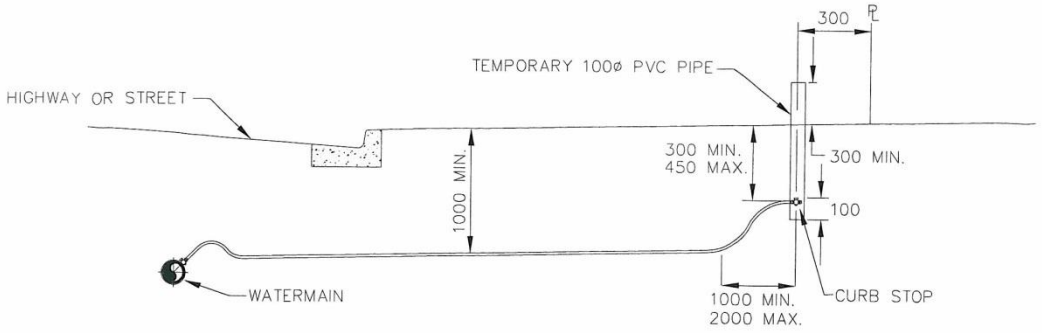
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

RELIEF DRAIN CLEANOUT

REVISIONS			
No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

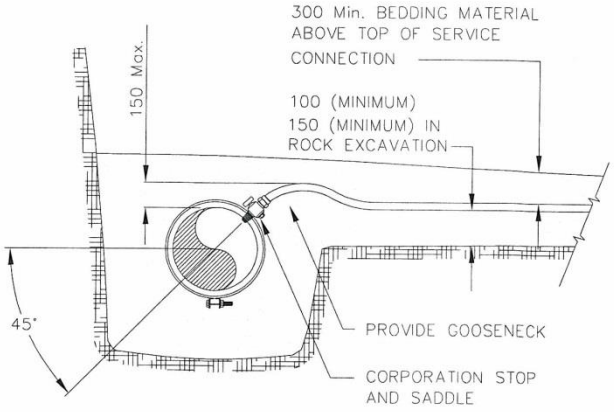
REVISION 0

DRAWING No. W-6



NOTES:

1. PROVIDE "SLACK" IN SERVICE PIPE TO ALLOW FOR SLIGHT SUBSIDENCE.
2. MIN. 20mm SERVICE PIPE GOLDENFLOW (HDPE SERIES 160) OR 20mm SERVICE PIPE TYPE "K" COPPER FOR PIPE SPLITTING.
3. SINGLE SERVICE UP TO 25mm, DETAILS ARE SIMILAR.
4. CENTRE TO CENTRE LOCATION OF SERVICE CONNECTIONS IN THE WATERMAIN NOT LESS THAN 1m.
5. CURB STOPS COMPRESSION BY METER SWIVEL NUT.
6. CONTRACTOR TO PROVIDE METER BOX TO RDN, CONCRETE BOX WITH FULL SUPPORT LIP AND STEEL LID DRILLED FOR TOUCH–READ METER PAD; LID TO READ "RDN WATER"
7. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.



TYPE OF PIPE	LARGEST SERVICE CONNECTION ALLOWABLE	
	DIAMETER	WITH STAINLESS STEEL BAND
POLY VINYL CHLORIDE (P.V.C.)	100mm	20mm
	150mm	25mm
	200mm	40mm
	250mm	40mm
	300mm	50mm

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

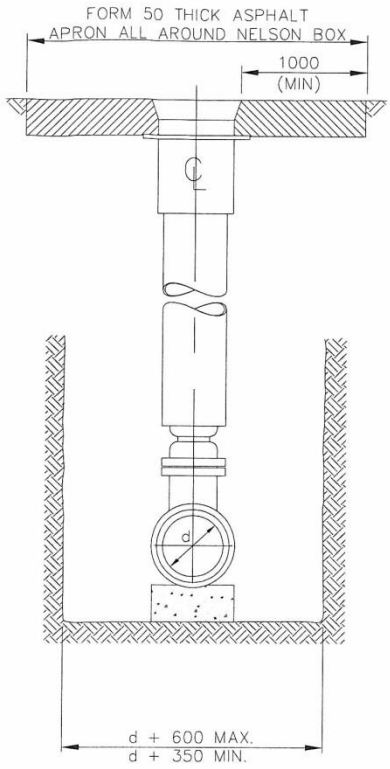
WATER SERVICE CONNECTION

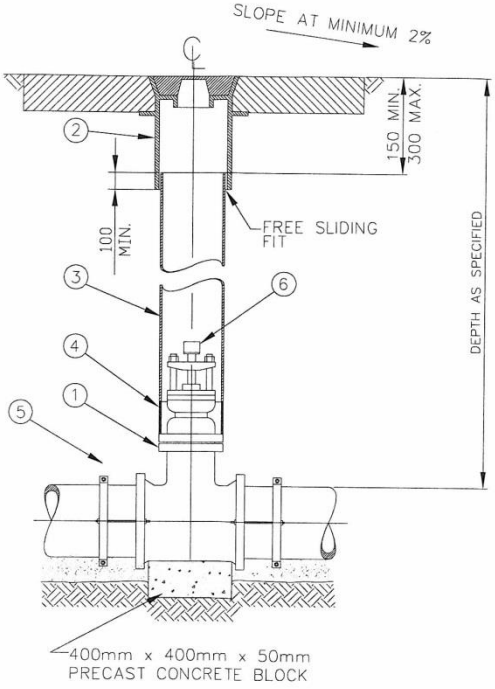
REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–7





NOTE:
JOINT RESTRAINTS AS PER MANUFACTURER'S RECOMMENDATIONS, ON EACH SIDE OF VALVE. ALL RESTRAINER RODS AND NUTS SHALL BE SUPPLIED BY THE MANUFACTURER OF THE RESTRAINTS USED.

1. GATE VALVE – (MJ x MJ FOR 250mm DIA. AND LARGER. HUB FOR 200mm DIA. AND SMALLER.)
2. VALVE BOX WITH CAST IRON LID (NELSON BOX STYLE) OR APPROVED ALTERNATIVE.
3. 150mm DIA. P.V.C. RISER PIPE, DR 18 IN TRAVELLED AREAS, DR 35 IN UNTRAVELLED AREAS.
4. VALVE BOOT REQUIRED ON 250mm DIA. VALVES AND LARGER.
5. MECHANICAL JOINT RESTRAINTS FOR 250mm DIA. AND LARGER, JOINT RESTRAINT CLAMPS FOR 200mm DIA. AND SMALLER.
6. VALVE OPERATING NUT TO BE CENTRED IN RISER PIPE, WHICH SHALL BE PERPENDICULAR TO THE MAIN.

NOTES:
1. ASPHALT APRON SHALL BE AT, OR LOWER THAN, ADJACENT PAVEMENT.
2. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

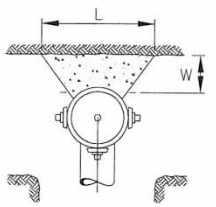
VALVE

REVISIONS

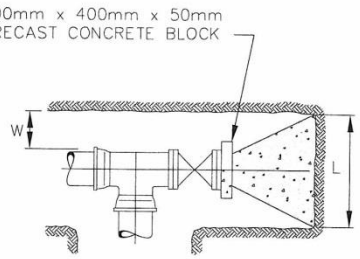
No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W-8



HYDRANT



DEAD–END, CAP, OR BLIND FLANGE

NOTE:
THRUST BLOCK MAY ONLY BE USED AT END–OF–MAIN HYDRANT. ALL OTHER HYDRANTS SHALL USE MANUFACTURED JOINT RESTRAINT CLAMPS AND MATCHING RESTRAINER RODS AND NUTS.

MINIMUM THRUST AREAS FOR FITTINGS AT 1030kN/m^2 PRESSURE AND FOR SOILS WITH A MINIMUM BEARING OF 96kN/m^2 (NOT TO BE USED FOR SOFT CLAY, MUCK, PEAT, ETC.)

FITTING SIZE "D" (mm)	OUTSIDE OF FITTING TO BEARING FACE "W" (mm)	LENGTH "L" (mm)	HEIGHT "H" (mm)
150	300	600	450
200	350	750	600
250	375	975	750
300	400	1200	900
350	425	1300	1000

NOTES:

1. DIMENSIONS APPLY TO THE LARGER DIAMETER END OF FITTING.
2. ALL THRUST BLOCKS TO BE CONSTRUCTED USING TRUCK DELIVERED WET PRE–MIXED CONCRETE ONLY, WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 20MPa.
3. WHERE GROUND CANNOT BE EXCAVATED TO FREE STANDING UNDISTURBED SOIL, UTILIZE THRUST RESTRAINT DEVICES IN PLACE OF THRUST BLOCK.
4. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

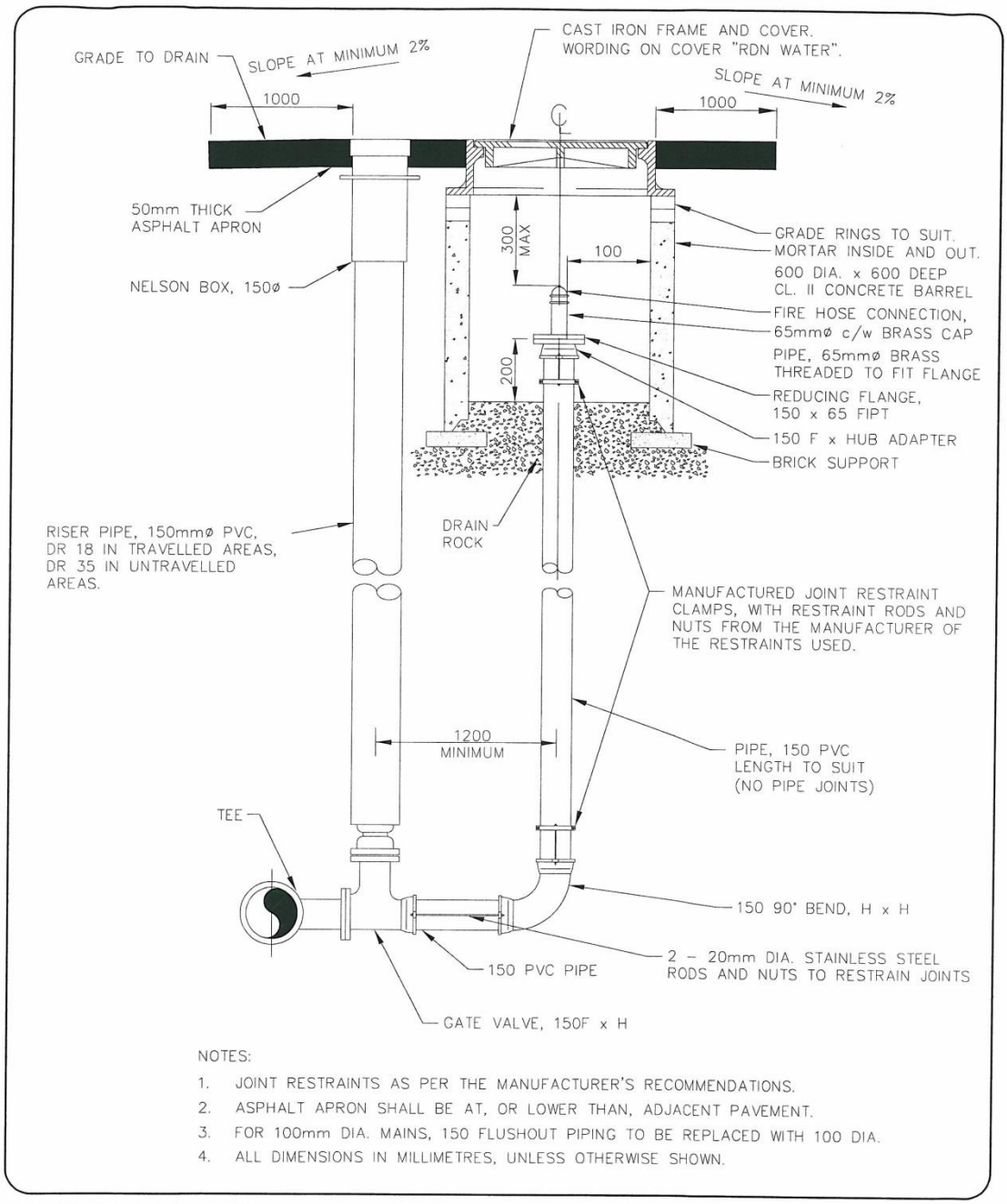
THRUST BLOCK DETAILS

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–9



NOTES:

1. JOINT RESTRAINTS AS PER THE MANUFACTURER'S RECOMMENDATIONS.
2. ASPHALT APRON SHALL BE AT, OR LOWER THAN, ADJACENT PAVEMENT.
3. FOR 100mm DIA. MAINS, 150 FLUSHOUT PIPING TO BE REPLACED WITH 100 DIA.
4. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

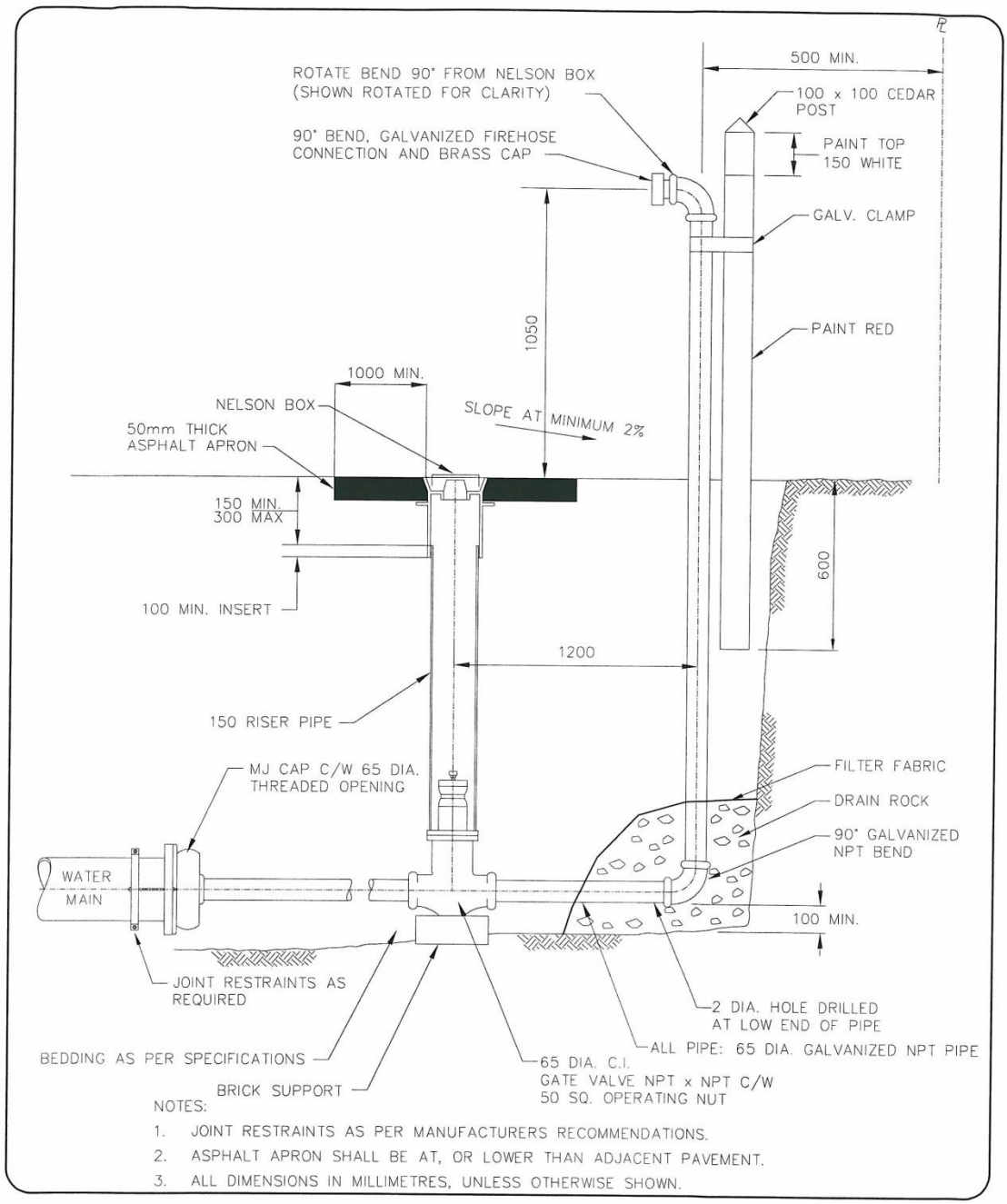
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

BELOW GROUND FLUSHOUT

REVISIONS			
No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–10



REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

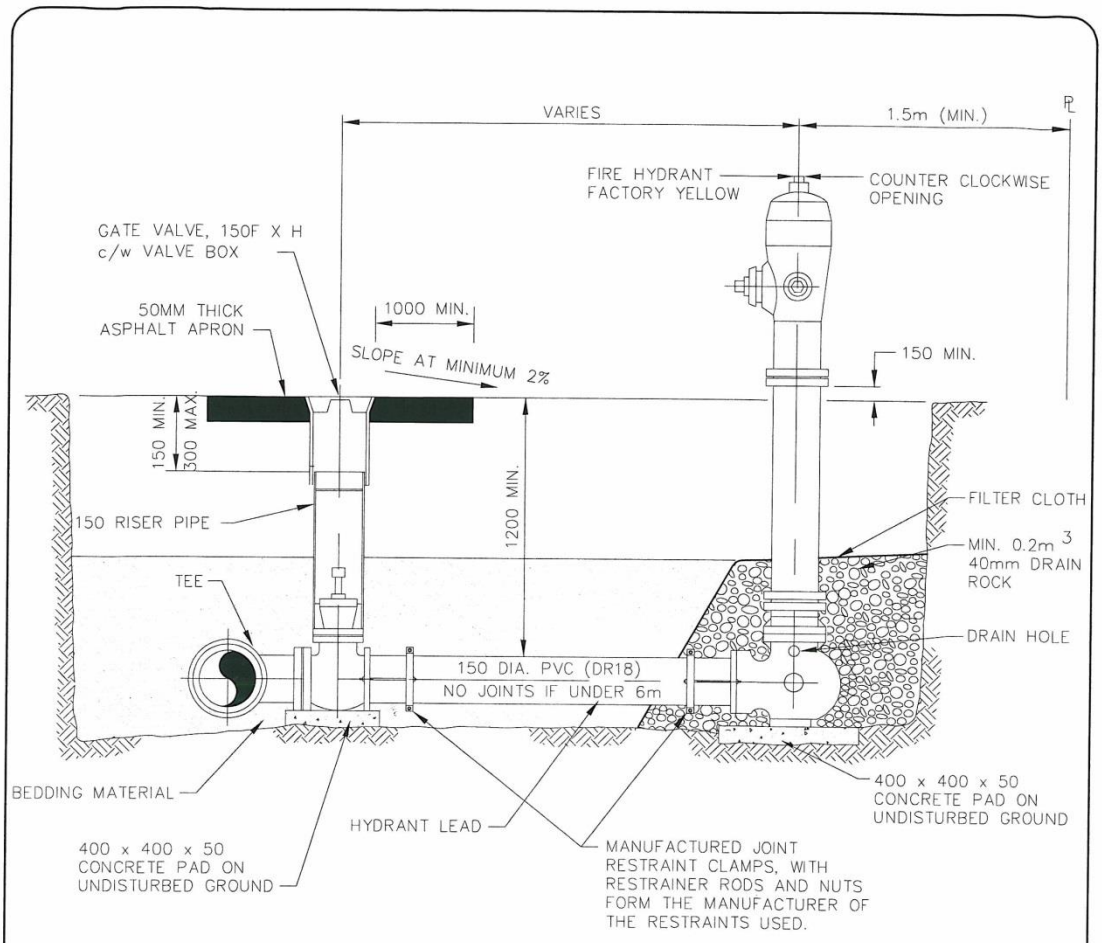
TEMPORARY
ABOVE GROUND FLUSHOUT

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–11



NOTES:

1. PUMPER NOZZLE PERPENDICULAR TO ROAD CENTRELINE.
2. HYDRANT TO BE INSTALLED VERTICAL.
3. MANUFACTURED JOINT RESTRAINERS TO BE USED AT EVERY PIPE JOINT FOR HYDRANT LEADS OVER 6m IN LENGTH. RESTRAINTS REQUIRED AT HYDRANT BOOT AND VALVE FOR LEADS 2m TO 6m LONG. LEADS LESS THAN 2m MAY BE RESTRAINED USING 2–20mm DIA. STAINLESS STEEL THREADED RODS c/w SS NUTS AND SS WASHERS.
4. END–OR–MAIN HYDRANT SHALL BE FULLY RESTRAINED AS PER MANUFACTURER'S RECOMMENDATIONS, OR MAY USE A THRUST BLOCK (SEE W–9 FOR DETAILS).
5. ASPHALT APRON SHALL BE AT, OR LOWER THAN, ADJACENT PAVEMENT.
6. WHERE CURB/GUTTER DOES NOT EXIST, PAVE FROM EDGE OF ROAD SURFACE TO 1m BEHIND HYDRANT AND 2m WIDE.
7. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

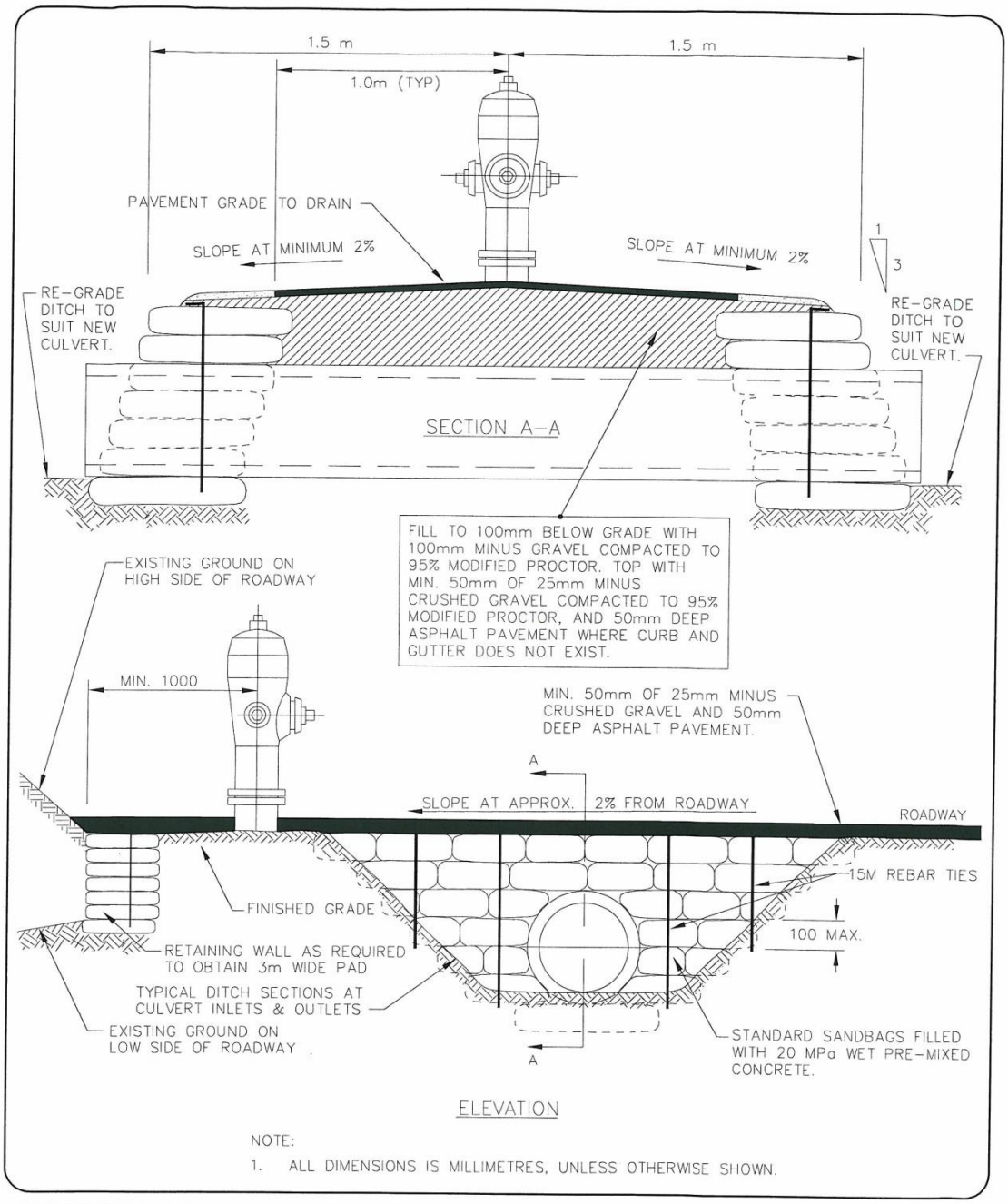
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

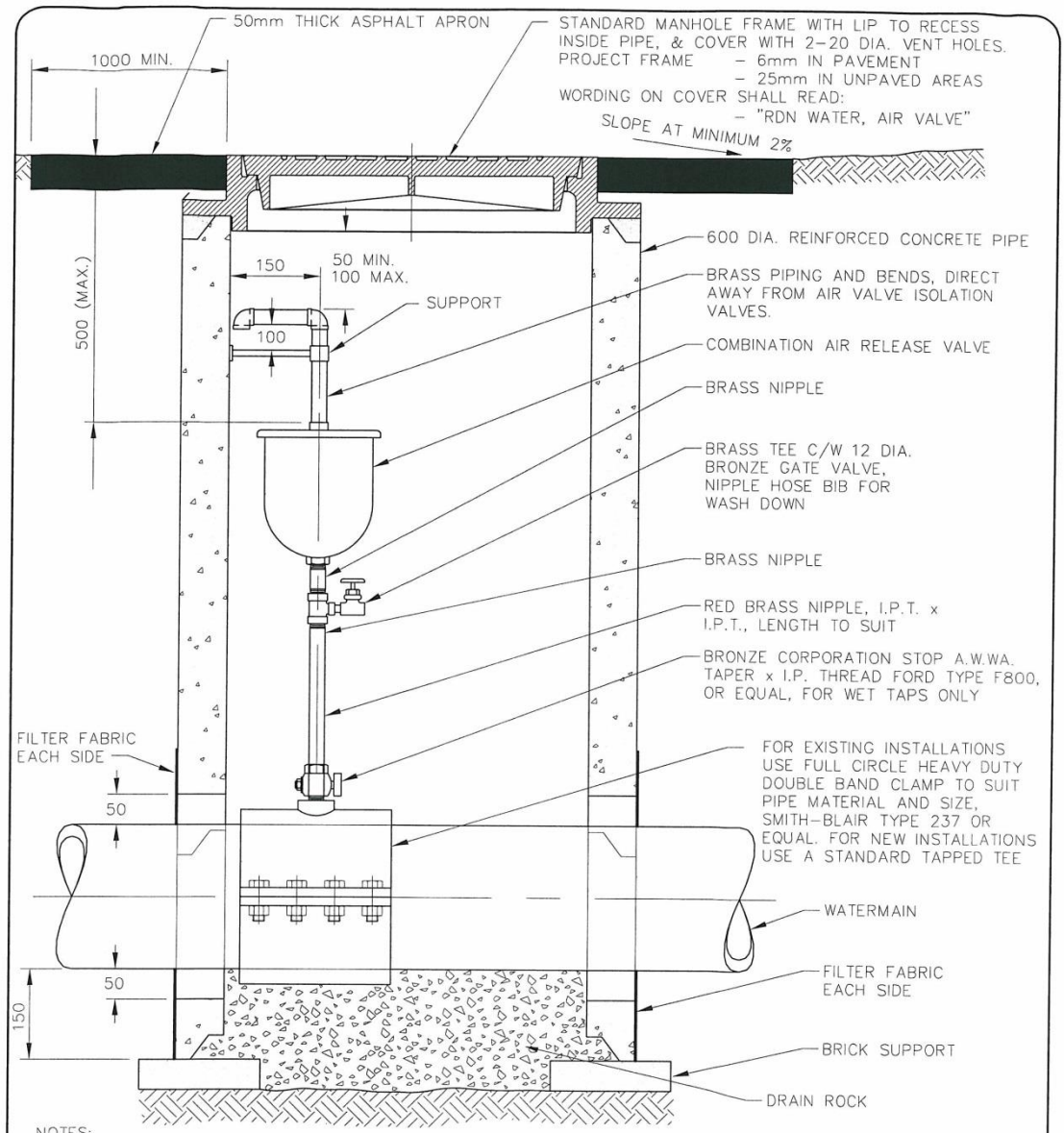
FIRE HYDRANT ASSEMBLY

REVISIONS			
No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–12


1.5 m
1.5 m
1.0m (TYP)
PAVEMENT GRADE TO DRAIN
SLOPE AT MINIMUM 2%
SLOPE AT MINIMUM 2%
1
3
RE-GRADE DITCH TO SUIT NEW CULVERT.
RE-GRADE DITCH TO SUIT NEW CULVERT.
SECTION A-A
FILL TO 100mm BELOW GRADE WITH 100mm MINUS GRAVEL COMPACTED TO 95% MODIFIED PROCTOR. TOP WITH MIN. 50mm OF 25mm MINUS CRUSHED GRAVEL COMPACTED TO 95% MODIFIED PROCTOR, AND 50mm DEEP ASPHALT PAVEMENT WHERE CURB AND GUTTER DOES NOT EXIST.
EXISTING GROUND ON HIGH SIDE OF ROADWAY
MIN. 1000
MIN. 50mm OF 25mm MINUS CRUSHED GRAVEL AND 50mm DEEP ASPHALT PAVEMENT.
A
SLOPE AT APPROX. 2% FROM ROADWAY
ROADWAY
15M REBAR TIES
FINISHED GRADE
100 MAX.
RETAINING WALL AS REQUIRED TO OBTAIN 3m WIDE PAD
TYPICAL DITCH SECTIONS AT CULVERT INLETS & OUTLETS
EXISTING GROUND ON LOW SIDE OF ROADWAY
STANDARD SANDBAGS FILLED WITH 20 MPa WET PRE-MIXED CONCRETE.
A
ELEVATION
NOTE:
1. ALL DIMENSIONS IS MILLIMETRES, UNLESS OTHERWISE SHOWN.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS
HYDRANT ACCESS CULVERT
REVISIONS
No. 0
DATE JUN/06
DETAILS BYLAW UPDATE
APP. W.F.M.
REVISION 0
DRAWING No. W-13



REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

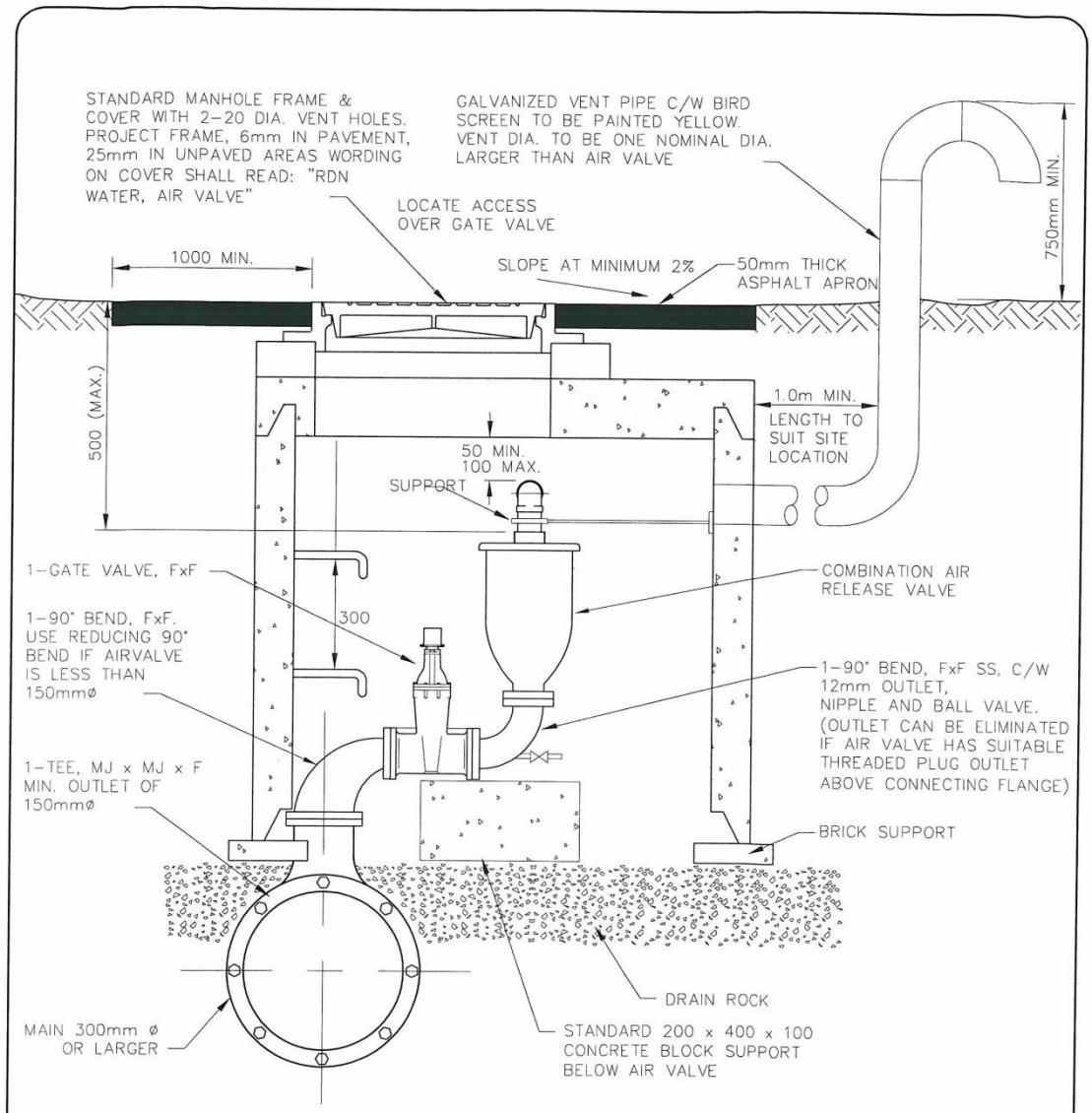
AIR VALVES UP TO 50mm DIAMETER

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–14



NOTES:

1. IN AREAS WHERE HIGH WATER TABLE MAY APPROACH AIR VALVE VENT OUTLET, CHAMBER DRAINAGE TO BELOW AIR VALVE SHALL BE PROVIDED. IF NOT FEASIBLE, VENT PIPE SHALL BE EXTENDED OUSIDE CHAMBER, INSIDE A GALVANIZED VENT PIPE.
2. SEE W–16 FOR PLAN VIEW.
3. ASPHALT APRON TO BE AT, OR LOWER THAN, ADJACENT PAVEMENT.
4. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE SHOWN.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

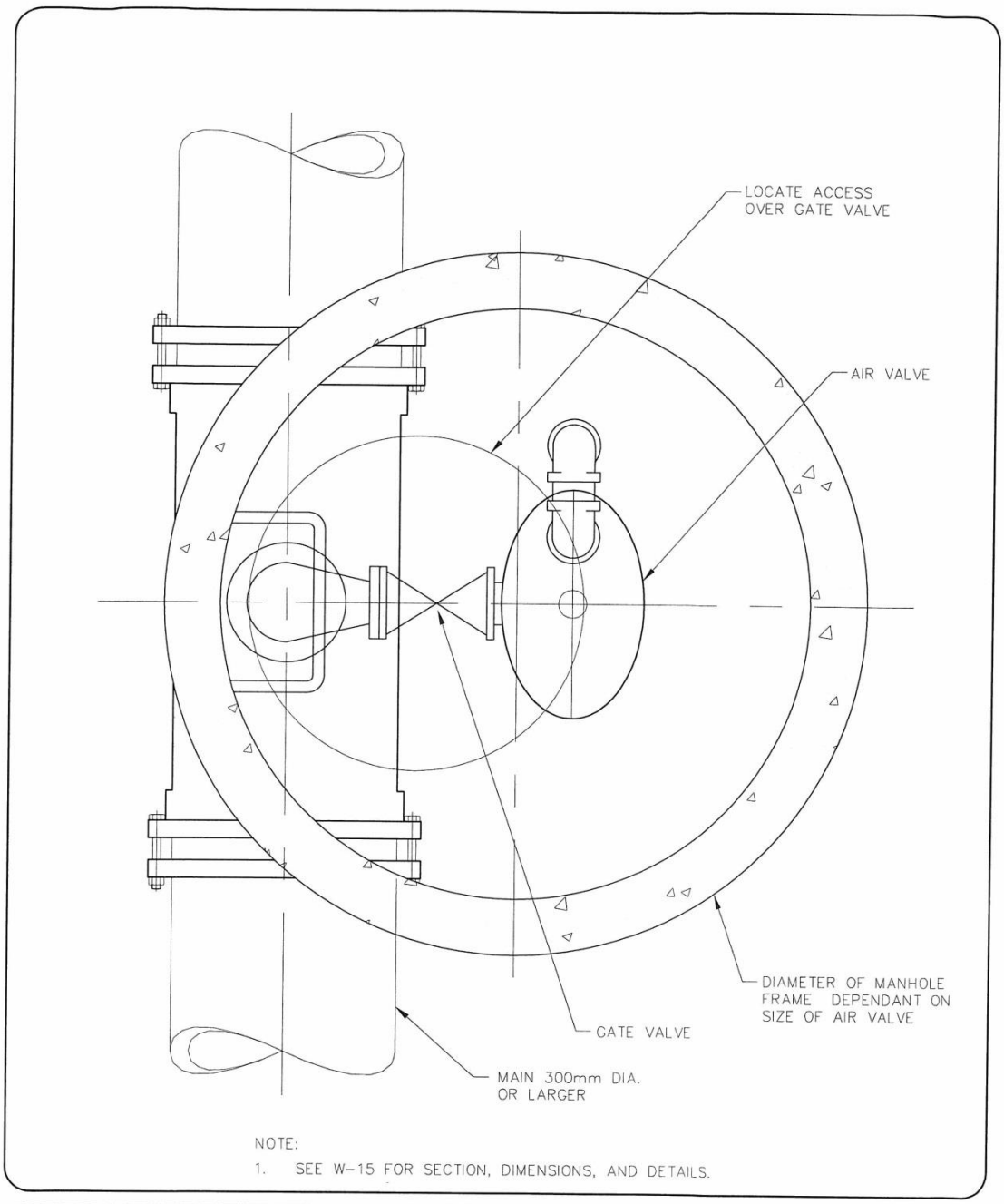
AIR VALVE 75mm DIA. AND LARGER SECTION

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No. W–15



NOTE:

1. SEE W–15 FOR SECTION, DIMENSIONS, AND DETAILS.

REGIONAL DISTRICT OF NANAIMO

BYLAW No. 1562
COMMUNITY WATER SYSTEM STANDARDS

AIR VALVE 75mm DIA. AND LARGER
PLAN

REVISIONS

No.	DATE	DETAILS	APP.
0	JUN/06	BYLAW UPDATE	W.F.M.

REVISION 0

DRAWING No W–16

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 2

LETTER OF ASSURANCE

REGIONAL DISTRICT OF NANAIMO

LETTER OF ASSURANCE

NOTE:

To be submitted at time of Feasibility Review

To: Manager of Engineering Services
Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo BC V9T 6N2

RE: _____
(Project)

Date: _____, 20__.

This will confirm that (Developer) has retained (Consultant) to provide, design, contract administration, inspection and as-constructed drawings for this project all in accordance with the current bylaws and standards of the Regional District and in accordance with good engineering practice.

_____
(Developer)

This confirms we have accepted this assignment on the above terms.

_____
(Consultant)

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 3

CERTIFICATE OF DESIGN

REGIONAL DISTRICT OF NANAIMO

CERTIFICATE OF DESIGN

I, _____, a Professional Engineer registered in the Province of British Columbia, hereby certify that the works as herein set out on the attached drawings entitled_____
_____
_____

have been designed in accordance with the Regional District of Nanaimo Bylaw 500 and/or in accordance with good engineering practice where such design is not covered by the Regional District Bylaw 500.

I have been retained to provide design, supervision, full-time inspection, as-built drawings, and final certification for this project by:

_____

(Name of Client)

I am satisfied that in the contractual mandate which exists between myself and my client, the terms of reference will permit me to render a level of supervision of the construction work which will allow me to put my name and seal to the "Certification of Installed Works" required by the Regional District of Nanaimo, a sample of which is attached to this document and initialed by me.

In the event that my client releases me from this project, or in the event that I find the terms of reference do not permit me to render a level of supervision of the construction work which will allow me to put my name and seal to the form of certification required by the Regional District of Nanaimo, I will notify the Regional District within twenty-four (24) hours verbally and follow it up with written confirmation and clarification.

Signed this _____ day of _____, 20____.

_____, P.Eng.

(signature)

_____

(name printed)

I understand that the "Certification of Installed Works" is to be completed in this format and submitted with the "as-constructed" drawings.

_____

(Engineer)

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 4

CERTIFICATION OF INSTALLED WORKS

REGIONAL DISTRICT OF NANAIMO

CERTIFICATION OF INSTALLED WORKS

NOTE: To be completed in this format and submitted with the 'As-Built' drawings

Location of the Construction Site and Works: (Legal Description / Location)

_____

_____

all within the Regional District of Nanaimo, British Columbia.

I, _____, a Registered Professional Engineer (Reg. No. _____) in the Province of British Columbia, hereby certify:

1. THAT the following construction tests were carried out to confirm that construction met the specifications required:

   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____

2. THAT I was able to monitor the construction and provide a level of supervision of the construction work sufficient to be able to confirm that the specifications in force and effect by the Regional District of Nanaimo and in the applicable design drawings for the said Works were generally met during the Construction Period; and

3. THAT the accompanying plans labeled:

   (i) _____
   (ii) _____
   (iii) _____

accurately record the materials, grades, inverts, offsets and dimensions of the constructed work.

DATED this _____ day of _____, 20 _____.

_____

Engineer (signature & seal)

_____

Engineering Firm

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 5

OUTLINE FOR WELLHEAD PROTECTION REPORT

(MINIMUM REQUIREMENTS)

OUTINE FOR WELLHEAD PROTECTION REPORT

(Version: November 19, 2009)

Acceptable Preliminary Well Head Protection Plan (WHPP) for New Wells supplied to the RDN by/for private land development (to be prepared by a qualified professional in ground water and well head protection and approved by the RDN prior to appointment).

Below are the minimum requirements for this Document:

Name of the Plan (WHPP), describe the well #'s, legal location of well(s), client, development for which the well is being provided and client file number.

1.0 INTRODUCTION

2.0 BACKGROUND

- 2.1 SITE DESCRIPTION (including a sketch of the current and proposed lot boundaries, locations of wells on current and proposed lots plus on adjacent properties, locations of sewage disposal fields, drainage ditches, dry wells or infiltrations areas, all surface bodies [either permanent and/or intermittent] and other relevant information)
- 2.2 OVERVIEW OF WELL PROTECTION PLANNING
- 2.3 SCOPE OF WORK

3.0 NOTES of MEETINGS with RDN, DEVELOPER, CONSULTANT, etc.

4.0 NOTES of DISCUSSIONS WITH VIHA STAFF

5.0 HYDROGEOLOGIC CONDITIONS

- 5.1 CLIMATE
- 5.2 TOPOGRAPHY AND SURFACE WATER DRAINAGE
- 5.3 GEOLOGY
- 5.4 LOCAL AQUIFERS (include sketch showing aquifer extent and boundaries if present, well head and static water level elevation, areas of recharge and discharge and direction of groundwater flow under natural conditions)
- 5.5 LOCAL GROUNDWATER USE (number and location of wells and estimates of seasonal water use)
- 5.6 WATER QUALITY (identify where the water quality exceeds guidelines and specifically iron and manganese)
- 5.7 NEW AND EXISTING WELLS ON PROPOSED LOTS (to include information on total well depth and depth of fractures producing groundwater or well screens. Also include testing and yield evaluation results. All pumping test data and well logs to be included with report)
- 5.8 COMPLIANCE OF WELLS WITH BC GROUNDWATER PROTECTION REGULATIONS
- 5.9 ASSESSMENT OF POTENTIAL FOR MUTUAL WELL INTERFERENCE

6.0 CURRENT ZONING OF WELL HEAD AND PROPOSED AND ADJACENT CURRENT LAND USE (within minimum 1 kilometre of well(s))

7.0 PRELIMINARY WELL HEAD PROTECTION PLAN

- 7.1 WELL HEAD PROTECTION AREA
- 7.2 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
  - 7.2.1 WELLS AS A POTENTIAL CONDUIT TO THE SUB-SURFACE
  - 7.2.2 SEWAGE DISPOSAL SEPTIC FIELDS
  - 7.2.3 STORMWATER DISPOSAL
  - 7.2.4 HEATING OIL ABOVE GROUND AND UNDERGROUND STORAGE TANKS
  - 7.2.5 HISTORICAL OPERATIONS (ON SITE AS WELL AS ADJACENT TO SITE)
  - 7.2.6 POTENTIAL FOR SALTWATER INTRUSION
- 7.3 DETERMINATION OF WELL HEAD CAPTURE ZONE (include background on methodologies to determine zones, why specific method was used and assumptions incorporated into analysis)
- 7.4 RECOMMENDATIONS FOR WELL PROTECTION AREA MANAGEMENT
  - 7.4.1 WELL CONSTRUCTION AND CLOSURE ISSUES
  - 7.4.2 SEWAGE DISPOSAL SEPTIC FIELD SYSTEMS
  - 7.4.3 STORMWATER DISPOSAL MANAGEMENT
  - 7.4.4 HEATING OIL UNDERGOUND STORAGE TANKS
  - 7.4.5 MONITORING SPECIFIC TO SALTWATER INTRUSION
  - 7.4.6 WATER QUALITY MONITORING

8.0 CONCLUSION AND RECOMMENDATIONS (ALSO INCLUDE ANY COST ASSOCIATIED WITH RECOMMENDATIONS)

9.0 COMMITMENT FOR ANNUAL MONITORING AND REPORTING ON WHPP TO RDN

REGIONAL DISTRICT OF NANAIMO

BYLAW NO. 500

LAKES DISTRICT AND SCHOONER COVE

COMMUNITY WATER SYSTEM STANDARDS

APPENDIX 6

STANDBY IRREVOCABLE LETTER OF CREDIT

[BANK LETTERHEAD]

Letter of Credit No.	_____	Amount:	_____
Applicant	_____	Initial Expiry Date:	_____
	_____	Beneficiary:	_____

For the account of _____

(Name of Customer)

up to an aggregate amount of _____ available on demand.

Pursuant to the request of our customer, we hereby establish and give you a Standby Irrevocable Letter of Credit in your favour in the above amount which may be drawn on by you at any time and from time to time, upon written demand for payment made upon us by you, which demand we shall honour without enquiring whether you have the right as between yourself and the said customer to make such demand, and without recognizing any claim of our said customer, or objection by it to payment by us.

This Letter of Credit relates to those Regional District of Nanaimo services and financial obligations set out in an Agreement between the customer and the Regional District of Nanaimo and briefly described as:

_____

_____

The amount of this Letter of Credit may be reduced from time to time as advised by notice in writing to us by the Regional District of Nanaimo.

Partial or full drawings may be made.

This Letter of Credit shall expire at 3:00 p.m. on _____. This Letter of Credit will continue in force for a period of 1 year, but shall be subject to the condition hereinafter set forth.

It is a condition of the Letter of credit that it shall be deemed to be automatically extended without amendment from year to year from the present or any future expiation date hereof, unless at lease 30 days prior to the present or any future expiration date, we notify you in writing by registered mail, that we elect not to consider this Letter of Credit to be renewable for any additional period. This Letter of Credit is subject to the Uniform Custom and Practice for Documentary Credits (1993 Revision) International Chamber of Commerce Publication No. 500.

DATED at _____, British Columbia, this _____ day of _____, 20___.

_____

(Name of Bank)

_____

(Address of Bank)

_____

PER:

_____

(Authorized Signature)

Schedule '1' to accompany "Regional District of Nanaimo Land Use and Subdivision Amendment Bylaw No. 500.388, 2013".

_____

Chairperson

_____

Corporate Officer

Schedule '2'

Schedule 4D1

Lakes District and Schooner Cove Community Sewer System Standards

REGIONAL DISTRICT OF NANAIMO
BYLAW NO. 500

COMMUNITY STREETLIGHTING SYSTEM STANDARDS
(version January 4, 2010)

REGIONAL DISTRICT OF NANAIMO
BYLAW NO. 500

STREETLIGHTING SPECIFICATIONS
(version January 4, 2010)

The Developer shall submit a proposal for streetlighting to the Manager of Engineering for review/comments/revision/approval. There shall be a fee submission of $250 plus $50 for each light proposed; this fee shall be provided prior to the RDN reviewing the submission.

Design of the streetlighting system (the Works) shall be undertaken by a qualified professional electrical engineer registered in the Province of British Columbia and in accordance with all relevant regulations. The roadway lighting systems shall be based on the IESNA (Illuminated Engineering Society of North America) RP-8 design guide; variation from this design guide can only be undertaken upon written confirmation from the RDN. The RDN also follows the guiding principles of Dark Skies. Lights referred to as **"full cut-off fixtures"** shall be utilized in all street lighting applications (these lights minimize light pollution and direct light down to where it is needed).

Each group of five lights shall be controlled by a single photo cell.

Upon completion of the Works the developer shall supply to the RDN Works Yard in Parksville spare luminaries (one for each ten lights or portions thereof) which shall include the mounting hardware, light housing, lamp, lens, photo cell and high power factory ballast etc . The final submission shall also include "as-constructed" drawings of the Works.

Table of Contents

PART 1 GENERAL

1.1 Purpose

.1 The purpose of this design standard is to set rainwater management practices and design guidelines implemented by Fairwinds for the Lakes District and Schooner Cove to full build out.

.2 This standard defines the implementation of Best Management Practices that were outlined in the 2012 'Fairwinds Lakes District and Schooner Cove ISMP'.

1.2 General Requirements

Briefly the ISMP discovered that volumetric and peak reduction was not a strong driver in watershed health for this catchment. The presence of very thin soils underlaid by rock throughout the site coupled with almost 30% exposed rock along with very short watercourses which run to large waterbodies mean that pre and post runoff are very similar. The peak controls proposed are contained at the outlets of Enos Lake, Dolphin Lake and the wetland north of Enos Lake. The two Lake controls are modifications of existing controls. The wetland control is to be combined with a safety berm to protect against another failure of the existing beaver dam.

The BMP's outlined in this document are focussed on water quality. Technical specifications for pipework, catchbasins etc are also included such that a complete design specification is presented.

1.3 Acknowledgments

.1 Sources for the standards adopted herein are as follows:

a. Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Habitat. – Fisheries and Oceans Canada

b. A Guidebook for British Columbia Stormwater Planning – BC Ministry of Water, Land and Air Protection

c. MMCDA Design Guideline Manual (2005)

d. Fairwinds Lakes District and Schooner Cove ISMP (KWL 2012)

PART 2 RAINWATER MANAGEMENT BMPS

2.1 Water Quality BMP (WQ)

Purpose: Mitigate water quality impacts to fish habitat by collecting and treating "first flush" events of smaller storms and more frequent runoff events from impervious areas.

Guidelines: Collect and treat the volume of the 24-hour precipitation 6 month event which equals 90% of the total rainfall from impervious areas with suitable BMPs. Rate-of-discharge will not be greater than required to provide suitable hydraulic retention time as to maximize the effectiveness of the specific BMP.

Suitable BMPs:

.1 Bio-filtration swales or burrows

.2 Raingardens

.3 Constructed wetlands

.4 Exfiltrating dry detention pond systems.

PART 3 DESIGN STANDARDS

3.1 Bio-Filtration Swale

.1 Calculate swale dimensions using equations 7.28 to 7.311 in Dr Gary Mintons' Stormwater Treatment 'Third Edition'.

.2 Flow to the swale should be distributed sheet flow, travelling through a grassy filter area at the swale verges. Provide pre-treatment and erosion control to avoid sedimentation in the swale.

.3 Provide a 25mm drop at the edge of paving to the swale soil surface, to allow for positive drainage and buildup of road sanding/organic materials at this edge. Edge to be concrete with a bury of 200 mm to avoid erosion.

.4 Swale planting is typically sodded lawn. Low volume swales can be finished with a combination of grasses, shrub, groundcover and tree planting.

.5 Swale bottom – flat cross section, minimum 600mm wide to a maximum 2400 mm wide, longitudinal slope 1-2%.

.6 Swale side slopes should be 4:1 V:H and no greater than 3:1 slope.

.7 Weirs to have level top to spread flows and avoid channelization, keyed in 100mm minimum.

.8 Maximum ponding level of 150mm. 24 hour drawdown time for the maximum surface ponded volume.

.9 Treatment soil depth should be 450mm average and no less than 300mm.

.10 Design stormwater conveyance using Manning's formula or weir calculations which ever governs with attention to channel stability during maximum flows.

3.2 Raingarden

.1 Rain garden areas should be approximately 2.5% of the upstream impervious area from roads, sidewalks, and driveways.

.2 The ISMP identifies locations for regional raingardens that could be used in lieu of roadside gardens. Where a regional facility is constructed two parallel storm mains will be required in the catchment. One will carry roof and footing drain water directly to the discharge point and bypass the raingarden. The second will be dedicated for roads and sidewalks and driveways that drain to the street and will be directed to the raingarden.

.3 Locate rain gardens a minimum 30 meters from wells, 3 meters downslope of building foundations, and only in areas where foundations have footing drains.

.4 Provide pre-treatment and erosion control with a grass filter strip to avoid introducing sediment into the garden.

.5 At point-source inlets, install non-erodible material, sediment cleanout basins, and weir flow spreaders.

.6 Bottom width shall be 600mm minimum to 3000mm optimum.

.7 Side slopes shall be a maximum 2:1 with 3:1 preferred for maintenance in non roadside areas. Maximum ponded level shall be 300 mm.

.8 Raingardens to have a 150 mm diameter SDR 35 perforated drain placed within 150 mm of drain rock. The drain shall have a minimum 1% slope.

.9 The interface between the growing medium and the drain rock shall be separated by a medium weight needle punched geofabric.

.10 An impermeable liner shall be placed between the drain rock and the native soil to avoid water leaving the raingarden. The liner shall be omitted when there is no danger of groundwater causing problems on adjacent property. The Engineer of Record shall make this determination.

.11 Treatment soil depth shall be 450mm. Soils shall have an infiltration rate of 70mm/hr +/- 15%..

.12 Surface planting should be primarily trees, shrubs, and groundcovers, with planting designs respecting the various soil moisture conditions in the garden. Planting may include rushes, sedges and grasses as well as lawn areas for erosion control and multiple use.

.13 Apply a 50-75mm layer of organic mulch for both erosion control and to maintain infiltration capacity.

.14 Install an overflow system that allows flow up to the 100 year event to enter the piped storm drain system.

.15 Avoid utility or other crossings of the rain garden. Where utility trenches must be constructed below the garden, install trench dams to avoid infiltration water following the utility trench.

3.3 Site and Lot Grading

Grading is to comply with the B.C. Building Code and the following:

.1 Avoid drainage across adjacent lots. If cross-lot drainage is unavoidable, provide swale to divert runoff away from lower lots.

.2 Grade areas around buildings away from foundations.

.3 Where lots are lower than the adjacent roadway, direct road runoff away from buildings and driveways and into a rainwater management system.

.4 Set the minimum building elevation a minimum of 0.3 meters above the 200-year return period instantaneous flood elevation or high water level of the rainwater management system and a minimum of 0.6 meters above the sewer service connection invert.

3.4 Remaining Stormwater Systems

.1 The remainder of the stormwater system shall be designed to the Section 4.0 of the 2005 MMCDA Design Guideline Manual.

Schedule 7: Other Nanoose Water Works

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

P.O. BOX 790
194 MEMORIAL AVENUE
PARKSVILLE, B.C. V9P 2G8
Phone (250) 248-3151
Fax (250) 248-5362
kael@koers-eng.com

May 14th, 2012
File: 1059-02

Regional District of Nanaimo
6300 Hammond Bay Rd.
Nanaimo, B.C.
V9T 6N2

Attention: **Mr. Mike Donnelly, A.Sc.T.**
Manager of Water Services

Dear Sirs:

Re: Nanoose Peninsula Water System
Development Cost Charges Study Final Draft Report, May 2012

We are pleased to submit three copies of our final draft report entitled **"Regional District of Nanaimo, Nanoose Peninsula Water System Development Cost Charges Study Final Draft Report, May 2012"**.

The report details works required to reflect the current projects, which considers existing users, building infill on existing serviced lots, and additional future growth. It has been prepared in accordance with the Development Cost Charge - Best Practices Guide, published by the Ministry of Community Services. The Final Draft DCC Report and calculations are based on statistics provided by Regional District staff, and includes current available project planning information and costs. It is based on a 20-year revolving period, with no allowance for government grants. Trunk watermains to be built by Fairwinds within the Lakes District Neighbourhood are shown with the 25% benefit to existing development as a rebate payment to Fairwinds, charged to existing users as agreed at our last review meeting.

The report has been modified to reflect comments received from review of the earlier draft versions, and the DCC calculation spreadsheet amended to suit.

The report identifies that exemptions can be included into a DCC bylaw if deemed necessary by the Regional District of Nanaimo. Please refer to page three (3) of the report for an example DCC Exemption that may be granted by the Regional District of Nanaimo. In addition, please refer to page eight (8) of the report which discusses the methods in which residential DCCs can be collected.

.../2

May 14th, 2012
File: 1059-02

Regional District of Nanaimo
Mr. Mike Donnelly, A.Sc.T.

Following the Regional District's review of the final draft with the development community and board members, please feel free to contact Koers & Associates Engineering Ltd. to discuss any final required adjustments. We will then proceed with final edits and issuing of the report.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.

Dave Shillabeer, P.Eng.
Project Manager

Ken Doll, P.Eng.
Project Engineer

Chris Downey, P.Eng.
Principal

Enclosures

REGIONAL DISTRICT OF NANAIMO

NANOOSE PENINSULA WATER SYSTEM
DEVELOPMENT COST CHARGES STUDY
FINAL DRAFT REPORT
MAY 2012

TABLE OF CONTENTS

APPENDICES

REGIONAL DISTRICT OF NANAIMO

NANOOSE PENINSULA WATER SYSTEM DEVELOPMENT COST CHARGES STUDY FINAL DRAFT REPORT MAY 2012

1 INTRODUCTION

1.1 BACKGROUND

The Regional District of Nanaimo (RDN) does not presently have in place a waterworks distribution system development cost charge (DCC) bylaw for the Nanoose Peninsula. With more development comes the need for upgrading and expansion of all waterworks servicing functions throughout the Nanoose Peninsula Water System service area. It is the Board's intention to equitably fund this servicing between existing and new users, by implementing a new DCC bylaw.

Findings detailed in this report result from the Regional District's need to implement DCCs for the various water system components and development categories. It reviews current applicable waterworks projects for an initial 20-year period in accordance with existing study requirements to estimated build-out in year 2045, with up-to-date cost estimates in anticipated year 2012 dollars, provides estimates of growth in each of the various development types over the year 2012 to 2031 period, and calculates required charges in each category.

DCC charges are imposed to provide funds for the Regional District to pay a portion of the capital cost of providing, altering, or expanding the Nanoose Peninsula Water Distribution System, in order to serve existing and new developments. The DCCs collected only represent a part of the funding required to construct the capital projects. The balance of the funds will come from the Regional District (taxpayers), and possibly with some assistance from the Province of B.C. and Federal Government (i.e. grants). The Regional District's contribution takes into account the benefit of the water distribution system to the existing users, and also provides an additional 1% assist factor to the development's share of the various project costs.

DCCs are monies collected from land developers by a local government to offset some of the infrastructure expenditures incurred, to service the needs of new development while not adversely affecting existing users. Imposed by bylaw pursuant to the Local Government Act (1996), the charges are intended to facilitate development by providing a method to finance capital projects related to

highway facilities, drainage, sewerage systems, waterworks and parks. This report relates only to the waterworks function. It should be noted that bulk water supply is provided to the Nanoose Peninsula Water System by the separate Arrowsmith Water Service (AWS). A DCC separate to the future Nanoose Peninsula DCC is in place for the AWS bulk water supply components and functions.

DCCs allow monies to be pooled from many developers, so that funds can be raised to construct necessary services in an equitable manner. Those who will use and benefit from the installation of the capital projects should pay infrastructure costs. Recognizing that costs should be shared amongst all benefiting parties, a breakdown between benefits for existing users and new development should be provided.

The 'Development Cost Charge - Best Practices Guide' (BPG) is a publication by the B.C Ministry of Community Services, dated 2005. It is the objective of the BPG to standardize general practices in the formation and administration of DCC bylaws, while allowing flexibility to meet specific needs as allowed by the Local Government Act.

The BPG contains two parts, Part 1 is a guidebook for board members and administration staff responsible for developing and adopting policies, and Part II is a technical manual detailing procedures and calculations to be used by technical personnel for preparation of the actual bylaw and calculation of DCC rates.

DCC bylaws must be approved by the Ministry. The Ministry has indicated that expedient approval of DCC bylaws will be received when prepared in accordance with the BPG. To assist the Ministry staff in the review of the proposed DCC bylaw, a Ministry Submission Summary Checklist is included in the BPG as Appendix C.

When a DCC bylaw is implemented, developers or those parties paying DCCs will be affected by the new charges. The BPG recommends a suitable period of notification before a DCC bylaw is in effect, known as a grace period. Newspaper articles and notices, information circulars and verbal communications should be provided to the Regional District residents, taxpayers and land developers to provide the opportunity to become aware of the proposed bylaw, the anticipated charge rates required and the approximate timing of the new bylaw's implementation. The DCC bylaw may state the effective date, or time period (of up to a year) from the date of DCC bylaw adoption, as confirmation of the grace period. This would apply to both initial bylaw implementation, and at the time of future updates with rate changes. As stated in the BPG: "The grace period is granted by a municipality as an acknowledgement of the impact DCCs may have on the development industry."

Section 943 of the Local Government Act provides in-stream protection of one year from the bylaw date for subdivision applications, provided that the application fees have been paid. Complete application usually means that the developer has received a letter of 'Conditional Approval' of subdivision, or equivalent such as 'Preliminary Layout Approval'. This applies at initial bylaw adoption and where DCCs have increased from the existing charges.

Upon adoption of the new bylaw, the proposed DCCs will immediately apply to subdivisions under the following conditions:

- Where an application has been denied.
- Where 'Conditional Approval' has lapsed during the one year in-stream protection period.
- Where final approval of subdivision has not been received prior to the first anniversary date of the new bylaw.

Note that developers of multi-phased subdivisions should be especially aware of significant dates. This includes dates such as that of the DCC bylaw adoption, the new bylaw's anniversary, and the expiry date attached to the Letter of Conditional Approval.

There are no Local Government Act provisions governing those DCCs where collection is tied to building permit applications. As a result, municipalities normally follow the Act, and do not normally provide any form of in-stream protection to these types of development. Unless the RDN specifically wishes to change this by clarification and amendment of the Regional District Building Permit Bylaws, the amount payable is determined in accordance with the rates applicable at the time of building permit application. As noted in the BPG: "However, the ruling of Acamar v. City of Surrey (1997) confirms the view that Section 943 only applies to subdivision applications."

As stated in the BPG: "Courts have concluded that the date which the appropriate DCCs should be calculated is the date that sufficient information is available to issue the permit, and not necessarily the actual date of building permit issuance."

The grace period should not be confused with in-stream protection. The former only serves to allow enough time for people to be notified of the new DCC rates as related to all types of development including those where DCCs are due at the time of building permit applications; the latter seeks to provide preferential treatment to developers meeting certain time criteria for those development types where DCCs are due at the subdivision stage.

Section 933 (4) of the Local Government Act describes circumstances when development is exempt from paying DCCs, and as amended in year 2004. If DCC

exemptions are necessary then the Regional District will need to incorporate language into the bylaw.

It is recommended, and assumed by this report that both Commercial and Institutional DCCs be charged, at a per square metre rate, where a building permit is issued for the construction, or alteration, or extension of a building that results in an increase of the original building area and where the value of the work covered by the building permit is greater than $100,000. The Bylaw should be worded such that DCCs would only apply to the increased building size, beyond the pre-existing area, or number of housing units for mixed-use developments.

It is assumed that in accordance with Section 933(4) of the Local Government Act, as amended in 2004, DCCs will be charged for residential buildings where a building permit is issued for the construction, or alteration, or extension of any residential-use building, including those with less than four dwelling units. In accordance with this provision, any building permit for alteration or construction of more than one dwelling unit will be charged DCCs. If the Board wishes to charge DCCs for residential buildings with less than four but more than one unit as anticipated, it must specify so in a by-law in accordance with Section 933 (4.1)(a) of the Local Government Act.

For institutional DCCs, it is possible that an existing school may be closed and demolished after a new school has been built on a different site, resulting in a transfer of the servicing burden. The bylaw should be worded to allow credit for DCCs payable is such instances, to ensure that they are only charged where an increased burden results from redevelopment or new development. DCCs would only apply to any upsized building area, and for new development when it occurs at the old site. If the building use is retained at the old site, for alternative additional use or sale, an increased burden will result, and this DCC credit would not be applicable. Similar provisions should be worded for all commercial and institutional buildings, where DCCs would only be charged on the increased building floor area beyond the existing total floor area, to equitably charge for the increased burden.

The bylaw with respect to industrial DCCs should be worded to ensure that Industrial DCCs are charged on a case by case basis. The amount of DCC collected will depend on servicing needs and the anticipated burden from the specific Industrial development. At the time of development approval, the existing bylaw would be updated and the appropriate amendment would be made.

There are no specific references to "DCC credits" or "DCC rebates" in the Local Government Act. The intent of Clause (8) of Section 933 is that developers providing trunk services beyond the local servicing needs of the development shall have those costs deducted from the applicable DCCs payable. This applies

provided it is an identified DCC project in the capital plan. To implement the provisions of the legislation, the concepts of a "DCC credit" and a "DCC rebate" are introduced. Policies regarding when the Regional District should offer a credit versus a rebate should be carefully considered. In either case, the DCC accounting system should allow credits and rebates to be monitored and tracked.

The DCC program is compiled to service new development in an orderly manner. A situation is likely to arise where a developer desires to proceed with a land development before the required trunk services are installed in that area. This type of development can be considered to be "out of sequence". If the Regional District cannot afford the financial burden of additional infrastructure requirements, the Approving Officer would decline the development for the present time. Alternatively, the developer can construct the necessary trunk services, in advance of the proposed timing.

In this case, the out-of-sequence development could be offered a **DCC credit**, where the cost of constructing the required trunk works is deducted from the amount of DCCs that would have otherwise been payable. The DCC credit cannot exceed the amount of DCC payable. For phased developments in the same site vicinity, it is assumed that the Regional District would execute a separate agreement with the land developer allowing any applicable excess credits to be carried forward to apply against future development DCCs. Similar agreements should be implemented to allow transfers of credits on property sale prior to building construction for categories where DCCs are collected at the building permit stage. Such credits should be allowed on a proportional basis against subdivided parcels, on a land area basis or anticipated building area basis, as deemed applicable by the Regional District.

The DCC program covers trunk main requirements and other facilities beyond the services required for local development areas. Should a developer wish to proceed with a development before the trunk services fronting his property are installed, the Regional District may allow the developer to construct the necessary portion of the works to a trunk standard. The Regional District would then offer a **DCC rebate** for the incremental portion of the costs beyond the local requirement, following acceptance of the completed trunk works and registration of the development lands. In such cases, the rebate amount could exceed the DCCs payable.

Where a development constructs non-DCC project trunk works, which benefit adjacent developments, those servicing function costs, or over-sizing costs, may be considered for inclusion in a latecomers' agreement. The agreement would be in accordance with the provisions of the Local Government Act. In this case, the development would be responsible for setting up and costs of the agreement, which would then be administered by the Regional District. Similarly, "out of

sequence" DCC projects that cannot be accommodated by the municipality as detailed in the BPG, where a developer's costs are not recoverable through a DCC credit or rebate, may also be considered for inclusion in a latecomers' agreement.

The BPG states that DCC recoverable costs should be clearly identified in the DCC documentation and must be consistent with Ministry provisions. According to the Local Government Act, the recoverable capital costs associated with DCC projects include planning, engineering, and legal costs (Section 935(4)). In practice, this section has been interpreted by the Ministry of Community Services to include the following activities:

- planning, public consultation, and engineering design
- right-of-way or land acquisition
- legal costs
- interim financing
- contract administration and site inspection services
- construction costs
- contingencies
- appropriate net sales tax in full

Ministry policy does not consider inflation and long term debt financing eligible for DCC recovery. However, Section 935(3) (c) of the Local Government Act does allow funds in DCC reserve accounts to be used to pay for the interest and principal on a debt resulting from DCC project costs.

The average cost of a typical unit of development should not change significantly over time except for the effects of inflation or changes in standards, provided development projections are accurate. However, due to the periodic revision of the OCP, the Regional District's financial situation, changing infrastructure needs, and other factors affecting new development that are beyond the Regional District's control, the DCC bylaw will require future amendment.

In general there are two levels of amendment: a minor adjustment to DCC rates to reflect inflation, and a major review of the DCC for updating of capital project requirements, development projections, and the DCC accounting.

A minor amendment to the DCC bylaw is an updating based on changes in construction costs and inflationary effects. This type of bylaw amendment requires statutory approval, but due to its nature is anticipated to receive expeditious Ministry approval. This type of amendment should be carried out when necessary, likely once every two to three years.

A major bylaw amendment involves a full review of the DCC methodology, including:

- Underlying DCC assumptions
- Broad policy considerations
- Updated development projections
- DCC program costs
- Study and project review updates and timing of proposed capital projects
- Addition of new projects to the DCC program, and deletion of completed capital projects

In accordance with the BPG recommendation, the major amendment to the DCC bylaws should be completed once every five years.

1.2 POPULATION ESTIMATES

Data on existing housing units, recent growth statistics and future development, has been obtained from the Regional District. This includes data provided by the RDN from recent planning studies conducted for Schooner Cove and the Lakes District.

Existing serviced unit counts and associated service population estimates have been extrapolated from RDN 2010 records. This shows that at the end of year 2010 there were a total number of serviced single-family residences of 1,975 (of which 462 are within the Fairwinds Community part of the service area, and 1,493 are in all other parts). Examination of the RDN January to December 2010 Commercial and Multi-family Water Usage Summary shows applicable development units of 238 multi-family (which includes the 100 mobile home units on Apollo Drive, 20 Brynmarl Road condominiums, and 118 townhomes within Fairwinds), 22 commercial services, and 5 institutional services. This record also shows many services to localized irrigated landscape areas, such as traffic islands, fireline services, and small golf course convenience toilets, all of which do not represent applicable development units. From these year 2010 records, an estimate of the end of year 2011 units has been made by applying the typical 2% growth rate experienced in the service area, for the one year. This results in an estimated existing 2,010 single-family and 243 multi-family units.

The existing end of year 2011 population is estimated at 5,085 people. RDN planning information has seen the average population per single-family residence drop over the last 25 years, from a typical 2.4 people per unit, with an anticipated future development density of 2.2 people per unit. Multi-family residential units,

where most of the housing is suited for 2 people with some one-person residences, have a design average of 1.9 people per unit suggested. Applying an average 2.3 people to each of the 2,010 existing single-family residences, and 1.9 people to each of the 243 existing multi-family units, the existing estimated population of 5,085 people is obtained.

Future population estimates are based only on that growth within the existing boundaries of the Nanoose Peninsula Water System service area. Expansion of the Nanoose Peninsula Water System service area is not included in this study.

Based on available land and current development strategies, lot build-out has been estimated and forms the basis of the population estimates. When multiplied by the provided future average population per household at approximately 2.2 persons per single family household and 1.9 persons per multi family unit the data projects a build-out population of approximately 10,000. The growth of approximately 4,900 people beyond the assumed current population is estimated to be accommodated within 1,167 single-family units at 2.2 people per unit (2,567 people), plus 1,231 multi-family units at 1.9 people per unit (2,339 people), and 50 congregate care units at 1.0 person per unit (50 people).

Future population estimates have been projected by simply reviewing recorded historical data and considering the generally positive development growth pattern on Vancouver Island. This used RDN future growth projections which have been approximated to be 2% per annum, compounded yearly. When extended over a period of thirty-four years, the projected population compares well with the projected build-out population. Additionally, taking the 2011 estimated population and compounding it annually at 2% over the next thirty-four year period, results in a projected total service area population of 9,971 for the year 2045.

The DCC Function table in this report has been developed to include all foreseeable capital projects over the initial revolving 20 year period, of the approximately 34-year period at which build-out has been estimated to occur using the data provided. The interim population growth to match this 20-year period is based on 2% compounded growth, with a corresponding population growth of 2,472 people.

1.3 RESIDENTIAL HOUSING UNIT ASSUMPTIONS

Residential housing includes single-family dwellings, multi-family dwelling and congregate care (intermediate care) facilities. The RDN's Nanoose Peninsula Official Community Plan (OCP) does not reference the development of congregate care facility units within the Nanoose Peninsula. However, this report

considers the potential construction of 50 new congregate care facility units during the DCC build-out period from year 2012 to year 2045. Congregate care units are expected to average 100 m^2 per unit (100 units/ha), with a site coverage of about 40%.

As mentioned in Section 1.2 of this report, current residential property counts and build-out property counts have been projected based on information provided by the Regional District, data gathered from the Nanoose Peninsula Water Distribution Study (2007), Nanoose Bay OCP and available planning studies completed for Fairwinds.

Much of the future development lands are currently owned by a corporation known as Fairwinds Development, the majority of which are contained within the recently approved Lakes District Neighbourhood Plan, and the proposed redevelopment of the existing Schooner Cove area designated as the Schooner Cove Neighbourhood Plan. In addition, Fairwinds Development has some adjacent in-stream properties, consisting of Phase 7D (single-family development with completion of Goodrich Road, being a small parcel in the south, adjacent to the DND boundary), Phase 8 (multi-family development at the present west end of Collingwood Drive), and Phase 11B (Schooner Ridge multi-family townhome development off Bonnington Drive). A subsidiary company of a previous Fairwinds Development owner holds some parcels within the existing developed Fairwinds lands, under the ownership of Nanoose Harbour Holdings Ltd. This includes a potential 57-unit multi-family development on Andover Road, a single-family zoned lot on Schooner Cove Drive at Dolphin Drive, and a small (already subdivided and serviced) multi-family zoned property being Lot 1 at Redden Road and Dolphin Drive. Other development within the overall Nanoose Peninsula Water System service area includes small scattered subdivisions, and potential redevelopment on existing developed parcels, some with possible rezoning.

Table 1, Potential Residential Development, shows the estimated units relating to the various development areas within the service area. For the Lakes District, an approximate breakdown between single-family and multi-development units is made for the total 1,675 allowable units, based on the objectives of the neighbourhood plan. This breakdown estimate should be reviewed and adjusted if necessary in future DCC update studies. Should a higher percentage of single-family development actually occur, it is not anticipated that any additional infrastructure works would be needed, due to the relatively small difference in design people per unit for the housing types. DCC funding would also not be adversely affected, as the higher DCC charge for single-family residential development would generate additional funds due to its greater burden.

Schooner Cove redevelopment is all multi-family residential (plus commercial

detailed in the next section), in accordance with the approved neighbourhood plan. Other specific known potential development have the anticipated unit numbers and types shown. For the Red Gap Area, where the OCP allows 211 more units beyond the existing 289, a nominal allowance of the development type breakdown is shown. For the remainder of Nanoose, allowance is made for some infill single-family housing.

It is noted that overall this results in a higher percentage of multi-family units compared to that estimated during the year 2007 Water Study. This is due to changing demographics, the desires and objectives of the Lakes District Neighbourhood Plan, and particularly as a result of proposed Schooner Cove redevelopment as detailed in the Schooner Cove Neighbourhood Plan, all of which has been recently approved in year 2011.

Table 1. Nanoose Peninsula Service Area, Potential Residential Development

	Single-Family	**Multi-Family**	**Congregate Care**
Lakes District Neighbourhood Plan (Total 1675 Housing Units plus congregate care allowance)	1,000	675	25
Schooner Cove Neighbourhood Plan	0	360	0
Fairwinds Community In-Stream Phases:			
Phase 7D	25	0	0
Phase 8	0	18	0
Phase 11	0	32	0
Nanoose Harbour Holdings:			
Andover Road	0	57	0
Schooner Cove Drive	10	0	0
Lot 1, Redden Road	0	3	0
Red Gap Area	100	86	25
Remainder of Nanoose	32	0	0
Total Additional to Build-out Projection (Year 2045)	**1,167**	**1,231**	**50**

From these information sources as summarized in Table 1, Potential Residential Development, it is estimated that a total of 1,167 new single-family dwellings, 1,231 new multi-family dwellings, and 50 congregate care units may be developed within the Nanoose Peninsula to build-out within the present Nanoose

Peninsula Water System service area. Table 2, Total Estimated Units, shows the addition of existing development and estimated growth, to obtain projected total estimated units at build-out of the service area.

Table 2. Nanoose Peninsula Service Area, Total Estimated Units

	Single-Family	Multi-Family	Congregate Care
Current (2011)	2,010	243	0
Estimated Growth to Build-Out	1,167	1,231	50
Total Units at Build-out Projection (Year 2045)	**3,177**	**1,474**	**50**

For an estimate of development within the initial 20-year revolving DCC period, growth is estimated at 2% per annum, increasing by an estimated 2,472 people from approximately 5,085 at the start of year 2012 to a projected 7,557 in year 2031. At the 2% assumed average annual growth rate, the 9,971 estimated build-out population is achieved in year 2045, matching that of previous studies and planning reports. Growth in the initial 20 year DCC period is estimated to consist of 775 single family units (1,705 people at 2.2 per unit), plus 390 multi-family units (741 people at 1.9 per unit), plus 25 congregate care (25 people at 1.0 per unit).

DCCs for single family residential development would be collected at the subdivision stage. Cost charges for residential units are expected to be applied to all forms of single-family development, including bare-land strata developments. Charges applicable to multi-family land uses, including mobile and modular homes, would be collected at the time of building permit issuance, when the exact number of units in the development is known.

1.4 COMMERCIAL AND INSTITUTIONAL LAND ASSUMPTIONS

Non-residential land uses are categorized separately from residential land use for DCC bylaws. In order to keep the number of designated land uses at a practical level, it is normal practice to consider the groupings under commercial /institutional and industrial /public utility categories.

Commercial use includes service commercial, office commercial, and commercial portion of mixed commercial/residential development. Institutional use includes government offices, recreational facilities, churches, community halls, fire halls, municipal halls and buildings, public and private schools, colleges, and universities, hospitals including private care facilities, and senior or low-cost housing (depending on the provisions of the Zoning Bylaw).

The BPG recommends that commercial and institutional development be charged on the basis of building floor space expressed in square metres, or per 1,000 sq.ft. The Regional District has selected to charge on the basis of gross building area expressed in square metres. DCCs for commercial/institutional land uses would be collected at the time of building permit issuance, when charges related to floorspace are easily calculated.

The Nanoose Peninsula commercial zones currently consist of the Red Gap Village Centre and Schooner Cove Neighbourhood Centre. Of these two areas, the Red Gap Village Centre is the much larger commercial centre. However, the Fairwinds Development is planning to add significant commercial and mixed-use development to the Schooner Cove and Lakes District Neighbourhood Plan.

It is anticipated that redevelopment will result in additional commercial floor space of approximately 5,600 m^2 of gross floor space at the Red Gap Village Centre. Additionally, Fairwinds is planning to incorporate approximately 2,325 m^2 of commercial space in the Schooner Cove Neighbourhood Centre and approximately 4,800 m^2 of mixed-use buildings in the Lakes District. This combines to a total estimated 12,725 m^2 of commercial development within the Nanoose Peninsula Water System service area to build-out. In the initial 20-year revolving DCC period, it is estimated that the Red Gap expansion and Schooner Cove will be fully developed, and one-third of the Lakes District commercial, for a total of 9,125 m^2 total. Where land uses on a site are mixed, it is intended that applicable DCCs be charged on the basis of all actual uses on a site. This may include a residential component, and a commercial component.

Institutional redevelopment will likely occur and result in additional floor space to the Nanoose Bay Elementary School, for which a 50% size increase of 2,320 m^2 is estimated. In addition, the Lakes District has included a Lakehouse Centre into its future development plans, for which 9,200 m^2 is estimated. Based on these assumptions, growth for institutional buildings is estimated at 11,520 m^2 of gross floor area. It is anticipated that this will be fully built within twenty years.

1.5 INDUSTRIAL AND PUBLIC UTILITY LAND ASSUMPTIONS

Industrial use includes light, medium or heavy industrial uses, warehouses, mini-storage, minor repair, fabrication and storage facilities or space, and fuel storage areas. Public utility use is also covered under this category, including B.C. Hydro, Telus, FortisBC Gas, Shaw Cablesystems, and similar utility storage, distribution and plant facilities. It should be noted any reference to industrial DCCs, are intended to apply to all industrial, warehouse and public utility land uses.

As determined and agreed upon through discussions with RDN staff, Industrial and Public Utility development is not applicable to this report at this time, as there are no industrial designated lands in the OCP. Similarly, no public utility use facilities that burden the water system are anticipated. Should this situation change in the future for industrial or public utility land uses, the anticipated burden would be established, and the appropriate DCC charges would apply and be included in a minor update to the DCC bylaw.

1.6 BENEFIT TO EXISTING USERS

Capital costs for DCC calculations must be net costs. It is recognized that most improvements within the Regional District provide a partial benefit to the existing residents and users.

All capital projects have been individually reviewed during this study, and the percentage benefit to existing users estimated. The cost for each project applicable to existing users is then deducted from the total expenditure, to calculate the allowable DCC recoverable portion of the project. Assumptions on the allocation are shown on the table detailing the DCC calculation.

1.7 MUNICIPAL ASSIST FACTOR

Section 933 (2) of the Local Government Act states that the purpose of DCCs is to provide funds to "assist" local government in paying costs of infrastructure. By not allowing 100% of the growth related costs to be charged to new developments, the legislation implicitly requires an "assist factor", with a minimum of 1%. It is important to note that this assist factor is separate from the allocation of project costs between new development and existing users, which is considered on a project specific basis.

The assist factor chosen reflects the Regional District's desire to encourage development, and is largely a political decision. Most DCC bylaws use assist factors in the 1% to 10% range, while some assist to 25% or more. With the healthy development climate over the last several years, and the anticipation that this would continue for the foreseeable future, a low assist factor has been considered to be appropriate by many other Vancouver Island municipalities.

Under certain conditions, the assist factor is adjusted to maintain DCC rates within a perceived affordable level. An assist factor of 1% has been used for the waterworks DCC charges calculated in this review.

The total Regional District contribution to the required projects can be

summarized as:

- the total capital cost attributed to existing users
- portion of costs associated with developments exempt from DCCs
- the costs involved in the 1% assist factor.

1.8 FINANCIAL ASSISTANCE FROM GOVERNMENT GRANTS

Government grants, including Federal/Provincial infrastructure funding programs and Provincial revenue sharing programs may be available for projects, particularly those that contribute towards major roadworks and bridges, improved public health and water quality considerations, environmental improvements relating to sanitary or storm drainage projects, downtown redevelopment infrastructure improvements, and high-profile park improvement works. If awarded, these can provide:

- A significant portion of study cost recovery.
- 25%, 33.3% or 75 to 80% Provincial Government funding, through various programs, including the recent Towns for Tomorrow funding.
- A total of 66.7% combined assistance under Infrastructure Funding Programs supported through joint Federal / Provincial agreements.

Given the extremely limited potential for availability, successful application, and award of grants under the ongoing anticipated economic climate, the calculations have assumed that no grants will be available for listed projects. An assumption of 0% has therefore been made and shown under the government grant column of the spreadsheet.

The Regional District should still continue to make every effort to obtain financial assistance towards all key eligible projects, particularly the larger scale and environmental type of system expansions. Small studies, reviews, and major DCC updates may prove to be eligible for receipt of some funding, such as a 50% study grant. For distant-future asbestos-cement (AC) watermain replacement projects, programs may be established prior to construction which could provide some funding assistance.

1.9 DCC RESERVE FUNDS

The reserve funds are the total amounts that have been collected from developers, and not yet been spent on DCC projects. Consideration of reserve funds in the DCC calculation would only be required at the time of a DCC update review, not for a new bylaw.

1.10 GENERAL CALCULATION METHOD

DCCs are calculated in accordance with the recommendation of the BPG using a common unit basis for each function. In order to provide an equitable basis for the calculation of DCCs between the various land-use types, an 'equivalent population method' is assigned to each of the different designations of land-use as appropriate. In order to meet this requirement, the common unit basis is generally different for each function. In particular, water distribution costs are related using the equivalent population demand, which is based on average densities and usage experience obtained from traditional records for all development categories.

DCC charges are on a system-wide basis for all functions, in accordance with the BPG.

The cost estimates include those capital costs listed in tables for the water system components and functions, identifying those for which costs are recoverable through the DCC bylaw. Interim financing costs for DCC projects is an allowable expense. Long-term debt however is not considered an allowable expense under the BPG, although a recent change to the act conditionally allows this expense under exceptional circumstances for specific projects.

Cost estimates are generally prepared to Ministry of Transportation policy, Class D, with an accuracy level suitable for preliminary project control budgets, for program planning, and to obtain approval in principle. In addition to the estimated construction costs there is a nominal 15% engineering design, tendering and contract administration plus inspection and record drawing completion allowance, and an overall 30% contingency allowance. The contingency allowance includes the Regional District's internal administration, legal interim financing, and present net 1.85% HST tax costs, as well as the project design and construction contingency costs for additional or unexpected works and expenditures which may arise as the projects proceed to detailed design and construction completion. Costs are based on estimated year 2012 construction costs.

There is no allowance for future inflation, as this is not permissible under the Local Government Act. This should be regularly assessed as projects and time advances, particularly in view of the recent rapid construction cost escalation within the Province of B.C., the uncertainty of oil pricing that affects pipe and construction equipment operation, and worldwide steel cost escalation that affects the supply of pipe and fittings. Inflationary affects will result from cost increases between the time of this report and tendering of the various stages and components of the projects. It is assumed that the minor, approximately biannual reviews of the bylaw will allow for adjustments to the DCC charges to accommodate inflation costs.

2 WATERWORKS DEVELOPMENT COST CHARGES

2.1 INTRODUCTION

To help defray the cost of providing fire protection and domestic water demand in future developments, waterworks DCCs are collected. This component of the report explains the resulting development cost charges arising from the expenditure program. Waterworks development cost charges are to be imposed on a system-wide basis.

2.2 PROPOSED WATERWORKS PROGRAM

The proposed expenditure program consists of a series of waterworks projects and improvements. The scope of works as identified in the DCC Function Table (Appendix A) was developed from information contained in the latest Nanoose Peninsula Water Distribution Study, the Nanoose Peninsula Water Audit Study, the Nanoose Peninsula Water System Capital Planning Study, current knowledge of future projects, the Capital Works Plan, and additional input from RDN staff. Construction cost estimates were prepared and updated from earlier studies as appropriate, together with consideration of recent project unit costs provided by the RDN. Proposed expenditures total about $9.2 million. An assist factor of 1% is applied.

The DCC Function Table (Appendix A), describes each project name, along with a numbering system containing a notation of anticipated year and project number for that year. All anticipated projects within the 20-year revolving period are included. The Water System Improvements Schematic (Appendix B) shows the location of applicable projects on a plan view of the service area, showing numbering and location of the various projects wherever applicable. Overall system projects, such as instrumentation covered under Supervisory Control and Data Acquisition (SCADA) projects, installation of Radio-read meters, and periodic DCC update studies are shown on the function table but not on the schematic drawing.

As detailed earlier in this report, much of the future development lands are owned by the Fairwinds Development. Several trunk watermains are required in the initial years of the 20-year revolving DCC period to suit the Fairwinds requirements for servicing adjacent lands in the Lakes District and Schooner Cove neighbourhoods. It is anticipated that these trunk mains will require being in service prior to sufficient DCC funds being generated, and therefore, in accordance with the BPG the RDN plans to have the trunk mains installed by the developer. As shown on the function table, a DCC rebate would be paid to the

developer for the incremental portion of the costs beyond the local requirement. This would occur following acceptance of the completed trunk works and registration of the applicable portion of subdivision lands. The cost estimate for such projects shown in the function table is the applicable portion of the total cost beyond the local requirement only, with the developer paying the remaining project costs. In such cases, the rebate amount could exceed the DCCs payable during the initial subdivision phases. The trunk watermains are the Collingwood Drive Loop Main (N2014-4), the Bonnington Drive Loop Main (N2016-4 and N2017-5), and the Schooner Cove Drive Loop Main (N2018-2 and N2020-4). In addition to serving the new development, these mains supply improved flow and some redundancy to the adjacent existing residences along Dolphin Drive and in earlier phases of Fairwinds Community, where the water system has been in service for approximately 10 to 25 years or longer. Based on these mains servicing in the range of 1,800 new units and 600 existing services, for 2,400 total, the benefit to existing is assessed at 25%. On this basis, 25% of the developer's cost for design and installation of the trunk watermains would be rebated, based on certified cost provided by the developer's Professional Engineer of Record.

For each project, an engineering assessment of the benefit to existing users is made and shown for the specific project. As an example, year 2013 project number N2013-4, Harlequin/Sea Lion Loop and Footbridge, is assessed 75% to existing users as it is a system improvement, leaving 25% benefitting new development through improved flow capability for the relatively small potential additional development or redevelopment it serves. Projects such as the West Bay PRV and Building Upgrade, N2015-3 and N2017-1, provide some improvement to existing users and a much larger design capacity to suit growth, and are assessed at 25% benefit to existing users. Project N2022-4, Arbutus Reservoir Replace/Enlarge, is assessed at 50% benefit to existing users, as this involves replacement of an outdated and under-designed existing reservoir with a new, larger water storage reservoir of increased size to meet development needs to system build-out.

Local projects, mostly involving replacement of aged distribution system and service connection piping, some with upsizing to meet current design flow needs, have most of the costs allocated to existing users. The small benefit to new development allows for some infill subdivision and potential redevelopment/small rezonings on such local streets.

Studies and SCADA projects are assessed at a rounded 50%. This considers new development equivalent population approximately doubling, as it increases from the present 5,085 people to 9,971 plus additional commercial and institutional building loading.

Radio-read meters are estimated to have a 90% benefit to existing users, with 10% benefit to new development through anticipated improved system capacity. It is expected that this will be achieved through the anticipated leak detection and water conservation monitoring and improvements available with radio-read metering, using improved water-use tracking.

2.3 COST CHARGE CALCULATIONS

Waterworks DCCs are established for the five land use categories. The charges are based on the relative consumption according to equivalent population demand, as detailed in Table 3, Equivalent Population Calculation.

Table 3. Equivalent Population Calculation

Land Use Category	Estimated New Development	Equivalent Population Factor	Equivalent Population
Single Family Residential	775 units	2.2	1,705
Multi-Family Residential	390 units	1.9	741
Congregate Care Facility	25 units	1.0	25
Commercial	9,125 m^2	0.01	91
Institutional	11,520 m^2	0.005	58
Industrial & Public Utility	n/a	n/a	n/a
		Total Equivalent Population	**2,620**

Equivalent population is used to assess future burden and is estimated by multiplying the approximated new development for single family, multi-family, congregate care, commercial and institutional by an equivalent population factor. For single-family and multi-family, the equivalent population factor is assumed to be equal to the average population per unit as anticipated by RDN staff. Congregate care is based on the assumption that a single person would be accommodated in a single unit.

Equivalent population factors for the commercial and institutional categories were reviewed initially by comparing the 2010 water consumption data provided by RDN staff and dividing it by the per-capita average daily consumption and approximate building footprint areas. These calculations assist in producing an estimated equivalent population factor. For the commercial category, a value of 0.005 persons per square metre equivalent was obtained. For the new development it is anticipated that smaller floor-space commercial units will be built compared to existing, where an approximate doubling of the load is likely. As this would closely match the 0.009 p/m^2 of the City of Nanaimo sanitary sewer standards, an equivalent population demand for commercial of 0.01 p/m^2 has been used in the calculations. Similarly for the institutional category, the City of

Nanaimo standard of 0.005 p/m^2 is considered to be appropriate for use in the projections. These equivalent population demand factors should be monitored against actual demand experienced as new development in these categories become operational, and appropriate adjustments made in future major DCC updates.

The DCC Function Table (Appendix A) lists all applicable water distribution projects and costs, and generates the net DCC recoverable amount of $2,292,004. This is divided by the total equivalent population of 2,620 from Table 3, to obtain the DCC charge per person of $874.86. Multiplying the charge per person by the equivalent population demand factor for each land use category produces the DCC charge.

3.0 SUMMARY OF DEVELOPMENT COST CHARGES

3.1 SUMMARY

In order to receive expedient approval of the DCC bylaw by the Ministry of Community Services, their publication 'Development Cost Charge - Best Practices Guide' should be followed in the bylaw preparation. The 'Ministry Submission Summary Checklist' (draft enclosed as Appendix C) should be completed and forwarded with the bylaw for review.

The DCCs are established on a 20-year "revolving" basis for calculation of cost charges.

As detailed earlier in this report, much of the future development lands are owned by the Fairwinds Development. Several trunk watermains are required in the initial years of the 20-year revolving DCC period to suit the Fairwinds requirements for servicing adjacent lands in the Lakes District and Schooner Cove neighbourhoods. It is anticipated that these trunk mains will require being in service prior to sufficient DCC funds being generated, and therefore, in accordance with the BPG the RDN plans to have the trunk mains installed by the developer. As shown on the function table, a DCC rebate would be paid to the developer for the incremental portion of the costs beyond the local requirement. This would occur following acceptance of the completed trunk works and registration of the applicable portion of subdivision lands.

With the introduction of DCCs, instream protection is to be provided to any complete subdivision applications, provided that the application fees have been paid. Such instream protection is conditional, and among other reasons expires if the subdivision is not completed within the one-year period from bylaw adoption. There are no Local Government Act provisions governing those DCCs where collection is tied to building permit applications, so no instream protection is available for development types so charged.

Minor amendment of the DCC bylaw should occur every two to three years, to accommodate inflationary costs. This should be regularly assessed as projects and time proceeds, particularly in view of the recent construction cost escalation, which may result in a need for more frequent inflationary revisions to the DCC bylaw. A major bylaw amendment with a full review of the DCC methodology should be completed once every five years.

LEGEND

SERVICE AREA BOUNDARY

WATERMAIN CONSTRUCTION OR REPLACEMENT

STRUCTURE OR COMPONENT CONSTRUCTION OR MODIFICATION

PROJECT YEAR & NUMBER, AND DECRIPTION. (TYP.)

2017–3
OUTRIGGER RD.
WATERMAIN

Salish Sea

Craig Bay

Northwest Bay

Strait of Georgia

Dolphin Lake

Enos Lake

Nanoose Harbour

2024–2
MADRONA DR.
WATERMAIN

2019–2
BEAVER CREEK WHARF RD.
WATERMAIN

2021–2
SANGSTER CR.
WATERMAIN

2022–2
STROUGLER RD.
WATERMAIN

2024–1
YEO ST.
WATERMAIN

2020–3
JENKINS CR.
WATERMAIN

2027–4
ACACIA RD.
WATERMAIN

2020–2
NORTHWEST BAY RD.
WATERMAIN

2025–1
BALLENAS RD.
WATERMAIN

2026–2
DOUGLAS CR.
WATERMAIN

2025–2
GERALD ST.
WATERMAIN

2018–1
DORCAS POINT RD.
WATERMAIN

2013–1
CHANGE CONTROLS
TO EAGLE HEIGHTS

2013–4
HARLEQUIN / SEA LION
LOOP WATERMAIN

2018–2
SCHOONER COVE DR.
LOOP WATERMAIN
PHASE 1

2017–3
OUTRIGGER RD.
WATERMAIN

2017–2
DOLPHIN DR.
WATERMAIN

2020–4
SCHOONER COVE DR.
LOOP WATERMAIN
PHASE 2

2014–2
WATER TREATMENT
EXPANSION FOR
CLAUDET WELLS

2035–1
FLORENCE DR.
WATERMAIN

2015–2
ARBUTUS PUMP
STATION IMPROVEMENTS

2017–5
BONNINGTON DR.
LOOP WATERMAIN
PHASE 2

2017–1
WEST BAY PUMPHOUSE
UPGRADE

2035–2
ASHCRAFT RD.
WATERMAIN

2016–3
ANCHOR WAY
WATERMAIN

2016–4
BONNINGTON DR.
LOOP WATERMAIN
PHASE 1

2014–4
COLLINGWOOD DR.
LOOP WATERMAIN

2015–3
WEST BAY PRV
BUILDING UPGRADE

2030–1
WHITE AVE.
WATERMAIN

2029–1
SHEPPARD RD.
WATERMAIN

2014–2
WATER TREATMENT
EXPANSION FOR
CLAUDET WELLS

2014–3
HEMLOCK DR.
WATERMAIN

2034–1
BALSAM CR.
WATERMAIN

2013–2
ARBUTUS RESERVOIR PRE–DESIGN

2022–4
ARBUTUS RESERVOIR
REPLACEMENT OR ENLARGEMENT

2028–2
SCHIRRA DR.
WATERMAIN

2027–1
IDA LANE
WATERMAIN

2013–3
GARRY OAK DR. PRV

2032–1
SPRUCE LANE
WATERMAIN

2015–1
ARMSTRONG / McDIVITT LION
LOOP WATERMAIN

2016–2
GARRY OAK DR.
WATERMAIN

2014–1
ARBUTUS CR.
WATERMAIN

2031–1
APOLLO DR.
WATERMAIN

2028–1
LEISURE WAY
WATERMAIN

2016–1
MARINE DR.
WATERMAIN

2033–1
ARBUTUS CR.
WATERMAIN

2031–2
GLENN PL.
WATERMAIN

2029–2
ARMSTRONG CR.
WATERMAIN

2030–2
COLLINS CR.
WATERMAIN

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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	1059
DRAWN	CACH/PB
DESIGNED	DS
CHECKED	DS
APPROVED	DS
DATE	APRIL 2012
SCALE	1:15,000

CLIENT

REGIONAL DISTRICT OF NANAIMO

PROJECT

NANOOSE PENINSULA WATER SYSTEM DCC STUDY

TITLE

WATER SYSTEM IMPROVEMENTS SCHEMATIC (TO BUILD OUT)

DRAWING No.	REV.	SHEET
1059 – Fig. 1	–	1/1

File: H:\5281 Nanaimo RD\1059 Nanoose Peninsula Water System DCC\103 Drawings\1059 - Fig 1.dwg Plot Time: May 11, 2012 - 5:42pm User: kdds

DCC FUNCTION TABLE
REGIONAL DISTRICT OF NANAIMO
Nanoose Peninsula Water System DCCs

Project No. (Year-#)	Project Description (for Replacements, Year reaching end of life is shown in brackets)	Cost Estimate (2011) (A)	Gov't Grant (B)	% Benefit to Ex. Users (C)	Net Expenditure (D) = (A)-(B)	Benefit to Existing Users (E) = (D)*(C)	Benefit to New Development (F) = (D)-(E)	1% Municipal Assist Factor (G) = (F)*1%	User (Regional District) Fees (H) = (E)+(G)	DCC Recoverable (I) = (D)-(H)
N2013-1	Change Controls to Eagle Heights	56,650	0	100%	56,650	56,650	0	0	56,650	0
N2013-2	Arbutus Reservoir Predesign Study	13,200	0	100%	13,200	13,200	0	0	13,200	0
N2013-3	Garry Oak Drive PRV	50,050	0	100%	50,050	50,050	0	0	50,050	0
N2013-4	Harlequin/Sea Lion Loop & Footbridge (System Improvements)	227,425	0	75%	227,425	170,569	56,856	569	171,137	56,288
TOTAL 2012-13		**347,325**							**291,037**	**56,288**
N2014-1	Arbutus Crescent Main (System Improvements)	160,050	0	90%	160,050	144,045	16,005	160	144,205	15,845
N2014-2	Water Treatment Expansion for Claudet Wells (225 igpm of 425 igpm benefits development)	2,000,000	0	47%	2,000,000	941,176	1,058,824	10,588	951,765	1,048,235
N2014-3	Hemlock Drive Main (System Improvements)	74,690	0	90%	74,690	67,221	7,469	75	67,296	7,394
N2014-4	Collingwood Drive Loop Main (Fairwinds Installs with 25% DCC Rebate)	48,125	0	100%	48,125	48,125	0	0	48,125	0
TOTAL 2014		**2,282,865**							**1,211,390**	**1,071,475**
N2015-1	Armstrong / McDivitt Loop (System Improvements)	192,060	0	90%	192,060	172,854	19,206	192	173,046	19,014
N2015-2	Arbutus Pump Station Improvements	121,000	0	75%	121,000	90,750	30,250	303	91,053	29,948
N2015-3	West Bay PRV Building Upgrade	12,100	0	25%	12,100	3,025	9,075	91	3,116	8,984
TOTAL 2015		**325,160**							**267,214**	**57,946**
N2016-1	Marine Drive Watermain Replacement (2016)	148,555	0	90%	148,555	133,700	14,856	149	133,848	14,707
N2016-2	Garry Oak Drive Main (System Improvements)	229,405	0	90%	229,405	206,465	22,941	229	206,694	22,711
N2016-3	Anchor Way Watermain Replacement (2016)	220,000	0	50%	220,000	110,000	110,000	1,100	111,100	108,900
N2016-4	Bonnington Drive Loop Main, Phase 1 (Fairwinds Installs with 25% DCC Rebate)	62,500	0	100%	62,500	62,500	0	0	62,500	0
TOTAL 2016		**660,460**							**514,142**	**146,318**
N2017-1	West Bay Pumphouse Upgrade	110,000	0	25%	110,000	27,500	82,500	825	28,325	81,675
N2017-2	Dolphin Drive Main	32,175	0	90%	32,175	28,958	3,218	32	28,990	3,185
N2017-3	Outrigger Road Main (System Improvements)	117,370	0	10%	117,370	11,737	105,633	1,056	12,793	104,577
N2017-4	DCC Major Update Study	11,000	0	50%	11,000	5,500	5,500	55	5,555	5,445
N2017-5	Bonnington Drive Loop Main, Phase 2 (Fairwinds Installs with 25% DCC Rebate)	75,000	0	100%	75,000	75,000	0	0	75,000	0
TOTAL 2017		**345,545**							**150,663**	**194,882**
N2018-1	Dorcas Point Rd Main (System Improvements)	586,850	0	90%	586,850	528,165	58,685	587	528,752	58,098
N2018-2	Schooner Cove Drive Loop Main, Phase 1 (Fairwinds Installs with 25% DCC Rebate)	37,500	0	100%	37,500	37,500	0	0	37,500	0
TOTAL 2018		**624,350**							**566,252**	**58,098**
N2019-1	SCADA - Initial System	220,000	0	50%	220,000	110,000	110,000	1,100	111,100	108,900
N2019-2	Beaver Creek Wharf Rd Northwest Bay to Madrona Drive (2012)	70,125	0	95%	70,125	66,619	3,506	35	66,654	3,471
TOTAL 2019		**290,125**							**177,754**	**112,371**
N2020-1	SCADA - Continue Expanding/Programming	55,000	0	50%	55,000	27,500	27,500	275	27,775	27,225
N2020-2	Northwest Bay Rd #1665 to Ballenas (2012)	328,103	0	95%	328,103	311,697	16,405	164	311,861	16,241
N2020-3	Jenkins Crescent Watermain Replacement (2012)	70,125	0	95%	70,125	66,619	3,506	35	66,654	3,471
N2020-4	Schooner Cove Drive Loop Main, Phase 2 (Fairwinds Installs with 25% DCC Rebate)	210,000	0	100%	210,000	210,000	0	0	210,000	0
TOTAL 2020		**663,228**							**616,290**	**46,937**
N2021-1	SCADA - Continue Expanding/Programming	55,000	0	50%	55,000	27,500	27,500	275	27,775	27,225
N2021-2	Sangster Crescent Watermain Replacement (2012)	76,890	0	95%	76,890	73,046	3,845	38	73,084	3,806
TOTAL 2021		**131,890**							**100,859**	**31,031**
N2022-1	SCADA - Continue Expanding/Programming	55,000	0	50%	55,000	27,500	27,500	275	27,775	27,225
N2022-2	Strougler Rd Watermain Replacement (2012)	70,125	0	95%	70,125	66,619	3,506	35	66,654	3,471
N2022-3	DCC Major Update Study	11,000	0	50%	11,000	5,500	5,500	55	5,555	5,445
N2022-4	Arbutus Reservoir Replace/Enlarge	550,000	0	50%	550,000	275,000	275,000	2,750	277,750	272,250
TOTAL 2022		**686,125**							**377,734**	**308,391**
N2023-1	SCADA - Continue Expanding/Programming	55,000	0	50%	55,000	27,500	27,500	275	27,775	27,225
TOTAL 2023		**55,000**							**27,775**	**27,225**
N2024-1	Yeo Street Watermain Replacemnt (2012)	81,813	0	95%	81,813	77,722	4,091	41	77,763	4,050
N2024-2	Madrona Drive W/main Replacement (2012)	376,922	0	95%	376,922	358,076	18,846	188	358,264	18,658
TOTAL 2024		**458,734**							**436,027**	**22,707**
N2025-1	Ballenas Road Watermain Replacement (2012)	155,128	0	95%	155,128	147,371	7,756	78	147,449	7,679
N2025-2	Gerald Street Watermain Replacement (2012)	126,225	0	95%	126,225	119,914	6,311	63	119,977	6,248
TOTAL 2025		**281,353**							**267,426**	**13,927**
N2026-1	Radio Read Water Meters - Initial System	330,000	0	90%	330,000	297,000	33,000	330	297,330	32,670
N2026-2	Douglas Crescent Watermain Replacement (2012)	46,173	0	95%	46,173	43,864	2,309	23	43,887	2,286
TOTAL 2026		**376,173**							**341,217**	**34,956**
N2027-1	Ida Lane Watermain Replacement (2014)	53,763	0	95%	53,763	51,074	2,688	27	51,101	2,661
N2027-2	Radio Read Water Meters - Continue System Conversion	110,000	0	90%	110,000	99,000	11,000	110	99,110	10,890
N2027-3	DCC Major Update Study	11,000	0	50%	11,000	5,500	5,500	55	5,555	5,445
N2027-4	Acacia Road Watermain Replacement (2012)	126,225	0	95%	126,225	119,914	6,311	63	119,977	6,248
TOTAL 2027		**300,988**							**275,743**	**25,244**
N2028-1	Leisure Way Watermain Replacement (2014)	107,525	0	95%	107,525	102,149	5,376	54	102,203	5,322
N2028-2	Schirra Drive Watermain Replacement (2014)	140,250	0	95%	140,250	133,238	7,013	70	133,308	6,942
N2028-3	Radio Read Water Meters - Continue System Conversion	110,000	0	90%	110,000	99,000	11,000	110	99,110	10,890
TOTAL 2028		**357,775**							**334,620**	**23,155**
N2029-1	Sheppard Road Watermain Replacement (2014)	32,725	0	95%	32,725	31,089	1,636	16	31,105	1,620
N2029-2	Armstrong Crescent Watermain Replacement (2014)	287,513	0	95%	287,513	273,137	14,376	144	273,281	14,232
N2029-3	Radio Read Water Meters - Continue System Conversion	110,000	0	90%	110,000	99,000	11,000	110	99,110	10,890
TOTAL 2029		**430,238**							**403,496**	**26,742**
N2030-1	White Avenue Watermain Replacement (2014)	32,725	0	95%	32,725	31,089	1,636	16	31,105	1,620
N2030-2	Collins Crescent Watermain Replacement (2014)	322,575	0	95%	322,575	306,446	16,129	161	306,608	15,967
N2030-3	Radio Read Water Meters - Continue System Conversion	110,000	0	90%	110,000	99,000	11,000	110	99,110	10,890
TOTAL 2030		**465,300**							**436,823**	**28,477**
N2031-1	Apollo Drive Watermain Replacement (2014)	18,700	0	95%	18,700	17,765	935	9	17,774	926
N2031-2	Glenn Place Watermain Replacement (2014)	44,165	0	95%	44,165	41,957	2,208	22	41,979	2,186
N2031-3	Radio Read Water Meters - Complete System Conversion	27,500	0	90%	27,500	24,750	2,750	28	24,778	2,723
TOTAL 2031		**90,365**							**84,531**	**5,834**
	Total	**$9,172,997**	**$0**		**$9,172,997**	**$6,857,841**	**$2,315,156**	**$23,152**	**$6,880,993**	**$2,292,004**

Total Development Cost **$2,292,004**

Single Family (EA.)	Multi Family (EA.)	Congregate Care (Unit)	Institutional (m^2)	Commercial (m^2)	Industrial (m^2)	
775	390	25	11,520	9,125	0	

Equivalent Population Demand, (EPD) **Total (EPD)** **2,620**

DCC Charge per Person (DCC / EPD) **$874.86**

	CATEGORY EQUIVALENT POP.	X	DCC / EPD	DCC CHARGE
DCC Charge for Single Family Unit	2.20	X	$874.86	$1,924.69
DCC Charge for Multi-Family Unit	1.90	X	$874.86	$1,662.24
DCC Charge for Congregate Care Facility Unit	1.00	X	$874.86	$874.86
DCC Charge for Commercial, per m^2 of Gross Building Area	0.0100	X	$874.86	$8.75
DCC Charge for Institutional, per m^2 of Gross Building Area	0.0050	X	$874.86	$4.37
DCC Charge for Industrial, per ha of Gross Site Area	0.0000	X	$874.86	$0.00

Estimates are in Jan 2012 dollars

APPENDIX B

Water System Improvements Schematic

APPENDIX C

Ministry Submission Summary Checklist

MUNICIPALITY/REGIONAL DISTRICT
MINISTRY OF COMMUNITY SERVICES
SUBMISSION SUMMARY CHECKLIST
(to be completed by local government)
DCC BYLAW(S) NO.(S)

Is this bylaw a ☒ **New DCC Bylaw**
☐ **Major DCC Bylaw Amendment**
☐ **Minor DCC Bylaw Amendment**

Please complete checklist by marking the appropriate boxes, and providing references to background material and other requested information. If DCCs are established on a basis other than the DCC Best Practices Guide, provide a brief explanation for the approach used. If space is insufficient, reference pages in submission where this is covered or append additional pages.

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
1.	Did the development of this DCC bylaw include: ☒ a full public process? Yes ☒ input from stakeholders? Yes ☐ Council input only?	2
	Why? Local developers and the general public have been kept advised of the proposed DCC bylaw implementation. They were also specifically invited to attend at a staff meeting where the DCC Report was presented. Following this, they were able to comment on the function tables and other information in the report.	2
2.	Are the Road DCCs established: Not applicable ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why? This is in accordance with the BPG.	
3.	Are the Storm drainage DCCs established: Not applicable ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why? This is in accordance with the BPG.	
4.	Are the Sanitary sewer DCCs established: Not applicable ☐ on a municipal-wide basis? Yes ☐ on an area specific basis?	
	Why? This is in accordance with the BPG.	

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
5.	Are Water DCCs established: ☒ on a municipal-wide basis? Yes ☐ on an area specific basis?	15, 17
	Why? This is in accordance with the BPG.	15
6.	Are Parkland and parkland improvement DCCs established: ☐ on a municipal-wide basis? Not applicable ☐ on an area specific basis?	
	Why? This is in accordance with the BPG.	
7.	Is the DCC time frame: ☒ a revolving program (20 Years)? Yes ☐ a build out program (_____ Years)? ☐ other?	8, 11, 17, 21
	Why? DCC program is tied into the anticipated 20-year capital expenditure plan, for improvement works determined from established studies.	17
8.	Are residential DCC categories established on the basis of: ☒ density gradient? Yes ☐ building form? ☐ other?	11
	Why? This is the traditional approach, with established records of average population per unit available to assist in the projection estimates.	11, 19
9.(a)	Are residential DCCs imposed on the basis of: ☒ development units? Yes ☐ floor space? ☐ other? If single-family residential DCCs are imposed on the basis of floor space, does the local government have a bylaw in place allowing DCCs to be levied at the building permit stage on fewer than 4 self-contained dwelling units? Yes	11, 19 4
	Why? Unit projection information is available.	11, 19

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
9.(b)	Are commercial and institutional DCCs imposed on the basis of: ☒ floor space? Yes, per square metre of gross building floor space. ☐ other?	12
	Why? Reliable, as records of equivalent to residential impacts are available.	12
9.(c)	Are industrial DCCs imposed on the basis of: Not applicable. ☐ gross site area? ☐ other?	12, 13
	Why? No industrial or public utility zoned lands presently exist in the service area or OCP. Should this change in the future, charges would be reviewed, and included in a DCC bylaw update.	12, 13
10.	Is the DCC program consistent with: ☒ the *Local Government Act*? Yes ☒ Regional Growth Strategy? Yes ☒ Official Community Plan? Yes ☒ Master Transportation Plan? N/A ☒ Master Parks Plan? N/A ☒ Liquid Waste Management Plan? N/A ☐ Affordable Housing Policy? ☒ Five Year Financial Plan Yes	1, 2, 3, 4 7, 9 9 17
	Why not? Other plans are not applicable to this DCC bylaw.	
11.	Are DCC recoverable costs, consistent with Ministry policy, clearly identified in the DCC documentation: ☒ Cost allocation between new and existing? Yes ☒ Grant Assistance? Yes ☒ Developer Contribution? Yes ☒ Municipal assist Factor? Yes ☒ Interim Financing? Yes ☒ Other: No – Long-term debt not allowable under the act. No – Inflation not allowable under the act.	13, 18, 19 14 19 13 6 6, 15 6, 15
	Why? To conform to the BPG.	
	Is capital cost information provided for: ☒ Roads? N/A ☒ Storm Drainage? N/A ☒ Sanitary Sewer? N/A ☒ Water? Yes ☒ Parkland? N/A ☒ Parkland improvements? N/A	Ref.17, 20

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
12.	Are DCC recoverable costs which include interest clearly identified in the DCC documentation as follows: ☒ Interest on long-term debt is *excluded*? Yes ☐ For specific projects, interest on long-term debt is *included*? ☐ Other? If interest on long-term debt in included for specific projects, does the DCC submission include: ☐ A council/board resolution authorizing the use of interest? ☐ Confirmation that the interest applied does not exceed the MFA rate or if borrowing has already been undertaken, the actual rate providing it does not exceed the MFA rate? ☐ Confirmation that the amortization period does not exceed the DCC program time frame? ☐ Evidence that the current DCC reserve fund balance is insufficient for the work in question? ☐ Demonstration that the project is an exceptional circumstance (fixed capacity, out-of-sequence, or Greenfield)? ☐ Evidence of public consultation and disclosure in the financial plan and DCC report regarding inclusion of interest?	15
13.	Does the municipal assist factor reflect: ☒ the communitys' financial support towards the financing of services for development? Yes ☐ other?	13, 14
	Why? Low assist factor is considered appropriate at this time, with the healthy development climate anticipated in the Nanoose Peninsula Water System service area, and large Local Area Neighbourhood Plans having been recently approved for new development to proceed.	13, 14
	Has a municipal assist factor been provided for: ☒ Roads? N/A Assist factor _____% ☒ Storm Drainage? N/A Assist factor _____% ☒ Sanitary Sewer? N/A Assist factor _____% ☒ Water? Yes Assist factor 1 % ☒ Park land? N/A Assist factor _____% ☒ Park land improvements? N/A Assist factor _____%	13
14.	Are DCCs for single family developments to be collected: ☒ at the time of subdivision approval? Yes ☒ other? Building permit stage for construction, alteration, or extension of residential buildings with less than four but more than one unit.	11 4
	Why? Recommended by the BPG. Subdivision approval collection creates an orderly flow of funds to allow for completion of the required works in a timely schedule, to achieve the necessary level of service. Redevelopment of existing developments with less than 4 dwelling units will require DCCs.	11 4

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
15.	Are DCCs for multi-family land uses to be collected: ☐ at the time of subdivision? ☒ at the time of building permit issuance? Yes	11
	Why? As the BPG. Charges related to the exact number of units, which are easily calculated at the building permit stage.	11
16.	Is a DCC monitoring and accounting system to provide a clear basis for the tracking of projects and the financial status of DCC accounts: ☐ in place? ☒ to be set up? Yes	6
	Why? This is a new DCC bylaw. System will be set up once bylaw is implemented.	
17.	Is a suitable period of notification before a new DCC bylaw is in effect, known as a grace period: ☒ provided for? Yes ☐ other?	2, 21
	Why not?	
18.(a)	Does the DCC bylaw set out the situations in which a DCC credit or rebate are to be given? ☒ Yes ☐ No	4, 5, 18, 21
18.(b)	If no, has Council adopted a policy statement that clearly identifies situations in which a DCC credit or rebate should be given or would be considered by Council? Not applicable ☐ Yes ☐ No If yes, a copy of the policy statement is included with this submission.	Ref._____
	If no, why not?	

MUNICIPALITY

SUMMARY OF DCCs - BYLAW NO(S).

	Residential (per single family <SF> , multi-family <MF> , or congregate care <CC> dwelling unit)	**Commercial** (per square metre)	**Institutional** (per square metre)	**Industrial** (per hectare)
Roads				
Storm Drainage				
Sanitary Sewer				
Water	$1,924.69 <SF> $1,662.24 <MF> $874.86 <CC>	$8.75	$4.37	N/A
Park Land				
Park Land Improvements – Included in Park Land				
Total	**$1,924.69 <SF> $1,662.24 <MF> $874.86 <CC>**	**$8.75**	**$4.37**	**N/A**

Note: If not on a municipal-wide basis, please indicate minimum and maximum charges.

For amendment bylaw, please indicate nature of change	Existing	Proposed
• New DCC service added		
• Time horizon		
• Capital costs		
• Weighting of types of development (residential, commercial, industrial, etc.)		
• Potential development		
• Allocation of benefit between existing and potential units of development		
• Assist factor		
• Inclusion of Specific Interest Charges		
• Provide that a charge is payable where there is fewer than 4 self-contained dwelling units		
• Establish an amount higher than the $50,000 minimum provided for in the *Local Government Act*.		
• Is a suitable period of notification before a new DCC bylaw in effect, known as a grace period?		
Other: (please list) • •		

Schedule 8: Analysis of NBPWS Water Supply Needs to Buildout

NANOOSE PENINSULA WATER SERVICE AREA
SUMMARY OF WATER SUPPLY NEEDS TO BUILD-OUT

July 3, 2013

Updated text, some maps

Further to our discussion this morning and the recent understanding between Rob Warren of KWL, Russell Tibbles of Fairwinds, and Mike Donnelly of the RDN that it is O.K. for Koers & Associates to release population and water use data and assumptions used in recent assignments for the RDN on Nanoose water supply and distribution, I provide the following summary:

There are three assignments that apply (in chronological order):

1. Arrowsmith Water Service (AWS). Englishman River Intake, Treatment Facilities and Supply Mains. Phase 1 – Conceptual Planning, Budgeting and Scheduling. Associated Engineering, April 2011. Koers & Associates, as well as KWL, were sub-consultants to AE on this project. A copy of this report and appendices is available on line.
2. RDN. Nanoose Peninsula Water System. Development Cost Charges Study, Final Draft Report. Koers & Associates Engineering Ltd. May 2012. This report has not yet been adopted by the RDN. This study covers local distribution system improvements only.
3. RDN. Nanoose Bulk Water Requirements. Review of a range of per capita water demand scenarios, population growth scenarios, and Nanoose groundwater availability scenarios, and the resulting need for additional water supply from the Englishman River Water Service (ERWS). May 2013.

Existing and Build-out Populations

There are some inconsistencies between the basic assumptions in these reports (reviews), for example, reports 1 and 2 each quote Nanoose Peninsula Water Service Area (NPWSA) build-out population and growth rate estimates from RDN staff. Report 1 projects 11,969 and a range of annual growth rates for Nanoose from 1.5 – 2.3%, and Report 2 projects 9,971 and a 2.0% annual growth rate. The report 1 assumptions do not achieve build-out until 2050 or later, whereas the report 2 assumptions achieve build-out by 2045. The existing NPWSA population was estimated by RDN staff at 4,803 for 2009 in report 1 and 5,085 for 2011 in report 2. Review 3 used the information contained in public report 1.

We suggest that the most realistic and likely conservative scenario is a total NPWSA build-out population of 11,969 (most recent public report), to be reached after 2050. The existing NPWSA population would be 5,190 for 2013, using the 4,803 estimate for 2009 and a 2% growth rate. The difference, or 6,779 people, would be contributed by new development over the next 40+ years.

Per Capita Water Consumption

Report 1 suggests a conservative overall per capita conservation water consumption target of 1.375 m^3/day per capita for the entire AWS service area, which also includes the City of Parksville, the Town of Qualicum Beach, and the French Creek Regional Service Area. Recent design demand determinations for Fairwinds by KWL suggest a figure of 1.168 m^3/day per capita for the Nanoose service area. We understand this has been adopted by the RDN. Review 3 therefore used for its "most probable" Nanoose bulk water use scenario a target value for Nanoose of 1.168 m^3/day per capita. We believe this is still a conservative number, and have used that number for the present summary review.

The maximum day water demands for the NPWSA are summarized as follows:

Present population (2013)	6,062 m^3/day
Build-out population (2050+)	13,980 m^3/day

Overall AWS Bulk Water Requirements

Report 1 projected that, with overall estimated groundwater resources at 19,000 m^3/day, the maximum day AWS surface water source requirement at full build-out (2050) would be between 46,329 and 21,218 m^3/day, without Town of Qualicum Beach participation, depending on growth and per capita consumption scenarios. The AWS Englishman River water licence was issued for a maximum 24-hour withdrawal of 47,888 m^3/day. There was no attempt made in Report 1 to project individual service area groundwater resources or individual service area bulk water requirements.

NPWSA Groundwater Availability

Review 3 considered four scenarios of available groundwater capacity for the NPWSA

a. With the old NWSA (Beachcomber, Dolphin Beach) wells in service. These wells, #2, 3, 4, and 7, totaling 2,454 m^3/day have been recently taken out of service due to water quality complaints.
b. With the old NWSA wells out of service.
c. With only Wallbrook Well #1 in service.
d. With Wallbrook Wells #1, 2, 3 and 4 in service.

For long term sustained capacity estimates, the RDN Operations Department 2013 maximum sustained 24-hour NPWSA well capacity values (May 17, 2013) were multiplied by a factor 0.7 to estimate the maximum capacity over a period of continuous pumping for several weeks. It should be noted that the Wallbrook # 1 well, which is currently hooked up, was included for its rated "summer capacity" of 367 m^3/day, but that the remaining Wallbrook wells, which have not yet been completed or connected to the system, are now assumed to be available due to the change in sanitary setback requirements, and have been rated at 70% of the preliminary rating by Dennis Lowen. We understand the final ratings are still to be confirmed based on pump testing by Fairwinds under the influence of interference from the irrigation wells on the Springford farm.

We believe the most realistic build-out scenario is for the old NWSA wells to remain off-line (unless treatment is provided for these wells), and for the other wells to be available at 70% (subject to confirmation of the Wallbrook well capacities noted above).

The current (2013) available total well capacity would be 2,534 m^3/day or 387 igpm, of which 1,352 m^3/day or 206 igpm is being provided from wells developed and paid for by Fairwinds (Fairwinds Wells # 1, 2, and 3 and Wallbrook Well # 1).

The NPWSA groundwater availability at build-out (2050) would be 3,636 m^3/day or 556 igpm. All of the additional well capacity (1,102 m^3/day or 168 igpm) would be provided by wells developed and paid for by Fairwinds (Wallbrook Wells # 2, 3, and 4).

NPWSA Requirement for ERWS Surface Water

Current 2013 Conditions – Maximum Day:

Design Water Demand	6,062 m^3/day
Available Well Supply	2,534 m^3/day
ERWS Surface Water Required	3,528 m^3/day (7.4 % of ERWS water licence)

Build-out Conditions – Maximum Day:

Design Water Demand	13,980 m^3/day
Available Well Supply	3,636 m^3/day
ERWS Surface Water Required	10,344 m^3/day (21.6 % of ERWS water licence)

ERWS Contribution from New Nanoose Development and Fairwinds:

Based on the assumptions provided in this summary, the amount of surface water required from ERWS * by new development in Nanoose is 10,344 – 3,528 = 6,816 m^3/day (66%).

The Fairwinds development has an ultimate population of 2,500 units x 2.2 people/unit = 5,500 people with a design water demand of 5,500 x 1.168 m^3/day/capita = 6,424 m^3/day. Of that total, it will have * provided 2,454 m^3/day in well capacity, leaving 3,970 m^3/day to be provided for Fairwinds from ERWS, again, subject to confirmation of the Wallbrook well ratings.

* marks changes from June 25 Copy.

Prepared by: Tony Koers

Tibbles, Russell

From: Tony Koers <dakoers@koers-eng.com>
Sent: Thursday, July 04, 2013 9:55 AM
To: Tibbles, Russell
Cc: David Scott; Rob Hoffman
Subject: FW: Fairwinds Meeting
Attachments: Scan0031.pdf; Scan0035.pdf

Good morning Russell,
Attached for your information.

Regards, Tony

Tony Koers
3309 Blueback Drive
Nanoose Bay, B.C. V9P 9J1
Ph: 250-468-5302
i-Ph: 250-954-9690

From: Tony Koers
Sent: July-04-13 9:37 AM
To: GGarbutt@rdn.bc.ca
Subject: Fairwinds Meeting

Good morning Geoff:
Attached is a scan of my review notes of the spreadsheets produced by Fairwinds, which can serve as an unofficial record of our discussion. I did not take any other notes.
Let me know if you have any questions or comments. Rob Hoffman will call you regarding invoicing instructions for my work.

Regards, Tony

Tony Koers
3309 Blueback Drive
Nanoose Bay, B.C. V9P 9J1
Ph: 250-468-5302
i-Ph: 250-954-9690

July 3, 2013
received from Fairwinds.
discussed in meeting with RDN July 3, 2013

Nanoose - Water Demand & Supply Projections

AWS Licence	47,888 m3/day	✓
Population		
Current	5,190	✓
Projected (2050)	11,969	✓
New Population	6,779	✓
Per Capita Consumption		
Original	1.375 m3/day	✓
Revised	1.168 m3/day	✓

NPWSA Maximum Day Water Demands

~~conversion: 0~~

	m3/day	IGPM	
Present Population (2013)	6,062	926	✓
Build Out Population (2050)	13,980	2,136	✓

conversion: 0.152756

NWPSA Well Capacity (70% Maximum Capacity)

	m3/day	IGPM	
Current	2,534	387	✓
Wall Brook	1,102	168	✓
Build Out (2045)	3,636	555	✓ ← not including old NWSA wells & Claudet well.

NPWSA Requirement for ERWS Water (Max Day)

	Current 2013		Build Out		
	m3/day	IGPM	m3/day	IGPM	
Design Water Demand	6,062	926	13,980	2,136	
Available Well Supply	2,534	387	3,636	555	— 21.6% of ERWS licence
ERWS Water Required	3,528	539	10,344	1,580	

ERWS Water for New Development	**6,816**	**m3/day**	✓	**66% of ERWS water for new development**
	1,041	**IGPM**		

It was confirmed that these values used by Fairwinds conform with the "summary of water supply needs to build-out" presented by Tony Koers, dated June 25, 2013 revised July 3, 2013

July 3, 2013 received from Fairwinds. Discussed in meeting with RDN July 3, 2013

Nanoose - Simplified Analysis of Projected Water DCCs

Note: Non-residential uses are ignored in this analysis for simplicity. $/unit amount relates to average of all residential unit types.

Residential Dwelling Units:	Existing Users	Future Additions		Total	
- to buildout	2,253	2,448	100%	4,701	100%
- 20yr time horizon	2,253	1,190	49%	3,443	73%
	65%	35%		100%	

} from May 2012 Draft DCC report for Nanoose by Koers & Assoc.

	NBPWS Capital Costs				DCC per Residential Unit	NBPWS Water Capacity Additions (igpm)			
	Total	Existing User Allocation		New Development Allocation		Total	Existing User Allocation		To Service New Development
~~Existing "Bulk Water" DCC (1998)~~					~~$2,346~~				
First Amendment (~2014):									
Wall Brook Wells (3 wells, excl. WB#1)	$ 2,798,858	$ -	0%	$ 2,798,858		~~225~~ 168	0	0%	~~225~~ 168
Claudet Rd Well (treatment)	2,000,000	941,176	47%	1,058,824		~~225~~ 159	~~106~~ 75	47%	~~119~~ 84
Other (NBPWS)	7,172,997	5,916,665	82%	1,256,332					
Subtotal	$ 11,971,855	$ 6,857,841		$ 5,114,014					
Less: Applicable reserves from previous DCC				196,000					
Total (Cumulative)				$ 4,918,014	/1,190 → $4,133	~~450~~ 327	~~106~~ 75		~~344~~ 252
Second Amendment - ERWS Phase 1 (~2016):									
ERWS Cost Allocation ($37.5m x 26%)	$ 9,750,000								
Less: Senior Government Funding (currently in place) 26%	338,000								
New/Incremental Capital	$ 9,412,000	$ 3,200,080	34%	$ 6,211,920	/1,190 → $5,220	1,271	432	34%	839
Add: Applicable DCC from previous (First) Amendment					4,133				
Total (Cumulative)					$9,353	~~1,721~~ 1,598	~~538~~ 507		~~1,183~~ 1,091
						Required per Tony Koers Analysis (Jun/13)			1,041
						Surplus/(Deficit)			~~142~~ 50

RDN purchase of ERWS share for Nanoose

full grant $1.3M

based on NWSA & Claudet wells not in

32 ML x 1000 x 26% = 8,320 m³/day = 1,271 igpm

6,816 m³/day p3. Tony K summary

Supply Projections per T Koers Analysis (Jun/13)		m3/day
Total New Supply (per above)	100%	~~11,266~~ 10,458
Required for Existing Development	~~34~~ ~~31%~~	3,528
Required for New Development	65 ~~61%~~	6,816
Contingency	1 ~~8%~~	~~922~~ 114

p 2. Tony K summary

p 3 " " "

Proforma Adjustments (to be deleted LD/SC Economic Analysis)

Incl in SC/LD EA (to be removed):

Capital Projects (reservoir etc)	$ 922,858	
Wall Brook Land at AV	940,000	(sunk cost)
Wall Brook Cost to Date for Next 3 Wells	186,000	
Wall Brook Cost to Date Compl for next 3 wells	750,000	
Total	**$ 2,798,858**	(rebate/credit to apply)

this appears to also be included in the 7,172,997 project total in the May, 2012 DCC report

$2,613

Net Effective DCC per Unit per current EA **$6,740**

Commercial msq	?	9125	9125
Institutional msq		11520	11520

Unknowns:

1. Costs — treatment Nanoose wells; inflation 2011 → 2013; ASR feasibility
2. % Allocation to EXISTING depending on NWSA wells in or out.
3. Politics?

Schedule 9: Wallbrook Groundwater Well Approval Process

Schedule 9

Wallbrook Groundwater Well Approval Process

(Note that all defined terms are found in the Community Water System Standards)

The process for applications involving the phased addition of each of the groundwater wells at the WallBrook site (2 sites located on Northwest Bay Road and legally described as PCL. C, DD 36525-N; and PT. D.L. 22, Plan 445R), shall be as follows:

a) The applicant submits a Feasibility Review application per Section 1.4(1) of the Lakes District and Schooner Cove Community Water Standards including a VIHA source approval letter; and Hydrology Report required per Section 2.6.1 of the Lakes District and Schooner Cove Community Water Standards. The Hydrogeology Report shall rate the capacity of the proposed new well and all other wells in the WallBrook wellfield that have been dedicated to date by the Applicant, with the incremental or new capacity being ascribed to the proposed new community water wellfield. It is recognized that this will implicitly account for interference between wells.

b) The RDN will reply in a timely manner (per Section 1.4.1 of the Lakes District and Schooner Cove Community Water Standards within 90 days indicating either:

- acceptance, in which case clarification shall be provided whether any optional provisions set out in the VIHA source approval letter are required by the RDN; or
- resubmission required, in which case the letter shall set out how the application is not in compliance with the standards set out herein, and the Applicant may resubmit per subsection (a) of the Lakes District and Schooner Cove Community Water Standards .

c) The Applicant may then submit a Detailed Design application per Section 1.4(2) of the Lakes District and Schooner Cove Community Water Standards .

d) RDN to reply within 90 days indicating, indicating either:

- acceptance; or
- resubmission required, in which case the letter shall set out how the application is not in compliance with the standards set out herein.

e) Upon completion of the construction of well infrastructure required per subsection (d) above, the parties shall arrange to connect the new well to the Community Water System, at which point:

- the well and related improvements shall become property of the RDN; and
- DCC credits applicable to the Applicant's expenditures shall be provided.

f) Water capacity attributable to the dedication a new well shall be recognized in the following increments:

i) concurrent with completion and connection under subsection (e) above, a "Preliminary Capacity Rating" equal to the new incremental capacity of the wellfield concluded under the Feasibility Review (subsection (a) above) shall be made available firstly for the satisfaction of water requirements relating to any subdivision application(s) submitted by the Applicant

prior to the connection of such well, and then generally for the use of the community water system; and

ii) a "Final Well Capacity Rating" shall be determined based on the results of a Hydrogeology report per subsection (a) above. If and to the extent that the Final Well Capacity Rating is greater than the aggregate of the Preliminary Well Capacity Rating(s) ascribed to each of the WallBrook wells previously dedicated by the Applicant, such additional capacity in igpm shall be made available firstly to satisfy water requirements for any subdivision application(s) previously submitted by the Applicant, and then to the community water system generally. The RDN agrees to operate the wellfield as per the instructions of the hydrogeologist such that the well can be properly tested over one dry season.

g) It is recognized that the RDN will own, control and operate the wells prior to the Final Well Capacity Rating, and shall therefore have sufficient opportunities to expose the wells to the demands required for testing, subject to the conditions to RDN's operation of community water wells in the wellfield prior to the Final Well Capacity Rating