REQUEST FOR PROPOSALS No. 22-013

PROFESSIONAL ENGINEERING SERVICES

FOR

The Design of Nanoose Additional Reservoir and Upgrade of Arbutus Park Booster Pump Station

ISSUED: April 6, 2022

CLOSING DATE AND TIME:
Submissions must be received on or before:
3:00 PM (15:00 hrs) Local Time on April 26th, 2022

Submissions and Questions are to be directed to:
Rocky Chowdhury, M.Sc., P.Eng.
Project Engineer, Water Services
Email: rchowdhury@rdn.bc.ca

Questions are requested at least five (5) business days before the closing date.

Proposals will not be opened in public

1. Instructions to Proponents

1.1 Closing Date/Time/Submission Method
Submissions must be received on or before 3:00 PM (15:00 hrs), Local Time, on April 26th, 2022.

Submission Method:

By Email: In PDF format with "22-013 *Design of Nanoose Additional Reservoir and Upgrade of Arbutus Park Booster Pump Station*" as the subject line at this electronic address:

rchowdhury@rdn.bc.ca

Please note: Maximum email file size limit is 20MB, or less. The RDN will not be liable for any technological delays of submissions.

Submissions received in any other manner will not be accepted.

1.2 Amendment to Proposals
Proposals may be amended in writing and sent via email to the RDN contact person identified on the cover page on or before the closing. Such amendments should be signed by the authorized signatory of the Proponent.

1.3 Addenda
If the RDN determines that an amendment is required to this RFP, the RDN will post the Addendum on the RDN (www.rdn.bc.ca) and BC Bid (www.bcbid.gov.bc.ca) websites. Each addendum will be incorporated into and become part of the RFP. No amendment of any kind to the RFP is effective unless it is contained in a written addendum issued by the RDN. It is the sole responsibility of the Proponent to check and ensure all amendments are included prior to submitting their final Proposal submission.

1.4 Withdrawal of Proposals
The Proponent may withdraw their Proposal at any time by submitting a written withdrawal email to the RDN contact person identified on the cover page on or before the closing.

1.5 Unsuccessful Vendors
The Regional District will offer debriefings to unsuccessful Proponents, on request, at a mutually agreeable time. The request for debriefing must be submitted to the RDN within 14 calendar days of the notice.

2. INTRODUCTION

The purpose of this Request for Proposal is to solicit submissions from qualified firms to provide Professional Engineering Services for the design of the Nanoose additional reservoir and upgrade of the Arbutus Park booster pump station.

Class B cost estimation is needed for the reservoir construction, booster pump station upgrade and Arbutus Park Reservoir demolition.

This project is to be completed by October 31, 2022.

3. BACKGROUND

The Nanoose Bay Peninsula Water Service Area (NBPWSA) serves approximately 2500 residential and 67 commercial water service customers. The water supply in this area is provided from a series of local groundwater wells and surface water from the Englishman River. The treated water is stored in several reservoirs which provide equalization volume to meet peak demands, maintain emergency storage to supply during fire or power outage and maintain pressure throughout the system. There are six storage reservoirs currently present in the NBPWSA. The reservoirs and their capacities are given in the following list –

1. Madrona Reservoir (concrete) – 525 m^3 or 100,000 Imp. Gallon capacity
2. Eagle Heights (concrete) – 335 m^3 or 75,000 Imp. Gallon capacity
3. Dolphin (concrete) – 440 m^3 or 100,000 Imp. Gallon capacity
4. Fairwinds Reservoir No. 1 (concrete) – 700 m^3 or 154,000 Imp. Gallon capacity
5. Fairwinds Reservoir No. 2 (concrete) – 700 m^3 or 154,000 Imp. Gallon capacity
6. Arbutus Park (lined concrete, wooden roof) – 570 m^3 or 125,000 Imp. Gallon capacity

Regional District of Nanaimo (RDN) also has access to the 580 m^3 additional storage volume from the City of Parksville Top Bridge Park Reservoir under a service agreement between the RDN and the City of Parksville. The Top Bridge Park Reservoir storage capacity is used to supplement the water supply from the above six reservoirs to the NBPWSA. The Arbutus Park reservoir is in poor condition and needs to be decommissioned soon.

Regional District of Nanaimo (RDN) conducted a predesign study in 2014 to assess the storage capacity requirement for the NBPWSA and determine the optimal size and location of any new reservoirs that would be required for the NBPWSA in future. The study determined that the storage capacity of above six reservoirs and the addition of 580 m^3 storage from the Top Bridge Reservoir would make the storage capacity sufficient for the NBPWSA until the year 2032. However, if the Arbutus Park Reservoir, which is in poor condition, is decommissioned soon, the available storage capacity for the NBPWSA will get reduced to 3255 m^3. This will create a 106 m^3 shortage in storage capacity for the current year. If no additional reservoir is added in near future, the capacity shortfall is anticipated to grow as housing development continues.

The attached 2014 predesign report by Koers & Associates Engineering Ltd. (Koers) recommended that RDN construct a new 859 m^3 reinforced concrete reservoir at the Fairwinds Reservoir site at 3220 Fairwinds Dr, Nanoose Bay, BC (49.27408°N, 124.15262°W). This will allow the Arbutus Park reservoir to be decommissioned and provide the additional capacity required to meet the NBPWSA storage requirement until the year 2038. If the new reservoir is located at the Fairwinds Reservoir site, it will be able to supply water to the entire distribution system through PRVs and pumps. Additionally, there is existing infrastructure in place to easily connect the new reservoir at Fairwinds site to the distribution system.

The 2014 predesign study by Koers also recommended that a larger pump station with emergency power be installed to service the Arbutus pressure zone if the Arbutus Park reservoir is demolished and the new reservoir is constructed at the existing Fairwinds reservoir site. It is important to note that the Arbutus pressure zone is at 170 m HGL and the new reservoir at the Fairwinds site would be at 125 m TWL. Therefore, when the Arbutus Park reservoir is demolished, the Arbutus pressure zone will completely rely on the booster pumping station, located at 2940 Fairwinds Dr, Nanoose Bay, to maintain pressure throughout the Arbutus Pressure zone. A pressure zone map of the NBPWSA is attached here for clarification.

4. SCOPE OF SERVICES

The overall project scope will include –

1. Detail (90%) design of a 1000 m^3 reinforced concrete above ground reservoir at the Fairwinds reservoir site at 3220 Fairwinds Dr, Nanoose Bay, BC (49.27408°N, 124.15262°W).
2. Detail (90%) design of the booster pump station upgrade with emergency backup power at the 2940 Fairwinds Dr, Nanoose Bay.
3. Class B cost estimation for the construction of the 1000 m^3 new reservoir, booster pump station upgrade and demolition of the existing Arbutus Park Reservoir.
4. A (maximum) pre-feasibility level assessment for constructing a 2000 m^3 reservoir (instead of 1000 m^3) at the Fairwinds Reservoir site and a (maximum) Class D level project cost estimation for this scenario.

The followings are the detailed scope, which is meant to be a minimum requirement, not a comprehensive list of all works required for this project.

- Attend and facilitate project kick-off meeting within two weeks of contract award to review project scope, timeline, and line of communication and subsequent progress meetings at every project milestone.
- Review pre-design study, available record drawings, NBPWSA pressure zones and overall water supply system.
- Detailed topographic survey of the reservoir site, booster pump-station site, connection points etc.

- Consideration of technical and cost feasibility of increasing height of existing reservoirs at this site as one of the options to get the desired volume.
- Determine the required land parcel size for a 1000 m^3 new reservoir site at 3220 Fairwinds Dr, Nanoose Bay, BC (49.27408°N, 124.15262°W).
- Geotechnical assessment of the site required for the foundation design.
- Structural design of the 1000 m^3 above ground Reinforced Concrete reservoir in accordance with the latest edition of the BC Building Code and any other applicable specialty codes.
- Reservoir design as per the design features listed in the MMCDA Design Guidelines (2014) section 2.23.4.
- Pipework details inside the reservoir and up to the distribution system tie-in point, the size and location of inlet, outlet, and overflow drainpipes.
- Valve chamber design and connection details.
- Site details including fencing, lighting, locks, alarms, and other security facilities to minimize vandalism and prevent water contamination.
- Integration into the existing control systems at both locations equipment as required.
- Design of the upgrade of the existing booster pump station located at 2940 Fairwinds Dr, Nanoose Bay. The existing booster pump station has one pump. The upgrade should include providing 24/7 pumping capacity by adding additional pumps and motors of same capacity as the existing ones, back-up power, and electrical upgrades. The existing pump at the Arbutus Pump Booster Station is rated to have 1.14 m^3/min flow capacity. The make, model and other available specs of existing pump and motor and Kiosk layout are attached here. A new kiosk will likely be required for the upgraded pump station.
- Mechanical and electrical system design including P&I diagram for both reservoir and pump station as per applicable standards.
- Section 3 of the RDN General Engineering requirement (attached) must be followed for all drafting related to this project. RDN will share the available AutoCAD drafting templates with the successful proponent.

5. OUTCOMES AND DELIVERABLES

The required outcome from this work is a 90% design and Class B cost estimate that the RDN can use to acquire the funding for the project.

The following list of deliverables are the minimum requirement and not a comprehensive list –

1. Preliminary (50%) design package.
    - A design memorandum listing the design criteria, design challenges, construction risks, design output, and any other notable features.
    - Design drawing set, including P&I Diagram for both the reservoir and the pump station.

- Class C cost estimation for the reservoir construction, booster pump station upgrade and Arbutus Park reservoir demolition. A detailed basis of estimate is required stating all assumptions made, cost indices used, etc.

2. 90% design package.
   - Design drawing set
   - Class B cost estimation.

6. REFERENCE/BACKGROUND INFORMATION

The reference information included with this RFP are as follows –

1. A Technical memorandum by Koers & Associates Engineering Ltd on the pre-design study for the additional reservoir in the NBPWSA.
2. A pressure zone map for the NBPWSA.
3. Available as-built drawings of the existing two reservoirs at Fairwinds reservoir site.
4. Available pump and motor information and as-built drawing of the Arbutus Park Booster pump station.
5. Section 3 of the RDN General Engineering Requirement.

6. BUDGET

The budget for this project is $100,000.

7. PROPOSAL SUBMISSION AND EVALUATION

To assist in receiving similar and relevant information, and to ensure your Proposal receives fair evaluation, the RDN asks Proponents to provide the following information.

Please include with your proposal:

a) Corporate background, history, and areas of expertise.
b) The examples of similar or relevant projects that were completed in the past by the proponent.
c) Curriculum vitae of key project team members, reasons why they were selected for this project and demonstrate how they will add value to the project.
d) Identify challenges, constraints and obstacles in the project and advise strategy to minimize.
e) Layout the plan to accomplish the project including timelines and key milestones.
f) Describe how your firm will manage the project and provide regular status reports.
g) A statement of your firm's approach to advancing equity and sustainability in corporate operations and service provision, including mention of official policies, achievements or standards met.
h) Comprehensive proposed fee, in Canadian Dollars, in a Schedule of Effort Table, identifying all project contributors, their per hour charge out rates, individual tasks, hours and all disbursements including travel. Please provide breakdown within the total proposed fee to show the fee for

prefeasibility level assessment for a 2000 m^3 reservoir and the associated class D cost estimation separately.

Proposals will be evaluated on the following basis 60% Technical, 40% Financial.

The lowest price proposal will receive full marks. Other proposals will receive reduced scores based on the proportion higher than the lowest price. i.e. Score = Min Cost/Cost x Fee Points.

Proposals submitted should be in enough detail to allow the RDN to determine the Proponent's qualifications and capabilities from the documents received. The selection committee, formed at the RDN's sole discretion, will score the Proposals in accordance with the criteria provided.

The RDN may evaluate proposals on a comparative basis by comparing one proponent's proposal to another proponent's proposal. The RDN reserves the right to not complete a detailed evaluation if the RDN concludes the proposal is materially incomplete or, irregular or contain any financial or commercial terms that are unacceptable to the RDN.

The selection committee may proceed with an award recommendation or the RDN may proceed to negotiate with the highest evaluated proponent with the intent of developing an agreement. If the parties after having bargained in good faith are unable to conclude a formal agreement, the RDN and the Proponent will be released without penalty or further obligations other than any surviving obligations regarding confidentiality and the RDN may, at its discretion, contact the Proponent of the next best rated Proposal and attempt to conclude a formal agreement with it, and so on until a contract is concluded or the proposal process is cancelled.

The RDN reserves the right to award the assignment in whole or in part or to add or delete any portion of the work. Throughout the evaluation process, the evaluation committee may seek additional clarification on any aspect of the Proposal to verify or clarify the information provided and conduct any background investigation and/or seek any additional information it considers necessary.

The successful proponent of this project may be engaged in future phases as well (e.g., construction services) contingent on successful performance on this project as well as future budget availability and internal approvals being obtained.

8. *PROPOSED PURCHASE CONTRACT*

The RDN's preferred form of Contract is similar to the latest version of MMCD Client Consultant agreement. Proponents should carefully review this form of Contract. Should any vendors request that RDN consider revisions to the form of Contract, Proponents should include any clauses of concern in their proposal submission and suggest replacement language. Section 3 (Drafting) of the RDN General Engineering Requirements (SP-G-0001) will be part of the contract agreement.

9. GENERAL CONDITIONS

9.1 No Contract

By submitting a Request for Proposal and participating in the process as outlined in this RFP, proponents expressly agree that no contract of any kind is formed until a fully executed contract is in place.

9.2 Privilege Clause

The lowest or any proposal may not necessarily be accepted.

9.3 Acceptance and Rejection of Submissions

This RFP does not commit the RDN, in any way to select a preferred Proponent, or to proceed to negotiate a contract, or to award any contract. The RDN reserves the right in its sole discretion cancel this RFP, up until award, for any reason whatsoever.

The RDN may accept or waive a minor and inconsequential irregularity, or where applicable to do so, the RDN may, as a condition of acceptance of the Submission, request a Proponent to correct a minor or inconsequential irregularity with no change in the Submission.

9.4 Conflict of Interest

Proponents shall disclose in their Proposals any actual or potential Conflict of Interest and existing business relationships it may have with the RDN, its elected officials, appointed officials, or employees.

9.5 Solicitation of Board Members and RDN Staff

Proponents and their agents will not contact any member of the RDN Board or RDN Staff with respect to this RFP, other than the RDN Contact named in this document.

9.6 Litigation Clause

The RDN may, in its absolute discretion, reject a Proposal submitted by Proponent, if the Proponent, or any officer or director of the Proponent is or has been engaged either directly or indirectly through another corporation in legal action against the RDN, its elected or appointed officers and employees in relation to:

(a) any other contract for works or services; or
(b) any matter arising from the RDN's exercise of its powers, duties, or functions under the Local Government Act, Community Charter, or another enactment within five years of the date of this Call for Proposals.

In determining whether to reject a Proposal under this clause, the RDN will consider whether the litigation is likely to affect the Proponent's ability to work with the RDN, its consultants and representatives and whether the RDN's experience with the Proponent indicates that the RDN is likely to incur increased staff and legal costs in the administration of this Contract if it is awarded to the Proponent.

9.7 Exclusion of Liability

Proponents are solely responsible for their own expenses in preparing and submitting a Proposal and for any meetings, negotiations, or discussions with the RDN. The RDN will not be liable to any Proponent for any claims, whether for costs, expense, losses or damages, or loss of anticipated profits, or for any other matter whatsoever, incurred by the Proponent in preparing and submitting a Proposal, or participating in negotiations for a Contract, or other activity related to or arising out of this RFP. Except as expressly and specifically permitted in these Instructions to Proponents, no Proponent shall have any claim for compensation of any kind whatsoever, as a result of participating in this RFP, and by submitting a Proposal each Proponent shall be deemed to have agreed that it has no claim.

9.8 Ownership of Proposals

All Proposals, including attachments and any documentation, submitted to, and accepted by the RDN in response to this RFP become the property of the RDN.

9.9 Freedom of Information

All submissions will be held in confidence by the RDN. The RDN is bound by the Freedom of Information and Protection of Privacy Act (British Columbia) and all documents submitted to the RDN will be subject to provisions of this legislation. The successful vendor and value of the award is routinely released.

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MAR 10 2014
REGIONAL DISTRICT of NANAIMO

1328 TECHNICAL MEMORANDUM NO.1, Rev No. 3

Regional District of Nanaimo
Nanoose Reservoir Review

Issued: March 3, 2014
Previous Issue: November 5, 2013

1. Objective

The objective of this technical memorandum is to review the reservoir storage requirements for the Nanoose Bay Peninsula Water Service Area (NBPWSA) and provide comments on the optimal location for a new storage reservoir to service the water system to 2038.

2. Background

The NBPWSA is supplied from local groundwater wells and surface water through a connection to the City of Parksville at the Craig Bay Pump Station. The distribution system is comprised of the following pressure zones:

HGL	Description
60 m	Madrona - TWL of Madrona reservoir, supplied by two wells and PRV from 125 m zone.
65 m	Nanoose - TWL of Beachcomber, Dolphin and Eagle Heights reservoirs supplied from the 125 m zone.
84 m	Andover, Controlled by Andover and Dolphin PRV's from the 125 m pressure zone.
90 m	West Bay, Controlled by Nanoose Road PRV and West Bay PRV from the 125 m pressure zone.
90 m	Gary Oak, Controlled by Gary Oak Dr. PRV from the 125 m pressure zone
125 m	Fairwinds, TWL of Fairwinds reservoirs No. 1 and No. 2 supplied by Nanoose WTP, City of Parksville, and Wallbrook Well.
170 m	Arbutus, TWL of Arbutus Park Reservoir, supplied from the 125 m pressure zone via a booster pump station at Fairwinds Drive and Anchor Way.

The existing reservoirs provide peak hour balancing, emergency storage during power outages, and fire protection. Table 1 shows the existing reservoirs, with and without the Beachcomber and Arbutus Reservoirs, in the NBPWSA system, their useable storage volumes and top water level (TWL) elevation.

A January 2013 technical memorandum identified that the structural integrity of the roof structure of the existing Beachcomber Reservoir does not meet the current codes and regulations and should be replaced as soon as possible. In addition to the total storage capacity for the system, table 1 also outlines the total storage available in the system if the Beachcomber Reservoir storage is removed from the system.

In addition, there are concerns with the condition of the Arbutus Reservoir, which has a bag liner and a wooden roof structure that is constructed out of treated lumber. Based on discussions with the RDN this reservoir should be replaced or upgraded with a new liner and roof structure.

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Table 1. Storage Reservoir Volumes

Reservoir Name	Volume (m^3)	TWL (m)
Madrona Reservoir No. 2	515	60
Beachcomber	530	66
Eagle Heights	325	66
Dolphin	429	66
Fairwinds No. 1	701	125
Fairwinds No. 2	701	125
Arbutus Park	572	171
Storage Volume	**3773**	
Storage Volume w/o Beachcomber	**3,243**	
Storage Volume w/o Beachcomber and Arbutus	**2,671**	

It should be noted that the two storage reservoirs at the Fairwinds site have the ability to supply all of the pressure zones in the systems through pumping or PRV stations located in the system.

In addition to the reservoirs listed in Table 1, the RDN also has additional storage volume in the City of Parksville Top Bridge Reservoir under the ERSA agreement. This volume is approximately 580 m^3 and is only available when the City of Parksville is utilizing the Englishman River as a water source, therefore it has not been included in the existing storage volume for the system. The storage will become available on a full time basis after the new water treatment plant for the Englishman River Water Service (ERWS) has been constructed.

3. Storage Requirements

The required reservoir storage volume as recommended by the Master Municipal Construction Documents is based on the following equation:

Volume (V) = A + B + C
Where: A = Fire Storage
B = Equalization (Peaking) Storage (25% of Maximum Day Demands)
C = Emergency Storage (25% of A + B)

3.1 2012 Storage Requirements

As shown in the enclosed spreadsheet the projected 2012 maximum day demands for the NBPWSA are 4,844 m^3. The resulting storage volume required for the system is detailed in the following table:

Storage Component	Design Standard	Storage (m^3)
Fire Storage (A)	150 lps for 2 hours	1,080
Peak Hour Balancing (B)	25% of Maximum Day Demand	1,211
Emergency Storage (C)	25% of A+B	573
Total Storage Requirement		**2,864**
Total Existing Storage		**3,773**
Total Existing Storage w/o Beachcomber		**3,243**
Total Existing Storage w/o Beachcomber and Arbutus		**2,671**

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The existing storage is adequate for the current 2012 maximum day demands with and without the storage at the Beachcomber Reservoir site, however there is not enough storage in the system without the Beachcomber and Arbutus Reservoirs. As shown in table 2 (attached), with a 2.0% growth rate, the existing storage is sufficient for the 2031 demands with the Beachcomber Reservoir and the 2018 demands without the Beachcomber Reservoir.

3.2 2038 Storage Requirements

The projected 2038 maximum day demands for the NBPWSA are 8,833 m^3. The resulting storage volume required for the system is detailed in the following table:

Storage Component	Design Standard	Storage (m^3)
Fire Storage (A)	150 lps for 2 hours	1,080
Peak Hour Balancing (B)	25% of Maximum Day Demand	2,208
Emergency Storage (C)	25% of A+B	822
Total Storage Requirement		**4,110**
Total Storage with Top Bridge w/o Beachcomber		**3,823**
Total Storage with Top Bridge w/o Beachcomber, Arbutus		**3,251**

Based on the storage volume calculations an additional 859 m^3 of storage is required to service the 2038 population without the existing Beachcomber and Arbutus Reservoir. This volume assumes that the RDN will have continuous access to the 580 m^3 of reservoir storage at the Top Bridge Reservoir.

3.3 Storage Improvement Options

The additional storage volume required can be added to the system by constructing a new reservoir in the system. Listed below are the following options for the new reservoir site along with the advantages and disadvantages of the proposed reservoir sites:

Location	Advantages	Disadvantages
New Reservoir Site	- Ability to locate reservoir in a location to service entire distribution system - No other existing structures to demolish or work around	- Land acquisition costs - Infrastructure upgrades to connect to existing system
Beachcomber Reservoir Site	- Land available for new reservoir - Existing infrastructure in place to connect to distribution system. - Allows for replacement of existing Beachcomber Reservoir that has reached the end of its useful design life.	- TWL of new tank would not be able to service the entire distribution system
Fairwinds Reservoir Site	- Existing infrastructure in place to connect to the distribution system - TWL would service the entire distribution system through pump stations and PRVs. - Construction of reservoir would allow the existing Beachcomber and Arbutus Reservoirs to be removed.	- Land may be required at the Fairwinds Reservoir site to accommodate new reservoir. - Larger pump station, with emergency power, would be required to service the Arbutus Pressure Zone (HGL 170 m)

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Based on a review of the proposed reservoir sites, it is recommended that the RDN construct a new 859 m^3 reservoir at the Fairwinds Reservoir site. This reservoir, along with full time connection to the City of Parksville Top Bridge Reservoir, will provide the additional storage required to service the NBPWSA demands to 2038. This storage volume assumes that the Beachcomber Reservoir (530 m^3) and the Arbutus Reservoir (572 m^3) would be removed. However should the Top Bridge Reservoir not be accessible then a 1,439 m^3 reservoir is required.

3.4 Class D Cost Estimate

Class D estimates are based on little or no site specific detailed engineering but provides magnitude of order or 'ball park' estimates and is derived from lump sum or unit costs from comparable projects of similar magnitude. This category is used in developing long term capital plans and for comparing conceptual options. Class D estimates will include a 30% general contingency allowance and a 30% allowance for engineering, legal, construction, financial and administration costs.

The Class D cost estimate for an 859 m^3 (190,000 igal) reservoir at the Fairwinds Reservoir site:

	Reservoir Type	Construction	Inc Contingency & Allowance
1)	Concrete Reservoir	$450,000	$720,000
2)	Bolted Steel Reservoir (Glass lined)	$500,000	$800,000
3)	Welded Steel Reservoir	$600,000	$960,000

4. Conclusions and Recommendations

The following conclusions are noted:

1. The system currently has a total storage volume of 3,773 m^3.
2. An additional 580 m^3 of storage is available at the Top Bridge Reservoir when the City is using the Englishman River water source.
3. The existing Beachcomber Reservoir has exceeded its useful design life and requires replacement due to age and condition.
4. The 2012 demands currently require 2,864 m^3 of storage.
5. Removal of the Beachcomber reservoir would reduce the system storage to 3,243 m^3, which at 2.0% growth rate will meet the demands to 2018.
6. A new 859 m^3 reservoir is required at the Fairwinds Reservoir location.
7. The condition of the Arbutus Reservoir is a concern and may require replacement or removal with an improved pump station.
8. Removal of the Beachcomber and Arbutus reservoirs would reduce the system storage to 2,641 m^3 without new Fairwinds Reservoir.
9. A reinforced concrete reservoir would be the most efficient for a low height reservoir similar to the existing reservoirs.

The following recommendations are noted:

1. Remove the existing Beachcomber Reservoir.
2. Construct a new 859 m^3 (or 1,439 m^3) reinforced concrete reservoir at the Fairwinds Reservoir site prior to 2018.
3. Remove the existing Arbutus Reservoir and construct a new pump station, with emergency power, to meet the domestic and fire flow demands in the Arbutus service area after construction of the new reservoir at the Fairwinds Reservoir site.

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Technical Memorandum No. 1 Rev 3
March 3, 2014

Regional District of Nanaimo
Nanoose Reservoir Review

We trust this is the information you require. Please call if you have any questions.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA M. E. BROOK # 35332

Mitchell Brook, P.Eng
Project Engineer

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA C. L. DOWNEY COMMON Mar. 4 2014

Reviewed By: Chris Downey, P.Eng.
Project Manager

Enclosure

Table 2. Nanoose Reservoir Capacity

Projected Shortfall from 2008 Capacity
Growth at 2.00%
Design Fire Flow 150 lps for 2 hours

2008-2012 Ave Day Demand based Meter Records
2008-2012 Max Day Demand based on 1.1 * Max Month Meter Records
2013 Max Day Demand and Ave Day based 5 year average * Growth Rate

Year	Max Day Demand	Peaking Storage	Avg Day Demand	Emergency Storage	Fire Flow Storage	Storage Required	Existing Storage	Excess (Shortfall) m3	Existing Storage + Top Bridge	Excess (Shortfall) m3	Storage without Beachcomber	Excess (Shortfall) m3	Storage no Beachcomber no Arbutus	Excess (Shortfall) m3	Storage No Beachcomber or Arbutus+ FWD 3 and Top Bridge	Excess (Shortfall) m3
2008	5,103	1,276	2,116	589	1,080	2,945	3,773	828	4,353	1,408	3,243	298	2,671	-274	4,110	1,165
2009	5,559	1,390	2,339	618	1,080	3,088	3,773	685	4,353	1,265	3,243	155	2,671	-417	4,110	1022
2010	6,242	1,560	2,169	660	1,080	3,300	3,773	473	4,353	1,053	3,243	-57	2,671	-629	4,110	810
2011	4,644	1,161	2,223	560	1,080	2,801	3,773	972	4,353	1,552	3,243	442	2,671	-130	4,110	1309
2012	4,844	1,211	2,230	573	1,080	2,864	3,773	909	4,353	1,489	3,243	379	2,671	-193	4,110	1246
2013	5,384	1,346	2,260	607	1,080	3,033	3,773	740	4,353	1,320	3,243	210	2,671	-362	4,110	1077
2014	5,491	1,373	2,305	613	1,080	3,066	3,773	707	4,353	1,287	3,243	177	2,671	-395	4,110	1044
2015	5,601	1,400	2,351	620	1,080	3,100	3,773	673	4,353	1,253	3,243	143	2,671	-429	4,110	1010
2016	5,713	1,428	2,398	627	1,080	3,135	3,773	638	4,353	1,218	3,243	108	2,671	-464	4,110	975
2017	5,828	1,457	2,446	634	1,080	3,171	3,773	602	4,353	1,182	3,243	72	2,671	-500	4,110	939
2018	5,944	1,486	2,495	642	1,080	3,208	3,773	565	4,353	1,145	3,243	35	2,671	-537	4,110	902
2019	6,063	1,516	2,545	649	1,080	3,245	3,773	528	4,353	1,108	3,243	-2	2,671	-574	4,110	865
2020	6,184	1,546	2,596	657	1,080	3,283	3,773	490	4,353	1,070	3,243	-40	2,671	-612	4,110	827
2021	6,308	1,577	2,648	664	1,080	3,321	3,773	452	4,353	1,032	3,243	-78	2,671	-650	4,110	789
2022	6,434	1,609	2,700	672	1,080	3,361	3,773	412	4,353	992	3,243	-118	2,671	-690	4,110	749
2023	6,563	1,641	2,754	680	1,080	3,401	3,773	372	4,353	952	3,243	-158	2,671	-730	4,110	709
2024	6,694	1,674	2,810	689	1,080	3,443	3,773	330	4,353	910	3,243	-200	2,671	-772	4,110	667
2025	6,828	1,707	2,866	697	1,080	3,484	3,773	289	4,353	869	3,243	-241	2,671	-813	4,110	626
2026	6,964	1,741	2,923	705	1,080	3,526	3,773	247	4,353	827	3,243	-283	2,671	-855	4,110	584
2027	7,104	1,776	2,982	714	1,080	3,570	3,773	203	4,353	783	3,243	-327	2,671	-899	4,110	540
2028	7,246	1,811	3,041	723	1,080	3,614	3,773	159	4,353	739	3,243	-371	2,671	-943	4,110	496
2029	7,391	1,848	3,102	732	1,080	3,660	3,773	113	4,353	693	3,243	-417	2,671	-989	4,110	450
2030	7,539	1,885	3,164	741	1,080	3,706	3,773	67	4,353	647	3,243	-463	2,671	-1035	4,110	404
2031	7,689	1,922	3,227	751	1,080	3,753	3,773	20	4,353	600	3,243	-510	2,671	-1082	4,110	357
2032	7,843	1,961	3,292	760	1,080	3,801	3,773	-28	4,353	552	3,243	-558	2,671	-1130	4,110	309
2033	8,000	2,000	3,358	770	1,080	3,850	3,773	-77	4,353	503	3,243	-607	2,671	-1,179	4,110	260
2034	8,160	2,040	3,425	780	1,080	3,900	3,773	-127	4,353	453	3,243	-657	2,671	-1,229	4,110	210
2035	8,323	2,081	3,493	790	1,080	3,951	3,773	-178	4,353	402	3,243	-708	2,671	-1,280	4,110	159
2036	8,490	2,122	3,563	801	1,080	4,003	3,773	-230	4,353	350	3,243	-760	2,671	-1,332	4,110	107
2037	8,659	2,165	3,634	811	1,080	4,056	3,773	-283	4,353	297	3,243	-813	2,671	-1,385	4,110	54
2038	**8,833**	**2,208**	**3,707**	**822**	**1,080**	**4,110**	**3,773**	**-337**	**4,353**	**243**	**3,243**	**-867**	**2,671**	**-1,439**	**4,110**	**0**

Existing Reservoirs

	Volume (m3)
Arbutus	572
Fairwinds No. 1	701
Fairwinds No. 2	701

	Volume (m3)
Beachcomber	530
Eagle Heights	325
Dolphin	429

	Volume (m3)
Madrona	515
Top Bridge (RDN Share)	580
Additional Storage Required at 2038	859

Nanoose Bay Peninsula Pump Station
74m (City of Parksville) >125m

Craig Bay Pump Station
74m (City of Parksville) >125m

CITY OF
PARKSVILLE

60m

125 m > 60 m

65m

Stewart Road Pump Station
65m > 125m

Englishman River Water Service
Water Treatment Plant

Madrona
Reservoir
60m

Eagle Heights
Reservoir
65m

125 m > 65 m

125 m > 65 m

Dolphin
Reservoir
65m

84 m > 65 m

125 m > 84 m

125m

Library Flow Control &
Former Booster Pump Station
74m (City of Parksville) > 125m

170m

125 m > 90 m

90m

84m

125 m > 90 m

Arbutus
Reservoir
170m

Fairwinds
Reservoirs
125m

125 m > 84 m

170 m > 125 m

Arbutus Pump Station
125m > 170m
and
170m>125m

0 1 2 4 Kilometers

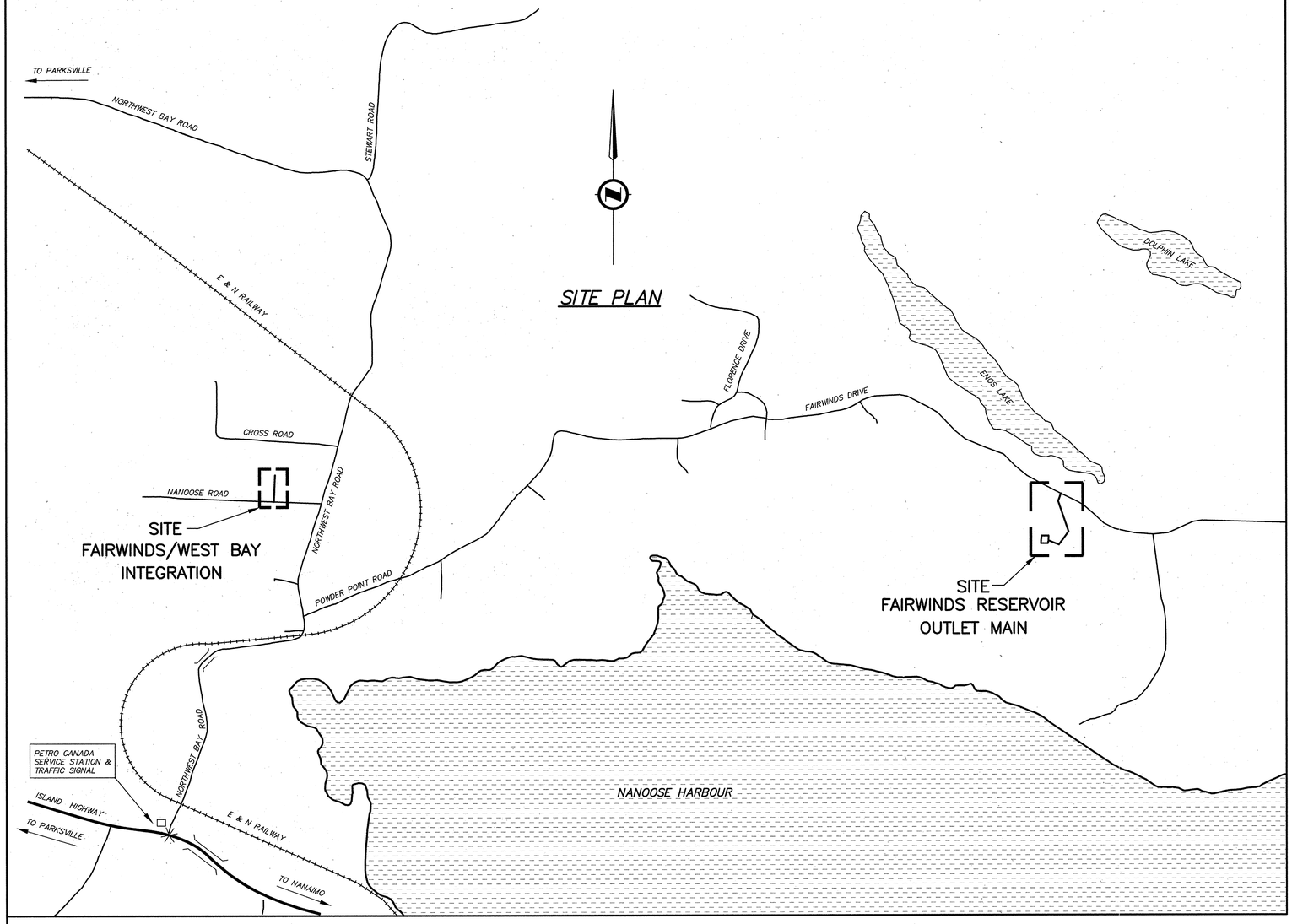
N

REGIONAL DISTRICT OF NANAIMO

Pressure Zone

60 m
65 m
84 m
90 m
125 m
170 m

Booster Pump Station
Water Storage Reservoirs
Production Wells
Treatment Plant
Pressure Reducing Valves
Pressure Relief Valves



LEGEND

EXISTING	DESCRIPTION	CONSTRUCTED
W 100 PVC	WATERMAIN	W 450 D.I.
	VALVE	
	HYDRANT	
A	AIR VALVE	
	PAVEMENT EDGE	
	GRAVEL EDGE	
	DITCH	
PP	POWER POLE	PP
	WATER SERVICE	WS
X X	FENCE	
	TREES	
	BUSH/HEDGE	
TOP	TOP OF BANK	
TOE	TOE OF SLOPE	
SC	SIGNAL CABLE	SC
	POWER CABLE	H
	SURVEY CONTROL POINT	

TYPICAL NOTES

1. ALL LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE ONLY AND ALL ARE NOT NECESSARILY SHOWN. ACTUAL LOCATIONS SHOULD BE CONFIRMED BY MANUAL EXCAVATION.
2. ALL STRUCTURES ARE NOT NECESSARILY SHOWN.
3. ALL CONSTRUCTION IN ACCORDANCE WITH DRAWINGS, MINISTRY OF TRANSPORTATION AND HIGHWAYS REQUIREMENTS AND CITY OF NANAIMO ENGINEERING STANDARDS AND SPECIFICATIONS.
4. ELEVATIONS ARE TO METRIC GEODETIC DATUM.

DRAWING LIST

FAIRWINDS RESERVOIR OUTLET MAIN	
DRAWING No.	DESCRIPTION
M9602–01	SITE PLAN, LEGEND AND DRAWING LIST
M9602–02	PLAN AND PROFILE
M9602–03	TIE–IN AT RESERVOIR
M9602–04	MISCELLANEOUS DETAILS
FAIRWINDS/WEST BAY INTEGRATION	
DRAWING No.	DESCRIPTION
M9603–02	PLAN AND PROFILE
M9603–03	WELLHEAD ALTERATIONS

krc CONSULTANTS

A Joint Venture
KOERS & ASSOCIATES ENGINEERING LTD.
REID CROWTHER & PARTNERS LTD.

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	AUG. /96	DH	DS	RECORD DRAWING

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A	MAR. 8/96	GH	DS	APPROVALS
B	MAR. 8/96	GH	DS	TENDER
C	MAR. 8/96	GH	DS	CONSTRUCTION
D	AUG. 21/96	DH	DS	RECORD DRAWING

SEAL

FW-133

PROJECT NO. M9603
DRAWN G.H. AUTOCAD 12
DESIGNED DS
CHECKED DS
APPROVED DAK
DATE FEB. 1996
SCALE HOR. 1:10,000

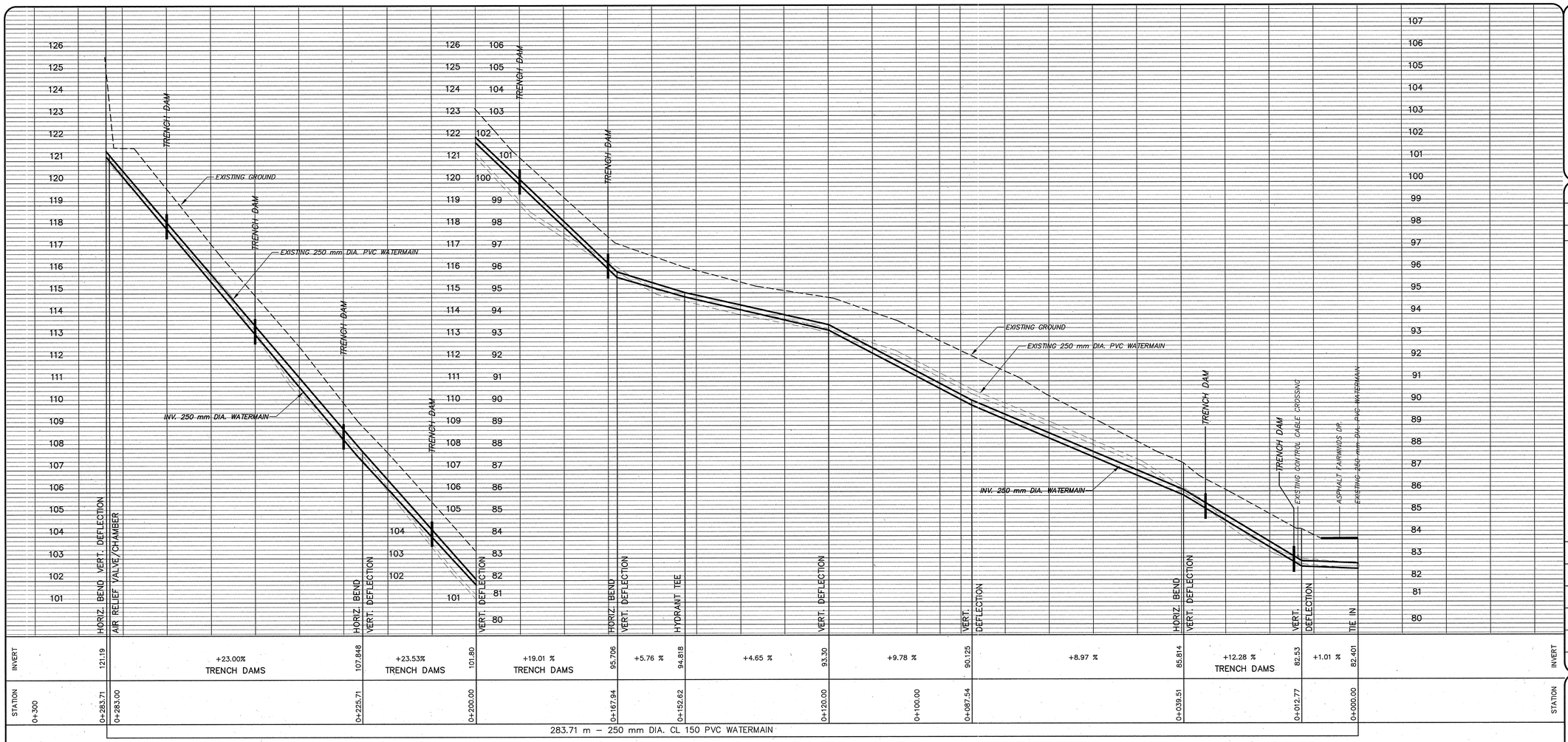
CLIENT
REGIONAL DISTRICT OF NANAIMO

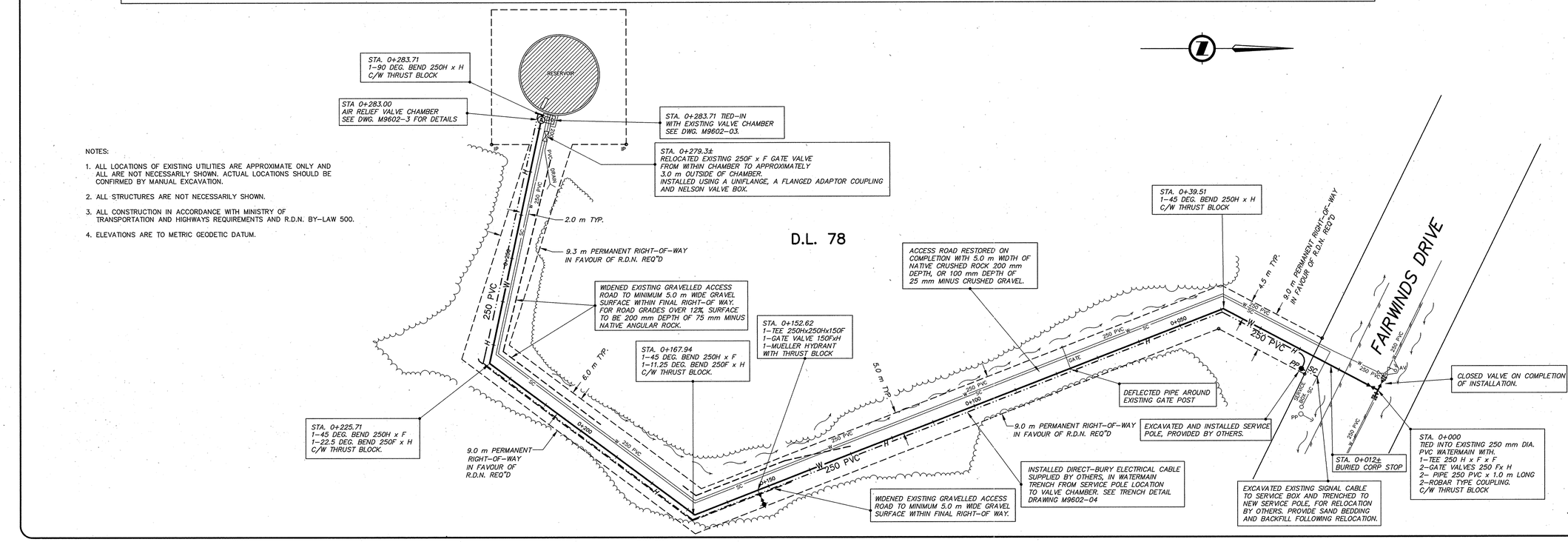
PROJECT
FAIRWINDS RESERVOIR OUTLET MAIN AND FAIRWINDS/WEST BAY INTEGRATION

TITLE
SITE PLAN, LEGEND & DRAWING LIST

FW-133

DRAWING No.	REV.	SHEET
M9602–01	1	1 / 6





NOTES:

1. ALL LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE ONLY AND ALL ARE NOT NECESSARILY SHOWN. ACTUAL LOCATIONS SHOULD BE CONFIRMED BY MANUAL EXCAVATION.
2. ALL STRUCTURES ARE NOT NECESSARILY SHOWN.
3. ALL CONSTRUCTION IN ACCORDANCE WITH MINISTRY OF TRANSPORTATION AND HIGHWAYS REQUIREMENTS AND R.D.N. BY–LAW 500.
4. ELEVATIONS ARE TO METRIC GEODETIC DATUM.

krc CONSULTANTS

A Joint Venture
KOERS & ASSOCIATES ENGINEERING LTD.
REID CROWTHER & PARTNERS LTD.

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	AUG. '96	DH	DS	RECORD DRAWING

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
1	MAR. 8/96	PRB	DS	ISSUED FOR APPROVALS
2	MAR. 8/96	PRB	DS	ISSUED FOR TENDER
3	MAR. 8/96	PRB	DS	ISSUED FOR CONSTRUCTION
4	AUG. 21/96	DH	DS	RECORD DRAWING

SEAL

FW-134

PROJECT NO.	M9602
DRAWN	P.R.B. AUTOCAD 12
DESIGNED	DS
CHECKED	DS
APPROVED	DAK
DATE	FEB. 1996
SCALE	HOR. 1:500 , VERT. 1:100

CLIENT

REGIONAL DISTRICT OF NANAIMO

PROJECT

FAIRWINDS RESERVOIR OUTLET MAIN

TITLE

PLAN AND PROFILE

FW-134

DRAWING No.	REV.	SHEET
M9602–02	1	2 / 6

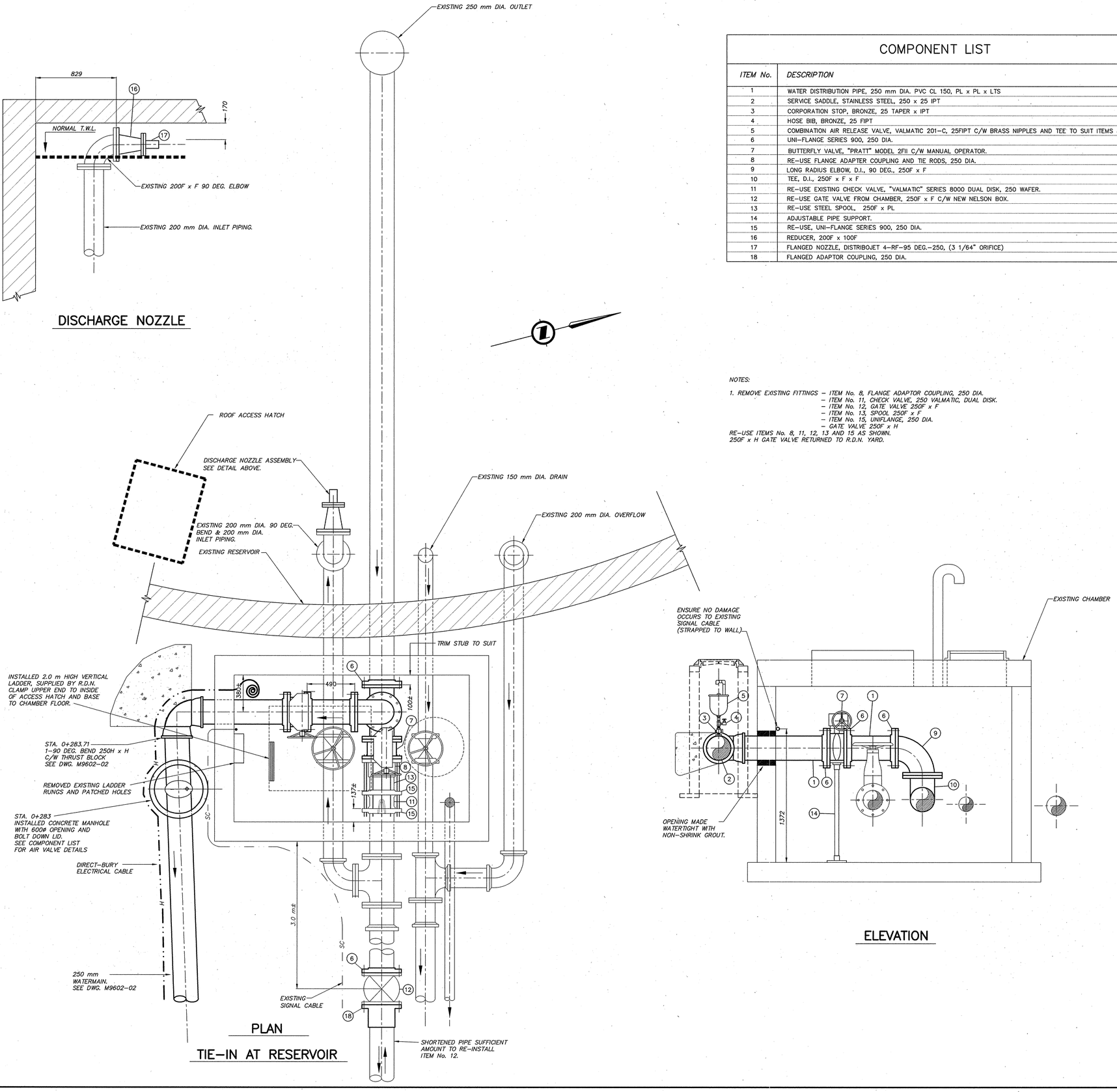
DISCHARGE NOZZLE

COMPONENT LIST

ITEM No.	DESCRIPTION	QUANTITY
1	WATER DISTRIBUTION PIPE, 250 mm DIA. PVC CL 150, PL x PL x LTS	TO SUIT
2	SERVICE SADDLE, STAINLESS STEEL, 250 x 25 IPT	1
3	CORPORATION STOP, BRONZE, 25 TAPER x IPT	1
4	HOSE BIB, BRONZE, 25 FIPT	1
5	COMBINATION AIR RELEASE VALVE, VALMATIC 201–C, 25FIPT C/W BRASS NIPPLES AND TEE TO SUIT ITEMS 3 & 4.	1
6	UNI–FLANGE SERIES 900, 250 DIA.	6
7	BUTTERFLY VALVE, "PRATT" MODEL 2FII C/W MANUAL OPERATOR.	2
8	RE–USE FLANGE ADAPTER COUPLING AND TIE RODS, 250 DIA.	EXISTS
9	LONG RADIUS ELBOW, D.I., 90 DEG., 250F x F	1
10	TEE, D.I., 250F x F x F	1
11	RE–USE EXISTING CHECK VALVE, "VALMATIC" SERIES 8000 DUAL DISK, 250 WAFER.	EXISTS
12	RE–USE GATE VALVE FROM CHAMBER, 250F x F C/W NEW NELSON BOX.	EXISTS
13	RE–USE STEEL SPOOL, 250F x PL	EXISTS
14	ADJUSTABLE PIPE SUPPORT.	1
15	RE–USE, UNI–FLANGE SERIES 900, 250 DIA.	EXISTS
16	REDUCER, 200F x 100F	1
17	FLANGED NOZZLE, DISTRIBOJET 4–RF–95 DEG.–250, (3 1/64" ORIFICE)	1
18	FLANGED ADAPTOR COUPLING, 250 DIA.	1

NOTES:

1. REMOVE EXISTING FITTINGS – ITEM No. 8, FLANGE ADAPTOR COUPLING, 250 DIA.
– ITEM No. 11, CHECK VALVE, 250 VALMATIC, DUAL DISK.
– ITEM No. 12, GATE VALVE 250F x F
– ITEM No. 13, SPOOL 250F x F
– ITEM No. 15, UNIFLANGE, 250 DIA.
– GATE VALVE 250F x H
RE–USE ITEMS No. 8, 11, 12, 13 AND 15 AS SHOWN.
250F x H GATE VALVE RETURNED TO R.D.N. YARD.



PLAN

TIE–IN AT RESERVOIR

ELEVATION

krc CONSULTANTS

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KOERS & ASSOCIATES ENGINEERING LTD.
REID CROWTHER & PARTNERS LTD.

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	AUG. '96	DH	DS	RECORD DRAWINGS

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A	MAR. 8/96	PRB	DS	*APPROVALS*
B	MAR. 8/96	PRB	DS	*TENDER*
C	MAR. 8/96	PRB	DS	*CONSTRUCTION*
D	AUG. 21/96	DH	DS	*RECORD DRAWING*

SEAL

FW-135

PROJECT NO.	M9602
DRAWN	P.R.B. AUTOCAD 12
DESIGNED	DS
CHECKED	DS
APPROVED	DAK
DATE	FEB. 1996
SCALE	1:20

CLIENT

REGIONAL DISTRICT OF NANAIMO

PROJECT

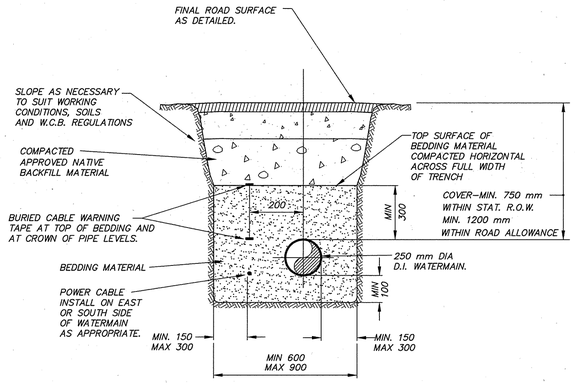
FAIRWINDS RESERVOIR OUTLET MAIN

TITLE

TIE–IN AT RESERVOIR

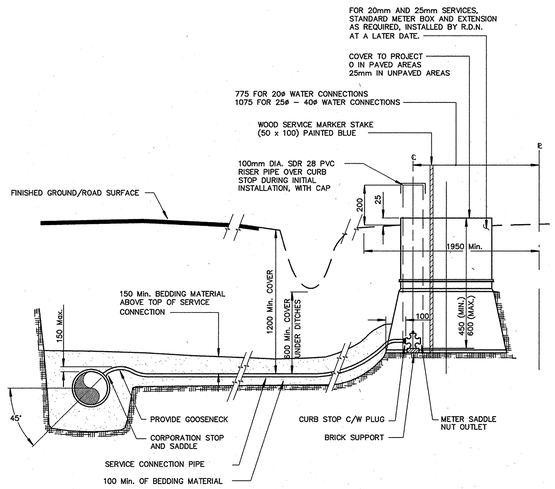
FW-135

DRAWING No. M9602–03 | REV. 1 | SHEET 3 / 6



TYPICAL PIPE TRENCH DETAIL
R.D.N. RIGHT OF WAY & ROAD ALLOWANCE AREAS

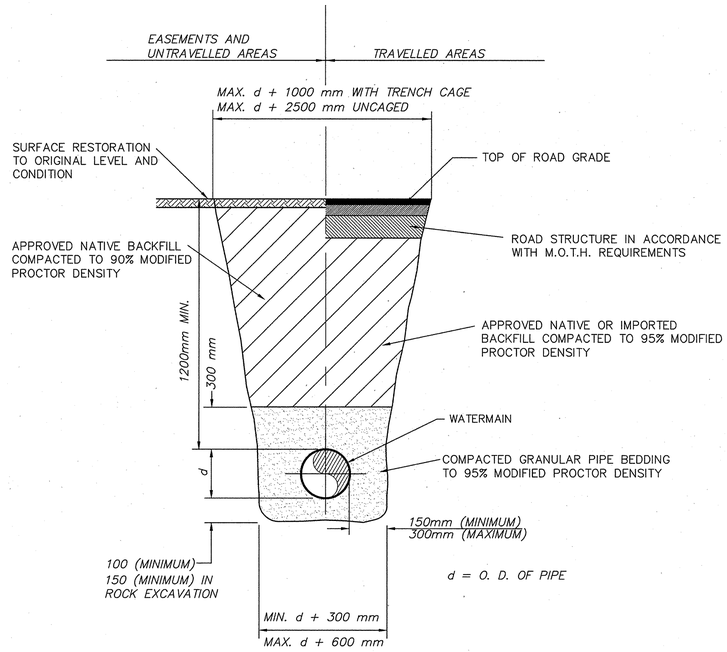
NTS



NOTES:
1. NOMINAL TRENCH WIDTH FOR SERVICE CONNECTION IS 600
2. METER BOX AND METER WILL BE INSTALLED BY THE R.D.N. DURING FINAL SERVICE HOOKUP.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.

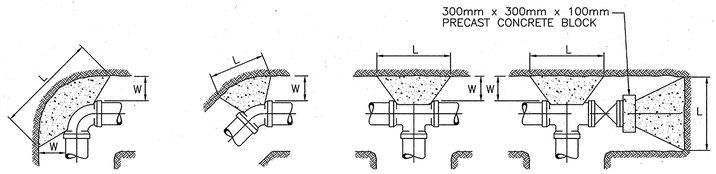
STANDARD SERVICE CONNECTION

NTS



STANDARD TRENCH SECTION

NTS



NOTE
WHERE GROUND CANNOT BE EXCAVATED TO FREE STANDING UNDISTURBED SOIL, UTILIZE THRUST RESTRAINT DEVICES IN PLACE OF THRUST BLOCK.

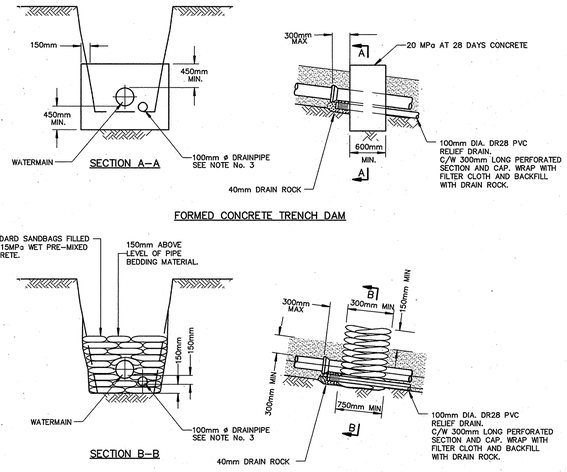
DIMENSIONS APPLY TO THE LARGER DIAMETER END OF FITTING

MINIMUM THRUST AREAS FOR FITTINGS AT 1030kN/m² PRESSURE AND FOR SOILS WITH A MINIMUM BEARING OF 96kN/m² (NOT TO BE USED FOR SOFT CLAY, MUCK, PEAT, ETC.)

TYPE OF FITTING	FITTING SIZE "D" (mm)	OUTSIDE OF FITTING TO BEARING FACE "W" (mm)	RECESS IN TRENCH WALL "W1" (mm)	LENGTH "L" (mm)	HEIGHT "H" (mm)	TYPE OF FITTING	FITTING SIZE "D" (mm)	OUTSIDE OF FITTING TO BEARING FACE "W" (mm)	RECESS IN TRENCH WALL "W1" (mm)	LENGTH "L" (mm)	HEIGHT "H" (mm)
90° BEND	150 200 250 300	300 350 375 400		900 1050 1425 1625	450 600 750 900	CROSS	150 200 250 300	300 350 375 400		600 750 975 1200	450 600 750 900
45° BEND	150 200 250 300	300 350 375 400		450 600 750 900	450 600 750 900	45° WYE	150 200 250 300	300 350 375 400	300 400 500 600	450 600 750 900	450 600 750 900
22 1/2° BEND	150 200 250 300	300 350 375 400		450 600 825 900	225 300 375 450	REDUCER	150 200 250 300	300 350 375 400	150 200 250 300	450 600 750 900	450 600 750 900
TEE	150 200 250 300	300 350 375 400		600 750 975 1200	450 600 750 900	CAPS AND PLUGS (IF NOT BOLTED)	150 200 250 300	300 350 375 400		450 600 750 900	450 600 750 900

THRUST BLOCKS

NTS



FORMED CONCRETE TRENCH DAM

SANDBAG CONCRETE TRENCH DAM

NOTES:
1. CONSTRUCT TRENCH DAMS ON MAINS WHERE GRADES EXCEED 10 %. MAXIMUM SPACING 20 m APART.
2. TRENCH DAMS MAY BE EITHER FORMED CONCRETE OR SANDBAG CONCRETE STYLE.
3. PROVIDE RELIEF DRAINS TO ACCEPTABLE WATERCOURSE OR COLLECTION SYSTEM FROM EVERY TRENCH DAM UNLESS OTHERWISE APPROVED.

TRENCH DAM

NTS

krc CONSULTANTS

A Joint Venture
KOERS & ASSOCIATES ENGINEERING LTD.
REID CROWTHER & PARTNERS LTD.

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	AUG. '96	DH	DS	RECORD DRAWING

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A	MAR. 8/96	GH	DS	APPROVALS
B	MAR. 8/96	GH	DS	TENDER
C	MAR. 8/96	GH	DS	CONSTRUCTION
D	AUG. 21/96	DH	DS	RECORD DRAWING

SEAL

FW-136

PROJECT NO. M9602
DRAWN G.H./ P.R.B. AUTOCAD 12
DESIGNED DS
CHECKED DS.
APPROVED DAK
DATE FEB. 1996
SCALE AS SHOWN

CLIENT

REGIONAL DISTRICT OF NANAIMO

PROJECT

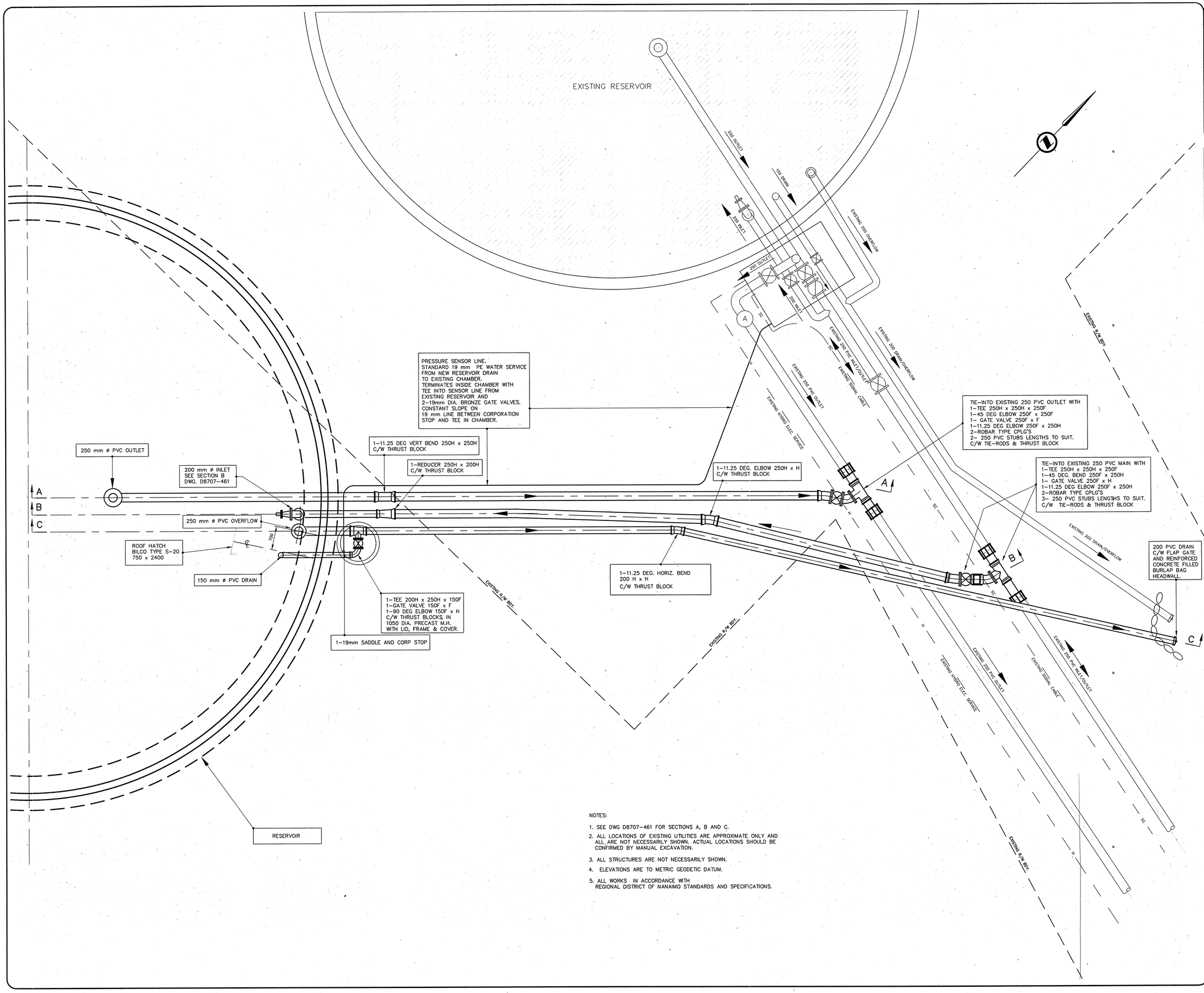
FAIRWINDS RESERVOIR OUTLET MAIN AND FAIRWINDS/WEST BAY INTEGRATION

TITLE

MISCELLANEOUS DETAILS

FW-136

DRAWING No.	REV.	SHEET
M9602–04	1	4 / 6



NOTES:

1. SEE DWG D8707-461 FOR SECTIONS A, B AND C.
2. ALL LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE ONLY AND ALL ARE NOT NECESSARILY SHOWN. ACTUAL LOCATIONS SHOULD BE CONFIRMED BY MANUAL EXCAVATION.
3. ALL STRUCTURES ARE NOT NECESSARILY SHOWN.
4. ELEVATIONS ARE TO METRIC GEODETIC DATUM.
5. ALL WORKS IN ACCORDANCE WITH REGIONAL DISTRICT OF NANAIMO STANDARDS AND SPECIFICATIONS.

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	MAY 13/98	P.B.		EXIST. VALVING.
2	MAY 19/98	P.B.		TEES REPLACE WYE'S
3	SEPT 10/98	P.B.		RECORD DRAWING

FW-149

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A	MARCH 18/98	PRELIM	DS	APPROVALS
B				TENDER
C				CONSTRUCTION
D	SEPT 10/98	PRELIM	DS	RECORD DRAWING

SEAL

PROJECT NO.	D8707
DRAWN	AUTOCAD 14
DESIGNED	PRELIM DS
CHECKED	DS
APPROVED	DS
DATE	FEB. 1998
SCALE	HOR. 1:50

CLIENT

FARWINDS DEVELOPMENT CORPORATION

PROJECT

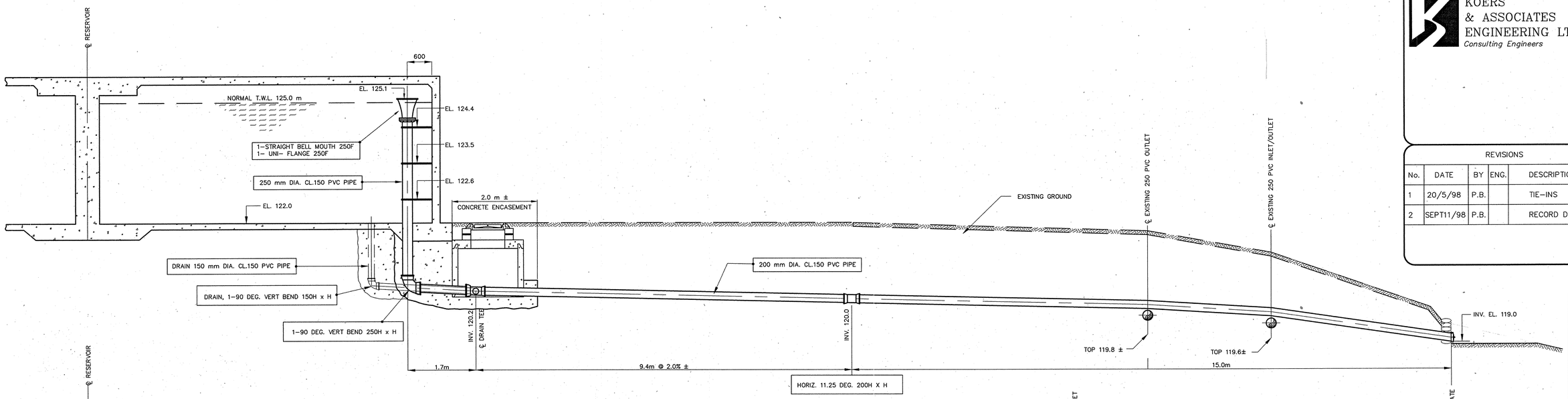
FAIRWINDS RESERVOIR No. 2

TITLE

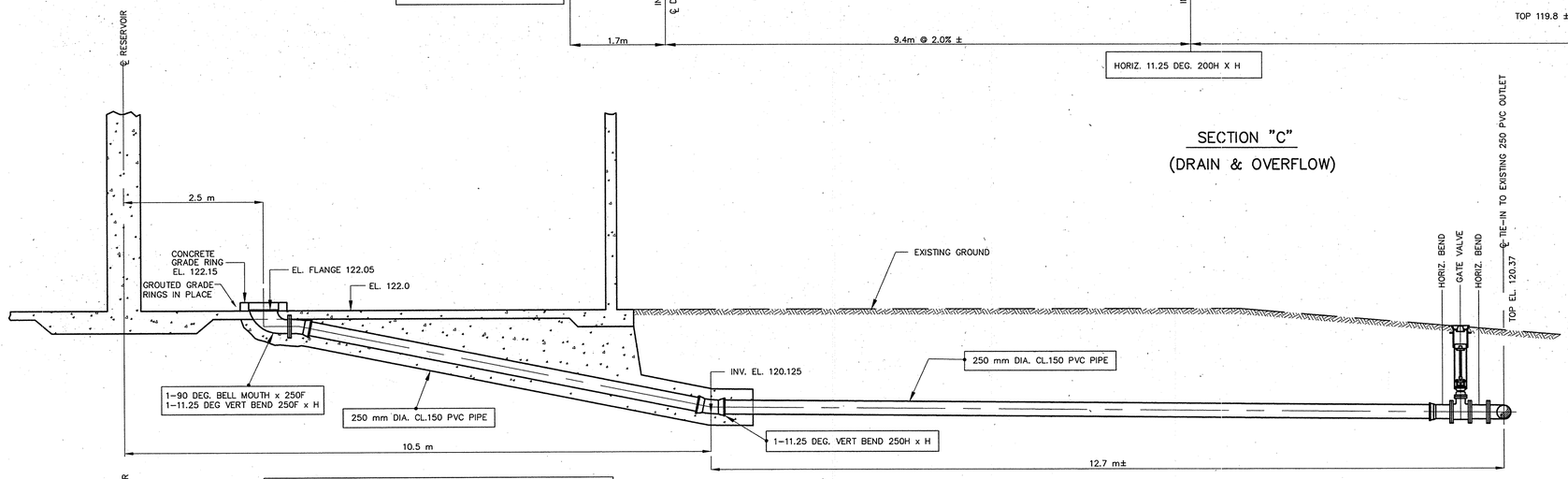
OUTLET, INLET & DRAIN PLAN

FW-149

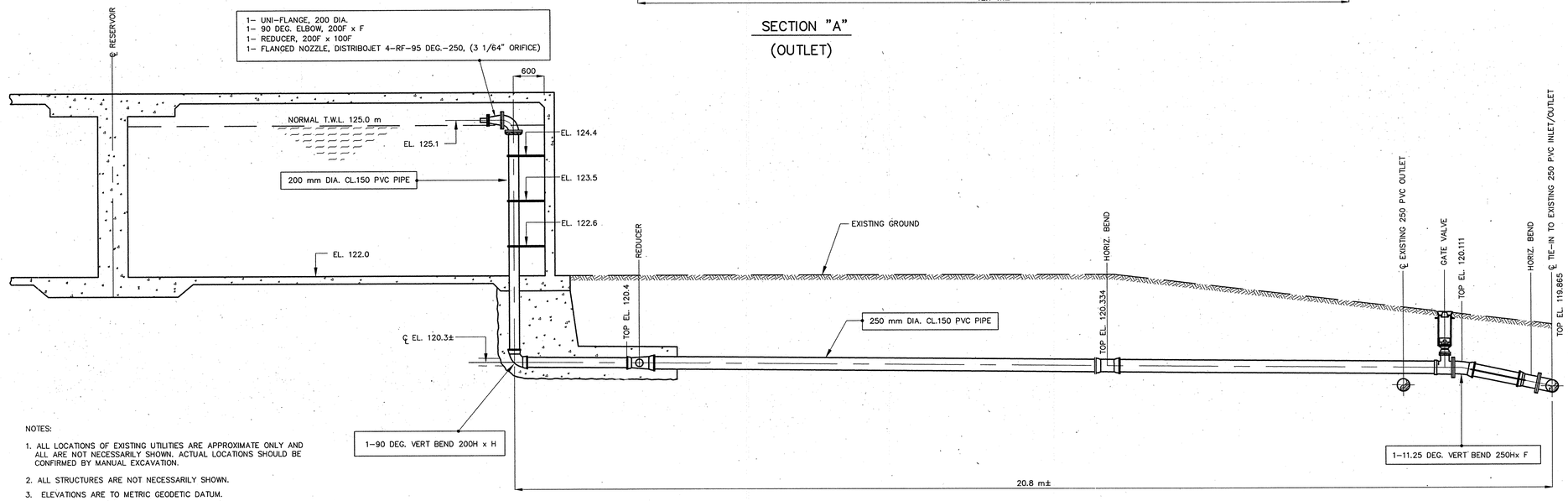
DRAWING No.	REV.	SHEET
D8707-460	3	X



SECTION "C"
(DRAIN & OVERFLOW)



SECTION "A"
(OUTLET)



SECTION "B"
(INLET)

NOTES:

1. ALL LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE ONLY AND ALL ARE NOT NECESSARILY SHOWN. ACTUAL LOCATIONS SHOULD BE CONFIRMED BY MANUAL EXCAVATION.
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3. ELEVATIONS ARE TO METRIC GEODETIC DATUM.
4. ALL WORKS IN ACCORDANCE WITH REGIONAL DISTRICT OF NANAIMO STANDARDS AND SPECIFICATIONS.

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

REVISIONS

No.	DATE	BY	ENG.	DESCRIPTION
1	20/5/98	P.B.		TIE–INS
2	SEPT11/98	P.B.		RECORD DRAWING

FW-150

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A	MARCH 18/98	PB	DS	APPROVALS
B				TENDER
C				CONSTRUCTION
D	SEPT 11/98	PB	DS	RECORD DRAWING

SEAL

PROJECT NO.	D8707
DRAWN	AUTOCAD 14
DESIGNED	PB DS
CHECKED	DS
APPROVED	DS
DATE	FEB.-1998
SCALE	HOR. 1:50

CLIENT

FARWINDS DEVELOPMENT CORPORATION

PROJECT

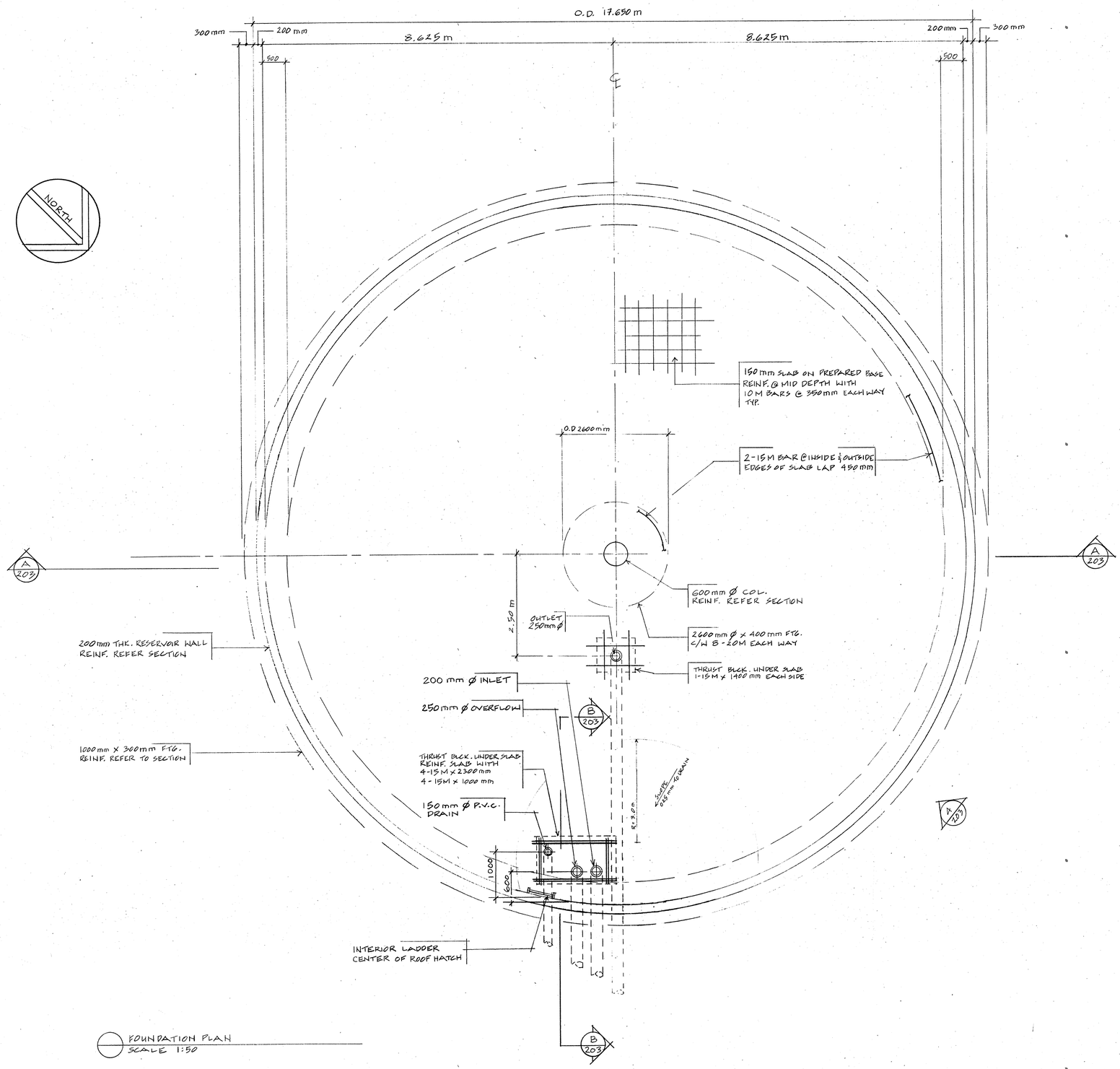
FAIRWINDS RESERVOIR No. 2

TITLE

DRAIN, OUTLET & INLET SECTIONS

FW-150

DRAWING No.	REV.	SHEET
D8707–461	2	X



FOUNDATION PLAN
SCALE 1:50

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

FairWinds

REVISIONS

Nº	DATE	BY	ENG	DESCRIPTION

FW - 151

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A				APPROVALS
B				TENDER
C				CONSTRUCTION
D	Nov 10/98	JW		RECORD DRAWING

WELLS ENGINEERING LTD.

JOHN WELLS, P. ENG.
consulting structural engineer

8 - 2480 kenworth rd., nanaimo, b.c., v9t 3y3
phone 758-8733

SEAL

PROJECT Nº D8707
DRAWN W. GEBHARDT
DESIGNED J. W.
CHECKED J. W.
APPROVED
DATE MARCH 1998
SCALE 1:50

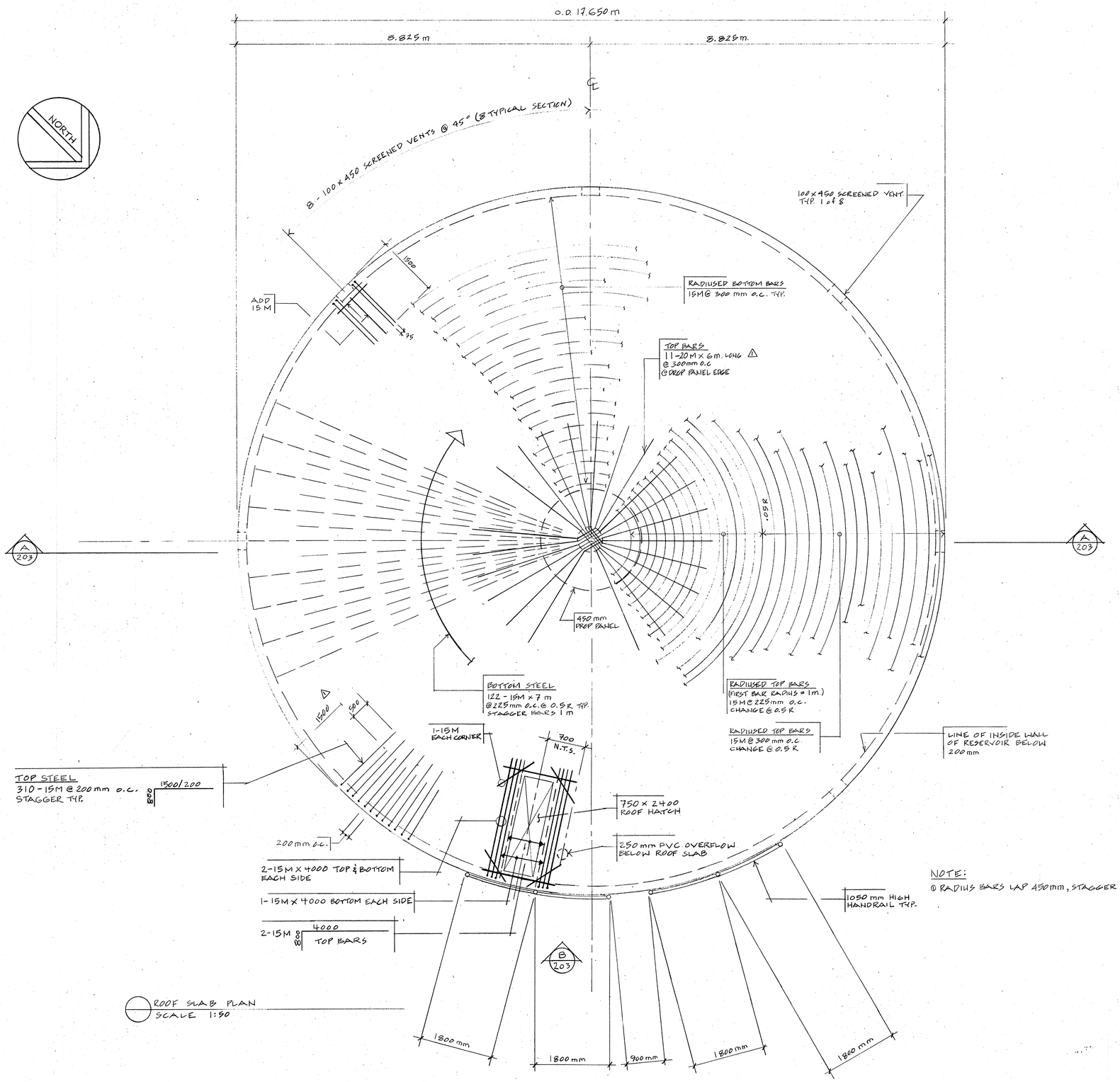
CLIENT PHASE 2
FAIRWINDS DEVELOPMENT CORP.

PROJECT
FAIRWINDS DR. RESERVOIR
NANOOSE B.C

TITLE
FOUNDATION PLAN

FW - 151

DRAWING Nº D8707 - 463 | REV. | SHEET



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

FairWinds

REVISIONS

Nº	DATE	BY	ENG	DESCRIPTION

FW-152

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A				*APPROVALS*
B				*TENDER*
C				*CONSTRUCTION*
D	Nov 10/98	J.W.		*RECORD DRAWING*

WELLS ENGINEERING LTD.

JOHN WELLS, P. ENG.
consulting structural engineer

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SEAL

PROJECT Nº	D8707
DRAWN	W GEBHARDT
DESIGNED	J. W.
CHECKED	J. W
APPROVED	
DATE	MARCH 1998
SCALE	1:50

CLIENT
FAIRWINDS DEVELOPMENT CORP.

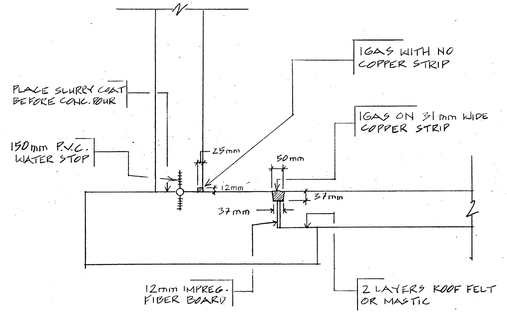
PROJECT PHASE 2
FAIRWINDS DR. RESERVOIR
NANOOSE B.C.

TITLE
ROOF SLAB PLAN

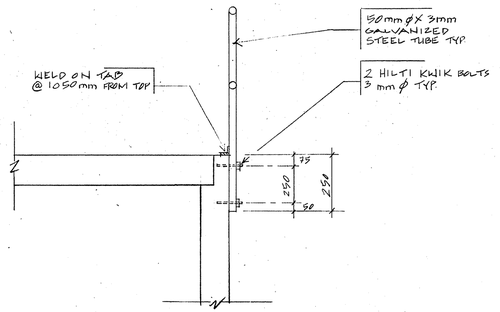
FW-152

DRAWING Nº	REV.	SHEET
D8707-464		

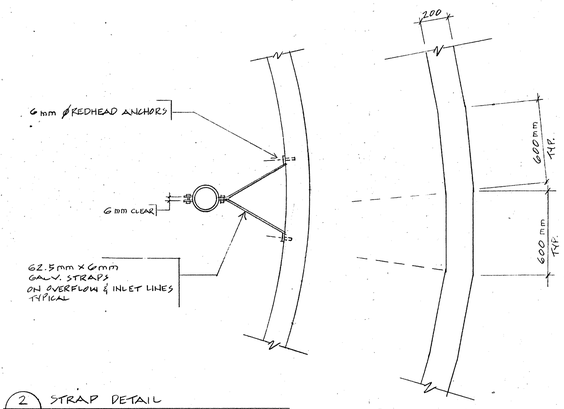
A2/A 40077



1/203 ALTERNATE JOINT DETAIL
N.T.S

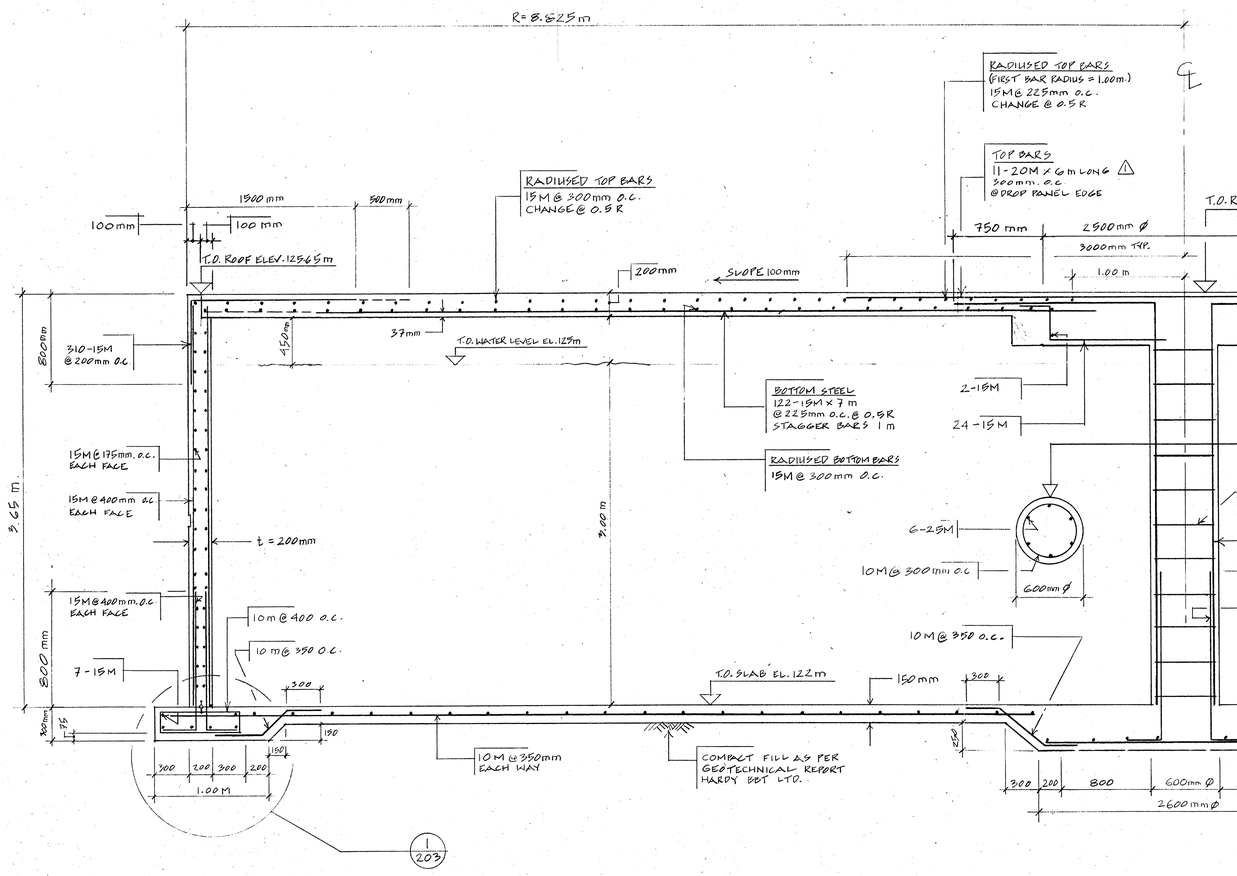


3/203 HANDRAIL CONNECTION DETAIL
SCALE = 1:20

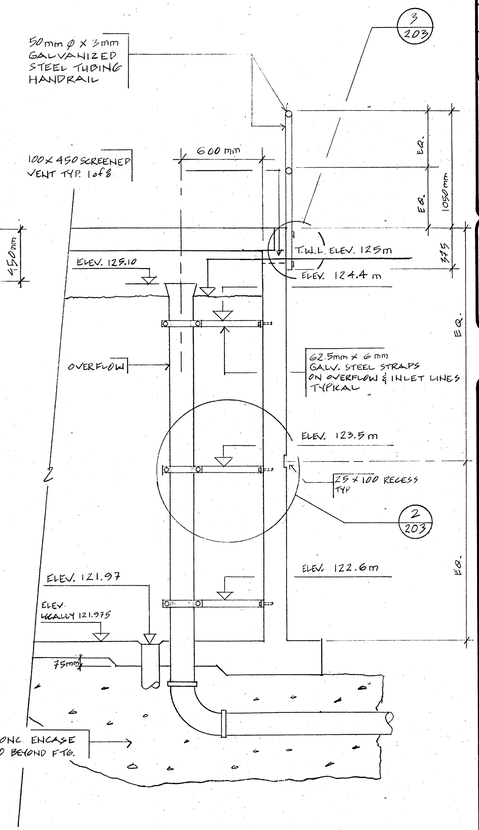


2/203 STRAP DETAIL
SCALE 1:25

4/203 WALL DETAIL (TYPICAL)
SCALE 1:20



A/203 SECTION
SCALE 1:25



B/203 SECTION
SCALE = 1:25

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Consulting Engineers

FairWinds

REVISIONS

No	DATE	BY	ENG	DESCRIPTION

FW-153

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A				APPROVALS
B				TENDER
C				CONSTRUCTION
D	Nov. 10/98	J.W.		RECORD DRAWING

WELLS ENGINEERING LTD.

JOHN WELLS, P. ENG.
consulting structural engineer

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phone 758-8733

SEAL

PROJECT Nº	D8707
DRAWN	W GEBHARDT
DESIGNED	J.W
CHECKED	J.W.
APPROVED	
DATE	MARCH 1998
SCALE	NOTED

CLIENT
FAIRWINDS DEVELOPMENT CORP.

PROJECT PHASE 2
FAIRWINDS DR. RESERVOIR
NANOOSE B.C.

TITLE
SECTIONS
ALTERNATE JOINT DETAIL
PIPE STRAP DETAIL
HANDRAIL CONNECTION DETAIL
WALL DETAIL

FW-153

DRAWING Nº	REV.	SHEET
D8707-465		

A224.08/97

FAIRWINDS DR. RESERVOIR

STRUCTURAL SPECIFICATIONS

1.0 GENERAL

1.1 Scope
Provide all materials, labour and equipment necessary to construct reinforced concrete reservoir.

1.2 Geotechnical
Reference report by Hardy BBT Ltd. of June 21, 1991 NX00040-002G for foundations and base preparation. Foundation design bearing pressure = 150 KPa.

1.3 Design Loads
Roof Live Load = 2.4 KPa.

1.4 Inspection
All work to be inspected by Engineer prior to placement of concrete. Provide 48 hours notice.

1.5 Testing
1.5.1 All concrete shall be inspected, sampled and tested for conformance with specifications by a qualified testing laboratory retained by the Owner.
1.5.2 The method of taking and testing test specimens to be in accordance with C.S.A. A23.2 - M90, 'Methods of Test for Concrete'.
1.5.3 Hydrostatic test loading not to be applied until wall concrete has obtained 28 day compressive strength.

2.0 PRODUCTS

2.1 Concrete
2.1.1 All concrete shall conform with the requirements of C.S.A. A23.1, 'Concrete Materials and Methods of Concrete Construction'.
2.1.2 All cement to be used for concrete shall be Portland Cement Type 1 conforming to C.S.A. A5.
2.1.3 All concrete shall have entrained air 5% ± 1.0%.
2.1.4 Concrete shall conform to these minimum standards.

	Compressive Strength at 28 Days	Maximum Slump	Max. Size Aggregate
Footings & Slab on Grade	20 Mpa	80 mm	20 mm
Walls	30 MPa	100 mm	20 mm
Roof Slab	30 MPa	60 mm	20 mm

2.2 Reinforcement
Reinforcement shall be new deformed bars of billet steel Grade 400 to C.S.A. G30.12 - M77.

2.3 Joint Fillers
Pre-moulded joint filler to be 12mm thick; non-extruding asphalt impregnated cane fibre, set flush with surface.

2.4 Metal Inserts
All metallic inserts, anchors and embedded items shall be galvanized.

2.5 Waterstops
Waterstop shall be extruded elastomeric PVC material chemically resistant to chlorinated water and oils.

3.0 EXECUTION

3.1 Conveying
Concrete shall be conveyed from the mix plant to place of final deposit by methods that will prevent separation or loss of materials. Equipment for conveying concrete shall be of such size and design to ensure a continuous flow of concrete at the delivery end without separation of materials.

3.2 Placing
3.2.1 Depositing: Concrete shall be deposited at slumps specified as close to final position as possible to avoid segregation due to rehandling or flowing. Concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between bars. Concrete that has partially hardened or been contaminated or retamped shall not be deposited.
3.2.2 Schedule: Concreting shall be carried on as a continuous operation until placing of the section is complete. Fresh concrete shall not be deposited on concrete which has hardened sufficiently to cause formation of seams and places of weakness within the section. When construction joints are necessary they shall be as directed.
3.2.3 Compaction: Concrete shall be thoroughly compacted by suitable means during placement and shall be thoroughly worked around reinforcement and embedded items and into corners of forms. Vibrators to compact concrete shall be used under experienced supervision and their use allowed for in design of forms.
3.2.4 Finishes: Roof slab and floor slab are to receive mechanical trowel finish.

3.3 Curing
Concrete shall be prevented from drying for at least 7 days after placement. Moist curing may be discontinued after 3 days if early strength admixtures approved by the Engineer are used.

3.4 Formwork
3.4.1 Erection: Design and erection of formwork shall conform with Workers Compensation Board Regulations. Exposed concrete forms shall have smooth plywood surface towards concrete.
3.4.2 Removal: Unless authorized by the Engineer no formwork, shoring or bracing shall be removed before 7 days from placement of concrete. Roof slab to be shored for 21 days.
3.4.3 Form Ties: Ties shall be provided as necessary to prevent spreading of forms. Ties shall be such that when forms are removed no metal shall be within 25mm of the finished surface. They shall be free of lugs, cones, washers or other devices which leave a hole > 37mm or depressions in the exposed surfaces. Unacceptable surface finishes to be repaired as directed.

3.5 Tolerance
Concrete shall be true to the following tolerances within 2.5m distance in any direction.

Footings & Floor Slab = ± 12mm
Walls & Roof Slab = ± 6mm

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REVISIONS

Nº	DATE	BY	ENG	DESCRIPTION

FW-154

RECORD OF ISSUE

No.	DATE	BY	ENG.	DESCRIPTION
A				APPROVALS
B				TENDER
C				CONSTRUCTION
D	Nov. 10/98	JW		RECORD DRAWING

WELLS ENGINEERING LTD.

JOHN WELLS, P. ENG.
consulting structural engineer

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phone 758-8733

SEAL

PROJECT Nº D8707
DRAWN W. G.
DESIGNED J.W.
CHECKED J.W.
APPROVED
DATE MARCH 1998
SCALE NOTED

CLIENT
FAIRWINDS DEVELOPEMENT CORP.

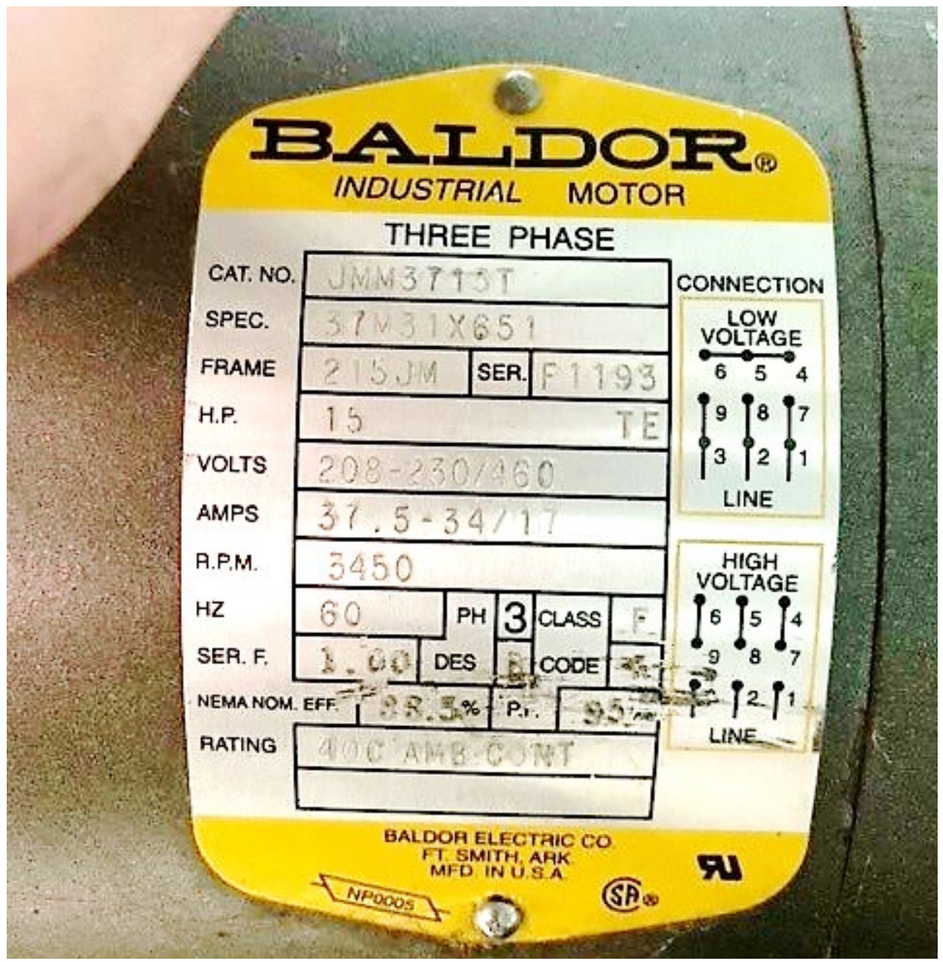
PROJECT PHASE 2
FAIRWINDS DR. RESERVOIR
NANOOSE B.C.

TITLE
STRUCTURAL SPECIFICATIONS

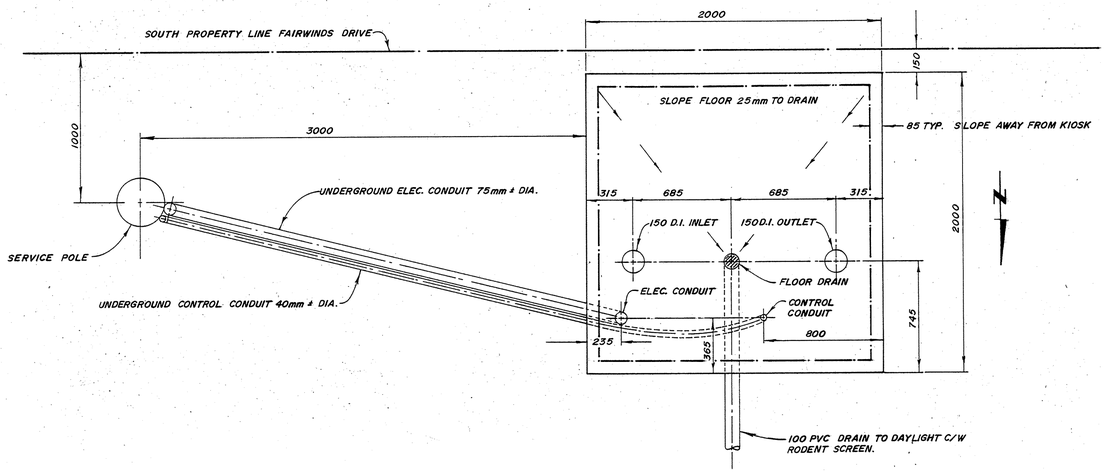
FW-154

DRAWING Nº	REV.	SHEET
D8707-466		

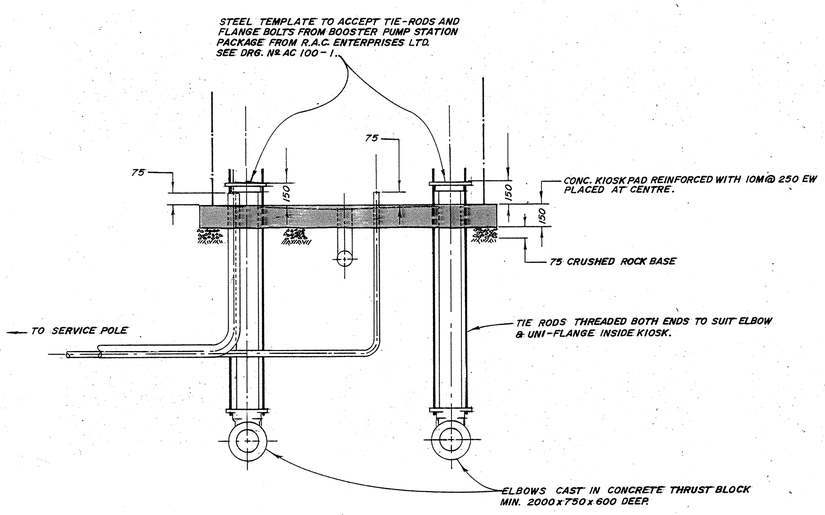
A2/A 48677



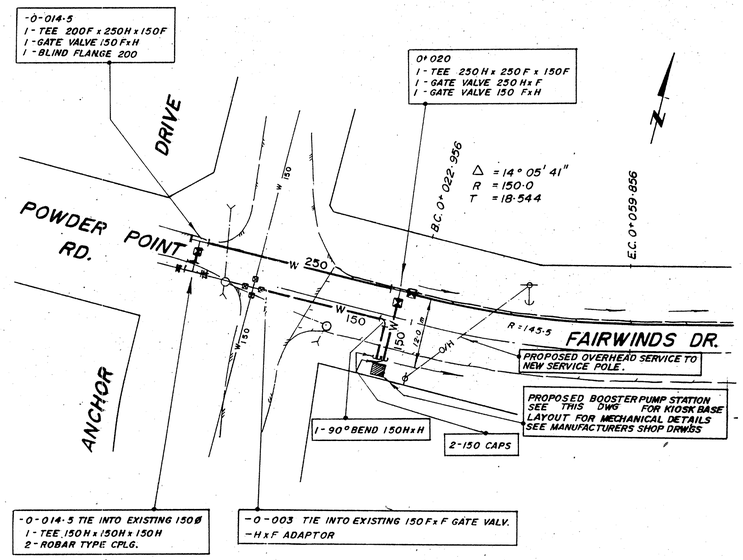
Existing Pump and motor at the Arbutus Booster Pump Station



PLAN



ELEVATION



LOCATION PLAN

SCALE 1:500

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.

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

Fairwinds

REVISIONS

Nº	DATE	BY	ENG	DESCRIPTION
1	MAR. 9/90	P.B.		DRG. Nº FROM D8707-148
2	MAR. / 91			RECORD DWG.

SEAL

FW-023

PROJECT Nº D8707
DRAWN DB
DESIGNED DS
CHECKED DS
APPROVED
DATE DEC. 11, 1989
SCALE 1:20

CLIENT
FAIRWINDS JOINT VENTURE

PROJECT
FAIRWINDS WATER SUPPLY

FW-023

TITLE
BOOSTER PUMP STATION
KIOSK BASE LAYOUT

DRAWING Nº	REV.	SHEET
D8707-158	2	1/1

A2ZA-9807

3. Drafting

3.1. Drafting General

1) All drawings shall be imperial sized (A,B,C and D) at a scale of 25.4:1 so they can be used for metric scale drawings.
2) D size drawings must be produced at the largest scale possible see section (3.3) due to the use of 11" x17" coordination prints and PDF copies. The Consultant shall review all D size drawings at reduced size for clarity and readability before submission to the RDN
3) RDN Border Templates are to be used for all new drawings.
4) All new drawings are to be supplied in AutoCAD format.
5) When modifying existing drawings, identify changes with revision clouds. Do not use phantom lines for backgrounds.

3.2. Paper Space/Model Space

1) Use Model Space for drawing and Paper Space for borders, text, and dimensions for all drawings except the following:
2) Piping Isometrics, Instrument Installations, Loop Diagrams, EHT Zone Drawings and P&I.D's. These drawings use Model Space only at a scale of 25.4:1.

3.3. Borders

1) All borders are supplied in the templates as blocks in Paper space.
2) The scale is 25.4:1 to allow the correct scale between Paper space and Model space.
3) Approved scales used are those listed in AutoCAD for view ports as follows:

1:1	1:10	1:40	4:1
1:2	1:16	1:50	8:1
1:4	1:20	1:100	10:1
1:8	1:30	2:1	100:1

4) For Plan and Profile drawings, a Horizontal Scale of 1:250 and Vertical Scale of 1:50 shall be used.
5) Custom scales or imperial scales are not to be used.
6) The border blocks must not be exploded, use edit attribute to add or change text.
7) Only one border per drawing, do not use multiple tabs for more than one drawing.
8) Isometrics, instrument installation, loop diagrams and EHT zone borders are in model space scaled at 25.4:1 for consistency.

3.4. Notations

1) The note "NOT FOR CONSTRUCTION "is to be marked on all review issued drawings, prior to issued for construction, in large text.

2) The Note "FOR DEMOLITION ONLY" is to be marked on all existing drawings, modified to show the extent of demolition for the project, in large text.

3.5. Drawing Coordinates

1) For plans, sections and isometrics, each drawing shall have a minimum of one Northing, Easting and Elevation to locate the project within the RDN.

2) Where appropriate, show existing bayline/column lines as a reference. This does not substitute for the above.

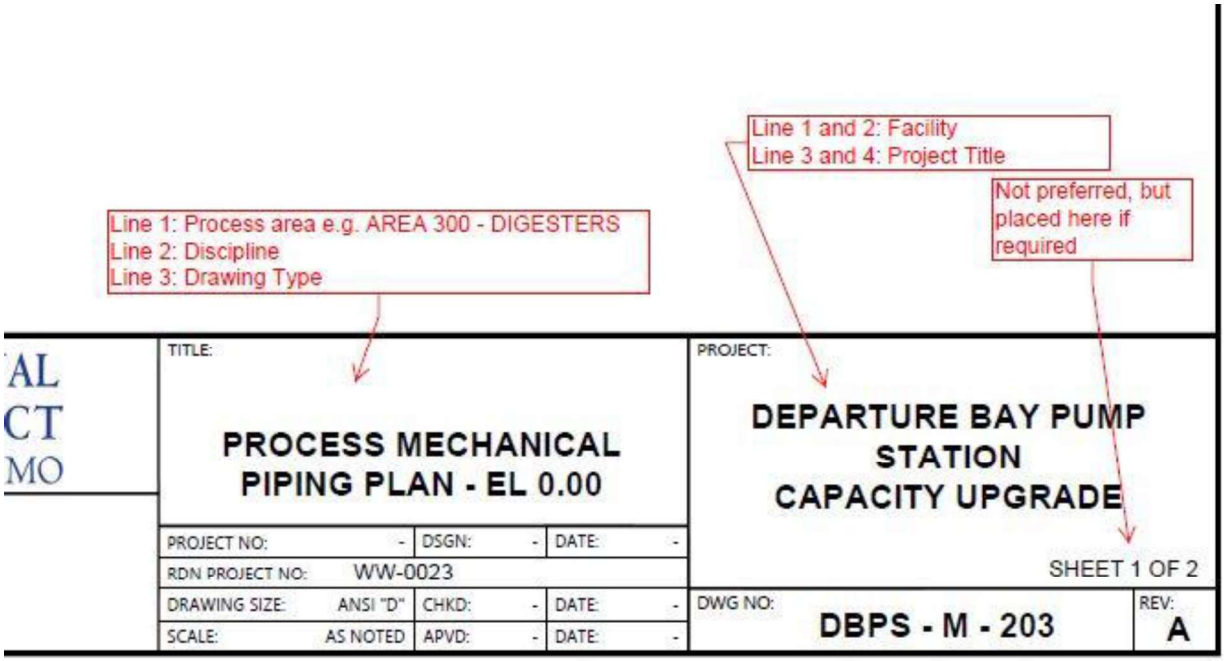
3) Do not create new bayline or grid references without approval by the RDN.

3.6. Auditing

1) Regular audits shall be carried out by the RDN's drafting designate, to ensure Consultant compliance with the RDN's drafting requirements. These audits shall be coordinated with the RDN Project Manager with results and status forwarded to the Manager for Record.

3.7. Drawing Title Blocks

1) Below is a typical title block for RDN drawings.



2) Drawing Title

Line 1 – Plant Process Area – (AREA 300 – DIGESTERS) for facilities that are not divided into process areas, leave line 1 blank.

Line 2: Engineering Discipline – (Architectural, Structural, Process etc.)

Line 3: Drawing Type - Process and Instrumentation Diagram, Load Diagram, Piping Plan etc.)

3) Project

Line 1 and 2– Facility (Departure Bay Pump Station or DBPS, GNPCC, FCPCC etc.)

Line 3 and 4 – Project Title (Sludge Storage Cell #3 replacement, Secondary Treatment etc.)

3.8. Revision Control General

1) The following is a general description of how to fill in the revision table in the border of all drawings. Rev. A is the first issue of any drawing. The description column shall read "ISSUED FOR REVIEW "Rev's B, C, and subsequent review revisions. The description column shall have a brief description of the changes made (e.g. revised to client's comments)
2) Rev 0 is the construction issue. The description column should read "ISSUED FOR CONSTRUCTION."
3) Rev 1, 2 etc. subsequent construction revisions. The description column shall have a brief description of the changes made (e.g. line 18" valve relocated)
4) When a drawing reaches Rev 0, "ISSUED FOR CONSTRUCTION," all preliminary revisions A, B, C etc., are removed from the revision table.
5) The final drawing revision prior to turnover to the RDN, the description column shall read
6) "RECORD DRAWING MOC 123".
7) The date shall be ddmmmyy (e.g. 09JAN06).

3.9. New Drawing Revisions

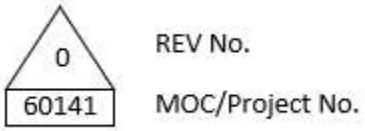
1) For all revisions up to IFC, letter revisions shall be used, i.e. A, B, C.
2) Both the drafter and the checker shall initial these issues.
3) At IFC (Issued for Construction), all review issues and clouds shall be removed and the drawing issued rev 0. The drafter, checker and project engineer shall initial this issue. An Engineer stamped copy is also required.
4) Any further issues, up to project completion, shall be number issues i.e. 1,2,3. Both the drafter and the checker shall initial these issues.
5) An Engineer stamped copy is also required for each issue.
6) All revisions from 1 onward are to be clouded, and each cloud is to have a standard revision triangle to indicate the change.
7) "Record Drawings" of all Master (Critical) drawings as noted on the RDN Engineering Documents Requirements List (EDRL), with all triangles and clouds removed, as the final issue for turnover to the RDN. The drafter, checker, and Engineer shall initial this issue, but as this is a "Record Drawing" based off contractor red-lines and not an "As-Built" drawing an Engineers Seal is not Required.

3.10. Existing Drawing Revisions

1) Both existing P&ID's and existing drawings are to have a revision border added for project revisions.
2) For issues up to IFC, letter revisions shall be used, i.e. A, B, C.

3) Both the drafter and the checker shall initial these issues.
4) At IFC, all the IFR revisions shall be removed from the drawing, and it shall be re-issued rev 0. The drafter, checker and the project engineer shall initial this issue.
5) An Engineer stamped copy is also required for each issue.
6) Any revisions after IFC will be rev 1, 2, 3 etc. The drafter, checker and the project
7) engineer shall initial these issues.

NOTE: The title block information on the original border shall not be changed or marked in any way other than the addition of new reference drawings if required.



8) Any changes are to be clouded, and each cloud is to have the above revision triangle.
9) The drawing shall have a CAD file name consisting of the following:
10) Dwg No – MOC/Project No – rev – No or letter (i.e. DBPS-M-203-60141-B). This shall be the number used in all correspondence.
11) During the close-out stage, the project border shall be removed, all rev triangles, clouds, and the original title block will be updated with the next revision number and issued Record for the project. Revision title:- Record FOR MOC 60141. The drafter, checker and Engineer shall sign this issue.

3.11. Record Drawings

1) The original stamped IFC (Issued for Construction) drawings will be submitted to the RDN during Project implementation.
2) All master IFC drawings will be revised and re-issued as "Record" regardless of whether or not they were altered during construction.
3) The redline mark-ups that are received from the Construction Contractor will be used as the basis for the Record master drawings.
4) Non-master IFC drawings will not be revised or re-issued regardless of whether or not they were altered during construction.
5) All record drawings turned over to the RDN will complete the following sign-offs.
    a) *Designer/Draftsperson*: the designer/draftsperson implements the drafting change to incorporate the Contractor's redline mark-ups onto the drawing.

b) *Checker*: The checker reviews the updated drawing and verifies the modified drawing matches the Contractor's redline mark-ups. This check does not include a technical review.

c) *Discipline Lead/Project Engineer*: The discipline lead/project engineer verifies that the requirements of the Record drawing process have been met and that suitable sets of redline mark-ups were used to prepare the Record drawing. Sign-off by the discipline lead/project engineer does not indicate that an engineering or technical review has occurred.

6) Any handwritten information, including approval signatures, on the hard copy of a drawing, shall be incorporated onto the electronic drawing file before handover to the RDN.

3.12. Support

The RDN shall:

1) Advise the Consultant on drawing format requirements/standards, symbology, drawing/project numbering when/where required, and RDN standards changes.

2) Support the Consultant with guidance and assistance in respect to drawing management (hard copies/digital or software) and as-built requirements.

3) Provide technical support and/or information, as required to facilitate design and drawing preparations.

4) Provide RDN drawing numbers for all new drawings as well as line and tag number information

3.13. Record and Handling

All drawings and schematics provided to the RDN shall be in a reproducible format.

1) After the project, and when record/construction drawings have been issued, drawings, transmittals and associated documents shall be forwarded to the RDN in digital and original signed format for archiving.

2) Drawings received by the RDN in digital format shall conform to this drafting specification.

3.14. Vendor Drawings

1) If third-party vendors were consulted and drawings were prepared on AutoCAD, the as-built drawings shall be requested in native .dwg format and forwarded to the RDN by the Consultant.

2) If drawings were produced by other CAD systems, the Consultant shall convert drawing files to ensure compatibility with the RDN system prior to sending them to the RDN.

3) Vendor Drawings are to have the RDN supplied equipment tag number clearly marked on the drawing, and electronic files are to be named by the equipment tag number.

3.15. Equipment Tagging

1) All tagging shall be as per RDN SP-G-0002 Identification Engineering Standard. When this standard is not provided, the Consultant will be provided with tag numbers using the RDN approved format.
2) Equipment tagging shall be presented to the RDN prior to the completion of preliminary engineering. After completion of preliminary engineering, only RDN approved tag numbers shall be present or referenced on any project documentation provided. Use of Consultant developed tagging systems is not allowed.
3) Only RDN approved tag numbers shall be present on Tender and Construction Documents. Use of placeholder tags is not allowed.
4) All field labelling shall match the design tagging.

3.16. CAD File Names

1) All drawings shall be saved using an AutoCAD file name that is the same as the drawing number, e.g. LRPS –S-0103 R0

3.17. Engineering Stamps

1) All drawings submitted to the RDN for any project shall have an EGBC Permit to Practice, and Professional Engineers seal applied to all "Issued for Construction" drawings and subsequent drawing revisions in accordance with the EGBC requirements for the use of Professional Seals and Permit to Practice.

3.18. Drawings – P&IDs

P&ID drawings shall include:

1) Equipment, instrument, control valve, isolation valve, and line tag numbers per SP-G-0002 Engineering Identification Standard
2) Critical process information is listed for each line (Flowrate Norm/Max, Pressure Norm/Max, Concentration Norm/Max, etc.).
3) Equipment name, tag number, make/model, critical process information (power, Capacity, volume, TDH, etc.)
4) Process safety control equipment set points (e.g. pressure relief set points, %LEL concentration set points, etc.)
5) Cloud around modifications to existing drawings.
6) Delineators for above-ground and below-ground piping.
7) All drawing references to be RDN drawing number, not sheet number.