



Request for Proposals

Professional Engineering Services
For The
Nanoose Bay Peninsula Pump Station

Closing:

3 complete hard copies plus 1 electronic (CD or USB) copy prepared in .pdf format of each Response must be received before 2:00 PM Pacific Time on October 12th, 2017

Closing location:

Regional District of Nanaimo
Regional and Community Utilities
Second Floor
6300 Hammond Bay Road
Nanaimo, BC V9T 6N2

Contact person:

Gerald St. Pierre, P.Eng., PMP
Project Engineer, Water & Utility Services
Phone 250-390-6751
GStPierre@rdn.bc.ca

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1 Background

In partnership with the City of Parksville (CoP), the Regional District of Nanaimo (RDN) supplies surface water from the Englishman River to the Nanoose Bay Peninsula Water Service Area (NBPWSA). The water supply is conveyed via an existing pumpstation located on Northwest Bay Road in Parksville, B.C.

As development within the NBPWSA progresses, the existing pumpstation will not be able to supply the required flows. See Appendices A and B.

As such, the purpose of this RFP is to request proposals from qualified engineering firms for the design, tendering, and contract management of a new pumpstation and associated transmission main, as well as decommissioning the existing pumpstation. The new pumpstation is proposed to be located approximately 100m further south along Northwest Bay Road from the existing pumpstation. See Appendix C.

The design will also include tie-in of the new pumpstation to CoP infrastructure, a back-up power supply, and the design and tie-in of the pumpstation controls into the existing SCADA system at the NBPWSA treatment plant, including any upgrades required to the existing systems.

2 Scope

- Review all available record documents and complete a topographic survey to provide a base plan for design.
- Review design requirements and facilitate a meeting with RDN Operations staff to discuss design options.
- Complete a hydraulic review of the existing supply main on Northwest Bay Road and prepare a Technical Memorandum providing supply main source/alignment from Parksville and pump configuration options to meet the buildout water demand for the NBP Water Service Area.
- Complete a review of existing and future chlorination levels to determine if re-chlorination is required as part of the new pumpstation.
- Complete a geotechnical investigation of the proposed pumpstation site and main alignment of sufficient detail to support the detailed design of the pumpstation and transmission main.
- Provide support, including survey and layout drawings, to aid the RDN in securing any required ROWs and agreements from the City of Parksville for the pumpstation and transmission main location.
- Prepare preliminary design drawings and a Class C Estimate for the pumpstation, transmission main, and decommissioning.
- Facilitate a design review meeting with RDN and Parksville staff, one week after the submission of preliminary drawings and Tech Memo.
- Prepare 75% design drawings and a Class B Estimate, addressing all the comments provided on the preliminary design.
- Facilitate a design review meeting with RDN and Parksville staff, one week after the submission of 75% drawings.
- Prepare 95% design drawings and a Class A Estimate, addressing all the comments provided on the 75% design.
- Facilitate a design review meeting with RDN and Parksville staff, one week after the submission of 95% drawings.
- Prepare tender drawings, addressing all the comments provided on the 95% design.
- Prepare and submit a Construction Permit Application to Island Health on behalf of the RDN.
- Design and coordinate connection of the new pumpstation to electrical, telephone, and internet utilities.
- Prepare a draft QC testing and commissioning plan to be included as part of the tender documents.
- Prepare tender documents in the latest CCDC 2 format and manage the tender process, including aiding the RDN in posting the tender, responding to tenderer questions, facilitating an on-site pre-tender meeting, preparing any required addenda, receiving and reviewing tenders, and preparing a recommendation for award.

- Prepare construction contract documents in the latest CCDC 2 format, including any required supplementary conditions and specifications, and Issued for Construction drawings.
- Manage the construction contract, including, but not limited to, progress payments, change orders, inspections, QA materials testing, shop drawing reviews, and substantial and final completion certificates.
 - o Assume a 24 week construction and commissioning schedule.
- Any QA materials testing required to be included as part of the engineering services contract.
- Manage and facilitate start-up and commissioning activities for all aspects of the pumpstation, including electrical and controls and SCADA tie-in.
- Prepare record drawings for the project and submit 3 full size copies, 3 half size copies, an electronic (.pdf) copy, and complete AutoCAD files to the RDN.
- Collect and compile all Operations and Maintenance materials and prepare a complete Operations and Maintenance Manual. Submit 3 complete hard copies and an electronic (.pdf) copy to the RDN.
- Prepare and submit a project record package including permits, photos, test results, and inspection reports to the RDN.
- Provide monthly progress reports throughout the design and construction stages of the project. Progress reports will include, as a minimum, the following sections:
 - o Summary
 - o Work Completed Last Period
 - o Work Planned for the Next Period
 - o Actual vs. Planned Progress, including anticipated schedule to complete and costs to complete
 - o Change Management
 - o Potential Issues/Opportunities

3 Schedule

The following dates, other than the RFP closing date, are guidelines only and may be adjusted based on the schedule provided by the successful proponent.

RFP Closing Date: October 12th, 2017

Anticipated Award Date: November 15th, 2017 (pending RDN Board approval)

Submit Design to Island Health for Approval: March, 2018

Construction Tender Posting: April, 2018

4 Extra Works

The consultant must receive written approval prior to commencing any additional works which will affect the project cost or schedule. The consultant is to submit a Change Order indicating the impact the extra or additional works will have on the project for written approval from the RDN.

A Change Order must also be submitted in the event the consultants fees will exceed the original Proposal amount (i.e. original budget change must be requested and must be approved in writing). In this situation the consultant may be requested to provide scope change alternatives to meet budget.

An invoice encompassing additional works that have not been approved in writing will not be accepted by the RDN.

5 Proposal Submission

5.1 General

This section describes the expectations for proposal submission and the basis for evaluation. Proposal layout and content should be in general alignment with these expectations to facilitate comparative evaluation.

Before submitting proposals, proponents must satisfy themselves about the nature and location of the work, local conditions, the professional services, equipment, technology and facilities needed for the execution of the work, and all other factors that might have a bearing on their proposal. Proponents are fully responsible for obtaining all information required for the preparation of proposals and the execution of the work.

Proponents are solely responsible for their own expenses in preparing and submitting Proposals, and for any meeting, negotiations, or discussions with the RDN or its representatives and consultants, relating to or arising from this RFP. Proponents agree that by participating in the RFP process, and/or submitting a Proposal, they have no claim for compensation.

5.2 Submission

5.2.1 Contact Person

The contact person for the RDN is:

Gerald St. Pierre, P.Eng., PMP
Project Engineer, Water and Utility Services
Office Phone: 250-390-6751
GStPierre@rdn.bc.ca

5.2.2 Requests for Information

Any requests for information (RFI) related to this RFP are to be directed, in writing by email, at least seven (7) calendar days prior to the Closing Date, to Gerald St. Pierre at the RDN. Email contact is GStPierre@rdn.bc.ca.

RFI's and answers will be recorded and distributed via addendum posted to BC Bid (www.bcbid.gov.bc.ca). It is the responsibility of the Proponent to download and obtain any addenda posted. Information obtained from any other source is not official and should not be relied upon.

5.2.3 Closing Date

Three (3) complete hard copies of each proposal plus one (1) electronic copy on CD or USB flash drive, prepared in .pdf format, must be received before 2:00 PM, Pacific Time, on October 12th, 2017 at the address on the front cover of this RFP.

Proposals sent by facsimile (fax) or e-mail will not be accepted.

There will be no public opening for this RFP.

Proposals are to be submitted in sealed envelopes clearly marked with:

1. Name and address of the Proponent
2. Proposal for Professional Engineering Services for the Nanoose Bay Peninsula Pump Station
3. Closing 2:00 PM, Pacific Time, October 12th, 2017

5.2.4 Late Responses

Proposal envelopes will be marked with their receipt time at the closing location. Only complete proposals received and marked before closing time will be considered to have been received on time.

Hard copies of late submissions will not be considered or evaluated and will be returned to the proponent.

In the event of a dispute, the proposal receipt time will be as recorded at the closing location for the hard copy.

5.2.5 Signed Offer

The proposal must include a signed 'offer of services' and the offer must be signed, by a person / persons authorized to sign on behalf of the proponent(s) and to bind the proponent(s) to statements made in the proposal.

5.2.6 Changes to Proposal Wording

The Proponent will not change the wording of its proposal after the closing date and time specified on the front cover of this RFP and no words or comments will be added to the proposal unless requested by the RDN for purposes of clarification.

5.2.7 Withdrawal

Proposals may be withdrawn prior to the deadline upon emailed notice to Gerald St. Pierre. Withdrawn proposals may be replaced by alternative proposals providing emailed notice of intent is delivered to Gerald St. Pierre at least 24 hours prior to the deadline for closing noted above.

Proposals must remain valid for 90 days following the RFP closing date and time noted. Proposals are irrevocable after the closing date and time.

5.2.8 Acceptance of Proposals

This RFP is not an agreement to purchase goods or services. The RDN is not bound to enter into a Contract with any proponent. Proposals will be assessed in light of the proposal review criteria. The RDN will be under no obligation to receive further information, whether written or oral, from any proponent. The offer of services will prevail whether accurate or not.

The acceptance of any proposal may be subject to approval by the Board of the Regional District.

5.2.9 Definition and Form of Contract

The receipt of an offer of services with a proposal will not constitute a contract. A contract will not be entered into until the RDN accepts a proposal and the RDN and the proponent enter into a full written contract as a result of this RFP. Only after a contract is mutually agreed to and signed by both parties, will a proponent acquire any legal or equitable rights or privileges.

Any Contract with the selected proponent will be substantially similar to the terms and conditions of the MMCD Client /Consultant agreement.

5.2.10 Modification of Terms

The RDN reserves the right to modify the terms of this RFP, in its sole discretion, at any time up to 5 working days prior to the noted closing date. This includes the right to cancel this RFP at any time without entering into a Contract.

5.2.11 Ownership of Responses

All documents, including Responses, submitted to the RDN become the property of the RDN. The RDN is bound by the provisions of the Freedom of Information and Protection of Privacy Act. All Proponents submitting Proposals pursuant to this RFP are advised that such Proposals will be treated as public documents and the contents of the same disclosed upon written request if required to do so pursuant to the Act.

5.2.12 Confidentiality of Information

Information pertaining to the RDN obtained by the proponent as a result of participation in this RFP is confidential and must not be disclosed without written authorization from the RDN.

6 Proposal Evaluation Criteria

The Regional District of Nanaimo reserves the right to reject any or all Proposals or to accept the Proposal deemed most favorable in the interest of the District. The lowest priced or any Proposal may not necessarily be accepted.

Requests for Proposals will be evaluated against the following criteria.

6.1 Project Team, Experience, and Corporate Commitment

This component of the evaluation will constitute 25% of the evaluation points. The expectations for this component are:

1. Demonstrate that the firms' organization and proposed team, including sub-consultants and specialists, has the necessary technical and managerial background and experience to carry out the requirements of this project.
2. Include a team organization chart and provide resumes of two pages (maximum) per key individual detailing who will be assigned responsibility for each component of the work. List staff and/or sub-consultants, who will be assigned to each component, and include their related experience. Subsequent substitution of staff and/or sub-consultants shall be submitted in writing for review and approval by the RDN. Acceptance of staff and/or sub-consultant substitutions will be at the sole discretion of the RDN.
3. State the proponent's corporate commitment to completing this Project within the scope, budget and timelines outlined.

6.2 Past performance, and references

This component of the evaluation will constitute 25% of the evaluation points. The expectations for this component are:

1. Prepare a list, in chronological order of three (3) recent and similar projects completed by the proponent including details of which projects were undertaken by members of the proposed project team. Provide the name and telephone number of a contact person from previous projects. For each of the projects provided as references include a brief outline of the project and its relevance to this project. References may be contacted to confirm the proponent's ability to meet budget, schedule, and quality targets.
2. Preference will be given to Proponents with multiple recent projects of similar scope.
3. Preference will also be given to Proponents whose similar projects were completed by the team members proposed for the Districts project.

6.3 Project Understanding, Methodology, Task List and Deliverables

This component of the evaluation will constitute 30% of the evaluation points. The expectations for this component are:

1. Provide a task list summary to clearly show project understanding, the level of effort planned and time commitment for all members of the project team on each part of the project. Clearly identify each team member per task and number of hours. Clearly indicate in the proposal which items or which parts of items will be undertaken by your firm or by a sub-consultant.
2. Provide a Gantt chart style schedule of the key work activities proposed and identified deliverables to meet the RDN's schedule requirements. Include key activities, deliverables and notifications to proceed in terms of weeks. The schedule should include 10 working days for review of all submissions by the RDN.
3. Demonstrate that the proponent understands the critical issues for a successful project.

6.4 Fees

This component of the evaluation will constitute 20% of the evaluation points. The expectations for this component are:

1. Provide a total fee budget for the provision of all services required to provide the deliverables noted in Section 2 of this RFP. Identify hourly rates that include local travel, detail and include any and all travel expenses expected with the proposed team and task list, and estimated disbursements.

Evaluation criteria for fees will be as per the following formula:

$$\text{Fees score} = \frac{\text{Lowest Price} \times 20 \text{ Points}}{\text{Proposal Price}}$$

7 Appendices

Appendix A - ERWS WATER INTAKE, TREATMENT PLANT AND SUPPLY MAINS, TM#4A: Distribution System Upgrades – Water Demands, KWL

Appendix B - ERWS WATER INTAKE, TREATMENT PLANT AND SUPPLY MAINS, TM#4B: Distribution System Upgrades- Water Modelling, KWL

Appendix C – Existing and Proposed Pumpstation Location Map

Appendix D – Existing pumpstation and transmission main record drawings

Appendix G
TM #4A – Distribution System Upgrades –
Water Demands



Technical Memorandum

REVISION 1

DATE: June 3, 2014

TO: Umar Alfaruq, CH2M Hill

CC: Mike Squire, Englishman River Water Service

FROM: Michelle Revesz, P.Eng.

**RE: ERWS WATER INTAKE, TREATMENT PLANT AND SUPPLY MAINS
TM#4A: Distribution System Upgrades – Water Demands
Our File 468.010-300**

1. Introduction

1.1 Scope

This memorandum (TM#4A) forms part of the technical deliverables for the design of the water supply intake for the proposed Englishman River Water Service (ERWS) Water Intake and Treatment Plant Project. The purpose of the memorandum is to summarize the existing water demands and to estimate future water demands for the design of upgrades to the transmission system (sizing typically governed by maximum day demands) to accommodate the water treatment plant.

The following items are described in this memorandum:

- Existing residential and ICI water demands;
- Existing service population and ICI population equivalents;
- Future development and population projections; and
- Future water demands.

1.2 Abbreviations and Definitions

ADD	Average Day Demand – The average demand for a one year period
BD	Base Demand – Generally indoor and industrial water demands that occur throughout the year, but can be easily measured during the winter months (November – March)
Bulk Meter	The meter that measures the volume of water into a water system.
CARL	Current Annual Real Losses – The volume of water losses as calculated by an AWWA water audit
ICI	Industrial, Commercial, Institutional
ILI	Infrastructure Leakage Index – The ratio of Current Annual Real Losses to Unavoidable Annual Real Losses. Used as a performance indicator for how well a water system is operating in terms of leakage.
MDD	Maximum Day Demand (24-hour average) within a year– MDD is comprised of BD and PSD
MLD	Million Liters per Day



NRW	Non-revenue water – Includes leakage, flushing, reservoir overflowing, construction uses from hydrants, and unauthorized usage. Note: excludes metered customers leakage and estimated un-metered residential demands
RDN	Regional District of Nanaimo
Res	Residential
PE	Population Equivalent
PHD	Peak Hour Demand
PSD	Peak Seasonal Demand – Seasonal demand on MDD
SD	Seasonal Demand – Water usage that occurs in the summer, generally for irrigation
Service Meter	The meter that measures the volume of water to an individual customer (i.e. a single residential customer)
WSA	Water Service Area
UARL	Unavoidable Annual Real Losses

1.2.1 References

The following references were used to estimate the existing water demands and develop the future water demands.

City of Parksville

1. City of Parksville – Daily Bulk Meter Usage for 2012 and 2013.
2. City of Parksville – 15-minute Bulk Meter Usage for 2012 and 2013.
3. City of Parksville – Annual Usage and MDD (2002 to 2012).
4. City of Parksville – Service Meter Data readings (Sept. 2012, Mar. 2013, and Sept. 2013).
5. City of Parksville GIS data, received on November 6, 2013.
6. Parksville Plan: A Vision for the Future, Bylaw 2013 No. 1492.
7. Statistics Canada National Household Survey 2011, Parksville Census Subdivision.

Nanoose Bay Peninsula WSA

8. Regional District of Nanaimo, *Water Service Area Annual Report 2012 - Nanoose Bay Peninsula Water System*, June 2013.
9. Regional District of Nanaimo, Nanoose Bay Official Community Plan, Bylaw No. 1400, 2005.
10. Regional District of Nanaimo, Land Use and Subdivision Bylaw No. 500, 1987.
11. Regional District of Nanaimo Land Use and Subdivision Amendment Bylaw No. 500.385, 2013.
12. Regional District of Nanaimo Land Use and Subdivision Amendment Bylaw No. 500.384, 2013.
13. Statistics Canada, National Household Survey 2011, Nanaimo E, Regional District Electoral Area.
14. Regional District of Nanaimo, Population Statistics, <http://www.rdn.bc.ca/cms.asp?wpID=440>.
15. Associated Engineering Et Al, Arrowsmith Water Service, Englishman River Water Intake, Treatment Facilities and Supply Mains, Phase 1- Conceptual Planning, Budgeting and Scheduling Final Summary Report. April 2011.



16. Koers & Associates Engineering Ltd., *RDN Nanoose Bay Peninsula Water System DCC Technical Report*, November 2013.
17. Single Family Residential Service Meter Data – September 2012 to September 2013.
18. ICI and Multi-Family Service Meter Data – October 2012 to October 2013.
19. Monthly groundwater Bulk Meter Usage – January 2012 to July 2013.
20. Morales Et. Al, Estimating Commercial, Industrial and Institutional Water Use on the Basis of Heated Floor Area, Journal AWWA, June 2011.

General

21. Metro Vancouver - Operations and Maintenance Department, Water Consumption Statistics Report, 2011 Edition.
22. Aquacraft, Analysis of Water Use in New Single Family Homes, January 2011.
23. Environment Canada, 2011 Municipal Water Use Report – Municipal Water Use 2009 Statistics.
24. AWWA M36 Manual, Water Audits and Loss Control Programs, Third Edition.
25. Kerr Wood Leidal, ERWS Water Intake, Treatment Plan and Supply Mains TM#4B: Distribution System Upgrades – Water Modeling, November 19, 2013.
26. Koers & Associates Engineering Ltd. – Reid Crowther & Partners Ltd., The Regional Water Supply System Englishman River Final Predesign Report, Finalized 1993.
27. Associated Engineering Et Al, Arrowsmith Water Service, Englishman River Water Intake, Treatment Facilities and Supply Mains, Phase 1- Conceptual Planning, Budgeting and Scheduling Final Summary Report. April 2011.

2. Existing Water Demands

2.1 Introduction

The Englishman River Water Service (ERWS) is comprised of two historically separate water systems:

- The Parksville water system which is owned and operated by the City of Parksville (Parksville); and
- The Nanoose Bay Peninsula Water Service Area (Nanoose Bay WSA), which is owned and operated by the Regional District of Nanaimo (RDN).

The two water systems generally operate independently during the winter months, when each system is supplied from independently owned groundwater wells. During the summer months, the Craig Bay Pump Station, which pumps water from the Parksville system to the Nanoose Bay WSA, connects the two water systems. Additional water is supplied from the Englishman River during the summer months.

RDN operates several other water utilities namely: French Creek WSA, Englishman River WSA, and the San Pareil WSA; these are not part of the ERWS. It is assumed that these WSA's will not be connected to the ERWS in the future.

The attached figure indicates the extent of the ERWS and the OCP land use designations.



2.2 Parksville

2.2.1 Bulk Meter Flows

Parksville’s water supply is from two well fields (Springwood and Railway), with a combined capacity of 86.9 L/s (7.5 MLD) and from the Englishman River (Licence capacity 12,170 m³/day (12.2 MLD)). The total source water capacity is 19.7 MLD.

The annual usage is summarized in the table below.

Table 2-1: City of Parksville Water Usage from Bulk Meters

Month	2012 Total (m ³)	2013 Total (m ³)	2013 Craig Bay Pump Station (m ³) (to Nanoose Bay WSA)	Parksville Annual Usage (m ³)	Parksville Annual Usage (MLD)
January	104,123	96,725		96,725	3.1
February	105,049	107,025		107,025	3.8
March	111,097	123,292		123,292	4.0
April	78,695	113,057		113,057	3.8
May	174,118	190,324		190,324	6.1
June	204,970	215,264	24,871	190,393	6.3
July	279,263	225,288 ⁽¹⁾	60,738	218,525	7.0
August	311,412	329,960	52,018	277,942	9.0
September	238,091	208,318	29,770	215,151 ⁽²⁾	7.2
October	154,360	132,967	23	154,342	5.0
November	93,997			93,997	3.1
December	94,593			94,593	3.1
Total	1,949,769		167,420	1,875,368	5.1

Sources: City of Parksville Daily Flow data (January 1, 2012 to October 31, 2013).

Notes:

- The total volume includes the volume of water to Parksville and to the Nanoose Bay WSA. Parksville’s usage is calculated from the following formula:
 - *Parksville Usage = Total Volume – Craig Bay Pump Station Volume*
- Annual Usage is from September 2012 to September 2013. Period generally matches meter reading period.
 1. 10 days of data was missing; therefore used July 2012. Scaled the volume to Nanoose Bay by 2012 volume to 2013 volume (129,010/167,420).
 2. Scale the volume to Nanoose Bay by 2012 volume to 2013 volume (129,010/167,420).

Base Demand

The Base Demand for Parksville was 38.4 L/s (3.3 MLD, 268.6 L/ca/day¹), based on the winter bulk meter usage from December 1, 2012 to February 28, 2013.



Maximum Day Demand

The 2013 MDD occurred on July 29, 2013, with a flow of 129.9 L/s (11.2 MLD, 910 L/ca/d¹). The highest MDD on record was in 2009 with a demand of 170.0 L/s (14.7 MLD, 1,268 L/ca/d²).

Average Day Demand

The average day demand for the annual usage was 59.5 L/s (5.1 MLD, 416 L/ca/day¹).

2.2.2 Water Use from Service Meters

Parksville has universal service metering. The service meters are read twice a year in September and March. The water usage for Parksville from the service meters is summarized in the table below.

It is noted that the winter base demand (BD) cannot be accurately determined from the service meter readings alone, as the winter readings include shoulder season irrigation (mostly in September). The estimated winter base demand was prorated using the bulk meter data for Parksville.

Table 2-2: Water Usage from Service Meters - Parksville

Type	Number of Meters	Annual Usage (m ³)	ADD		Sep – Mar. Readings*	BD Metered (Estimated)**	
			(MLD)	(L/ca/d)		(MLD)	(L/ca/d)
Residential	5,660	1,126,009	3.1	250 ⁽¹⁾	2.5	1.9	156.4 ⁽¹⁾
ICI**	233	496,360	1.3		1.0	0.9	
Total	5,893	1,622,369	4.4		3.5	2.8	

Source: City of Parksville Meter Data
 1. Assumes 2013 estimated residential population of 12,354.

Notes:
 *Calculated from Sept. 2012 to Feb 2013 period, no. of meters is based on same period.
 **BD corrected adjusts the winter service meter usage by a ratio of 0.787. The bulk meter base demand was 3,314 m³/d while the average winter bulk meter usage for the meter reading period was 4,209 m³/d. Assuming the proportion of usage for all customer classes and unaccounted for water remains constant for both periods, the service meter base demand was corrected by the ratio of Bulk Meter BD to Bulk Meter usage during the service meter reading period (3,314/4,209 = 0.787).

2.3 Nanoose Bay Water Service Area

2.3.1 Bulk Meters Flows

The Nanoose Bay WSA is supplied by ten groundwater wells and from Parksville during the summer months, via the Craig Bay Pump Station. The wells have a combined total capacity of 2.81 MLD and a sustainable supply capacity of 1.97 MLD.

The annual usage for the Nanoose Bay WSA is summarized in the table below.

¹ Assumes estimated 2013 population of 12,354.
² Assumes a 2009 population of 11,583 based on census data.



Table 2-3: Nanoose Bay WSA Water Usage from Bulk Meters

Month	2012 Groundwater Well (m ³)	2013 Groundwater Wells (m ³)	2013 Craig Bay Pump Station (m ³) (to Nanoose Bay WSA)	Nanoose Bay Annual Usage * (m ³)	Nanoose Bay Annual Usage (MLD)
January	36,937	29,074		29,074	0.9
February	34,294	28,462		28,462	1.0
March	37,377	41,068		41,068	1.3
April	37,670	41,646		41,646	1.4
May	52,718	49,120	24,871	73,991	2.4
June	41,365	41,204	60,738	101,942	3.0
July	71,547	73,539	52,018	125,557	4.1
August	70,426		29,770	100,197	3.2
September	55,315		23	55,338	1.8
October	49,329			49,329	1.6
November	29,853			29,853	1.0
December	31,211			31,211	1.0
Total	548,044		167,420	707,667	1.9

Sources:
 - Regional District of Nanaimo Monthly Ground Water Data.
 - City of Parksville 2013 Daily Flow Data for Craig Bay Pump Station.
 *Note: Annual Usage is from September 2012 to September 2013. Period generally matches meter reading period.

Base Demand

The Base Demand for the Nanoose Bay WSA was 11.4 L/s (0.99 MLD), based on the monthly winter bulk meter usage from December 1, 2012 to February 28, 2013. For the fall-winter 8-month period, September through May, that corresponds approximately to the meter reading schedule, the average winter demand was 13.7 L/s (1.18 MLD).

Maximum Day Demand

Daily data was not available for the Nanoose Bay WSA; however, the maximum monthly demand was 4.1 MLD for July. The average monthly seasonal demand therefore was 3.1 MLD.

Average Demand

The Average Demand for the September 2012 to September 2013 period was 22.4 L/s (1.9 MLD, 373 L/ca/d³).

2.3.2 Water Use from Service Meters

The Nanoose Bay WSA has universal service metering. The meters for single-family residences are read twice a year (September and May). Meters for multi-family residences and ICI properties are read quarterly (September, January, March, and June). A summary of the metered usage is provided in the table below.

³ Assumed a 2013 estimated population of 5,196.



Similar to the Parksville data, the metered winter base demand (BD) cannot be directly determined from the service meter readings alone, as the winter readings include shoulder season usage. The estimated winter base demand was prorated using the bulk meter data for the Nanoose Bay WSA.

Table 2-4: Water Usage from Service Meters – Nanoose Bay WSA

Type	No. of Meters	Annual Usage (m ³)	ADD		Sep – May Readings*	BD Metered (Estimated)**	
			(MLD)	(L/ca/d)	(MLD)	(MLD)	(L/ca/d)
Single Family*	2,053	524,828	1.4		0.89	0.75	
Multi-Family	325	66,269	0.2		0.12	0.10	
Total Residential			1.6	305.4⁽¹⁾	1.01	0.85	163.1⁽¹⁾
ICI	47	26,852	0.1		0.04	0.03	
Total	2,425	617,949	1.7		1.05	0.88	

Source: Regional District of Nanaimo Water Meter Data
 1) Assumes 2013 estimated residential population of 5,196.

Notes:
 *BD calculated from Sept. 2012 to May 2013 period, no. of meters is based on same period.
 **BD corrected adjusts the BD service meter usage by a ratio of 0.838. The Bulk Meter usage during the meter-reading period was 1.18 MLD. To estimate the demands for each customer class, for the based demand period (Dec to March) the service meter usage was adjusted by the ratio of bulk meter usage BD to bulk meter usage during service meter reading period. (0.99 MLD/1.18MLD = 0.838).

3. Existing Demands and Unit Rates

3.1 Parksville

3.1.1 Population

The 2011 census population for Parksville is 11,977. The Parksville planning staff estimates that the existing (2013) population is 12,354.

Parksville is a tourist destination during the summer months and a haven for seniors during the winter months due to its mild climate. Water demands cannot be used to understand the transient population, due to seasonal (irrigation) water use. Dry weather sanitary flows are not impacted by seasonal water usage; therefore analysis of the winter and summer dry weather sanitary flows can provide an indication of seasonal populations.

The table below provides a summary of the average winter and summer dry weather sanitary flows, and the average annual water usage.



Table 3-1: Parksville Sanitary Flows

Period	Dates	Sanitary Dry Weather Average Daily Flow (m ³ /d)	Water Average Annual Daily Flow (m ³ /d)
Winter	Jan. 9 – Jan. 22, 2013	5,271.1	
Summer	Jun. 28 – Aug. 1, 2013	5,205.4	
Annual			5,195.1
Sources: - FlowWorks Data for station 236R-Ocean Place Parksville – less Pacific Shores and French Creek Sanitary Flows. - City of Parksville Daily Flow data (Jan. 1, 2012 to Oct. 31, 2013). – Bulk Meter Data			

The average dry weather sanitary flow is higher than the average annual water flow, which may indicate inflow and infiltration into the sanitary sewers or meter inaccuracies. From the available data, it is concluded that analysis of the dry weather sanitary flow is not an accurate method to determine the transient population for Parksville.

The results of the analysis indicate that there is no significant variation in the dry weather flows. It could be concluded that there is no change in population between winter and summer, however from discussions with the Parksville Qualicum Beach Tourism Association, the existing transient population in the summer is estimated to be 10,447.

3.1.2 Existing Unit Rates

Non-Revenue Water (NRW)

Non-revenue water is the volume of water lost between the bulk water meters and the service meters. Table 3-2 summarizes the annual bulk and service meter water flows, and the NRW.

Table 3-2: Non-Revenue Water - Parksville

Flow Data	Annual Usage (m ³ /yr)	Annual Usage (MLD)
Total Bulk Meter Usage	1,875,368	5.1
Total Service Meter Usage	1,622,369	4.4
Non-Revenue Water (NRW)	252,999	0.7
NRW (% of Total Bulk Meter Usage)		13.5%
Base demand – Bulk Meter		3.3
% of BD		21.0%

Environment Canada’s 2011 Municipal Water Use Report reports that the average water loss rate in 2009 across Canada was 13.3%, which is inline with the water loss value calculated for Parksville.

Base and Seasonal Demands

The residential base demand for 2013 was calculated to be 156.4 L/ca/d. The per capita base demand is lower than most design criteria figures, however it is not considered un-realistic due to:

- The recent changes to the BC Building code;
- The success of the regional water conservation incentives (i.e. toilet replacement program, education



- program);
- Parksville’s transient population; and
- Design criteria generally contain safety factors.

The base demands are inline with benchmarks [22] for single family homes retrofitted with water efficient fixtures and appliances of 155.4 L/ca/d – 162 L/ca/d (1.8 - 2.4 cap/dwelling).

For comparison the District of Saanich and the City of Richmond have estimated residential base demand of 203 L/ca/d and 208 L/ca/d, respectively. The lower base demand experienced for Parksville and the Nanoose Bay WSA could be attributed to the water rate structure, transient population or due to universal metering. The table below summarizes water rates for the subject areas.

Table 3-3: Summary of Single-Family Residential Water Rates (6 month period)

Jurisdiction		Base Rate/unit	Consumption Rate (\$/m ³)						Notes
			Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6	
Parksville	Rates	\$86.00	\$0.60	\$1.20	\$2.00	\$3.00	\$1.68		Universally Metered
	Volume (m ³)		<60	120	160	400	>400		
RDN	Rates	\$52.78	\$0.94	\$1.08	\$1.37	\$1.63	\$2.17	\$3.25	Universally Metered
	Volume (m ³)		127.4	254.8	382.2	509.6	637	>637	
Saanich	Rate	\$22.50	\$1.34						Universally Metered
Richmond	Rate	\$72.00	\$1.20						Not Universally Metered

The calculated irrigation rate for Parksville (on MDD) was 23,800 L/ha/day for 2013 (observed MDD less BD). The 2013 irrigation rate was less than historical values; therefore the 2009 MDD, which was the highest MDD on record, was used to estimate the irrigation rate for the demand forecast. Assuming that the irrigable area remained constant since 2009, the 2009 MDD irrigation rate was 34,300 L/ha/d.

3.2 Nanoose Bay Water Service Area

3.2.1 Population

Existing Population

The Nanoose Bay WSA is located in the Regional District of Nanaimo, Electoral Area E. The 2011 census for the Electoral Area E shows a population of 5,674 and 2,892 total dwelling units. Of the 2,892 dwelling units, 2,587 dwelling units were occupied. The average density is 1.96 capita/dwelling unit and 2.19 capita/occupied dwelling.

In 2013 there were 2,378 occupied residential dwellings (2,053 single-family residential units and 325 multi-family residential units) in the Nanoose Bay WSA. Assuming that single-family residential and multi-family residential use approximately the same amount of water indoors (i.e. Base Demand L/ca/d), the population densities were calculated to be 2.2 ca/dwelling and 1.95 ca/dwelling, respectively.



RDN staff indicated during the November 7, 2013 meeting that there is no significant transient population in the Nanoose Bay WSA; therefore the estimated existing population is 5,196.

Table 3-4: 2013 Population Estimate – Nanoose Bay WSA

Type	Population Density (ca/dwelling)	Number of Units	Residential Estimated Population	Estimated Population
Single Family	2.2	2,053	4,564	4,564
Multi-Family	1.95	325	632	632
ICI		47		196
Total		2,378	5,196	5,392

Note: Population equivalents are based on Base ICI usage.

3.2.2 Existing Demands

Non-Revenue Water (NRW)

Non-Revenue Water (NRW) is the volume of water lost between the bulk water meters, and the service meters. The table below summarizes the annual water usage for the bulk and service meters, and the calculated NRW.

Table 3-5: Non-Revenue Water - Nanoose Bay WSA

Flow Data	Annual Usage (m ³ /yr)	Annual Usage (MLD)
Total Bulk Meter Usage	707,667	1.94
Total Service Meter Usage	617,949	1.69
Non-Revenue Water (NRW)	89,718	0.25
NRW (% of Total Bulk Meter Usage)		12.7%
Base demand – Service Meter		0.88
% of BD		28%

Environment Canada's 2011 Municipal Water Use Report, reports that the average water loss rate in 2009 across Canada was 13.3%. The NRW calculated for Parksville (13.5%) and the Canadian average are in line with the NRW calculated for the Nanoose Bay WSA (12.7%).

Base and Seasonal Demands

The residential base demand was calculated to be 163.1 L/ca/day. The residential base demand is comparable to the Parksville's residential base demand of 156.4 L/ca/d.

As indicated the MDD for the Nanoose Bay WSA was not available; therefore the 2009 MDD irrigation rate for Parksville was used to estimate the future demands. The design irrigation rate is 34,300 L/ha/d.



4. Water Use Benchmarking

4.1 Historical Local Water Use

Much higher water demands were previously calculated for Parksville and the Nanoose Bay WSA in 1995 (from the Regional Water Supply System Englishman River Final Predesign Report). The average day demand and maximum day demand for the area were calculated to be 580 L/ca/d and 1,350 L/ca/d, respectively [26]. This 1995 pre-design report recommended 1,375 L/ca/day as a per capita rate for water demand projections.

4.2 Other Jurisdictions

Water usage for Parksville and Nanoose Bay WSA align with typical water usage in Canada. The table below summarizes the average annual usage for Parksville, Nanoose Bay WSA, Canada, British Columbia, and Metro Vancouver.

Table 4-1: Comparison of Annual Water Usage

Jurisdiction	Average Annual Water Consumption (L/ca/d)	
	Total	Residential
Parksville	416 ⁽³⁾	250 ⁽⁴⁾
RDN - Nanoose Bay	373 ⁽³⁾	305 ⁽⁴⁾
Metro Vancouver ⁽¹⁾	471	
Canada ⁽²⁾	510	274
British Columbia ⁽²⁾	606	353
Municipal Population between 5K -50K ⁽²⁾	570	313
Sources:		
1. Metro Vancouver Water Consumption Statistics Report, 2011		
2. Environment Canada, 2011 Municipal Water Use Report, 2009 Statistics.		
3. Calculated from bulk meter data.		
4. Calculated from residential service meter data.		
Note: Estimated populations are 12,354 and 5,196 for Parksville and RDN, respectively.		

5. Future Demand Projection

5.1 Parksville

5.1.1 Future Development

Parksville’s projected future development was based on the population projections provided by Parksville staff, Parksville’s OCP, and from discussions with Parksville’s planning staff during a meeting on November 7, 2013.

Parksville staff provided the residential growth projection and population estimates, see Table 5-1. The probable growth projection assumes a yearly increase in population by 1.53% per year in 2013, decreasing gradually over time to 0.69 % per year at 2035 and onward. For the high-growth scenario, the estimated population growth is constant at 1.8% per year.



From discussions with the Parksville Qualicum Beach Tourism Association, it is expected that within the next ten years the Sunrise Ridge Resort and the Parksville Beach Resort will re-develop, adding an additional 130 units (839 tourist population). Based on the projected number of units, the tourist population growth rate was estimated to be 0.8%. Table 5-1 summarizes the projected tourist populations assuming the growth rate remains constant to 2050.

Table 5-1: Projected Population – Parksville

Year	Estimated Residential Population		Estimated
	Probable Growth	High Growth	Tourist Population
2013 (Existing)	12,354		10,447
2018	13,228		10,769
2035	15,828		12,381
2050	17,548	24,017	13,902

Development within Parksville is expected to be a combination of new green-field development (at a gross density of 25 units/ha) and infill development (with density of 50 units/ha of additional lot area). The table below summarizes the expected development areas and residential units based on planning staff's knowledge. Timing of future development was based on the population projection.

Table 5-2: Projected Development - Parksville

Area	Residential No. Units		ICI PE	
	Probable Growth	High Growth	Probable Growth	High Growth
South of Greig Rd.	468	1,732		
East of Alberni Hwy., South of Despard Ave.	187	693		
East of Alberni Hwy., North of Despard Ave.	241	241		
West of Renz Rd.	338	338		
North of Stanhope Rd. at Island Hwy.	55	55		
Infill Development	1,308	2,772	1,583	3,554
Total	2,597	5,832	1,583	3,554

5.1.2 Water Demand Projection

Table 5-3 summarizes the results of the demand forecast. Appendix 1 provides a further breakdown of the projected water demands. For all forecasts the 2009 design irrigation rate of 34,300 L/ha/day was used, this compares to the 'observed' value of 23,800 L/ha/day from 2013. The irrigation rate is the key variable in overall water use.

The following additional assumptions are built into the demand projections:

- Existing residential indoor water use per capita stays constant over time (current rate is 156.4 L/ca/day);



- Future residential indoor water use per capita matches the benchmark data for new homes [22] (163.0 L/ca/d);
- Irrigated land area for residential usage is 65% of lot area (i.e. 35% for building(s)) up to a maximum lot size of 0.3 ha;
- Irrigated land area for ICI usages is 45% of lot area;
- Serviced ICI lot areas are increased at the same rate as the ICI base demand;
- Overall ICI base demand remains constant as a percentage of total base demand (34% of total); and
- NRW estimate remains constant over time at 21% of base demand.

Table 5-3: Parksville Water Demand Projections

Forecast Year	Population (ca)	Un-factored Demands			Factored Demands
		BD (MLD)	ADD (MLD)	MDD (MLD)	MDD (MLD)
2013 (Existing)	12,354	3.4	6.4	16.3	20.4
2018	13,228	3.6	6.7	17.1	21.4
2035	15,828	4.2	7.7	19.2	24.0
2050	17,548	4.7	8.4	20.8	26.0
2050 (high growth scenario)	24,017	6.4	10.8	25.7	32.1

A factored MDD (125% of projection) is also presented in the table above, which was applied to the projected water demands to account for:

- uncertainties in potential climate change and its effects on irrigation;
- uncertainty in future growth and population predictions;
- potential expansion of water service area boundaries; and
- changes in existing water use.

To demonstrate the effect of the tourist population, the table below summarizes the estimated tourist demands for the various design horizons. The water demand projections in Table 5-3 include the tourist component.

Table 5-4: Parksville Water Demand Projections

Forecast Year	Population (ca)	Tourist Population (ca)	Factored Demands	Tourism ⁽¹⁾ SD (MLD)
			MDD (MLD)	
2013 (Existing)	12,354	10,447	20.4	1.6
2018	13,228	10,769	21.4	1.7
2035	15,828	12,381	24.0	1.9
2050	17,548	13,902	26.0	2.2
2050 (high growth scenario)	24,017	13,902	32.1	2.2

Note: (1) Demand included in ADD and MDD



5.2 Nanoose Bay Water Service Area

5.2.1 Future Development

Two new developments are proposed for the Nanoose Bay WSA: Schooner Cove and the Lakes District. In addition, redevelopment of the Red Gap area and infill development through out the WSA is expected. Expansion of the Nanoose Bay WSA to areas outside of the current service area has not been included in the future development estimates.

The table below summarizes the projected number of lots and ICI gross floor area to be developed to the 2046 OCP build-out and the estimated number of vacant lots based on British Columbia Assessment Authority Actual Land Use codes.

Table 5-5: Projected Development to OCP Build-out 2046 – Nanoose Bay WSA

Development	Single Family No. Units	Multi-Family No. Units	Congregate Care	Total No. Units	Commercial Floor Area (m ²)	Institutional Floor Area (m ²)
Schooner Cove		360		360	2,325	
Lakes District	1,122	553	155	1,675	4,800	9,200
Red Gap	100	111		211	5,600	2,320
Infill	33			33		
Vacant Lots	300			300		
Total	1,555	1,024	155	2,579	12,725	11,520

Sources: Land Use and subdivision Bylaw(s). Koers & Associates Engineering Ltd., RDN Nanoose Bay Peninsula Water System DCC Technical Review, Nov. 2013. GIS Data: BCAA Codes and Parcel data.

Based on the projected development, and estimated population densities (i.e. single family residential 2.2 ca/dwelling and Multi-family 1.95 ca/dwelling) the projected population for 2046 is estimated to be 10,799. The estimated annual growth rate is approximately a 2.2%.

The design horizon for the water treatment plant is 2050. Assuming that the annual growth rate remains constant, and that all new development beyond 2046 is infill development (i.e. no additional irrigated land) the 2050 projected population is 11,801. The table below summarizes the population projections for the Nanoose Bay WSA for the water treatment plant design horizons, and the 2046 OCP build out.

Table 5-6: Projected Population – Nanoose Bay WSA

Year	Estimated Population
2013 (Existing)	5,196
2018	5,805
2035	8,462
2046	10,799
2050	11,801
Assumes a constant growth Rate of 2.2%.	



5.2.2 Water Demand Projection

Table 5-7 summarizes the results of the demand forecast. Appendix 2 provides a further breakdown of the projected water demands. For all MDD forecasts a design irrigation rate of 34,300 L/ha/day was used.

The following additional assumptions are built into the demand projections:

- Existing indoor water use per capita stays constant over time (current rate is 163.1 L/ca/day);
- Future indoor water use per capita meet the benchmark data for new homes [22] (163.0 L/ca/day);
- Population growth remains at 2.2% over study duration (Existing to 2050);
- Population densities remain constant over the study duration:
 - Single Family Residential – 2.2 ca/dwelling, and
 - Multi-Family Residential – 1.95 ca/dwelling.
- No additional lot area will be serviced, except for the planned areas (Schooner Cover and Lakes District) and the current vacant lots. Other than these areas, additional dwelling units will be the result of infill.
- Lot coverage for irrigated land area is:
 - Residential – 45% - up to a maximum lot size of 0.3 ha;
 - Multi-Family – 20%; and
 - Commercial – 15%.
- ICI square footage is as provided in the DCC Technical Memorandum [16]. Water demands for future ICI usages are based on heated floor space as indicated in a journal published by the AWWA [20]. The application rates for ICI usage are as follows:

Non-Residential Use	MDD (L/m ² /d)	ADD (L/ m ² /d)
Commercial	6.8	5.3
Institutional	4.1	3.2

- Leakage estimate remains constant over time at 28% of base demand.

Table 5-7: Nanoose Bay WSA- Water Demand Projections

Forecast Year	Population (ca)	Un-factored Demands			Factored Demands
		BD (MLD)	ADD (MLD)	MDD (MLD)	MDD (MLD)
2013 (Existing)	5,196	1.1	2.4	6.6	7.6
2018	5,805	1.3	2.6	7.0	8.1
2035	8,462	1.9	3.5	8.6	9.9
2050	11,801	2.6	4.5	10.5	12.1

A safety factor was applied to the projected water demands, indicated in the above table, to account for:

- uncertainties in potential climate change and its effects on irrigation;



- uncertainty in future growth and population predictions;
- potential expansion of water service area boundaries; and
- changes in existing water use.

At the request of RDN staff, a 15% safety factor was applied to the projected water demands. The safety factor is lower than the value utilized by Parksville, but the value was inline with RDN's current design philosophy. The reduced safety factor will reduce the extents of the water system upgrades, reducing capital costs.

5.3 Summary

The projected water demands for Parksville and Nanoose Bay WSA are summarized in the table below.

Table 5-8: ERWS – Water Demand Projections

Forecast Year	Population (ca)	Un-factored Demands			Factored
		BD (MLD)	ADD (MLD)	MDD (MLD)	MDD (MLD)
2013 (Existing)	17,550	4.5	8.8	22.9	28.0
2018	19,033	4.9	9.3	24.1	29.5
2035	24,290	6.1	11.2	27.8	33.9
2050	29,349	7.3	12.9	31.3	38.1
2050 (high growth scenario)	35,818	9.0	15.3	36.2	44.2

Figure 5-1, indicates the BD, ADD, MDD and the factored MDD for the projected design horizon. Note that the dashed lines indicate the high growth scenario.

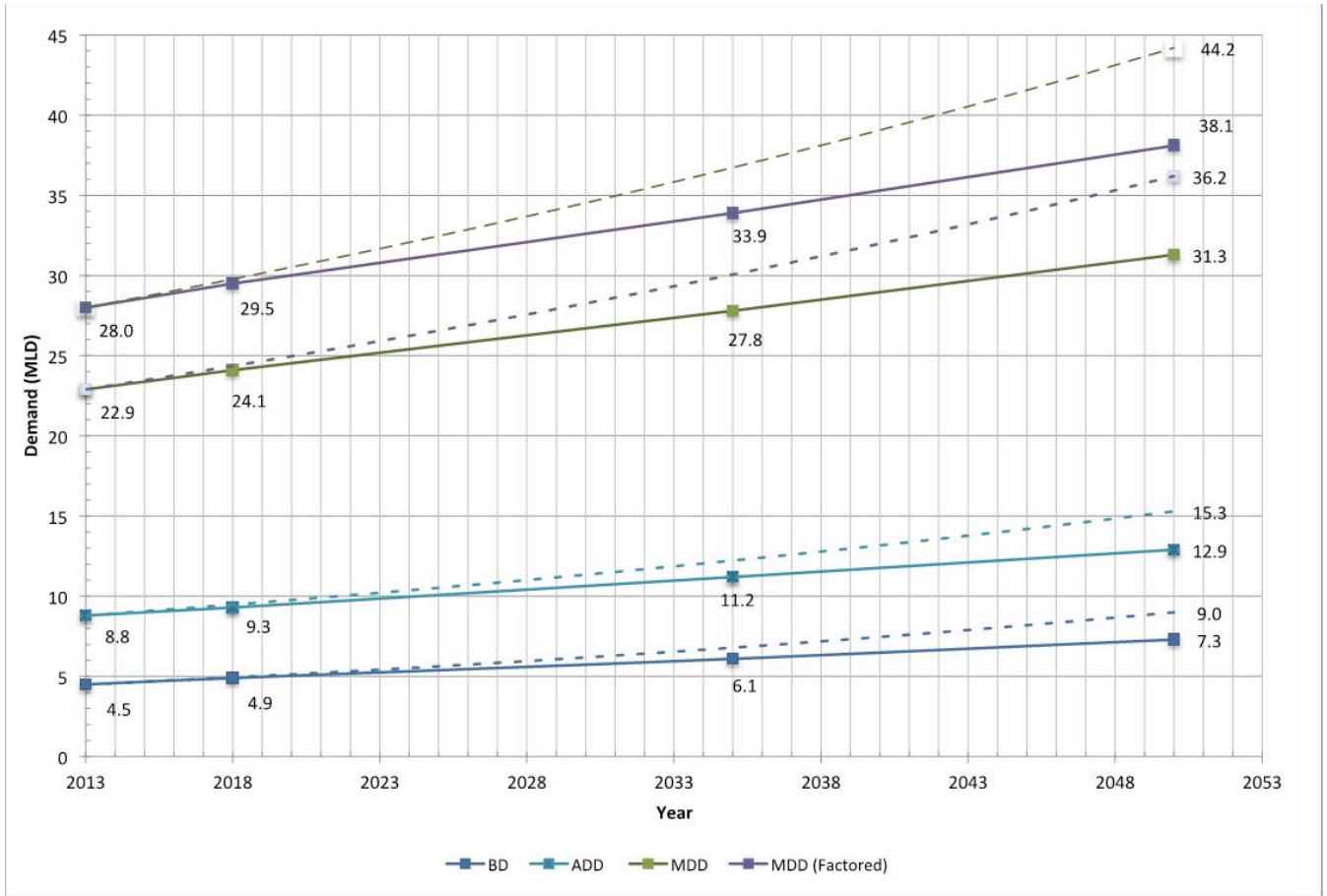


Figure 5-1: EWRS – Water Demand Projections



The figure below indicated the division of water use, by customer class (e.g., Residential, ICI) and demand type (i.e., Base Demand, Seasonal Demand) for the 2050 MDD High Growth scenario for the ERWS.

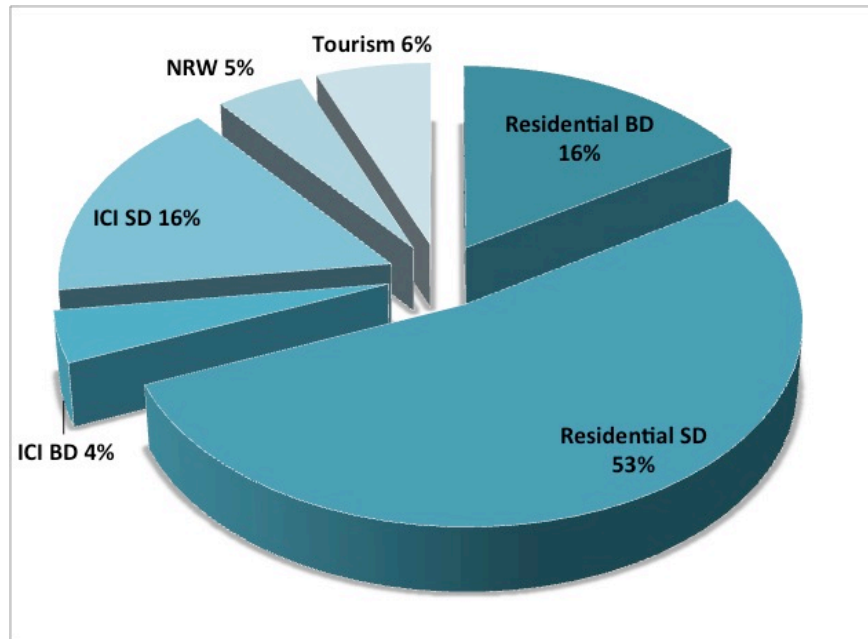


Figure 5-2: ERWS Demands Split for 2050 High Growth MDD

6. Conclusions

Assuming a design irrigation rate of 34,300 L/ha/day, the estimated existing maximum day demands for Parksville and Nanoose Bay WSA are:

- Parksville: 16.3 MLD
- Nanoose Bay WSA: 6.6 MLD
- Total: 22.9 MLD

The recommended factored design flows for the Englishman River Water Treatment Plant, for a 2050 design horizon are:

- Parksville: 32.1 MLD
- Nanoose Bay WSA: 12.1 MLD
- Total: 44.2 MLD



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MDR/am

- Encls: Figure 1: Overall OPC and Water Systems
 Appendix 1: Parksville Projected Water Demands
 Appendix 2: Nanoose Bay WSA Projected Water Demands

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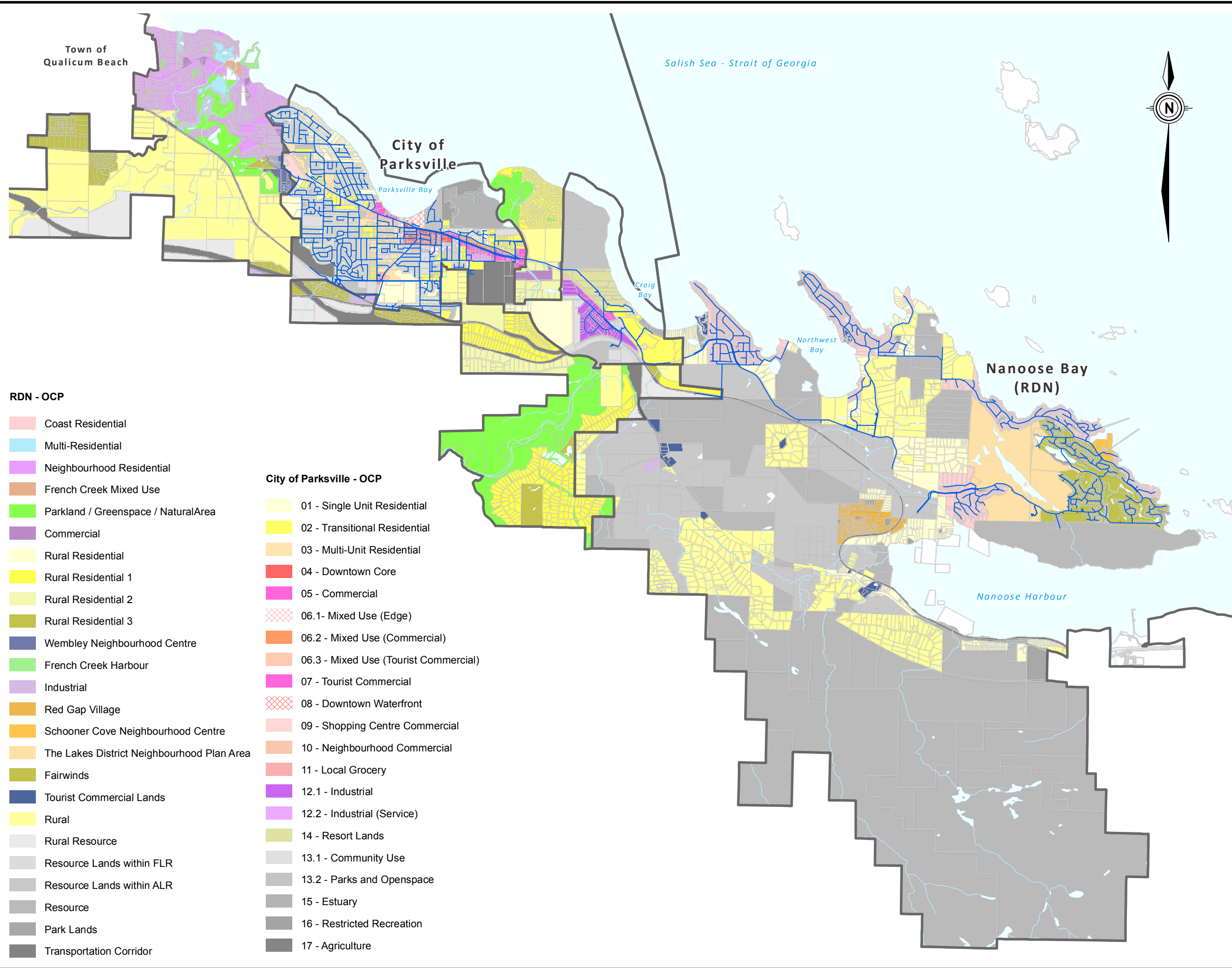
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Revision History

Revision #	Date	Status	Revision Description	Author
0			Original	MDR
1	Dec. 2, 2013	Interim Draft		NW
2	Dec. 6, 2013	Draft	Incorporate Client Comments	MDR
3	Jan. 27, 2014	Final	Incorporate Client Comments. Updated demands	MDR
4	June 3, 2014	Revised Final	Incorporate Client Comments. Updated demands for RDN	MDR



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RDN - OCP

- Coast Residential
- Multi-Residential
- Neighbourhood Residential
- French Creek Mixed Use
- Parkland / Greenspace / Natural Area
- Commercial
- Rural Residential
- Rural Residential 1
- Rural Residential 2
- Rural Residential 3
- Wembley Neighbourhood Centre
- French Creek Harbour
- Industrial
- Red Gap Village
- Schooner Cove Neighbourhood Centre
- The Lakes District Neighbourhood Plan Area
- Fairwinds
- Tourist Commercial Lands
- Rural
- Rural Resource
- Resource Lands within FLR
- Resource Lands within ALR
- Resource
- Park Lands
- Transportation Corridor

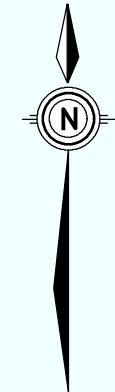
City of Parksville - OCP

- 01 - Single Unit Residential
- 02 - Transitional Residential
- 03 - Multi-Unit Residential
- 04 - Downtown Core
- 05 - Commercial
- 06.1- Mixed Use (Edge)
- 06.2 - Mixed Use (Commercial)
- 06.3 - Mixed Use (Tourist Commercial)
- 07 - Tourist Commercial
- 08 - Downtown Waterfront
- 09 - Shopping Centre Commercial
- 10 - Neighbourhood Commercial
- 11 - Local Grocery
- 12.1 - Industrial
- 12.2 - Industrial (Service)
- 14 - Resort Lands
- 13.1 - Community Use
- 13.2 - Parks and Openspace
- 15 - Estuary
- 16 - Restricted Recreation
- 17 - Agriculture

**ERWS
Water Intake, Treatment Plant
and Supply Mains**

Legend

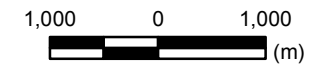
- Electoral Boundary
- Water System



Reference: GIS background data from The City of Parksville and the Regional District of Nanaimo.



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Project No. 468-010	Date December 2013
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**Overall OCP
and Water System**

Appendix 1 - Parkville Projected Water Demands

PARKVILLE - GROWTH TO YR-2050 (HIGH GROWTH SCENARIO - 24,017 ca)

AREA	Base Demand															Peak Seasonal Demand										ADD	MDD															
	Residential					ICI					NRW					BD					Residential							Tourism					ICI					PSD				
	Population (ca)	Dwelling Units	Lot Area	% BUILT-OUT	Net Lot Area	DU/density (du/ha)	Rate (L/ca/day)	ca/DU	Total (MLD)	PE	Lot Area	Rate (L/PE/day)	Total (MLD)	(% of BD)	Total (MLD)	Total (MLD)	Lot Area (ha)	Lot Coverage	Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Tourist Population	Total (MLD)	Lot Area	Lot Coverage			Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Total (MLD)	Total (MLD)	Total (MLD)									
Existing	12,354	5,645	482.0		354.8	11.71	156.4	2.2	1.9	5,415	223	156	0.8	21%	0.6	3.4	354.8	65%	230.6	34,300	7.9	10,447	1.6	223	45%	100	34,300	3.4	13.0	6.4	16.3											
1 South of Greig Rd.	3,464	1,732	69.3	100%	55.4	25.00	163	2.0	0.6					21%	0.1	0.7	55.4	65%	36.0	34,300	1.2		-					-	1.2	1.0	1.9											
2 East of Alberni Hwy., South of Despard Ave.	1,386	693	27.7	100%	22.2	25.00	163	2.0	0.2					21%	0.0	0.3	22.2	65%	14.4	34,300	0.5		-				-	0.5	0.4	0.8												
3 East of Alberni Hwy., North of Despard Ave.	483	241	9.7	100%	7.7	25.00	163	2.0	0.1					21%	0.0	0.1	7.7	65%	5.0	34,300	0.2		-				-	0.2	0.1	0.3												
4 West of Renz Rd.	676	338	13.5	100%	10.8	25.00	163	2.0	0.1					21%	0.0	0.1	10.8	65%	7.0	34,300	0.2		-				-	0.2	0.2	0.4												
5 North of Stanhope Rd at Island Hwy.	110	55	2.2	100%	1.8	25.00	163	2.0	0.0					21%	0.0	0.0	1.8	65%	1.1	34,300	0.0		-				-	0.0	0.0	0.1												
6 Residential Infill	5,545	2,772	55.4	100%	55.4	50.00	163	2.0	0.9					21%	0.2	1.1	55.4	65%	36.0	34,300	1.2	3,455	0.6				-	1.8	1.5	2.9												
7 ICI Infill									-	3,554	152	163	0.6	21%	0.1	0.7	-						-	152	45%	68.6	34,300	2.4	2.4	1.2	3.1											
Total	24,017	11,477	659.9		508.1				3.8	8,969	375		1.4		1.1	6.4	508.1		330.27		11.3	13,902	2.2	375	100		5.8	19.3	10.8	25.7												

PARKVILLE - GROWTH TO YR-2050 (MOST PROBABLE GROWTH SCENARIO 17,548 ca)

AREA	Base Demand															Peak Seasonal Demand										ADD	MDD															
	Residential					ICI					NRW					BD					Residential							Tourism					ICI					PSD				
	Population (ca)	Dwelling Units	Lot Area	% BUILT-OUT	Net Lot Area	DU/density (du/ha)	Rate (L/ca/day)	ca/DU	Total (MLD)	PE	Lot Area	Rate (L/PE/day)	Total (MLD)	(% of BD)	Total (MLD)	Total (MLD)	Lot Area (ha)	Lot Coverage	Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Tourist Population	Total (MLD)	Lot Area	Lot Coverage			Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Total (MLD)	Total (MLD)	Total (MLD)									
Existing	12,354	5,645	482.0		354.8	11.71	156	2.2	1.9	5,415	223	156	0.8	21%	0.6	3.4	354.8	65%	230.6	34,300	7.9	10,447	1.6	223	45%	100	34,300	3.4	13.0	6.4	16.3											
1 Greig Rd	935	468	69.3	27%	15.0	25.00	163	2.0	0.2					21%	0.0	0.2	15.0	65%	9.7	34,300	0.3		-				-	0.3	0.3	0.5												
2 East of Alberni Hwy., South of Despard Ave.	374	187	27.7	27%	6.0	25.00	163	2.0	0.1					21%	0.0	0.1	6.0	65%	3.9	34,300	0.1		-				-	0.1	0.1	0.2												
3 East of Alberni Hwy., North of Despard Ave.	483	241	9.7	100%	7.7	25.00	163	2.0	0.1					21%	0.0	0.1	7.7	65%	5.0	34,300	0.2		-				-	0.2	0.1	0.3												
4 Humphrey Rd	676	338	13.5	100%	10.8	25.00	163	2.0	0.1					21%	0.0	0.1	10.8	65%	7.0	34,300	0.2		-				-	0.2	0.2	0.4												
5 North of Stanhope Rd at Island Hwy.	110	55	2.2	100%	2.2	25.00	163	2.0	0.0					21%	0.0	0.0	2.2	65%	1.4	34,300	0.0		-				-	0.0	0.0	0.1												
6 Residential Infill	2,616	1,308	26.2	100%	26.2	50.00	163	2.0	0.4					21%	0.1	0.5	26.2	65%	17.0	34,300	0.6	3,455	0.6				-	1.1	0.8	1.7												
7 ICI Infill									-	1,583	65	156	0.2	21%	0.1	0.3	-						-	65	45%	29.3	34,300	1.0	1.0	0.5	1.3											
Total	17,548	8,242	630.6		422.6				2.8	6,998	288		1.1		0.8	4.7	422.6		274.70		9.4	13,902	2.2	223	100		4.45	16.1	8.4	20.8												

PARKVILLE - GROWTH TO YR-2035 MOST PROBABLE GROWTH SCENARIO, 15828 ca)

AREA	Base Demand															Peak Seasonal Demand										ADD	MDD															
	Residential					ICI					NRW					BD					Residential							Tourism					ICI					PSD				
	Population (ca)	Dwelling Units	Lot Area	% BUILT-OUT	Net Lot Area	DU/density (du/ha)	Rate (L/ca/day)	ca/DU	Total (MLD)	PE	Lot Area	Rate (L/PE/day)	Total (MLD)	(% of BD)	Total (MLD)	Total (MLD)	Lot Area (ha)	Lot Coverage	Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Tourist Population	Total (MLD)	Lot Area	Lot Coverage			Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Total (MLD)	Total (MLD)	Total (MLD)									
Existing	12,354	5,645	482.0		354.8	11.71	156	2.2	1.9	5,415	223	156	0.8	21%	0.6	3.4	354.8	65%	230.6	34,300	7.9	10,447	1.6	223	45%	100	34,300	3.4	13.0	6.4	16.3											
1 South of Greig Rd.	-	-	69.3	0%	-	25.00	163	2.0	-					21%	-	-	-	65%	-	34,300	-		-				-	-	-	-												
2 East of Alberni Hwy., South of Despard Ave.	-	-	27.7	0%	-	25.00	163	2.0	-					21%	-	-	-	65%	-	34,300	-		-				-	-	-	-												
3 East of Alberni Hwy., North of Despard Ave.	483	241	9.7	100%	7.7	25.00	163	2.0	0.1					21%	0.0	0.1	7.7	65%	5.0	34,300	0.2		-				-	0.2	0.1	0.3												
4 West of Renz Rd.	676	338	13.5	100%	10.8	25.00	163	2.0	0.1					21%	0.0	0.1	10.8	65%	7.0	34,300	0.2		-				-	0.2	0.2	0.4												
5 North of Stanhope Rd at Island Hwy.	110	55	2.2	100%	2.2	25.00	163	2.0	0.0					21%	0.0	0.0	2.2	65%	1.4	34,300	0.0		-				-	0.0	0.0	0.1												
6 Residential Infill	2,206	1,103	22.1	100%	22.1	50.00	163	2.0	0.4					21%	0.1	0.4	22.1	65%	14.3	34,300	0.5	1,935	0.3				-	0.8	0.6	1.2												
7 ICI Infill									-	1,059	44	156	0.2	21%	0.0	0.2	-						-	44	45%	20	34,300	0.7	0.7	0.4	0.9											
Total	15,828	7,382	626.5		397.6				2.5	6,473	266		1.0		0.7	4.2	397.6		258.4		8.9	12,382	1.9	223	100		4.1	14.9	7.7	19.2												

PARKVILLE - GROWTH TO YR-2018 MOST PROBABLE GROWTH SCENARIO, 13,228 ca)

AREA	Base Demand															Peak Seasonal Demand										ADD	MDD															
	Residential					ICI					NRW					BD					Residential							Tourism					ICI					PSD				
	Population (ca)	Dwelling Units	Lot Area	% BUILT-OUT	Net Lot Area	DU/density (du/ha)	Rate (L/ca/day)	ca/DU	Total (MLD)	PE	Lot Area	Rate (L/PE/day)	Total (MLD)	(% of BD)	Total (MLD)	Total (MLD)	Lot Area (ha)	Lot Coverage	Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Tourist Population	Total (MLD)	Lot Area	Lot Coverage			Irrigable Lot Area (ha)	Rate (L/ha/day)	Total (MLD)	Total (MLD)	Total (MLD)	Total (MLD)									
Existing	12,354	5,645	482.0		354.8	11.71	156	2.2	1.9	5,415	223	156	0.8	21%	0.6	3.4	354.8	65%	230.6	34,300	7.9	10,447	1.6	223	45%	100	34,300	3.4	13.0	6.4	16.3											
1 South of Greig Rd.	-	-	69.3	0%	-	25.00	163	2.0	-					21%	-	-	-	65%	-	34,300	-		-				-	-	-	-												
2 East of Alberni Hwy., South of Despard Ave.	-	-	27.7	0%	-	25.00	163	2.0	-					21%	-	-	-	65%	-	34,300	-		-				-	-	-	-												
3 East of Alberni Hwy., North of Despard Ave.	241	121	9.7	50%	3.9	25.00	163	2.0	0.0					21%	0.0	0.0	3.9	65%	2.5	34,300	0.1		-				-	0.1	0.1	0.1												
4 West of Renz Rd.	338	169	13.5	50%	5.4	25.00	163	2.0	0.1					21%	0.0	0.1	5.4	65%	3.5	34,300	0.1		-				-	0.1	0.1	0.2												
5 North of Stanhope Rd at Island Hwy.	55	28	2.2	50%	0.9	25.00	163	2.0	0.0					21%	0.0	0.0	0.9	65%	0.6	34,300	0.0		-				-	0.0	0.0	0.0												
6 Residential Infill	240	120	2.4	100%	2.4	50.00	163	2.0	0.0					21%	0.0	0.0	2.4	65%	1.6	34,300	0.1	323	0.1				-	0.1	0.1	0.2												
7 ICI Infill									-	266	11	156	0.0	21%	0.0	0.1	-						-	11	45%	5	34,300	0.2	0.2	0.1	0.2											
Total	13,228	6,082	606.8		367.3				2.1	5,681	234		0.9		0.6	3.6	367.3		238.8		8.2	10,770	1.7	223	100		3.6	13.5	6.7	17.1												

0000-0999:0400-0499:468-010:400-Work:Water Demands:May 30 submission:[20140120-parkvillemeterdata.xlsx]Report Table

Appendix 2 - Nanoose Bay WSA Projected Water Demands

Nanoose Bay WSA - YR- 2050 (Population 11,801)

Development	Single Family Residential							Multi-Family Residential							ICI						NRW		Total						
	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Building area (sq. m)	Population Equivalents (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	Sub-Total BD	BD (MLD)	Residential Population (ca)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	ADD (MLD)	MDD (MLD)
Existing	100%	2,053	4,564	452	153	0.7	5.2	100%	325	632	21.0	4.2	0.1	0.1	100%	-	196	14.3	2.1	0.0	0.1	0.9	0.2	5,196	158.9	1.1	5.5	2.4	6.6
Schooner Cove	100%	-	-	-	-	-	-	100%	360	700	3.3	0.7	0.1	0.0	100%	2,325.0	76	-	-	0.0	0.0	0.1	0.0	700	0.7	0.2	0.0	0.2	0.2
Lakes District	100%	1,122	2,494	103	46	0.4	1.6	100%	553	1,076	2.5	0.5	0.2	0.0	100%	14,000.0	336	-	-	0.1	0.0	0.6	0.2	3,570	46.9	0.8	1.6	1.2	2.4
Red Gap - Infill	100%	100	222	-	-	0.0	-	100%	111	216	-	-	0.0	-	100%	7,920.0	228	-	-	0.0	0.0	0.1	0.0	438	-	0.1	0.0	0.1	0.1
WSA - Infill Development	1465%	483	1,075	-	-	0.2	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	0.2	0.0	1,075	-	0.2	-	0.2	0.2
WSA - Vacant Lots	100%	300	667	51	23	0.1	0.8	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	0.1	0.0	667	22.9	0.1	0.8	0.3	0.9
Congregate Care Facility	100%	-	-	-	-	-	-	100%	-	155	-	-	0.0	-	100%	-	-	-	-	-	-	0.0	0.0	155	-	0.0	-	0.0	0.0
Total	0%	4,058	9,022	606	222	1.5	7.6	0%	1,349	2,779	26.8	5.4	0.5	0.2	0%	24,245.0	836	14.3	2.1	0.1	0.1	2.1	0.6	11,801	229.3	2.6	7.9	4.5	10.5

Nanoose Bay WSA - YR- 2035 (Population 8,462)

Development	Single Family Residential							Multi-Family Residential							ICI						NRW		Total						
	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Building area (sq. m)	Population Equivalents (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	Sub-Total BD	BD (MLD)	Residential Population (ca)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	ADD (MLD)	MDD (MLD)
Existing	100%	2,053	4,564	452	153	0.7	5.2	100%	325	632	21.0	4.2	0.1	0.1	100%	-	196	14.3	2.1	0.0	0.1	0.9	0.2	5,196	158.9	1.1	5.5	2.4	6.6
Schooner Cove	100%	-	-	-	-	-	-	100%	360	700	3.3	0.7	0.1	0.0	100%	2,325.0	76	-	-	0.0	0.0	0.1	0.0	700	0.7	0.2	0.0	0.2	0.2
Lakes District	50%	561	1,247	52	23	0.2	0.8	50%	277	538	2.5	0.3	0.1	0.0	75%	10,500.0	252	-	-	0.0	0.0	0.3	0.1	1,785	23.4	0.4	0.8	0.6	1.2
Red Gap - Infill	50%	50	111	-	-	0.0	-	67%	74	145	-	-	0.0	-	100%	7,920.0	228	-	-	0.0	0.0	0.1	0.0	256	-	0.1	0.0	0.1	0.1
WSA - Infill Development	50%	17	37	-	-	0.0	-	50%	-	-	-	-	-	100%	-	-	-	-	-	-	-	0.0	0.0	37	-	0.0	-	0.0	0.0
WSA - Vacant Lots	50%	150	333	25	11	0.1	0.4	50%	-	-	-	-	-	100%	-	-	-	-	-	-	-	0.1	0.0	333	11.4	0.1	0.4	0.2	0.5
Congregate Care Facility	100%	-	-	-	-	-	-	100%	-	155	-	-	0.0	-	100%	-	-	-	-	-	-	0.0	0.0	155	-	0.0	-	0.0	0.0
Total		2,831	6,292	529	187	1.0	6.4		1,036	2,170	26.8	5.1	0.4	0.2		20,745.0	752	14.3	2.1	0.1	0.1	1.5	0.4	8,462	194.4	1.9	6.7	3.5	8.6

Nanoose Bay WSA - YR- 2018 (Population 5,805)

Development	Single Family Residential							Multi-Family Residential							ICI						NRW		Total						
	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Dwelling Units	Population (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	% Build-out	Building area (sq. m)	Population Equivalents (ca)	Lot Area (ha)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	Sub-Total BD	BD (MLD)	Residential Population (ca)	Irrigation Area (ha)	BD (MLD)	SD (MLD)	ADD (MLD)	MDD (MLD)
Existing	100%	2,053	4,564	452	153	0.7	5.2	100%	325	632	21.0	4.2	0.1	0.1	100%	-	196	14.3	2.1	0.0	0.1	0.9	0.2	5,196	158.9	1.1	5.5	2.4	6.6
Schooner Cove	0%	-	-	-	-	-	-	55%	198	385	3.3	0.4	0.1	0.0	50%	1,162.5	38	-	-	0.0	0.0	0.1	0.0	385	0.4	0.1	0.0	0.1	0.1
Lakes District	0%	-	-	-	-	-	-	0%	-	-	2.5	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Gap - Infill	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSA - Infill Development	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSA - Vacant Lots	34%	101	224	17	8	0.0	0.3	0%	-	-	-	-	-	0%	-	-	-	-	-	-	-	0.0	0.0	224	7.7	0.0	0.3	0.1	0.3
Congregate Care Facility	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		2,154	4,788	469	160	0.781	5.5		523	1,017	26.8	4.6	0.166	0.2		1,162.5	234	14.3	2.1	0.0	0.1	1.0	0.3	5,805	167.0	1.3	5.7	2.6	7.0

Appendix H
TM #4B – Distribution System Upgrades –
Water Modelling



Technical Memorandum

REVISION 1

DATE: June 2, 2014

TO: Umar Alfaruq, CH2M Hill

CC: Mike Squire, Englishman River Water Service

FROM: Eric Morris, Kerr Wood Leidal Associates
Rose Sinnott, Kerr Wood Leidal Associates

RE: **ERWS WATER INTAKE, TREATMENT PLANT AND SUPPLY MAINS**
TM#4B: Distribution System Upgrades- Water Modelling
Our File 468.010-300

1. Introduction

1.1 Scope

This memorandum (TM#4B) forms part of the deliverables for the design of the Englishman River Water Service (ERWS) Water Intake, Treatment Plant and Supply mains Project. The purpose of the memorandum is to outline the required water system upgrades to integrate the water treatment plant.

The scope of work focusses on the **transmission system** (sizing typically governed by maximum day demands) and does not include an analysis of smaller diameter water mains in the **distribution system** (sizing typically governed by fire flow).

The following items are described in this memorandum;

- Water model build for existing system;
- Water model build for future system;
- Modelling scenarios;
- Water model results for existing and future scenarios;
- Required upgrades and phasing;
- Capital cost estimate.

The demands used for the modelling are summarized in Technical Memorandum TM#4A- Distribution System Upgrades- Demands.

1.2 Abbreviations

ASR	Aquifer Storage and Recovery
BD	Base Demand (Typical Indoor Winter Water Usage)
ca	Capita (Person)
COM	Commercial
CoP	City of Parksville



EPS	Extended Period Simulation
FUS	Fire Underwriters Survey
GD	Geodetic Datum
ha	Hectare
HGL	Hydraulic Grade Line
HP	Horsepower
ICI	Industrial, Commercial and Institutional
IND	Industrial
INST	Institutional
KWL	Kerr Wood Leidal Associates Ltd.
MDD	Maximum Day Demand
MF	Multi Family
MMCD	Master Municipal Construction Documents
NBP	Nanoose Bay Peninsula
PE	Population Equivalent
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PRS	Pressure Reducing Station
RDN	Regional District of Nanaimo
RES	Residential
SCADA	Supervisory Control and Data Acquisition
SD	Seasonal Demand (Irrigation Demand on MDD; BD+SD = MDD)
SF	Single Family
TWL	Top Water Level
UFW	Unaccounted for Water
VFD	Variable Frequency Drive
WSA	Water Service Area

2. Water Model Build for Existing System

2.1 Introduction

The water distribution system which will be supplied by the water treatment plant is comprised of two historically separate systems:

- the City of Parksville system which is owned and operated by the CoP; and
- the Nanoose Bay Peninsula Water Service Area which is owned and operated by the RDN.

Since 2007 the two water systems have been connected by the Craig Bay Pump Station which pumps from the CoP System to the NBP WSA.

The water model was built using the following sources of data:

City of Parksville System

- GIS shapefiles (watermains.shp – Parksville)- source of water main data;
- 2004 WaterCAD model of Parksville system (pv2004.wtg)- source of majority of facilities data, operational controls and setpoints;
- Springwood Complex schematic (Springwood Complex.pdf) - used to model the Springwood Complex;



- City of Parksville 2012 Annual Water Report- used for background information and well capacities; and
- LiDAR elevation data file from the City of Parksville (flown April 22, 2010)- used to determine elevations where data was lacking from the GIS or water model.

Nanoose Bay Peninsula WSA

- GIS shapefiles (WaterUtility_Lines.shp)- source of water main data;
- 2006 WaterCAD model of Nanoose Bay Peninsula (RDN_2006.wtg)- source of water main, facilities data, and elevation information;
- 60 HP pump curve (Grundfos CR 90-4-1)for the pump at Craig Bay Pump Station;
- Dolphin Drive PRV Chamber and Dolphin Reservoir Altitude Valve Chamber Drawings (Koers & Associates Drawing No. 1028-02, 1028-03, and 0814-01);
- Beachcomber Reservoir Tie-In Details Drawing (Koers & Associates Drawing No. 0934-02);
- Regional District of Nanaimo Water Service Area 2012 Annual Report, Nanoose Bay Peninsula Water System- used for background information; and
- Average well capacity data for RDN wells from weekly pump data (Weekly Pump Data.xlsx for 07-Nov-2013) supplemented with updated well capacity data from Mr. Mike Donnelly of the RDN received on May 29, 2014.

The water model was built using Bentley WaterCAD software. The pipe network was imported from GIS shapefiles and was checked for connectivity. Edits made to the pipe network were documented in a shapefile and were provided to CoP and RDN for review.

The CoP and NBP water systems are described in detail below.

2.2 Existing Parksville Water System

The Parksville water transmission system is shown on Figure 1 (highlighted water mains) and a schematic of the system is shown in Figure 2. Water system facilities included in the model are described below.

Pressure Zones

The CoP distribution system has two pressure zones:

- the Low Zone with a nominal HGL of 74 m which encompasses the bulk of the distribution system with pressure set by Reservoirs 3, 4 and 5; and
- the smaller High Zone at the western end of the system which has a nominal HGL of 108 m is supplied by the Springwood Pump Station and has no dedicated gravity storage.

Water Mains

Water mains were assigned actual inside diameters and roughness coefficients based on material type and nominal diameters, according to the table included in Appendix A.

Ground Water Wells

There are 16 active ground water wells in the CoP water system including 8 wells at the Springwood Well Complex and 8 wells at the Railway Well Complex. The capacity of each well is described in the Table B-1 included in Appendix B. The well fields were combined and modelled as a single reservoir with an



elevation set at the nominal HGL of the low zone and a flow control valve limiting the well output to the total combined capacity (86.9 L/s).

The Springwood Well Complex includes Reservoirs #1 and #2 and the Springwood Pump Station which are part of the water treatment system – providing a means to achieve the required contact time for chlorine disinfection; these reservoirs and pump station were not included in the water model because they are not directly part of the transmission system.

River Intakes

There are two water intake pumps on the Englishman River. The intakes are used May to October to provide water to meet demands in the summer. The licensed capacity is 12.2 MLD (141 L/s). The operational settings of the intakes are described in Table B-2 included in Appendix B.

Reservoirs

The CoP water system has three water storage reservoirs in the transmission system. Reservoir #4 is located in the Springwood Water Complex on Despard Road. Reservoirs #3 and #5 are located in the Top Bridge Park area on the east side of the water system.

Reservoirs #3, #4 and #5 provide fire, emergency, and balancing storage for the Low Pressure Zone. There are no reservoirs providing storage for the High Pressure Zone.

Table B-3 in Appendix B summarizes the dimensions of the water storage reservoirs.

Pump Stations

There are two water pump stations in the CoP water transmission system.

- Springwood Booster Pump Station - pumps water directly to the High Pressure Zone; and
- River Intake Pump Station - pumps water from the surface water treatment system to the Low Pressure Zone.

Data and operational settings for each station are summarized in Table B-4 in Appendix B.

Pressure Reducing Valve Stations

There is one PRV station in the CoP system, located on Pym Street North at Doehle Avenue. The valve supplies water from the High Pressure Zone to the Low Pressure Zone at peak hour and for local fireflows. PRV station data is summarized in Table B-5 included in Appendix B.

2.3 Existing Nanoose Bay Peninsula Water System

The Nanoose Bay Peninsula (NBP) water transmission system is shown on Figure 1 (highlighted water mains) and a schematic of the system is shown in Figure 3; the water system facilities included in the model are described below.

Pressure Zones

The NBP water system has seven pressure zones ranging from 170 m HGL on Notch Hill to 60 m HGL in the lowest areas. Most of the pressures zones have storage reservoirs except for Andover (84 m HGL),



Gary Oak (90 m HGL), and West Bay (90 m HGL) which are supplied with water via PRV stations (from higher zones with water storage).

Water Mains

Water mains were assigned actual inside diameters and roughness coefficients based on material type and nominal diameters, according to the table included in Appendix A.

Ground Water Wells

There are 7 ground water wells in the NBP water system. The capacity of each well is described in Table C-1 included in Appendix C. The wells were modelled as reservoirs with elevations set to the values listed in Table C-1 and a flow control valve limiting the well output to an appropriate value.

The long term well capacity in the RDN has been assumed to be 70% of the existing capacity as directed by RDN staff.

Note that wells supplying the 125 m pressure zone (Fairwinds, West Bay, and Wallbrook are assumed to be able to pump to 160 m HGL to enable them to fill the Fairwinds Reservoirs.

Bulk Water Supply from Parksville

The water supply to NBP is supplemented seasonally with water from the CoP water system via the Craig Bay Pump Station.

Reservoirs

The NBP water system has seven water storage reservoirs. Table C-2 included in Appendix C summarizes the dimensions of the water storage reservoirs.

Pump Stations

There are two booster pump stations in the NBP water system

- Craig Bay Pump Station – pumps water from the CoP System to the NBP WSA (located on Northwest Bay Road, east of Langara Place).
- Arbutus Pump Station - pumps water from the Fairwinds 125 m pressure zone to the Arbutus 170 m pressure zone (located on Fairwinds Drive at Anchor Drive).

The characteristics and operational settings of the pump stations are described in Table C-2 included in Appendix C.

Pressure Reducing Valve Stations

There are 10 PRV stations in the NBP system. The location and description of the stations are described in Table C-4 included in Appendix C. The settings of the PRVs on Dolphin Drive and Claudette Road have been adjusted to 73.0 m in accordance with 2014 proposed operational changes¹ in the Nanoose

¹ Email from Chris Downey (Koers & Associates Engineering Ltd.), February 18, 2014 and Dave Welz (Regional District of Nanaimo), May 29, 2014



Zone. It should be noted that these settings raise the zone pressure higher than the top of the Dolphin and Eagle Heights Reservoirs.

2.4 Model Validation

Model validation and calibration has not been completed as part of the transmission system analysis. Hydrant flow tests and model validation will be included as part of the distribution system analysis.

3. Water Model Build for Future System

The initial water model build for the future systems are the same as for the existing system with the following exceptions:

- The new water treatment plant, modelled as a reservoir with a discharge HGL of 79 m, is added to the model at the City of Parksville Public Works Yard and is connected to the transmission system;
- The existing Parksville surface water intake and pump station on the Englishman River is taken out for service;
- The Beachcomber Reservoir in the RDN Nanoose system is taken out of service due to the condition of the roof structure (Mr. Mike Donnelly Personal Communication, December 11, 2013);

4. Demands and Water Treatment Plant Sizing

4.1 Demands

The existing and projected water demands for Parksville and Nanoose Bay Peninsula WSA are summarized in Table 1 below. Detailed information on the derivation of these demands is provided in Technical Memorandum TM#4A- Distribution System Upgrades- Demands. Appendix D includes the demands broken down by pressure zone.

Safety factors of 1.25 and 1.15 were applied to the demands for the City of Parksville and NBP WSA respectively for the purpose of sizing infrastructure and upgrades. This factor of safety accounts for uncertainties in potential climate change and its effects on irrigation, future growth and population predictions, and changes in existing water use. The safety factors for each service area were developed in consultation with the CoP and RDN are based on their confidence in growth projections, historical precedents in safety factors used for water system sizing and general tolerance for risk.

Table 1: ERWS – Water Demands

Forecast Year	Population (ca)	Un-factored Demands				Factored Demands			
		BD		MDD		BD		MDD	
		MLD	L/s	MLD	L/s	MLD	L/s	MLD	L/s
2013 (Existing)	17,550	4.5	52.1	22.9	265	5.5	63.6	28.0	324
2018	19,033	4.9	56.7	24.1	279	5.9	68.3	29.5	314
2035	24,290	6.1	70.6	27.8	322	7.4	85.6	33.9	392
2050	29,348	7.3	84.5	31.3	362	8.9	103	38.1	441
2050 (high growth scenario)	35,818	9.0	104.1	36.2	419	11.0	127	44.2	511

It should be noted that the 2013 un-factored MDD of 22.9 MLD exceeds the supply capacity of the combined Parksville and Nanoose Bay Peninsula WSA systems (surface water plus ground water based



on licenced ground water supply capacity) of 22.5 MLD (NBP at 100% of existing capacity) indicating that supply challenges would occur if a hot summer with high seasonal demands occurred with the current population.

4.2 Water Treatment Plant Sizing

The proposed water treatment plant is to be constructed in or adjacent to the City of Parksville Public Works Yard by 2016. This treatment plant will be fed from the Englishman River and will replace the existing intake on the Englishman River close to Highway 19A.

After the construction of the treatment plant, the combined CoP and NBP WSA systems will be supplied by the water treatment plant, ground water wells and potentially ASR wells. For the purposes of sizing the water treatment plant, the existing well capacity for the CoP system is assumed to be maintained through 2050 (i.e. no net change in well capacity or ASR contribution), and the well capacity of the NBP WSA system will be 70% of the existing capacity. As ASR sizing, feasibility and location is ongoing, initial sizing assumes that the ASR wells do not supply any capacity under design MDD/PHD scenarios. Further, it is assumed that there is sufficient balancing storage in the combined CoP and NBP WSA systems such that the water treatment plant can be sized for the factored MDD less the existing well capacity. The required water treatment plant capacity, based on factored demands at each demand horizon is summarized in Table 2.

Table 2: Required Water Treatment Plant Capacity

Forecast Year	Factored MDD		Ground Water Well Capacity ¹		Required Firm Treatment Plant Capacity (MLD)	
	MLD	L/s	MLD	L/s	MLD	L/s
2013 (Existing)	28.0	324	9.5	110	18.5	214
2018	29.5	314	9.5	110	20.0	231
2035	33.9	392	9.5	110	24.4	282
2050	38.1	441	9.5	110	28.6	331
2050 (high growth scenario)	44.2	511	9.5	110	34.7	402

Notes:
1) NBP wells at long term capacity (70% of existing capacity).

5. Design Criteria

Design criteria provided by ERWS to be used for transmission system evaluation is summarized in the sections below. The ERWS criteria have been supplemented with criteria from the Master Municipal Construction Document (MMCD) Design Guideline Manual² as required.

Required Fire Flows

The required fire flow is based on land use type and is summarized in Table 3. The fire storage required for each pressure zone is calculated based on the governing ICI land use, summarized in Table 4. CoP

² Master Municipal Construction Documents Association, Design Guideline Manual, 2005.



provided required fire flows (based on Fire Underwriter's Survey) to be used to evaluate the transmission system in Parksville³. The required fire flow for NBP was developed through discussions with Koers & Associates⁴ and verified with RDN staff⁵.

Table 3: Minimum Required Fire Flows by Land Use Type

Land Use Type	Required Fire Flow (L/s)	Duration (hr)	Storage Volume (ML)
Single Family Residential (CoP)	75	1.625	0.44
Multi Family Residential	150	2	1.08
Comprehensive Development	90	1.85	0.60
Downtown Commercial	250	3.25	2.93
Resort / Recreational	250	3.25	2.93
Institutional	250	3.25	2.93
Industrial	200	2.5	1.80
Rural	75 ¹	1.625	0.44
Single Family Residential (NBP)	60	1.4	0.30
Institutional, Commercial, Industrial (NBP)	150	2	1.08
Notes: 1) Where fire hydrant protection is available.			

³ Email from Mike Squire – August 21, 2013.

⁴ Email from Chis Downey (Koers & Associates Engineering Ltd .)- February 11, 2014.

⁵ Email from Mike Donnelly – February 12, 2014.



Table 4: Governing Land Use and Fire Flow Requirements by Pressure Zone

Pressure Zone	Existing		Future 2050	
	Governing Land Use	Required Fire Flow (L/s)	Governing Land Use	Required Fire Flow (L/s)
CoP Low Zone	Downtown Commercial	250	Downtown Commercial	250
CoP High Zone	Downtown Commercial	250	Downtown Commercial	250
NBP Madrona	Single Family Residential	60	Single Family Residential	60
NBP Nanoose	Marina	150	Mixed Use, Marina	150
NBP Andover	Golf course	60	Golf course	60
NBP Garry Oak	Oyster Farm	60	Oyster Farm	60
NBP West Bay	School, Community Hall, Grocery	150	School, Community Hall, Mixed Retail	150
NBP Fairwinds	Fairwinds Centre	150	Mixed Use, School	150
NBP Supply	Single Family Residential	60	Single Family Residential	60
NBP Arbutus	Single Family Residential	60	Mixed Use	150

System Pressure

Desired minimum pressures from the MMCD Design Criteria Guideline are outlined in Table 5 below.

Table 5: Desired Minimum Pressures

Design Case Description	Desired Minimum Pressure
Peak Hour Demand (PHD)	300 kPa / 44 psi
Fire Flow plus Maximum Day Demand	150 kPa / 22 psi

6. Modelling Results and Required Upgrades

6.1 Scenarios

The existing and future water models have been run using extended period simulation (to model peak hour demands and reservoir levels) and maximum day demand plus fire flow scenarios for various planning horizons. Existing and year 2050 horizons are modelled to determine existing deficiencies and ultimate upgrade requirements along with year 2035 and year 2018 scenarios to determine construction phasing. For the year 2018 scenario, model runs are conducted with and without Aquifer Storage and



Recovery (ASR) to determine the changes in the ultimate upgrading requirements. The modelled scenarios are summarized in Table 6.

Table 6: Summary of Modelled Scenarios

Scenario #	Scenario Name	Model	Demands	Water Sources
1	Existing Peak Hour Demand (PHD)	Existing	Unfactored Existing EPS	Wells River Intake
2	Existing Maximum Day Demand (MDD)+ Fire Flow (FF)	Existing	Unfactored Existing MDD	Wells River Intake
3	2050 PHD	Future	Factored 2050 EPS- High Growth	Wells WTP
4	2050 MDD + FF	Future	Factored 2050 MDD- High Growth	Wells WTP
5	2035 PHD	Future	Unfactored 2035 EPS	Wells WTP
6	2035 MDD + FF	Future	Unfactored 2035 MDD	Wells WTP
7	2018 PHD	Future	Unfactored 2018 EPS	Wells WTP
8	2018 MDD + FF	Future	Unfactored 2018 MDD	Wells WTP
9	2018 PHD- with ASR	Future	Unfactored 2018 EPS	Wells WTP ASR at Nanoose Well Site

6.2 Existing Peak Hour and Fire Flow (Scenarios 1 and 2)

A 72 hour extended period simulation was conducted for the existing water system with 2013 unfactored demands to determine the baseline performance of the existing system. This simulation consists of 3 consecutive days of maximum day demand and is therefore somewhat conservative.

Model results for peak hour demand are presented in Figure 4. The existing transmission and distribution system performs well, with acceptable peak hour pressures in most areas with the following exceptions:

- CoP Low Zone, at the south end on Despard Ave., Alberni Highway and Bernard Ave. and along the western side at the boundary with the High Zone;
- NBP WSA West Bay Zone, on Schira Dr. Weston Pl., and Nanoose Rd.;
- NBP WSA Nanoose Zone, on Davenham Rd. around the Eagle Heights Reservoir;
- NBP WSA Nanoose Zone, on Swallow and Harlequin Cres.;
- NBP WSA Nanoose Zone, on Sea Otter Pl. and Eagle Ridge Pl.;
- NBP WSA Supply Zone, on the suction side of the Arbutus Pump Station;
- NBP WSA Fairwinds Zone on Simmons Pl.; and
- NBP WSA Fairwinds Zone, on Bonnington Dr.



Many of the reservoirs are empty or are less than 10% full after 3 consecutive days of maximum day demand. This is mainly the result of the demand exceeding the supply capacity (rather than transmission system inadequacies).

A fire flow simulation was conducted for the existing water system with 2013 unfactored demands. Only the transmission system (highlighted on Figure 1) was evaluated using the required fire flow criteria from Table 4 for the various pressure zones. There are fire flow deficiencies in the following areas:

- CoP High Zone;
- CoP Low Zone, western border; and
- Fairwinds Zone.

6.3 Future Peak Hour and Fire Flow (Scenarios 3 through 8)

72 hour extended period and fire flow simulations were conducted for the future transmission system with *factored* 2050 demands for the high growth scenario, and *unfactored* demands for the 2035 and 2018 phasing scenarios.

As previously mentioned, upgrade requirements have been determined for the transmission system only. The upgrades recommended to maintain adequate system performance are shown on Figure 5. The upgrades are colour coded according to their required phasing.

The earliest phasing horizon is 2018. The demands in 2018 are 5% higher than the demands in 2013; therefore the projects that are required in 2018 are effectively required immediately. However, not all of the 2018 projects are required for the water treatment plant to function: i.e. if they are not constructed, the water system will continue to perform with the same performance it has currently. In order to identify projects that must be constructed with the water treatment plant, a “2016” time horizon has been added to the phasing.

Transmission Main Upgrades

Transmission main upgrades are listed in Table 7. This table provides the length, diameter, location and required phasing for each upgrade. Also provided is the reason for the upgrade (peak hour demand, fire flow, etc.) and whether it is a new water main (i.e. new alignment) or replacement of an existing water main.



Table 7: Water Main Upgrades

Task No.	Length (m)	Dia-meter (mm)	Location	Required For ¹	Phasing (year required)	Replace / New
W1	4,850	600	WTP to Springwood Reservoir #4, via Martindale Rd, private property and the E&N ROW. New ROW required.	WTP Tie-in, Supply Redundancy, PH	2016	New
W2	1,110	400	WTP to Industrial Reservoirs via the E&N ROW and Top Bridge Park. New ROW required.	WTP Tie-in, PH	2016	New
W4	460	400	NBP Supply Pump Station on Industrial Way to NW Bay Rd via Island Hwy E (including existing highway crossing).	PH	2018	New
W6	2,520	300	NW Bay Rd to Anchor Way via. private property, Harold Rd, Transtide Dr and Florence Dr. New ROW required.	PH	2035	New
W8	2,240	300	Schooner Cove Drive Loop water main.	FF	2035	New
W11	160	250	High Zone Loop, Ackeman Rd to Stanhope Rd. Scheduled to be completed as part of a DCC project in 2014.	FF	N/A	New
W12	220	350	ROW between Lodgepole Dr and Chestnut St.	FF	2050	Replace
W13	240	400	Springwood Booster Station to Chestnut St.	FF	2050	Replace
Notes:						
1.) FF = Fire Flow, PH = Peak Hour						

Task W1 is a second crossing of the Englishman River; the existing crossing is at a bridge at Highway 19A. This upgrade is required in 2016 to provide adequate pressures in the west side of Parksville and is also recommended for construction to provide a redundant supply across the river. An alternate solution would be to shorten the transmission main by approximately 1 km by connecting to the distribution system at Corfield Street. However, the transmission main task recommended connects directly to Springwood Reservoir to improve water quality and facilitate the operation of the system.

Reservoir Upgrades

Reservoir upgrades will be required to provide adequate balancing, fire and emergency storage. The balancing storage requirement is calculated as 25% of the zone MDD. The fire storage required for each pressure zone calculated based on the governing land use which is summarized in Table 4. The emergency storage is calculated as 25% of the sum of the balancing storage and fire storage requirements. The total storage requirements for factored 2050 high growth demands for each service area is summarized in Table 8.



The Parkville High zone fire flow requirement is supplied from the Low zone via a fire pump. The Madrona, Fairwinds, Andover, West Bay and Nanoose zones are supplied with fire flows from the Fairwinds Reservoirs. The Arbutus zone is supplied with fire flows from the Fairwinds Reservoirs via a fire pump.

Table 8: Reservoir Upgrades for Factored 2050 High Growth Demands by Fire Flow Service Area

Reservoir	Existing Volume (ML)	Required Storage (ML)				Deficiency (ML)
		Balancing	Fire	Emergency	Total	
CoP Low Zone, CoP High Zone						
Industrial 3	0.7	8.0	2.9	2.7	13.6	4.1
Springwood 4	4.5					
Reservoir 5	4.3					
Total	9.5					
NBP Fairwinds, NBP Madrona, NBP Andover, NBP West Bay, NBP Nanoose, NBP Arbutus						
Fairwinds 1	0.9	3.0	1.1	1.0	5.1	1.0
Fairwinds 2	0.9					
Beachcomber	Not in Service					
Madrona	0.5					
Eagle Heights	0.7					
Dolphin	0.5					
Arbutus	0.6					
Total	4.1					

Based on the foregoing, the recommended reservoir upgrades are summarized in Table 9.

It is noted that the upgrade to the Fairwinds Reservoirs (**Task R2**) in 2018 is primarily driven by fire flow requirements. Sizing of this reservoir should be reviewed based on detailed local fire flow calculations.

Table 9: Reservoir Upgrades

Task No.	Task Name	Serves Zones	Required For	Volume (ML)	Phasing (year required)
R1	Springwood Reservoir Upgrade	CoP Low Zone, CoP High Zone	Balancing, fire and emergency storage	4.1	2035
R2	Fairwinds Reservoir Upgrade	Fairwinds, Madrona, Nanoose, West Bay, Andover, Garry Oak, Arbutus (via fire pump)	Balancing, fire and emergency storage	1.0	2018



Pump Station Upgrades

The recommended pump station upgrades are summarized in Table 10.

Table 10: Pump Station Upgrades

Task No.	Task Name	Installed Power (kW)	Phasing (year required)
P0	Pump station in water treatment plant	N/A ¹	2016 - 2050
P1	New NBP Supply Pump Station	270	2018
P3	Springwood Booster Station fire pump upgrade	160	2018
P4	Arbutus fire pump upgrade	100	2050
P5	Decommission Existing Craig Bay Pump Station	N/A	2018
Notes:			
1) Treated water booster pump station sizing is discussed in the water treatment plant pre-design report.			

Task P0 is the booster pump station in the water treatment plant that pumps from the clearwell to the Parksville 74 m low zone. The particulars of this pump station are not discussed in this report since they are covered in the water treatment plant pre-design report.

Task P1 and the accompanying **Task P5** is the decommissioning of the existing Craig Bay Pump Station and the construction of a new pump station (and associated water main **Task W4**) close to the existing station at the eastern end of Industrial Way. KWL has been informed that the Northwest Bay Road supply main can operate at a hydraulic grade of 160 m GD⁶ (215 psi at elevation 8 m), and therefore a single pump station can deliver the required flow from the proposed NBP Supply Pump Station site to the Fairwinds Reservoirs.

In addition to capacity limitations, the existing Craig Bay Pump Station only has a single duty pump (there is a 20 hp jockey pump), and is a critical supply source for the NBP (roughly 60% of the supply capacity). Given the station's critical role, it is recommended that it be replaced with a duplex (or triplex) station with a redundant pump as a high priority project.

Two pump station upgrades are also required to provide adequate fire protection to the CoP High Zone (**Task P3**) and Arbutus Zone (**Task P4**). The CoP High zone (Springwood) fire pump upgrade is required in 2018 to address an existing fire flow deficiency. The Arbutus zone fire pump upgrade is listed as being required in 2050 but will be triggered by the development of the Mixed-Use Zoned lot in the Arbutus zone.

6.4 2018 Peak Hour with Aquifer Storage and Recovery (Scenario 9)

An aquifer storage and recovery (ASR) well may be constructed at the Nanoose Well Field (see Figure 5). This well field would have an expected initial yield of about 6 MLD with an ultimate yield of 15 MLD.

An additional scenario was modelled to determine the impacts of the construction of a 6 MLD ASR well on the 2018 transmission system upgrades. The model run consisted of a 72 hour extended period

⁶ Mr. Chris Downey, P.Eng., Koers and Associates, Personal Communication May 28th, 2014.



simulation. The results indicate that the new NBP Supply Pump Station (replacing the exiting Craig Bay Station) could be deferred past 2018 on the basis of capacity. However, due to redundancy and level of service considerations, the new NBP Supply Pump Station is still recommended.

The ultimate ASR capacity of 15 MLD is greater than the expected 2050 MDD of the NBP water service area, therefore some excess capacity can be fed to the CoP system via a PRV.

7. Capital Costs

Class “D”, indicative capital cost estimates have been developed for each proposed upgrade. These estimates have been assembled with little or no site information and are considered to be suitable for long term capital planning.

Parameters used in cost estimating are summarized as follows:

- Site specific project conditions have been considered only at a high level. These site specific conditions include clearing requirements, traffic control requirements, surface restoration, utility conflicts, bedrock blasting and dewatering and diversion requirements.
- The costs include a 15% allowance for engineering / field inspections and 25% allowance for contingencies;
- Land acquisition costs are not included; and
- All costs are in 2014 dollars with no allowance for inflation.

Unit costs used in the preparation of the cost estimates are provided in Table 11.

Table 11: Unit Rates

Size	Unit	Unit Rate Including Engineering and Contingency
Water Mains in Paved Road ROWs		
250	m	\$550
300	m	\$670
350	m	\$700
400	m	\$810
600	m	\$1220
Water Mains in Unpaved ROWs- No Clearing Required		
350	m	\$410
400	m	\$480
600	m	\$820
Water Mains in New ROWs- Access and Clearing Required		
300	m	\$470
400	m	\$570
600	m	\$920
Englishman River Crossing at Levirs Rd- Buried Installation		
600	m	\$2250
Pump Stations		
> 200 kW	kW	\$8,000



Size	Unit	Unit Rate Including Engineering and Contingency
< 200 kW	kW	\$10,000
Fire Pump Upgrade (without structural upgrades)		
Fire Pump & Controls	kW	\$500
Reservoirs		
< 1.5 ML	m ³	\$900
>1.5 ML	m ³	\$600

Cost estimates for each task are tabulated in Appendix E; the total costs for each phase are summarized in Table 12. The cost estimates do not include the following items:

- Water treatment plant, site servicing, raw water main and access road;
- Booster pump station from water treatment plant to Parksville 74 m Zone (in WTP);
- ASR wells.

Table 12: Summary of Capital Costs (\$M 2014)

Phase	Water Main Upgrades	Reservoir Upgrades	Pump Station Upgrades	Total
by 2016	\$5.11	\$0.00	\$0.00	\$5.11
2016 - 2018	\$0.37	\$0.90	\$2.27	\$3.54
2018 - 2035	\$2.43	\$2.46	\$0.00	\$4.89
2035 -2050	\$0.35	\$0.00	\$0.05	\$0.40
Total	\$8.26	\$3.36	\$2.32	\$13.94



8. Summary and Recommendations

The Englishman River Water Service (ERWS) is proposing to construct a water intake on the Englishman River just upstream of the Highway 19 bridge and a water treatment plant at the City of Parkville Public Works Yard on the north side of the highway. This memorandum identifies the transmission system upgrades required to integrate the water treatment plant into the water system. The required date of construction (phasing) has been determined based on the expected growth in demands.

The most significant transmission system upgrades include:

- A new 4850 m long, 600 mm diameter transmission main from the water treatment plant to Springwood Reservoir #4 (Task W1);
- A new 400 mm diameter water main from the water treatment plant to the Industrial (#3 & #5) Reservoir site in Parkville (Task W2);
- A new booster pump station on Industrial Way pumping to the Nanoose Bay Water Service Area, replacing the Craig Bay Pump Station (Task P1);
- A new 400 mm diameter water main from the new booster pump station on Industrial Way to the Regional District of Nanaimo Boundary at Northwest Bay Road (Task W4);
- A new 300 mm diameter water main from Northwest Bay Rd to Anchor Way (Task W6);
- Reservoir capacity upgrades at Springwood and Fairwinds Reservoirs to increase balancing, emergency and fire storage (Tasks R1 and R2);
- Upgrades to the fire pumps in the Springwood and Arbutus Pump Stations to increase fire flow capacity (Tasks P3 and P4).

In addition, it is recommended that:

- ERWS monitor the growth in system-wide demands on an ongoing basis to update the required construction timing for each task;
- the sizing and alignment of each task be confirmed at the detailed design phase to account for any changes that have been made to the water distribution system;
- investigations be made into acquiring land and rights of-way for the proposed infrastructure that is on private property;
- ERWS initiate/continue design for tasks that are recommended for construction in 2016 and 2018.



8.1 Submission

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Encl. Figure 1: Existing Water System
Figure 2: Existing Water System Schematic City of Parksville
Figure 3: Existing Water System Schematic RDN Nanoose Bay Peninsula Water Service Area
Figure 4: Existing Water System 2013 Unfactored Demands Peak Hour Pressure Results
Figure 5: Future Growth Scenarios Recommended Upgrades and Phasing
Appendix A: Water Main Diameters and C Factors
Appendix B: City of Parksville Water System Facility Information
Appendix C: Nanoose Bay Peninsula Water System Facility Information
Appendix D: Modelled Maximum Day Demands by Pressure Zone
Appendix E: Cost Estimate

Statement of Limitations

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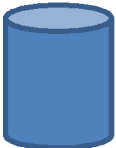

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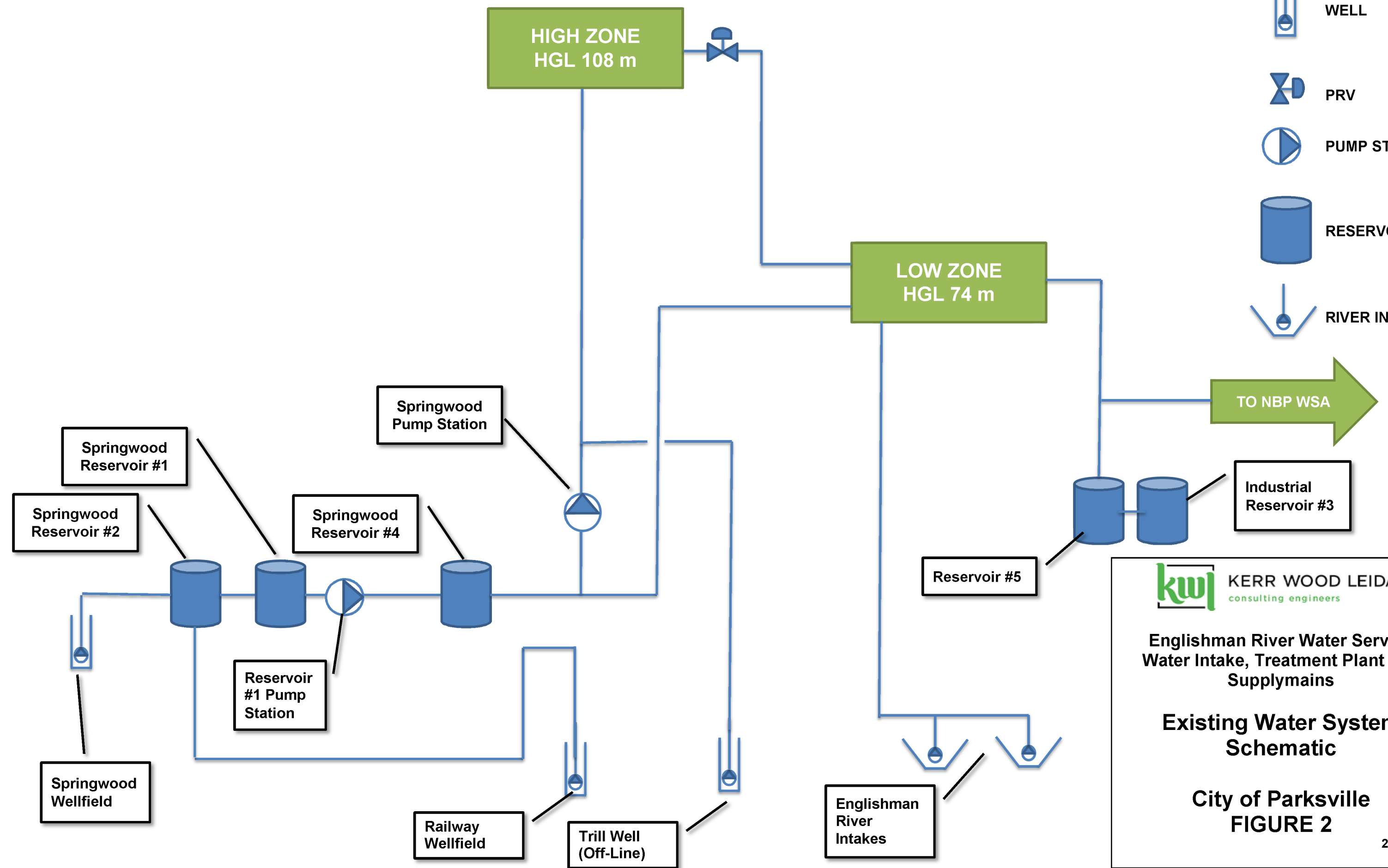
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Revision History

Revision #	Date	Status	Revision	Author
0	Nov. 19, 2013	Interim Draft		RS / EM
1	Dec 23, 2013	Interim Draft 2	Updated design criteria and facility data based on feedback from COP and RDN. Added modelling results and recommendations.	RS / EM
2	Jan 15, 2014	Interim Draft 3	Revised location of proposed pump stations. Completed storage assessment calculations to be reviewed by ERWS.	RS / EM
3	March, 2014	Draft 4	Revised fire flow requirements Revised elevations of nodes in RDN using contour data provided. Completed phasing and cost estimates for required upgrades.	RS / EM
4	April 25, 2014	Final	Revise alignment of Task 4B. Finalize	RS / EM
5	June 2, 2014	Revision 1	Revised NBP Demands and Well Capacities. Revisions to transmission main upgrades.	RS / EM

LEGEND

-  WELL
-  PRV
-  PUMP STATION
-  RESERVOIR
-  RIVER INTAKE



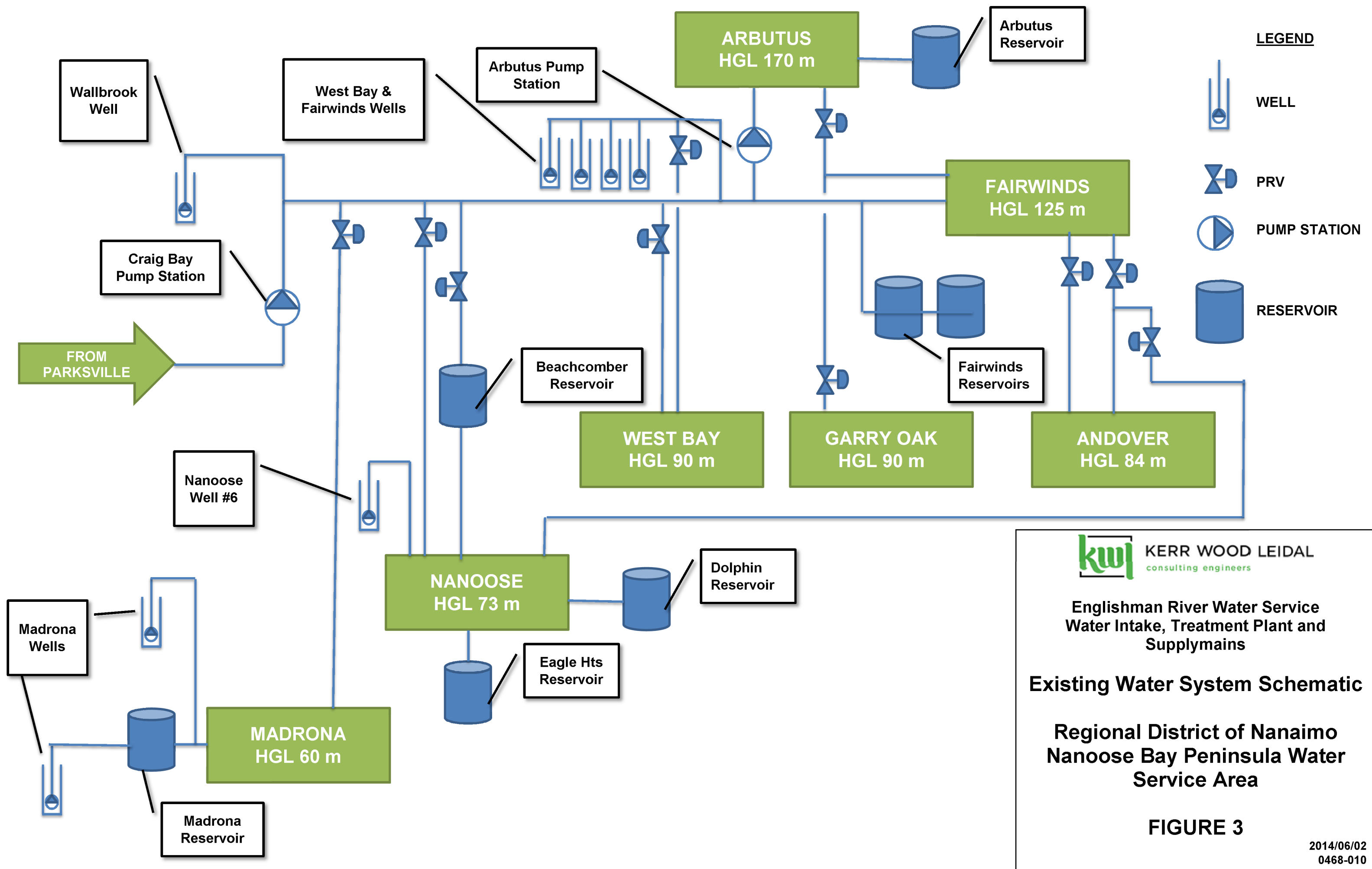
kwj KERR WOOD LEIDAL
consulting engineers

Englishman River Water Service
Water Intake, Treatment Plant and
Supply mains

Existing Water System
Schematic

City of Parksville
FIGURE 2

2014/01/14
0468-010



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Englishman River Water Service
Water Intake, Treatment Plant and
Supply mains

Existing Water System Schematic

**Regional District of Nanaimo
Nanoose Bay Peninsula Water
Service Area**

FIGURE 3



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Appendix A

Water Main Diameters and C Factors



Table A-1: Water Main Diameters and C Factors

Material	Abbreviation	Nominal Diameter (mm)	Modelled Diameter (mm)	C Factor
Asbestos Cement	AC	100	101.6	110
	AC	150	152.4	110
	AC	200	203.2	110
	AC	250	254	110
	AC	300	304.8	110
	AC	350	355.6	110
	AC	400	406.4	110
Cast Iron	CI	150	152.4	90
Ductile Iron	DI	100	106	120
	DI	150	159.4	120
	DI	200	214	120
	DI	250	265.5	120
	DI	300	317.9	120
	DI	350	371.2	120
	DI	400	423.5	120
HDPE	HDPE	200	176.9	135
Permastrand	PS	150	150	100
	PS	200	200	100
PVC	PVC	25	25	135
	PVC	50	50	135
	PVC	75	75	135
	PVC	100	108	135
	PVC	150	155	135
	PVC	200	204.3	135
	PVC	250	250	135
	PVC	300	297	135
	PVC	350	345.4	135
	PVC	400	392.8	135
	Stainless Steel	SS	100	102.3
SS		150	154.1	120
SS		200	202.7	120
SS		250	254.5	120
SS		300	304.8	120
SS		350	336.6	120
SS		400	387.35	120



Material	Abbreviation	Nominal Diameter (mm)	Modelled Diameter (mm)	C Factor
Steel	ST	100	102.3	120
	ST	150	154.1	120
	ST	200	202.7	120
	ST	250	254.5	120
	ST	300	304.8	120
	ST	350	336.6	120
	ST	400	387.40	120
Steel(Coated)	ST	100	102.3	120
	ST	150	154.1	120
	ST	200	202.7	120
	ST	250	254.5	120
	ST	300	304.8	120
	ST	350	336.6	120
	ST	400	387.4	120
	ST	1525	1525.0	120
Unknown	UNK	0	0	100
	UNK	25	25	100
	UNK	50	50	100
	UNK	75	75	100
	UNK	100	100	100
	UNK	150	150	100

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Appendix B

City of Parksville Water System Facility Information



Table B-1: Parksville Well Summary

Model ID	Well Capacity		Modelled Reservoir HGL
	L/s	MLD	
Springwood Well Field			
R-SW-1	0.9	0.08	See Note 1
R-SW-2	Off line		
R-SW-3	1.3	0.11	
R-SW-4	Off line		
R-SW-5	6.0	0.52	
R-SW-6	6.7	0.58	
R-SW-7	9.1	0.79	
R-SW-8	10.3	0.89	
R-SW-10	9.0	0.78	
R-SW-11	7.0	0.60	
Railway Well Field			
R-RW-1	5.0	0.43	See Note 1
R-RW-2	5.3	0.46	
R-RW-3	2.5	0.22	
R-RW-4	1.7	0.15	
R-RW-5	7.3	0.63	
R-RW-6	6.2	0.54	
R-RW-7	4.1	0.35	
R-RW-8	4.5	0.39	
Trill Well			
R-TW-1	Off line		Off line
Total CoP Well Capacity	86.9	7.52	74 m
Notes:			
1. All wells modeled as one reservoir with a capacity of 86.9 L/s and an HGL of 74 m.			



Table B-2: Parksville River Intake Summary

Model ID	Intake Level (m HGL)	Control Point in System	Max Day (Summer) Set Points		Base Day (Winter) Set Points	
			ON % Reservoir Level	OFF % Reservoir Level	ON % Reservoir Level	OFF % Reservoir Level
R-ER-1	1.0	Reservoir #4	92.7%	97.6%	Off	Off
R-ER-2	1.0	Reservoir #4	93.9%	97.6%	Off	Off

Table B-3: Parksville Water Storage Reservoir Summary

Model ID	Name	Purpose	Pressure Zone	Capacity (ML)	Base Elevation (m)	Top Water Level (m)	Diameter (m)	Area (m2)
T-1	Springwood Reservoir #1	Water Treatment – See Note 1	N/A	0.616	45.5	47.2	N/A	362.4
T-2	Springwood Reservoir #2	Water Treatment – See Note 1	N/A	2.023	45.5	48.4	29.8	697.6
T-3	Industrial Reservoir #3	Fire and Balancing Storage– See Note 2	Low	0.671	58.7	73.9	7.5	44.1
T-4	Springwood Reservoir #4	Fire and Balancing Storage	Low	4.559	57.0	73.74	18.6	272.3
T -5	Reservoir #5	Fire and Balancing Storage– See Note 2	Low	4.300	61.9	73.74	21.5	361.6

Notes:

1. Springwood Reservoir #1 and Springwood Reservoir #2 are not included in the water model.
2. Industrial Reservoir #3 and Reservoir #5 are modelled as one tank, with a combined volume of 4.971 ML and TWL of 73.74



Table B-4: Parksville Water Pump Station Summary

Model ID	HP	Pump Make / Model	Pump Curve Provided	Max Day (Summer) Set Points		
				Control Point in System	ON Set Point	OFF Set Point
Springwood Pump Station – See Note 1.						
PMP-S-1	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
PMP-S-2	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
PMP-S-3	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
PMP-S-4	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
PMP-S-5	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
PMP-S-6	25 HP	Grundfos CR 90 2-2	Yes	Unknown	Unknown	Unknown
Springwood Booster Station						
PMP-SWBS-15HP	25 HP	Unknown	Yes – from 2004 model	None	Always ON	Always ON
PMP-SWBS-40HP	40 HP	Unknown	Yes – from 2004 model	Flow rate (Q) to High Zone	Q > 51.7 L/s	Q < 46.0 L/s
PMP-SWBS-40HP	40 HP	Unknown	Yes – from 2004 model	Flow rate (Q) to High Zone	Q > 126.2 L/s	Q < 115.0 L/s
PMP-SWBS-100HP	100 HP	Unknown	Yes – from 2004 model	Flow rate (Q) to High Zone	Q > 190.5 L/s	Q < 170.0 L/s
River Intake Pump Station						
PMP-ER-1	Unknown	Unknown	Yes – from 2004 model	Reservoir #4	Reservoir Level < 92.7%	Reservoir Level > 97.6%
PMP-ER-2	Unknown	Unknown	Yes – from 2004 model	Reservoir #4	Reservoir Level < 93.9%	Reservoir Level > 97.6%
Notes:						
1. Springwood Pump Station is not included in the water model.						



Table B-5: Parksville PRV Station Summary

Model ID	Location	Supplies Zone	Valve Diameter (mm)	Modelled Valve Setting (m HGL)
PRV-1	Pym Street North at Doehle Avenue	Low Zone 74 m	200	63.0

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Appendix C

Nanoose Bay Peninsula Water System Facility Information



Table C-1: NBP Well Summary

Model ID	Well Capacity		Modelled Capacity ¹		Modelled Reservoir HGL
	L/s	MLD	L/s	MLD	
Wallbrook					
WALL-1	2.7	0.235	1.9	0.16	160 m
Madrona					
MAD-4	1.4	0.12	1.0	0.08	62 m
MAD-8	1.6	0.14	1.1	0.10	62 m
Nanoose					
NAN-2	Offline				
NAN-3	Offline				
NAN-4	Offline				
NAN-6	Offline				
Fairwinds					
FW-1	5.7	0.49	4.0	0.34	160 m
FW-2	5.3	0.46	3.7	0.32	160 m
FW-3	3.2	0.27	2.2	0.19	160 m
West Bay					
WEST-3	12.7	1.09	8.9	0.77	160 m
Total NBP Well Capacity	32.6	2.81	22.8	1.97	
Notes:					
1. Modelled capacity is 70% of the well capacity.					



Table C-2: NBP Water Storage Reservoir Summary

Model ID	Name	Purpose	Pressure Zone	Capacity (ML)	Base Elevation (m)	Top Water Level (m)	Diameter (m)	Area (m ²)
T-MAD	Madrona Reservoir	Fire and Balancing Storage	Madrona 60 m	0.537	57.3	61.0	N/A	146.8
T-BC	Beachcomber Reservoir	Fire and Balancing Storage	Nanoose 65 m	0.547	49.0	66.0	6.4	32.2
T-EH	Eagle Heights Reservoir	Fire and Balancing Storage	Nanoose 65 m	0.735	59.5	66.0	N/A	113.7
T-DOL	Dolphin Reservoir	Fire and Balancing Storage	Nanoose 65 m	0.471	60.0	66.0	10.0	78.5
T-FW1	Fairwinds Reservoir 1	Fire and Balancing Storage -- See Note 1	Fairwinds 125 m	0.853	122.0	125.7	17.25	233.7
T-FW2	Fairwinds Reservoir 2	Fire and Balancing Storage- See Note 1	Fairwinds 125 m	0.876	122.0	125.8	17.25	233.7
T-ARB	Arbutus Reservoir	Fire and Balancing Storage	Arbutus 170 m	0.620	165.9	171.0	12.44	121.2

Notes:

1. Fairwinds Reservoir 1 and 2 are modelled as one tank, with a combined volume of 1.729 ML and TWL of 125.8m

Table C-3: NBP Water Pump Station Summary

Model ID	HP	Pump Make / Model	Pump Curve Provided	Max Day (Summer) Set Points		
				Control Point in System	ON Set Point	OFF Set Point
Craig Bay Pump Station						
PMP-CB-1	60	Grundfos CR 90-4-1	Yes	Fairwinds Reservoirs	Reservoir Level < 80%	Reservoir Level > 90%
Arbutus Pump Station						
PMP-ARB	Unknown	Unknown	Yes – from 2006 model	Arbutus Reservoir	Reservoir Level < 77.6%	Reservoir Level > 92.2%



Table C-4: NBP PRV Station Summary

Model ID	Location	Supplies Zone	Valve Diameter (mm)	Modelled Valve Setting (m HGL)
PRV-BALL	Ballenas Road	Madrona 60 m	150	61.0
PRV-DEL	Delanice Road	Nanoose 65 m	150	65.0
PRV-DOL	Dolphin Road	Nanoose 65 m	150	73.0
PRV-CLA	Claudette Road	Nanoose 65 m	150	73.0
PRV-AND-1	Andover Road at Fairwinds Drive	Andover 84 m	100	84.0
PRV-AND-2	Andover Road at Fairwinds Drive	Andover 84 m	100	80.0
PRV-SHR	Dolphin Drive and Sherbrooke Road	Andover 84 m	150	82.0
PRV-GARRY	Garry Oak Drive	Garry Oak 90 m	100	90
PRV-WBAY-FH	Nanoose Road, at Nanoose Bay Fire Hall	West Bay 90 m	150	83.0
PRV-WBAY	NW Bay Road at Nanoose Road	West Bay 90 m	150	90.0
PRV-ARB	Arbutus Crescent and Marine Drive	Fairwinds 125 m	150	123.0

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Appendix D

Water Demands by Pressure Zone

Table D-1: Modelled Maximum Day Demands by Pressure Zone

Pressure Zone	Nominal HGL (m)	Maximum Day Demand (L/s)					Maximum Day Demand (MLD)			
		2013 Unfactored	2018 Unfactored	2035 Unfactored	2050 Unfactored	2050 High Growth Factored	2013 Unfactored	2018 Unfactored	2035 Unfactored	2050 High Growth Factored
CoP High Zone	115	30.5	32.8	35.4	35.6	45.8	2.6	2.8	3.1	4.0
CoP Low Zone	74	158.7	164.9	186.8	204.9	325.0	13.7	14.2	16.1	28.1
Sub-Total		189.2	197.7	222.1	240.6	370.8	16.3	17.1	19.2	32.0
NBP Madrona	60	13.4	14.1	14.4	15.5	17.8	1.2	1.2	1.2	1.5
NBP Nanoose	65	28.7	30.4	31.5	35.2	40.5	2.5	2.6	2.7	3.5
NBP Andover	84	8.0	9.1	9.9	10.4	12.0	0.7	0.8	0.9	1.0
NBP West Bay	90	6.8	7.0	8.0	8.2	9.5	0.6	0.6	0.7	0.8
NBP Garry Oak	90	0.6	0.6	0.6	0.6	0.7	0.1	0.1	0.1	0.1
NBP Fairwinds	125	14.4	15.4	29.8	45.0	51.8	1.2	1.3	2.6	4.5
NBP Arbutus	170	4.2	4.4	5.6	6.8	7.9	0.4	0.4	0.5	0.7
Sub-Total		76.1	81.0	99.7	121.9	140.2	6.6	7.0	8.6	12.1
Total		265.3	278.7	321.9	362.4	511.0	22.9	24.1	27.8	44.1



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Appendix E

Cost Estimate

Table 1E- Capital Costs for Watermains- no ASR

Task No.	Phasing	Length (m)	Diameter (mm)	Conditions	Unit Rate (\$/m)	Cost (\$ 2014)
W1	2016	4850 (Total)	600	Uncleared ROW, River Crossing, Paved Road, Cleared Unpaved ROW	\$820 - \$2250	\$4,501,000
W2	2016	1110 (Total)	400	Cleared, Unpaved ROW, Uncleared ROW	\$480 - \$570	\$609,000
W4	2018	460	400	Existing Paved ROW	\$810	\$373,000
W6	2035	2520 (Total)	300	Uncleared ROW, Existing Paved Road	\$470 - \$670	\$1,556,000
W8	2035	2,240	300	Cleared, Unpaved ROW	\$390	\$874,000
W11	N/A	160	250	Existing Paved ROW	N/A - DCC project scheduled for 2014 construction	N/A
W12	2050	220	350	Existing Paved ROW	\$700	\$154,000
W13	2050	240	400	Existing Paved ROW	\$810	\$194,000
2016 TOTAL						\$5,110,000
2018 TOTAL						\$373,000
2035 TOTAL						\$2,430,000
2050 TOTAL						\$348,000
GRAND TOTAL						\$8,261,000

Table 2E- Capital Costs for Reservoir Upgrades

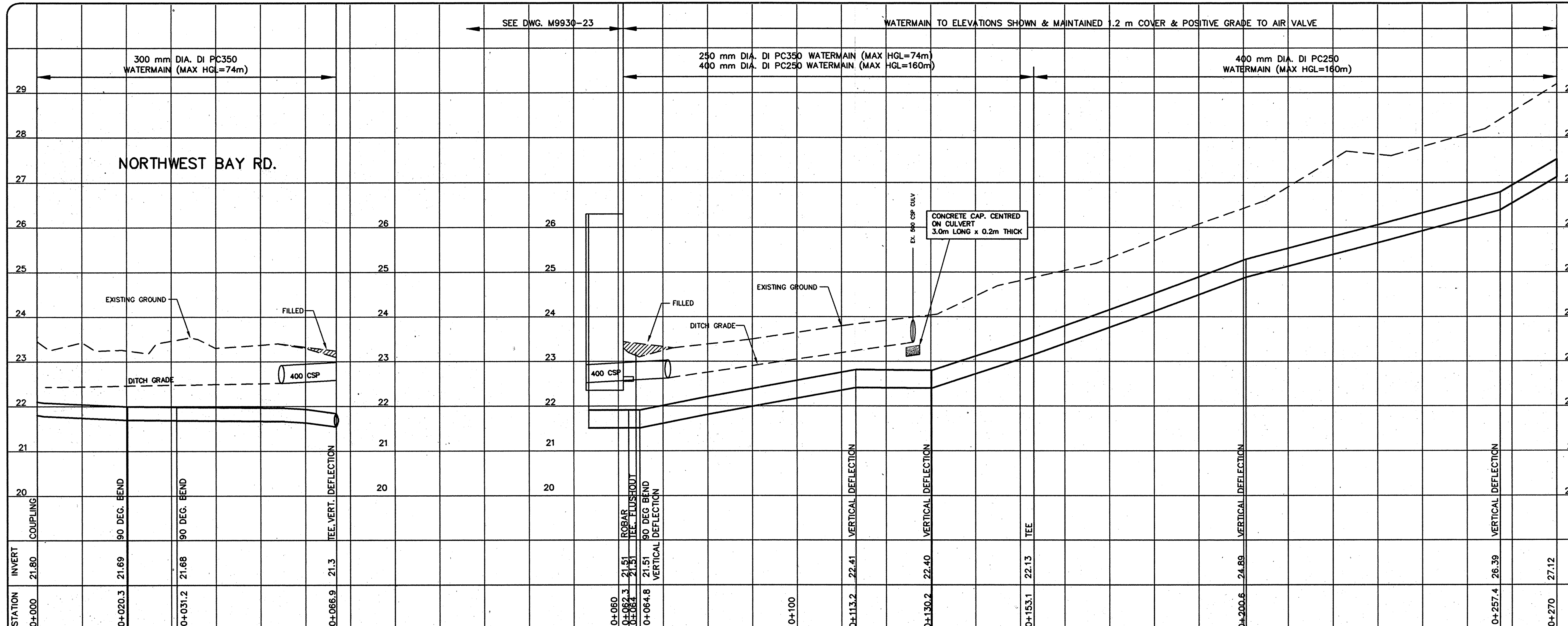
Task No.	Phasing	Task Name	Description	Volume (ML)	Unit Cost (\$/m ³)	Cost (\$ 2014)
R1	2035	Springwood Reservoir Upgrade	Increase Existing	4.1	\$600	\$2,460,000
R2	2018	Fairwinds Reservoir Upgrade	Increase Existing	1.0	\$900	\$900,000
2016 TOTAL						\$0
2018 TOTAL						\$900,000
2035 TOTAL						\$2,460,000
2050 TOTAL						\$0
GRAND TOTAL						\$3,360,000



Table 3E- Capital Costs for Pump Station Upgrades

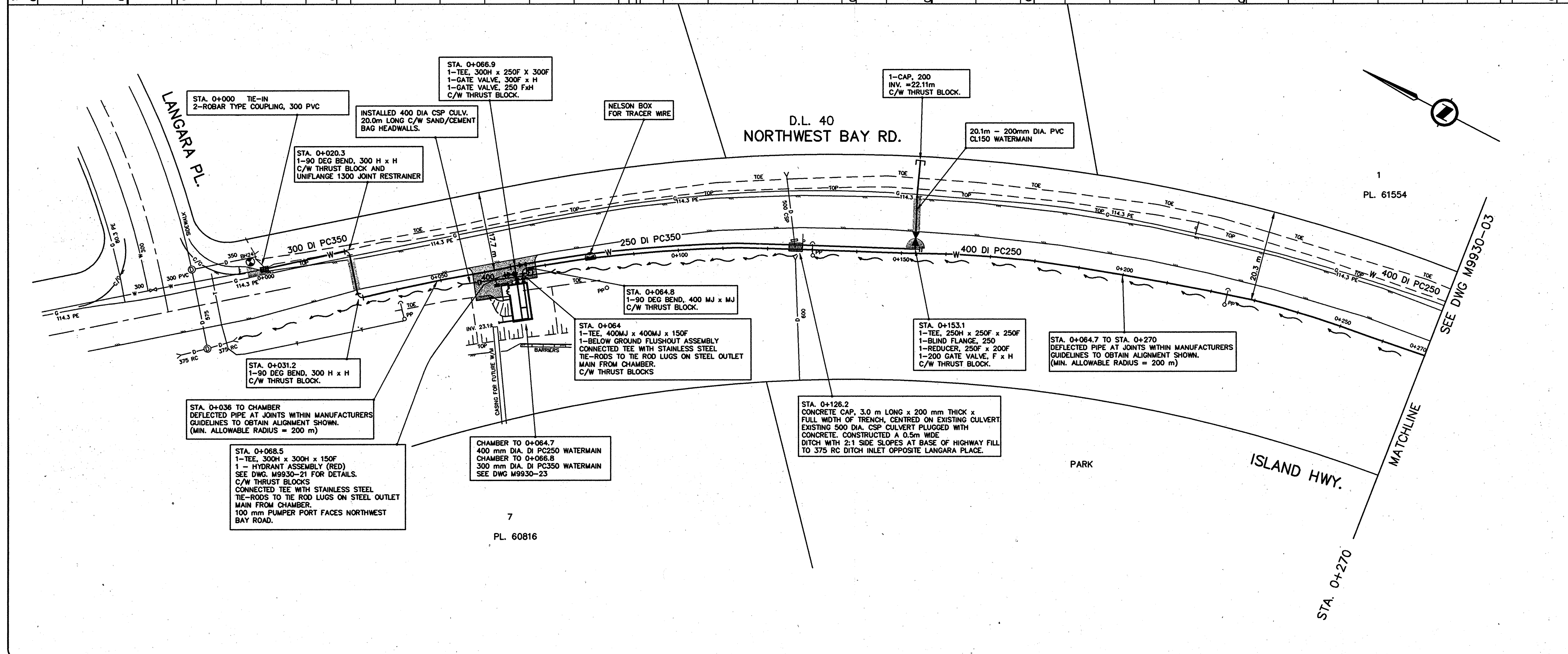
Task No.	Phasing	Task Name	Power (kW)	Unit Cost (\$/kW)	Cost (\$ 2014)
P0	2016 - 2050	Pump station in water treatment	Cost Included in WTP Pre-Design Report		
P1	2018	NBP Supply Pump Station	270	\$8,000	\$2,160,000
P3	2018	Springwood Booster Station Fire Pump Upgrade	160	\$500	\$80,000
P4	2050	Arbutus Station Fire Pump Upgrade	100	\$500	\$50,000
P5	2018	Decommission Craig Bay Pump Station	N/A	\$30,000	\$30,000
2016 TOTAL					\$0
2018 TOTAL					\$2,270,000
2035 TOTAL					\$0
2050 TOTAL					\$50,000
GRAND TOTAL					\$2,320,000





REVISIONS				
No.	DATE	BY	ENG.	DESCRIPTION
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2	FEB. 28/01	G.H.	CD	RECORD DRAWING

RECORD OF ISSUE				
No.	DATE	BY	ENG.	DESCRIPTION
A	APRIL 14/00	P.B.	CD	APPROVALS
B	APRIL 17/00	D.H.	CD	TENDER
C	AUG. 18/00	P.B.	CD	CONSTRUCTION
D	FEB. 28/01	G.H.	CD	RECORD I



PROJECT NO. M9930				
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DESIGNED	CD			
CHECKED	CD			
APPROVED	PS			
SCALE	HOR. 1:500, VERT. 1:50			

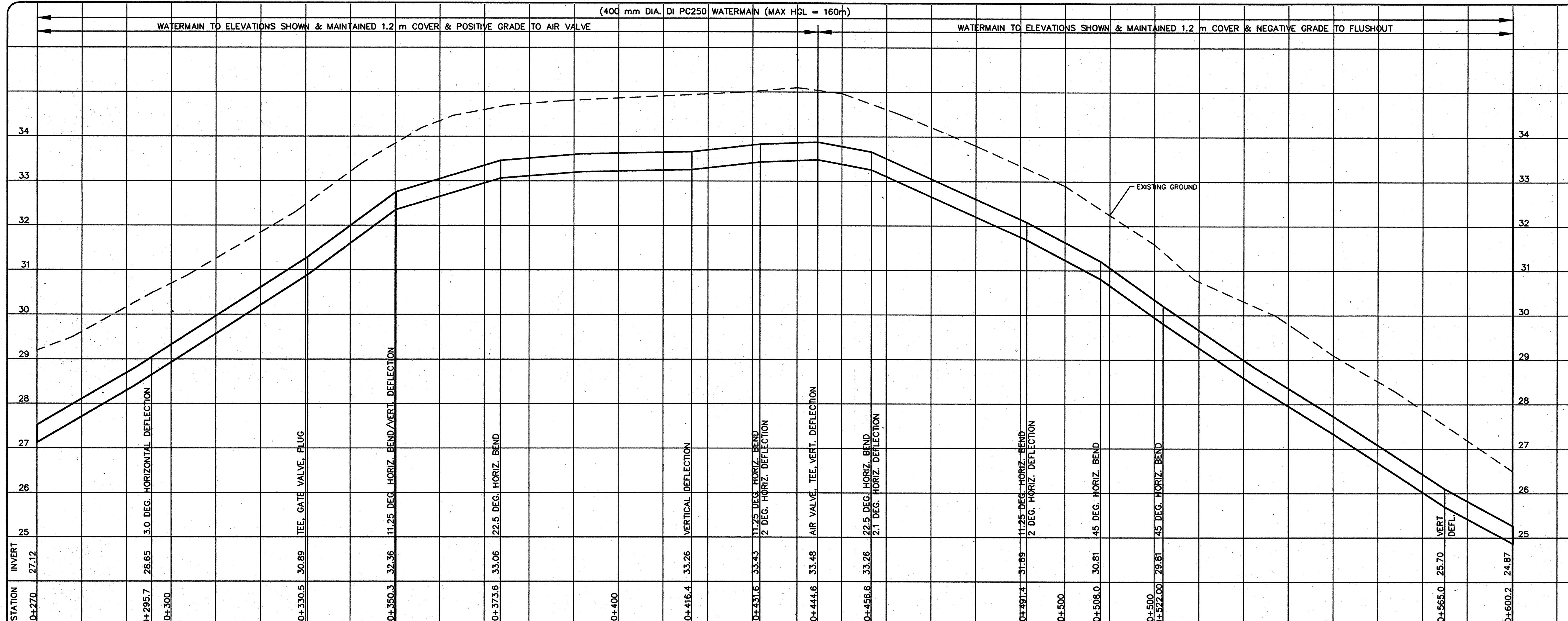
CUSTOMER
THE REGIONAL DISTRICT OF NANAIMO

PROJECT
NANOOSE BULK WATER SUPPLY MAIN PHASE II

TITLE
NORTHWEST BAY ROAD PLAN & PROFILE STA. 0+000 - 0+270 NA-135

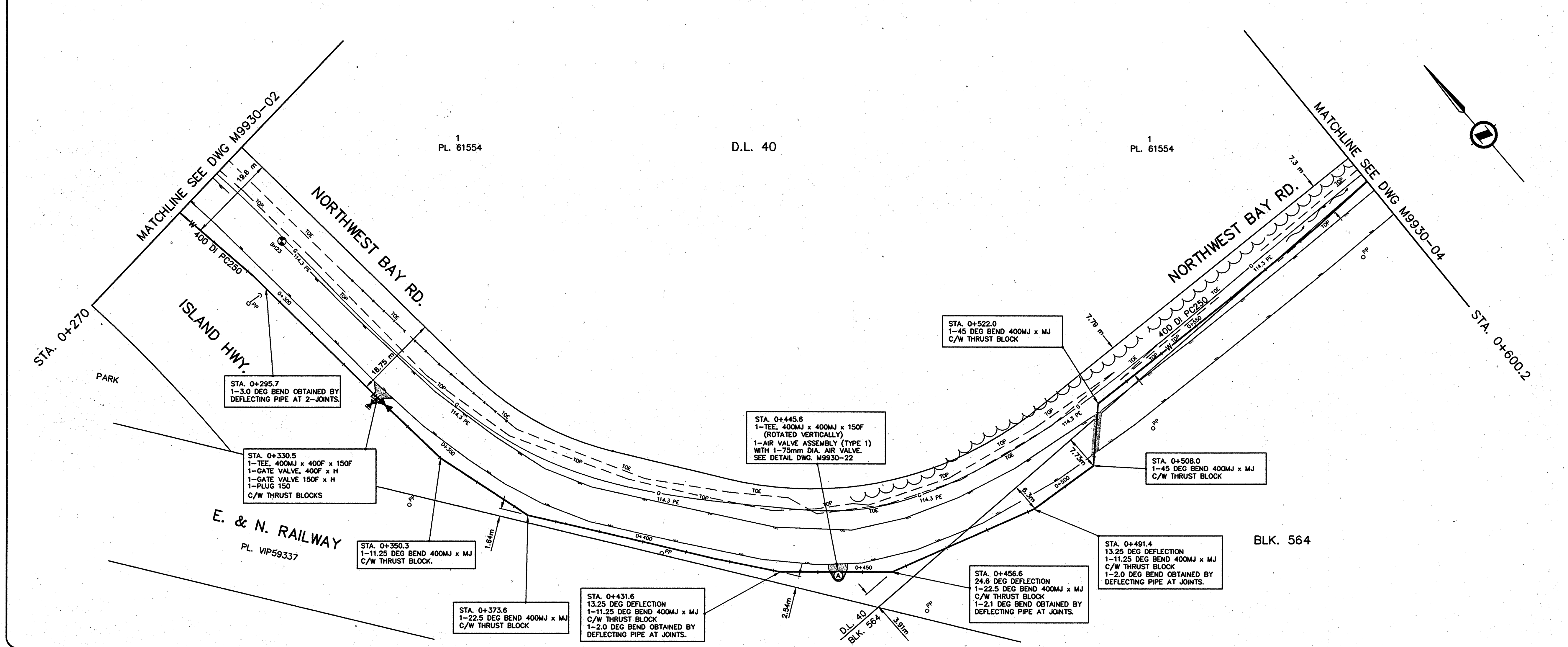
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NA-135



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2	FEB. 28/01	G.H.	CD	RECORD DRAWING

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B	APRIL 17/00	D.H.	CD	TENDER
C	AUG. 18/00	P.B.	CD	CONSTRUCTION
D	FEB. 28/01	G.H.	CD	RECORD



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No.	DATE	BY	ENG.	DESCRIPTION

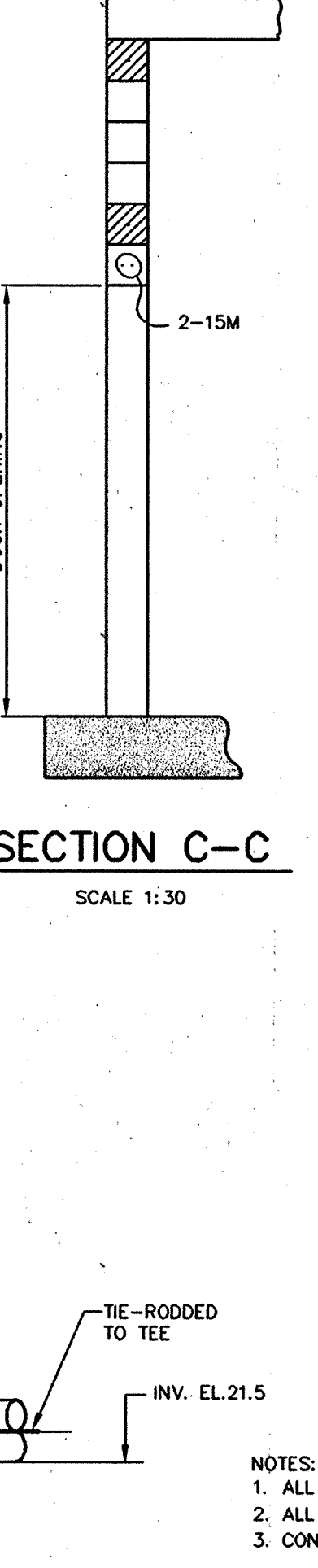
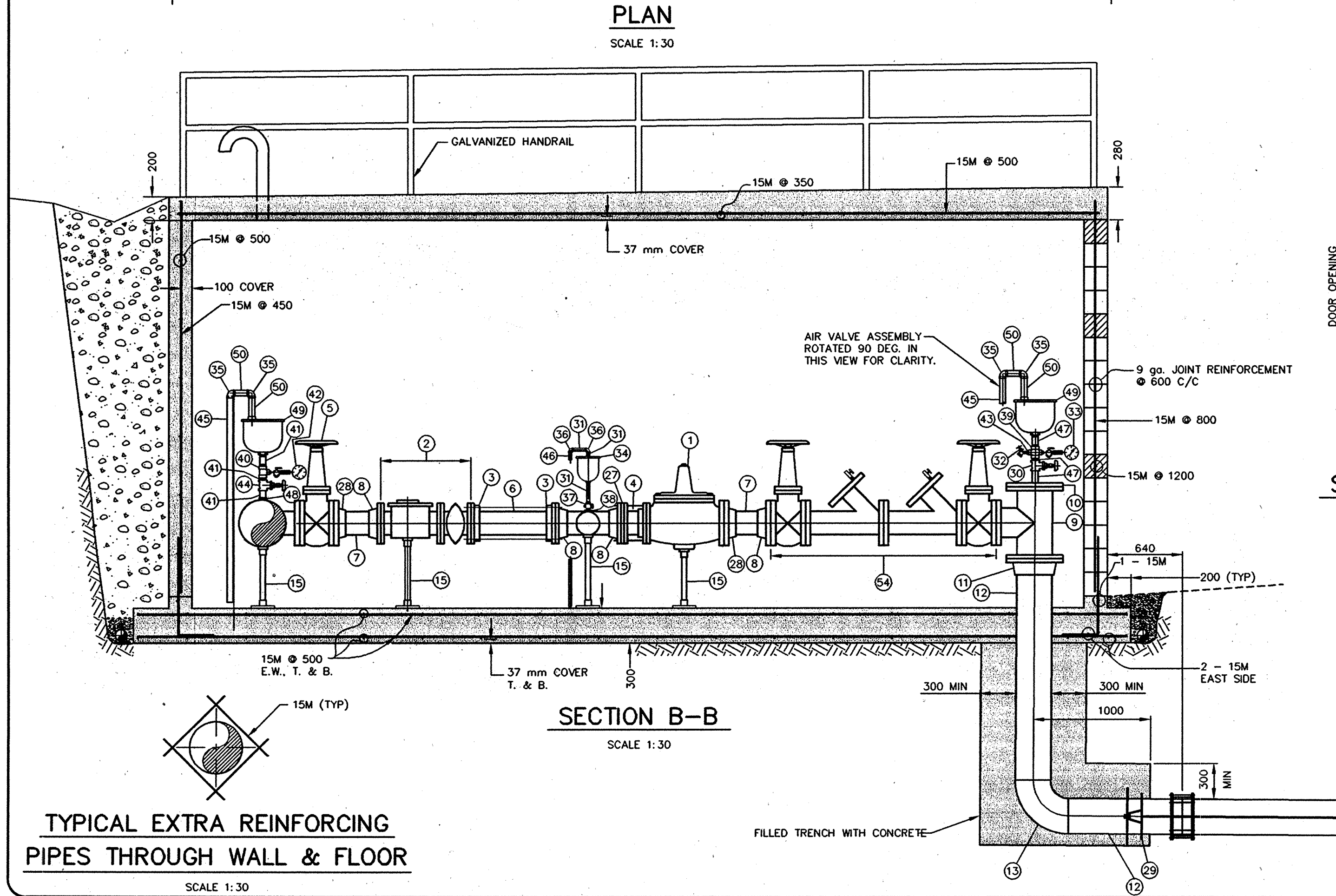
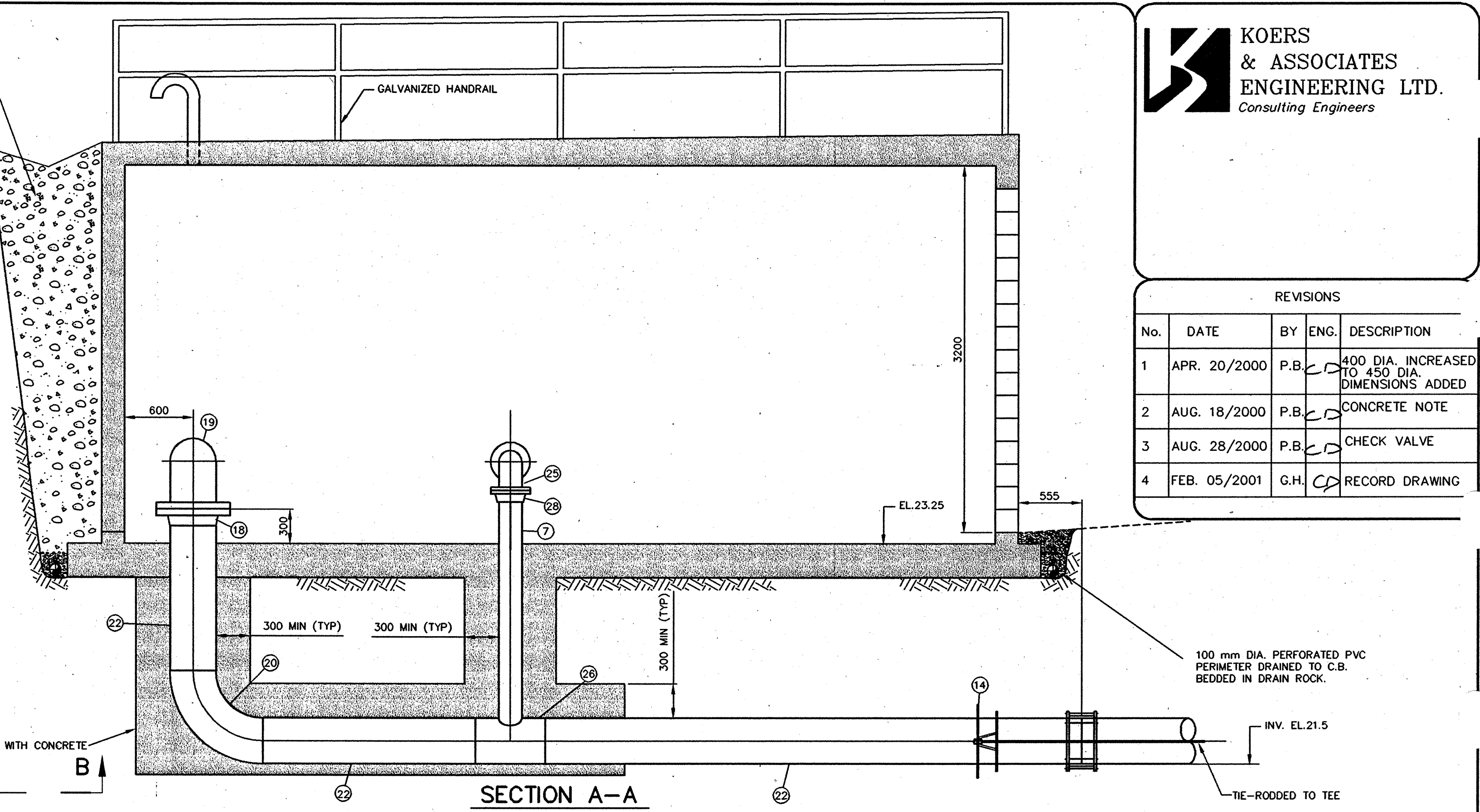
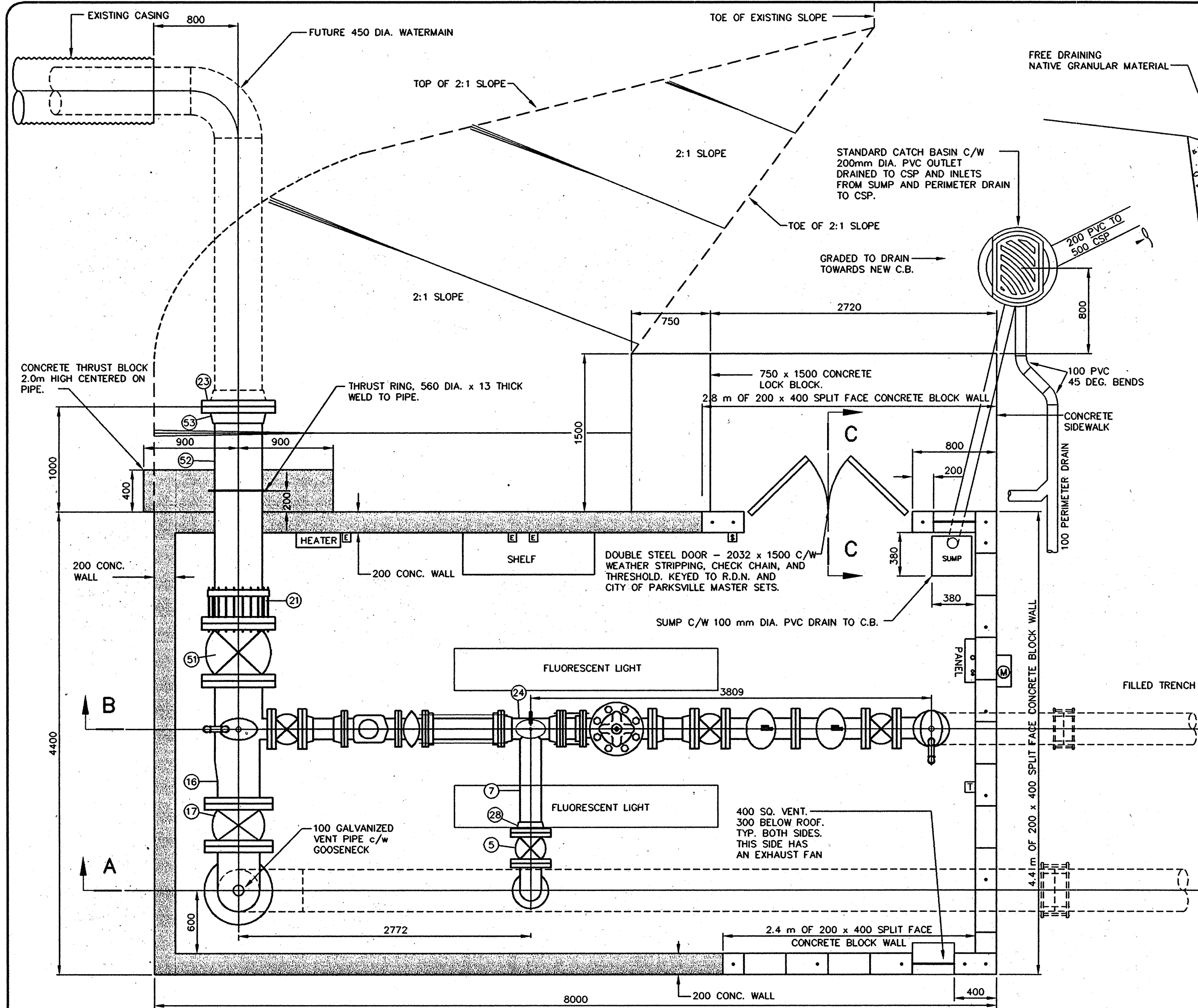
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DESIGNED CD
CHECKED CD
APPROVED BS

SCALE HOR. 1:500, VERT. 1:50
CLIENT
THE REGIONAL DISTRICT OF NANAIMO

PROJECT
NANOOSE BULK WATER SUPPLY MAIN PHASE II
TITLE
NORTHWEST BAY ROAD PLAN & PROFILE STA. 0+270 - 0+600.2 NA-136

NA-136

REVISIONS				
No.	DATE	BY	ENG.	DESCRIPTION
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2	AUG. 18/2000	P.B.	CD	CONCRETE NOTE
3	AUG. 28/2000	P.B.	CD	CHECK VALVE
4	FEB. 05/2001	G.H.	CD	RECORD DRAWING



ITEM No.	DESCRIPTION	QUANTITY
1	P.R.V., PSV & FCV, CLA-VAL, 49-05 BCSY, 200F x F, CL250 x CL150F C/W SOLENOID CONTROL VALVE, SET AT 500 kPa (72 psi), PSV SET AT 460 kPa (65 psi), FCV SET AT 381 kPa (500 ipgm), 500 MAX. INLET PRESSURE 1,340 kPa (195 psi) CLA-VAL CO. 150-180 MODEL 8-100-01KX 494, SER. # W02824-SV	1
2	TURBINE METER, SENSUS W3500, 200F x F C/W STRAINER, ELECTRONIC HIGH SPEED REGISTER AND MODEL 1100D FLOW INDICATOR ANALOG OUTPUT.	1
3	UNIFLANGE ADAPTOR, SERIES 400	2
4	DISMANTLING JOINT, BAKER, 200 DIA. CL150.	2
5	AVK GATE VALVE, RESILIENT SEAT, 200F x F, CL250 C/W HANDWHEEL.	2
6	200 DUCTILE IRON PIPE, PC350	TO SUIT
7	PIPE, 200 DIA. STEEL	TO SUIT
8	WELD NECK FLANGE, 200 DIA., CL150	4
9	TEE, STEEL 300F x 300F x 200F, CL150.	1
10	REDUCING FLANGE, 300 x 50FIPT., CL. 150.	1
11	WELD NECK FLANGE, 300 DIA., CL150	1
12	PIPE, 300 STEEL	TO SUIT
13	90 DEG. ELBOW, STEEL, 300 DIA.	1
14	HARNES RING ASSEMBLY, SEE DWG. M9930-25.	1
15	ADJUSTABLE PIPE SUPPORT.	5
16	TEE, STEEL 450F CL E x 400F CL E x 200F, CL250. C/W ITEM #48.	1
17	GATE VALVE, RESILIENT SEAT, 400F x F, CL E FLANGE 150 DRILLING C/W HANDWHEEL.	1
18	WELD NECK FLANGE, 400 DIA., CL E FLANGE 150 DRILLING	1
19	90 DEG. ELBOW, STEEL 400 F x F, CL E FLANGE 150 DRILLING	1
20	90 DEG. ELBOW, STEEL, 400 DIA., CL250.	1
21	ROBAR FLANGE COUPLING ADAPTER, 450 DIA. CL E FLANGE 150 DRILLING	1
22	PIPE, 400 DIA. STEEL, CL. 250.	TO SUIT
23	BLIND FLANGE, 450, CL E FLANGE 150 DRILLING	1
24	TEE, STEEL, 200 x 200 x 200. C/W ITEM #38.	1
25	90 DEG. ELBOW, D.I., 200F x F, CL250.	1
26	TEE, STEEL, 400 x 400 x 200.	1
27	ORIFICE PLATE ASSEMBLY, 200 DIA. WITH BORE SIZE OF 114.3mm DIA.	1
28	WELD NECK FLANGE, 200 DIA., CL250.	3
29	HARNES RING ASSEMBLY, SEE DWG. M9930-25.	1
30	GATE VALVE, BRASS, 50FIPT, CL150.	1
31	NIPPLE, BRASS, 25MIPT x 25MIPT, CL150.	TO SUIT
32	HOSE BIB, BRASS, 25FIPT, CL150.	1
33	PRESSURE GAUGE, 0-2070kPa (0-300 PSI) C/W SNUBBER, BRASS SHUTOFF, BRASS NIPPLES & REDUCING BUSHING ALL SIZED TO SUIT.	1
34	AIR VALVE, APCO 143C, 25 FIPT	1
35	90 DEG. ELBOW, BRASS, 50FIPT, CL150.	4
36	90 DEG. ELBOW, BRASS, 25FIPT, CL150.	2
37	GATE VALVE, BRASS, 25FIPT, CL150.	1
38	WELDDOLET, 25FIPT, CL150.	1
39	CROSS, BRASS, 50FIPT, CL150.	1
40	TEE, BRASS, 50FIPT, CL250.	1
41	NIPPLE, BRASS, 50MIPT x 50MIPT, CL250.	TO SUIT
42	PRESSURE GAUGE, 0-2070kPa (0-300 PSI) C/W SNUBBER, BRASS SHUTOFF, BRASS NIPPLES & REDUCING BUSHING ALL SIZED TO SUIT.	1
43	REDUCING BUSHING, BRASS, 50 x 25 FIPT	1
44	GATE VALVE, BRASS, 50FIPT, CL250.	1
45	NIPPLE, BRASS, 50MIPT x PLAIN, CL150., TO FLOOR.	2
46	NIPPLE, BRASS, 25MIPT x PLAIN, CL150., TO FLOOR.	1
47	NIPPLE, BRASS, 50MIPT x 50MIPT, CL150.	TO SUIT
48	THREDOLET, 50FIPT, CL250.	1
49	AIR VALVE, APCO 145C, 50 FIPT	2
50	NIPPLE, BRASS, 50MIPT x 50MIPT, CL150.	TO SUIT
51	GATE VALVE, RESILIENT SEAT, 450F x F, CL E FLANGES 150 DRILLING C/W HANDWHEEL.	1
52	PIPE, 450 DIA. STEEL	TO SUIT
53	WELD NECK FLANGE, 450 DIA., CL E FLANGE 150 DRILLING	1
54	DOUBLE CHECK VALVE ASSEMBLY, WATTS SERIES 709(-8), MAX. 175 p.s.i., SER. # 326237	1

NOTES:
 1. ALL STEEL PIPE SAND BLASTED, LINED AND COATED WITH FUSION BONDING TO AWWA C213 AND NSF61. EXTERNAL COATING FINISHED WITH BLUE ENAMEL.
 2. ALL BURIED BOLTS, NUTS, TIE-RODS AND IRREGULAR SURFACES COATED WITH PETROLATUM AND WAX TAPE IN ACCORDANCE WITH AWWA C217.
 3. CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 25 MPa AFTER 28 DAYS, SLUMP 50 - 75 mm, AIR CONTENT 4 - 6%, AND MAXIMUM AGGREGATE SIZE OF 20 mm.

RECORD OF ISSUE				
No.	DATE	BY	ENG.	DESCRIPTION
A	APRIL 14/00	P.B.	CD	APPROVALS
B	APRIL 17/00	P.B.	CD	TENDER
C	AUG 18/00	P.B.	CD	CONSTRUCTION
D	FEB 05/01	G.H.	CD	RECORD DRAWING

PROJECT NO. M9930
 DRAWN P.R.B. AUTOCAD 14
 DESIGNED CD
 CHECKED CD
 APPROVED BS
 DATE JAN. 2000
 SCALE AS SHOWN

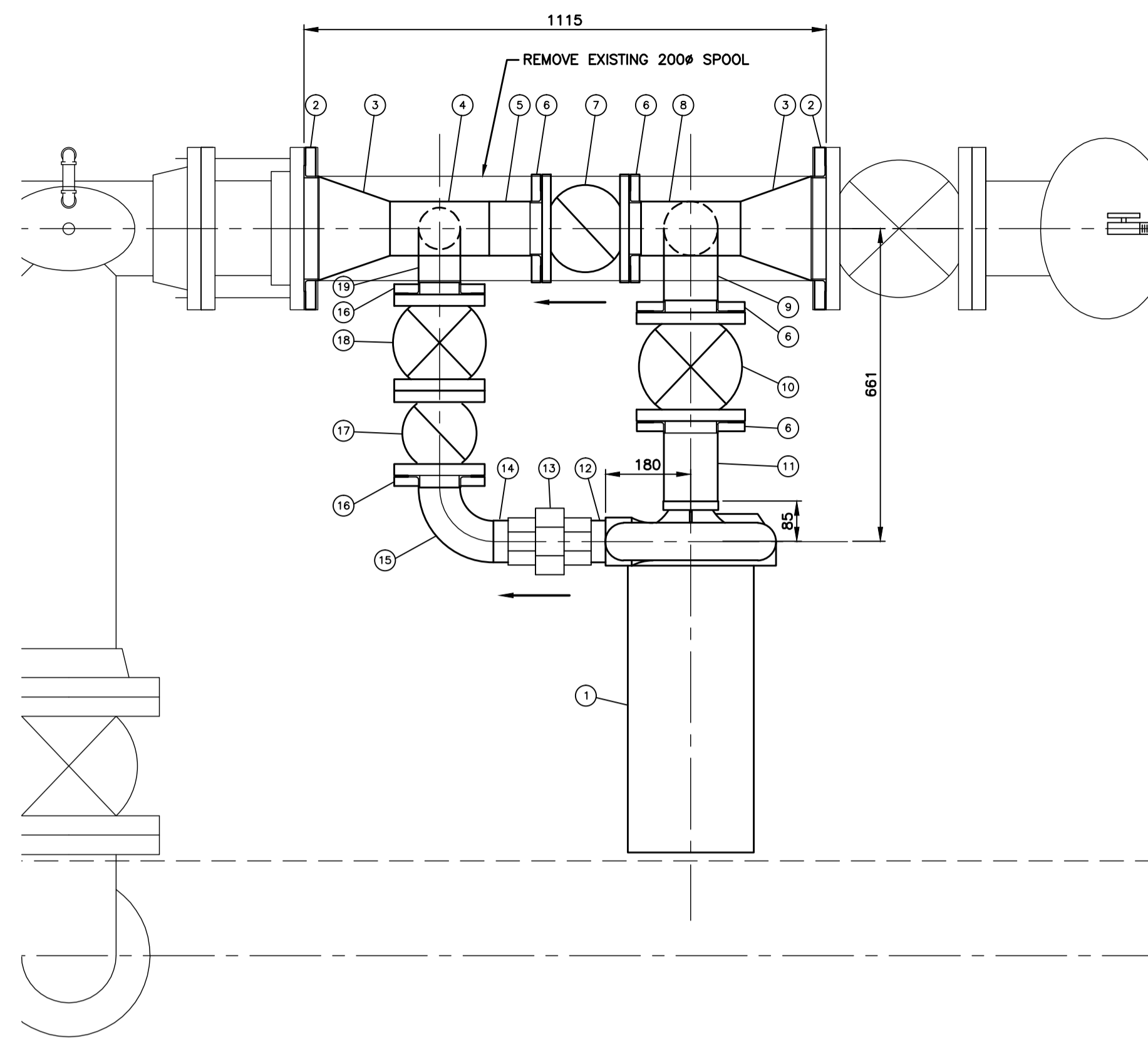
CLIENT
REGIONAL DISTRICT OF NANAIMO

PROJECT
NANOOSE BULK WATER SUPPLY MAIN PHASE II

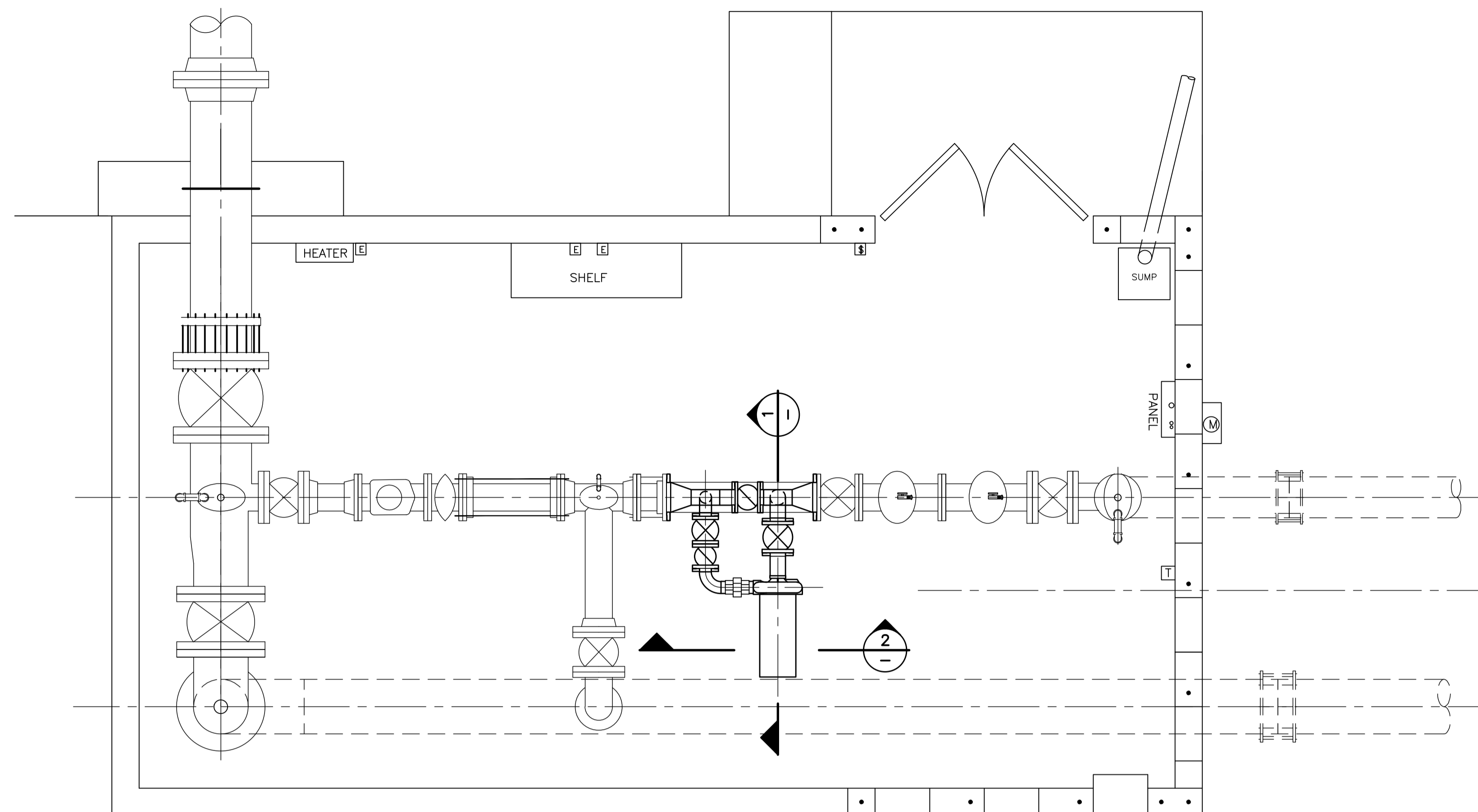
TITLE
CRAIG BAY P.R.V. CHAMBER NA-156

DRAWING No. M9930-23
 REV. 4
 SHEET 23/25

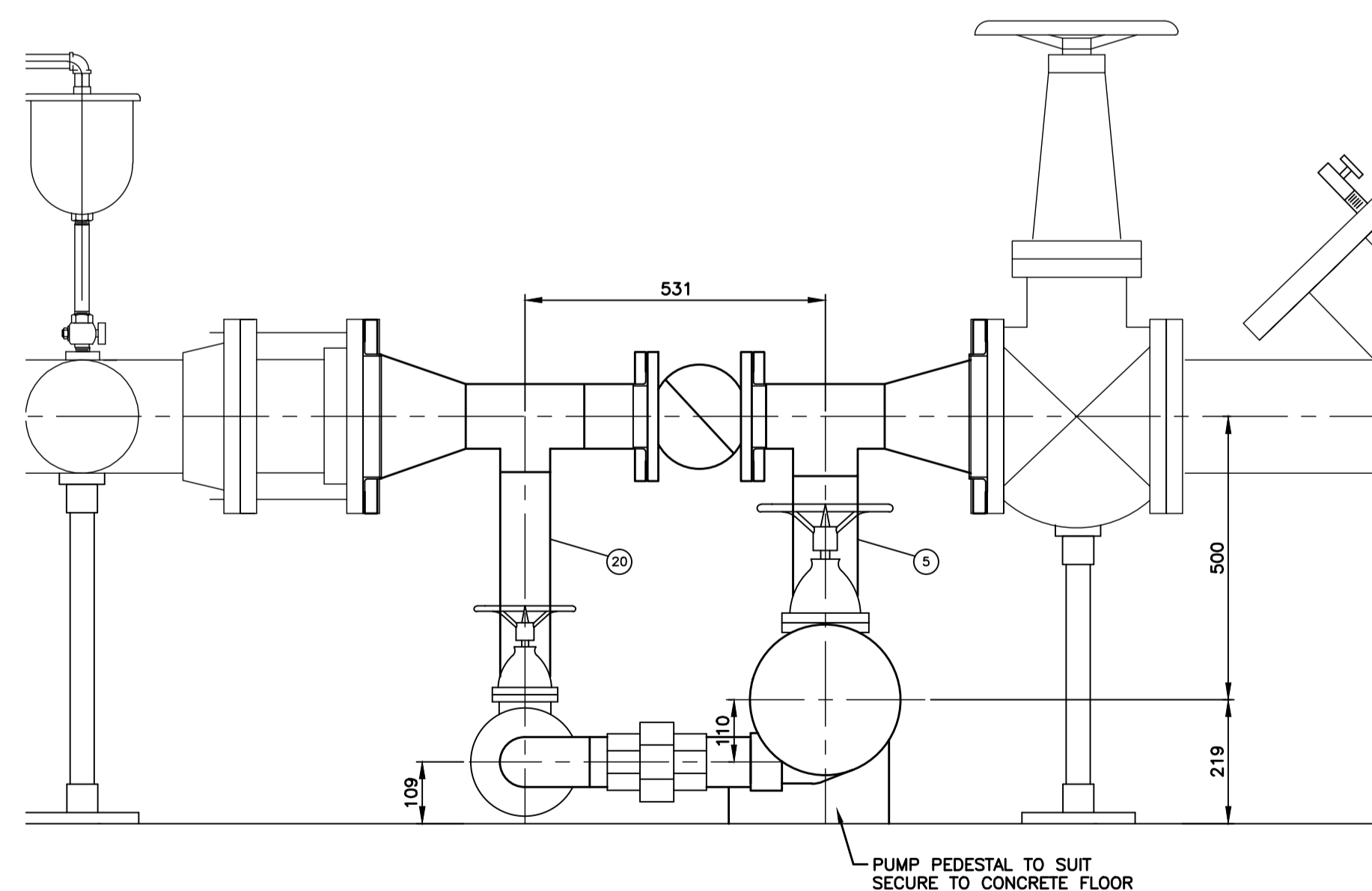
NA-156



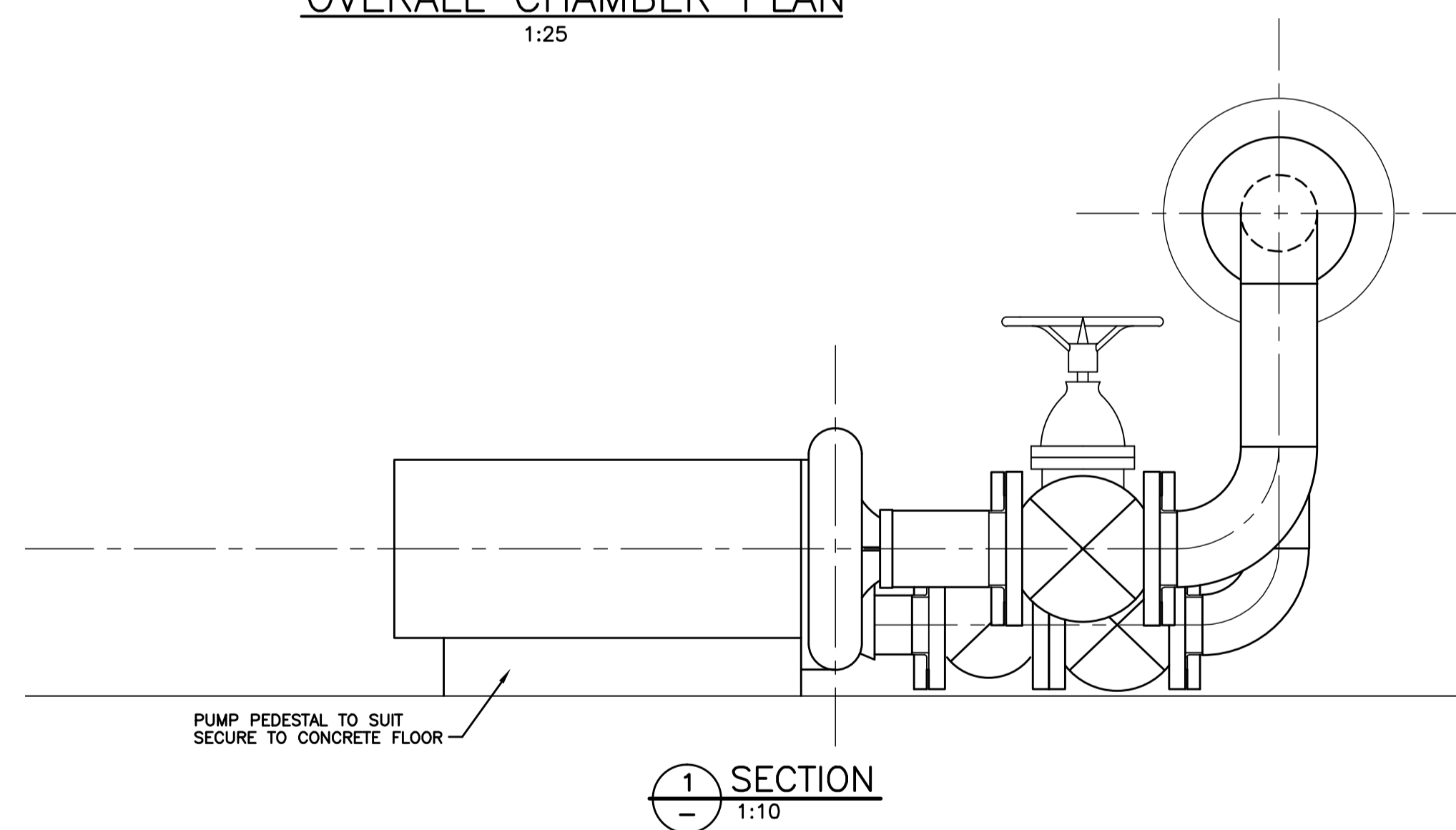
PUMP TIE-IN PLAN
1:10



OVERALL CHAMBER PLAN
1:25

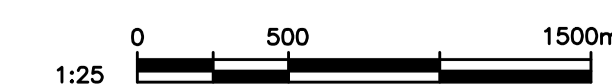


SECTION 2
1:10



SECTION 1
1:10

COMPONENT LIST		
ITEM No.	DESCRIPTION	QUANTITY
1	OWNER SUPPLIED - BERKELEY TYPE "B" BOOSTER PUMP	1
2	VAN-STONES, 200# SS	2
3	REDUCER, 200PEX100PE SS	2
4	TEE, 100PEX100PEX75PE SS	1
5	SPOOL, 100PEX100PE SS	TO SUIT
6	VAN-STONES, 100# SS	4
7	CHECK VALVE, 100# VALMATIC 1800 SERIES	1
8	TEE, 100PEX100PEX100PE SS	1
9	90° BEND, 100PEX100PE SS	1
10	GATE VALVE, 100Fx100F	1
11	SPOOL, 100PEX100NPT SS	TO SUIT
12	SPOOL, 75NPTx75NPT SS	TO SUIT
13	UNION, 75# BRASS	1
14	SPOOL, 75NPTx75PE SS	1
15	90° BEND, 75PEX75PE SS	1
16	VAN-STONES, 75# SS	2
17	CHECK VALVE, 75# VALMATIC 1800 SERIES	1
18	GATE VALVE, 75Fx75F	1
19	90° BEND, 75PEX75PE SS	1
20	SPOOL, 75PEX75PE SS	TO SUIT



RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
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A	20MAY04	BRC	CD	ISSUE FOR TENDER
ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PRELIMINARY

PROJECT NO.	0104
DRAWN	BRC
DESIGNED	BRC/CD
CHECKED	
APPROVED	
DATE	APRIL 01, 2004
SCALE	1:500

CLIENT

THE REGIONAL DISTRICT OF NANAIMO

PROJECT

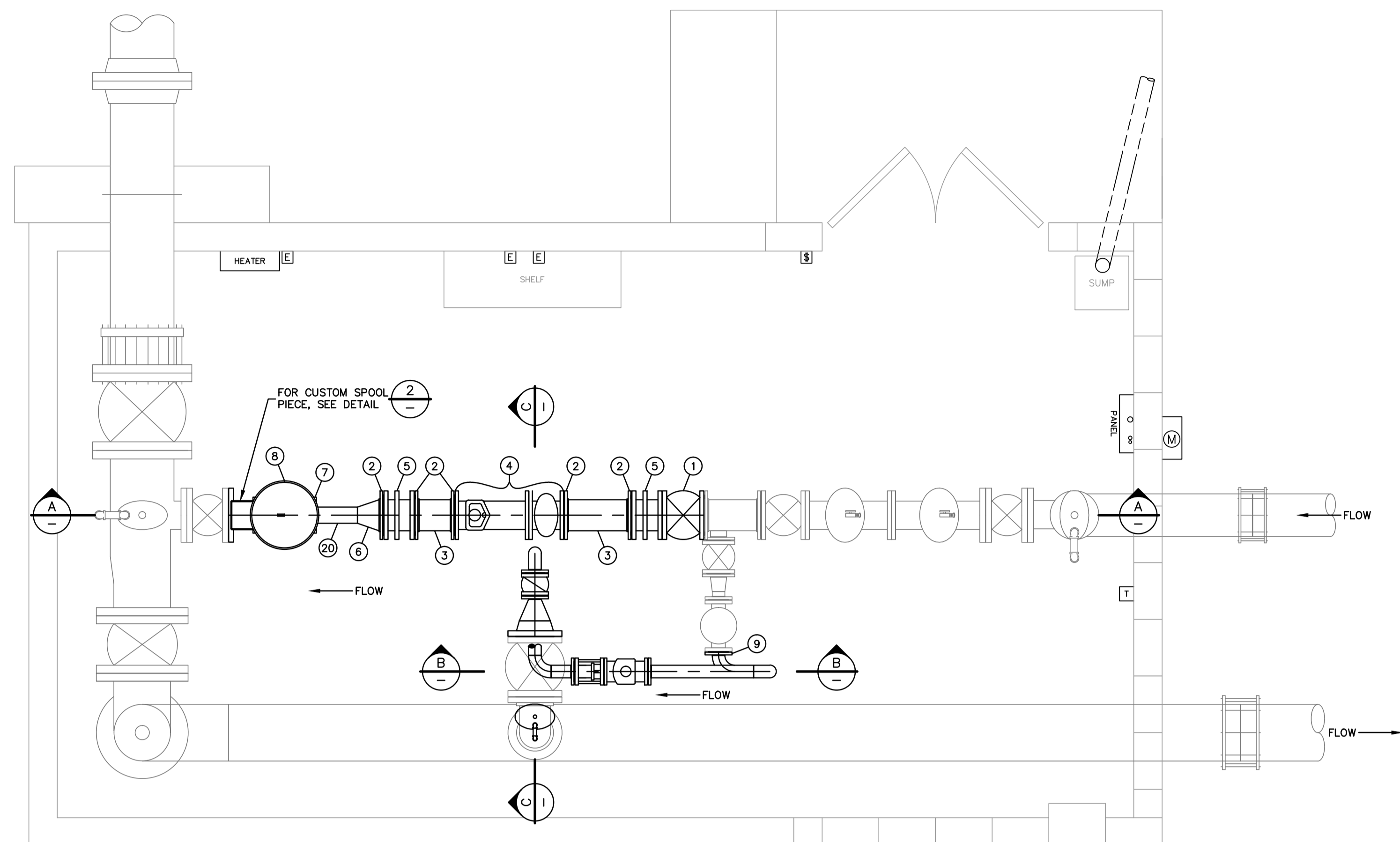
NANOOSE BULK WATER SUPPLY

TITLE

CRAIG BAY FLOW CONTROL BUILDING TEMPORARY PUMP MODIFICATION

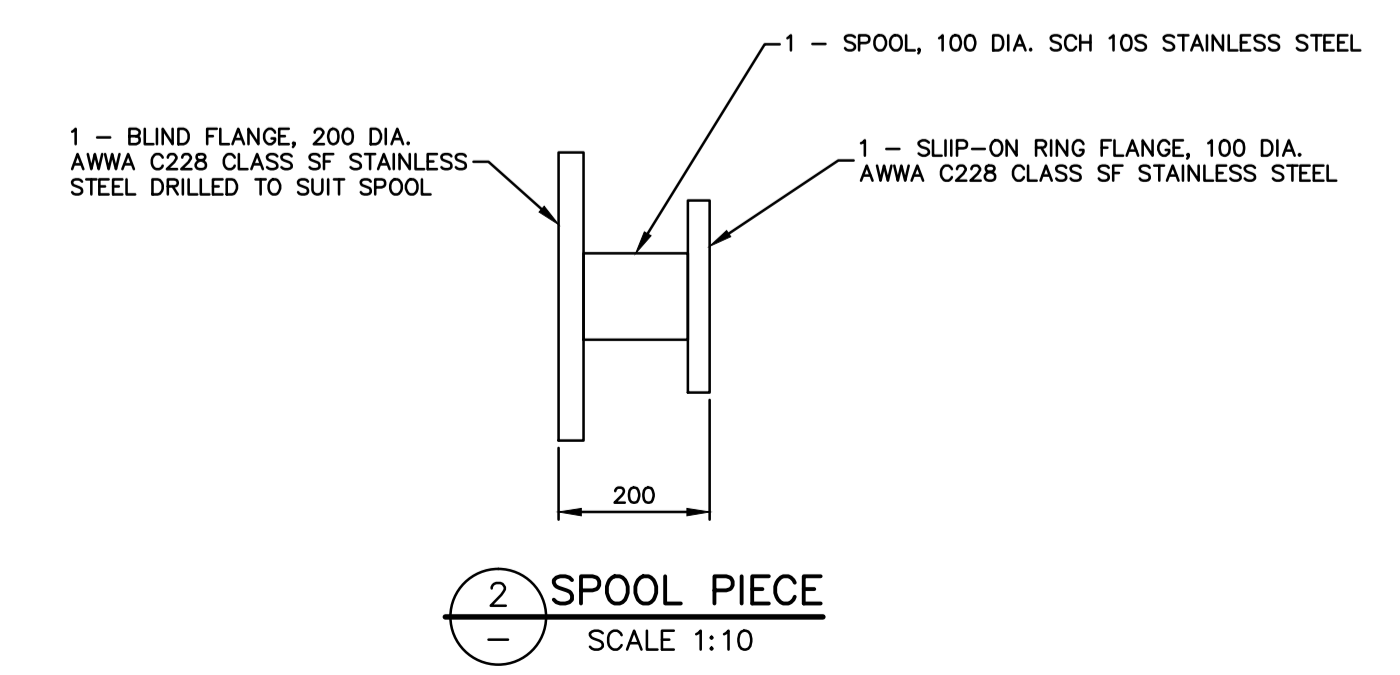
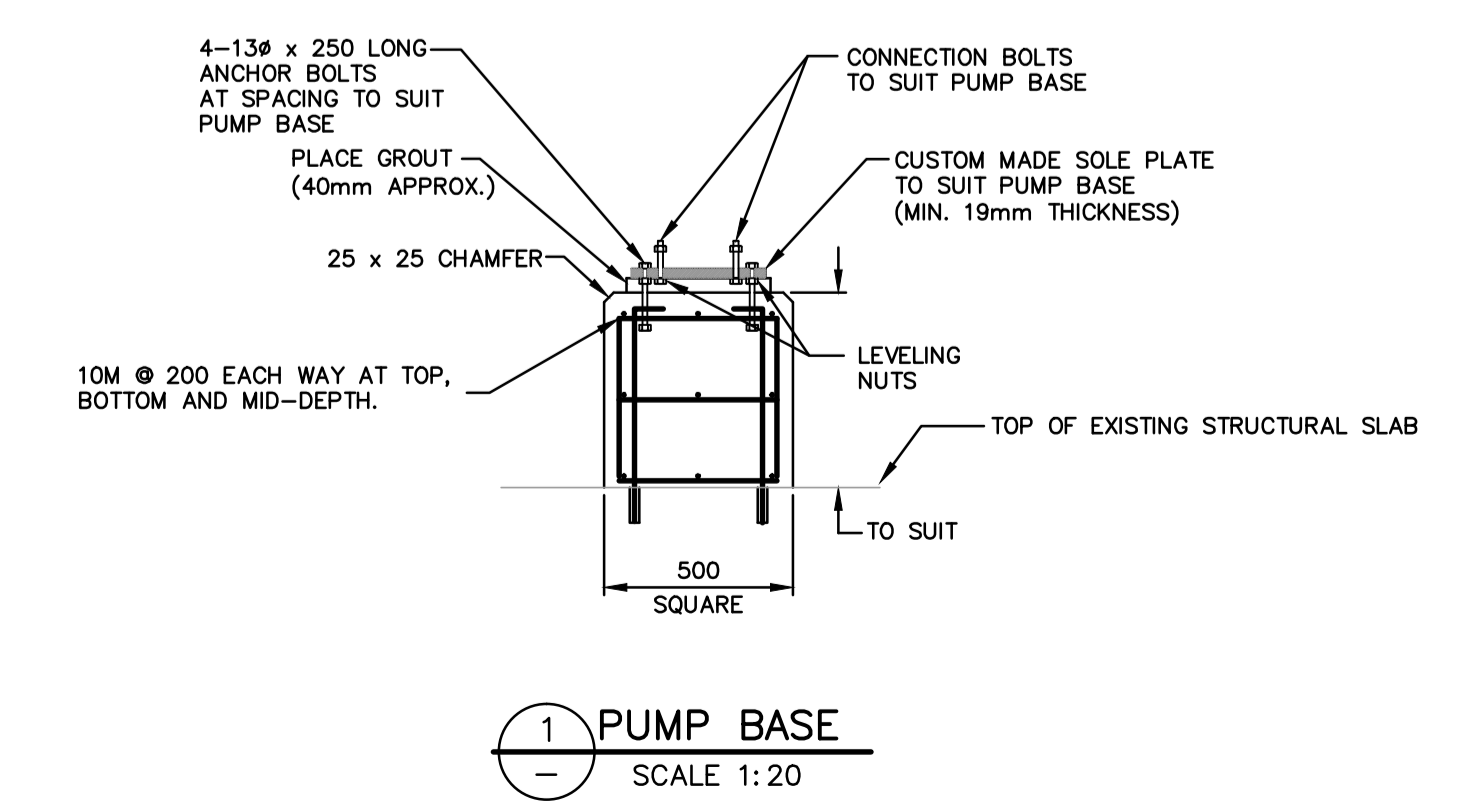
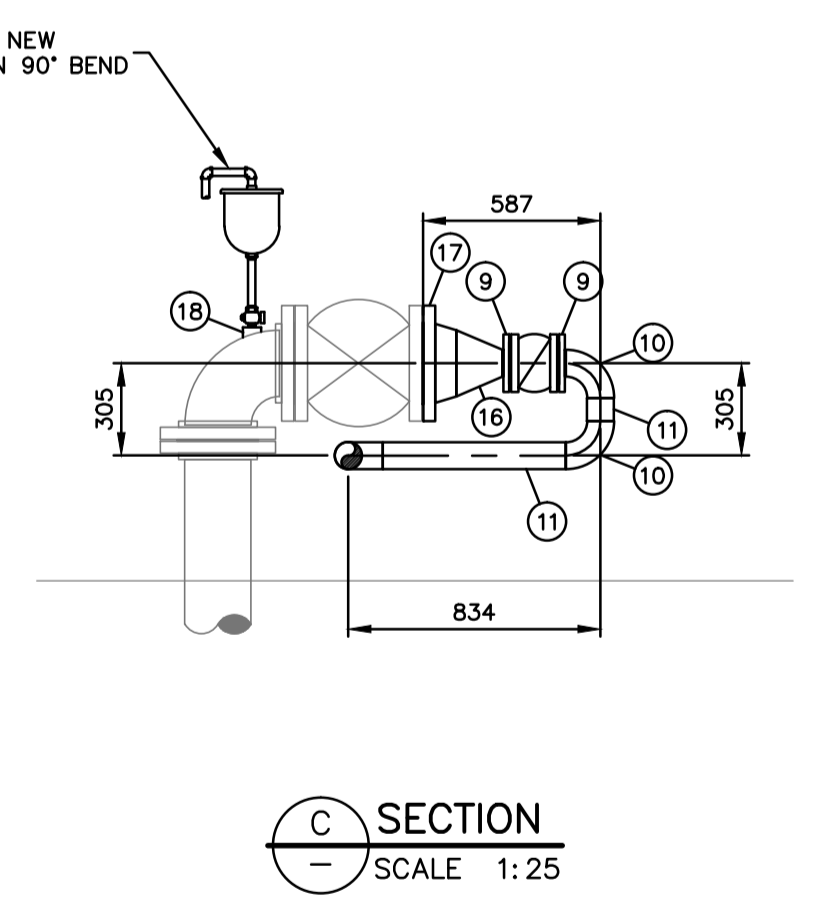
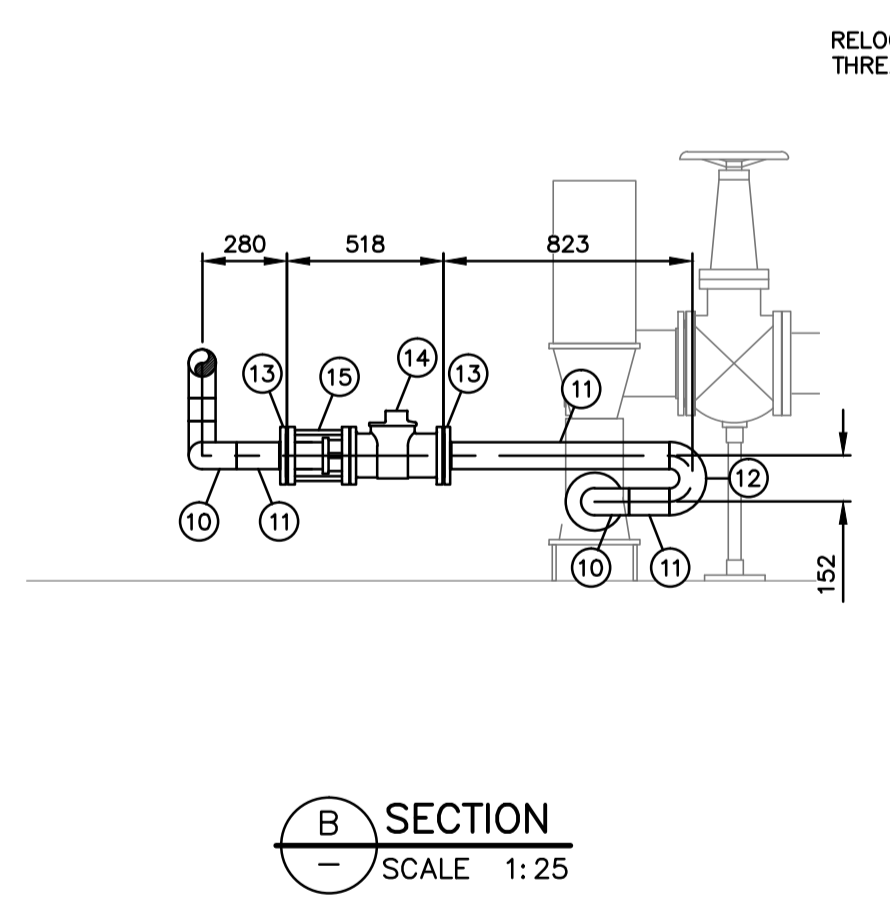
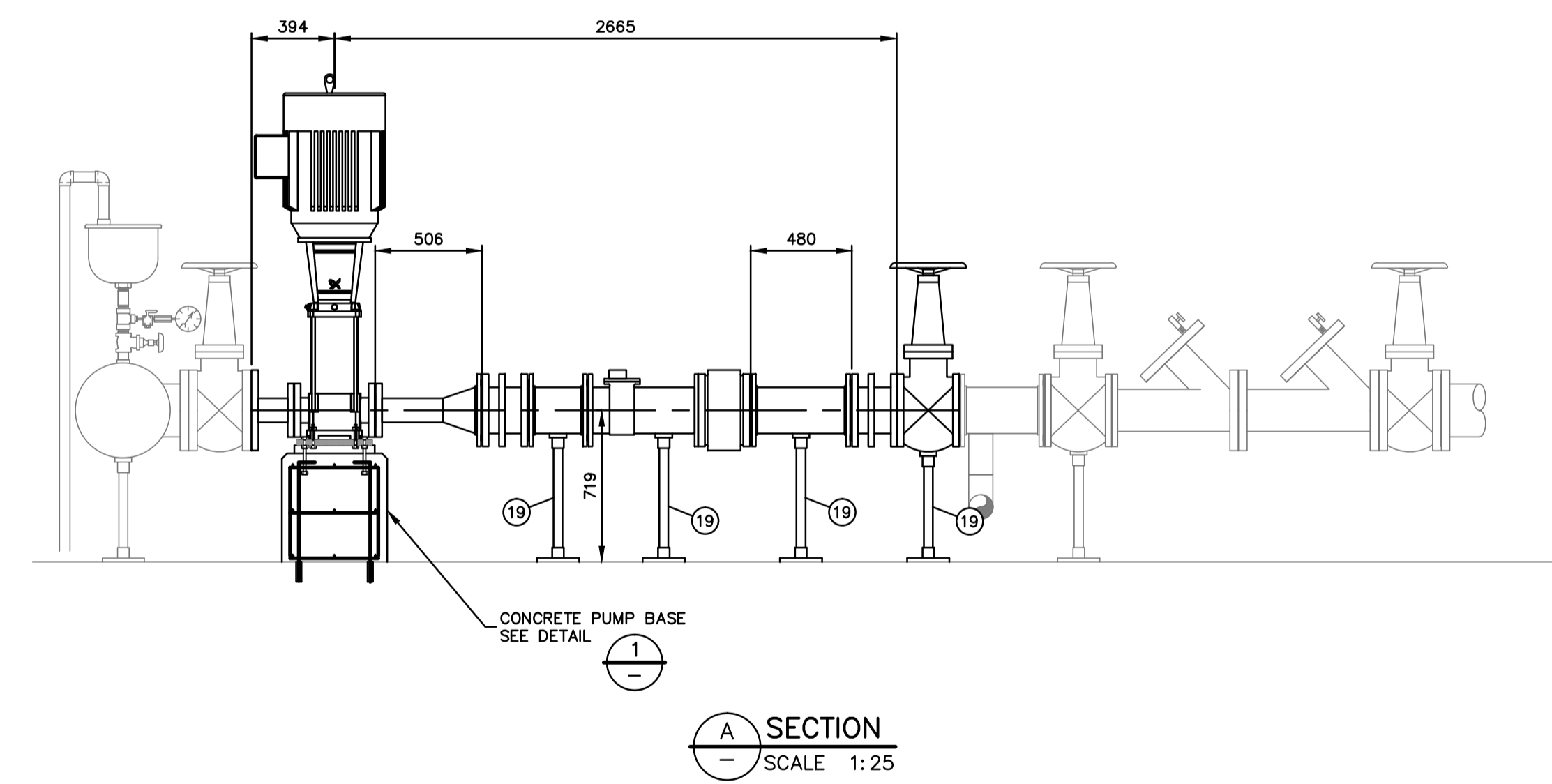
DRAWING No.	REV.	SHEET
0104-02		1 of 1

File: \\A:\5251_Nanaimo, RD\1302_Craig Bay Flow Pump\03 Drawings\Record Drawings\0104-02.dwg Plot Time: Aug 30, 2017 - 4:26pm User: ccdawney



COMPONENT LIST		
ITEM No.	DESCRIPTION	QUANTITY
1	GATE VALVE, 200FXF c/w HANDWHEEL	1
2	SLIP-ON VANSTONE FLANGE, 200 DIA. CL 150 STAINLESS STEEL c/w GALVANIZED STEEL BACKING RING	5
3	PIPE, 200 DIA. SCH 10S STAINLESS STEEL	TO SUIT
4	FLOWMETER, 200FXF (SENSUS W3500) c/w STRAINER	OWNER SUPPLIED
5	DISMANTLING JOINT, 200FXF (BAKER CL 150)	OWNER SUPPLIED
6	REDUCER, 200x100 SCH 10S STAINLESS STEEL	1
7	SLIP-ON HUB FLANGE, 100 DIA. CL 300 STAINLESS STEEL	1
8	VERTICAL PUMP, 100FXF (GRUNDFOS MODEL CR 90-4-1)	OWNER SUPPLIED
9	BUTT-WELD VANSTONE FLANGE, 75 DIA. CL 150 STAINLESS STEEL c/w GALVANIZED STEEL BACKING RING	3
10	LONG RADIUS 90° BEND, 75 DIA. SCH 10S STAINLESS STEEL	4
11	PIPE, 75 DIA. SCH 10S STAINLESS STEEL	TO SUIT
12	SHORT RADIUS 180° RETURN, 75 DIA. SCH 10S STAINLESS STEEL	1
13	SLIP-ON VANSTONE FLANGE, 75 DIA. CL 150 STAINLESS STEEL c/w GALVANIZED STEEL BACKING RING	2
14	FLOWMETER, 75FXF (SENSUS W350 DR)	OWNER SUPPLIED
15	DISMANTLING JOINT, 75FXF (ROMAC INDUSTRIES DJ 400 SHOWN)	1
16	REDUCER, 200x75 SCH 10S STAINLESS STEEL	1
17	WELD-NECK FLANGE, 200 DIA. CL 300 STAINLESS STEEL	1
18	THREDOLET, SIZED TO SUIT EXISTING AIR VALVE PIPING, CARBON STEEL LIQUID EPOXY COATED TO AWWA C210 (MIN 16 MILS DFT)	1
19	ADJUSTABLE PIPE SUPPORT	OWNER SUPPLIED
20	PIPE, 100 DIA. SCH 10S STAINLESS STEEL	TO SUIT

ATTENTION:
DO NOT RELY ON THIS INFORMATION ALONE!
 You must hand dig to expose the line at several locations to determine its exact location and depth before using any mechanized equipment. All locations are approximate only. Any additional lines built after the date shown are not included in this information package. The RDN will not accept responsibility for errors or omissions. Line depths identified are at time of construction and may have changed.



RECORD OF REVISIONS				
REV	DATE	BY	ENG	DESCRIPTION
1	24JAN13	CACH	CD	RDN COMMENTS
2	05FEB13	CJM	CD	UNDO REV. 1
3	14MAR13	CACH	CD	REVISE EX. PIPING ADD SECOND METER
4	04JUL13	CACH		RECORD DRAWINGS

RECORD OF ISSUE				
ISS	DATE	BY	ENG	DESCRIPTION
B	23JAN13	CACH		RECORD DRAWING
A	23JAN13	CACH	CD	FOR CONSTRUCTION

PROJECT NO.	1302
DRAWN	CACH
DESIGNED	CD
CHECKED	CD
APPROVED	CD
DATE	JANUARY 2013
SCALE	AS SHOWN

CLIENT
REGIONAL DISTRICT OF NANAIMO

PROJECT
CRAIG BAY FLOW CONTROL BUILDING PUMP MODIFICATION

TITLE
PIPING AND EQUIPMENT MODIFICATIONS

DRAWING No.	1302-01	REV.	4	SHEET	1/1
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