REQUEST FOR PROPOSALS No. 24-002

Departure Bay Pumpstation and Forcemain: Collaborative Design and Construction – Contractor Team Selection

ISSUED: February 15th, 2024

CLOSING DATE AND TIME:
Submissions must be received on or before:
3:00 PM (15:00 hrs) Local Time on March 27th, 2024

Submissions and Questions are to be directed to:

Gerald St. Pierre, P.Eng., PMP
Project Engineer, Capital Projects
Regional District of Nanaimo
Phone: 250-713-6957
Email: gstpierre@rdn.bc.ca

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

1. INTSTRUCTIONS TO PROPONENTS

a. Closing Date/Time/Submission Method

Submissions must be received on or before 3:00 PM (15:00 hrs), Local Time, on **March 27th, 2024**.

Submission Method:

By Email: In PDF format with "**24-002 - Departure Bay Pumpstation and Forcemain: Collaborative Design and Construction – Contractor Team Selection**" as the subject line at this electronic address:

gstpierre@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.

b. 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.

c. Addenda and Questions & Answers

If the RDN determines that an amendment or questions & answers are required for this RFP, the RDN will post the Addendum on the RDN (www.rdn.bc.ca/current-bid-opportunities) 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.

d. 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.

e. Unsuccessful Vendors

The Regional District will offer debriefings to unsuccessful Proponents, on request, at a mutually agreeable time.

2. INTRODUCTION

The Regional District of Nanaimo (RDN) invites qualified and experienced Contractor Teams to submit Proposals to join a collaborative effort to complete the detailed design and construction for the above-noted Project.

This RFP contains capitalised terms referring to Integrated Project Delivery (IPD) methods. The terms are defined in **Appendix A** which contains two documents:

1. "Exhibit A – Definitions" from the sample contract "Hanson Bridgett Integrated Project Delivery (IPD) Agreement", and;
2. A glossary taken from "Integrated Project Delivery: An Action Guide for Leaders", available on the Integrated Project Delivery Alliance's (IPDA) website at: https://www.ipda.ca/knowledge-competency/tools/integrated-project-delivery-an-action-guide-for-leaders/. The RDN does not represent or warrant the accuracy or completeness of any information contained within the above-referenced guide or the IPDA's website.

"Exhibit A – Definitions" shall take precedent where a term is defined in both above documents.

This Request for Proposals (RFP) is issued to determine the most qualified and experienced team of service providers that can meet the RDN's requirements, expectations, and timeline using the Integrated Project Delivery (IPD) model. The Respondent Team is expected to include a Lead Contractor, Mechanical & Process Contractor, Structural Contractor, Linear Infrastructure (Civil) Contractor, and Electrical & Instrumentation Contractor, who would be selected as a Team but who would engage with RDN as individual organizations and partners in the IPD process. It is possible that the Lead Contractor may have the required mechanical, process, electrical and instrumentation, structural, and civil capabilities in-house. In this case, the Respondent shall identify this in their proposal. Together, the Owner, Designer Team and Contractor Team form the overall IPD Team.

The RDN, along with the City of Nanaimo, will review and evaluate the Team submissions received in response to this RFP and conduct interviews with 2 or more of the top-ranked Respondent Teams. The RDN will then proceed to negotiate with the overall top-ranked Team to perform the scope of work required to complete the Validation Report (the Work). Should these negotiations fail to result in an agreement for the Work, the RDN may then elect to negotiate with the next highest ranked Respondent Team and so on until an agreement is reached or the process is cancelled.

Following approval of the Validation Report, the RDN intends to enter into an IPD agreement using the Hanson Bridgett contract with the successful Respondents. This would indicate the start of the detailed design and construction phases of the project.

In any event, the RDN shall not be bound to enter into a contract with any Respondent to this RFP and, at its sole discretion, may elect to collapse this process. RDN Board approval is required prior to entering into any agreements referenced in this document.

3. BACKGROUND

The RDN operates four wastewater treatment facilities, 23 pump stations, and two septage receiving sites to transport and treat wastewater from more than 130,000 residents between Qualicum Beach and Duke Point.

The Departure Bay Pumpstation (DBPS) and Hammond Bay Forcemain (HBFM) were built in 1974 and are owned and operated by the Regional District of Nanaimo (RDN). The DBPS is located at 2936 Departure Bay Road in Nanaimo, B.C. and the forcemain runs from there to the Greater Nanaimo Pollution Control Centre (GNPCC) at 4600 Hammond Bay Road. The pumpstation provides conveyance of approximately 75% of the wastewater flows directed to GNPCC. Capacity constraints at the DBPS have resulted in back-ups within the interceptor and eventually overflows within the system. It is therefore necessary to upgrade the capacity of the pumpstation and the forcemain to handle future projected flows.

The project will be completed in multiple phases and will involve significant upgrades to the DBPS, construction of a new forcemain along Hammond Bay Road, and influent channel improvements at the GNPCC. There will also be substantial scope related to replacement and/or upgrades to City of Nanaimo owned water, sewer, and storm utilities (including a creek crossing) within the Hammond Bay Road corridor. City of Nanaimo staff will be active but non-signatory participants in this project.

The IPD Team will review the Project and complete a Validation Report that will include a Base Target Cost for the project base program and scope. Once approved, the Project would then proceed through detailed design and construction using the Hanson Bridgett IPD agreement. Reference **Appendix B** for a sample copy of the Hanson Bridgett IPD agreement.

To help ensure success of the project for all IPD Team members, the RDN has engaged a third-party coach (Colliers Project Leaders) to facilitate and guide the IPD Team process.

Integrated Project Delivery is not a business-as-usual arrangement. The process is highly collaborative and requires commitment from all IPD Team members to establish an open, trusting relationship and joint project management processes to be successful. For those not familiar with IPD and the governing agreement, it is advised to research the project delivery model and carefully review the sample Hanson Bridgett IPD agreement in **Appendix B** prior to submitting a response to this RFP. Some suggested resources for more information on IPD and Lean construction are:

- Home | The Integrated Project Delivery Alliance (IPDA)
- Integrated Project Delivery for Construction - IPD (leanipd.com)
- About | Lean Construction Institute
- Lean Design Construction Canada

The above website links are provided for general information purposes only. The RDN does not represent or warrant the accuracy or completeness of any information contained within the websites.

4. PROJECT CHALLENGES

This project has some key challenges to consider and address, including:

a. The DBPS is located on Departure Bay Beach adjacent to a documented First Nations' village site.

b. Departure Creek, a fish bearing stream, runs underneath the DBPS property.

c. The existing DBPS must remain operational during the upgrades.

d. Hammond Bay Road is a key transportation corridor for City of Nanaimo residents/commuters as well as Emergency Services. The corridor contains many other underground utilities including sewer, water, storm, and natural gas.

5. PROJECT OBJECTIVES

The execution of both the design and construction of this Project must consider some specific objectives as follows:

a. Increase the capacity of the DBPS, HBFM, and GNPCC influent channel to meet the projected 2076 flows of 2460 L/s.

b. Design and Construct the DBPS to meet or exceed requirements related to sea level rise and seismic codes and provide high levels of back-up and redundancy.

c. Design and Construct replacements and/or upgrades to existing CoN utilities to meet the City's Manual of Engineering Standards and Specifications. Linked Here

d. Construction of the works should be designed and executed to mitigate disruption to existing pumpstation Operations, archeological values, the environment, and CoN residents.

6. SCOPE OF SERVICES

The general scope of services requested as part of this RFP includes the following:

a. Reliable in-person participation in Big Room activities using Lean IPD procedures, tools and techniques. The Big Room will be located in Parksville, BC.

b. Provide a representative for the Senior Management Team (SMT) per organization.

c. Provide an experienced representative for the Project Management Team (PMT) per organization.

d. Provide experienced technical and other experts for Project Implementation Teams (PITS), to engage in the key discipline areas of civil / structural, mechanical / process piping and electrical / instrumentation and associated project management and cost modelling / estimation. The proposed team should also include members with expert knowledge and/or relative experience in Building Information Modelling (BIM), specifically the use of Autodesk Plant 3D, Revit, Navisworks, and Civil 3D, including other types where applicable, in planning and executing the related scope of work.

e. Engage collaboratively with the Designer and RDN in the project design to provide innovative ideas that improve construction operations across all aspects of work execution, including supply chain considerations and labour productivity, to adapt plans and continual estimates accordingly. The Design Team, as registered professionals, will take overall responsibility for design but the Contractor Team will assume responsibility for execution of a constructable design.

f. Jointly develop, with the other IPD Partners:

    i. the Expected Cost, the Base Target Cost, and standards for the integration of Project financial information from all Project Participants. This will include an appropriate Project Contingency (Risk & Opportunities balanced) and Allowances (including Escalation);

    ii. the associated Business Terms Sheet in the Hanson Bridgett IPD Agreement;

    iii. the financial management processes for the project including development of the Incentive Program;

    iv. the Baseline Milestone Schedule, engaging in adaptive, agile Lean planning processes;

    v. a Responsibility Matrix; and

    vi. the Validation Report, following the IPD team process.

g. Assuming Validation approval, and conditional upon execution of the IPD Agreement, work collaboratively with the other IPD Partners, and within the IPD processes and framework, for the remaining project execution including:

    i. the completion of detailed design, construction documentation and remaining procurement;
    ii. all logistics and supply chain planning and execution to prepare for construction operation;
    iii. field leadership for the construction phase and the ongoing continuous improvement processes to meet or exceed performance expectations; and
    iv. an integrated commissioning plan.

7. CONTEMPLATED SCHEDULE

The Validation phase is expected to take at least three months to complete. The IPD Team will determine the Validation phase schedule at the outset and the overall Project schedule in Validation. Below is an initial estimate of the Project timing, for guidance.

- Evaluate and Select IPD Team – Second Quarter (Q2) 2024
- Onboarding for IPD Team – Q2 2024
- Pre-Validation Geotechnical Investigations – Q2 2024
- Commence Validation phase – Q2 2024
- Negotiate IPD Agreement – Q3 2024
- Complete Validation phase – Q3 2024
- **Proceeding beyond this point is dependent on outcome of the Validation Report, successful negotiation of an IPD agreement and Project approval by the RDN Board.**
- RDN Board approval – Q3 2024

Timing of the detailed design and construction phases will be dependent upon the IPD Team defined approach captured in the Validation Report. Note that the IPD Team will be expected to integrate work structuring that supports design-to-construction flow efficiency with Lean Project Delivery.

- Commence detailed design – Q4 2024
- Complete forcemain and influent channel detailed design & construction preparations – Q1 2025
- Commence forcemain and influent channel construction – Q2 2025
- Complete pumpstation detailed design & construction preparations – Q3 2025
- Commence pumpstation construction – Q4 2025

8. PROPOSAL SUBMISSION

The Proposal submission should include the information outlined in this section. To facilitate uniformity of presentation and ease of evaluation, the Proposal should be limited to a maximum of 50 single sided pages, with a minimum 10-point font, (including appendices) and address the following evaluation items in order:

a. Executive Summary

i. One or two pages summarizing the Proposal and highlighting the Respondent Team's key attributes that addresses the qualifications and experience to successfully collaborate in this IPD project.

b. Project Methodology

i. Demonstrate an understanding of Lean principles, tools, and techniques and how they can be applied to the various stages of this project through completion.

ii. Discuss the Respondent Team's view regarding Big Room activities in the Validation, Design, Construction, Commissioning and Post-Commissioning phases of the project.

iii. Discuss the role of contractors and trades during design, and discuss the role of consultants during construction, with a focus on collaborative methodologies.

iv. Discuss the project challenges listed in Section 4 of this document and some of the strategies your team would recommend to address these challenges.

c. Resource Availability and Responsibilities

i. Provide an organization chart representing the multiple companies and roles involved, specific to the project, using a typical IPD structure. Identify only the team members that will be actively and directly contributing to the project. At a minimum, this must include SMT and PMT roles plus the primary construction leadership roles representing each organization.

ii. Clearly identify each team member's role and include a Responsibility Matrix showing contributions at each phase of the IPD process.

iii. Describe methodology for crew planning during construction/commissioning. Include how your team will manage variation to respond to changes in labour reliability, work volumes or construction bottlenecks.

iv. Clearly identify current commitments (as a percentage) and availability for identified team members to be committed to this project.

d. Project Team Qualifications

i. For the team identified above, summarize how the team's technical and managerial experience on IPD projects, or other collaborative projects, will make them well suited to successfully complete this IPD project.

ii. For each of these key personnel, provide roles and responsibilities on three previous projects demonstrating experience related to their proposed role on this project.

iii. As a separate appendix, provide resumes including, but not limited to the following roles[1]:

- Senior Management Team Member (Must be Principal or President)
- Project Management Team Member (Proposed)
- Project Implementation Team Members (May include superintendent, project coordinator, site inspector, estimator, etc.)

e. Project Management

i. Demonstrate understanding of the role of the Senior Management Team, Project Management Team and Project Implementation Teams including during field execution. Discuss how the team approach would maximize value to the project, reduce waste and improve efficiency.

[1] Respondents should anticipate that any personnel listed with resumes may be requested by the RDN to participate in the interview process. At a minimum, the RDN will require the SMT member and a PMT member for the interview.

ii. Demonstrate understanding of the IPD joint project management approach, particularly explaining the financial aspects including forecasting, open-book accounting, invoicing and change management processes.

iii. Discuss strategies for estimation including conceptual cost modelling, continuous estimation and risk/contingency integration practices that will support the IPD process.

iv. Provide methodology for civil / structural, mechanical / process piping and electrical / instrumentation construction. Include any experience with the integration of technology and BIM.

v. Demonstrate an understanding of pull planning and adaptive/agile systems and their use in collaborative projects.

f. Project Firm Qualifications

i. Identify each of the firms comprising the Respondent's team, (clearly identifying any joint ventures or partnerships) and provide a brief history of each of the Respondent's firms, specifying the role and interest each firm has in participating in an IPD project.

ii. Based on each of the Respondent firm's roles and responsibilities (as identified in section c and d above), describe how the Respondent firm's corporate culture supports collaboration, transparency, and willingness to perform as part of a multi-disciplinary team.

iii. For each of the Respondent firms, describe the corporate qualifications, resources, and the ability of each firm to undertake this project.

g. References and Past Experience in Collaborative Projects

i. List and describe three collaborative (3) projects carried out by the Respondent Team that showcase the Contractor Team working together. Projects should be within the last ten (10) years and clearly demonstrate relevant experience and qualifications to design, construct, and commission projects similar in scope, value, and challenges to this Project. Include:

a. Description of the projects demonstrating how they are similar to this Project and the collaborative tools and techniques used to complete them;

b. Identification of the Delivery Method that was used to deliver the project;

c. Date of completion, or if in progress, estimated date of completion and stage of the project;

d. Outline which of the Respondent firms and key personnel were part of the project, and their role(s);

e. A summary of lessons learned with respect to the collaborative delivery aspects; and

f. A reference for each project. Include name, title, organization, phone number and email address.

h. Equity and Sustainability

i. 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.

i. Financials

i. Provide a summary table, similar to the sample below, that is calculated in a manner consistent with Exhibit 'E' – Builder Chargeable Costs, provided in **Appendix C.**

Company	Employee	Role	BHWR	DPEM	DPE	Labour Cost

ii. Provide a summary table, similar to the sample below, to show:

a. your proposed overhead rate as per Section 2.2.3 (b) of Exhibit 'E' – Builder Chargeable Costs, provided in **Appendix C.**

b. your proposed Stipulated Profit Percentage as per Section 8.3 of the Sample Hanson Bridgett IPD Agreement included as **Appendix B**.

Company	Overhead Rate Proposed	Stipulated Profit Percentage Proposed

9. *EVALUATION*

a. Proposals will be initially evaluated by the RDN and the City of Nanaimo based on the above list and assigned a score out of 100, as per the matrix below.

Evaluation Item	Weighting
1. Executive Summary	**5**
2. Project Methodology	**20**
3. Resource Availability and Activities	**5**
4. Project Team Qualifications	**20**
5. Project Management	**15**
6. Project Firm Qualifications	**5**
7. References and Past Experience in Collaborative Projects	**15**
8. Equity and Sustainability	**5**
9. Financials	**10**
Total	**100**

b. The evaluation team will then conduct an in-person interview with 2 or more of the highest rated Respondents and assign each Respondent an interview ranking out of 50.

c. Following the interviews, the RDN will add up the proposal and interview scores and award the project to the highest overall rated Proponent, out of 150.

10. COMPENSATION

The successful Respondent Team firms will each be compensated for their Chargeable Costs (Ref. Exhibit 'E' in **Appendix C**) in the Validation Phase consistent with IPD pricing models, which separates and excludes profit. This will be negotiated with the highest rated Respondent.

Should the project be approved past Validation, this Profit-at-Risk pricing will be added and addressed accordingly and go through final negotiation for all IPD parties as per the Hanson Bridgett IPD Agreement.

Please note that during the Validation Phase, the RDN will conduct an audit of the Non-Owner Parties' financial records as per Section 9.2.1 of the Sample Hanson Bridgett IPD Agreement included as **Appendix B**.

11. GENERAL CONDITIONS

a. 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.

b. Privilege Clause

The lowest priced or any proposal may not necessarily be accepted.

c. 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.

d. 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.

e. 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.

f. 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.

g. 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.

h. 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.

i. 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.

12. LIST OF APPENDICIES

- Appendix A – Exhibit A – Definitions, and IPDA Guide Glossary
- Appendix B – Sample Hanson Bridgett IPD Agreement
- Appendix C – Sample Exhibit 'E' – Builder Chargeable Costs
- Appendix D –Departure Bay Pumpstation Upgrade Study, Associated Engineering, 2021
- Appendix E – Departure Bay Pumpstation Update to Pump Selections – Associated Engineering, 2023
- Appendix F – Hammond Bay Road – Corridor Topographic Survey, GeoVerra, 2023

Integrated Project Delivery Agreement
Exhibit A – Definitions

1. "**Achievement Event**" is an event described in Exhibit B-5.

2. "**Actual Net Recovery from Builder's Risk Insurance**" is the amount of actual funds received from the Builder's Risk insurance required by the Agreement, less any amount incurred to prosecute the Builder's Risk claim.

3. "**Added Value Incentive Items**" means those items set forth in Exhibit F.

4. "**Adverse Weather**" is a weather event having a statistical recurrence interval of 25 years or more in the geographical area where it occurs and which prevents or substantially impedes a Builder's ability to perform Construction Work resulting in a delay in the Contract Time beyond the number of lost days built into the Project Schedule for adverse weather. Construction work is substantially impeded if the Builder loses more than half of a planned and otherwise available workday except to the extent the delay is also caused by any fault, neglect, act, or omission of the Designers, Builders, or their respective employees, consultants, subcontractors, or suppliers.

5. "**Affiliate**" has the meaning provided in *Business Corporations Act*, SBC 2002, c 57, as amended from time to time.

6. "**Agreement**" is the Integrated Project Delivery Agreement executed by the Parties for this Project and all of the exhibits referenced in the Agreement.

7. "**Allowance**" is an estimated cost for a specific portion of the Work that is not at risk and does not contribute to shared savings. An Allowance is reconciled when it becomes an actual cost, or when the cost for the Allowance item can be reasonably estimated. If the reconciled amount is more or less than the estimated cost for the Allowance, then the Base Target Cost or Final Target Cost (depending on the Project Phase) is increased or decreased by the difference between the reconciled amount and the estimated cost.

8. "**Allowed Claim**" is defined in Section 12.1.2 of the Agreement.

9. "**Amendment**" is a document executed by the Parties amending the terms and/or conditions of the Agreement.

10. "**Anti-Corruption Laws**" means Applicable Laws, rules, or regulations concerning or relating to public or commercial bribery or corruption.

11. "**Applicable Law**" includes all local, provincial, and federal laws, rules, regulations, ordinances, building code, or other codes, statutes, or regulations, or lawful orders of Governmental Authorities that are relevant to any Party's rights or obligations under the Agreement. Applicable Laws include Anti-Corruption Laws.

12. "**Architect of Record**" ("**AOR**") is the Designer with primary responsibility for creating all architectural design documents and to sign and seal all architectural documents within its scope and in accordance with Applicable Law.

13. "**Base Target Cost**" is the amount agreed by the Parties at the conclusion of the Validation Phase per Section 5.4.17 of the Agreement.

14. "**Baseline Schedule**" is described in Section 5.4.10 of the Agreement.

15. "**BIM**" means Building Information Model.

16. "**BIM Execution Plan**" is described in Section 5.4.1 of the Agreement.

17. "**Builder**" means each Party who is responsible for performing the Construction Work in whole or part, among other things. The Contractor is a Builder.

18. "**Builders Lien Act**" means *Builders Lien Act*, SBC 1997 c 45, as amended from time to time.

19. "**Building Information Model**" is a parametric, computable representation of the Project design developed by the Designers, their consultants, and any Design-Build Trades, and will include construction details developed by the Parties and their respective consultants and subcontractors. As used in this Agreement, references to Building Information Model include the primary design model or models and all linked, related, affiliated, or subsidiary models developed for design, estimating, detailing, fabrication, or construction of the Project, or any portion or element of the Project. The portions of the BIM prepared by the Designers, their consultants, and the Design-Build Trades, and those portions prepared by the Builders under the responsible control of a licensed design professional, are Implementation Documents. The portions of the BIM prepared by the Builders or subcontractors (other than Design-Build Trades) to illustrate means and methods for constructing, fabricating, or installing portions of the Construction Work are Submittals, which are not Contract Documents or Implementation Documents.

20. "**Business Day**" is any Calendar Day other than Saturdays, Sundays, and legally recognized holidays in the jurisdiction where the Project is located.

21. "**Business Terms Sheet**" are the page(s) under that heading prior to Article 1 of the Agreement that sets forth the key business terms among the Parties.

22. "**Calendar Day**" is any day whether a Business Day or not.

23. "**Change Event**" has the meaning set forth in Section 11.1 of the Agreement.

24. "**Change Order**" is a mutually agreed written order between Parties adjusting the Base Target Cost, Final Target Cost, ICL, and/or Contract Time.

25. "**Change Order Percentage**" is the value, as applicable, set forth in the Business Terms Sheet.

26. "**Change Order Request**" is a written request for Change Order, which sets forth the nature of the change, the reason for the change, and the effect, if any, on the Base Target Cost or Final Target Cost, the Contract Time, or ICL.

27. "**Chargeable Cost**" is a cost incurred in the performance of the Work (excluding profit), specifically those defined in Exhibits D and E, and are chargeable against the Base Target Cost and Final Target Cost.

28. "**Co-location Plan**" is described in Section 6.6 of the Agreement.

29. "**Commissioning Phase**" is described in Section 5.4.2 of the Agreement.

30. "**Commissioning Plan**" is described in Section 5.4.3 of the Agreement.

31. "**Communication and Decision Plan**" is described in Section 5.4.4 of the Agreement.

32. "**Confidential Information**" means, with respect to a Party, any and all information and materials disclosed in furtherance of this Agreement or any Amendment hereto by or on behalf of the Party, its Affiliates, or any of their respective representatives to another Party or any of its representatives to the extent that the information:

    a. is marked or otherwise identified as confidential or proprietary information, or

    b. should, by its nature, or under the circumstances of its disclosure, reasonably be understood to be confidential or proprietary information of the Party.

    c. Without limiting the foregoing, Confidential Information includes:

    d. the Personal Information of any employee, officer, or director of a Party;

    e. Owner's business, technical, and financial data, including Owner's intellectual property;

    f. the trade secrets of a Party including existing and future products or service offerings, designs, business plans, business opportunities, finances, research, development, know-how, and other business, operational or technical information if the information satisfies the conditions of clause a or clause b, above, and

    g. the existence, pricing, and terms and conditions of this Agreement are not Confidential Information as between the Parties but are Confidential Information as to persons or organizations not a party to this Agreement.

33. "**Conformed Design Documents**" means the documents described in Section 6.5.1 of the Agreement.

34. "**Consequential Damages**" are unanticipated or indirect losses, including loss of anticipated profits, loss of business opportunities, loss of bonding capacity, unabsorbed or increased overhead except as otherwise provided in this Agreement, increased financing costs, increased insurance or bonding costs, inability to obtain insurance or bonding, loss of current or prospective projects, loss of markets, loss by reason of plant shutdown, non-operation or increased expense of operation of other equipment, or other consequential loss or damage of any nature arising from any cause whatever.

35. "**Construction Work**" includes all labour, materials, equipment, appurtenances, and services necessary for construction and commissioning of the Project in accordance with the Contract Documents performed by Builders or Builders' subcontractors.

36. "**Contract Documents**" include the Agreement (inclusive of all exhibits), the Building Information Model, the Implementation Documents, and all other documents issued by the Designers, their consultants, and Design-Build Trades for construction of this Project, any PMT Bulletins, SMT Bulletins, and/or Owner's Directives, and any subsequent Amendments or Change Orders. The Contract Documents include Submittals prepared by Design-Build Trades and those Submittals incorporated into the BIM. The documents included in the Contract Documents are complementary and what is required by one is required by all. If there are conflicting requirements within or between the various Contract Documents, the PMT will determine which requirements will better achieve the Project Objective and issue PMT Bulletins to that effect.

37. "**Contract Time**" is the date of Final Completion or, if Contract Time is stated as a duration, it is the number of Calendar Days between Notice to Proceed and Final Completion, either as set out in the Business Terms Sheet.

38. "**Contractor**" is the party identified as the Contractor in the Business Terms Sheet. The Contractor is a Builder that leads the other Builders and has overall responsibility for supervising and coordinating the Work of the Builders; advising the Parties on construction matters; providing overall coordination, scheduling, logistics, site safety, cost modeling, constructability, and information and document management; and managing Builder participation in the Target Value Design and pre-construction efforts.

39. "**COR**" means Change Order Request.

40. "**Cost Model**" is described in Section 5.4.5 of the Agreement.

41. "**day**" means a Calendar Day.

42. "**Deficiency List**" is a list of items that must be completed, repaired, or replaced prior to the Project or a Project Stage achieving Substantial Completion.

43. "**Design Consultants**" are specialty design or engineering that provide specialized Design Services, such as mechanical, electrical, structural, civil or other design or engineering specialties. Design Consultants may be Designers or subconsultants to a Party.

44. "**Design Materials**" are the latest issued construction drawings, including any changes made by RFI or Change Order, issued by a Designer, subsidiary drawings necessary for design and construction of the Project, and include the BIM, Record Model, the subsidiary BIM models necessary for design and construction of the Project, all electronic design data for the Project, any related two dimensional drawings, calculations, schedules or specifications, and any other design materials, created for the Project.

45. "**Design/Pre-construction Phase**" is described in Section 6.4 of the Agreement.

46. "**Design Services**" are those professional architectural and engineering services rendered by the Designers, their consultants, and any Design-Build Trades necessary to develop and

complete the Project design in accordance with the standard of care set forth in the Agreement and Applicable Law.

47. "**Design-Assist Trades**" are specialty contractors whose services include participation in the design effort but who are not Design-Build Trades. That participation includes provision of comments and recommendations on design elements and materials, preparation of cost opinions to inform design decisions, reviewing for constructability, trade coordination, and, where appropriate, execution of drafting efforts. Nothing in this Agreement requires the Design-Assist Trades to perform any Work outside their license or contrary to Applicable Laws. Design-Assist Trades may be Builders or subcontractors to a Party.

48. "**Design-Build Trades**" are specialty contractors that provide Design Services and Design Materials required for their respective portion of the Construction Work. Design-Build Trades have full architecture and engineering responsibility for their portion of the Work and will have their drawings and calculations signed and sealed by architects and/or registered professional engineers licensed in the jurisdiction where the Project is located in accordance with all Applicable Laws. Design-Build Trades may be Builders or subcontractors to a Party.

49. "**Designer**" means each Party who is responsible for performing the Design Services in whole or part, among other things, but do not include Design-Build Trades. The Lead Designer is a Designer. Designers are not responsible for providing Construction Work.

50. "**Effective Date**" is described in Section 1.2 of the Agreement.

51. "**Engineer of Record**" ("**EOR**") is a Designer with primary responsibility for reviewing and coordinating Design Materials with respect to its discipline and will coordinate Submittals with the Lead Designer. It will also sign and seal all engineering documents within its scope and in accordance with Applicable Law.

52. "**Estimated Final Cost**" is the sum of incurred Chargeable Costs that have been actually incurred at the time the estimate is made plus the estimated Chargeable Costs that will be required to complete the Project.

53. "**Final Actual Cost**" is the sum of all incurred Chargeable Costs upon Final Completion of the Work.

54. "**Final Completion**" of the Project occurs when all the following have occurred:

    a. the Builders have completed the Construction Work in full compliance with the Implementation Documents; all Final Deficiency List items have been completed and accepted by the PMT;

    b. all final unconditional waivers and releases complying with Applicable Laws covering the Construction Work have been received by Owner except that with respect to any Construction Work for which Final Payment is being sought, Owner shall have received final conditional waivers and releases complying with Applicable Laws covering the Construction Work; if applicable,

    c. if applicable, all final unconditional waivers and releases complying with Applicable Laws covering the Design Services have been received by Owner except that with respect to any Design Services for which Final Payment is being sought, Owner

shall have received final conditional waivers and releases complying with Applicable Laws covering the Design Services; the Project has been commissioned;

d. all close-out documentation required under the Contract Documents has been transmitted to Owner;

e. a final certificate of occupancy has been issued by the Governmental Authority having jurisdiction over occupancy of the Project;

f. and the PMT has issued a certificate of Final Completion.

55. "**Final Deficiency List**" is the Deficiency List prepared after Substantial Completion and final inspections documenting all Construction Work that needs to be corrected or completed to achieve Final Completion.

56. "**Final Payment**" is Owner's payment of all amounts due and owing to the other Parties, including any ICL due after Final Completion of the Project.

57. "**Final Target Cost**" is described in Section 6.3.3 of the Agreement.

58. "**Force Majeure**" means natural disasters; named storms; labour strikes that cannot be resolved through a dual gate or other measures; disruptions in utility service and/or connections not caused by the Builders or those for whom they are responsible; Governmental Authority actions other than permitting, design review or inspection of construction; and civil disobedience; an act of terror; unavoidable casualties or catastrophic events, provided the above events are beyond the control, and not due to any act or omission of, the Designers, Builders, or anyone for whom they are responsible.

59. "**General Conditions**" means the document provided in Exhibit K.

60. "**Governance Plans**" is described in Section 5.4 of the Agreement.

61. "**Governmental Authority**" means all crown, provincial, county, district or municipal boards, departments, courts, offices or agencies that have jurisdiction over the Project.

62. "**Hazardous Materials**" means any and all pollutants, wastes, flammables, explosives, radioactive materials, hazardous or toxic materials, hazardous or toxic wastes, hazardous or toxic substances or contaminants and all other materials governed by Applicable Law for environmental protection, occupational health and safety, or any substance or material that has been determined, or during the time of performance of the Construction Work is determined, to be capable of posing a risk of injury to health, safety, property or the environment by any Governmental Authority.

63. "**Holdback**" means the amount described in Section 4(1) of the Builders Lien Act or, if the statute is amended or replaced, any equivalent amount thereby established.

64. "**ICL**" means Incentive Compensation Layer.

65. "**ICL Percentage**" is described in Section 8.2 of the Agreement.

66. "**Implementation Documents**" consist of the BIM; plans, sections, and elevations extracted from the BIM; and any ancillary drawings, specifications, and construction details together with dimensions and layouts for civil, architectural, structural, mechanical, electrical, plumbing systems, and landscape design. The Implementation Documents will describe in detail the requirements for the Construction Work and provide information necessary and appropriate to obtain all necessary permits for construction of the Project.

67. "**Implementation Phase**" commences on the effective date of the Notice to Proceed with construction and ends at Final Completion.

68. "**Incentive Compensation Layer**" is described in Section 8.2 of the Agreement.

69. "**Incentive Program**" means the document attached in Exhibit I to the Agreement.

70. "**Joining Agreement**" is described in Section 1.5.4 of the Agreement.

71. "**Joint Site Investigation**" is a site investigation attended by the Parties during the Validation Phase for the purpose of reviewing existing information and investigating the Project Site to identify deficiencies and discrepancies, and to determine the extent of any additional investigations or testing required for proper design and construction of the Project.

72. "**Justified Delay**" is a critical path delay meeting one of the categories described in Section 11.2 of the Agreement.

73. "**Key Employees**" are those employees of the Non-Owner Parties listed in Exhibit J that may not be removed from the Project without Owner approval. (See Section 4.9 of the Agreement.)

74. "**Key Performance Indicator**" is described in Exhibit B-4.

75. **"Labour Escalation Allowance"** is an Allowance established during the Validation Phase that will be included within the Base Target Cost and Final Target Cost and used to cover escalation in field labour rates due to collective bargaining agreements and off-island labour. The Labour Escalation Allowance will be included as a separate line item in the Base Target Cost and Final Target Cost and reconciled through additive or deductive Change Order before the final accounting of the Chargeable Costs and determination of the Final Actual Cost.

76. "**Lead Designer**" is the party identified as the Lead Designer in the Business Terms Sheet.

77. "**Lean**" means principals, tools, and processes that maximize project value by optimizing effort and resource use by eliminating activity and waste that does not add value to the project. (See, www.leanconstruction.org.)

78. "**Lean Phase Plan**" is a plan for defining and integrating the necessary work, services, processes, and hand-offs among multiple firms and teams that are necessary to accomplish project Milestones while employing Lean objectives and values. The Lean Phase Plan is developed jointly by those that are responsible for carrying out the work or services referenced in the Lean Phase Plan.

79. "**Material Escalation Contingency**" is an agreed amount determined during the Validation Phase and included in a separate line item in the Base Target Cost and Final Target Cost reflecting a reasonable anticipated projection for material and equipment escalation through procurement of all materials and equipment.

80. "**Milestone**" means an events noted in Exhibit B-4.

81. **"Net Escalation"** is the cumulative sum of the total amount expended for materials and equipment that will be incorporated into the Project minus the sum of the Material Escalation Contingency. Net Escalation is not calculated on a line item basis but on the totality of materials and equipment, considering both cost increases and decreases, upon completion of procurement.

82. "**Non-Owner Party**" is a Party to this Agreement that is not the Owner.

83. "**Non-Owner Parties**" are the Parties to this Agreement, except the Owner.

84. "**Notice of Final Completion**" means the notice described in Section 6.6.2 of the Agreement.

85. "**Notice of Substantial Completion**" means the notice described in Section 6.6.2 of the Agreement.

86. "**Notice to Proceed**" is a written document issued by the Owner or the PMT to initiate commencement of a certain Project Phase or Project Stage as set out in the said document.

87. "**OCIP Manual**" means the document provided in Exhibit L-4;

88. "**Owner**" is the entity identified as the Owner on the signature page at the end of the Agreement.

89. "**Owner-Elected Change**" is a material change directed by the Owner to the scope of the Work described in the Implementation Documents that (i) impacts either the Base Target Cost or Final Target Cost; (ii) requires Work that is not reasonably inferred from the Project Objective; and (iii) requires Work that is not due to (a) the failure of the Construction Work to be executed in conformance with the Implementation Documents, (b) the negligent acts, errors, or omissions in the design of the Project or its component systems; or (c) the repair, modification, or replacement of Construction Work that does not meet the functional and performance requirements of the Project Objective or Implementation Documents.

90. "**Owner's Directive**" is a written directive from the Owner that overrides a decision by PMT or the SMT. An Owner's Directive may be construed as an Owner-Elected Change if it affects the Base Target Cost or Final Target Cost and/or Contract Time.

91. "**Owner's Separate Consultant**" is a design, technical, scientific, or other professional engaged directly by Owner to perform services that are related to the Project although not within the scope of the Agreement.

92. "**Owner's Separate Contractor**" is a contractor engaged directly by Owner to perform work that is related to the Project although not within the scope of the Agreement.

93. "**Parties**" means, collectively, each Party;

94. "**Party**" means any entity that has executed the Agreement.

95. "**PCO**" means Proposed Change Order.

96. "**Personal Information**" means any information from which an individual may be identified, by direct or indirect means, that is provided to a Party by the Owner, or processed by a Party for or on behalf of the Owner, including without limitation an individual's name, address, telephone number, social security number, driver's license number, passwords, personal identification numbers (PIN), account numbers, account balances, account histories, and "personal information", "nonpublic personal information", "protected health information" (and other similar information, however described) as defined in any Applicable Laws protecting the Personal Information of a person.

97. "**PIT**" means Project Implementation Team.

98. "**PMT**" means Project Management Team.

99. "**PMT Bulletin**" is a written directive from the Project Management Team derived from a unanimous vote that affects design, cost, schedule, or allocation of the Work. A PMT Bulletin may affect the Project Objective.

100. "**Post Commissioning Phase**" is described in Section 6.8 of the Agreement.

101. "**Post Permit Change**" is a substantive change to a permit by a Governmental Authority or made necessary as a result of changes to Applicable Laws that impacts the Construction Work subsequent to the issuance of the affected permit provided that the changes are not due to (i) the failure of the Construction Work to be executed in conformance with the Implementation Documents, (ii) the negligent acts, errors or omissions in the design of the Project or its component systems; and (iii) the repair, modification, or replacement of Construction Work that does not meet the functional and performance requirements of the Project Objective or Implementation Documents and provided that the changes were not reasonably known or anticipated when the Base Target Cost was set.

102. "**Product Data**" are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Builders, or a subcontractor, tier-subcontractor, manufacturer, vendors, supplier, or distributor to illustrate materials or equipment for some portion of the Construction Work.

103. "**Project**" is the project described in Article 2 of the Agreement, and includes all activities that are undertaken pursuant to this Agreement.

104. "**Project Information**" has the meaning set forth in Section 15.2.6 of the Agreement.

105. "**Project Implementation Team**" is an interdisciplinary group of Project Participants organized by the PMT. PITs are part of the collaborative process to develop the Implementation Documents and other deliverables and may be formed temporarily or for the duration of the Project.

106. "**Project Management Information System**" ("**PMIS**") is a digital system or interrelated systems for communicating amongst Project Participants and managing, distributing, and storing digital documents, files, logs, and communications. The PMIS contains detail of the Project Objective, including cost, time, scope, and quality; identifies the Project Participants, the people organizations, and their roles; manages agreements, including contracts, permits, approvals, and commitments; manages project control documents; is used to create reports and dashboards for the Project; and guides collaboration and communicates best practices with policies, workflow diagrams, and document management.

107. "**Project Management Team**" must include a representative of the Owner, a Designer, and a Builder, and may include additional members as jointly agreed by the Parties, who will act in a collaborative manner to provide management level leadership during the design and construction process in a concerted effort to achieve the Project Objective.

108. "**Project Manual**" means the document attached in Exhibit J to the Agreement.

109. "**Project Objective**" includes all Owner requirements, goals, and limitations documented in Exhibit B.

110. "**Project Participant**" is any person or entity that is providing material, equipment, work, or services for the Project.

111. "**Project Phase**" is a functional segregation of the Project into Validation Phase, Design/Preconstruction Phase, and Implementation Phase.

112. "**Project Requirements**" means the requirements set out in Exhibit B to the Agreement, particularly Exhibit B-1.

113. "**Project Schedule**" is the schedule for Project performance and completion as calculated at a specific date. The Project Schedule is initially based on the Baseline Schedule, but reflects modifications required due to occurrence of events, opportunities, and rescheduling.

114. "**Project Site**" is the physical location where the Project is being constructed and any adjacent laydown or storage areas dedicated to staging or storing material or equipment to be incorporated into the Project. In addition, the Project Site may include non-adjacent physical locations that are identified in writing if these locations are dedicated to providing or preparing for Construction Work.

115. "**Project Stage**" is a portion of the Project that is geographically or otherwise distinct.

116. "**Proposed Change Order**" is described in Section 11.3.1 of the Agreement.

117. "**QA**" means Quality Assurance.

118. "**Quality Assurance**" means a system of actions required to provide confidence that Work (or portion thereof) was performed in accordance with the Agreement.

119. "**QC**" means Quality Control.

120. "**Quality Control**" means the actions required to check, monitor, or inspect the Work (or portion thereof) to determine if it was performed in accordance with the Agreement.

121. "**Record Model**" is the version of the BIM that will be updated throughout construction to reflect the as-built condition of the Project and is turned over to the Owner upon Final Completion.

122. "**Representatives**" means a Party's Affiliates and such Party's and its Affiliates' respective officers, board members, directors, partners, members, employees, agents and any other persons or entities (excluding the other Party or its Affiliates) who contribute to the performance of such Party's obligations under this Agreement. For purposes of this Agreement, Designers', Contractor's, and Builders' Representatives will include any and all consultants and subcontractors and such consultants' and subcontractors' directors, officers, employees, and agents. Owner's Representatives will include its or its Affiliates' collaborators and licensees.

123. "**Responsibility Matrix**" means the document provided in Exhibit C.

124. "**Risk and Opportunity Register**" is described in Section 5.4.11 of the Agreement.

125. "**Safety Plan**" is described in Section 5.4.13 of the Agreement.

126. "**Samples**" are physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Construction Work will be judged.

127. "**Senior Management Team**" ("**SMT**") includes a senior executive member from each Party, who will act in a collaborative manner to resolve any matters referred to it by the PMT either through consensus or, if a consensus is not reached, by a majority vote, subject to an Owner's Directive.

128. "**Set Based Design**" is a design strategy that advances in parallel alternative design solutions that meet Project criteria and constraints until a decision is made to select one solution over the alternatives.

129. "**Shop Drawings**" are drawings, diagrams, schedules, and other data specially prepared for the Construction Work by a Builder or a subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

130. "**SMT Bulletin**" is a written directive from the SMT derived from a majority vote of the SMT and is binding on all Project Participants unless vetoed or modified by an Owner's Directive.

131. "**Staging Schedule**" is used if the Project will be performed in stages. At a minimum, the Staging Schedule defines the dates for commencement of construction, Substantial Completion, and Final Completion of each Project Stage.

132. "**Standard Consultant**" is a consultant engaged by a Designer or a Design-Build Trade that has not placed profit at risk and therefore is not eligible to share in the Agreement's financial incentives, ICL, and mutual liability waivers. Standard Consultants are Project Participants but are not Parties to this Agreement.

133. "**Standard Subcontractor**" is a subcontractor, supplier, or vendor engaged by Contractor or a Builder that has not placed profit at risk and therefore is not eligible to share in the ICL and mutual liability waivers. Standard Consultants are Project Participants, but are not Parties to this Agreement.

134. "**Stipulated Overhead**" is described in Section 8.5 of the Agreement.

135. "**Stipulated Profit**" is described in Section 8.3 of the Agreement.

136. "**Submittals**" include Shop Drawings, Product Data, and Samples, but are not Contract Documents unless they are produced and stamped by a Design-Build Trade. To the extent required by the Contract Documents, all Submittals that are not produced by a Design-Build Trade only demonstrate how the Builders, including the Contractor if it performs any of the Construction Work, and subcontractors propose to execute the Construction Work shown by the Contract Documents.

137. "**Substantial Completion**" occurs on the date when the Project or Project Stage, as applicable, is substantially performed as defined in the *Builders Lien Act*, SBC 1997, c 45.

138. "**Target Value Design**" is a design discipline that requires project values, cost, schedule, and constructability to be basic components of the design criteria, and uses cost targets to drive innovation in designing a project to provide optimum value to an owner. Target Value Design uses constructability and cost information from the Designers and Builders before design decisions are made to allow the design to progress within the Base Target Cost, Final Target Cost, and Contract Time.

139. "**Termination Date**" is described in Section 15.2.2 and 15.2.3 of the Agreement.

140. "**Unforeseen and Differing Site Conditions**" is the discovery of an unknown, subsurface or otherwise concealed physical condition at the Project Site that differs materially from those indicated in the Implementation Documents or the information obtained from the Joint Site Investigation; an unknown physical condition of an unusual nature at the Project Site that differs materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character and nature provided for in the Implementation Documents; or an unknown, pre-existing hazardous substance or condition at the Project Site that requires removal or remediation.

141. "**Unusual Material Escalation**" is an increase in the cost of materials that exceeds 5% per annum that could not reasonably have been anticipated when the Base Target Cost or Final Target Cost was set and which is caused by extreme and unusual fluctuation in the market cost of the material or materials.

142. **"Unusual Escalation"** is a Change Event that may increase or decrease the cost of labour or materials caused by extreme and unusual fluctuation in the market, currency fluctuation, excise taxes on imports, or regulatory changes that were unknown and unanticipated at the time of setting the Final Target Cost. Unusual Escalation in labour will be reconciled through the Labour Escalation Allowance per Section 11.4.2. Unusual Escalation in materials and equipment occurs when the Material Escalation Contingency included in the Base Target Cost and Final Target Cost (as applicable) has been exceeded.

143. "**Validation Phase**" is described in Section 6.2 of the Agreement.

144. "**Validation Report**" is defined and described in Section 5.4.17 of the Agreement.

145. "**Warranty Period**" is described in Section 14.2 of the Agreement.

146. "**Willful Default**" is any one of the following events:

a. actual or constructive abandonment of the Project;

b. persistent and repeated failure, after written notification, to correct Construction Work that significantly and materially deviates from the Implementation Documents or Applicable Law;

c. fraud, reckless disregard, or willful injury to the persons or property of another, or violation of the law, whether willful or negligent; or

d. willful and wanton misconduct.

Actual abandonment occurs if the Party, without justification, ceases performing Work for a period of 21 consecutive days or notifies one of the Parties that it is ceasing to perform Work on the Project.

Constructive abandonment occurs if the Party, without justification, expends so little effort on the Project that there is no meaningful progress on its scope of work for 21 consecutive days. The good faith exercise of any contractual suspension rights granted the Designers, Contractor, and Builders under this Agreement or under an applicable subcontract or consulting agreement is not an intentional or constructive abandonment.

147. "**Work**" includes all labour, materials, equipment, appurtenances, and services required to design, construct, and commission the Project in accordance with the Contract Documents. It includes Design Services and Construction Work.

148. "**Workers Compensation Act**" means Workers Compensation Act, RSBC 2019, c 1.

END OF EXHIBIT

GLOSSARY

A3

A one-page report on a single 11 x 17 sheet of paper, which uses PDCA thinking as it applies to collaborative problem solving, strategy development, or reporting. An A3 includes a problem statement, data and background information, analysis, proposed options, recommendations and agreements, actions, expected results, and follow-through. (*See Appendix 12 for an example of an A3.*)

A3 Thinking

A3 Thinking refers to the structured process of documenting a problem, solution, and action plan. The A3 Thinking process is undertaken collaboratively, with input from all stakeholders on the topic. It begins with consensus on the problem statement and arrives at consensus on a solution and path forward.

Actual Cost

The sum of the total cost of the work actually incurred by the project participants in connection with the performance of all phases of the project. Does not include owner expenses, such as fees for permit, inspection, or equipment. Depending on the contract form used, actual cost may be direct costs plus overhead or may be direct cost plus overhead plus profit.

Allowable Cost

The owner's absolute maximum project cost, based on the project business case, which is the subject of the validation study. The allowable cost includes all elements: direct costs, overhead, and profit (also called ICL).

Big Room

A space where all stakeholders in the team can come together and work, typically with visual documentation posted. Shared space can support communication and dialogue, resulting in greater efficiency and work product that is updated in real time, as well as less reworking and revising. Big Room setup, duration, and usage varies.

Building Information Model(ing) (BIM)

The product (model) and process (modeling) of generating and managing building data during the life cycle of a building. BIM uses three-dimensional building modeling software. BIM includes building geometry, spatial relationships, geographic information, and quantities and properties of building components.

Blended Rate

An average hourly rate that can be used for financial tracking when precise amounts are not needed. Typically used for trade partners when a range of hourly rates based on person-hours can be averaged to project costs. (See Appendix 23 for an example of how a blended rate was used to calculate costs based on hours.) Can also be used in situations when design partners may not wish to highlight differences in salaries for personnel who share the same job title. Averaging multiple people at the same title creates one rate that can be openly shared without revealing sensitive information.

Burn Rate

The rate at which project funds are expended. Typically tracked in a spreadsheet with budgeted versus actual cost for labor and materials, focusing on rate of expenditure over time. (*See Appendix 24 for an example of how the burn rate can be tracked.*)

Choosing by Advantages (CBA)

A structured decision-making system that compares the advantages of alternatives based on objective facts and transparently evaluated subjective preferences.

Co-location

Physically locating personnel in a single area, often referred to as the Big Room, to enable constant communication and integrated thinking, build relationships, and increase productivity. Co-location may be face-to-face 100% of the time or part-time. Virtual co-location, the commitment of the team to collaborate at specific dates and times through use of web-based collaboration technology, is another method of co-location.

Conditions of Satisfaction (CoS)

An explicit description by an owner and/or other members of the IPD team, stating all requirements that must be satisfied to deem the outcomes as successful. Distinct from a project charter, which typically focuses on team-behavioral goals. (*See Appendix 2 and Appendix 4 for examples of CoS.*)

Dashboard

Visual management system to track data and metrics important to the team, which highlights whether the project is on track and also prompts actions. (*See Appendix 14 for examples of dashboards and their use in the Big Room.*)

Design Assist

Builders providing design assist services offer suggestions, insight, costing, and constructability review, but do not take responsibility for design, which remains with a design professional unaffiliated with the builder. All builders that are within the IPD group typically provide design assist or design/build services. In some instances, trade contractors who are not in the IPD group may provide design assist services under their subcontracts.

Design/Build

Design/build can refer to a project delivery method or a method for delivering an element of a project, such as a mechanical system. As a project delivery method, the design/builder is responsible for the design and construction of the project. As a method for delivering an element of a project, the design/builder has the design and the construction responsibility for that element. Fire protection systems, for example, are often delivered as a design/build element within an IPD project.

Design Management

Design management brings order and structure to the development of the design through defining outcomes and decision-making processes and by identifying and optimizing information flow and pull planning.

Guaranteed Maximum Price (GMP)

A cost-type contract that compensates the contractor for actual costs incurred plus a fee subject to a ceiling price.

Huddle

Huddle (or "daily huddle") is a very short daily stand-up meeting that addresses the day's work. Huddles are a part of scrum but are also frequently used in lean construction. (*See also Scrum.*)

Incentive Compensation Layer (ICL)

The team's collective, at-risk profit. The ICL can increase or decrease based on the project outcome. An adjusted ICL is the ICL after adjustment based on project outcome.

IPD Agreement or Integrated Form of Agreement (IFoA)

In this guide, we use IPD agreement to reference the multiparty or poly-party agreement that includes, at minimum, the owner, design professional, and constructor as signatories to the same construction contract. Examples include custom agreements (such as those by the law firm Hanson Bridgett) and templates (such as CCDC-30, ConsensusDocs 300, and AIA-C191 or C195). An IPD agreement is synonymous with IFoA. An IFoA or IPD agreement may be a multiparty (three-party agreement) or a poly-party agreement that can have more than three parties. (*See also Multiparty Agreement and Poly-party Agreement.*)

Integrated Project Delivery (IPD)

IPD is a contractually based approach, which creates an environment that enhances collaboration, innovation, and value. IPD is characterized by early involvement of IPD team members, shared risk and reward based on project outcome, joint project management, liability reduction among IPD team members, and joint validation of project goals.

IPD Team

The IPD team is made up of the participants who have placed their profit at risk and have the opportunity for increased profitability, based on project outcome. Under a multiparty agreement, IPD team members who are not signatory to the multiparty agreement are engaged through appropriate subcontracts or subconsulting agreements that reflect the terms of the multiparty IPD agreement. Sometimes called the risk/reward team, parties, or the ICP participants.

Last Planner System (LPS)

The collaborative, commitment-based planning system that integrates pull planning, make-ready look-ahead planning with constraint analysis, weekly work planning based on reliable promises, and learning based upon analysis of PPC and reasons for variance. (*See Appendix 15 for an example of LPS statistics.*)

Lean

A culture based on a set of principles focused on creating more value for the customer through elimination of waste, streamlined processes, and continuous improvement (*See More Resources for more information on lean.*)

Level of Development (LOD)

The LOD specification is a product of the BIMForum. Based on the basic LOD definitions developed by AIA, it is used to clearly define and communicate to what level of completion work will be done in a BIM and by whom: who will be responsible for modeling which building elements to a specific level of detail at a particular point in time. (*See Appendix 13 for an example of a LOD matrix.*)

Likert Scale

A common means of psychological measurement used to gauge a person's opinions, values, and/or attitude along a range of responses. The range of responses usually consists of five to seven possible answers—for example, ranging from strongly disagree to strongly agree—with a number value corresponding to each response.

Logs/Registers

This family of tools includes constraint logs and risk and opportunity registers. These have multiple functions. They are used to track and mitigate risks and issues. The development and consistent usage of them builds team consensus and can drive accountability. (*For examples of logs and registers, please see Appendix 10 and Appendix 11.*)

MEP

Mechanical, electrical, and plumbing systems. These are often inclusive of fire protection and data cabling as well.

Milestone

An item on a master schedule that defines the end or beginning of a phase or a contractually required event.

Multiparty Agreement

Referencing a three-party IPD agreement between owner, designer, and builder. Though the prefix multi does not imply a specific number, it is industry standard that multi-party is a three-party agreement due to the history of the development of IPD agreements. (*See also IPD Agreement and Poly-party Agreement.*)

Non-Signatory

A company that is participating in the project that is not part of the IPD team. That is, they are not included in the IPD agreement with the shared risk/reward and other terms.

Off-Boarding

The deliberately planned process for removing team members or firms.

On-Boarding

The deliberately planned process for bringing new players onto the team. In IPD, there is a need to on-board and align the initial team and to have a process for on-boarding new players added later to the team.

One-Piece-Flow

A methodology used to address a process from end to end with all parties involved in order to identify which step(s) must be completed for the next step to occur without waiting or waste.

Overhead (Home Office Overhead)

The amount, which may be expressed as a percentage applied to costs or a fixed amount, to compensate a firm for items such as rent, executive salaries, and other non-project-specific costs. (*To see an example of how overhead can be calculated, see Appendix 27 for trade partners and Appendix 28 for designers*.)

Owner Controlled Insurance Program (OCIP)

An OCIP is an insurance program in which the owner obtains a policy to cover loss and liability during the project, reducing the coverages provided by other parties, such as the construction manager/general contractor and trade partners. An OCIP program has requirements for safety management, reporting, and the like, which must be incorporated into the IPD team's plan.

Owner's Project Requirements (OPR)

Developed by the owner, this is a project narrative defining the owner's requirements. The OPR is often used as a basis for the team to develop the CoS. In the context of a high-performance certification, this can include quantitative measures, such as meeting LEED or Petal standards. (*See Appendix 3 for an example of OPR.*)

Percent Plan Complete (PPC)

A basic measure of how well the planning system is working, calculated as the number of commitments completed by the time stated divided by the total number of commitments made for the time stated. It measures the percentage of assignments that are 100% completed as planned. (*For examples of how PPC is visually tracked, see Appendix 14 and Appendix 15.*)

Plan-Do-Check-Act (PDCA; also sometimes Plan-Do-Check-Adjust)

A four-step process intended to support continuous improvement in a product or process: plan, do, check, act. This is conceived of as a repeating and never-ending cycle, which creates a feedback loop for teams to assess their ability to achieve and improve outcomes.

Plus/Delta

Performed at the end of an activity, such as a meeting or a decision process. This review is used to evaluate the activity. Two questions are asked and discussed. Plus: what produced value during the session? Delta: what could we change to improve the process or outcome?

Poly-party Agreement

An IFoA that has more than three parties and generally includes, as parties, all members of the IPD team. The distinction between a multiparty (three party) and poly-party agreement is relevant to contract structure, governance, and insurance.

Project Charter

(*See also Conditions of Satisfaction.*)

Project Implementation Team (PIT)

PITs are nimble, multidisciplinary groups of project participants assigned by the PMT to conduct deep dives into specific project needs (e.g., building envelope, mechanical systems). PITs typically have an initial mission, a time frame in order to perform their work and report back, and the authority to incorporate the right people to perform the work. These are sometimes called clusters or cluster groups. PITs can include all members of the team—PMT, signatories, non-signatories, owners, architects, contractor, trades, and suppliers. Common PITs include structure, mechanical, electrical, envelope, etc. The specific number of PITs needed will be determined by the team. (*See also Project Management Team.*)

Project Management Team (PMT)

A team composed of representatives from each IPD contract party, with membership as defined by the specific IPD contract and subsequently others as jointly agreed by the parties. The PMT is charged to act in a collaborative manner to provide project management leadership during the design and construction process in a concerted effort to achieve the project's objectives. The PMT is the project's administrative workhorse, making the tough decisions and monitoring financials. Sometimes called the core group or core team. Interfaces with the SMT and PIT. (*See also Senior Management Team and Project Implementation Team.*)

Project Team

The totality of all firms participating in the project, regardless of their status in the risk/reward structure. For the purposes of this guide, the firms participating in risk/reward make up the IPD team. There may be firms working on the project that are not part of the risk/reward structure. These are referenced as non-signatory or the project team. The totality of all the individuals on the team is referenced as project participants. (*See also IPD Team and Non-Signatory Agreement*).

Pull

A method of advancing work when the next-in-line partner is ready to use it. A request from the partner signals that the work is needed and is pulled from the performer. In the pull method, work is released when the other members of the team are ready to use it.

Push

The opposite of pull. During push, an order is made from a central authority based on a schedule and advancing work based on a central schedule. Releasing materials, information, or directives possibly according to a plan but independent from whether or not the downstream process is ready to process them.

Request for Information (RFI)

A formal question asked by one party of the contract to another party. Typically, a request from the contractor to the designer.

Request for Proposals (RFP)

Owner's call for teams to submit proposals. In IPD this often includes how the team is going to handle collaboration and integration. (*See Appendix 1 for an RFP example.*)

Request for Qualifications (RFQ)

Typically includes relevant previous work, key personnel, and approach to work. In IPD this often includes demonstrations of lean and IPD experience.

Risk/Reward

A collectively agreed upon amount or percentage of final cost that will be distributed among the members of the IPD team (sometimes called risk/reward pool) if project goals are met. Sometimes called ICL or profit pool.

Rough Order of Magnitude (ROM)

Estimate of time or cost before details are known. A way to describe the impact and likelihood of an occurrence that could impact the project budget, positively or negatively. Calculated by taking possible cost or savings multiplied by the probability of occurrence. Typically used with risk logs or opportunity logs, sometimes combined into one format, sometimes weighted with probabilities and costs so that it can be managed in conjunction with contingency funds.

Scrum

Scrum is a term borrowed from agile project management, often used in software development, referring to a process involving small teams engaging in short, repeatable, sustainable "sprints," the outcome of which is a chunk of delivered value.

Senior Management Team (SMT)

A team composed of representatives from each IPD team member, typically the project executive of the firm. The SMT always handles dispute resolution and backs up the PMT as required. In many cases they also conduct contract negotiations and resolve questions of scope change, but this can alternatively be done by the PMT. The SMT is composed of one C-level executive from every party who signs the IPD agreement.

Target Cost (TC)

The cost goal established by the project team as the target for its design and delivery efforts, typically determined after the validation process. In some projects, there is only TC, which can be adjusted by the owner in the rare situations when that is appropriate. Other times, TC is broken into two measures:

- Base Target Cost: The TC amount that matches the base program in the project objective.
- Final Target Cost: The TC amount that matches the base program, plus any value added Items. Because the value added Items are funded from savings off of the base TC, the final TC must be less than or equal to the base TC (unless there are change orders).

Target Value Design (TVD)

A disciplined approach to design that requires project values, cost, schedule, and constructability to be basic components of the design criteria, and uses cost targets to drive innovation in designing a project to provide optimum value to an owner. TVD uses constructability and cost information from the owner and IPD team before design decisions are made to allow the design to progress within the base TC, final TC, and schedule. (*To see an example of PIT tracking during TVD, see Appendix 26.*)

Trade Partners

Trade partners are the IPD team members (signatories to the IFoA) who are the specialty contractors engaged to put the construction work in place. Trade partners typically include mechanical contractor, electrical contractor, structural steel contractor, and the like. Not to be confused with trade contractors, subcontractors, and trades, which are ambiguous terms that do not imply membership on the IPD team.

Validation

Validation is a process through which the IPD team establishes certainty for the project. It proves or disproves whether the team can meet the full range of the owner's CoS within the owner's constraints (including cost and schedule). Validation is not compressed schematic design. The project is developed only to the degree necessary to achieve certainty. Validation is a go/no-go gate, undertaken at the beginning of the project, and often has its own budget, schedule, prerequisites, and approvals. (*For an example of a validation checklist, see Appendix 8.*)

Virtual Design and Construction (VDC)

The use of BIM and other tools to optimize and coordinate design, virtually rehearse and manage construction, and/or operations.

Visual Management

Placing tools, parts, plans, schedules, measures, and performance indicators in plain view for transparency, allowing the system to be understood at a glance by everyone involved and actions taken locally in support of system objectives. (*For examples of dashboards and visual management in the Big Room, see Appendix 14.*)

Weekly Work Plan (WWP)

The commitment-level step of LPS, identifying the promised task completions agreed on by the project team. The WWP is used to determine the success of the planning effort and to determine what factors limit performance and is the basis of measuring PPC. (*See Appendix 16 for examples of WWPs.*)

Appendix B

Sample Hanson Bridgett IPD Agreement

[Project]

Integrated Project Delivery Agreement

REGIONAL DISTRICT OF NANAIMO

By: _____

[insert name, title]

By: _____

[insert name, title]

[LEAD DESIGNER]

By: _____

[insert name, title]

By: _____

[insert name, title]

[CONTRACTOR]

By: _____

[insert name, title]

By: _____

[insert name, title]

THE PARTIES AGREE TO THE FOLLOWING TERMS AND CONDITIONS.

Business Terms Sheet

The key business terms of this Agreement are set forth below and included in the Agreement:

Senior Management Team (SMT)	Owner: Lead Designer: Contractor:
Project Management Team (PMT)	Owner: Lead Designer: Contractor:
Base Target Cost	$_____ or (established by Amendment)
Material Escalation Contingency	$_____ (established during Validation Phase)
Labour Escalation Allowance	$_____(established during Validation Phase)
Final Target Cost	By Amendment

Notices required by this Agreement must be sent to:		
Party #1	Email:	
	Address:	
Party #2	Email:	
	Address:	
Party #3	Email:	
	Address:	

Overhead							
Overhead and ICL Change Order Percentages [Exhibit D – Designers, Exhibit E – Builders]	Party	DPEM	OH Basis [Choose 1 – others can be deleted]			OH Rate	ICL Change Order %
			Fixed	Include in C3ssRates (% Labour)	% of Chargeable Costs		
	[Lead Designer's				N/A		

	Name]						
	[Contractor's Name]						
	[Other Non-Owner Parties]						

Stipulated Profit	
Non-Owner Party#1	$
Non-Owner Party#2	
Non-Owner Party#3	
Non-Owner Party#4	
Time	
Date for Substantial Completion of the Project	[_____] or (established by Amendment)
Date for Final Completion	[_____] or (established by Amendment)

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INTEGRATED PROJECT DELIVERY

AGREEMENT

1. General

1.1 Parties to the Agreement. This Agreement is between the following parties:

Party Name	Type	Description	Role
	Owner	Owner	Owner
[To be added]	Designer	Architect	AOR
[To be added]	Designer	Lead Designer	EOR
[To be added]	Designer	Mechanical Engineer	EOR

AOR = Architect of Record for the Project
EOR = Engineer of Record for an engineering discipline
D-A = Design-Assist Trade Contractor
D-B = Design-Build Trade Contractor
D-C = Design Consultant

1.2 Effective Date. The Effective Date of this Integrated Project Delivery Agreement (Agreement) is _____ as to all Parties that initially executed this Agreement and all Parties later added to this Agreement by Joining Agreements.

1.3 Defined Terms. Defined terms are indicated in upper case and are defined in Exhibit A or are defined in this Agreement when first used. References to contractors, subcontractors, consultants, subconsultants, parties, and similar descriptors, if in lower case, refer to those categories of entities, generally, and not in their defined sense.

1.4 Exhibits, Articles and Sections. Reference to an Exhibit includes all the Exhibit. Reference to an Article includes all its Sections and Subsections of any level. Reference to a Section includes the Section and all its Subsections of any level. Reference to a Subsection of any level includes the Subsection and any lower-level Subsections.

1.5 Parts of this Agreement. This Agreement consists of four parts that in combination form the Agreement. The parts are:

1.5.1 Business Terms Sheet. The Business Terms Sheet contains the financial and other information that may need to be readily referenced during the Project. The Business Terms Sheet will be amended as Parties are joined to the Agreement, or as the Project Requirements or other terms are amended.

1.5.2 Body. The body of the Agreement contains the principal legal terms and including the rights and obligations of the Parties.

1.5.3 Exhibits. The Exhibits incorporate additional information and requirements related to the subject of the Exhibit.

1.5.4 Joining Agreements. Joining Agreements add additional Non-Owner Parties to the Agreement as if they had been Parties on the Effective Date.

2. Project Description

[Insert description of the project.]

3. Project Principles and General Obligations

3.1 Project Principles. The Parties agree to perform their obligations in accordance with the following collaborative principles:

- Foster innovation and collaboration by creating a safe environment for active, open, and respectful communication that embraces diverse viewpoints and experience.
- Develop trust by developing competent, transparent, and reliable relationships.
- Maximize project value by zealously eliminating waste, continuously applying learning, and making decisions that optimize project outcomes, rather than individual, outcomes.
- Prioritize flow before utilization.
- Closely integrated people, processes, and systems.

3.2 General Obligations. The Parties will work together to achieve the Project Requirements by:

3.2.1 Individually performing the contract tasks designated as their respective responsibilities in the Responsibility Matrix;

3.2.2 Jointly managing the Project through the PMT and SMT pursuant to Article 5;

3.2.3 Cooperating with and assisting the SMT, PMT, and the PITs, subject to the limits of their respective professional expertise, licensing, and abilities;

3.2.4 Executing the Work according to Lean principles as described in the General Conditions;

3.2.5 Collaborating with Owner's Separate Contractors and Owner's Separate Consultants; and

3.2.6 Complying with all other obligations, terms, and conditions of this Agreement and the Contract Documents.

4. Parties

4.1 Relationship of the Parties. Although this Agreement establishes a relationship of mutual trust and good faith among the Parties, who recognize that their individual success is directly tied to the performance of other Project Participants, it does not create an agency relationship, fiduciary relationship, partnership, or joint venture among or between the Parties. Except as otherwise provided in this Agreement, the Parties are each independent contractors (except the Owner) solely responsible for directing and managing their own forces and services within their respective area of responsibility as described in Sections 4.2 through 4.6.

4.2 Owner

4.2.1 Owner will serve as a member of the PMT and SMT and has the rights granted to it by this Agreement and Applicable Law. Owner is responsible for providing Owner's requirements, goals, and limitations for the Project and for actively participating in developing and documenting the Project Requirements.

4.2.2 Owner will actively participate in the Target Value Design process in its role as Owner, but it is not a Designer or a Builder. Owner's participation does not reduce, in any way, the responsibility of the Designers and Builders to perform their respective obligations in accordance with the Agreement and Applicable Law.

4.2.3 Owner's Separate Contractors and Owner's Separate Consultants. Owner may directly retain consultants and contractors to perform services or work related to the Project. As between Owner and other Parties, Owner is responsible for the timeliness and quality of the work and services of the Owner's Separate Contractors and Owner's Separate Consultants. The Parties will coordinate their Work with the work and services of Owner's Separate Contractors and Owner's Separate Consultants to allow for smooth and efficient workflow and integrated work product. Owner's Separate Contractors and Owner's Separate Consultants may be included in the Responsibility Matrix, for reference only.

4.2.4 Owner Provided Information. Owner will provide a legal description of the property where the Project is situated, access to all existing documentation, and all geotechnical or environmental impact reports, surveys, and other reports as the PMT reasonably determines, may be required for proper performance of the Work and that are in Owner's possession. Parties that participated in the Joint Site Investigation may rely upon the completeness and accuracy of the information provided by Owner to the extent that it is not contradicted by information the Parties obtain through the Joint Site Investigation, any additional documents and reports provided by Owner, or any other information either known by the Non-Owner Parties or discovered during the Joint Site Investigation.

4.2.5 Permits and Fees. Owner will pay for all entitlements, easements, assessments, and fees required for the development, use, or occupancy of the Project. Permits and fees related to the Construction Work that are paid by a Party other than Owner are included in the Final Target Cost and are a Chargeable Cost of that Party when paid.

4.2.6 Testing and Inspections. Owner may separately contract with and pay for all third-party testing, inspections, or commissioning. If Contractor or another Builder pays for any inspections or reports required by Applicable Law or by the Contract Documents, the cost of these inspections or reports is a Chargeable Cost of the paying Party.

4.2.7 Legal and Insurance Services. Owner will provide legal counseling services for the Project, but each Party is responsible for legal services it may believe necessary to protect its own interests. Owner will provide insurance coverage for which it is responsible under Exhibit L.

4.2.8 PMT Participation and Deliverables. Owner will actively participate with the PMT and PITs in further development of the Responsibility Matrix, a BIM Execution Plan, and other management protocols and tools, and will perform the contract tasks assigned to it in the Responsibility Matrix, as amended.

4.2.9 Other Obligations. In addition to the above, Owner will provide the PMT with timely decisions necessary to support the Project Requirements throughout the Project duration, make timely payments, and perform all other tasks designated to the Owner under this Agreement.

4.2.10 No Statutory Effect. Nothing contained or implied in this Agreement will affect the Owner's rights, powers, duties, or obligations in the exercise of its functions as a municipality pursuant to any enactment of the legislature of British Columbia. For certainty, neither the Project principles nor obligations of the Owner set out in this Agreement are applicable to any decision made by the Owner pursuant to its statutory role as a municipality.

4.3 Builders

4.3.1 General Duties and Obligations. Each Builder will perform its obligations under this Agreement and the Responsibility Matrix, as amended, including, but not limited, to the following:

(a) Assist the Designers during all phases of design by providing assistance in Target Value Design and by coordinating design information between Design-Build Trades and the PITs;

(b) Actively collaborate with the other Parties, PITs, and other Project Participants throughout the design process to develop a complete set of coordinated Implementation Documents that meet or exceed the Project Requirements;

(c) Co-locate with Parties as required by the Co-location Plan;

(d) Manage Project Information by using a BIM or models related to Project cost and schedule databases and provide checking and validation of such models, including clash detection and integration of subcontractor models and integration with the Project Schedule;

(e) Collaborate with Designers to produce visualization aids such as renderings or computer-generated video;

(f) Actively collaborate with the other Parties, PITs, and other Project Participants throughout the Project;

(g) Provide a Record Model and Conformed Design Documents to Owner upon Final Completion of the Project;

(h) Manage, perform, oversee, and direct its respective Construction Work in accordance with the Implementation Documents and Project Requirements through Final Completion;

(i) Coordinate work with Owner's Separate Contractors and Owner's Separate Consultants, including integration of the Owner's Separate Contractors and Owner's Separate Consultants into Project planning and coordination activities;

(j) Install, commission, and test all Owner-furnished materials and equipment on the Project as required in the Responsibility Matrix;

(k) Prepare a submittal schedule that provides reasonable opportunity for review by the Owner and the Designers. Submittals must be prepared and submitted in accordance with the submittal schedule and in conformance with the Implementation Documents and the requirements set forth in the General Conditions. Builders will work with Designers to integrate information directly into the BIM to minimize the number of Submittals required;

(l) Provide the PMT with timely decisions necessary to support the Project Requirements, make timely payments, and perform all other tasks designated to the Builder under this Agreement;

(m) Propose a QA/QC plan for its portion of the Construction Work for approval by the PMT, and implement the approved QA/QC plan; and

(n) Commission the Project with the assistance of the Project Participants and the independent commissioning agent, if any.

4.3.2 E ach Builder is responsible for providing preconstruction services and performing its portion of the Construction Work in accordance with the Implementation Documents and for supervising, directing, managing, and performing its Construction Work in a manner that meets the Project Objective. Without limiting each Builder's own responsibility for its Work, the Contractor has overall responsibility for supervising and coordinating the Work of the Builders and Standard Subcontractors, and advising the Parties on construction matters. Each Builder will support the Contractor in its role as lead builder, take direction from the Contractor, and coordinate its portion of the Work with that of the other Builders and Standard Subcontractors. As further described in this Agreement, including the General Conditions, each Builder, Standard Subcontractor, and their respective tier-subcontractors are responsible for all means, methods,

sequences, and safety procedures related to their respective portion of the Construction Work. Each Builder, Standard Subcontractor, and their respective tier-subcontractors are responsible for fulfilling all statutory obligations of an 'employer', as defined in the Workers Compensation Act, related to their respective portion of the Construction Work. In addition, all Construction Work provided by Builders must be consistent with the Project Requirements.

4.3.3 Standard of Care. Each Builder will perform its preconstruction services and all Construction Work using its best skill and attention and in a timely, workman-like manner consistent with the degree of care and skill customarily exercised by prudent licensed contractors performing preconstruction services and Construction Work on projects of similar size, scope, quality, and complexity in the jurisdiction where the Project Site is located. To the extent that a Builder engages Design-Build Trades, the Builder must ensure that those trades comply with the design standard of care in Section 4.5.3 for their respective Design Services except that Design-Build Trades are also responsible for the means and methods of their respective portion of the Construction Work. Nothing in this Agreement requires any of the Builders to perform any work or services outside its license or contrary to Applicable Law or to provide Design Services.

4.3.4 Subcontractors. Builders will retain all subcontractors required for performance of the Builder's portion of the Work in accordance with Article 7. Builders are responsible for, and will review, supervise, coordinate, and manage their respective subcontractors.

4.3.5 Design-Assist Trades. Design-Assist Trades will actively engage in Target Value Design services and will construct their respective portions of the Project but are not required to provide Design Services as defined in this Agreement.

4.3.6 Design-Build Trades. Design-Build Trades will provide Design Services for their respective scopes of the Work through appropriately licensed design professionals who are responsible for the Design Services rendered by the Design-Build Trade. Design-Build Trades will actively engage in Target Value Design services and coordinate their Design Services with those of the Lead Designer and the other Designers, their Design Consultants, and other Design-Build Trades. Design Services deliverables will be stamped and signed by a registered professional engineer or architect who is licensed in the jurisdiction where the Project Site is located in the appropriate discipline, to the extent required by Applicable Law, and must be consistent with the design standard of care in Section 4.5.3. All design-build Construction Work must meet and be consistent with the construction standard of care in Section 4.3.3. The Design-Build Trades will furnish all reports, affidavits, certificates, and other documents required by any Governmental Authority that are required by Applicable Laws.

4.3.7 PMT Participation and Deliverables. The Builders will actively participate with the SMT, PMT and PITs in further development of the Responsibility Matrix, a BIM Execution Plan, and other management protocols and tools.

4.4 Contractor

4.4.1 The Contractor is a Builder and has all the obligations of a Builder under this Agreement and the additional obligations of the Contractor as specified in this Section and elsewhere in this Agreement. Provisions that specifically reference the Contractor supersede provisions applicable to Builders, but only to the extent of any inconsistency.

4.4.2 Coordination and Construction Management. The Contractor has overall responsibility for the Implementation Phase of the Project and will provide overall coordination, scheduling, logistic, site safety, security, cost modeling, constructability, and information and document management. Contractor will manage Builder participation in the development of the design, the Target Value Design and other pre-construction efforts. During performance of the Construction Work, Contractor will manage, direct, and supervise performance of the Construction Work in accordance with the Final Target Cost and Project Schedule.

4.4.3 Standard of Care. Contractor will perform their services in a timely, workman-like manner consistent with the degree of care and skill customarily exercised by:

(a) prudent licensed contractors performing preconstruction services and construction work on projects of similar size, scope, quality, and complexity as the Project and in the geographic vicinity of the Project; and

(b) prudent construction management professionals providing construction management services on projects of similar size, scope, quality, and complexity as the Project and in the geographic vicinity of the Project.

Contractor will perform services in connection with this Agreement in accord with Applicable Law. Nothing in this Agreement requires the Contractor to perform any services outside its license or contrary to Applicable Law. The Contractor is professionally responsible for the means, methods, sequences, and procedures, and safety precautions in connection with the Construction Work.

4.4.4 Safety. Contractor is responsible for creating and implementing a Project Site safety plan required by Section 5.4.13.

4.4.5 Prime Contractor. “Prime Contractor” has the meaning provided in section 13 of the Workers Compensation Act.

At any time during the term of this Agreement that the Project Site could be deemed to be a ‘multiple-employer workplace’ (as defined in the Workers Compensation Act), Contractor shall act as Prime Contractor and shall be solely responsible for carrying out all obligations of a Prime Contractor set out in the Workers Compensation Act or its regulations. For purposes of the preceding sentence, any provision under the Workers Compensation Act or its regulations requiring the owner or, in the alternative, the Prime Contractor to perform a certain act shall be deemed to be an obligation of the Prime Contractor alone. Contractor represents that it is qualified to act as Prime Contractor.

The parties agree that this Section 4.4.5 constitutes an agreement between the Owner and Contractor for purposes of section 13 of the Workers Compensation Act.

4.5 Designers

4.5.1 General Duties and Obligations. Each Designer will perform all its obligations under the Responsibility Matrix, as amended, and the Agreement including, but not limited to the following:

(a) Perform all Design Services encompassed by the Designer's scope of work using processes and software required by the BIM Execution Plan;

(b) Consult with Builders, Owner and Owner's Separate Contractors and Owner's Separate Consultants to consider and incorporate into the Implementation Documents, as the Designer deems professionally appropriate, information provided by any of them related to systems, materials, equipment, constructability, and logistics;

(c) With respect to its individual discipline, manage and coordinate all design submissions, questions, and responses to any applicable Governmental Authority, with the Lead Designer having overall responsibility to manage and coordinate these matters;

(d) Sign and affix its professional seal on all documents prepared by it and arrange for its subcontractors to do the same for all documents prepared by the subconsultants, to the extent required by Applicable Law;

(e) Perform all Design Services set out in the Project Requirements in accordance with Applicable Law and furnish all reports, affidavits, certificates, and other documents required by any Governmental Authority relating to those portions of the Project designed by it, and its consultants;

(f) Propose a QA/QC plan for its Design Services for approval by the PMT, and implement the approved QA/QC plan;

(g) Co-locate with Parties as required by the Co-location Plan;

(h) Use Set Based Design, where appropriate;

(i) Utilize Target Value Design in performance of Design Services;

(j) Actively collaborate with the other Parties, PITs, and other Project Participants throughout the design process to develop a complete set of coordinated Implementation Documents that meet or exceed the Project Requirements;

(k) Engage in pull-based planning for design production using Lean project delivery methods to avoid advancing the design beyond what is called for in the Lean work plan or identified as workable back-log;

(l) Timely review and approve all Submittals in accordance with the requirements set forth in the General Conditions for conformance with the Implementation Documents;

(m) Provide the PMT with timely decisions necessary to support the Project Requirements, make timely payments, and perform all other tasks designated to the Designer under this Agreement; and

(n) Work with Contractor and other Builders to deliver a Record Model to Owner upon Final Completion.

4.5.2 Each Designer is responsible for performing the Design Services for which it is responsible under the Responsibility Matrix. Each Designer will support the Lead Designer in its coordination role, take direction from the Lead Designer that is consistent with PMT direction, and integrate its services and work product with that of the other Designers, Design-Assist Trades, Design-Build Trades, and Owner's Separate Consultants. All Design Services by Designers and their consultants must be consistent with the Project Requirements and meet or exceed the standard of care in Section 4.5.3.

4.5.3 Standard of Care. Each Designer and its Design Consultants will perform its Design Services using that skill and care used by other competent licensed architects and engineers or consultants (who will be licensed to the extent required by Applicable Law) skilled in designing projects in the jurisdiction where the Project Site is located that are similar in size, scope, quality, and complexity to the Project. Design Services performed in connection with this Agreement must also be in accord with Applicable Law. If any of the Applicable Laws conflict, the Designers will consult with the PMT on how the conflict should be resolved. Nothing in this Agreement requires the Designers or their Design Consultants to perform any services outside the scope of their license or contrary to Applicable Law.

4.5.4 Subcontractors. The Designers may retain design subcontractors to perform portions of the Design Services in accordance with Article 7. Designers shall ensure that all subcontractors retained by Designers are appropriately licensed, sign and seal all architectural or engineering documents prepared by them to the extent required by Applicable Law, perform all services in accordance with the standard of care in Section 4.5.3, and, in the case of engineering subcontractors, will be the Engineer of Record for their respective scopes of Work. All subcontractors will be identified in the Project roster and incorporated into the Responsibility Matrix, for reference.

4.5.5 Review and Integration of Design-Build Information. The PMT may elect to have Design Services performed by Design-Build Trades or under design-build subcontracts through a Builder. Design Services for design-build Work will be provided by appropriately licensed design professionals and all design-build documents will be stamped and signed by registered professional engineers or architects who are licensed in the jurisdiction where the Project Site is located. The applicable Designers and their consultants will provide all applicable performance specifications and design criteria for design-build Work and will review the design documents prepared by the Design-Build Trades for integration

into the overall design and for conformance with the design intent and Project Requirements.

4.5.6 PMT Participation and Deliverables. Each Designer will actively participate with the PMT in further development of the Responsibility Matrix, a BIM Execution Plan, and other management protocols and tools.

4.6 Lead Designer

4.6.1 The Lead Designer is a Designer and has the obligations of a Designer under this Agreement and the additional obligations of the Lead Designer as specified in this Section and elsewhere in this Agreement. Provisions that specifically reference the Lead Designer supersede provisions applicable to Designers, but only to the extent of any inconsistency. The Lead Designer is not responsible for the technical adequacy of design information prepared by other Designers but must manage the integration of this design information into a comprehensive and coordinated whole.

4.6.2 Design Coordination. The Lead Designer has primary responsibility for the overall design of the Project, coordinating the activities of the Designers with each other, with the Design-Build Trades, and with Owner's Separate Consultants, and advising the Parties on design matters. If the Lead Designer is also an Engineer of Record, it will perform the services required of a Designer for its engineering discipline. The purpose of design coordination is to eliminate conflicts, omissions, and inconsistencies from the Contract Documents.

4.6.3 QA/QC. Lead Designer will coordinate the QA/QC plans of all Designers, prepare a comprehensive QA/QC plan for all Design Services, and monitor and implement the approved QA/QC plan.

4.6.4 Regulatory Review. The Project will require review from Governmental Authorities that have review, approval, and licensing authority for the Project. Lead Designer, with appropriate support from Designers, Design-Build Trades, and Owner will manage the communications and submissions with Governmental Authorities on behalf of the Project. The Lead Designer must keep Owner closely advised of all interactions with Governmental Authorities.

4.6.5 Stakeholder Inclusion. The Lead Designer will schedule, manage, and facilitate meetings with key users and stakeholders to reflect, as appropriate, their needs, preferences, concerns, and ideas into the Project design. The stakeholders include, without limitation, Owner operations and maintenance staff, City of Nanaimo, _____.

4.6.6 Presentations. In coordination with Owner, Lead Designer will prepare, as required, presentation materials and will, at Owner's request, present information regarding the project to Owner, Owner's staff, stakeholders, Governmental Authorities, and neighbouring and general public, as required.

4.7 Project Advisor ("PA")

4.7.1 General. Owner may engage a consulting firm to assist Owner in performing some of its obligations under this Agreement. The PA may participate in PMT and SMT meetings, although the PA is not a Party to this Agreement and the presence of the PA firm at a PMT or SMT meeting does not increase the number of votes allocated to Owner. Owner may delegate its decision-making authority to the PA for PIT and PMT meetings.

4.7.2 Role of PA. The PA may, on behalf of Owner, assist the Parties in:

(a) Selecting additional Parties to be joined to this Agreement or subcontractors and consultants to be added as Project Participants;

(b) Organizing and managing the co-location facility, including facilitating discussions within and between the PITs, PMT, and SMT;

(c) Facilitating the Target Value Design process;

(d) Managing the validation process, including preparation of the Validation Report;

(e) Leading and documenting PMT and SMT discussions and decisions;

(f) Developing and validating the Cost Model used to track Project costs;

(g) Managing and monitoring the scheduling processes, including the Project Schedule, and the detailed pull schedules;

(h) Developing and monitoring the QA/QC programs;

(i) Establishing and tracking Key Performance Indicators to proactively manage the Project;

(j) Managing root cause analyses of deviations in QA/QC, Cost Model, Project Schedule and Key Performance Indicators, and based on those analyses, initiating corrective action;

(k) Reviewing Non-Owner Party payment applications for conformance with the requirements of this Agreement;

(l) Providing advice and counsel to Owner regarding management of the Project; and

(m) Oversight in the scheduling of commissioning and turnover processes.

4.8 **Joining Agreements**. Parties may be added to this Agreement upon unanimous written agreement of the existing Parties. Upon execution of a Joining Agreement the added Party will assume the responsibilities—within its scope of work—as if it had been a party to this Agreement from the Effective Date and the Business Terms Sheet will be updated to reflect the added Party and any changes to the Base Target Cost, Final Target Cost, ICL, or ICL Percentages.

4.9 **Key Employees**. The Parties acknowledge that in entering into this Agreement, Owner has relied upon each Non-Owner Party assigning to this Project the Key Employees listed in Exhibit M, each of whom must perform their respective work or services throughout the term of this Agreement. No Key Employee may be replaced, reassigned, or removed without Owner's written approval, which will not be unreasonably withheld. Owner may require replacement of any Key Employee if, in the Owner's reasonable opinion, the continued involvement of the said Key Employee is not in the best interests of the Project. Replacement Key Employees cannot be replaced, reassigned, or removed except as allowed in this Section 4.9 and must have experience and capability that is equivalent or better than the replaced Key Employee.

5. Governance

5.1 Project Management Team

5.1.1 Membership. The PMT will provide management-level guidance for collaborative planning, design, and construction of the Project to achieve the Project Requirements and will be chaired by a person designated by the Owner. The PMT is responsible for monitoring all Project progress and for developing benchmarks, metrics, and standards for progress evaluation.

5.1.2 Meetings

(a) Regular Meetings. The PMT will establish a regular meeting schedule, which, in general, should occur weekly. Regular meetings held in accordance with the agreed meeting schedule do not need to be noticed. Regular meetings will be held to review, discuss, and evaluate the status of the Project with respect to design issues, cost, and schedule, and to implement programs to improve overall Project performance. The regular meetings will be held separately from other meetings to assure proper management of the Project and encourage candor among the Parties. The regular meetings may include SMT members from each of the Parties, as well as any other necessary Project Participants that may be required to attend based on the meeting agenda.

(b) Special Meetings. Special meetings may be requested by any PMT member to allow the PMT to address a matter of urgency. The Party requesting the special meeting must provide at least 1 Business Day's electronic notice to each PMT member, unless all PMT members agree to a shorter timeframe. Notice of a special meeting will identify the issues to be addressed.

5.1.3 Responsibility; Authority. The PMT will manage and coordinate achievement of the Project Requirements and provide direction to the Parties and to the PITs.

Subject to the requirement that its decisions be unanimous, the PMT is authorized to manage and direct the Project in a manner consistent with the Project Requirements. The PMT is not, however, authorized to direct or supervise the actions of any Party's employees and is not responsible for any failure of a Party to perform its obligations. PMT decisions are final and not subject to review or modification except by the SMT, as described in this Agreement, or by Owner's use of an Owner's Directive.

5.1.4 Reliable Participation. Fundamental to the success of the PMT is the willingness and ability of each member of the PMT to participate reliably throughout the Project by providing dependable commitments, promises, and information in the best interest of the Project. The Parties commit to supporting the full engagement of their PMT representative and to providing the necessary resources to allow its PMT member to meet his or her commitments.

5.1.5 PIT Management. The PMT will create, organize, manage, and mentor the PITs and through a designated PMT member, and maintain a direct management/mentoring connection with each PIT.

5.1.6 Interpretation of the Project Requirements and Implementation Documents. The PMT has the authority to interpret the Project Requirements and Implementation Documents, subject to SMT approval. Work related to a request for information or clarification that affects the Base Target Cost, Final Target Cost, or Contract Time must be documented in a PMT Bulletin, but will not result in a Change Order unless approved by the SMT. The PMT will resolve questions, discrepancies, ambiguities, and other clarifications regarding the requirements of the Project Requirements and Implementation Documents according to this Agreement, the Project Requirements, and in the best interests of the Project.

5.1.7 Decisions. All PMT decisions must be unanimous and recorded in the PMT meeting minutes, or in the case of a project wide directive, a PMT Bulletin. If the PMT cannot reach a unanimous decision, the unresolved issue is referred to the SMT for determination at the SMT's next regular or special meeting.

5.2 Senior Management Team

5.2.1 Responsibility; Authority. The SMT is responsible for the overall management and guidance of the Project to achieve the Project Requirements and will provide senior management-level guidance for collaborative planning, design, and construction of the Project to achieve the Project Requirements. The SMT is chaired by the Owner. The SMT has the authority to take the actions listed below and to take any action that the PMT is authorized to take.

(a) PMT Membership. The SMT will establish the Project Management Team, choosing its members and providing mentoring and direction to the PMT as required. The SMT may remove and replace a PMT member.

(b) Resolve issues that the PMT could not resolve and are referred to the SMT under Section 5.1.7.

(c) Project Requirements. The SMT will review the Validation Report and confirm the Project Requirements, which will then be amended into this Agreement as Exhibit B.

(d) Change Orders. Issue Change Orders permitted under Article 11. The SMT may by SMT Bulletin delegate authority to issue Change Orders valued less than a stated amount, and less than a stated increase in Contract Time, individually and in aggregate.

(e) Approval of Governance Plans. The SMT will review the Governance Plans prepared by or under the direction of the PMT and will either approve the plan or direct that the plan be modified and resubmitted. After approval, the SMT may require modifications to a plan to respond to additional information or changed circumstances.

5.2.2 Membership. Each Party will have a representative to the SMT and, if a Party chooses, an alternate representative, who are both identified in the Business Terms Sheet. Each Party will endeavor not to change its representative during the Project, but, if necessary, may replace its representative or alternate by notifying the SMT in writing of the new representative or alternate. By majority vote, the SMT may require a Non-Owner Party to replace its representative to the SMT.

5.2.3 Meetings

(a) Regular Meetings. The SMT will establish a meeting schedule that is available to all Parties. Regular meetings held in accordance with the agreed meeting schedule do not need to be noticed. Regular meetings will be held to review, discuss, and evaluate the status of the Project with respect to design issues, cost, and schedule, and to implement programs to improve overall Project performance.

(b) Special Meetings. Special meetings may be requested by any Party to allow the SMT to address a matter of urgency. The Party requesting the special meeting must provide at least 1 Business Day's electronic notice to each SMT member, unless all SMT members agree to a shorter timeframe. Notice of a special meeting will identify the issues to be addressed.

5.2.4 Decisions

(a) Voting. All SMT decisions will be recorded in SMT meeting minutes, or in the case of a project wide directive, an SMT Bulletin. Decisions of the SMT are by majority vote of the members present, but no decision can be made if Owner is absent. Each SMT member has one vote, except that Owner's SMT member will have additional votes, to provide Owner with at least 1/3 of the total number of votes. All decisions of the SMT are final and binding on the Parties, with the exception that Owner can overrule a SMT decision by issuing an Owner's Directive.

(b) Owner Directive. If Owner objects to a SMT decision, it may issue a written Owner's Directive that supersedes the SMT decision. However, if the Owner's Directive changes the cost, scope, or schedule, any Non-Owner Party may use the dispute resolution procedures of Article 16 to contest the Owner's Directive and have a Change Order issued, if, and to the extent, a Change Order is allowed under Article 11.

5.3 Personnel Management. Neither the PMT nor the SMT will supervise or control any person whom a Party employs or directly contracts with in connection with the Project. The PMT or SMT may require any Non-Owner Party to remove from the Project any person employed in connection with the Project, or personnel of companies that any Non-Owner Party directly contracted with, if it determines that the presence of that person is detrimental to achievement of the Project Requirements. Each Non-Owner Party will provide personnel according to staffing plans approved by the PMT. The Parties will not remove or reduce involvement of any Key Employees set forth in an approved staffing plan without the Owner's written consent, which will not be unreasonably withheld. Staffing plans may be prepared and approved in phases, as directed by the PMT.

5.4 Project Manual and Governance Plans. The Project Manual will contain detailed information regarding processes, procedures, project controls and policies applicable to the Project and forms that must be used on the Project. The Project Manual will be maintained in the Project Management Information System, be available to all Parties, and may be updated by the PMT from time to time. The PMT will provide each Party with written notice when the Project Manual is updated. The updated Project Manual is binding on all Parties unless, within 10 Business Days of being notified of an update, a Party objects to the update by notifying the PMT and Owner in writing. The Project Manual will include the following plans and tools ("Governance Plans"), which will be created by the PMT for SMT review and approval.

5.4.1 BIM Execution Plan. The BIM Execution Plan will outline how BIM workflows, tools, and techniques will be used to achieve the Project Requirements.

5.4.2 Co-Location Plan. The Co-location plan will detail the physical arrangements, digital and other technical infrastructure, scheduling, facilitation, PIT organization and leadership, and operational procedures for the co-location facility.

5.4.3 Commissioning Plan. The Commissioning Plan will specify the tasks to be accomplished during pre-commissioning and commissioning, and the standards that must be achieved. The Commissioning Plan will identify the responsibilities of the parties participating in pre-commissioning and commissioning. The Commissioning Plan will identify any commissioning agents and outline all systems subject to commissioning and all Parties required to participate.

5.4.4 Communication and Decision Plan. The Communication and Decision Plan will detail the systems and procedures to be used to enhance effective communication amongst the Project Participants and provide for efficient preservation and access to communications with appropriate levels of security and authorization. In addition, the plan will detail a system for effectively documenting, disseminating, and retrieving Project Information and decisions.

5.4.5 Cost Model. The Cost Model will be the primary document for displaying and analyzing project financial information. It should, in as close to real time as practicable, reflect the current state of incurred and projected project costs and identify areas that require attention from the PMT and SMT to avoid cost overruns at the line item, discipline, sector, and Project levels.

5.4.6 Information Integration Plan. The Information Integration Plan will establish standards and procedures for obtaining timely information from all Project Participants.

5.4.7 Joint Site Investigation Plan. The Joint Site Investigation Plan will specify the reasonable investigative tasks required to reduce the risk of encountering Unforeseen and Differing Site Conditions during construction of the Project. The Joint Site Investigation Plan should balance the risks to be reduced and the cost of investigation.

5.4.8 On-Boarding Plan. The On-Boarding Plan will detail the indoctrination, training, and integration that each Project Participant and their respective employees will receive as they commence working on the Project. The purpose of on-boarding is to explain the principal purpose and specific goals of the Project, how the Project differs from other projects that the person or organization has been involved with, how the person or organization fits into the Project, how they are expected to interact and collaborate with other Project Participants, and to provide administrative and safety information. On-boarding is a continuous process that will occur throughout the Project duration.

5.4.9 Pre-fabrication Plan. Pre-fabrication may provide significant opportunities to improve quality while reducing cost and duration. The Pre-fabrication Plan should explore these opportunities and detail how pre-fabrication will be utilized on the Project. In addition, it should address how the Project will respond to challenges created by pre-fabrication, such as Quality Assurance and inspection, labour considerations, logistics, material and equipment protection, transport, storage, ownership, and insurance for pre-fabricated components.

5.4.10 Baseline Schedule. During the Validation Phase the Parties will develop a Baseline Schedule that identifies the Final Completion date, Substantial Completion date, and the key milestones for achieving those dates. The Baseline Schedule must be in Critical Path Method format, using a computer program acceptable to Owner, and sufficiently detailed to understand the relationships between milestones, key dates, and critical long duration tasks and procurements. It is recognized, however, that detailed project scheduling will be accomplished through pull scheduling using the Last Planner System™ or equivalent and that the Baseline Schedule should provide general, rather than detailed information, and form the basis for the Project Schedule. Throughout the later phases of the Project, the PMT will maintain and update the Project Schedule.

5.4.11 QA/QC plans. There will be two Project-level QA/QC plans. The Design QA/QC plan defines the standards used for design, the processes for coordination and conflict checking design information, and the processes for review of the completeness, accuracy, clarity, and adequacy of design information. The Lead

Designer is responsible for creating the Design QA/QC plan. The Construction QA/AC plan focuses on the completeness and quality of the Construction Work to maintain the quality required by the Implementation Documents and reduce, to the greatest practical extent, re-work, and warranty call-backs. The Contractor is responsible for creating the Construction QA/QC plan.

5.4.12 Risk and Opportunity Register. The Risk and Opportunity Register will identify and quantify potential project risks and will be used to develop a reasonable Project contingency that will be included in the Base Target Cost.

5.4.13 Safety Plan. The Safety Plan should set out requirements for safety of workers, visitors, and others on or around the Project Site, including any off-site fabrication facilities, that are consistent with Applicable Law and customary industry practices.

5.4.14 Strategic Sourcing Plan. The Strategic Sourcing Plan will evaluate opportunities to procure material and equipment for the Project using a centralized facility procurement and logistics facility.

5.4.15 Target Value Design Plan. The Target Value Design Plan will evaluate, implement, monitor, and manage Target Value Design processes, such as those discussed in Target Value Design: Introduction, Framework & Current Benchmark, and Target Value Delivery: Practitioner Guidebook to Implementation – Current State 2016, both available from the Lean Construction Institute.

5.4.16 Turnover Plan. The Turnover Plan details the schedule, tasks, deliverables, training, and requirements for transitioning the Project from Non-Owner Party control to Owner control.

5.4.17 Validation Report. The Validation Report will document the Parties' evaluation of Owner's requirements and desired outcomes, the scope and schedule required to achieve them, and the expected cost for the Project. It must provide sufficient detail to be a reliable guide to project cost and schedule and is the primary source document when setting the Base Target Cost, which is a negotiated number that may be less than the expected cost. The Validation Report, when completed and accepted by all Parties, becomes Exhibit B to this Agreement.

5.5 Project Charter. The PMT will, jointly with the Project Participants, develop a Project Charter that embodies the key goals and values that the Project Participants have committed to achieve. The Project Charter will be signed by representatives of each Project Participant and be prominently displayed in the co-location facility.

5.6 Project Implementation Teams

5.6.1 Creation and Operation. The PMT will create PITs as necessary for the efficient design and implementation of the Project. Each PIT will appoint a leader, subject to approval by the PMT. The PMT will monitor PIT effectiveness and, as necessary, the PMT will take action to increase PIT effectiveness, including facilitating PIT meetings and replacing PIT leaders. The PMT can create, dissolve, modify, or otherwise use PITs as the PMT finds appropriate. Each Party

will provide personnel to staff the PITs, as required by the PMT, but PITs may also include persons employed by any Project Participant, or other persons whose participation is useful to the PITs' successful functioning.

5.6.2 Authority. The PITs are the primary working unit of the Project during the Validation Phase and the Design/Pre-construction Phase and may continue working through all Project Phases. As such, the PITs will make many of the day-to-day decisions necessary to achieve the Project Requirements. PITs are not, however, authorized to change the Base Target Cost, Final Target Cost, ICL, ICL Percentages, the Parties' respective Stipulated Profit, or the Contract Time.

6. Responsibilities by Project Phase

6.1 Phases and Stages. The Project has 5 Project Phases: Validation Phase, Design/Pre-construction Phase, Implementation Phase, Commissioning Phase, and Post Commissioning Phase. The Project may also be divided into one or more Project Stages based on geographic or other relationships. At any point in time, Work in different Project Stages may be in different Project Phases. For example, Work may be in the Implementation Phase for one Project Stage while in the Design/Pre-construction Phase of a different Project Stage.

6.2 Validation Phase. The purpose of the Validation Phase is to align the Parties regarding the Project scope, schedule, cost, and quality and to document that alignment in the Validation Report. The Validation Phase is also a decision point to determine if the Project will continue or be terminated.

6.2.1 Compensation. For the Validation Phase the Non-Owner Parties are paid their respective incurred Chargeable Costs, which includes Stipulated Overhead, but they will not be paid, and are not due, any profit.

6.2.2 Tasks. During the Validation Phase, the Parties will:

(a) Develop the Project design sufficiently to identify and determine the key design decisions affecting floor plans, elevations, building exterior systems, mechanical systems, electrical, civil, and structural systems and to support development of the Estimated Final Cost.

(b) Set the Base Target Cost, set the Labour Escalation Allowance and Material Escalation Contingency, and set standards for the integration of Project financial information from Project Participants. Develop the Estimated Final Cost and include, in separate line items, an appropriate Project contingency, the Labour Escalation Allowance, Material Escalation Contingency, and other Allowances (specifically identified).

(i) Project contingency. The Parties' projections of their Chargeable Costs that are included in the Base Target Cost cannot include any contingency amount. However, the Parties will jointly develop a Risk and Opportunity Register that identifies and quantifies potential project risks. The Risk and Opportunity Register will, among other things, be used to develop a reasonable Project contingency that will be included in the Base Target Cost;

(c) Develop a Baseline Schedule pursuant to Section 10.2.1;

(d) Develop the Key Performance Indicators;

(e) Develop Achievement Events;

(f) Develop terms for Unusual Escalation for material and equipment escalation;

(g) Develop the Incentive Program;

(h) Develop the Project Manual;

(i) Develop the Responsibility Matrix to allocate key tasks amongst the Project Participants;

(j) Plan and perform a Joint Site Investigation. The Parties will jointly determine the level of effort necessary to provide reasonable information regarding Project Site conditions. The level of effort should balance the risk to be avoided and the cost of the investigation. In addition, the Parties should determine when it is most appropriate for given investigative tasks to be performed. The Joint Site Investigation should be summarized in a report that will set the baseline for Unforeseen and Differing Site Conditions; and

(k) Establish the Base Target Cost, the ICL, each Non-Owner Party's Stipulated Profit, each Non-Owner Parties' Stipulated Overhead, and any other information necessary to complete the Business Terms Sheet.

6.2.3 Completion of the Validation Phase. The Validation Phase is complete when:

- The Validation Report has been issued and accepted by all Parties;
- The Base Target Cost is agreed by all Parties and amended into the Agreement;
- The Parties' Stipulated Profit and Stipulated Overhead are agreed by all Parties and amended into the Agreement; and
- The Incentive Program is agreed by all Parties and incorporated in the Agreement.

6.2.4 Project Termination for Failure to Validate. If the Parties are unable to agree on all the items in Section 6.2.3, Owner may issue a written notice of non-validation to all Parties. If, within 25 Business Days after issuance of the notice, the Parties do not reach agreement on all the items in Section 6.2.3, the Project is terminated on the following terms:

(a) Owner will pay the Parties any unpaid Chargeable Costs, including overhead, for Work performed prior to termination, but no profit or any other compensation will be due the Non-Owner Parties; and

(b) Owner will own preliminary Design Materials (including copyright) and each Party must provide Owner, within 10 Business Days after receipt of a written request from Owner, any of the preliminary Design Materials it created. Owner releases the Parties from any liability to Owner that is caused by Owner's use of the preliminary Design Materials and will defend and indemnify each Non-Owner Party from any liability, claims or damages that are caused by Owner's use of the preliminary Design Materials.

6.3 Design/Pre-construction Phase

6.3.1 Notice to Proceed. If the Validation Phase is completed, Owner will issue to the Parties a written Notice to Proceed with the Design/Pre-construction Phase.

6.3.2 Tasks. During the Design/Pre-construction Phase, the PMT will oversee development of the project design and creation of the Implementation Documents for the Project in accordance with the Project Requirements and will complete the following design and preconstruction activities.

(a) Procurement of Other Project Participants. During the Design/Pre-construction Phase, any remaining subcontractors, vendors, suppliers, consultants, Owner's Separate Contractors, and Owner's Separate Consultants will be contracted by the applicable. The Project roster will be updated by the PMT to include all Project Participants.

(b) Update Responsibility Matrix. The PMT will update the Responsibility Matrix as required to include the necessary subcontractors, vendors, suppliers, consultants, Owner's Separate Contractors, and Owner's Separate Consultants procured during the Validation Phase that will be performing certain tasks. The Responsibility Matrix will be updated from time to time as the PMT deems necessary to reflect the status of the Project and assign necessary tasks to the most qualified Project Participant.

(c) Early Release and Prefabrication. The PMT may authorize early release of certain systems, phases, or prefabrication of materials or equipment.

(d) Project Implementation Teams. The PMT will develop, guide, and direct PITs.

(e) Cost Model. With the assistance of the PITs and Contractor, the PMT will maintain and update the Cost Model developed during the Validation Phase, which the PMT will review monthly or more frequently as necessary for effective project management. The Cost Model must track paid Chargeable Costs, incurred but unpaid Chargeable Costs, current estimate of future Chargeable Costs, the percentage of the Work completed, projected of each Non-Owner Party on a monthly and quarterly basis, any ICL distributions, the predicted variance of each line item, and the projected variance from the Base Target Cost.

(f) Project Scheduling. The PMT and PITs will update and maintain the Project Schedule using pull-based planning, such Last Planner™ or equivalent to the standards required in the Project Manual.

(g) BIM Execution Plan. Early in the Design/Pre-construction Phase, the PMT and other relevant consultants, vendors, suppliers, and subcontractors will participate in a workshop to establish a BIM Execution Plan that addresses the uses specified in the General Conditions or identified in the Project Requirements. The BIM Execution Plan will be approved by the PMT.

(h) Target Value Design Process. The PMT and PITs will utilize the Target Value Design process to optimize and coordinate the design in accordance with the Project Requirements and endeavor to create additional value by identifying alternative systems, means, and methods to reduce capital expenditures and life-cycle costs, analyze and improve work-flow, improve constructability and functionality, provide more operational flexibility, and endeavor to reduce the actual Chargeable Costs while maintaining or increasing the quality and overall function of the Project. The agreed Base Target Cost is a design criterion.

(i) Continuous Costing. To the greatest extent practicable, the Builders and their subcontractors will provide continuous cost projections and rapid cost evaluation of proposed design alternatives to the PITs and PMT throughout the Target Value Design process to assist the Parties and the PMT, in making informed decisions about proposed design solutions.

6.3.3 Final Target Cost. The Final Target Cost will be established at or near the end of the Design/Pre-construction Phase and will include all Chargeable Costs to design and perform the Work described in the Implementation Documents. The Final Target Cost measures whether the Project meets the Owner's financial expectations and will be the threshold against which the Final Actual Cost is compared upon Final Completion of the Work to determine the final ICL amount earned, if any.

(a) If during this phase, the PMT projects that the expected cost is less than the Base Target Cost, then it may declare that savings have occurred and 25% of the amount saved will be added to the ICL and the Base Target Cost reduced by 75% of the amount saved.

(b) The Owner may choose to include Added Value Incentive Items, or other scope, that are funded in whole or in part, by the reduction in the Base Target Cost.

(c) The Final Target Cost is the Base Target Cost, minus 75% of the savings declared during the Design/Pre-construction Phase, plus the agreed Change Orders, if any, for Added Value Incentive Items, or other agreed scope increases that are funded, in whole or in part, by the savings during the Design/Pre-construction Phase.

6.4 **Governmental Laws and Regulations**. The PMT, in collaboration with the PITs, will identify and determine the meaning and effect of all applicable building code provisions and other building restrictions and requirements of Governmental Authorities. The Designers, in conjunction with the Builders, will assist Owner with filing all required applications, drawings, specifications, calculations, and other documents required for permits.

6.5 **Implementation Phase**. Notice to Proceed. Owner will issue a written Notice to Proceed to the Non-Owner Parties to commence the Implementation Phase. If the Project proceeds in Project Stages, Owner will issue a written Notice to Proceed with Implementation Phase Work for each separate Project Stage.

6.5.1 Tasks. During the Implementation Phase, the remainder of the consultants, subcontractors, suppliers, and Owner's Separate Contractors, if any, will be procured and the Construction Work will be performed in accordance with the approved and permitted Implementation Documents.

(a) Reconciliation of Material Escalation Contingency. Upon procurement of the remaining Project Participants, the Material Escalation Contingency will be reconciled per Section 11.4.3.

(b) Cost Model. The Cost Model will be continuously updated to reflect incurred and projected costs and reported to the PMT and SMT. It will be reviewed as required by Section 6.3.2(e).

(c) Project Schedule. The Project Schedule will be continuously updated to reflect Project progress and the projected dates for key milestones, Substantial Completion, commissioning and Final Completion.

(d) Productivity. The PMT will monitor productivity and proactively act to remove or mitigate impediments to efficient production. Processes will be monitored and continuously improved through application of Lean processes, principles, and continuous learning cycles.

(e) QA/QC. The PMT will monitor the quality of installed work and investigate the root causes of quality or rework issues to improve installed quality and reduce rework. As the Implementation Phase is completing, the PMT will prepare Deficiency List and manage Deficiency List completion.

(f) Safety. The PMT will monitor adherence to the Safety Plan and act to eliminate any material deviations from the Safety Plan and to communicate the importance of safety to all Project Participants.

(g) Pre-Commissioning and Turnover. The PMT will, with the assistance of the independent commissioning agent update the Commissioning Plan to include all deadlines, tasks, deliverables, training, and tests necessary and commence any activities required to timely support the Commissioning Phase. The PMT will also coordinate with Owner's operational staff to plan for the turnover of the Project.

(h) Conformed Design Documents. Under the Lead Designer's direction, the Designers will update the Contract Documents to include all additions and modifications to the design, including incorporation of approved submittals and working drawings/models. The documents so created ("Conformed Design Documents") are intended to be the final and complete expression of the Project design. The Conformed Design Documents must be provided to Owner in their native digital format.

(i) As-Built Documents. Under the Contractor's direction, the Builders will update the Conformed Design Documents to identify all material instances where the Project, as constructed, deviates from the Conformed Design Documents.

6.6 Commissioning Phase

6.6.1 Commencement. The Commissioning Phase will commence when required by the Commissioning Plan. It is anticipated that commissioning of different Project Stages may commence on different dates and have different durations.

6.6.2 Tasks

(a) Commissioning. Execute the operation, adjustment, training, and documentation tasks detailed in the Commissioning Plan and provide the deliverables specified in the plan.

(b) Notice of Substantial Completion. When Substantial Completion of the Project is achieved, the PMT will issue a written notice of the same ("Notice of Substantial Completion"). Before a Notice of Substantial Performance can be issued, all Work required by this Agreement must be satisfactorily completed, with only minor Deficiency List work that can be completed without interfering with using the Project.

(c) Notice of Final Completion. When Final Completion of the Project is achieved, the PMT will issue a written notice of the same ("Notice of Final Completion"). Within 45 days after Substantial Performance, the following must be completed unless otherwise agreed to by the Owner.

(i) Correction of all Final Deficiency List items;

(ii) Provision of all required training;

(iii) Delivery to Owner of all documents, manuals, and warranties as required by the Implementation Documents;

(iv) Delivery to Owner of all spares and attic stock, surplus material, tools, and equipment that were paid for under this Agreement and required by the Implementation Documents;

(v) Delivery to Owner of the Conformed Design Documents and the Record Model; and

(vi) Delivery to Owner of any inspection reports, certifications, or other documents and assurances required by the Agreement or the Commissioning Plan.

6.7 Post Commissioning Phase

6.7.1 Tasks

(a) Warranty. During the Warranty Period, or during a longer period specified by the Contract Documents for specific equipment, materials or systems, the Contractor will manage the investigation and correction of defective equipment, materials, or systems, and will involve the appropriate Non-Owner Parties, subcontractors, and vendors that provided warranties for the deficient equipment, materials, or systems.

(b) Re-Commissioning. 60 days prior to the expiration of the Warranty Period, the Non-Owner Parties and their respective consultants and subcontractors will inspect, repair, and adjust all systems to operate within the performance parameters used when initially commissioning the Project.

7. Subcontracts

7.1 Written Agreements. The Work performed under this Agreement will be executed by various Project Participants, which will include subcontractors, suppliers, vendors, and consultants. Consultants, subcontractors, and vendors will be Standard Subcontractors or Standard Consultants, unless made a Party to this Agreement by execution of a Joining Agreement.

7.2 Selection. The PMT will prepare a protocol for selection and engagement of consultants, subcontractors, and vendors. In the absence of an agreed protocol, the following procedure will be used.

7.2.1 Each Party will provide the PMT, in writing, with the names of persons or entities proposed to perform any portion of the Work as a subcontractor or consultant, together with their qualifications, educational history, work history, proposed compensation terms, and any other information relevant to their proposed role on the Project.

7.2.2 Within 5 Business Days of receipt, the PMT will provide a written response if it objects to the proposed person or entity because of the proposed person's or entity's qualifications, educational history, work history, or another reasonable basis. The procuring party will then propose another person or entity for review by the PMT. This process will continue until the PMT has no reasonable objection. Failure of the PMT to timely object waives the PMT's right to object.

7.2.3 Substitution of an approved subcontractor or consultant will not be made without PMT approval. Substitution must be made following the same process set out in Section 7.2.1 and Section 7.2.2 for initial selection.

7.2.4 Key consultants, subcontractors, and vendors will be procured early during the Validation Phase. Those consultants, subcontractors, and vendors that were not procured during the Validation Phase will be procured during the Design/Pre-construction Phase or, in some cases, early during the Implementation Phase.

7.3 Transparency in Negotiating or Bidding. Standard Subcontractors and Standard Consultants will be selected on an open bid or negotiated basis as determined by the PMT in consideration of procedural obligations under applicable trade agreements. Even if trade agreement obligations are found to not apply to such selection, the selection process will be open and transparent with subcontractors and consultants submitting detailed breakdowns of their bids or proposals. Standard Subcontractors and Standard Consultants will provide detailed information about their respective bids or proposals including costs associated with the Work and overhead and profit for Change Orders. No Standard Subcontracts or Standard Consultant agreements can be procured on an uncapped cost reimbursable basis.

7.4 Licensing Requirements. All consultants, subcontractors, and vendors will be properly licensed for their respective portions of the Work, including any Design Services performed by Design-Build Trades.

7.5 Required Pass-Through Provisions. The Non-Owner Parties must have written agreements with and pass the following provisions through to their respective consultants, subcontractors, and vendors.

7.5.1 Contract Pass-Through. By appropriate written agreement, the Non-Owner Parties will require each of their consultants, subcontractors, and vendors to the extent of the portion of the Work each of them performs, to be bound to the Non-Owner Parties by terms of the Contract Documents, and to assume toward the Non-Owner Parties all the obligations and responsibilities that the contracting Non-Owner Parties assumes toward Owner through those documents. Each subcontract, purchase order, and consulting agreement will preserve and protect the rights of the Parties under this Agreement with respect to the Work to be performed by others so that subcontracting will not prejudice the Parties' rights. The Non-Owner Parties will require each consultant, subcontractor, and vendor that enters into agreements with lower-tier consultants, subcontractors, and vendors to pass-through these provisions into the lower-tier agreements. In addition to this general pass-through requirement, the Non-Owner Parties are specifically required to pass-through the requirements in Section 7.5.2 through Section 7.5.9 and agree to defend and indemnify the Owner from any claims, damages, loss or liability that would have been avoided or reduced had the Non-Owner Party complied with this section. No subcontract, purchase order, or consulting agreement will limit or modify this Agreement.

7.5.2 Assignment. All subcontracts, purchase orders, and consulting agreements will include a provision requiring the subcontractor, consultant, or vendor to assign the subcontract, purchase order, or consulting agreement to Owner upon termination of this Agreement by Owner for default pursuant to Section 15.2.1(b) and Owner's election to accept the assignment of the subcontract. All subcontracts, consulting agreements and purchase orders will also include a provision stating that if the subcontract, consulting agreement, or purchase order is assigned to Owner because of a termination for default, and the Work has

been suspended for more than 30 days, the subcontractors', consultants', and vendors' compensation will be equitably adjusted for increases in cost resulting from the suspension.

7.5.3 Audit. The Non-Owner Parties will require their respective consultants, subcontractors, and vendors to be bound by and fully comply with the records and audit provisions of Article 9.

7.5.4 Insurance. The Non-Owner Parties must pass through all of the requirements contained in their respective insurance exhibit (Exhibits L-2 or Exhibit L-3, as applicable) to their respective consultants, subcontractors, and vendors.

7.5.5 Indemnification. The Non-Owner Parties will each include indemnification provisions into their respective subcontracts, purchase orders, and consulting agreements that require each Standard Consultant and each Standard Subcontractor to defend and indemnify the Parties and their respective Representatives:

(a) From all claims, liability, damages, loss, costs, and expenses (including legal, expert witness, and consulting fees and costs), to the extent arising from the negligence, breach of contract or willful misconduct of the Standard Consultant's or Standard Subcontractor's or of anyone for whom they are responsible;

(b) From all liens or payment bond actions based on the Standard Consultant's or Standard Subcontractor's portion of the Work performed on the Project;

(c) From any claims, liability, damages, loss, cost, and expenses (including legal, expert witness, and consulting fees and costs) to the extent arising from the Standard Subcontractor's or Standard Consultant's negligent acts or omissions in requiring, causing, or permitting any Hazardous Materials to be specified, generated, released, disposed, discharged, brought to, or stored at the Project Site, or used in the Construction Work; and

(d) From any claims, liability, damages, loss, cost, and expenses (including legal, expert witness, and consulting fees and costs) arising from alleged infringement of any copyrights, patents, or trade secrets.

7.5.6 Dispute Resolution Proceedings. Each Non-Owner Party will require their consultants, subcontractors, and vendors to be subject to the dispute resolution proceedings in Article 16.

7.5.7 Third Party Beneficiaries. The Non-Owner Parties will include in their agreements with all consultants, subcontractors, and vendors that:

(a) Owner is a third party beneficiary to such agreements; and

(b) the consultants, subcontractors, and vendors are not third-party beneficiaries to this Agreement.

7.5.8 Standard of Care. Each Non-Owner Party will require that their consultants, subcontractors, and vendors conform to the hiring Non-Owner Party's standard of care set forth in this Agreement.

7.5.9 Confidentiality and Non-Disclosure. Each Builder will require all subcontractors, vendors, and suppliers, and each Designer will require all consultants, to be bound by the provisions of Section 17.2 before receiving any information regarding this Project.

8. Compensation

8.1 General. The Parties' compensation for the Work is the sum of their respective Chargeable Costs incurred for the Project to the extent allowed in Exhibit D for Designers and Exhibit E for Builders and, subject to Project success, their respective percentage of the adjusted and available ICL.

8.2 Incentive Compensation Layer; ICL Percentage. The Incentive Compensation Layer is the sum of all Parties' Stipulated Profits and is subject to performance adjustment as detailed in Exhibit B-4 and Exhibit I. A Party's ICL Percentage is the ratio of its Stipulated Profit to the sum of all Parties' Stipulated Profit. Changes in a Party's Stipulated Profit by Change Order may result in a change to the ICL Percentage of each Party.

8.3 Stipulated Profit. When the Base Target Cost is set, Owner and each Party will agree on an amount of profit the Party will receive if the Project meets the agreed goals in the Project Requirements. A Party's Stipulated Profit is earned pursuant to the requirements of Exhibit I. The Stipulated Profit may be adjusted by Change Order, to the extent permitted by Article 11.

8.4 Contingent Distribution of Stipulated Profit.

8.4.1 The following procedure will be followed with respect to distribution of Stipulated Profit.

(a) When an Achievement Event occurs, Owner will distribute each Non-Owner Party the percentage of its contingent Stipulated Profit identified for that Achievement Event in Exhibit B-5. Prior to any distribution of Stipulated Profit, the PMT must determine that the pre-conditions for the Achievement Event have occurred and that the Project is projected to complete at or below Final Target Cost and within the Contract Time.

(b) If, when an Achievement Event occurs, the Project is not projected to complete at or below Final Target Cost and within the Contract Time, then the contingent distribution of Stipulated Profit associated with the Achievement Event will be deferred until the Project is projected to complete at or below Final Target Cost and within the Contract Time.

(c) If, subsequent to a distribution of Stipulated Profit, the PMT determines that the requirements for earning profit outlined were not met and that the sum of the prior distributions paid Stipulated Profit exceeds the amount of ICL that will be due on Project completion after the adjustments in Exhibit I, then at Owner's option:

(i) The Non-Owner Parties will each pay back to Owner the amount of Stipulated Profit that it received, less the amount of Stipulated Profit it is projected to be due at Final Completion; or

(ii) Owner may withhold from payments to a Non-Owner Party an amount equal to the amount calculated in (i) above.

8.4.2 Increases in ICL. If provided for in the Incentive Program and earned, increases in the ICL, if any, will be made at Final Completion and are not included in contingent distribution of Stipulated Profit.

8.5 Stipulated Overhead. When the Base Target Cost is set, Owner and each Party will agree on an amount of overhead the Party will receive through completion of the Project. A Party's Stipulated Overhead is earned and will be paid on a percentage of completion basis.

8.6 Negotiated Trade Work.

8.6.1 Owner, at its sole discretion, may choose to directly negotiate the performance of trade work with the Contractor on a fixed profit and fixed overhead of basis. If the trade work is awarded to the Contractor, the fixed trade contractor profit amount will be added to the Contractor's ICL and the fixed trade contractor overhead added to the Contractor's fixed overhead. The respective ICL Percentages of the Designers and Builders will then be proportionately adjusted. The Contractor cannot add any mark-ups on the self-performed trade contractor work.

8.7 Affiliates. No Party may contract to have work performed, or purchase material, equipment, tools, or furnishings from, or obtain insurance from an Affiliate of the Party unless Owner agrees in writing. Invoices issued by an Affiliate will separately list the amount of profit in that invoice and the profit will not be due the Affiliate, but will be added to the Party's Stipulated Profit and will be subject to the performance adjustments in Exhibit B-4 and Exhibit I.

8.8 Payment. Owner will pay each Party the amounts due under this Agreement in accordance with the payment procedures in Exhibit H, provided that Owner has timely received a complete and accurate application for payment from the Party using the forms contained in the Project Manual.

8.8.1 Withholding. Payment to Parties for their Chargeable Costs, including Stipulated Overhead, is subject to withholding pursuant to Article 2 of Exhibit H.

8.8.2 Builder's Lien Act Holdback. Notwithstanding any provision otherwise in Exhibit H or Exhibit K, the Owner will retain Holdback on any payment to a Non-Owner Party with respect to which a Holdback is required to be retained under the Builders Lien Act.

9. Records and Audits

9.1 **Records**. Each Non-Owner Party must keep full and detailed accounts and records related to the performance of Work under this Agreement for a period of three years after Final Completion or termination of this Agreement, whichever occurs first. The detailed accounts and records will be created and maintained in accordance with generally accepted accounting practices or other accurate and reliable accounting practices and control systems satisfactory to Owner. The records maintained must include, without limitation, books, records, contracts, subcontracts, purchase orders, vouchers, receipts, evidence of payment, job cost reports, general ledgers, time records, written and electronic communications, estimates, bids, change order logs, correspondence, email, meeting notes, software used on the Project, Change Order Request logs and files, and records related to any Chargeable Costs charged to the Project.

9.2 Audits.

9.2.1 During the Validation Phase, the Owner will conduct an audit of the Non-Owner Parties' financial records for the past 3 years and the claimed profit, including, but not limited to, the Parties' receipts, billable rates, overhead, and profit percentage ("Rate Audit"). The Owner may use the audit provided for in this Section 9.1 to verify the Non-Owner Parties' billable rates, Stipulated Overhead, and Stipulated Profit under the Agreement. Documentation relating to award of subcontracts and consulting agreements, and the build-up of unit prices or lump sum prices must be transparent and will be subject to audit.

9.2.2 If Parties are added to the Agreement after the initial Rate Audit, Owner or a consultant retained by Owner may audit the rates of the added Party to determine its billable rates, Stipulated Profit, and overhead for the Project. Prior compensation paid to a newly added Party is subject to the adjustments set forth in Section 9.2.1.

9.2.3 Other Audits. At any time during the performance of the Work and through one year after Final Completion, Owner may, upon reasonable notice, during normal business hours, and at its expense, audit and copy the records of any Non-Owner Party, and their consultants and subcontractors of any tier, related to:

- All Chargeable Costs provided in establishing the Base Target Cost, Final Target Cost, and determination of Final Actual Cost incurred on the Project (inclusive of all Change Orders);
- Any payment application or calculation of amounts Owner owes or is alleged to owe;
- Subcontractor or consultant costs submitted as Chargeable Costs; and
- Performance of obligations imposed by this Agreement.

9.2.4 Software. Owner's audit and inspection rights include any software used on the Project and the audited party must coordinate and make such software available to for use in the audit and inspection by Owner or its Auditor.

9.2.5 Verification During the Project. Owner may also conduct independent verifications, including counting employees at the Project Site, witnessing the distribution of payroll, and verifying information and amounts through interviews and written confirmations with employees, consultants, subcontractors, and suppliers.

9.2.6 Cooperation. The person or organization being audited will reasonably cooperate and make its records available for inspection, copying, and audit at a reasonably convenient location and for a sufficient time to perform a thorough audit.

9.2.7 Auditor Qualifications; Compensation. The auditor must have at least 5 years of experience in performing construction audits. Auditor's compensation may not be contingent on the outcome of the audit and the auditor may not receive any bonus or other compensation based on the audit result or the amount of savings, if any, recovered by Owner due to the audit.

9.2.8 Reimbursement of Audit Costs; Damages.

(a) Owner's audit costs will be reimbursed if the audit reveals undisputed overcharges on an invoice that exceeds the lesser of $50,000 or 10% of any invoice.

(b) If either condition exists, then the Party responsible for the overcharge will reimburse Owner for the overcharge and the costs Owner incurred in having the audit performed. If multiple Parties are responsible for the overcharge, each will reimburse Owner its proportion of the amount of the overcharge and audit cost.

(c) If the inspection or audit indicates that the audited Party's records were fraudulently or negligently prepared or maintained, Owner may seek damages and legal remedies from the audited party in accordance with Applicable Law.

9.3 Survival of Record and Audit Provisions. These audit provisions survive the termination of this Agreement.

10. Contract Time

10.1 Contract Time. The Contract Time may only be extended by unanimous agreement of the SMT for a Justified Delay and in pursuant to Article 11.

10.2 Project Scheduling.

10.2.1 Baseline Schedule; Project Schedule. A Baseline Schedule that includes design, construction and commissioning will be prepared during the Validation Phase as required by Section 5.4.10, and will be updated at least monthly prior to construction commencing and weekly, thereafter. The purpose of the Project Schedule is to show the overall schedule, key milestones, and progress.

10.2.2 Pull Scheduling. Detailed planning and scheduling will be performed jointly by the Project Participants under the direction of the Contractor using the Last Planner

System™, or an equivalent system. To be pull-based, the planning system must be based upon requests from a Project Participant to other Project Participants upon whom the requester's work is dependent, and receipt of reliable promises made by the upstream performer about when it will finish the Work agreed upon per the hand-off criteria, to enable the downstream performers to begin their respective portion of the Work. Results of pull scheduling will be used to update the Project Schedule.

10.3 Schedule Slippage. Each Non-Owner Party will notify the PMT promptly of any delay in the most current approved Project Schedule because of its Work and must submit a detailed recovery plan for the PMT to evaluate and approve.

10.4 Notice of Justified Delay. A Party will not be entitled to a change in the Contract Time for a Justified Delay unless it:

- Notifies the PMT no later than 5 Business Days after the Party first observed or should have first observed the event causing the delay;
- Demonstrates that it could not have anticipated or avoided the delay, obstruction, hindrance, or interference; and
- Has used all available means to minimize the consequences of the delay.

10.5 Acceleration. The PMT may determine that it is in the best interest of the Project to direct certain Project Participants to accelerate performance through, among other means, additional shifts, longer work hours, etc., in an attempt to recapture any delays to the Project Schedule. To the extent the PMT directs Project Participants to accelerate performance, the PMT will issue a PMT Bulletin, and any resulting overtime premium will be reimbursed as a Chargeable Cost, but neither the Contract Time nor the Final Target Cost will be increased due to a PMT acceleration order, except to the extent the need for acceleration is caused by a Justified Delay.

11. Changes

11.1 Entitlement to Changes to Base Target Cost, Final Target Cost, Stipulated Profit, Overhead, and ICL. The Base Target Cost, Final Target Cost, the Stipulated Profits, the Stipulated Overheads, or the ICL cannot be changed unless one of the following events (each a "Change Event") occurs:

11.1.1 Owner-Elected Changes;

11.1.2 Owner's Directive;

11.1.3 Unforeseen and Differing Site Conditions;

11.1.4 Post Permit Changes that could not have reasonably been anticipated or avoided;

11.1.5 Owner's suspension of the Work per Section 15.1;

11.1.6 Actual Net Recovery from Builder's Risk Insurance, or other insurance required by this Agreement that provides coverage for a project loss; and

11.1.7 Unusual Escalation.

11.2 Entitlement to Changes to Contract Time (Justified Delay)

Provided that notice has been properly given under Section 10.4 and subject to PMT and approval, as appropriate, the Contract Time will be increased by the number of days the Project's critical path was lengthened by a Justified Delay. The following is an exclusive list of Justified Delays:

11.2.1 Owner-Elected Changes;

11.2.2 Owner's Directive;

11.2.3 Unforeseen and Differing Site Conditions;

11.2.4 Post Permit Changes that could not have reasonably been anticipated or avoided;

11.2.5 Owner's suspension of the Work per Section 15.1;

11.2.6 A Force Majeure event; and

11.2.7 Adverse Weather.

11.3 Process

11.3.1 PMT Review. Provided that the required notifications have been given, a Party may request that the PMT review a Change Order Request (COR). The COR must provide details regarding the contractual basis for a contract change, the entitlement to the change, the amount of the change (in cost and time) and any other detail the PMT reasonably requires. If the PMT determines that a Change Order is warranted, it will prepare and submit to the SMT, a Proposed Change Order (PCO). If the PMT determines that a Change Order is not warranted, no further action will be taken on the Change Order Request.

11.3.2 SMT Review. The SMT will review all PCOs sent by the PMT. The SMT may:

(a) Approve the PCO and issue a Change Order in accordance with the terms of the PCO;

(b) Deny the PCO in whole or in part. If denied in whole, no further action will be taken regarding the COR and PCO. If denied in part, then the SMT will issue a Change Order for that portion of the PCO that the SMT approves and in an amount (in cost and time) approved by the SMT; or

(c) Request additional information to assist it in its review, and after receipt of the information, take one of the actions in (a) and (b), above.

11.3.3 Calculation of Changes to Base Target Cost, Final Target Cost, Stipulated Profit, Stipulated Overhead, and ICL. If notice is properly given and the SMT, as appropriate, determines that a change to Base Target Cost or Final Target Cost and ICL is justified under Section 11.1, then the Change Order will be calculated as follows:

(a) If the Change Order is issued after the Design Services or Construction Work related to the Change Event has been substantially completed, then the Base Target Cost is increased or decreased by the increase or reduction in each Non-Owner Parties' Chargeable Costs. The Non-Owner Party's ICL is increased or decreased by the product of the Non-Owner Party's Change Order Percentage and amount the Non-Owner Party's Chargeable Cost increased or decreased due to the Change Order. The ICL is increased or decreased by the sum of the changes in ICL for each Non-Owner Party. Each Non-Owner Party performing Work arising from a Change Order will maintain separate records of the cost incurred due to the Change Order.

(b) If the Change Order is issued before the Design Services or Construction Work related to the Change Event has been substantially completed, the Parties must jointly agree to an estimate of the increase or decrease in Chargeable Costs for each Non-Owner Party whose Construction Work or Design Services is increased or decreased by the Change Order. The Base Target Cost or Final Target Cost is increased or decreased by the sum of all the changes in Chargeable Costs and each Party's Stipulated Profit is increased or decreased by the product of its Change Order Percentage and the increase or decrease in its Chargeable Costs due to the Change Order. The ICL is increased or decreased by the sum of the changes in ICL for each Non-Owner Party.

11.3.4 Calculation of Changes to Contract Time. If notice is properly given and the SMT determines that a change to Contract Time is justified under Section 11.2, then the Contract Time will be increased or decreased by the increase or decrease in the critical path due to the Change Order, less the amount of time the Justified Delay is concurrent with delay caused by any fault, neglect, act, or omission of a Designer, Builder, or any of their respective employees, consultants, subcontractors, or suppliers.

11.4 Unusual Escalation.

11.4.1 Owner's Escalation Contingency. The Owner will carry an amount for Unusual Escalation in the Owner's budget, which will only be transferred into the Base Target Cost or Final Target Cost through executed Change Order to cover overages in either the Labour Escalation Allowance or Net Escalation in the Material Escalation Contingency.

11.4.2 Labour Escalation Allowance. The Parties will agree on a Labour Escalation Allowance during the Validation Phase. The Labour Escalation Allowance will project escalation in labour rates due to collective bargaining agreements and off-island labour and will be incorporated into the Business Terms Sheet. The Labour Escalation Allowance will be included in the Base Target Cost and the

Final Target Cost, and will be reconciled through executed Change Order before determination of the Final Actual Cost. If the Labour Escalation Allowance set forth in the Business Terms Sheet is exceeded, Contractor will submit a COR seeking an adjustment for Unusual Escalation per Sections 11.1.8 and 11.3 for PMT review (one time event). All unused Labour Escalation Allowance amounts accrue 100% to Owner through deductive Change Order.

11.4.3 Material Escalation Contingency. During the Validation Phase, the Parties will agree on a reasonable anticipated amount for material and equipment escalation to be included in the Base Target Cost and Final Target Cost as the Material Escalation Contingency. The Material Escalation Contingency will be incorporated into the Business Terms Sheet. If, after procurement of all materials and equipment that will be incorporated into the Project, the actual Chargeable Cost exceeds the Material Escalation Contingency amount set forth in the Business Terms Sheet, Contractor will submit a COR for Unusual Escalation in the amount of the Net Escalation per Section 11.1.8 and 11.3 for PMT review (one time event). As part of the COR, Contractor must provide the PMT with the actual Chargeable Costs through necessary documentation to substantiate the claim as further described in Exhibit B-7. All unused Material Escalation Contingency amounts will accrue to the Project contingency and remain in the Final Target Cost until determination of the Final Actual Cost, at which time unused contingency will accrue to ICL for distribution per the ICL Percentage.

12. Liability Allocation

12.1 Waiver of Liability

12.1.1 Waiver of Liability. The Parties waive and release all claims and liability between and among each other related to the performance of this Agreement except for the Allowed Claims listed in Section 12.1.2. However, the liability waivers of this Section are void as to any Party in Willful Default of this Agreement and the Party in Willful Default will be responsible to the Owner, or any other Party to this Agreement for any resulting losses or damages it caused to the fullest extent permitted by this Agreement, at equity or under Applicable Law.

12.1.2 Allowed Claims. An Allowed Claim may be brought by any Party against any other Party or by Owner as an express third-party beneficiary of the obligations of any consultant, subcontractor or vendor under any subcontract, consulting agreement or purchase order related to the Project. Allowed Claims are limited to the following claims:

(a) Willful Default. Claims for damages against any Party in Willful Default of this Agreement;

(b) Warranty Claims. Claims against the Builders to enforce rights and remedies to the extent set forth in Article 14 of the Agreement and claims against the subcontractors or suppliers of the Builders to enforce either their correction of work obligations or for breach of warranty obligations under their respective subcontracts;

(c) Project Performance. Claims for loss or damage first occurring after Final Completion for:

(i) Bodily injury, death, or property damage:

(1) Caused by the failure of the Construction Work to be executed in conformance with the Implementation Documents; or

(2) Caused by negligent acts, errors, or omissions in the design of the Project or its component systems;

(ii) The repair, modification, or replacement of Construction Work that does not meet the functional and performance requirements of the Project Requirements or Implementation Documents.

(d) Contribution and Indemnification. Claims for contribution or indemnification from claims of third parties to the extent caused by or arising from any acts or omissions of one or more of the Parties, subcontractors, suppliers, and consultants resulting from their performance of the Work and for contractual indemnification under Section 12.3, or elsewhere in this Agreement;

(e) Non-Payment and Overpayment. Claims from Owner's failure to pay amounts due under this Agreement or amounts withheld by Owner pursuant to Section 8.8.1, claims for amounts overpaid by Owner, as determined by audit under Section 9.2 or for return of excessive distribution of contingent ICL under Section 8.4.

(f) Termination or Suspension. Claims for amounts due following termination or suspension to the extent permitted by Article 15;

(g) Insurance. Claims that arise from the failure of the liable party to obtain insurance required by the Agreement, or claims among Parties necessary solely to trigger insurance coverage outlined in Article 13 if required under the applicable policy;

(h) Intellectual Property. Claims to enforce intellectual property rights under this Agreement; and

(i) Damages to Owner's Property. Damages to Owner's property, other than the Work itself.

12.2 Consequential Damages

12.2.1 Consequential Damage Waiver. The Parties mutually release each other from any claims for Consequential Damages under any theory of law including breach of contract, strict liability, tort (including negligence) or other legal or equitable theory. This waiver is void as against any Party to the extent the claim for Consequential Damages against that Party: (a) arises out of the Party's Willful Default of this Agreement or criminal conduct, (b) arises out of defense or

indemnification obligations under Section 12.4 covered by one or more insurance policies required under Exhibit L of this Agreement, or (c) arises out of a Builder or Contractor failing to perform its warranty related obligations under Section 14 of this Agreement.

12.3 Indemnification

12.3.1 Non-Owner Party Indemnification.

(a) Scope. The indemnification obligations of this Section 12.3.1 only arise to the extent caused by:

(i) Breach of a Non-Owner Party's representations, covenants, or warranties contained in this Agreement; or

(ii) The negligent acts, negligent omissions or willful misconduct of a Non-Owner Party, its consultants, subcontractors, and vendors or any person for whom the Non-Owner Party is responsible at law.

(b) Indemnification. Subject to Section (a), each Non-Owner Party will defend and indemnify the Parties from and against any claims, losses, damages, liabilities, and expenses (including reasonable legal, expert witness, and consulting fees and costs) alleged by any third parties (including any of their respective employees), arising out of, or resulting from:

(i) bodily injury (including disease and death); or

(ii) damage to tangible property (other than the Work itself).

(c) Indemnification Flow-Through. Each Non-Owner Party must require in writing that its subcontractors, vendors, and subconsultants, of any tier, defend and indemnify Owner to the same extent as the indemnity obligation in Section 12.3.1.

12.3.2 Patent and Copyright. Each Non-Owner Party represents and warrants that designs, processes, methods, and materials used by each for the Project do not and will not violate any patents, copyrights, or trademarks. Each Non-Owner Party, but only for its own breach of this Section, will defend and indemnify Owner from and against claims, damages, losses, royalties, and expenses, including, without limitation, reasonable legal, expert witness and consulting fees and costs attributable to the patent, copyright, or trademark violations.

12.3.3 Lien-Free Obligation.

(a) If Owner has paid the Non-Owner Party for the Design Services or Construction Work performed by the Non-Owner Party's subcontractor, supplier, or consultant and

(b) If the Non-Owner Party's subcontractor, supplier, or consultant records, files, or maintains any action regarding a claim of lien relating to the Work or the property where the Project is situated, then,

(c) the Non-Owner Party, as applicable, will immediately procure, furnish, and record appropriate release bonds or otherwise remove or cancel the claim of lien.

12.3.4 If any Non-Owner Party fails to make timely payments to their respective consultants, subcontractors, and vendors as required, Owner may, at its discretion, settle or bond over those claims, or take other actions necessary to prevent a default under any other agreement affecting Owner's property or the Project, and each Non-Owner Party, as applicable, will, upon written demand, reimburse Owner for any substantiated amounts that were necessary to satisfy the respective Non-Owner Party's obligations to satisfy, discharge, or defend against any claim of lien. For the avoidance of doubt, the preceding sentence is not intended to make any of the said consultants, subcontractors, or vendors a third-party beneficiary to this Agreement. Owner is entitled to deduct the amount it paid to a Non-Owner Party's consultants, subcontractors, and vendors from any amount due, or to become due, to the Non-Owner Party.

12.3.5 Each Non-Owner Party will defend, indemnify, and hold Owner harmless from any claims filed by their respective consultants, subcontractors, and vendors for enforcement of, provided Owner has made payment to the respective Non-Owner Party for the Work that is subject to the claim.

12.3.6 The obligations of any Non-Owner Party under Sections 12.3.3, 12.3.4 or 12.3.5 shall not apply to the extent of Owner's non-payment of amounts due under this Agreement to that Non-Owner Party.

12.3.7 Owner's Choice of Counsel. In all instances where there is an obligation to defend Owner or to pay the cost of Owner's defense, Owner may reasonably reject counsel appointed for its defense and select counsel of its own choosing, which will be paid by the party obligated to defend Owner as if selected by that party.

12.3.8 Relation to Insurance. The indemnification obligations set forth in this Section 12.3 are not limited in any way by the amount or type of damages, compensation, or benefits payable by or for the Builder or its subcontractors or suppliers (inclusive of tiers) under the workers' compensation acts, disability benefit acts, or other employee benefit acts.

12.3.9 Construction with Applicable Law. Nothing contained within the obligations of Section 12.3, or in any other indemnification provision in this Agreement, requires defense or indemnity that is not permitted under Applicable Law. If a conflict exists between Applicable Law and any of the indemnification provisions in this Agreement, then the indemnification obligations should be construed to require defense and indemnification to the greatest extent permitted by Applicable Law.

13. Project Insurance

13.1 Provided Insurance

13.1.1 Owner will provide the insurance specified in Exhibit L-1 and as more particularly described in the OCIP Manual. Compliance with the terms, conditions, and

procedures in the OCIP Manual are a pre-condition to a Non-Owner Party or its subcontractors or subconsultants of any tier, receiving the benefits of the insurance specified in Exhibit L-1. If there are any inconsistencies between Exhibit L-1, the OCIP Manual, and the insurance policies procured by Owner, they are resolved in the following order: insurance policies take precedence over the OCIP Manual, which takes precedence over Exhibit L-1.

13.2 Required Insurance

13.2.1 Builders must obtain and maintain, and cause each of their subcontractors to obtain and maintain, the insurance specified Exhibit L-2.

13.2.2 Designers must obtain and maintain, and cause each of their subcontractors to obtain and maintain, the insurance specified in Exhibit L-3.

14. General Warranties

14.1 Warranty and Correction of Work. Each Builder warrants that the Construction Work performed by it and the Contractor will be of good quality, free from defects, and conforming to the Implementation Documents and Applicable Law. Under this warranty, each Builder will repair or replace, at its own expense, any deficient or defective Construction Work related to is portion of the Work, together with any other work that is damaged during repair or replacement. Establishment of the Warranty Period relates only to that Builder's specific obligation to correct defective or non-conforming Construction Work and does not shorten or restrict the statute of limitations periods for legal claims arising from this Agreement.

14.2 Warranty Commencement and Duration. The warranty obligation in Section 14.1 commences for any given Project Stage when that Project Stage has achieved Substantial Completion and continues until two years after Substantial Completion of the entire Project or the date of repair of the defective component, whichever is later ("Warranty Period"). If, for certain equipment manufacturers or suppliers, a longer warranty period is specified in the Implementation Documents, then the longer period applies.

14.3 Warranty Exclusions. Each Builder's warranty excludes damage or loss due to improper or insufficient maintenance, improper operation, normal wear and tear, and normal usage. Each Builder will procure all subcontractors and manufacturers' express warranties required under the Implementation Documents on Owner's behalf and will transmit the warranties to Owner before Final Completion and Project close-out.

14.4 Warranty Costs. At or before setting of the Base Target Cost, the Parties will agree upon a warranty cost for each Builder that will be included in the Base Target Cost. After Substantial Completion, but prior to Final Completion, each Builder will invoice the Project for its agreed warranty costs, which will be paid by Owner in the Final Payment. Standard Subcontractors will include the cost of warranty work within their subcontract price and will not receive any additional payment for complying with their warranty obligations. Other than these agreed warranty cost payments, all costs of complying with a Builder's warranty obligations will be paid solely by the warranting Builder or Builders.

15. Default, Suspension and Termination

15.1 Project Suspension. Owner may suspend the Project without cause for as long as Owner may determine, and the Contract Time will be extended per Section 11.3.4. During a period of suspension, unless otherwise agreed, Non-Owner Parties will not commit Key Employees to other projects, although all efforts should be made to find other work for them to perform while the project is suspended.

15.1.1 Payment. If Owner suspends the Project after the Validation Phase and the suspension results in an increase in the Chargeable Costs for the Work, the Final Target Cost will be increased by the increase in Chargeable Costs reasonably caused by the suspension, and each Party's ICL will be increased by the product of its Change Order Percentage and the increase in its Chargeable Costs due to the suspension. No adjustment will be made to the extent that performance was suspended, delayed, or interrupted by acts or omissions of the Non-Owner Parties, or any entity or persons working directly for them for which they are responsible.

15.1.2 Excessive Suspension Termination. If the Project is suspended for more than 90 consecutive Business Days, and if a Non-Owner Party provides Owner with at least 30 Business Days written notice, it may treat the suspension as a termination for convenience by Owner and have the rights and obligations of a Non-Owner Party that is terminated for convenience.

15.2 Termination

15.2.1 Basis. The Agreement or a Non-Owner Party may be terminated by Owner for convenience or for default. Owner's termination notice must state whether the termination is for default or for convenience.

(a) Owner may terminate the Agreement or a Non-Owner Party at Owner's discretion.

(b) Owner may terminate the Agreement or a Non-Owner Party for default, for any or all the following grounds:

(i) A Non-Owner Party fails to provide adequate labour and resources to achieve the Project Requirements;

(ii) A Non-Owner Party refuses to rectify Work that is not in accordance with this Agreement, the Project Requirements, or Implementation Documents;

(iii) A Non-Owner Party fails to collaborate with the PMT for the benefit of the Project;

(iv) A Non-Owner Party fails to properly pay their consultants, subcontractors, and vendors;

(v) A Non-Owner Party has a material change in ownership, financial, managerial, or technical capability, including insolvency, reorganization, refinancing, restructuring, merger, acquisition, or loss of key personnel necessary to meeting the Non-Owner Party's obligations under this Agreement;

(vi) A Non-Owner Party commits acts of Willful Default; and

(vii) A Non-Owner Party fails to procure or maintain insurance required by this Agreement.

15.2.2 Termination for Convenience: Notice; Termination Date. Owner may terminate this Agreement or a Party to this Agreement, by providing 10 Business Days written notice to all Parties that the Agreement, or a Party, is being terminated The Termination Date for a convenience termination is 10 Business Days after providing written notice.

15.2.3 Termination for Default: Notice; Termination Date. Owner may terminate a Party to this Agreement, upon 10 Business Days prior written notice, and an additional 10 Business Days to cure. The effective date of termination will be 20 Business Days from the date of the notice, unless the Party has commenced curing, in which case the Party will not be terminated unless it fails to diligently pursue the cure to completion.

15.2.4 Non-Owner Party Obligations on Termination. Upon receipt of a notice terminating a Party or the Agreement, the terminated Party, or in the case of termination of the Agreement, all Non-Owner Parties, will promptly:

(a) Organize all project records, design documents, construction documents, whether digital or tangible, for orderly transfer to Owner;

(b) Provide Owner with the organized project records, design documents, construction documents;

(c) If requested by Owner assign any subcontracts, subconsulting agreements, vendor agreements or purchase orders for material and equipment;

(d) Take any necessary actions to protect the Project Site, including equipment and material stored on or off the Project Site, and to preserve the Work;

(e) Terminate all subcontracts, subconsulting, and vendor agreements and to the extent possible, all purchase orders for material or equipment that are not assigned to Owner;

(f) Provide Owner with a final invoice including documentation for any termination costs incurred; and

(g) Assist Owner in resolving any stop notice claims from Non-Owner Party's subcontractors, subconsultants, or vendors.

15.2.5 Owner's Remedies. In addition to any other remedies available under this Agreement, upon termination Owner may:

(a) Take possession of the site and of all materials and equipment procured for the Project;

(b) Accept assignment of any purchase orders, subcontracts, and consulting agreements, as well as rental agreements for construction equipment and machinery at the site;

(c) Finish the Work by whatever reasonable method Owner may deem expedient; and

(d) Pursue any claim against the defaulted Party if, and to the extent, allowed under Section 12.1.2.

15.2.6 Ownership and Use of Documents; Release and Indemnification.

(a) Ownership. Each Non-Owner Party grants, and must require its respective consultants, subcontractors, and vendors to grant, Owner ownership and all intellectual property rights in ~~all~~ the Design Materials whether tangible or digital, that were created for this Project. Nothing contained in this Section 15.2.6 (a) limits the intellectual property rights of Non-Owner Parties and their respective consultants, subcontractors, and vendors to continue to use their respective general details that each of them uses or has used on multiple projects. Payment of the amounts required under Section 15.2.7 is a condition precedent to the grant of ownership in this paragraph.

(b) Release and Indemnification. If a Non-Owner Party, or the Agreement, is terminated for convenience, Owner will defend and indemnify the author of the Design Materials from claims, liability, loss, or damage caused by Owner's use and completion of the Design Materials if:

(i) The terminated party is not engaged to complete the Project; and

(ii) The termination occurred before issuance of the permits from Governmental Authorities required to commence construction.

15.2.7 Payment

(a) Termination for Convenience. If termination is for convenience pursuant to Section 15.2.2, a Non-Owner Party, or all Non-Owner Parties if the Agreement is being terminated, will be paid:

(i) All Chargeable Costs incurred prior to the Termination Date, less any amounts previously paid by Owner;

(ii) Chargeable Costs after the Termination Date if the Chargeable Costs could not reasonably be avoided or mitigated;

(iii) Reasonable costs incurred in protecting the Work and securing the Project Site;

(iv) Reasonable costs in preparing project records, Design Materials, and construction documents for delivery to Owner; and

(v) The Non-Owner Party's projected ICL, less any amounts of ICL previously paid to the Party. The projected ICL is the ICL amount, using the adjustments in Exhibit I, but estimating the Final Actual Cost based on information available on the Termination Date.

(vi) If the termination is for Willful Default, the defaulted Non-Owner Party or Non-Owner Parties will only be paid Chargeable Costs incurred prior to the termination date. The defaulted Non-Owner Party or Non-Owner Parties are not due any payment for ICL and previously disbursed ICL is subject to claw-back.

16. Dispute Resolution

16.1 Scope. All disputes among the Parties and their respective consultants, subcontractors, and vendors arising from or in connection with this Agreement will be resolved as provided in this Article.

16.2 Responsibility. The responsibility to establish entitlement to and the amount of a claim is with the Party asserting the claim.

16.3 Continued Performance. At all times during the pendency of a dispute or a dispute resolution proceeding, the Parties will continue to meet their obligations under this Agreement and the Non-Owner Parties, and their respective consultants, subcontractors, and vendors must not cause any delay, cessation, or termination of Construction Work or Design Services.

16.4 Permitted Disputes. No Party may bring any action, suit, or other proceeding against any other Party to this Agreement relating to or arising from this Agreement, except for:

16.4.1 Allowed Claims;

16.4.2 Proceedings to enforce the dispute resolution provisions of Article 16; and

16.4.3 Proceedings to enforce statutory lien or payment bond claims that cannot be waived and must be resolved in a court of competent jurisdiction.

16.5 Notice; Statement of Claim.

16.5.1 A Party may initiate dispute resolution by providing notice to the other Party or Parties of a claim, sent by registered mail or certified mail, return receipt requested to the persons and addresses of the responding Parties specified in the Business Terms Sheet. Notice of a dispute must be given within 10 Business Days following the discovery of the occurrence of the event or condition or circumstance giving rise to the dispute, or the claim is waived. If a claim arises from a disputed Change Order, the Non-Owner Party must also provide notice to Owner's SMT member.

16.5.2 All claims must include a detailed factual narrative of events fully describing the nature and circumstances giving rise to the claim, including:

(a) Necessary dates, locations, and areas of the Project that are impacted or affected work or services;

(b) A detailed breakdown of the amount of damages or cost associated with the claim; and

(c) And reasonable documentation to support entitlement to the claim.

16.5.3 If the claim is being made by a Non-Owner Party because of an Owner's Directive, the claim must be accompanied by:

(a) A detailed breakdown of the amount of money being claimed or the requested increase in the Contract Time, and justification for the same; and

(b) Information sufficient to demonstrate that the claim is being timely submitted with reference to the provisions of the Contract Documents being relied on to support the claim.

16.6 Owner Claims Review; Payment of Undisputed Amounts. After receiving a timely and complete claim, Owner, with the assistance of the SMT, will conduct a reasonable review and within 45 Calendar Days (which period may be extended by mutual agreement of the Parties), provide the claimant with a written statement identifying what portion of the claim is disputed and what portion, if any, is undisputed. The claim is rejected if not responded to within the 45-day period. If only a portion of the claim is approved within review period, the remainder is rejected. Owner will pay the claimant for any approved portion of the claim within 30 Calendar Days after issuing the written statement. Rejection due to an untimely response by Owner is not an adverse finding about the merits of the claim or the responsibility or qualifications of the claimant.

16.7 Mediation

16.7.1 Submission; Waiver. If the claim is not fully resolved by Owner claim review, the disputed portion of the claim must be submitted to non-binding mediation unless the Parties to the dispute mutually agree in writing to waive the requirement to mediate and proceed directly to arbitration pursuant to Section 16.8.

16.7.2 Mediator Selection. Within 10 days after a mediation demand, the disputing Parties will jointly select a mediator. If the parties cannot agree upon a mediator, each Party will select a mediator and those mediators will select a qualified neutral third party to mediate. Each Party will bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

16.7.3 Mediation Process. Each Party to the dispute will give the mediator a written statement regarding the asserted claims. The mediator may inspect the Project Site, Contract Documents, and other information reasonably required to understand the factual and legal basis of the dispute. All Parties involved in the claim must arrive at the mediation fully briefed and must send a representative who has the authority to fully resolve the dispute. The Parties involved in the dispute will bear the cost of mediation equally. The mediation proceeding is confidential and inadmissible in an arbitration or court proceeding. The mediation process must be completed within forty-five (45) Calendar Days after the Party's selection of the mediator, unless all Parties involved in the dispute agree to extend the mediation period. If, because of the mediation, a negotiated settlement is reached, the signatories for the Parties to the dispute will enter into a written settlement agreement that will be enforceable in a court of competent jurisdiction.

16.8 Arbitration.

16.8.1 All disputes that are not either resolved through the informal process under Section 16.6 or by the mediation process in Section 16.7 will be resolved by a single arbitrator (the "Arbitrator") pursuant to the *Arbitration Act*, RSBC 1996, c 5, as amended from time to time, under the:

- Shorter Rules of Procedure of the Vancouver International Arbitration Centre if the claim is estimated to be equal or less than $100,000; or

- then-current Domestic Commercial Arbitration Rules of Procedure of the Vancouver International Arbitration Centre if the claim is estimated to above $100,000,

unless the Parties agree to a final resolution of the dispute by another means. The costs of the Arbitrator shall be borne equally by the Parties, unless the Arbitrator determines otherwise. The decision of the Arbitrator shall be final, subject only to recourse available under the *Arbitration Act*.

16.8.2 Enforceability. The Parties have reviewed the claims and dispute resolution procedures with legal counsel and agree to the terms and conditions set forth in this Article 16. If a court of competent jurisdiction finds any term or provision in this Article 16 is void or unenforceable, the unenforceable term or provision will be severed, and the remainder of the terms and provisions will remain in full force and effect.

16.8.3 No Oral Approval. The Non-Owner Parties agree and understand that no oral approval, either express or implied, of any claim is binding upon Owner unless and it is ratified by execution of a written Change Order.

16.8.4 Consolidation and Joinder. The Parties consent to consolidation of claims and the joinder of other necessary Project Participants in any dispute resolution procedure, if claims for or against a disputing Party arise from the same, substantially the same, or interrelated facts, issues, or incidents relating to the Project, or where separate dispute resolution processes create a risk of inconsistent awards or results.

16.9 Statutes of Limitation Unaffected. Nothing in this Agreement permits an action, suit, or other proceeding that is otherwise barred by a statute of limitation.

17. Miscellaneous Provisions

17.1 License. Each Designer and Builder represents that it is properly licensed as required by the jurisdiction where the Project is located, to perform the Work required under this Agreement, and that each Party's business entity is in good standing and qualified to do business in the jurisdiction where the Project is located.

17.2 Confidentiality. The Parties will be disclosing information concerning their methods of accounting, pricing of products and services, and other Confidential Information. Each Party agrees that it will keep such information confidential and will only provide it to other persons or entities as reasonably necessary for the design or construction of the Project. If a Party makes a written demand for return of Confidential Information, the other Parties will make reasonable attempts to destroy any copies of the Confidential Information in their possession.

17.3 Owner's Proprietary Information. Information provided by Owner or made available to the Parties during performance of this Agreement will not be disclosed to persons or entities other than as necessary to perform the Work or Design Services required by this Agreement.

17.4 Compliance with Anti-Corruption Laws. The Non-Owner Parties (including their respective subsidiaries and Affiliates and any directors, officers, and employees of each such entity) each represent and warrant that they have each complied, and will continue to comply, with all applicable anti-corruption laws in connection with their respective Work under this Agreement.

17.5 Notices. Any notice required to be given by this Agreement must be sent to the person(s) specified in the Business Terms Sheet in writing and will be deemed effective upon:

17.5.1 The date of personal delivery or email delivery if received by the addressee before 4:30 p.m. local time on a Business Day (if received after 4:30 p.m. it will be deemed to have arrived on the next Business Day);

17.5.2 Three Business Days after being sent via registered or certified mail with a return receipt requested; or

17.5.3 One Business Day after being sent by overnight commercial courier providing next-business-day delivery.

Delivery by email is not deemed effective if the sender receives an automated reply indicating that the email was not delivered to the intended recipient or that the intended recipient was out of the office. Notices must be sent to the person(s) specified in the Business Terms Sheet.

17.6 Governing Law. This Agreement will be governed and construed under the laws of the Province of British Columbia without giving effect to any choice of law or rule of conflict that would cause the application of the laws of any other jurisdiction. For any legal action or proceeding commenced under or in relation to this Agreement, the Parties hereby irrevocably submit to the exclusive jurisdiction of the courts of the Province of British Columbia.

17.7 Assignment. This Agreement is binding on the Parties, and their respective successors, and assigns. The Non-Owner Parties may not assign this Agreement without the express written consent of Owner, and any unconsented assignment will be void. Owner may assign this Agreement to any lending institution for the purpose of obtaining financing for the Project and the Non-Owner Parties will cooperate with Owner and execute all required assignment and subordination agreements that do not materially change their rights and responsibilities under this Agreement.

17.8 Notice of Dissolution and Other Change of Business. If at any time during the performance of the Work and for a period of 2 years following the completion of the Work:

17.8.1 Dissolution of any Party occurs;

17.8.2 Any Party experiences or anticipates a material change in business, including a reorganization, refinancing, restructuring, or buyout; or

17.8.3 Any Party has notice of any of the matters referred to in Sections 17.8.1 or 17.8.2, then that Party must furnish the other Parties with written notice of the same within 5 days and, in the case of Designers and Builders, take all necessary and proper safeguards to allow Owner the opportunity to retrieve its property, the Work, and anything relating to the Work from their then-current location.

Dissolution means, in respect of any Party, the making of an assignment for the benefit of creditors or admitting in writing its inability to pay its debts as they mature, bankruptcy, insolvency, liquidation, winding-up, administration, and dissolution and the appointment in respect of it or any of its assets of a receiver, administrator, manager, or similar officer and any proceeding or event which is equivalent or analogous to any of the same by whatever name known and in whatever jurisdiction and any step taken for or with a view to any of the foregoing.

17.9 No Third-Party Beneficiaries. Nothing contained in this Agreement creates a contractual relationship with, or a cause of action in favor of a third party against Owner or any of the Non-Owner Parties. However, Owner will be a third-party beneficiary to subcontracts and consulting agreement per Section 7.5.7. The Parties acknowledge and agree that the obligations of the Non-Owner Parties are solely for the benefit of Owner and are not intended in any respect to benefit any third parties.

17.10 Rights and Remedies. The rights and remedies under this Agreement are the exclusive remedies available to the Parties.

17.11 Survival. The following provisions will survive the termination or expiration of this Agreement: Sections 4.3.3, 4.4.3 and 4.5.3 and Articles 7 through 17.

17.12 Waiver. No Party's action or failure to act will constitute a waiver of a right or duty afforded them under this Agreement and such action or failure to act will not constitute approval of or acquiescence in a breach of this Agreement, unless specifically agreed to in writing by the Parties.

17.13 Execution. By executing this Agreement, each of the individuals represents that he or she has authority to bind the Party on whose behalf his or her execution is made.

17.14 Counterparts. This Agreement may be executed in multiple counterparts, each of which will be deemed an original. When proving this Agreement, it will only be necessary to produce or account for the counterpart signed by the Party against whom enforcement is sought. Electronic copies or photocopies of this Agreement showing the true signatures of the Parties may be used for all purposes as originals.

17.15 Exhibits. The exhibits referred to in this Agreement and listed in the Table of Exhibits, whether attached at the time of execution or added by Amendment signed by the Parties, are incorporated into this Agreement by reference as though set forth in full.

17.16 Interpretation and Enforceability. Each Party to this Agreement has sought, or had the opportunity to seek, the advice of legal counsel concerning this Agreement and has been, or has had the opportunity to have been, fully advised of the meaning and effect of this Agreement. Each Party has executed this Agreement after independent investigation without fraud, duress, or undue influence and without reliance on any representation, warranty, promise, or inducement not specifically set forth in this Agreement. This Agreement will be construed as if all Parties jointly prepared it, without any uncertainty or ambiguity being construed against any one Party. To the extent a court of competent jurisdiction finds any term or provision in this Agreement to be void or unenforceable, the unenforceable term or provision will be severed, and the remainder of the terms and provisions will remain in full force and effect.

17.17 Entire Agreement. This Agreement constitutes the entire integrated agreement between the Parties and supersedes all prior oral and written negotiations, representations, or agreements by the Parties with respect to this subject matter.

END OF BODY OF AGREEMENT

Integrated Project Delivery Agreement
Exhibit A – Definitions

1. "**Achievement Event**" is an event described in Exhibit B-5.

2. "**Actual Net Recovery from Builder's Risk Insurance**" is the amount of actual funds received from the Builder's Risk insurance required by the Agreement, less any amount incurred to prosecute the Builder's Risk claim.

3. "**Added Value Incentive Items**" means those items set forth in Exhibit F.

4. "**Adverse Weather**" is a weather event having a statistical recurrence interval of 25 years or more in the geographical area where it occurs and which prevents or substantially impedes a Builder's ability to perform Construction Work resulting in a delay in the Contract Time beyond the number of lost days built into the Project Schedule for adverse weather. Construction work is substantially impeded if the Builder loses more than half of a planned and otherwise available workday except to the extent the delay is also caused by any fault, neglect, act, or omission of the Designers, Builders, or their respective employees, consultants, subcontractors, or suppliers.

5. "**Affiliate**" has the meaning provided in *Business Corporations Act*, SBC 2002, c 57, as amended from time to time.

6. "**Agreement**" is the Integrated Project Delivery Agreement executed by the Parties for this Project and all of the exhibits referenced in the Agreement.

7. "**Allowance**" is an estimated cost for a specific portion of the Work that is not at risk and does not contribute to shared savings. An Allowance is reconciled when it becomes an actual cost, or when the cost for the Allowance item can be reasonably estimated. If the reconciled amount is more or less than the estimated cost for the Allowance, then the Base Target Cost or Final Target Cost (depending on the Project Phase) is increased or decreased by the difference between the reconciled amount and the estimated cost.

8. "**Allowed Claim**" is defined in Section 12.1.2 of the Agreement.

9. "**Amendment**" is a document executed by the Parties amending the terms and/or conditions of the Agreement.

10. "**Anti-Corruption Laws**" means Applicable Laws, rules, or regulations concerning or relating to public or commercial bribery or corruption.

11. "**Applicable Law**" includes all local, provincial, and federal laws, rules, regulations, ordinances, building code, or other codes, statutes, or regulations, or lawful orders of Governmental Authorities that are relevant to any Party's rights or obligations under the Agreement. Applicable Laws include Anti-Corruption Laws.

12. "**Architect of Record**" ("**AOR**") is the Designer with primary responsibility for creating all architectural design documents and to sign and seal all architectural documents within its scope and in accordance with Applicable Law.

13. "**Base Target Cost**" is the amount agreed by the Parties at the conclusion of the Validation Phase per Section 5.4.17 of the Agreement.

14. "**Baseline Schedule**" is described in Section 5.4.10 of the Agreement.

15. "**BIM**" means Building Information Model.

16. "**BIM Execution Plan**" is described in Section 5.4.1 of the Agreement.

17. "**Builder**" means each Party who is responsible for performing the Construction Work in whole or part, among other things. The Contractor is a Builder.

18. "**Builders Lien Act**" means *Builders Lien Act*, SBC 1997 c 45, as amended from time to time.

19. "**Building Information Model**" is a parametric, computable representation of the Project design developed by the Designers, their consultants, and any Design-Build Trades, and will include construction details developed by the Parties and their respective consultants and subcontractors. As used in this Agreement, references to Building Information Model include the primary design model or models and all linked, related, affiliated, or subsidiary models developed for design, estimating, detailing, fabrication, or construction of the Project, or any portion or element of the Project. The portions of the BIM prepared by the Designers, their consultants, and the Design-Build Trades, and those portions prepared by the Builders under the responsible control of a licensed design professional, are Implementation Documents. The portions of the BIM prepared by the Builders or subcontractors (other than Design-Build Trades) to illustrate means and methods for constructing, fabricating, or installing portions of the Construction Work are Submittals, which are not Contract Documents or Implementation Documents.

20. "**Business Day**" is any Calendar Day other than Saturdays, Sundays, and legally recognized holidays in the jurisdiction where the Project is located.

21. "**Business Terms Sheet**" are the page(s) under that heading prior to Article 1 of the Agreement that sets forth the key business terms among the Parties.

22. "**Calendar Day**" is any day whether a Business Day or not.

23. "**Change Event**" has the meaning set forth in Section 11.1 of the Agreement.

24. "**Change Order**" is a mutually agreed written order between Parties adjusting the Base Target Cost, Final Target Cost, ICL, and/or Contract Time.

25. "**Change Order Percentage**" is the value, as applicable, set forth in the Business Terms Sheet.

26. "**Change Order Request**" is a written request for Change Order, which sets forth the nature of the change, the reason for the change, and the effect, if any, on the Base Target Cost or Final Target Cost, the Contract Time, or ICL.

27. "**Chargeable Cost**" is a cost incurred in the performance of the Work (excluding profit), specifically those defined in Exhibits D and E, and are chargeable against the Base Target Cost and Final Target Cost.

28. "**Co-location Plan**" is described in Section 6.6 of the Agreement.

29. "**Commissioning Phase**" is described in Section 5.4.2 of the Agreement.

30. "**Commissioning Plan**" is described in Section 5.4.3 of the Agreement.

31. "**Communication and Decision Plan**" is described in Section 5.4.4 of the Agreement.

32. "**Confidential Information**" means, with respect to a Party, any and all information and materials disclosed in furtherance of this Agreement or any Amendment hereto by or on behalf of the Party, its Affiliates, or any of their respective representatives to another Party or any of its representatives to the extent that the information:

    a. is marked or otherwise identified as confidential or proprietary information, or

    b. should, by its nature, or under the circumstances of its disclosure, reasonably be understood to be confidential or proprietary information of the Party.

    c. Without limiting the foregoing, Confidential Information includes:

    d. the Personal Information of any employee, officer, or director of a Party;

    e. Owner's business, technical, and financial data, including Owner's intellectual property;

    f. the trade secrets of a Party including existing and future products or service offerings, designs, business plans, business opportunities, finances, research, development, know-how, and other business, operational or technical information if the information satisfies the conditions of clause a or clause b, above, and

    g. the existence, pricing, and terms and conditions of this Agreement are not Confidential Information as between the Parties but are Confidential Information as to persons or organizations not a party to this Agreement.

33. "**Conformed Design Documents**" means the documents described in Section 6.5.1 of the Agreement.

34. "**Consequential Damages**" are unanticipated or indirect losses, including loss of anticipated profits, loss of business opportunities, loss of bonding capacity, unabsorbed or increased overhead except as otherwise provided in this Agreement, increased financing costs, increased insurance or bonding costs, inability to obtain insurance or bonding, loss of current or prospective projects, loss of markets, loss by reason of plant shutdown, non-operation or increased expense of operation of other equipment, or other consequential loss or damage of any nature arising from any cause whatever.

35. "**Construction Work**" includes all labour, materials, equipment, appurtenances, and services necessary for construction and commissioning of the Project in accordance with the Contract Documents performed by Builders or Builders' subcontractors.

36. "**Contract Documents**" include the Agreement (inclusive of all exhibits), the Building Information Model, the Implementation Documents, and all other documents issued by the Designers, their consultants, and Design-Build Trades for construction of this Project, any PMT Bulletins, SMT Bulletins, and/or Owner's Directives, and any subsequent Amendments or Change Orders. The Contract Documents include Submittals prepared by Design-Build Trades and those Submittals incorporated into the BIM. The documents included in the Contract Documents are complementary and what is required by one is required by all. If there are conflicting requirements within or between the various Contract Documents, the PMT will determine which requirements will better achieve the Project Objective and issue PMT Bulletins to that effect.

37. "**Contract Time**" is the date of Final Completion or, if Contract Time is stated as a duration, it is the number of Calendar Days between Notice to Proceed and Final Completion, either as set out in the Business Terms Sheet.

38. "**Contractor**" is the party identified as the Contractor in the Business Terms Sheet. The Contractor is a Builder that leads the other Builders and has overall responsibility for supervising and coordinating the Work of the Builders; advising the Parties on construction matters; providing overall coordination, scheduling, logistics, site safety, cost modeling, constructability, and information and document management; and managing Builder participation in the Target Value Design and pre-construction efforts.

39. "**COR**" means Change Order Request.

40. "**Cost Model**" is described in Section 5.4.5 of the Agreement.

41. "**day**" means a Calendar Day.

42. "**Deficiency List**" is a list of items that must be completed, repaired, or replaced prior to the Project or a Project Stage achieving Substantial Completion.

43. "**Design Consultants**" are specialty design or engineering that provide specialized Design Services, such as mechanical, electrical, structural, civil or other design or engineering specialties. Design Consultants may be Designers or subconsultants to a Party.

44. "**Design Materials**" are the latest issued construction drawings, including any changes made by RFI or Change Order, issued by a Designer, subsidiary drawings necessary for design and construction of the Project, and include the BIM, Record Model, the subsidiary BIM models necessary for design and construction of the Project, all electronic design data for the Project, any related two dimensional drawings, calculations, schedules or specifications, and any other design materials, created for the Project.

45. "**Design/Pre-construction Phase**" is described in Section 6.4 of the Agreement.

46. "**Design Services**" are those professional architectural and engineering services rendered by the Designers, their consultants, and any Design-Build Trades necessary to develop and

complete the Project design in accordance with the standard of care set forth in the Agreement and Applicable Law.

47. "**Design-Assist Trades**" are specialty contractors whose services include participation in the design effort but who are not Design-Build Trades. That participation includes provision of comments and recommendations on design elements and materials, preparation of cost opinions to inform design decisions, reviewing for constructability, trade coordination, and, where appropriate, execution of drafting efforts. Nothing in this Agreement requires the Design-Assist Trades to perform any Work outside their license or contrary to Applicable Laws. Design-Assist Trades may be Builders or subcontractors to a Party.

48. "**Design-Build Trades**" are specialty contractors that provide Design Services and Design Materials required for their respective portion of the Construction Work. Design-Build Trades have full architecture and engineering responsibility for their portion of the Work and will have their drawings and calculations signed and sealed by architects and/or registered professional engineers licensed in the jurisdiction where the Project is located in accordance with all Applicable Laws. Design-Build Trades may be Builders or subcontractors to a Party.

49. "**Designer**" means each Party who is responsible for performing the Design Services in whole or part, among other things, but do not include Design-Build Trades. The Lead Designer is a Designer. Designers are not responsible for providing Construction Work.

50. "**Effective Date**" is described in Section 1.2 of the Agreement.

51. "**Engineer of Record**" ("**EOR**") is a Designer with primary responsibility for reviewing and coordinating Design Materials with respect to its discipline and will coordinate Submittals with the Lead Designer. It will also sign and seal all engineering documents within its scope and in accordance with Applicable Law.

52. "**Estimated Final Cost**" is the sum of incurred Chargeable Costs that have been actually incurred at the time the estimate is made plus the estimated Chargeable Costs that will be required to complete the Project.

53. "**Final Actual Cost**" is the sum of all incurred Chargeable Costs upon Final Completion of the Work.

54. "**Final Completion**" of the Project occurs when all the following have occurred:

    a. the Builders have completed the Construction Work in full compliance with the Implementation Documents; all Final Deficiency List items have been completed and accepted by the PMT;

    b. all final unconditional waivers and releases complying with Applicable Laws covering the Construction Work have been received by Owner except that with respect to any Construction Work for which Final Payment is being sought, Owner shall have received final conditional waivers and releases complying with Applicable Laws covering the Construction Work; if applicable,

    c. if applicable, all final unconditional waivers and releases complying with Applicable Laws covering the Design Services have been received by Owner except that with respect to any Design Services for which Final Payment is being sought, Owner

shall have received final conditional waivers and releases complying with Applicable Laws covering the Design Services; the Project has been commissioned;

d. all close-out documentation required under the Contract Documents has been transmitted to Owner;

e. a final certificate of occupancy has been issued by the Governmental Authority having jurisdiction over occupancy of the Project;

f. and the PMT has issued a certificate of Final Completion.

55. "**Final Deficiency List**" is the Deficiency List prepared after Substantial Completion and final inspections documenting all Construction Work that needs to be corrected or completed to achieve Final Completion.

56. "**Final Payment**" is Owner's payment of all amounts due and owing to the other Parties, including any ICL due after Final Completion of the Project.

57. "**Final Target Cost**" is described in Section 6.3.3 of the Agreement.

58. "**Force Majeure**" means natural disasters; named storms; labour strikes that cannot be resolved through a dual gate or other measures; disruptions in utility service and/or connections not caused by the Builders or those for whom they are responsible; Governmental Authority actions other than permitting, design review or inspection of construction; and civil disobedience; an act of terror; unavoidable casualties or catastrophic events, provided the above events are beyond the control, and not due to any act or omission of, the Designers, Builders, or anyone for whom they are responsible.

59. "**General Conditions**" means the document provided in Exhibit K.

60. "**Governance Plans**" is described in Section 5.4 of the Agreement.

61. "**Governmental Authority**" means all crown, provincial, county, district or municipal boards, departments, courts, offices or agencies that have jurisdiction over the Project.

62. "**Hazardous Materials**" means any and all pollutants, wastes, flammables, explosives, radioactive materials, hazardous or toxic materials, hazardous or toxic wastes, hazardous or toxic substances or contaminants and all other materials governed by Applicable Law for environmental protection, occupational health and safety, or any substance or material that has been determined, or during the time of performance of the Construction Work is determined, to be capable of posing a risk of injury to health, safety, property or the environment by any Governmental Authority.

63. "**Holdback**" means the amount described in Section 4(1) of the Builders Lien Act or, if the statute is amended or replaced, any equivalent amount thereby established.

64. "**ICL**" means Incentive Compensation Layer.

65. "**ICL Percentage**" is described in Section 8.2 of the Agreement.

66. "**Implementation Documents**" consist of the BIM; plans, sections, and elevations extracted from the BIM; and any ancillary drawings, specifications, and construction details together with dimensions and layouts for civil, architectural, structural, mechanical, electrical, plumbing systems, and landscape design. The Implementation Documents will describe in detail the requirements for the Construction Work and provide information necessary and appropriate to obtain all necessary permits for construction of the Project.

67. "**Implementation Phase**" commences on the effective date of the Notice to Proceed with construction and ends at Final Completion.

68. "**Incentive Compensation Layer**" is described in Section 8.2 of the Agreement.

69. "**Incentive Program**" means the document attached in Exhibit I to the Agreement.

70. "**Joining Agreement**" is described in Section 1.5.4 of the Agreement.

71. "**Joint Site Investigation**" is a site investigation attended by the Parties during the Validation Phase for the purpose of reviewing existing information and investigating the Project Site to identify deficiencies and discrepancies, and to determine the extent of any additional investigations or testing required for proper design and construction of the Project.

72. "**Justified Delay**" is a critical path delay meeting one of the categories described in Section 11.2 of the Agreement.

73. "**Key Employees**" are those employees of the Non-Owner Parties listed in Exhibit J that may not be removed from the Project without Owner approval. (See Section 4.9 of the Agreement.)

74. "**Key Performance Indicator**" is described in Exhibit B-4.

75. **"Labour Escalation Allowance"** is an Allowance established during the Validation Phase that will be included within the Base Target Cost and Final Target Cost and used to cover escalation in field labour rates due to collective bargaining agreements and off-island labour. The Labour Escalation Allowance will be included as a separate line item in the Base Target Cost and Final Target Cost and reconciled through additive or deductive Change Order before the final accounting of the Chargeable Costs and determination of the Final Actual Cost.

76. "**Lead Designer**" is the party identified as the Lead Designer in the Business Terms Sheet.

77. "**Lean**" means principals, tools, and processes that maximize project value by optimizing effort and resource use by eliminating activity and waste that does not add value to the project. (See, www.leanconstruction.org.)

78. "**Lean Phase Plan**" is a plan for defining and integrating the necessary work, services, processes, and hand-offs among multiple firms and teams that are necessary to accomplish project Milestones while employing Lean objectives and values. The Lean Phase Plan is developed jointly by those that are responsible for carrying out the work or services referenced in the Lean Phase Plan.

79. "**Material Escalation Contingency**" is an agreed amount determined during the Validation Phase and included in a separate line item in the Base Target Cost and Final Target Cost reflecting a reasonable anticipated projection for material and equipment escalation through procurement of all materials and equipment.

80. "**Milestone**" means an events noted in Exhibit B-4.

81. **"Net Escalation"** is the cumulative sum of the total amount expended for materials and equipment that will be incorporated into the Project minus the sum of the Material Escalation Contingency. Net Escalation is not calculated on a line item basis but on the totality of materials and equipment, considering both cost increases and decreases, upon completion of procurement.

82. "**Non-Owner Party**" is a Party to this Agreement that is not the Owner.

83. "**Non-Owner Parties**" are the Parties to this Agreement, except the Owner.

84. "**Notice of Final Completion**" means the notice described in Section 6.6.2 of the Agreement.

85. "**Notice of Substantial Completion**" means the notice described in Section 6.6.2 of the Agreement.

86. "**Notice to Proceed**" is a written document issued by the Owner or the PMT to initiate commencement of a certain Project Phase or Project Stage as set out in the said document.

87. "**OCIP Manual**" means the document provided in Exhibit L-4;

88. "**Owner**" is the entity identified as the Owner on the signature page at the end of the Agreement.

89. "**Owner-Elected Change**" is a material change directed by the Owner to the scope of the Work described in the Implementation Documents that (i) impacts either the Base Target Cost or Final Target Cost; (ii) requires Work that is not reasonably inferred from the Project Objective; and (iii) requires Work that is not due to (a) the failure of the Construction Work to be executed in conformance with the Implementation Documents, (b) the negligent acts, errors, or omissions in the design of the Project or its component systems; or (c) the repair, modification, or replacement of Construction Work that does not meet the functional and performance requirements of the Project Objective or Implementation Documents.

90. "**Owner's Directive**" is a written directive from the Owner that overrides a decision by PMT or the SMT. An Owner's Directive may be construed as an Owner-Elected Change if it affects the Base Target Cost or Final Target Cost and/or Contract Time.

91. "**Owner's Separate Consultant**" is a design, technical, scientific, or other professional engaged directly by Owner to perform services that are related to the Project although not within the scope of the Agreement.

92. "**Owner's Separate Contractor**" is a contractor engaged directly by Owner to perform work that is related to the Project although not within the scope of the Agreement.

93. "**Parties**" means, collectively, each Party;

94. "**Party**" means any entity that has executed the Agreement.

95. "**PCO**" means Proposed Change Order.

96. "**Personal Information**" means any information from which an individual may be identified, by direct or indirect means, that is provided to a Party by the Owner, or processed by a Party for or on behalf of the Owner, including without limitation an individual's name, address, telephone number, social security number, driver's license number, passwords, personal identification numbers (PIN), account numbers, account balances, account histories, and "personal information", "nonpublic personal information", "protected health information" (and other similar information, however described) as defined in any Applicable Laws protecting the Personal Information of a person.

97. "**PIT**" means Project Implementation Team.

98. "**PMT**" means Project Management Team.

99. "**PMT Bulletin**" is a written directive from the Project Management Team derived from a unanimous vote that affects design, cost, schedule, or allocation of the Work. A PMT Bulletin may affect the Project Objective.

100. "**Post Commissioning Phase**" is described in Section 6.8 of the Agreement.

101. "**Post Permit Change**" is a substantive change to a permit by a Governmental Authority or made necessary as a result of changes to Applicable Laws that impacts the Construction Work subsequent to the issuance of the affected permit provided that the changes are not due to (i) the failure of the Construction Work to be executed in conformance with the Implementation Documents, (ii) the negligent acts, errors or omissions in the design of the Project or its component systems; and (iii) the repair, modification, or replacement of Construction Work that does not meet the functional and performance requirements of the Project Objective or Implementation Documents and provided that the changes were not reasonably known or anticipated when the Base Target Cost was set.

102. "**Product Data**" are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Builders, or a subcontractor, tier-subcontractor, manufacturer, vendors, supplier, or distributor to illustrate materials or equipment for some portion of the Construction Work.

103. "**Project**" is the project described in Article 2 of the Agreement, and includes all activities that are undertaken pursuant to this Agreement.

104. "**Project Information**" has the meaning set forth in Section 15.2.6 of the Agreement.

105. "**Project Implementation Team**" is an interdisciplinary group of Project Participants organized by the PMT. PITs are part of the collaborative process to develop the Implementation Documents and other deliverables and may be formed temporarily or for the duration of the Project.

106. "**Project Management Information System**" ("**PMIS**") is a digital system or interrelated systems for communicating amongst Project Participants and managing, distributing, and storing digital documents, files, logs, and communications. The PMIS contains detail of the Project Objective, including cost, time, scope, and quality; identifies the Project Participants, the people organizations, and their roles; manages agreements, including contracts, permits, approvals, and commitments; manages project control documents; is used to create reports and dashboards for the Project; and guides collaboration and communicates best practices with policies, workflow diagrams, and document management.

107. "**Project Management Team**" must include a representative of the Owner, a Designer, and a Builder, and may include additional members as jointly agreed by the Parties, who will act in a collaborative manner to provide management level leadership during the design and construction process in a concerted effort to achieve the Project Objective.

108. "**Project Manual**" means the document attached in Exhibit J to the Agreement.

109. "**Project Objective**" includes all Owner requirements, goals, and limitations documented in Exhibit B.

110. "**Project Participant**" is any person or entity that is providing material, equipment, work, or services for the Project.

111. "**Project Phase**" is a functional segregation of the Project into Validation Phase, Design/Preconstruction Phase, and Implementation Phase.

112. "**Project Requirements**" means the requirements set out in Exhibit B to the Agreement, particularly Exhibit B-1.

113. "**Project Schedule**" is the schedule for Project performance and completion as calculated at a specific date. The Project Schedule is initially based on the Baseline Schedule, but reflects modifications required due to occurrence of events, opportunities, and rescheduling.

114. "**Project Site**" is the physical location where the Project is being constructed and any adjacent laydown or storage areas dedicated to staging or storing material or equipment to be incorporated into the Project. In addition, the Project Site may include non-adjacent physical locations that are identified in writing if these locations are dedicated to providing or preparing for Construction Work.

115. "**Project Stage**" is a portion of the Project that is geographically or otherwise distinct.

116. "**Proposed Change Order**" is described in Section 11.3.1 of the Agreement.

117. "**QA**" means Quality Assurance.

118. "**Quality Assurance**" means a system of actions required to provide confidence that Work (or portion thereof) was performed in accordance with the Agreement.

119. "**QC**" means Quality Control.

120. "**Quality Control**" means the actions required to check, monitor, or inspect the Work (or portion thereof) to determine if it was performed in accordance with the Agreement.

121. "**Record Model**" is the version of the BIM that will be updated throughout construction to reflect the as-built condition of the Project and is turned over to the Owner upon Final Completion.

122. "**Representatives**" means a Party's Affiliates and such Party's and its Affiliates' respective officers, board members, directors, partners, members, employees, agents and any other persons or entities (excluding the other Party or its Affiliates) who contribute to the performance of such Party's obligations under this Agreement. For purposes of this Agreement, Designers', Contractor's, and Builders' Representatives will include any and all consultants and subcontractors and such consultants' and subcontractors' directors, officers, employees, and agents. Owner's Representatives will include its or its Affiliates' collaborators and licensees.

123. "**Responsibility Matrix**" means the document provided in Exhibit C.

124. "**Risk and Opportunity Register**" is described in Section 5.4.11 of the Agreement.

125. "**Safety Plan**" is described in Section 5.4.13 of the Agreement.

126. "**Samples**" are physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Construction Work will be judged.

127. "**Senior Management Team**" ("**SMT**") includes a senior executive member from each Party, who will act in a collaborative manner to resolve any matters referred to it by the PMT either through consensus or, if a consensus is not reached, by a majority vote, subject to an Owner's Directive.

128. "**Set Based Design**" is a design strategy that advances in parallel alternative design solutions that meet Project criteria and constraints until a decision is made to select one solution over the alternatives.

129. "**Shop Drawings**" are drawings, diagrams, schedules, and other data specially prepared for the Construction Work by a Builder or a subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

130. "**SMT Bulletin**" is a written directive from the SMT derived from a majority vote of the SMT and is binding on all Project Participants unless vetoed or modified by an Owner's Directive.

131. "**Staging Schedule**" is used if the Project will be performed in stages. At a minimum, the Staging Schedule defines the dates for commencement of construction, Substantial Completion, and Final Completion of each Project Stage.

132. "**Standard Consultant**" is a consultant engaged by a Designer or a Design-Build Trade that has not placed profit at risk and therefore is not eligible to share in the Agreement's financial incentives, ICL, and mutual liability waivers. Standard Consultants are Project Participants but are not Parties to this Agreement.

133. "**Standard Subcontractor**" is a subcontractor, supplier, or vendor engaged by Contractor or a Builder that has not placed profit at risk and therefore is not eligible to share in the ICL and mutual liability waivers. Standard Consultants are Project Participants, but are not Parties to this Agreement.

134. "**Stipulated Overhead**" is described in Section 8.5 of the Agreement.

135. "**Stipulated Profit**" is described in Section 8.3 of the Agreement.

136. "**Submittals**" include Shop Drawings, Product Data, and Samples, but are not Contract Documents unless they are produced and stamped by a Design-Build Trade. To the extent required by the Contract Documents, all Submittals that are not produced by a Design-Build Trade only demonstrate how the Builders, including the Contractor if it performs any of the Construction Work, and subcontractors propose to execute the Construction Work shown by the Contract Documents.

137. "**Substantial Completion**" occurs on the date when the Project or Project Stage, as applicable, is substantially performed as defined in the *Builders Lien Act*, SBC 1997, c 45.

138. "**Target Value Design**" is a design discipline that requires project values, cost, schedule, and constructability to be basic components of the design criteria, and uses cost targets to drive innovation in designing a project to provide optimum value to an owner. Target Value Design uses constructability and cost information from the Designers and Builders before design decisions are made to allow the design to progress within the Base Target Cost, Final Target Cost, and Contract Time.

139. "**Termination Date**" is described in Section 15.2.2 and 15.2.3 of the Agreement.

140. "**Unforeseen and Differing Site Conditions**" is the discovery of an unknown, subsurface or otherwise concealed physical condition at the Project Site that differs materially from those indicated in the Implementation Documents or the information obtained from the Joint Site Investigation; an unknown physical condition of an unusual nature at the Project Site that differs materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character and nature provided for in the Implementation Documents; or an unknown, pre-existing hazardous substance or condition at the Project Site that requires removal or remediation.

141. "**Unusual Material Escalation**" is an increase in the cost of materials that exceeds 5% per annum that could not reasonably have been anticipated when the Base Target Cost or Final Target Cost was set and which is caused by extreme and unusual fluctuation in the market cost of the material or materials.

142. **"Unusual Escalation"** is a Change Event that may increase or decrease the cost of labour or materials caused by extreme and unusual fluctuation in the market, currency fluctuation, excise taxes on imports, or regulatory changes that were unknown and unanticipated at the time of setting the Final Target Cost. Unusual Escalation in labour will be reconciled through the Labour Escalation Allowance per Section 11.4.2. Unusual Escalation in materials and equipment occurs when the Material Escalation Contingency included in the Base Target Cost and Final Target Cost (as applicable) has been exceeded.

143. "**Validation Phase**" is described in Section 6.2 of the Agreement.

144. "**Validation Report**" is defined and described in Section 5.4.17 of the Agreement.

145. "**Warranty Period**" is described in Section 14.2 of the Agreement.

146. "**Willful Default**" is any one of the following events:

a. actual or constructive abandonment of the Project;

b. persistent and repeated failure, after written notification, to correct Construction Work that significantly and materially deviates from the Implementation Documents or Applicable Law;

c. fraud, reckless disregard, or willful injury to the persons or property of another, or violation of the law, whether willful or negligent; or

d. willful and wanton misconduct.

Actual abandonment occurs if the Party, without justification, ceases performing Work for a period of 21 consecutive days or notifies one of the Parties that it is ceasing to perform Work on the Project.

Constructive abandonment occurs if the Party, without justification, expends so little effort on the Project that there is no meaningful progress on its scope of work for 21 consecutive days. The good faith exercise of any contractual suspension rights granted the Designers, Contractor, and Builders under this Agreement or under an applicable subcontract or consulting agreement is not an intentional or constructive abandonment.

147. "**Work**" includes all labour, materials, equipment, appurtenances, and services required to design, construct, and commission the Project in accordance with the Contract Documents. It includes Design Services and Construction Work.

148. "**Workers Compensation Act**" means Workers Compensation Act, RSBC 2019, c 1.

END OF EXHIBIT

Integrated Project Delivery Agreement
Exhibit B – Validation Report

Project

Roles and Responsibility Matrix

Date Created: xx/xx/xxxx

Date Revised: xx/xx/xxxx (revisions in bold)

ITEMS TO BE REVIEWED AND REVISED

R = Responsible (Party who owns the deliverable)
A = Accountable (Party who must sign off on the deliverable)
C = Consulted (Party who reviews the deliverable and provides input/support on the deliverable)
I = Informed (Party that is notified when the deliverable is complete/provided the deliverable)
Blank = Not applicable to the deliverable

		IPD Partners							Owner Vendors		
		Owner	Lead Designer	Builder	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	Vendor *Item	Vendor *Item	Vendor *Item
Item	Deliverable										
	Validation Phase										
	Combining and Formatting Validation Report	A	C	R							
	Executive Summary										
	Table of Contents										
	Project History and Background										
	IPD Overview										
	Project Organization Chart										
	Owners Requirements										
	Regulatory Requirements										
	Effluent Quality										
	Timelines										
	Project Values										
	Allowable Cost										
	Communication Approach Overview										
	Internal IPD Team										
	External Stakeholders										
	Design Narrative - Process										
	Design Narrative - Electrical										
	Design Narrative - Civil										
	Design Narrative - WWPT										
	Design Narrative - Buildings										
	Design Narrative - Building Mechanical										
	Design Narrative - Instrumentation and Control										
	Risk Analysis Overview										
	Assumptions Overview										
	Operational Cost Methodology										
	Procurement Strategy										
	Construction Schedule and Execution Plan										
	Milestone Schedule										
	Cost Estimate Summary										
	Cash Flow Forecast										
	Drawings Appendix										
	Equipment List										
	Commissioning Plan										
	Project Management and Administration										
	Project Management (Mtg Notes, Action List, Comm Mgmt, Etc.)										
	Program Master Schedule										
	Cost Forecast and Reporting										
	Process Equipment Cost Forecast and Reporting										
	Executive Stakeholder Management (Part of PM)(part of IPD)										
	Project Risk Management										
	Design Risk Management										
	Construction Risk Management										
	Scope Change Management										
	Contract Change Management										
	Overall Budget Tracking										
	Design / Permitting / Procurement Phase										
	Master Floorplan ownership - Equipment G/A Layout										
	Design - Process										
	Design - Electrical										
	Design - Civil / Site										
	Design - Buildings										
	Design - Building Mechanical										
	Design - Instrumentation and Controls (Building Utilities)										

EXAMPLE

Project

Roles and Responsibility Matrix

Date Created: xx/xx/xxxx

Date Revised: xx/xx/xxxx (revisions in bold)

ITEMS TO BE REVIEWED AND REVISED

R = Responsible (Party who owns the deliverable)
A = Accountable (Party who must sign off on the deliverable)
C = Consulted (Party who reviews the deliverable and provides input/support on the deliverable)
I = Informed (Party that is notified when the deliverable is complete/provided the deliverable)
Blank = Not applicable to the deliverable

		IPD Partners							Owner Vendors		
		Owner	Lead Designer	Builder	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	Vendor *Item	Vendor *Item	Vendor *Item
Item	**Deliverable**										
	Design - Instrumentation and Controls (Process/Packaging)										
	Design Criteria - Security, fire alarm, phone, data										
	Design - Bulk Chemical Storage Racking										
	Design - Speedline Storage Racking										
	Design - Building Utility Controls										
	Design - Furniture Design										
	Delegated Design - Onsite Wastewater Pretreatment										
	Delegated Design - Offsite Wastewater Conveyance										
	Wastewater Building & Utility Design										
	Constructibility Design Sign-off										
	Design - Process Equipment Utility Connections										
	Master Equipment List w/utility requirements										
	Design Pull Plan Schedule										
	Revit / BIM / Digital 3d Model (During Design)										
	Noise Consulting										
	Noise Equipment Integration into Building design										
	Building/Site/Utilities Permitting										
	Environmental Permitting (Operations)										
	Environmental Permitting for Development Permit										
	Environmental Monitoring During Construction										
	Process/Packaging Equipment selection										
	Process Equipment Procurement Recommendation										
	Process Equipment Purchase Order/Contract Execution										
	Procurement - Process Equipment Vendors										
	Commodity Trade Bid Document Assembly										
	Commodity Trade Procurement										
	Procurement - Electrical										
	Procurement - Civil / Site										
	Procurement - Buildings										
	Procurement - Building Mechanical										
	Procurement - Instrumentation and Controls (Building Utilities)										
	Procurement - Instrumentation and Controls (Process)										
	Construction Phase										
	Construction Management										
	Design Construction Administration										
	Construction - Process										
	Construction - Electrical										
	Construction - Civil										
	Construction - Buildings										
	Construction - Building Mechanical										
	Construction - Instrumentation and Controls (Building Utilities)										
	Construction - Instrumentation and Controls (Process)										
	Construction - Offsite Wastewater Conveyance										
	Construction Adiminstration - Offsite Wastewater Conveyance										
	Construction - Systems Integration										
	Construction - Habitat Restoration										
	Construction Pull Plan										
	Construction Resource Loaded Schedule										
	IT Network for Construction										
	Revit / BIM / Digital 3d Model (During Construction)										
	IT Hardware & Software (Business Network)										
	Utility Services										
	Utility Demand Definition / Coordination - BC Hydro										
	Utility Demand Definition / Coordination - Fortis BC										

Project

Roles and Responsibility Matrix

Date Created: xx/xx/xxxx

Date Revised: xx/xx/xxxx (revisions in bold)

ITEMS TO BE REVIEWED AND REVISED

R = Responsible (Party who owns the deliverable)
A = Accountable (Party who must sign off on the deliverable)
C = Consulted (Party who reviews the deliverable and provides input/support on the deliverable)
I = Informed (Party that is notified when the deliverable is complete/provided the deliverable)
Blank = Not applicable to the deliverable

		IPD Partners							Owner Vendors		
		Owner	Lead Designer	Builder	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	(Future) Contractor *Discipline	Vendor *Item	Vendor *Item	Vendor *Item
Item	**Deliverable**										
	Utility Demand Definition / Coordination - City of Abbotsford Water										
	Design - BC Hydro										
	Design - Fortis BC										
	Design - City of Abbotsford Water										
	Construction / Site Coordination - BC Hydro										
	Construction / Site Coordination - Fortis BC										
	Construction / Site Coordinaton - City of Abbotsford Water										
	Commissioning / Warranty Phase / Post Construction										
	Building Commissioning										
	Process Commissioning										
	3rd Party Commissioning (Potential Vitalus Team Lead)										
	Building - Equipment										
	Building - Materials										
	Building - Systems										
	Process - Equipment										
	Process - Systems										
	Commissioning and Operator Training										

Integrated Project Delivery Agreement
Exhibit D – Designer Chargeable Costs

1. DEFINITIONS

The following terms in this Exhibit D are defined as follows:

1.1 Billable Rates. Billable rates are the hourly rates that a Designer may charge for its Hourly Employees and Salaried Employees, as applicable, consistent with this Exhibit D and listed in the Designer's individual Exhibit D-1.

1.2 Stipulated Overhead Rate. A rate agreed to between Designer and Owner that compensates Designer for all of its Indirect Costs and is, depending on the option specified in the Business Terms Sheet, either included in Designer's Billable Rates or fixed fee.

1.3 Direct Salary Expense (“DSE”). DSE is the amount actually paid by the Designer to an employee, exclusive of bonuses and profit sharing, and before any income tax, FICA (Federal Insurance Contribution Act) withholdings or equivalent State withholdings.

1.4 Base Hourly Wage Rate (“BHWR”).

1.4.1 For Hourly Employees. The Base Hourly Wage Rate for Hourly Employees is the amount of DSE paid to the employee per working hour for non-overtime work.

1.4.2 For Salaried Employees. The Base Hourly Wage Rate for Salaried Employees is the amount of the employee’s annual DSE divided by 2,080 hours.

1.5 Direct Personnel Expense (“DPE”). DPE is the employer’s contribution to the mandatory benefits provided to its Hourly Employees and Salaried Employees.

1.5.1 DPE only includes employment taxes, statutory employee benefits including workers’ compensation insurance (net of premium discounts, dividends or rebates), and group insurance (including health, dental, term life and accidental death and dismemberment insurance, all net of employee contributions), sick pay, holidays, vacation actually earned and accrued, employer contributions to employee savings plans, and pension and profit sharing plans that are nondiscretionary, requiring equal distribution of benefits.

1.5.2 DPE does not include any charge for severance pay, tuition reimbursement, employee training, employee morale programs, employee bonuses, executive bonuses, provision of, or reimbursement for automobiles, computers, software, cellular phones and internet or telephone charges, liability insurance of any kind, or any non-mandatory employer contribution to employee compensation.

1.6 Direct Personnel Expense Multiplier (“DPEM”). DPEM is a multiplier, that when multiplied by an employee's BHWR, calculates the amount of DPE allocated to an hour of the employee's work.

Example				
BHWR	*	DPEM	=	DPE
$60	*	0.25	=	$15

1.7 Direct Costs. As defined in Section 2.1, below.

1.8 Indirect Costs. As defined in Section 2.2, below.

1.9 Chargeable Costs. As calculated in Section 2, below.

1.10 Hourly Employees. A Designer's employees that are directly engaged in the performance of Work on the Project that are non-salaried and whose compensation is paid on an hourly basis.

1.11 Salaried Employees. A Designer's employees that are directly engaged in the performance of Work on the Project that are paid a salary and whose compensation is not paid on an hourly basis.

2. CHARGEABLE COSTS. Chargeable Costs only include Designer’s Direct Costs and Indirect Costs directly related to performing Design Services for the Project, but do not include profit. All Chargeable Costs are actual costs, without markup and are net of any credits, discounts or rebates.

2.1 Direct Costs. Designer's Direct Costs are the following:

2.1.1 Design Services.

(a) Labor Cost. The cost of Designer’s employees directly performing Design Services on the Project calculated for each employee as follows:

Example				
BHWR	+	(BHWR * DPEM)	=	Labor Cost
$60	+	($60 * 0.25)	=	$75

(b) Limitation on Cost of Salaried Personnel. Charges for Design Services performed by Designer's salaried personnel in excess of the 40 hour work week are not allowable, unless agreed to by the PMT in writing prior to being incurred and only in an amount agreed to by the PMT as appropriate.

(c) Standard Consultants. Payments made by a Designer to its consultants will be in accordance with the requirements of their written consulting agreements.

2.1.2 Miscellaneous Expenses.

(a) Services. Actual costs for teleconferencing, video-conferencing, and express delivery or messenger services.

(b) Travel Expenses. All reasonably and actually incurred direct, non-salary, travel-related reimbursable expenses will be billed to Owner at actual cost without markup. Unless otherwise stated in Owner's travel guidelines, all air travel, regardless of domestic or international destination, will be at unrestricted coach class fare or other class, whichever is lowest. Mileage will be reimbursed at the IRS standard mileage rates for travel by Designer in its own vehicles.

(c) Models and Mock-ups. Actual cost of physical models and mock-ups requested by the PMT.

(d) Fees. License fees paid for the use of a particular design or process required by the Agreement and approved by the PMT. Filing or other fees paid for securing approval of Governmental Authorities for the design of the Project.

(e) Insurance. Insurance expenses for coverage specifically required of Designer by the Agreement and allocable to this Project that are incurred prior to Project Final Completion. Deductibles are a Chargeable Cost only to the extent specifically provided in Exhibit L-3 and Article 15 of the Agreement.

(f) Reproduction. The cost of oversize reproduction and printing (greater than 11x17) at actual cost.

(g) Cost of Repair/Correction. Cost of repairing or correcting deficient design work executed by a Designer, provided that (1) the costs are incurred prior to Final Completion and (2) the damaged or non-conforming work was not intentional or caused by Willful Default. Correction or repair of deficient or non-conforming work that was performed or installed by a Standard Consultant or Standard Subcontractor will be remedied at the Standard Consultant's or Standard Subcontractor's own expense and is not a Chargeable Cost.

(h) Other Incurred costs. Other costs incurred by Designer that are necessary for the Project, if approved by the PMT in writing prior to being incurred.

2.2 Indirect Costs or Overhead. Designer's Indirect Costs are the following:

2.2.1 Defined. Designer's Indirect Costs are costs, of any kind, other than Direct Costs and Excluded Costs. Designer's Indirect Costs customarily include the cost of personnel not working directly in connection with Designer's performance of its services, executive salaries, association dues and fees, depreciation on all property, equipment or other assets, payroll processing costs, corporate taxes or fees, business development costs, employee training, all home office infrastructure costs, general administrative personnel costs, risk management costs, interest expense, perquisites such as car allowances, home office expenses (including without limitation rent, utilities, telephones, faxes, and postal charges), software and computer hardware costs, accounting personnel, legal personnel, recruiting costs, cellular telephones and pagers, severance pay, and employee morale programs.

2.2.2 Overhead Rate. If Indirect Costs are paid under option 2.2.3(b), below, the Overhead Rate is a factor included in the Hourly Employees' or Salaried Employees' Billable Rate (as applicable).

2.2.3 Payment. Indirect Costs are paid as Chargeable Costs using one of the following methods selected when the Agreement is executed and indicated on the Business Terms Sheet:

(a) A fixed amount paid in equal monthly installments for a specified number of months, as indicated in the Business Term Sheet; or

(b) Included with the Designer's Hourly Employees' or Salaried Employees' Billable Rates calculated as (BHWR + (BHWR *DPEM)) * Overhead Rate;

3. EXCLUDED COSTS

3.1 Direct Costs. The following costs are excluded from Designer's Direct Costs.

3.1.1 Offsite Personnel. Salaries and other compensation of personnel stationed at any office or offices other than the Project Site office or the Designer's principal office identified in the Notices provision of the Business Terms Sheet, unless otherwise agreed in writing by the PMT.

3.1.2 Offsite Expenses. Expenses related to a firm's principal office and offices other than the Project Site office.

3.1.3 Business Licenses, Permits, and Taxes. All costs of business and/or operating permits, licenses, fees, and taxes required by any local, state, or federal Governmental Authorities to enable Designers or their consultants of any tier to be qualified to do business and/or perform services and/or any Design Services.

3.1.4 Costs Not Included in Direct Costs. Any cost not explicitly included as a Direct Cost in Section 2.1, above.

3.2 **Chargeable Costs**. The following costs are excluded from Chargeable Costs, and will not be paid by Owner.

3.2.1 Financing or Cost of Use of Money. Financing costs, cost of use of money, or other capital expenses, including interest on capital employed for the Design Services.

3.2.2 Bonuses and Incentive Programs. Employee bonuses or incentive program payments regardless of whether personnel are specifically assigned to this Project.

3.2.3 Fraud and Willful Default. Any cost resulting from fraud, Willful Default, or willful misconduct.

3.2.4 Stale Invoices. Work performed 75 days or more before the submittal date of the invoice to Owner, unless prior written approval is obtained from the PMT.

3.2.5 Costs incurred after Project Final Completion. Costs incurred for the Work after Project Final Completion.

[END OF EXHIBIT]

Integrated Project Delivery Agreement
Exhibit E – Builder Chargeable Costs

1. DEFINITIONS

1.1 Billable Rates. Billable rates are the hourly rates that a Builder may charge for its Hourly Employees and Salaried Employees, as applicable, consistent with this Exhibit E and listed in the Builder's individual Exhibit E-1.

1.2 Stipulated Overhead Rate. A rate agreed to between Builder and Owner that compensates Builder for all of its Indirect Costs (except for Indirect Costs related to its shop or fabrication facilities, if any) and that is, depending on the option specified in the Business Terms Sheet, either included in Builder's Billable Rates, or applied to the Builder's Chargeable Costs.

1.3 Shop Overhead Rate. A rate agreed between Builder and Owner that compensates Builder for all of its Indirect Costs related to its shop or fabrication facilities and, if used, is included in the Billable Rates for Builder's shop personnel.

1.4 Direct Salary Expense ("DSE"). DSE is the amount actually paid by the Builder to an employee, exclusive of bonuses and profit sharing, and before any federal income tax, employment insurance, Canada Pension Plan withholdings or equivalent provincial taxes or withholdings.

1.5 Base Hourly Wage Rate ("BHWR").

1.5.1 For Hourly Employees. The Base Hourly Wage Rate for Hourly Employees is the amount of DSE paid to the employee per working hour for non-overtime work.

1.5.2 For Salaried Employees. The Base Hourly Wage Rate for Salaried Employees is the amount of the employee's annual DSE divided by 2,080 hours.

1.6 Direct Personnel Expense ("DPE"). DPE is the Builder's contribution to the mandatory benefits provided to its Hourly Employees and Salaried Employees.

1.6.1 For employees who are subject to a collective bargaining agreement, DPE shall only include those benefits the Builder is required to pay on behalf of the employees pursuant to the collective bargaining agreement.

1.6.2 For employees who are not subject to a collective bargaining agreement, DPE shall only include employment taxes, statutory employee benefits including workers' compensation insurance (net of premium discounts, dividends or rebates), and group insurance, (including health, dental, term life and accidental death and dismemberment insurance, all net of employee contributions), sick pay, holidays, vacation actually earned and accrued, employer contributions to employee savings plans, and pension and profit sharing plans that are nondiscretionary, requiring equal distribution of benefits.

1.6.3 DPE does not include any charge for severance pay, tuition reimbursement, employee training, employee morale programs, employee bonuses, executive bonuses, provision of, or reimbursement for automobiles, computers, software, cellular phones and internet or telephone charges, liability insurance of any kind, or any non-mandatory employer contribution to employee compensation.

1.7 Direct Personnel Expense Multiplier ("DPEM"). DPEM is a multiplier, that when multiplied by an employee's BHWR, calculates the amount of DPE allocated to an hour of the employee's work.

Example				
BHWR	*	DPEM	=	DPE
$60	*	0.25	=	$15

1.8 Direct Costs. As defined in Section 2.1, below.

1.9 Indirect Costs. As defined in Section 2.2, below.

1.10 Chargeable Costs. As calculated in Article 2, below.

1.11 Hourly Employees. A Builder's employees that are directly engaged in the performance of Work on the Project that are non-salaried and whose compensation is paid on an hourly basis.

1.12 Salaried Employees. A Builder's employees that are directly engaged in the performance of Work on the Project that are paid a salary and whose compensation is not paid on an hourly basis.

2. CHARGEABLE COSTS. Builders' Chargeable Costs only include Builder's Direct Costs and Indirect Costs directly related to performing Work for the Project, but do not include profit. All Builder Chargeable Costs are actual costs, without markup and are net of any credits, including input tax discounts or rebates.

2.1 Direct Costs. Builder's Direct Costs are the following:

2.1.1 Labor Cost. The cost of Builder's employees directly performing work on the Project calculated for each employee as follows:

Example				
BHWR	+	(BHWR * DPEM)	=	Labor Cost
$60	+	($60 * 0.25)	=	$75

2.1.2 Materials and Equipment Incorporated into the Project.

(a) Materials and Equipment. Costs, including transportation and storage, of materials and equipment incorporated or to be incorporated into the Project that are either delivered to the Project Site or suitably stored off-site at a mutually acceptable location, if pre-approved by the PMT and fully insured against loss or damage. Purchases or costs from any Builder affiliated entities, divisions, groups, etc. for materials, equipment, and other costs will be billed at the actual and auditable cost incurred by those affiliated entities, divisions, groups, etc., except as pre-approved by the PMT.

(b) Waste and Spoilage. Costs of materials described in Section 2.1.2(a) of this exhibit in excess of those actually incorporated into the Project to allow for reasonable waste and spoilage. Unused excess materials, if any, will become Owner's property at Final Completion or, at Owner's option, will be sold by the Builder and credited against the final cost of the Project.

2.1.3 Subcontracted Work and Services. The actual cost, net of any credits, discounts or rebates, paid by Builder to a subcontractor, subconsultant, supplier, vendor, inspector or permitting agency, that is not owned by or affiliated with Builder, for performance of Work necessary for the Project.

2.1.4 General Requirements.

(a) On-Site Temporary Facilities & Services. Costs for Builder's on-site office or big room and temporary facilities (including trailers, power, water, sanitary, utilities, telephone, internet), on-site security, on-site temporary protection and barricades (including fences, signage and traffic control), on-site temporary office furniture and equipment (including cost of computers and software purchased specifically for this Project with the concurrence of the PMT and inclusive of all variable software, applications, systems, and support costs directly related to this Project); postage and parcel delivery charges; and on-site devices, servers, printers, copiers, plotters, facsimile transmissions and long-distance telephone calls, including costs of transportation, installation, minor repairs and replacements, dismantling and removal thereof. Any equipment or materials purchased and charged to the Project will remain the property of Owner at the end of its usage.

(b) Temporary Materials and Equipment. Costs, including transportation and storage, installation, maintenance, dismantling and removal of construction materials, supplies, machinery, equipment, and small tools over $500 not customarily owned by the construction workers, that are provided by the Builder at the site (but not incorporated into the Project) and fully consumed in the performance of the construction work. If items are not fully consumed, the cost less salvage value, whether sold to others or retained by the Builder, will be included. Salvage value will be the

fair market value or actual value received. The cost of small tools under $500 will not be reimbursable as part of Builder's Direct Cost, but should be included in the Builder's Indirect Costs.

(c) Third Party Rental Expenses. Rental charges for non-affiliated third-party equipment will be considered reimbursable and will be reimbursed at actual costs, as long as rental rates are consistent with those prevailing in the locality. Such equipment will be exclusive of small tools, and limited to the direct costs of transportation, delivery, installation, dismantling, removal, and maintenance. Rental charges will be equitably prorated if the foregoing equipment is not exclusively devoted to the Project.

(d) Builder Owned Rental Expenses. For rental charges for items described in Section 2.1.4(c) of this exhibit that are rented from the Builder or an affiliate of the Builder, the aggregate rental amounts (exclusive of all installation, maintenance, dismantling, removal, transportation, and delivery costs) for any one piece of equipment cannot exceed 80% of the purchase price (at the time it is placed in service) during the rental period of the equipment used for this Project. Agreed rates for equipment that is owned by the Builder or an affiliate and rented to the Project are subject to these same terms and must be scheduled in Exhibit F-2. Upon Owner's request, the Builder will present an analysis of an opportunity to purchase rather than rent the item. All purchased items will be a Chargeable Cost and title to the property will vest to Owner upon Final Completion.

2.1.5 Miscellaneous Costs

(a) Taxes. The Goods and Services Tax, imposed under Part IX of the *Excise Tax Act* (Canada) ("GST") imposed by a Governmental Authority, on the Owner, provided that the Builder provides the Owner with the information prescribed by the *Excise Tax Act* (Canada) to allow Owner to claim an input tax credit but for greater certainty, excluding all GST, provincial sales tax, franchise or income based tax or any similar taxes imposed by a Governmental Authority on the Builder.

(b) Insurance. Insurance expenses specifically required of Builder by the Agreement and allocable to this Project. Deductibles are a Chargeable Cost only to the extent specifically provided in Exhibit L-2 and Article 13 of the Agreement.

(c) Permits, Fees, and Assessments. Fees and assessments for the building permit for the Project and for other permits, licenses and inspections that Builder is required to pay under the Agreement. Major permits may be paid by Owner directly.

(d) Testing. Fees of laboratories for tests required by the Agreement.

(e) Fees. License fees paid for the use of a particular design or process required by the Agreement and approved by the PMT.

(f) Recycle & Waste. Costs of removal and disposal of debris from the site and recycle costs not offset by recycle fees or rebates.

(g) Document Reproduction. Costs for blueprinting and other document reproduction necessary for constructing and administrating the Project.

(h) Travel Expenses. All reasonably and actually incurred direct, non-salary, travel-related reimbursable expenses will be billed to Owner at actual cost without markup. Unless otherwise stated in Owner's travel guidelines, all air travel, regardless of domestic or international destination, will be at unrestricted coach class fare or other class, whichever is lowest. Mileage will be reimbursed at the Canada Revenue Agency's published automobile allowance rates for travel by Designer in its own vehicles.

(i) Emergencies & Repairs. Subject to the Agreement, costs incurred in taking action to prevent threatened damage, injury, or loss in case of an emergency that threatens the safety of persons.

2.1.6 Trade Discounts and Surplus. Trade discounts and refunds for Builder purchased material and equipment will be credited against the incurred Chargeable Cost. Sales of surplus materials and equipment will likewise be credited against the Chargeable Costs.

2.1.7 Cost of Repair/Correction. Cost of repairing or correcting Construction Work that is deficiently designed, or damaged or non-conforming Construction Work executed by a Builder , provided that (1) the costs are incurred prior to Final Completion and (2) the damaged or non-conforming work was not intentional or caused by Willful Default. Correction or repair of deficient or non-conforming work that was performed or installed by a Standard Consultant or Standard Subcontractor will be remedied at the a Standard Consultant's or Standard Subcontractor's own expense and is not a Chargeable Cost.

2.1.8 Other Incurred Costs. Other costs incurred by Builder that are necessary for the Project, if approved by the PMT in writing prior to being incurred.

2.2 Indirect Costs or Overhead. Builder's Indirect Costs are the following:

2.2.1 Defined. Builder's Indirect Costs are costs, of any kind, other than Direct Costs and Excluded Costs. Builder's Indirect Costs customarily include the cost of personnel not working directly in connection with the Work; executive salaries; association dues and fees; depreciation on all property, equipment or other assets; payroll processing costs; corporate taxes or fees; business development costs; employee training; all home office infrastructure costs; general administrative personnel costs; risk management costs; interest expense; perquisites such as car allowances,

home office expenses (including without limitation rent, utilities, telephones, faxes, postal charges, and reprographics); software and computer hardware costs; accounting personnel; legal personnel; recruiting costs; field office; cellular telephones and pagers; severance pay, and employee morale programs.

2.2.2 Overhead Rate. If Indirect Costs are paid under option 2.2.3(b) below, the Overhead Rate is a factor only included in the Hourly Employees' or Salaried Employees' Billable Rate (as applicable). If Indirect Costs are paid under option 2.2.3(c) below, the Overhead Rate is a factor applied to the sum of Builder's Chargeable Costs, and not included in the employee's Billable Rate.

2.2.3 Payment. Indirect Costs are paid as Chargeable Costs using one of the following methods selected when the Agreement is executed and indicated on the Business Terms Sheet:

(a) A fixed amount paid in equal monthly installments from execution of the Agreement until Final Completion;

(b) Included with the Builder's Hourly Employees' and Salaried Employees' Billable Rates calculated as (BHWR + (BHWR * DPEM)) * Overhead Rate; or

(c) Applied as an Overhead Rate multiplied by the Builder's Direct Costs incurred during a payment period.

2.2.4 Shop Indirect Costs. Builders that use pre-fabrication or shop facilities to perform portions of the Work may, with the written approval of Owner, have a separate Shop Overhead Rate that applies only to the hourly rate of Builder's employees that directly perform Work in the shop or pre-fabrication facility ("Shop Personnel") such that the Billable Rate of Shop Personnel is calculated as (BHWR + (BHWR * DPEM)) * Shop Overhead Rate.

3. EXCLUDED COSTS

3.1 Direct Costs. The following costs are excluded from Builder's Direct Costs.

3.1.1 Offsite Personnel. Salaries and other compensation of personnel stationed at any office or offices other than the Project Site office or the Contractor's principal office identified in the Notices provision of the Business Terms Sheet, unless otherwise agreed in writing by the PMT.

3.1.2 Offsite Expenses. Expenses related to a firm's principal office and offices other than the Project Site office.

3.1.3 Business Licenses, Permits, and Taxes. All costs of business and/or operating permits, licenses, fees, and taxes required by any local, provincial, or federal Governmental Authorities to enable Builders or their

subcontractors of any tier to be qualified to do business and/or perform their respective portions of the Work.

3.1.4 Costs Not Included In Direct Costs. Any cost not explicitly included as a Direct Cost in Section 2.1 of this exhibit.

3.2 Chargeable Costs. The following costs are excluded from Chargeable Costs, and will not be paid by Owner.

3.2.1 Financing or Cost of Use of Money. Financing costs, cost of use of money, or other capital expenses, including interest on capital employed for the Construction Work.

3.2.2 Bonuses and Incentive Programs. Employee bonuses or incentive program payments regardless of whether personnel are specifically assigned to this Project because these costs are carried in Contractor's Indirect Costs.

3.2.3 Fraud and Willful Default. Any cost resulting from fraud, Willful Default, or willful misconduct.

3.2.4 Stale Invoices. Work performed 75 days or more before the submittal date of the invoice to Owner, unless prior written approval is obtained from the PMT.

3.2.5 Costs incurred after Project Final Completion. Costs incurred for the Work after Project Final Completion.

END OF EXHIBIT

Integrated Project Delivery Agreement
Exhibit F – Added Value Incentive Items

Integrated Project Delivery Agreement
Exhibit G – Owner's Chargeable Costs

Integrated Project Delivery Agreement
Exhibit H – Payment Protocol

1. APPLICATIONS FOR PAYMENT OF CHARGEABLE COSTS

1.1 General Requirements

1.1.1 On or before the 30th day of each calendar month during the term of this Agreement (the "Payment Application Date"), each Non-Owner Party will individually submit for Owner's review and approval an application for payment of their respective Chargeable Costs on a form reasonably acceptable to Owner (each an "Application for Payment"). Each Application for Payment must comply with the requirements of Article 10 of the Agreement, and the provisions of this Exhibit H.

1.2 Builder's Applications for Payment

1.2.1 A Builder's payment application will include documentation of its Chargeable Costs and those of its consultants, subcontractors, and vendors for the billing period and other amounts covered by the payment application including the following, as applicable:

(a) A duly executed statement from the Builder detailing all incurred Chargeable Costs for which payment is sought in the payment application, with separate tracking of the following: overhead to which the Builder is entitled, Chargeable Costs for Owner's Directives and approved Change Order Work, self-performed work by the Contractor being compensated on a lump sum basis, and amounts to be retained or withheld;

(b) Payrolls for labor, transactional registers for materials, invoicing for all stored materials, and/or a schedule of values with percentage of completion for Work on a lump sum basis;

(c) New adjustments to previous payment applications;

(d) The amount of past payments received, a schedule of values for Work completed to date, and the Builder's anticipated amount of other future Chargeable Costs to complete the Project; and

(e) A certification by Builder that Builder is unaware of any recorded or filed Statement of Account, or complaint to enforce a lien with respect to the Work performed by others and that all of its subcontractors, consultants, and suppliers have been paid to date or will be paid with the proceeds for Work covered under the payment application.

1.2.2 A Builder's Application for Payment must separately identify the Stipulated Overhead to which the it is entitled pursuant to Section 8.5 of the Agreement.

1.2.3 With respect to work self-performed by a Builder and approved by Owner pursuant to Section 8.6 of the Agreement and compensated on a lump sum basis, the portion of the Builder's Application for Payment for such Builder self-performed lump sum work will be on a percentage of completion basis pursuant to a schedule of values for such work. The schedule of values is subject to prior review and approval by Owner, and must exclude the Builder's overhead pursuant to Section 8.6 of the Agreement.

1.2.4 With respect to work performed by Standard Subcontractors compensated by the Builder on a lump sum basis, the Builder's Application for Payment must include and separately identify each such lump sum Standard Subcontractor's work on a percentage of completion basis pursuant to a schedule of values for such work.

1.2.5 With respect to work performed by Standard Subcontractors on a basis other than lump sum (such as time & materials, unit price, cost plus, etc.), a Builder's Application for Payment must include and separately identify each such Standard Subcontractor's work and the basis for such compensation, together with any and all supporting documents as the PMT may require pursuant to the Agreement. The Builder will, in its Application for Payment, summarize such amounts and by submitting the invoice the Builder is certifying that it has conducted a thorough and complete review of such supporting documents and determined such Standard Subcontractor's compensation included in the Application for Payment to be in accordance with the Agreement and the terms of the respective subcontract. Nothing in this paragraph will prejudice Owner's rights pursuant to Section 9.2 of the Agreement.

1.3 Designers' Applications for Payment

1.3.1 A Designer's payment application will include documentation of its Chargeable Costs and those of its consultants for the period and amounts covered by the payment application including the following, as applicable:

(a) Copies of payrolls for labor;

(b) Copies of monthly labor detail reports, showing the identity and trade/discipline of each person performing labor each day with reasonable detail;

(c) All bills, invoices and the like pertaining to all of the Designer's other Chargeable Costs and payment;

(d) Separately tracked Chargeable Costs for Owner's Directives and approved Change Order Work;

(e) A summary of Chargeable Costs incurred by its consultants;

(f) New adjustments to previous payment applications;

(g) The amount of past payments received;

(h) The Designer's anticipated amount of other future Chargeable Costs to complete the Project; and

(i) A certification by Designer that Designer is unaware of any recorded or filed Statement of Account, or complaint to enforce a lien with respect to the Work performed by others and that all of its subcontractors, consultants, and suppliers have been paid to date or will be paid with the proceeds for Work covered under the payment application.

1.3.2 With respect to services performed by Standard Consultants compensated by a Designer on a fixed price basis, the Designer's Application for Payment will include and separately identify each such fixed price Standard Consultant's services on a Achievement Event payment basis pursuant to a schedule of Achievement Events. The schedule of Achievement Events and other relevant terms are subject to prior review and approval by the PMT pursuant to the Agreement.

1.3.3 With respect to work performed by Standard Consultants on a basis other than lump sum (such as time & materials, not to exceed, etc.), a Designer's Application for Payment must include and separately identify each such Standard Consultant's services and the basis for such compensation, together with any and all supporting documents as the PMT may require pursuant the Agreement. The Designer will, in its Application for Payment, summarize such amounts and by submitting the invoice the Designer is certifying that it has conducted a thorough and complete review of such supporting documents and determined such Standard Consultant's compensation included in the Application for Payment to be in accordance with the Agreement and the terms of the respective subconsultant agreement. Nothing in this paragraph will prejudice Owner's rights pursuant to Section 9.2 of the Agreement.

2. PAYMENT WITHHOLDING

2.1 Right to Withhold. Owner may refuse to approve a payment application or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or any part of a prior payment application to the extent the PMT determines, or the SMT determines by majority vote, is necessary to protect Owner from loss arising out of or resulting from:

2.1.1 The Willful Default of the Party submitting the invoice;

2.1.2 Failure of a Builder, or its subcontractors, to make timely payments to their respective consultants, subcontractors, and vendors for labor, materials, or equipment, provided Owner has made payment required by this Agreement;

2.1.3 Failure of a Designer or its consultants to make timely payments to their respective consultants for Design Services rendered in connection with

the Project, provided Owner has made payment required by this Agreement;

2.1.4 Failure of the Strategic Sourcing Manager or its consultants and vendors to make timely payments to their respective consultants for its services rendered in connection with the Project, provided Owner has made payment required by this Agreement; or

2.1.5 Insufficient documentation, erroneous estimates of value of the Work performed, or other incorrect statements in a payment application.

2.2 Cure. If the reason for withholding payment is cured, Owner will pay the withheld amount within 7 days of receiving reasonable documentation evidencing that the reason for the withholding has been cured. The right to withhold does not apply to undisputed portions of any payment application.

3. PAYMENT HOLDBACK

3.1 The Owner will retain Holdback on any payment to a Non-Owner Party with respect to which a Holdback is required to be retained under the Builders Lien Act, SBC 1997 c 45, as amended from time to time.

4. APPLICATIONS FOR PAYMENT OF ICL

4.1 Pursuant to Section 8.4 of the Agreement, if the preconditions for ICL distribution have been met, then each applicable Non-Owner Party will submit a separate Application for Payment for the portion of the ICL to which they are entitled pursuant to the Agreement. For the avoidance of doubt, Applications for Payment for ICL distribution are to be separate from Applications for Payment of Chargeable Costs as set forth in Article 1 of this Exhibit H, and will be in accordance with the most current Incentive Program requirements.

4.2 Pursuant to the Incentive Program, any increases to ICL which may result from Project performance will be determined at Final Completion of the Project and be the subject of separate Applications for Payment from the Non-Owner Parties.

5. PAYMENT BY OWNER

5.1 Periodic payments will be made to the Non-Owner Parties as provided below and elsewhere in the Agreement.

5.2 After receiving Applications for Payment approved by the PMT, Owner will have 15 Business Days to finish its review and approve/disapprove payments. Owner will pay each application for payment (or uncontested portion thereof) to the respective Non-Owner Party within 15 days of Owner's approval of the reviewed payment application. If Owner disapproves a payment application or determines to withhold a portion of the requested amount for payment pursuant to this Article 2, Owner will notify the applicable Party(ies) within 15 Working Days of receipt of the Applications for Payment.

5.3 Builders will pay their respective consultants, subcontractors, and vendors, and consultants within 10 days of the Builder's receipt of payment from Owner.

5.4 Designers and the Strategic Sourcing Manager will pay their respective consultants and vendors within 10 days of their receipt of payment from Owner.

6. FINAL PAYMENT BY OWNER

6.1 Subject to the Agreement, Owner will make Final Payment to the Non-Owner Parties within 60 calendar days after all of the following are complete:

6.1.1 The Work has been fully performed by the Non-Owner Parties, except for their responsibility to satisfy other requirements, if any, which necessarily survive Final Payment;

6.1.2 A payment application for final payment has been submitted by the Non-Owner Parties;

6.1.3 A final accounting of Chargeable Costs has been submitted by the Non-Owner Parties and reviewed by Owner, which review must be completed no more than 30 days after submission. Owner’s approval will not be unreasonably withheld; and

6.1.4 The other conditions to Final Payment in the Contract Documents have been satisfied.

6.1.5 In addition to all other requirements above and in the Contract Documents, as a condition to Final Payment, the Non-Owner Parties must, as applicable:

(a) Deliver any special guarantees or warranties required by the Contract Documents and assignments of all guarantees or warranties from subcontractors, vendors, suppliers, or manufacturers (with the addresses and telephone numbers of those Builders, subcontractors or other persons providing guarantees and warranties);

(b) Deliver to Owner the documents required by Section 6.6.2 of the Agreement.

END OF EXHIBIT

Integrated Project Delivery Agreement
Exhibit I – Incentive Program

Note: The Incentive Program will be developed by all Parties during the Validation Phase and will outline the factors determining the distribution of ICL on the Project. These may include Key Performance Indicators or other considerations. As an example, the following is a simple 100% profit at risk, 50% shared savings that includes a cap on the increase on team profit.

1. ADJUSTMENT OF ICL

1.1 Final Actual Cost Exceeds Target Cost. If, at the time of Final Completion, the Final Actual Cost exceeds the Target Cost (as adjusted for all approved Change Orders), then the ICL is reduced by the amount of the difference, but not below $0.

1.1.1 If the ICL, as adjusted in Section 1.1 is less than the amount of ICL distributed to the Non-Owner Parties under Section 10.4 of the Agreement, then each Non-Owner Party will pay to Owner, within 20 Business Days of a written demand, its proportionate share of the difference between the distributed ICL and the adjusted ICL, using each Non-Owner Party's ICL percentage.

1.2 Final Actual Cost Equals the Target Cost. If, at the time of Final Completion, the Final Actual Cost equals the Target Cost, then Owner will pay each Non-Owner Party its proportionate share of the ICL, using each Non-Owner Party's ICL percentage, less any amount of ICL previously paid to that Party.

1.3 Final Actual Cost Is Less Than the Final Target Cost. If, at the time of Final Completion, the Final Actual Cost is less than the Target Cost, then then the ICL will be increased by the lesser of:

1.3.1 __% of the ICL; or

1.3.2 __% of the difference between the Target Cost and the Final Actual Cost.

2. PAYMENT OF ADJUSTED ICL. If the ICL is adjusted under Sections 1.2 or 1.3, Owner will pay each Non-Owner Party its proportionate share of the Adjusted ICL, using each Non-Owner Party's ICL percentage, less any amount of ICL previously paid to that Party.

END OF EXHIBIT

Integrated Project Delivery Agreement
Exhibit J – Project Manual

Integrated Project Delivery Agreement
Exhibit K – General Conditions to the Agreement

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GENERAL CONDITIONS TO THE INTEGRATED FORM OF AGREEMENT

1. TERMS

1.1 Defined Terms. Capitalized terms used in these General Conditions are either defined in the Agreement, these General Conditions, or Exhibit A to the Agreement.

2. PROJECT ADMINISTRATION

2.1 Risk and Opportunity Register. The PMT will facilitate a workshop to identify risks that could jeopardize the Project success. These risks will be documented in a risk registry that identifies the risks in priority order and documents the strategies to avoid, mitigate, and monitor these risks. The risk registry will be regularly reviewed and updated by the PMT, and reviewed monthly by the SMT. The SMT will also review the effectiveness of the risk management strategies and will modify or implement new strategies to reduce or eliminate Project risks.

2.2 Progress Monitoring. The PMT is responsible for developing goals, strategies, protocols, and tools for monitoring Project progress against schedule, budget, and key performance indicators. These management tools will be used to track the status of the Project against achievement of the Project Requirements. If it appears that the Project Requirements is not likely to be achieved, the PMT will develop a recovery plan to enable the Project to achieve the Project Requirements.

2.2.1 Project Log. The PMT, through the Contractor, will maintain a daily log that summarizes the conditions and activities on the Project including, without limitation, a record of weather conditions, the number and types of workers on-site, the subcontractors working, the areas where Construction Work is progressing and the Construction Work accomplished, problems encountered on the Project, significant visitors to the site, including inspectors and testing agencies, and other similar relevant information as Owner may reasonably require.

2.3 Requests for Information and Bulletins

2.3.1 Informal Resolution of Issues. Questions, conflicts, and issues regarding coordination and constructability should be resolved during design and before the Implementation Documents are issued. Requests for Information ("RFI") should not be used as a substitution for collaboration. If issues arise during construction, the issues or questions should be resolved collaboratively and informally among the affected Project Participants. RFIs are intended to be used to document the result of the informal process and to document decisions that reflect differences from the Implementation Documents.

2.3.2 RFI Scheduling. In collaborating to resolve an issue for which an RFI will be used to document the solution, the party needing the information will indicate when the issue needs to be resolved to avoid delaying the Work. If the requesting and responding parties are able to resolve the issue in their initial conversation, the responding party will produce the RFI documenting the solution before the date at which a delay will occur. If the requesting and responding

party cannot agree on a plan for resolving the issue before a delay will occur, the responding party must notify the PMT, who will promptly address the issue with the parties. All RFIs will be in writing to the Contractor with a copy to the PMT and, to the extent possible, will be documented in the BIM. If the RFI affects the Target Cost, or the Achievement Events, the Contractor will immediately commence the Change Order process under Article 11 of the Agreement. If the RFI does not affect the Target Cost, or Achievement Events, the Contractor will immediately post the RFI and its resolution on the PMIS and notify all necessary parties for implementation in the field. The PMT will develop goals for latency and RFI resolution and will measure actual durations against the RFI goals.

2.3.3 Bulletins. The PMT will issue PMT Bulletins as required by the Contract Documents or as necessary to efficiently manage the Project. SMT Bulletins are issued by the SMT as required by the Agreement or as necessary to efficiently manage the Project. PMT Bulletins and SMT Bulletins are binding on the Project Participants unless revoked or modified by a Owner Directive. PMT Bulletins giving rise to potential Change Orders will be governed by Article 11 of the Agreement.

2.3.4 Electronic Submission and Archiving. The PMT will establish a PMIS to track RFIs, PMT Bulletins, and SMT Bulletins and make them available to all Project Participants.

2.4 Submittals and Shop Drawings.

2.4.1 Reduction of Submittals. Whenever reasonably possible, Builders should coordinate their submittal information with the Designers and incorporate agreed information into the Model or other Implementation Documents. Where direct integration into the design is not practical, Builders will provide submittals in accordance with this Section 2.4.

2.4.2 Content. All submittals must be complete and contain the information necessary for review by the Designers, and Owner, as appropriate. The PMT will designate a format for submittal numbering. Each submittal must have a unique identification number and resubmittals must use the unique number plus a version number. Builders will not submit submittals that only have the information already in the Contract Documents. Any Submittals that are not required by the Contract Documents may be returned by the Lead Designer without action.

2.4.3 Electronic Submission and Archiving. The PMT will establish a PMIS to track and archive Submittals and Submittal reviews. To the greatest extent possible, Submittals will be delivered in an electronic format capable of being read and integrated into the BIM. By transmitting a Submittal, the submitter represents that it has reviewed the submission for accuracy and compliance with all Contract Documents, coordinated the information contained within the Submittal with the existing field conditions and requirements of the Construction Work and other contiguous work, and that all original engineering, if required, has been performed by a qualified professional engineer or architect appropriately licensed in accordance with Applicable Law.

2.4.4 Scheduling and Priority. The Builders and Designers will jointly create a submittal schedule that prioritizes submittal submission and review by when the information is needed and the importance of the submittal. The submittal schedule will provide a reasonable time for Designer and Owner review, where required.

2.4.5 Tracking. The PMT will maintain a submittal log that, at a minimum, tracks:

(a) Submittal by reference number, name and description;

(b) When the submittal was due pursuant to the Submittal Schedule;

(c) When the submittal was received;

(d) The issuing party responsible for the submittal;

(e) The reviewing party, or parties responsible for reviewing the submittal;

(f) The date the submittal was returned to the issuing party;

(g) The status of the submittal;

(h) The criticality of the submittal, i.e., critical, urgent, routine;

(i) Where submittals are returned for resubmittal, the revised and resubmitted submittal must designate that it is a resubmittal.

2.4.6 Resubmission of Submittals. Upon return of any Submittal, the Contractor will require the appropriate party to make any correction required in accordance with the Contract Documents and, within 1 week or less, to furnish corrected resubmissions to the Lead Designer for approval. The Builders will not perform any of the Work for which the Contract Documents require a Submittal until the respective Submittal has been approved by the Lead Designer. Upon receipt of approval from the Lead Designer on a Submittal, the Contractor will post a final corrected copy into PMIS per Section 2.4.3 of this exhibit.

2.4.7 Lead Designer's Review. The Lead Designer will review the Submittals for conformance with the Implementation Documents and approve or take other appropriate action. Approval of a Submittal does not relieve the Contractor or submitter from any of its contractual obligations. The Lead Designer's approval of a specific item does not constitute approval of an assembly of which the item is a component.

2.4.8 Design-Build Trades. If the PMT requires a Builder to subcontract for design-build services for certain trades, the design-build Submittals must be prepared by, or under the responsible charge of, a registered professional engineer or architect licensed in accordance with Applicable Law who will sign and seal all design-build Submittals indicating that the design professional is the engineer or architect of record. Any Builder subcontracting for Design-Build Trades must enter into a written subcontract that expressly states that Owner and other Parties are intended beneficiaries of the subcontract and entitled to enforce all

obligations and obtain all benefits under the subcontract, including any Owner rights. Submittals will be in accordance with the provisions set forth in Sections 2.4.3 through 2.4.7 of this exhibit. The Design-Build Trades will remain liable and responsible for all design-build Submittals. The Lead Designer will review design-build Submittals to confirm that the Submittals are in general conformance with the design intent indicated in the Implementation Documents and to coordinate the design-build Submittals with the Design Materials prepared by the Designers and their consultants.

2.5 Inspection and Certificate of Substantial Completion. When the Contractor believes that the Project or a Project Stage has achieved Substantial Completion, it will notify the PMT who will review the entire Project or the Work performed in the Project Stage, as applicable. If the applicable Governmental Authority approves occupancy of the Project, or partial occupancy for the Project Stage per Section 2.5.1 of this exhibit, and the PMT finds that Substantial Completion has been achieved, the PMT will issue a certificate of Substantial Completion. If the Project or Project Stage (as applicable) has not achieved Substantial Completion, the PMT will provide the Contractor with a Punch List before Substantial Completion and the Contractor, after the Builders have completed those items, will notify the PMT that the Project or the Project Stage is ready for re-inspection. Unless otherwise agreed, the certificate of Substantial Completion, or certificate of beneficial occupancy per Section 2.5.1 of this exhibit establishes the date when responsibility for security, maintenance, heat, utilities, damage to the Construction Work, and insurance transfers from the Builders to Owner.

2.5.1 Partial Use and Occupancy. Upon 3 Business Days' written notice to the PMT, and provided that the Governmental Authorities having jurisdiction over the Project have deemed the Project Stage fit for legal use and occupancy, Owner may occupy or otherwise make use of all or any part of the Project Stage or equipment before Substantial Completion of the entire Project. The PMT will issue a certificate of beneficial occupancy describing those portions of the Project deemed fit for legal occupancy by the Governmental Authorities and establishing the date for when the risk of damage to the Construction Work in that Project Stage is transferred to Owner.

2.6 Final Inspection and Acceptance

2.6.1 Final Inspection and Beneficial Occupancy of a Project Stage. Before Owner uses and occupies a Project Stage, the PMT will review all Work contained within the Project Stage and prepare a list of items that need to be completed, repaired, or replaced ("Stage Punch List"). Correction of all Stage Punch List items to the PMT's satisfaction is a condition precedent to Final Completion of the Project Stage.

2.6.2 Final Completion and Owner Occupancy. After the Contractor notifies the PMT that it believes the Project has achieved Final Completion, the PMT will review the entire Project and prepare a list of any items that require completion, repair, or replacement ("Final Punch List"). Any Final Punch List items for previously completed and occupied Project Stages will be corrected under the warranty provisions of the Agreement. Correction of all Final Punch List items to the PMT's satisfaction is a condition precedent to Final Completion of the Project and

Final Payment. When the PMT has determined that Final Completion of the Project has occurred, it will issue a certificate of Final Completion.

3. JOINT SITE INVESTIGATION

3.1 Access to Existing Documents. At its expense, Owner will exercise commercially reasonable efforts to provide the PMT with access to all documents Owner knowingly possesses related to the condition of the Project Site that are requested in writing and reasonably required by the PMT. This information includes:

3.1.1 Documents describing the physical characteristics of the site, including surveys, site evaluations, legal descriptions, data, or drawings depicting existing conditions and subsurface conditions (geotechnical engineering survey and report), and environmental studies, reports, and investigations;

3.1.2 Tests, inspections, and other reports dealing with environmental matters, Hazardous Materials and other existing conditions, including structural, mechanical, and chemical tests, required by the PMT or by law; and

3.1.3 Any other information or services reasonably relevant to the planning, design, and construction of the Project.

3.2 Joint Site Investigation. Prior to establishing the Project Requirements, the PMT and PIT members will conduct a Joint Site Investigation. Owner will make the Project Site available for the Joint Site Investigation and will provide information in its possession that is required by this Section or otherwise requested by the PMT or PITs. During the Joint Site Investigation, the PMT will:

3.2.1 Document all site-related information that is needed to design and construct the Project;

3.2.2 Verify existing conditions within the Project Site, including all points of connection, and verify the accuracy of existing as-built documents provided by Owner through field investigations with proper due diligence to eliminate major Unforeseen and Differing Site Conditions that would result in a Change Order. If as-built documents are insufficient, inaccurate, or incomplete, the PMT will decide whether a surveying program to provide required information is justified;

3.2.3 Notify Owner of the need to view inaccessible spaces (e.g., spaces containing Hazardous Materials, hard lid ceilings, buried utilities, occupied spaces, etc.) to allow for field verification;

3.2.4 Review any existing information and identify, in writing, any apparent deficiencies or discrepancies in the information provided by Owner during the Project;

3.2.5 Describe additional site investigations or information reasonably required to develop the Project Requirements and prepare the Implementation Documents, including surveys, subsoil investigations, analyses, tests, and reports relative to the Project Site;

3.2.6 Evaluate the need for air balance reports, electrical load tests, and gas and utility reports to verify the condition and capacity of existing systems;

3.2.7 Determine whether to extend the Joint Site Investigation for additional surveying or necessary testing to allow effective design and construction of the Project; and

3.2.8 Upon completion of the Joint Site Investigation, reasonably recommend whether or not Owner should proceed with the Project.

3.3 Reliance on Information. If a party has participated in the Joint Site Investigation, it may rely upon the completeness and accuracy of the information provided by Owner, to the extent that it is not contradicted by the Joint Site Investigation, any additional documents and reports produced under Article 5, or any information otherwise known by the party.

4. BUILDING INFORMATION MODEL

4.1 Building Information Modeling Workshop. The PMT will meet and develop detailed protocols for the use of Building Information Modeling on this Project, which will be documented in a BIM execution plan that is incorporated into the Project Manual. Among other things, the protocols developed will:

4.1.1 Specify where and how the Model will be maintained including the parties with substantive responsibility for controlling the information within specific models or model elements;

4.1.2 Provide minimum hardware and software requirements, including the software (including software revision or build date if applicable) that will be used to develop the Model or Models;

4.1.3 Specify protocols for naming conventions, data structure, version control, roll-back, gate keeping, and archiving;

4.1.4 Establish a common coordinate system and conventions as to units;

4.1.5 Specify the level of detail that will be modeled and incorporate appropriate allowances for differing construction tolerances. Designers are required to design to accurate dimensions in the Model;

4.1.6 Specify when and how information regarding constructability and cost will be derived from the Models and provided to the designers to inform design;

4.1.7 Specify when and how existing site information is incorporated into the Model;

4.1.8 Specify how RFIs, clarifications, Shop Drawing, and Submittal information will be reviewed and incorporated into the Model;

4.1.9 Specify when and how clash detection/conflict resolution sessions will occur;

4.1.10 Determine what information is more efficiently developed and conveyed using traditional 2D design tools and develop protocols for assuring consistency between the BIM and ancillary 2D information;

4.1.11 Specify how the BIM will be updated and function as a Record Model; and

4.1.12 Specify what design information, if any, will be developed or maintained outside of the BIM.

4.1.13 The BIM workshop will be scheduled by the Model Administrator early in the Validation Phase. Any disagreement regarding protocols will be decided by the PMT. The Model Administrator will document the decisions reached in the draft BIM execution plan.

4.2 Model Administrator. Each Party is responsible for maintaining any individual design or analysis models and providing their modeling information, at appropriate intervals, to Model Administrator. During the Validation Phase, the PMT will select a Model Administrator who is responsible for receiving modeling information from the Project Participants and incorporating the information into a master BIM. Unless otherwise agreed, the Model Administrator will host and manage the modeling information.

4.2.1 The Parties will utilize all aspects of BIM in their day-to-day operations on the Project, including cost, scheduling, quality, safety, and minimization of interference issues during the Construction Phase.

4.2.2 The PMT will develop a procedure to define and specify software, timing, reviews, accuracy requirements, and management of the Building Information Model for this Project.

4.3 Modeling Goals. Use of a Model will provide the Project Participants the best opportunity to incorporate collaboration, communication, understanding, and visualization into their normal project behavior. Generally, to the greatest extent practical, all Project information will be developed and maintained through the use of BIM. The design will be developed in the Model, constructability and cost information will be incorporated through the Model, conflict resolution will occur through the Model, Shop Drawings will be submitted and reviewed through the Model, and the Model will be kept current to reflect as-constructed-conditions. In addition, model elements will contain information relevant to facility operation and maintenance that can be exported to Owner's computerized maintenance management system.

4.4 Ownership of the Building Information Model

4.4.1 Ownership and Use. All of the Project Documents will remain the sole and exclusive property of Owner. All original Project Documents will be delivered to Owner upon completion of the Work, unless, in the sole opinion of Owner, it is necessary for the Designers, design consultants, Builders, or Design-Build Trades to retain possession for a longer period of time. Owner will have the unrestricted right to use the Project Documents in connection with design and construction of the Project, to later maintain or alter the facilities, to construct the same Project at another site, or any other use whatsoever. Designers, design consultants, Builders, or Design-Build Contractors may retain copies of the

Project Documents for their respective records, provided that the Project Documents are not used without Owner's prior written consent. Designers, design consultants, Builders, or Design-Build Trades are not to recreate any designs, or any other tangible work product included in the Project Documents, which if constructed or otherwise materialized, would be reasonably identifiable as a part of this Project or the design expressed in the Project Documents.

4.4.2 Copyrights and Patents to Materials and Designs. Owner retains all rights to all materials or designs developed for this Project. To the extent Work performed under this Agreement produces or includes any copyrightable or patentable materials or design, such materials or designs are work made for hire for Owner as the author, creator, or inventor upon creation, and Owner will maintain all Intellectual Property rights, title and interest, without limitations, to reproduce any and all parts of such materials or designs. Designers, design consultants, Builders, or Design-Build Trades expressly acknowledge that Owner is the motivating factor for the design and materials used for this Project and therefore has the right to direct and supervise the preparation of any copyrightable or patentable materials or designs developed for this Project.

4.4.4 Indemnification. Owner agrees that if a Project Document created by Designers, design consultants, Builders, or Design-Build Trades is modified by Owner without the architect or engineer of records' consent in connection with this Project or used for another project, and the architect or engineer of record is not retained to provide the Design Services in connection with the modification or the use for another project, Owner will indemnify, defend, and hold the architect and/or engineer of record (as applicable) harmless from and against any and all losses, liabilities, damages, actions, causes of action, costs and expenses, including, without limitation, reasonable attorneys' fees and costs incurred by architect and/or engineer of record arising out of (but only to the extent of) the modification. However, this indemnification obligation will not release the architect of record and/or engineer of record (as the case may be) from liability with regard to this Project for that portion of Project Documents completed by the architect and/or engineer of record, or their respective employees and consultants that were not modified.

4.4.5 Licensing. The Parties grant a non-exclusive, irrevocable, perpetual license to each other to use any BIM information solely for the purpose of designing, analyzing, and constructing this Project and for its future maintenance and remodeling. Provided the Party has not been terminated for convenience or cause, Owner grants each Party a non-exclusive, irrevocable, perpetual license solely for use or display of the Project BIM information for educational or promotional purposes.

4.4.6 Pre-Existing Work. Nothing in this Agreement will vest in Owner any proprietary interest in, or ownership of, any Pre-Existing Work of Designers, Builders, or any of their respective Representatives; provided, however, that if such Pre-Existing Work is incorporated into the Project Documents or the Work, or is otherwise provided to Owner in connection with this Agreement and such Pre-Existing Work is owned by Designers, Contractor, or Builders, then Designers, Contractor, or Builders will grant, and hereby do grant, to Owner and its successors and assigns a non-exclusive, irrevocable, perpetual, transferable (but

only (i) to an affiliate, subsidiary, parent or licensee of Owner, (ii) in connection with a merger, consolidation or sale of substantially all of the Project or business to which the Project or this Agreement relates, or (iii) in connection with a sale, lease, renting or other transfer of some or all of the Project), royalty-free, fully paid-up license worldwide to (and to permit others to) fully use such Pre-Existing Work solely in connection with the Project and its future operation, maintenance and renovation, provided that attribution is given to the author in such use any manner and for any purpose as Owner so chooses. Except as expressly set forth herein, Owner may not assign, delegate, sublicense, or otherwise transfer this license to another party (other than an affiliate, subsidiary, or parent of Owner) without the prior written consent of the applicable Party, such consent not to be unreasonably withheld. This limited license is granted only in connection with Pre-Existing Work provided in connection with Work for which the applicable Party has received full payment, unless payment has been withheld pursuant to rights under this Agreement. The authoring company retains all common law, statutory, and other reserved rights, including all copyrights, in its Pre-Existing Work. To the extent Pre-Existing Work is owned by a consultant or subcontractor, Designers, Contractor, or Builder (as applicable) will obtain all necessary consents, releases and licenses from such consultant or subcontractor to enable the applicable Party to grant the license in this paragraph to Owner and its Representatives in accordance with this Section 4.4.5 to fully use the Pre-Existing Work in any manner and for any purpose as Owner so chooses and, at the request of Owner, Designers, Contractor, or Builders will use its best efforts to cause its consultant or subcontractor to grant directly to Owner and its Representatives in accordance with this Section 4.4.5 a license consistent with that set forth above.

4.5 Status of the Building Information Model. The Builders will construct the Project in accordance with the BIM and other Contract Documents deemed necessary by the PMT at the conclusion of the Design/Preconstruction Phase subject to any subsequent modifications. Elements necessary for a fully functional Project, but not modeled due to their size or level of detail, will be provided by the Builders as part of the Construction Work without any change to the Target Cost and with a level of quality consistent with the Project Requirements and the Implementation Documents. It is anticipated that some design information, such as construction details, will not be incorporated into the BIM, but will be provided to the Builders as conventional 2D drawings or CAD files. Subject to the agreed level of modeling, the Model provides controlling dimensional information except where 2D drawings are specifically intended to be prepared at a greater level of accuracy than in the Model. Some design information will only be contained in the written specifications. The BIM, the 2D drawings, and the written specifications are all Contract Documents.

4.6 Submission of Signed and Stamped Drawings. 2D drawings, calculations, and specifications must be generated, reviewed, sealed, and submitted to reviewing agencies and applicable Governmental Authorities. The Designers and the Design-Build Trades will each be responsible for, and will sign and stamp, the drawings, specifications, and calculations prepared by them. To the greatest extent possible, the 2D drawings will be generated from the Model.

4.7 Miscellaneous BIM Issues

4.7.1 Participation by the consultants, vendors, Builders or any subcontractor or supplier, other than Design-Build Trades, in contributing data or advice for use in the BIM will not be deemed a provision of Design Services.

4.7.2 A person may only rely on the substantive information contained within any data in the BIM to the extent appropriate to the level of detail required of the BIM at the time.

4.7.3 Any costs incurred by Owner to rebuild, repair or restore the BIM as a result of the failure of Designers, Builders, or those for whom they are responsible to comply with the provisions of Article 4 and the BIM execution plan will be at the Parties expense and not reimbursable as a Chargeable Cost.

4.7.4 A Project Participant will not be individually responsible for modifications to any BIM data generated by it if the modifications were made by another team member without the creating member's knowledge and approval.

5. PROJECT SCHEDULING

5.1 Project Scheduling. All planning and scheduling performed on the Project will use "pull scheduling" techniques pursuant to the Last Planner System™, or an equivalent system. In order to be pull-based, the planning system must be based upon requests from a Project Participant to other Project Participants upon whom the requester's work is dependent, and receipt of reliable promises made by the upstream performer about when it will finish the Work agreed upon per the hand-off criteria, in order to enable the downstream performers to begin their respective portion of the Work. At a minimum, the system must include the Achievement Events included in Exhibit B-5, collaboratively created Lean Phase Plans per Section 5.2 of this exhibit, make-ready work plans per Section 5.3 of this exhibit, and a method for measuring, recording, and improving planning reliability.

5.2 Lean Phase Planning. Lean Phase Plans must be based on collaborative planning through direct communications by all Project Participants performing Work in a particular Phase, who, working backwards from the most current approved Achievement Events, create collaborative Lean Phase schedules indicating when their portion of the Work will be completed. Direct communications among Project Participants allows the various parties to make reliable promises to each other, and specifically discuss and negotiate the hand-off criteria or other conditions of satisfaction that are mutually understood and agreed upon, which the Project Participants will memorialize in the Lean Phase Plans.

5.3 Work Plans. As part of developing Lean Phase Plans, the PMT, in collaboration with the PITs, will establish a work plan to review upcoming design and construction performance requirements and establish the frequency of look ahead meetings and work plan schedules. The work plan schedules will document all Work performed during the prior week's period and project Work to be performed during the upcoming week(s). The work plans are to be used as a working tool to reflect commitments made in look ahead meetings, evaluate any upcoming constraints or schedule slippages, identify workable backlog and collaborate on methods for labor efficiency. Work flow will be scheduled to optimize the flow of Work through the Project and reduce bottlenecks and activities that will not advance the Contract Time or other Achievement Events.

6. OWNER'S SEPARATE CONSULTANTS AND CONTRACTORS

6.1 Owner's Separate Contractors and Separate Consultants. Owner may Separate Contractors or Separate Consultants to perform work and services that are related to Work being performed under the Agreement. Owner is responsible for the timeliness and quality of the work and services of Owner's Separate Consultants and Owner's Separate Contractors. The Parties will coordinate their Work with the work and services of Owner's Separate Consultants and Owner's Separate Contractors and will accommodate the storage of materials and equipment, work and services of Owner's Separate Consultants and Owner's Separate Contractors to effect smooth and efficient workflow and integrated work product. The Contractor will include Owner's Separate Consultants and Contractors in scheduling, conflict resolution, and site safety programs. Owner's Separate Contractors and Separate Consultants will remain responsible and liable for all safety violations arising from their respective work.

6.2 Execution. If the execution or result of any part of the Construction Work depends upon any work of Owner's Separate Contractor, each Builder will, prior to execution of its Construction Work, inspect and promptly report to the Contractor and Owner, in writing, any apparent discrepancies or defects in the Separate Contractor's work that render it unsuitable for the proper execution of the Construction Work. Failure of any Builder to inspect and report deficiencies or defects in a Separate Contractor's work constitutes an acceptance of Owner's Separate Contractor's work as fit and proper to receive the subsequent Construction Work, except for defects that may develop in Owner's Separate Contractor's work after completion of the Construction Work which the Builder could not have reasonably discovered by inspection. The Builders will cooperate with Owner in resolution of any disputes or claims that may arise between a Builder and an Owner's Separate Contractor. All Project related disputes among any of the Parties, and Standard Consultants or Standard Subcontractors will be resolved in accordance with Article 16 of the Agreement. To the extent that the Builder is unable to recover from Owner's Separate Contractor, Owner will be responsible.

7. TESTING AND INSPECTIONS

7.1 Notice and Preparation for Inspections. Tests, inspections, and approvals of portions of the Construction Work required by the Contract Documents, or by Applicable Law will be coordinated by the Contractor. When portions of the Project are ready for third party inspection, the Contractor will make arrangements for tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the PMT or with the appropriate Governmental Authority having jurisdiction over the Project. The Contractor will provide the PMT and Governmental Authority not less than 48 hours' notice of when and where tests and inspections are to be made so that the appropriate parties may be present for the procedures. The Builders will provide any labor necessary to make their Construction Work ready for inspection, including labor necessary to uncover and re-cover their Construction Work. The Builders, if applicable, will provide any labor necessary to make their material or equipment ready for inspection.

7.2 Cost of Inspections. The cost of inspections is a Chargeable Cost for the Builders, including costs associated with required re-inspection of that Work. However, Standard Subcontractors will bear all costs associated with re-inspection if the re-inspection is caused by the negligence of the Standard Subcontractor or because the Construction Work was not ready for inspection.

7.3 Covered Work Prior to Inspection. If a portion of the Construction Work is covered prior to inspection by the proper Governmental Authorities specifically expressed in the Contract Documents, it will be uncovered for inspection and examination by the required Governmental Authorities with jurisdiction over the Project, and be replaced without change in the Target Cost or Contract Time.

8. NON-CONFORMING WORK

8.1 Rejection of Work. Owner will reject Construction Work that is not in conformance with the Contract Documents.

8.2 Cost of Correction. Non-conforming Construction Work must be promptly corrected, repaired, or replaced. Correction of non-conforming Construction Work that was performed or installed by a Standard Subcontractor will be remedied at the Standard Subcontractor's own expense. If not promptly corrected, repaired, or replaced, Owner or applicable Builder may correct the non-conforming Construction Work and back-charge the Standard Subcontractor. Correction of non-conforming Construction Work prior to Final Completion that was performed or installed by a Builder is a Chargeable Cost.

8.3 No Waiver. Neither Owner's failure to note non-conforming Construction Work prior to Project Final Completion, nor its Final Payment under this Agreement will waive any claim by Owner for correction of non-conforming Construction Work.

9. SAFETY PRECAUTIONS AND PROGRAMS

9.1 Responsibility. The Contractor and Builders have the responsibilities described, as applicable, in Article 4 of the Agreement. Their safety obligations apply continuously and are not limited to normal working hours. Each Builder must take reasonable precautions for safety of, and will provide reasonable protection to prevent damage, injury, or loss to:

9.1.1 Personnel performing Construction Work and other persons who may be affected by the Construction Work;

9.1.2 Materials and equipment to be incorporated into the Project, whether stored on-site or off-site and whether or not under the care, custody, or control of the Builder, its subcontractors, or lower-tier-subcontractors; and

9.1.3 Other property at or adjacent to the site, such as structures and utilities, not designated for removal, relocation, or replacement in the course of construction.

9.2 Safety Program and Safety Manager. The Contractor will develop a written safety program applicable to this Project Site and will designate a director of safety. The director of safety will be responsible for conducting regular site safety meetings for all Project Participants and for monitoring compliance with the safety program.

9.3 Safety Notices. The Builders will give notices and comply with Applicable Laws, ordinances, rules, regulations, and lawful orders of Governmental Authorities bearing on safety of persons or property or their protection from damage, injury, or loss.

9.4 Safety Meetings. During the Construction Phase, Contractor will hold safety meetings with the Builders and subcontractors to review compliance with the health and safety program.

9.5 **Safety Inspections**. Builders will conduct jobsite inspections to verify that the Construction Work is being performed in a safe and workmanlike manner and in accordance with the health and safety program. Builders will provide written notice to their subcontractors demanding immediate correction of any known safety violation. Builders will also notify Owner of any known safety violations of its Separate Contractors.

9.6 **Emergencies.** In an emergency affecting safety of persons or property, the Builders may act, at their discretion, to prevent or mitigate threatened damage, injury, or loss. Any additional compensation or extension of Contract Time claimed by the Builders on account of an emergency will be determined by the PMT.

9.7 **Accidents.** The Contractor must promptly report, in writing, and as required in the UCIP manual, all accidents arising out of, or in connection with, the Construction Work that result in death, personal injury or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident must be reported immediately by telephone or messenger to the PMT and to all applicable Governmental Authorities.

9.8 **Fines and Penalties.** Each Builder is responsible for the payment of all fines levied against it or against Owner arising from or related to violation of safety rules, regulations, or statutes except for safety violations arising from Owner's Separate Contractors' work. These fines and penalties are not Chargeable Costs under the Agreement, unless approved by the PMT.

9.9 **Statutory Requirements.** Nothing in this exhibit is intended to substitute any Party's obligation under the *Workers Compensation Act*, RSBC 2019 c 1, or regulations thereunder.

10. PROTECTION OF SITE AND ADJACENT PROPERTIES

10.1 **Site Utilities.** The Contractor will contact a site utility location service and comply with all Applicable Laws, including, without limitation, any and all notifications, searches, and permits required by any Governmental Authorities, before any excavating at the Project Site and the Builders will not undertake any site activities that could damage utilities until they have been located and marked.

10.2 **Adjacent Properties.** The Contractor will give 48 hours' written notice to the PMT before breaking ground, as well as to any other persons having interests on or near the site, including utility companies, adjacent property owners, relevant landlords, superintendents, inspectors, or those otherwise in charge of property, streets, water pipes, gas pipes, sewer pipes, telephone cables, electric cables, railroads, or otherwise who may be affected by construction operations, so they may remove any obstruction that they are responsible for and have a representative on-site to see that their property is properly protected.

10.3 **Barriers and Warnings.** The Builders will erect and maintain, as required by existing conditions and performance of the Construction Work, all necessary barricades and signage for safety and protection and will notify owners and users of adjacent sites and utilities.

10.4 Water Precautions. If applicable to the Construction Work, the Builder(s) that will perform grading portions of the Work will grade the Project Site as required by the civil design included in the Construction Documents. During construction, the Builders will maintain all of their trenches and excavated areas free from water accumulation and will provide the necessary barriers to protect the Project Site from ponding, running water, and soil erosion. The Builder(s) that will perform grading portions of the Work will provide for increased drainage of storm water and any water that may be applied or discharged on the Project Site during performance of the Construction Work. All drainage facilities will be adequate to prevent damage to the Construction Work, Project Site, and adjacent property. The Builder(s) that will perform grading portions of the Work will construct dikes, if necessary, to divert any increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Construction Work, and to direct water to drainage channels or conduits. The Builder(s) that will perform grading portions of the Work will provide ponding as necessary to prevent downstream flooding.

10.5 Pollution Control. If applicable to the scope of Work, the Contractor and appropriate Builder(s) will work together to prepare a pollution control plan that complies with Applicable Law to prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances and/or soil erosion during construction operations.

10.5.1 No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers without authorization of the receiving sanitary sewer service, and all possible best management practices will be taken to prevent materials from entering into any drain or watercourse.

10.5.2 If dewatering of excavations is required, appropriate Builder(s) will obtain the necessary permits from local Governmental Authorities for discharge of the dewatering effluent. The appropriate Builder(s) will be responsible for assuring that water quality of the discharge meets the appropriate permit requirements prior to any discharge.

10.6 Erosion Control. If applicable to the Construction Work, the appropriate Builder(s) that will perform erosion control portions of the Work will collaborate with the civil engineer during the design process to develop an erosion control plan that is consistent Applicable Law to prevent soil erosion at the Project Site and adjacent property resulting from construction operations. Effective measures will be initiated before commencement of clearing, grading, excavation, or other operations that will disturb the natural protection.

10.6.1 Erosion and sedimentation control practices will include installation of silt fences, straw wattle, soil stabilization, re-vegetation, and runoff control to limit increases in sediment in storm water runoff, including but not limited to, detention basins, straw bales, silt fences, check dams, geo-fabrics, drainage swales, and sand bag dikes.

10.6.2 The Construction Work will be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation will be preserved to the greatest extent practicable. Temporary storage and construction buildings will be located, and construction traffic routed, to minimize erosion. Temporary fast-

growing vegetation or other suitable ground cover will be provided as necessary to control runoff.

10.7 Traffic Control. Contractor will prepare a traffic control plan in accordance with Applicable Law.

10.7.1 Traffic control will include signs, warning lights, reflectors, barriers, and other necessary safety devices and measures, including sufficient flagmen to direct vehicular traffic through the construction areas. No material or equipment will be stored or parked where it will interfere with the free and safe passage of public traffic.

10.7.2 All traffic associated with construction operations including, without limitation, delivery and mail trucks, will enter through the construction site access gate. Contractor will provide signs directing construction and delivery traffic to this gate and will take all necessary steps to minimize inconvenience to Owner, landlord(s), other tenants/occupants, and the general public throughout the construction process. No driveways or private roads will be blocked without notifying the property owner, and access must be restored during all non-working hours.

10.7.3 Safe access must be maintained for pedestrian traffic throughout any public work area at all times.

10.7.4 At least one lane of traffic in each direction on roads used on the Project must be kept open at all times unless prior approval is provided by the PMT and any affected Governmental Authorities. No roads will be blocked or made inaccessible without prior consent of the PMT and the affected Governmental Authorities. Under no circumstances will Builders block or obstruct fire lanes.

10.8 Security. Each Party will be responsible for the security of its workers and their tools, materials and equipment located on and moving to and from the jobsite. All tools and equipment belonging to Parties and their Representatives must be clearly identified as such. Parties' responsibility for Work in progress and materials and equipment required for the performance of its obligations under this Agreement will include without limitation the following:

10.8.1 Receiving, unloading, inspecting, and storing materials and equipment in a secure place and in a manner subject to Owner's review and approval. Storage of materials and equipment subject to degradation by the elements must be in weather tight enclosures;

10.8.2 Delivering from storage to the jobsite all required materials and equipment; and

10.8.3 Maintaining complete and accurate records, to be made available for Owner's review, of all materials and equipment received, stored and issued for use in performance of the Work.

10.9 Loss, Theft, or Damage. Parties will perform their obligations under this Agreement in a manner so as to avoid exposure to the risk of loss, theft, or damage by vandalism, sabotage, or any other means to any Work, materials and equipment, or other property at the jobsite. Parties will inspect all Work and materials and equipment to determine whether any conditions exist that might involve exposure to such risks and, to the extent such conditions exist, will immediately correct such conditions. Parties will not be entitled to any extension of time or additional compensation on account of Parties' failure to protect any materials and equipment or Work in progress.

10.10 Approvals and Authorizations. Parties must plan and conduct their operations and perform the Work so as not to do any of the following unless and until all required approvals and authorizations have been obtained:

10.10.1 Damage, close, or obstruct any utility installation, highway, road, or other property;

10.10.2 Disrupt or otherwise interfere with the operation of any pipeline, communication cable, electric transmission line, or structure; or

10.10.3 Damage or destroy vegetation, trees, plants, shrubs, grass, or any cultivated or planted areas on or adjacent to the jobsite including damage caused by operation of equipment or stockpiling of materials.

11. PERMITS AND FEES

11.1 Permits and Fees. The Contractor will secure and pay for the overall building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Construction Work and that are not otherwise the responsibility of another Builder or subcontractor. The other Builders and subcontractors will be responsible for securing and paying for their individual trade specific permits, licenses, and inspections. Owner will be responsible for any permits or approvals required of Owner by Applicable Laws in order to develop the Project, and the other Parties will provide any necessary assistance. Permits, fees, and inspections are Chargeable Costs, other than those paid directly by Owner.

12. HAZARDOUS MATERIALS

12.1 Pre-existing Hazardous Conditions. Except to the extent remediation of existing Hazardous Materials is included in a Builder's scope of work, Owner is responsible for all Hazardous Materials existing at the Project Site prior to commencement of the Construction Work and will separately contract for the remediation of pre-existing Hazardous Materials. Owner will indemnify, defend and hold harmless the other Parties from any claims, damages, and liability to the extent arising from those pre-existing Hazardous Materials. Notwithstanding the above, each Builder will defend, indemnify, and hold harmless Owner and the other Parties from any claims, demands, and liability to the extent arising from that Builder's negligent handling, transporting, treating or disturbing of pre-existing Hazardous Materials, as well as any Hazardous Materials brought onto the Project Site by that Builder or any of its subcontractors or suppliers.

12.2 Introduction of Hazardous Materials. Unless specifically required by the Contract Documents, or reasonably required by the construction process, the Builders may not use, introduce to the Project Site, or incorporate into the Project any Hazardous Materials. If Hazardous Materials are specifically required by the Contract Documents, the Builders will take all necessary precautions to protect workers and the public from deleterious exposure to the Hazardous Materials and will properly and lawfully dispose of any residual Hazardous Materials.

12.3 Reporting of Hazardous Materials Release. If Hazardous Materials are released at or from the Project Site, the observing Builder will immediately notify the PMT and the Contractor will timely notify all Governmental Authorities having jurisdiction over the release.

13. CLEANING UP AND RECYCLING

13.1 Material Recycling. Builders and their subcontractors will comply with any municipal code standards regarding reduction of the amount of waste material generated during construction and reuse/recycle materials where possible. The Project Requirements may impose other green building standards on the Project. The Builders and their subcontractors must comply with any Applicable Laws regarding reduction of the amount of waste material generated during construction and reuse and recycle of construction materials.

13.2 Cleaning Up. Builders will keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Agreement. At completion of their Construction Work, the Builders are responsible for lawfully removing and disposing of waste materials, rubbish, construction tools and equipment, machinery and surplus materials from and about the Project. If the Builders fail to clean up as provided in the Contract Documents, Owner may do so and the cost associated with the clean-up will be allocated by Owner among the Builders without increase to the Target Cost.

14. LEAN PRINCIPLES

14.1 Lean Construction. To the extent directed by the PMT, the Parties will utilize Lean principles and techniques as developed or defined by the Lean Construction Institute™ and as generally identified below.

14.2 Open Communication. Communication is open, clear, and direct. It is important that all Parties be apprised of information that affects their performance or which they can impact. Whenever possible, communication should be directly between the immediate participants through the most expeditious manner, with information or decisions documented and made available to Project Participants. The goal of communication in Lean is to assure that all Project Participants have a high level of common understanding.

14.3 Collaboration. The Parties will freely share concepts and ideas with other Project Participants to improve the overall Project outcome. Within the limits of licensing or professional registration, the Parties will review the Work of other Project Participants and recommend improvements and will openly consider suggestions from other Project Participants regarding the individual Party's Work. Nothing in this paragraph changes a Party's responsibility for its scope of Work or requires the Party to assume responsibility for the Work of others or to engage in Work that requires licensure beyond that required to perform its respective scope of Work.

14.4 Reliable Promising. Effective Project planning requires that each Project Participant clearly communicates its needs and must provide reliable promises to other Project Participants with regard to its own performance. If a Project Participant discovers that it will not achieve a promise, it must immediately inform the PMT identifying when it can perform, and any impediments to its performance.

14.5 Commitment-Based (Pull) Scheduling. The Achievement Events will be collaboratively developed by the Project Participants based on Owner schedule requirements and realistic durations agreed by those who are primarily responsible for delivering the information, services, or materials for various components of the Project. In making detailed work plans for accomplishing the various Achievement Events, Project Participants will use a planning system based on requests and commitments by Project Participants to each other for information, materials, or resources that the requester needs to accomplish its task by a certain time. This optimizes the flow of Work through the Project by increasing schedule reliability and reducing bottlenecks and activity that does not facilitate achievement of the Achievement Events.

14.6 Elimination of Waste. Design or construction effort that does not add value is waste and should be reduced or eliminated. Design effort that is not necessary for construction or for regulatory purposes, should be avoided. Similarly, construction resources and materials that are not incorporated into the completed Project should be reduced or eliminated. The Project Participants will maximize the use of just-in-time delivery of materials and information to reduce waste associated with maintaining inventories.

14.7 Quality and Reduction in Rework. Quality is created through careful work, not by inspection and rejection. The Project team will consider innovative ways to design Work that reduces the risk of installation errors. Each Project Participant must strive to accurately complete its Work and should identify any Work that does not meet the Project requirements, so that necessary corrections can be identified and executed before, or at the time, the Work is being performed. Project Participants should strive to eliminate rework. Contractor will collaborate with the Builders and subcontractors to develop clear and effective procedures for a trade to hand off its work to follow-on trades so that any quality deviations are caught early.

14.8 Best Person. Work is performed, to the greatest extent possible, by the organization or individual best capable of performing that Work.

14.9 Value of Ideas, not Status of Author. Open communication and collaboration leads to the development of new ideas and concepts. Good ideas can come from any team member and it is the value of the ideas, not the role or status of the author, that determines whether an idea or concept will be used.

14.10 Optimize the Whole Project, not its Components. Under the leadership of the PMT, each Project Participant will focus efforts on creating value for the Project as a whole within the Project Requirements. Efforts to optimize any individual team member's portion of the Work must benefit the entire Project to be justifiable.

14.11 Continuous Improvement. Lessons learned are generated continuously and used to guide and improve processes while the Project is underway rather than only at its conclusion.

END OF EXHIBIT

Integrated Project Delivery Agreement
EXHIBIT L-1 Owner Provided Insurance

1. OVERVIEW

Owner will obtain the insurance coverages specified in this Exhibit L-1. All policies will be issued by underwriters licensed to conduct business in British Columbia. All policy limits may be satisfied by any combination of primary, excess and umbrella limits. If deductibles, self-insured retentions are incurred prior to Final Completion, they are deemed Chargeable Costs under the Agreement for the purpose of calculating Final Actual Cost. If deductibles, self-insured retentions or retained loss are incurred after Final Completion, they are not Chargeable Costs but are paid by the insured party or parties directly benefiting from the insurance.

2. WRAP UP INSURANCE

2.1 General.

Owner will obtain Commercial General Liability insurance that jointly names as insureds Owner, Builder, Standard Subcontractors, Designers, Standard Subcontractors and Project Managers, if any.

2.2 Term.

The policy will be carried from the date of commencement of the work until 24 months from the date of Substantial Performance of the Project.

2.3 Scope.

The insurance coverage will be on an occurrence bases and at least as comprehensive as the insurance provided by IBC Form 2100 and IBC Form 2320. The insurance will be primary and non-contributing with any other insurance carried by Owner, Builders or Designers. The policy will include an extension for a standard provincial and territorial form of non-owned automobile liability policy.

2.3.1 This policy shall include but not be limited to:

(a) Cross-liability and severability of interest

(b) Blanket Contractual

(c) Products and Completed Operations

(d) Premises and Operations Liability

(e) Personal Injury Liability

(f) Contingent Employers Liability

(g) Owners and Contractors Protective

(h) Broad Form Property Damage

(i) Firefighting Expenses

(j) Elevator and Hoist Liability

(k) Attached Machinery – while loading and unloading

2.3.2 If applicable to the Project, coverage will also include shoring, blasting, excavation underpinning, demolition, pile driving, caisson work and work below ground surface including tunneling and grading.

2.3.3 If the work involves asbestos removal, the policy will either provide coverage for this exposure or coverage will be provided through a professional liability policy.

2.4 Liability Limits and Deductibles

Type	Liability Limit[1]	Aggregate Liability	Maximum Deductible
Wrap Up Liability	$10,000,000	$10,000,000	$25,000
Non Owned Automobile Liability	$10,000,000	$10,000,000	$5,000
Unmanned Aerial Vehicle (if used)	$5,000,000	$5,000,000	$1,000
Sudden and Accidental Pollution Liability Sub Limit	$5,000,000	$5,000,000	$25,000
[1]Liability limits are per occurrence, per accident, or per claim, as applicable.			

2.5 Cooperation

Builders, Designers, Standard Subcontractors and Standard Subconsultant will comply with reasonable requirements of the Wrap-Up insurer or insurers regarding, record keeping, reporting of accidents and occurrences, complying with safety programs, and cooperation in the investigation and defence of claims.

3. BUILDERS' RISK INSURANCE

Owner will obtain Broad Form Builders' Risk property insurance in the joint names of the Owner, Builders and Standard Subcontractors.

3.1 Policy Limit

The policy limit will be 1.1 times the sum of the estimated Chargeable Costs of the Builders, contingency associates with the estimated Chargeable Costs and their respective Stipulated Profits at the time the Target Cost is set. If the estimated Chargeable Costs and Stipulated Profits is reduced during the Project, Owner may reduce the policy limit proportionally.

3.2 Scope

The insurance coverages will not be substantially less than the insurance provided by IBC Forms 4042 and 4047 in effect at the time the Target Cost is set. The policy will include permission of occupancy for the purpose intended prior to completion.

3.3 Term

The Builder's Risk insurance will be provided from the commencement of Construction Work until 10 days after Substantial Performance of the Project until the earliest of:

3.3.1 10 calendar days after the date Substantial Performance of the Project is achieved;

3.3.2 Upon conclusion of 30 consecutive calendar days during which the Project has been left unattended; or

3.3.3 Upon conclusion of 30 consecutive calendar days during which no construction activity occurred.

3.4 Loss and Adjustment

3.4.1 Cooperation

If a loss or damage occurs, Builders and Designers will assist Owner in providing evidence and adjustment of the loss or damage. Owner, at is sole option, may designate Builders or Designers, or some of them, to present and support the Builders' Risk claim.

3.4.2 Payment of Proceeds and Adjustment of Target Cost

(a) Net Payment

The Net Payment is the actual proceeds received from the Builders' Risk insurer less Owner's (or the parties designated by Owner) reasonable cost of presenting, prosecuting, and adjusting the claim and less the deductible or retained loss, if any.

(b) Payment

The policy will provide that payment will be made to Owner, on its behalf and on behalf of the Builders, Designers, Standard Subcontractors and Standard Subconsultants, as their interest appear. Builders, Designers, Standard Subcontractors and Standard Subconsultants agree that if the Target Price is increased by the Net Payment, then Owner will retain the full Net Payment which will be used to pay Chargeable Costs as they are incurred. However, if any portion of the Net Proceeds is paid directly to a Builder, Designer, Standard Subcontractor or Standard Subconsultant then the increase in Target Price, if any, will exclude the amount of the insurance proceeds not paid to the Owner.

4. BOILER AND MACHINERY/EQUIPMENT BREAKDOWN

Owner will obtain Boiler and Machinery/Equipment Breakdown insurance in the joint names of Owner, Builders, Designers, Subconsultants and Subcontractors with a deductible amount agreed by Owner in consultation with the PMT. The coverage will be maintained from commencement of the Construction Work until 10 calendar days after Substantial Performance.

5. PROJECT SPECIFIC PROFESSIONAL LIABILITY INSURANCE

5.1 Overview

Owner will provide Project Specific Professional Liability (PSPL) Insurance that provides defence and indemnity against claims for negligent acts, errors, or omissions in the performance, or failing to perform, professional services by Designers, Builders, Subconsultants and Subcontractors regarding the Project, subject to the limits, self-insured-retention, conditions, and exclusions of the policy. The policy will be procured on a claims made and reported basis.

5.2 Term, Retroactive Date, and Extended Reporting Period

The PSPL policy term will be no later than the commencement of Construction Work and will continue for ____ years after Substantial Performance of the Work. The policy will have an Extended Reporting Period of ____ years after completion of the policy term and a Retroactive Date no later than the commencement of Design Services under the Agreement.

6. PROJECT SPECIFIC POLLUTION LIABILITY INSURANCE

Owner will obtain and maintain project-specific pollution liability insurance providing coverage for bodily injury, death, and damage to property.

End of Exhibit

Integrated Project Delivery Agreement
EXHIBIT L-2 Contractor Provided Insurance

1. OVERVIEW

Contractor must obtain and maintain the insurance coverages required by this Exhibit. All defined terms have the same meaning as used in the Agreement.

1.1 Term

The insurance coverages must commence no later than the date of execution of the Agreement and continue until completion of the Warranty period. If Professional Liability is required, it must be maintained for 6 years after Substantial Performance.

1.1.1 Completed Operations

Completed operations coverage under Contractor's General Liability policy must continue for 24 months after Substantial Performance.

1.2 Insurers

All insurers providing coverage must be licensed to issue insurance policies in the province where the Project is located and where any Construction Work is performed.

1.3 Stacking of policies

Excess and umbrella policies may be used to achieve the required limits of liability.

1.4 Insurance Amounts are not Limitations

This Exhibit establishes the minimum insurance required by the Agreement, but does not limit, in any way, Contractor's liability under the Agreement or at law, not does it create any limit on Contractor's obligation to indemnify Parties, to the extent required by the Agreement.

1.5 Additional Insureds

Contractor must have the Owner, its officers, directors, and employees added as additional insureds to the insurance policies required by this Exhibit, except Professional Liability, Contractor's Equipment, and Worker's Compensation.

1.6 Waiver of subrogation

Except for professional liability, the insurance provided by Contractor must waive all rights of subrogation against the Additional Insureds in Section 1.5.2 and the Parties to the Agreement, and their officers, directors, partners, and employees.

1.7 Certificates of Insurance

Contractor must provide Owner with certificates evidencing the insurance required by this Exhibit no later than 10 days after execution of the Agreement. The certificate must identify each insurer, its liability limit, whether it is primary, excess or umbrella, the policy

number, the inception date and the renewal or expiration date for the policy. If any policy expires or must be renewed before the Term stated in Section 1.1, Contractor must provide Owner, prior to expiration of any policy, with certificate of insurance evidencing the uninterrupted continuation of coverage required by this Exhibit.

2. LIMITS AND DEDUCTIBLES

The minimum liability limits and the maximum deductible amounts are set forth in Table 1, below.

Table 1: Insurance Limits and Deductibles

Type	Liability Limit[1]	Aggregate Liability	Deductible[2]
General Liability	$10,000,000	$10,000,000	$25,000
Automobile Liability	$10,000,000	$10,000,000	$25,000
Aircraft & Watercraft	$10,000,000	$10,000,000	10,000
Unmanned Aerial Vehicle	$5,000,000	$5,000,000	10,000
Contractor's Pollution Liability	$5,000,000	$5,000,000	25,000
Professional Liability	$10,000,000	$10,000,000	$50,000
[1]Liability limits are per occurrence, per accident, or per claim, as applicable. [2]Self-insured retention for professional liability.			

3. GENERAL LIABILITY

Contractor must obtain and maintain general liability insurance providing coverage equal or better than the coverage afforded by IBC Form 2100 (including an extension for a standard provincial and territorial form of non-owned automobile liability policy) and IBC Form 2320. The policy must provide coverage for completed operations for the period defined in Section 1.1.1.

If Owner provides wrap-up insurance providing general liability coverage for Contractor, Contractor's insurance will be excess of the wrap-up insurance, if the wrap-up insurance and contractor's insurance co-insure, but will be primary in all instances where the wrap-up insurance does not provide coverage for an occurrence or accident.

4. AUTOMOBILE LIABILITY

Contractor must obtain and maintain automobile liability insurance for all vehicles that are owned or leased by Contractor that are required by law to be insured under a contract by a Motor Vehicle Liability Policy. The policy must provide coverage for bodily injury, death, and damage to property. If the policy has been issued pursuant to a government-operated automobile insurance system, the Contractor must provide the Owner with confirmation of automobile insurance coverage for all automobiles registered in Contractor's name.

5. AIRCRAFT AND WATERCRAFT LIABILTIY

If aircraft or watercraft are directly or indirectly used in the performance of the Construction Work, Contractor must obtain and maintain aircraft and watercraft liability for owned and non-owned aircraft or watercraft for bodily injury, death, and damage to property, including loss of use, with limits and deductibles as set forth in Table 1. The aircraft passenger hazard limit

must be equal to the liability limit. Aircraft and Watercraft Liability insurance must be in a form acceptable to Owner.

6. UNMANNED AERIAL VEHICLE LIABILITY

If unmanned aerial vehicles (UAV) are directly or indirectly used in the performance of the Construction work, Contractor must obtain for owned and non-owned UAVs insurance for bodily injury, death, and damage to property, including loss of use, with limits and deductibles as set forth in Table 1.

7. CONTRACTOR'S POLLUTION LIABILITY INSURANCE

Contractor must obtain and maintain contractor's pollution liability insurance providing coverage for bodily injury, death, and damage to property.

8. CONTRACTOR'S EQUIPMENT INSURANCE

Contractor acknowledges that Owner's insurance does not provide coverage to Contractor for loss or damage to its equipment and Contractor waives any claim against Owner for these losses. Contractor represents that it has or will obtain contractor's equipment insurance coverage on an "all risks" basis that does not allow subrogation claims by the insurer against the Owner.

9. PROFESSIONAL LIABILITY

If Contractor's work scope includes design as well as construction of specific systems, and Owner does not provide a Project Specific Professional Liability policy, either Contractor, or the subcontractor providing the Design Services, must obtain and maintain professional liability insurance meeting the requirements of Exhibit L-3 and with liability limits, terms, extended reporting period, and self-insured retentions agreed by Owner in writing.

10. SUBCONTRACTORS

Contractor's subcontractors must provide insurance that complies with the provisions of this Exhibit, except that the limits of liability, deductibles or self-insured retentions will be agreed between Owner and Contractor.

11. WORKERS' COMPENSATION

Contractor will, and will require its Subcontractors, to always be in full compliance with all Applicable Laws related to workers compensation at the Project and anywhere that Construction Work is being performed. Except where prohibited by law, Consultant will require insurers to waive all rights of recovery or subrogation against the Owner, its subsidiaries, and affiliated companies, and is and their respective officers, directors, shareholders, employees and agents.

Contractor must indemnify, defend, and hold harmless the Additional Insureds from and against all claims, demands, losses, costs, damages, actions, or proceedings by any employee of Contractor or its subcontractors, or by WorkSafeBC with respect to workers' compensation insurance. This indemnification survives the completion of the Work or the termination, for any reason, of the Agreement.

END OF EXHIBIT

Integrated Project Delivery Agreement
EXHIBIT L-3 Designer Provided Insurance

1. OVERVIEW

Designer must obtain and maintain the insurance coverages required by this Exhibit. All defined terms have the same meaning as used in the Agreement.

1.1 Term

The insurance coverages must commence no later than the date of execution of the Agreement and continue until completion of the Warranty period. If Professional Liability is required, it must be maintained for 6 years after Substantial Performance.

1.1.1 Completed Operations

Completed operations coverage under Designer's General Liability policy must continue for 24 months after Substantial Performance.

1.2 Insurers

All insurers providing coverage must be licensed to issue insurance policies in British Columbia.

1.3 Stacking of policies

Excess and umbrella policies may be used to achieve the required limits of liability.

1.4 Insurance Amounts are not Limitations

This Exhibit establishes the minimum insurance required by the Agreement, but does not limit, in any way, Designer's liability under the Agreement or at law, not does it create any limit on Designer's obligation to indemnify Parties, to the extent required by the Agreement.

1.5 Additional Insureds

Designer must have the Owner, its officers, directors, and employees added as additional insureds to the insurance policies required by this Exhibit, except Professional Liability, Designer's Equipment, and Worker's Compensation.

1.6 Waiver of subrogation

Except for professional liability, the insurance provided by Designer must waive all rights of subrogation against the Additional Insureds in Section 1.5.2 and the Parties to the Agreement, and their officers, directors, partners, and employees.

1.7 Certificates of Insurance

Designer must provide Owner with certificates evidencing the insurance required by this Exhibit no later than 10 days after execution of the Agreement. The certificate must identify each insurer, its liability limit, whether it is primary, excess or umbrella, the policy

number, the inception date and the renewal or expiration date for the policy. If any policy expires or must be renewed before the Term stated in Section 1.1, Designer must provide Owner, prior to expiration of any policy, with certificate of insurance evidencing the uninterrupted continuation of coverage required by this Exhibit.

2. LIMITS AND DEDUCTIBLES

The minimum liability limits and the maximum deductible amounts are set forth in Table 1, below.

Table 1: Insurance Limits and Deductibles

Type	Liability Limit[1]	Aggregate Liability	Deductible[2]
General Liability	$10,000,000	$10,000,000	$25,000
Automobile Liability	$5,000,000	$5,000,000	$25,000
Professional Liability	$10,000,000	$10,000,000	$50,000
[1]Liability limits are per occurrence, per accident, or per claim, as applicable. [2]Self-insured retention for professional liability.			

3. GENERAL LIABILITY

Designer must obtain and maintain general liability insurance providing coverage equal or better than the coverage afforded by IBC Form 2100 (including an extension for a standard provincial and territorial form of non-owned automobile liability policy) and IBC Form 2320. The policy must provide coverage for completed operations for the period defined in Section 1.1.1.

If Owner provides wrap-up insurance providing general liability coverage for Designer, Designer's insurance will be excess of the wrap-up insurance, if the wrap-up insurance and Designer's insurance co-insure, but will be primary in all instances where the wrap-up insurance does not provide coverage for an occurrence or accident.

4. AUTOMOBILE LIABILITY

Designer must obtain and maintain automobile liability insurance for all vehicles that are owned or leased by Designer that are required by law to be insured under a contract by a Motor Vehicle Liability Policy. The policy must provide coverage for bodily injury, death, and damage to property. If the policy has been issued pursuant to a government-operated automobile insurance system, the Designer must provide the Owner with confirmation of automobile insurance coverage for all automobiles registered in Designer's name.

5. PROFESSIONAL LIABILITY

If Owner provides a Project Specific Professional Liability Policy (PSPL) that insures Designer and its Subconsultants against claims arising from negligent acts, errors, and omissions in their performance of professional services for the Project, then Designer and its Subconsultants need not provide professional liability insurance for this Project. If they choose to have professional liability insurance in addition to the PSPL, they may do so, but at their sole cost.

If Owner does not provide a PSPL, Designer and its Subconsultants must obtain and maintain professional liability insurance with the minimum liability limits and maximum self-insured

retentions specified in this Exhibit. The professional liability insurance must have a retroactive date that precedes any Design Services for this Project and an extended reporting period of at least 30 days after policy expiration. If the professional liability policy expires during pendency of the Project, or for a period of 6 years after Final Completion, Designer and its Subconsultants must renew or replace the professional liability policy with a policy of equivalent terms, retroactive date, liability limits and self-insured retentions to assure continuous coverage from inception of Design Services through 6 years after Final Completion.

6. SUBCONSULTANTS

Designer's Subconsultants must provide insurance that complies with the provisions of this Exhibit, except that the limits of liability, deductibles or self-insured retentions will be agreed between Owner and Designer.

Table 2: Subconsultant Insurance

Type	Liability Limit[1]	Aggregate Liability	Deductible[2]
General Liability	10,000,000	10,000,000	25,000
Automobile Liability	10,000,000	10,000,000	25,000
Professional Liability	5,000,000	5,000,000	50,000

[1]Liability limits are per occurrence, per accident, or per claim, as applicable.
[2]Self-insured retention for professional liability.

7. WORKERS' COMPENSATION

Designer will, and will require its subcontractors, to always be in full compliance with all Applicable Laws related to workers compensation at the Project and anywhere that Design Services are being performed. Except where prohibited by law, Designer will require insurers to waive all rights of recovery or subrogation against the Owner, its subsidiaries, and affiliated companies, and is and their respective officers, directors, shareholders, employees and agents.

Designer must indemnify, defend, and hold harmless the Additional Insureds from and against all claims, demands, losses, costs, damages, actions, or proceedings by any employee of Designer or its subcontractors, or by WorkSafeBC with respect to workers' compensation insurance. This indemnification survives the completion of the Work or the termination, for any reason, of the Agreement.

END OF EXHIBIT

Integrated Project Delivery Agreement
Exhibit M – Key Employees

Company	Title	Name

[END OF EXHIBIT]

Integrated Project Delivery Agreement
Exhibit N – Project Roster

Integrated Project Delivery Agreement
Exhibit E – Builder Chargeable Costs

1. DEFINITIONS

1.1 Billable Rates. Billable rates are the hourly rates that a Builder may charge for its Hourly Employees and Salaried Employees, as applicable, consistent with this Exhibit E and listed in the Builder's individual Exhibit E-1.

1.2 Stipulated Overhead Rate. A rate agreed to between Builder and Owner that compensates Builder for all of its Indirect Costs (except for Indirect Costs related to its shop or fabrication facilities, if any) and that is, depending on the option specified in the Business Terms Sheet, either included in Builder's Billable Rates, or applied to the Builder's Chargeable Costs.

1.3 Shop Overhead Rate. A rate agreed between Builder and Owner that compensates Builder for all of its Indirect Costs related to its shop or fabrication facilities and, if used, is included in the Billable Rates for Builder's shop personnel.

1.4 Direct Salary Expense ("DSE"). DSE is the amount actually paid by the Builder to an employee, exclusive of bonuses and profit sharing, and before any federal income tax, employment insurance, Canada Pension Plan withholdings or equivalent provincial taxes or withholdings.

1.5 Base Hourly Wage Rate ("BHWR").

1.5.1 For Hourly Employees. The Base Hourly Wage Rate for Hourly Employees is the amount of DSE paid to the employee per working hour for non-overtime work.

1.5.2 For Salaried Employees. The Base Hourly Wage Rate for Salaried Employees is the amount of the employee's annual DSE divided by 2,080 hours.

1.6 Direct Personnel Expense ("DPE"). DPE is the Builder's contribution to the mandatory benefits provided to its Hourly Employees and Salaried Employees.

1.6.1 For employees who are subject to a collective bargaining agreement, DPE shall only include those benefits the Builder is required to pay on behalf of the employees pursuant to the collective bargaining agreement.

1.6.2 For employees who are not subject to a collective bargaining agreement, DPE shall only include employment taxes, statutory employee benefits including workers' compensation insurance (net of premium discounts, dividends or rebates), and group insurance, (including health, dental, term life and accidental death and dismemberment insurance, all net of employee contributions), sick pay, holidays, vacation actually earned and accrued, employer contributions to employee savings plans, and pension and profit sharing plans that are nondiscretionary, requiring equal distribution of benefits.

1.6.3 DPE does not include any charge for severance pay, tuition reimbursement, employee training, employee morale programs, employee bonuses, executive bonuses, provision of, or reimbursement for automobiles, computers, software, cellular phones and internet or telephone charges, liability insurance of any kind, or any non-mandatory employer contribution to employee compensation.

1.7 Direct Personnel Expense Multiplier ("DPEM"). DPEM is a multiplier, that when multiplied by an employee's BHWR, calculates the amount of DPE allocated to an hour of the employee's work.

Example				
BHWR	*	DPEM	=	DPE
$60	*	0.25	=	$15

1.8 Direct Costs. As defined in Section 2.1, below.

1.9 Indirect Costs. As defined in Section 2.2, below.

1.10 Chargeable Costs. As calculated in Article 2, below.

1.11 Hourly Employees. A Builder's employees that are directly engaged in the performance of Work on the Project that are non-salaried and whose compensation is paid on an hourly basis.

1.12 Salaried Employees. A Builder's employees that are directly engaged in the performance of Work on the Project that are paid a salary and whose compensation is not paid on an hourly basis.

2. CHARGEABLE COSTS. Builders' Chargeable Costs only include Builder's Direct Costs and Indirect Costs directly related to performing Work for the Project, but do not include profit. All Builder Chargeable Costs are actual costs, without markup and are net of any credits, including input tax discounts or rebates.

2.1 Direct Costs. Builder's Direct Costs are the following:

2.1.1 Labor Cost. The cost of Builder's employees directly performing work on the Project calculated for each employee as follows:

Example				
BHWR	+	(BHWR * DPEM)	=	Labor Cost
$60	+	($60 * 0.25)	=	$75

2.1.2 Materials and Equipment Incorporated into the Project.

(a) Materials and Equipment. Costs, including transportation and storage, of materials and equipment incorporated or to be incorporated into the Project that are either delivered to the Project Site or suitably stored off-site at a mutually acceptable location, if pre-approved by the PMT and fully insured against loss or damage. Purchases or costs from any Builder affiliated entities, divisions, groups, etc. for materials, equipment, and other costs will be billed at the actual and auditable cost incurred by those affiliated entities, divisions, groups, etc., except as pre-approved by the PMT.

(b) Waste and Spoilage. Costs of materials described in Section 2.1.2(a) of this exhibit in excess of those actually incorporated into the Project to allow for reasonable waste and spoilage. Unused excess materials, if any, will become Owner's property at Final Completion or, at Owner's option, will be sold by the Builder and credited against the final cost of the Project.

2.1.3 Subcontracted Work and Services. The actual cost, net of any credits, discounts or rebates, paid by Builder to a subcontractor, subconsultant, supplier, vendor, inspector or permitting agency, that is not owned by or affiliated with Builder, for performance of Work necessary for the Project.

2.1.4 General Requirements.

(a) On-Site Temporary Facilities & Services. Costs for Builder's on-site office or big room and temporary facilities (including trailers, power, water, sanitary, utilities, telephone, internet), on-site security, on-site temporary protection and barricades (including fences, signage and traffic control), on-site temporary office furniture and equipment (including cost of computers and software purchased specifically for this Project with the concurrence of the PMT and inclusive of all variable software, applications, systems, and support costs directly related to this Project); postage and parcel delivery charges; and on-site devices, servers, printers, copiers, plotters, facsimile transmissions and long-distance telephone calls, including costs of transportation, installation, minor repairs and replacements, dismantling and removal thereof. Any equipment or materials purchased and charged to the Project will remain the property of Owner at the end of its usage.

(b) Temporary Materials and Equipment. Costs, including transportation and storage, installation, maintenance, dismantling and removal of construction materials, supplies, machinery, equipment, and small tools over $500 not customarily owned by the construction workers, that are provided by the Builder at the site (but not incorporated into the Project) and fully consumed in the performance of the construction work. If items are not fully consumed, the cost less salvage value, whether sold to others or retained by the Builder, will be included. Salvage value will be the

fair market value or actual value received. The cost of small tools under $500 will not be reimbursable as part of Builder's Direct Cost, but should be included in the Builder's Indirect Costs.

(c) Third Party Rental Expenses. Rental charges for non-affiliated third-party equipment will be considered reimbursable and will be reimbursed at actual costs, as long as rental rates are consistent with those prevailing in the locality. Such equipment will be exclusive of small tools, and limited to the direct costs of transportation, delivery, installation, dismantling, removal, and maintenance. Rental charges will be equitably prorated if the foregoing equipment is not exclusively devoted to the Project.

(d) Builder Owned Rental Expenses. For rental charges for items described in Section 2.1.4(c) of this exhibit that are rented from the Builder or an affiliate of the Builder, the aggregate rental amounts (exclusive of all installation, maintenance, dismantling, removal, transportation, and delivery costs) for any one piece of equipment cannot exceed 80% of the purchase price (at the time it is placed in service) during the rental period of the equipment used for this Project. Agreed rates for equipment that is owned by the Builder or an affiliate and rented to the Project are subject to these same terms and must be scheduled in Exhibit F-2. Upon Owner's request, the Builder will present an analysis of an opportunity to purchase rather than rent the item. All purchased items will be a Chargeable Cost and title to the property will vest to Owner upon Final Completion.

2.1.5 Miscellaneous Costs

(a) Taxes. The Goods and Services Tax, imposed under Part IX of the *Excise Tax Act* (Canada) ("GST") imposed by a Governmental Authority, on the Owner, provided that the Builder provides the Owner with the information prescribed by the *Excise Tax Act* (Canada) to allow Owner to claim an input tax credit but for greater certainty, excluding all GST, provincial sales tax, franchise or income based tax or any similar taxes imposed by a Governmental Authority on the Builder.

(b) Insurance. Insurance expenses specifically required of Builder by the Agreement and allocable to this Project. Deductibles are a Chargeable Cost only to the extent specifically provided in Exhibit L-2 and Article 13 of the Agreement.

(c) Permits, Fees, and Assessments. Fees and assessments for the building permit for the Project and for other permits, licenses and inspections that Builder is required to pay under the Agreement. Major permits may be paid by Owner directly.

(d) Testing. Fees of laboratories for tests required by the Agreement.

(e) Fees. License fees paid for the use of a particular design or process required by the Agreement and approved by the PMT.

(f) Recycle & Waste. Costs of removal and disposal of debris from the site and recycle costs not offset by recycle fees or rebates.

(g) Document Reproduction. Costs for blueprinting and other document reproduction necessary for constructing and administrating the Project.

(h) Travel Expenses. All reasonably and actually incurred direct, non-salary, travel-related reimbursable expenses will be billed to Owner at actual cost without markup. Unless otherwise stated in Owner's travel guidelines, all air travel, regardless of domestic or international destination, will be at unrestricted coach class fare or other class, whichever is lowest. Mileage will be reimbursed at the Canada Revenue Agency's published automobile allowance rates for travel by Designer in its own vehicles.

(i) Emergencies & Repairs. Subject to the Agreement, costs incurred in taking action to prevent threatened damage, injury, or loss in case of an emergency that threatens the safety of persons.

2.1.6 Trade Discounts and Surplus. Trade discounts and refunds for Builder purchased material and equipment will be credited against the incurred Chargeable Cost. Sales of surplus materials and equipment will likewise be credited against the Chargeable Costs.

2.1.7 Cost of Repair/Correction. Cost of repairing or correcting Construction Work that is deficiently designed, or damaged or non-conforming Construction Work executed by a Builder , provided that (1) the costs are incurred prior to Final Completion and (2) the damaged or non-conforming work was not intentional or caused by Willful Default. Correction or repair of deficient or non-conforming work that was performed or installed by a Standard Consultant or Standard Subcontractor will be remedied at the a Standard Consultant's or Standard Subcontractor's own expense and is not a Chargeable Cost.

2.1.8 Other Incurred Costs. Other costs incurred by Builder that are necessary for the Project, if approved by the PMT in writing prior to being incurred.

2.2 Indirect Costs or Overhead. Builder's Indirect Costs are the following:

2.2.1 Defined. Builder's Indirect Costs are costs, of any kind, other than Direct Costs and Excluded Costs. Builder's Indirect Costs customarily include the cost of personnel not working directly in connection with the Work; executive salaries; association dues and fees; depreciation on all property, equipment or other assets; payroll processing costs; corporate taxes or fees; business development costs; employee training; all home office infrastructure costs; general administrative personnel costs; risk management costs; interest expense; perquisites such as car allowances,

home office expenses (including without limitation rent, utilities, telephones, faxes, postal charges, and reprographics); software and computer hardware costs; accounting personnel; legal personnel; recruiting costs; field office; cellular telephones and pagers; severance pay, and employee morale programs.

2.2.2 Overhead Rate. If Indirect Costs are paid under option 2.2.3(b) below, the Overhead Rate is a factor only included in the Hourly Employees' or Salaried Employees' Billable Rate (as applicable). If Indirect Costs are paid under option 2.2.3(c) below, the Overhead Rate is a factor applied to the sum of Builder's Chargeable Costs, and not included in the employee's Billable Rate.

2.2.3 Payment. Indirect Costs are paid as Chargeable Costs using one of the following methods selected when the Agreement is executed and indicated on the Business Terms Sheet:

(a) A fixed amount paid in equal monthly installments from execution of the Agreement until Final Completion;

(b) Included with the Builder's Hourly Employees' and Salaried Employees' Billable Rates calculated as (BHWR + (BHWR * DPEM)) * Overhead Rate; or

(c) Applied as an Overhead Rate multiplied by the Builder's Direct Costs incurred during a payment period.

2.2.4 Shop Indirect Costs. Builders that use pre-fabrication or shop facilities to perform portions of the Work may, with the written approval of Owner, have a separate Shop Overhead Rate that applies only to the hourly rate of Builder's employees that directly perform Work in the shop or pre-fabrication facility ("Shop Personnel") such that the Billable Rate of Shop Personnel is calculated as (BHWR + (BHWR * DPEM)) * Shop Overhead Rate.

3. EXCLUDED COSTS

3.1 Direct Costs. The following costs are excluded from Builder's Direct Costs.

3.1.1 Offsite Personnel. Salaries and other compensation of personnel stationed at any office or offices other than the Project Site office or the Contractor's principal office identified in the Notices provision of the Business Terms Sheet, unless otherwise agreed in writing by the PMT.

3.1.2 Offsite Expenses. Expenses related to a firm's principal office and offices other than the Project Site office.

3.1.3 Business Licenses, Permits, and Taxes. All costs of business and/or operating permits, licenses, fees, and taxes required by any local, provincial, or federal Governmental Authorities to enable Builders or their

subcontractors of any tier to be qualified to do business and/or perform their respective portions of the Work.

3.1.4 Costs Not Included In Direct Costs. Any cost not explicitly included as a Direct Cost in Section 2.1 of this exhibit.

3.2 Chargeable Costs. The following costs are excluded from Chargeable Costs, and will not be paid by Owner.

3.2.1 Financing or Cost of Use of Money. Financing costs, cost of use of money, or other capital expenses, including interest on capital employed for the Construction Work.

3.2.2 Bonuses and Incentive Programs. Employee bonuses or incentive program payments regardless of whether personnel are specifically assigned to this Project because these costs are carried in Contractor's Indirect Costs.

3.2.3 Fraud and Willful Default. Any cost resulting from fraud, Willful Default, or willful misconduct.

3.2.4 Stale Invoices. Work performed 75 days or more before the submittal date of the invoice to Owner, unless prior written approval is obtained from the PMT.

3.2.5 Costs incurred after Project Final Completion. Costs incurred for the Work after Project Final Completion.

END OF EXHIBIT

Associated Engineering | 75 YEARS

CONCEPT REPORT

Regional District of Nanaimo

Departure Bay Pump Station Upgrade Study

SEPTEMBER 2021

EXECUTIVE SUMMARY

Introduction

The Departure Bay Pump Station (DBPS) is owned and operated by the Regional District of Nanaimo (RDN). The DBPS is a wastewater pump station located at Departure Bay, within the City of Nanaimo. The DBPS is in its fifth decade of operation and has some underlying challenges; these challenges justify the consideration of a significant upgrade.

The RDN has engaged Associated Engineering (AE) to undertake an upgrade study for the DBPS. The study focuses on three primary drivers for the upgrade, as follows:

1. Capacity requirements;
2. Climate Change and Flood Risk;
3. Compliance with codes, regulations, and engineering best practices.

Overview of the DBPS

The DBPS is a critical piece of infrastructure in the RDN's wastewater system, as it handles approximately 75% of the wastewater flow to the Greater Nanaimo Pollution Control Centre (GNPCC). Failure of the station results in discharges of wastewater into Departure Bay at the Brechin Point overflow. The wastewater pumped from the DBPS flows through the Departure Bay Pipeline to the GNPCC. The four-kilometer alignment consists of a forcemain and gravity sewer.

The DBPS is split into a superstructure and a substructure. The superstructure provides space for equipment and spare parts storage as well as the necessary access into the substructure. The substructure is a multi-level concrete structure that consists of both a wet well and a dry well.

The lower-level Pump Floor houses the four wastewater pumps, suction pipes, discharge piping, valves and forcemain. The original pumps are Worthington model 10CFA-2. The "firm capacity" of the station (with the largest unit out of service) is 950 L/s.

The Motor Floor is located on an intermediate level between the Pump Floor and ground level. The Motor Floor contains the motors for all four pumps. This includes the motor drives for Pumps #1 through #3 and the combination drive for Pump #4. The diesel engine for Pump #4 is located in the southeast corner of the Motor Floor in the Diesel Room. The Motor Floor also houses much of the electrical and controls infrastructure. This includes the original eddy current drives for Pumps #2 through #3, the variable-frequency drive (VFD) for Pump #1, and the Motor Control Centre (MCC).

The wet well is split into two symmetrical sides. Each side can be isolated using gate valves that must be actuated above grade. There are two pump bays on each side, for a total of four pump bays. The approximate combined active storage volume of the wet well is 250 m^3.

Design Basis for Upgrades

The design criteria for the DBPS Upgrades can be summarized as follows:

- Flow Capacity
  - The full build-out flow capacity design basis for the upgrades is 1955 L/s. This value is based on InfoSWMM modeling of the Nanaimo Interceptor performed by GeoAdvice for the year 2073.
- Target Flood Design Level
  - The target flood design level (FDL) for the facility was assumed to be 5.41 m (geodetic). The RDN does not have an official flood construction level for the project site at this time. The target FDL represents a conservative design level. The grade of the DBPS at the ground floor is about 1.68 m below the target FDL.
- Regulatory Requirements
  - The regulatory requirements that must be considered in the design include, but, are not limited to, the following:
    - BC Municipal Wastewater Regulation;
    - Hydraulic Institute Standards for Pump Station Design;
    - NFPA 820 and the Canadian Electrical Code;
    - 2018 BC Building Code (BCBC);
    - Local Safety Regulators including WorkSafe BC and Technical Safety BC;
    - Environmental Regulations including the Fisheries Act, Water Sustainability Act, Species at Risk Act, Migratory Birds Convention Act, Wildlife Act, and any applicable municipal bylaws.
- Phased Approach and Constructability:
  - A phased approach to upgrades is preferred to spread out capital spending of major works.
  - Minimizing the need for bypass pumping will be key to keep operation costs low during construction.
  - Future design phases will need to take into account constructability.

Options and Upgrade Approach

Investigations have found that the existing downstream Departure Bay Pipeline has an existing flow capacity limit of approximately 1320 L/s. At flowrates higher than this value, the friction losses within the gravity forcemain would become too great, which would lead to flooding of wastewater at the existing stand pipe. Upgrades to this system are therefore required prior to and/or in parallel with upgrades at the DBPS.

AE developed three system curves for the Departure Bay Pipeline that represent potential alignment options to meet the capacity increase. The options are summarized as follows:

- **Option A** – The stand pipe connecting the forcemain to the gravity sewer along the Departure Bay Pipeline is removed, and the two lines are connected. This option requires the installation of wastewater air valves at the previous stand pipe location.
- **Option B** – The stand pipe is kept by twinning the gravity main (2 x 900 mm lines), thus removing the bottleneck to facilitate higher flow conditions.
- **Option C** – Building off of Option B, the upstream forcemain is also twinned (2 x 900 mm lines) to reduce friction and minor losses in the system.

Note that the RDN also provided a recommendation for an Option D (new forcemain along a marine alignment to Chinook Road). This option is discussed within the Comment Log of **Appendix C**.

Three potential options to mitigate against floods based on the FDL were reviewed. The selected option (Option 3) involves raising the entire superstructure above the FDL to prevent flood waters entering the dry well and wet well. This option was selected because it was deemed to be the most resilient option that has the least risk of failure when compared with the other two options. It should be noted that Option 3 was deemed to have the highest capital costs; however, the reduction in flood and safety risks and low operational requirements could offset the initial capital cost requirements in the long-term.

A site visit found that the existing building and process systems had many vulnerabilities that could fail during a distressing event such as an earthquake or major storm. Failure events could lead to undesirable or irreparable damage to the DBPS. In addition, the general aging of the existing infrastructure at the DBPS poses a risk in terms of reliability. Inherent safety concerns were also noted, including the lack of redundant egress from the lower levels of the DBPS. As a result, it was assumed that a significant upgrade would be needed to incorporate the latest codes and standards.

Phased Approach for Hydraulics and Pump Selection

A phased upgrade approach was developed for the hydraulic and pump design to meet the new capacity:

- **Phase 1**
  - Upgrade three of the existing pumps (Pumps #2, #3 and #4) to larger-capacity pumps. This will provide an increase in capacity to counter the capacity limitations of the existing system.
- **Phase 1a**
  - Twin the gravity sewer line to achieve flows above the existing bottleneck. Phase 1a follows the curve presented as Option B.
  - Complete this work concurrently with, or subsequent to, the Phase 1 upgrades at the DBPS, depending on the actual capacity of the gravity sewer.
- **Phase 1b**
  - Twin the forcemain to get further capacity out of the Phase 1 pumping system by reducing head requirements. Without the need to install any additional pumps, the RDN could get further capacity out of the pumping system by reducing the dynamic losses within the forcemain. Phase 1b follows the curve presented in Option C.
  - Complete Phase 1b prior to installation of additional flow capacity, as velocities through the system would become too high.
- **Phase 2**
  - Install two smaller pumps (replacing Pump #1) to bring the DBPS system to a firm capacity of 1955 L/s.

The conceptual pump selections are summarized in **Table E-1**.

Table E-1
Preliminary Pump Selection

	Model	Rated Power	Impeller Diameter	Rated Speed	No. of New Units in Phase 1	No. of New Units in Phase 2
Large Pump (56 MLD)	Flygt CT 3351/936	765 hp	625 mm	1200 rpm	3 units (Pumps #2, #3 and #4)	0
Small Pump (28 MLD)	Flygt NT 3312/936	385 hp	530 mm	1200 rpm	No units	2 units (Pump #1)

Conceptual Facility Upgrades

The conceptual design is presented in Sections 5 and 6 of this report. The upgrades involve, but are not limited to, the following:

- Ground Floor Elevation will be lifted 1.7 m above grade to combat flooding. This involves the full replacement of the superstructure/building, and bringing the substructure walls up to the new level.
- Extension of the Motor Floor and Ground Floor along the north end of the building. The extension is to allow for the addition of a new enclosed staircase. To comply with BCBC 2018 and safety regulations.
- Structural enhancements to meet seismic design requirements.
- Installation of a new header along the west wall on the Pump Floor. This new header will accommodate flows from the new 56 MLD pumps.
- Relocation of the existing header to make room for a new enclosed staircase.
- New piping and valving for the new upsized pump suction and discharge lines. It is proposed that the level of automation in the pump station be increased with the upgrades.
- Floor modifications on the Pump Floor to facilitate the new suction line assembly for new smaller pumps (Phase 2).
- Installation of new pipe and pump supports, new equipment pads, new crane equipment and restraints, new base for outdoor transformer and switch gear, fuel tank area upgrades, and replacement of grating.
- Retrofit or replacement of the new surge anticipation system. New valves and assembly may be required to meet the capacity increase in the system.
- Replacement of bulk heads that separate the dry well from the wet well to accommodate the larger-diameter suction pipe.
- Replacement of the existing ferric chloride dosing and storage system.
- Minor modifications to wet well to meet additional hydraulic capacity.
- Extension of the grated square openings that exist for pump motor access to facilitate the installation and removal of the new larger-capacity pumps.
- New forced-air HVAC system. Additional cooling and air exhaust will be required in the proposed electrical and generator room.
- General plumbing upgrades throughout the building.
- Retrofit or replacement of the existing odour control system.
- Upgrades to the power distribution system to accommodate new peak power demands. It is anticipated that the power distribution system will need to be upgraded to support a 2500 Amp service at 600 VAC. This will involve the replacement of:
    - The existing unit substation with a 2500 kVA unit substation,
    - The existing genset, and
    - The existing automatic transfer switch.
- The new genset will consist of two or three diesel generators wired in parallel. The generators shall be located within a new generator room, equipped with a new ventilation system.
- New 600 VAC distribution equipment (Motor Control Centre, motor starters, cables and raceway).
- Three 765 HP, normal-duty VFDs, with active harmonic filtering, for flow control (Phase 1). The new VFDs to be located in their own freestanding enclosures/cabinets to reduce the overall space requirements as compared to a single MCC lineup. The existing VFD for Pump #1 to be reused during Phase 1.
- Relocation of identified existing electrical equipment to the Ground Floor in a new dedicated Electrical Room.
- New lighting throughout the building and wet well with energy-efficient light-emitting diode (LED) fixtures.
- Full upgrade to the process control system. This includes the replacement of instrumentation and a new facility PLC control panel.

Opinion of Probable Cost for Phase 1

A Class C opinion of probable cost was prepared for the DBPS Phase 1 Upgrade. The cost estimate summary is presented in **Table E-2**. The total capital works with direct and indirect costs are estimated at $21.3 million.

The cost estimate excludes the necessary upgrade works to the downstream forcemain and gravity sewer. These costs will be significant and need to be considered independently of this assignment.

Table E-2
Opinion of Probable Capital Cost Summary

	Capital Cost
Direct + Indirect Costs	$15,952,000
Contingency (30%)	$4,786,000
Escalation to 2022 (2.5%)	$519,000
Total Project Cost	$21,257,000

Recommendations

AE recommends that the RDN proceed forward with upgrading the capacity of the DBPS to meet current and future demands. Recommendations have been separated into four categories (capacity, climate change, regulatory and planning and financial).

ACKNOWLEDGEMENTS

Associated Engineering would like to thank the Regional District of Nanaimo for their overall management and direction for this phase of the project. We would also like to acknowledge the efforts of the following Regional District of Nanaimo project staff and operational staff for providing background data and operational and maintenance information.

From the engineering team, Gerald St. Pierre (Project Engineer) and Duncan Taylor (Manager of Engineering Services). From operations, Ian Lundman (Superintendent of Wastewater Services) and Robert Skwarcynski (Chief Operator at the Greater Nanaimo Pollution Control Centre (GNPCC)), Jeff Singbeil (Wastewater Operator) and Jeremy Kaye (Senior Instrumentation Technician for Wastewater Services).

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LIST OF ABBREVIATIONS

AE	Associated Engineering
ANSI	American National Standards Institute
BCBC	British Columbia Building Code
BCEC	British Columbia Electrical Code
CEC	Canadian Electrical Code
CSA	Canadian Standard Association
DBPS	Departure Bay Pump Station
EL	Elevation
FCL	Flood Construction Level
FDL	Flood Design Level
FRP	Fibreglass Reinforced Plastic
GNPCC	Greater Nanaimo Pollution Control Centre
HI	Hydraulic Institute
hp	Horsepower
HWL	High Water Level
Hz	Hertz
Kg	Kilogram
L/s	Litres per Second
LWL	Low Water Level
LWMP	Liquid Waste Management Plant
m	Metre
m^3	Cubic Metre
MCC	Motor Control Centre
mm	Millimetre
MWR	Municipal Wastewater Regulation
O&M	Operations and Maintenance
PLC	Programmable Logic Controller
PWWF	Peak Wet Weather Flow
RDN	Regional District of Nanaimo
SCADA	Supervisory Control and Data Acquisition
TDH	Total Dynamic Head
VFD	Variable Frequency Drive

1 INTRODUCTION

1.1 Background and Objective

The Regional District of Nanaimo (RDN) owns and operates the Departure Bay Pump Station (DBPS). The DBPS is a wastewater pump station located at Departure Bay in the City of Nanaimo. The DBPS was built in 1974, and although the facility has undergone a variety of upgrades, the station is essentially in its original form. As the facility is in its fifth decade of operation, the DBPS has some underlying challenges. These challenges justify the consideration of a significant upgrade. The RDN has engaged Associated Engineering (AE) to undertake an upgrade study for the DBPS. The study focuses on three primary drivers for the upgrade as follows:

4. Capacity requirements
    a. In recent years, the DBPS has not always been able to keep up with flow capacity during peak flow conditions. During peak events, all pumps must operate at full capacity. In addition, on some occasions, peak flow has caused overflowing of the wastewater collection system. This overflowing has occurred at Brechin Point. Through its Liquid Waste Management Plan (LWMP), the RDN has identified the need to increase the capacity of the DBPS to eliminate overflows.[1]
5. Climate change
    a. As the climate changes, the DBPS can expect to have new challenges. The most significant challenge is likely sea level rise. Sea level rise in combination with storm surge events increases the risk of an extreme flooding event at the DBPS. The upgrades to the DBPS should consider the necessary improvements to adapt for future climatic requirements.
6. Compliance with codes, regulations, and engineering best practices
    a. Due to its age, some existing infrastructure of the DBPS will not be in compliance with current codes, regulations, and engineering best practices. The upgrades need to consider the latest codes and regulations as they are applicable. One area of concern is seismic design requirements. The RDN would like to consider the necessary upgrades to bring the pump station up to the current BC Building Code standards. The upgrades should also meet as applicable: the Occupational Health and Safety Regulation, Technical Safety BC, British Columbia Electrical Code, Environmental Regulations and energy standards.

The objective of the upgrade is to extend the life of the pump station by another 50 years. The study is to consider conceptual level design and typical budget requirements.

The intent of this report is to document the study and present the upgrade options. The study is based on background information provided by the RDN, including target flood levels, future capacity requirements, probable forcemain upgrades, and other relevant studies.

1.2 Overview of Facility

The DBPS is situated adjacent to the ocean at the northwest end of Departure Bay, within the City of Nanaimo. Since it was commissioned in 1974, the station has conveyed municipal wastewater to the Greater Nanaimo Pollution Control Centre (GNPCC). The DBPS is a key component in the overall system as it handles approximately 75% of the wastewater flow to the GNPCC.

[1] Regional District of Nanaimo (2020) Liquid Waste Management Plan: 2019 Annual Report

The DBPS has a traditional wet well and dry well arrangement. The station features four 350 hp centrifugal wastewater pumps. There is a back-up generator at the station, which provides power to the station in the event of a power outage.

1.3 Previous Upgrades and Recent Studies

Since commissioned in 1974, the DBPS has undergone some improvements and upgrades. Previous major upgrades at the DBPS include but are not limited to the following:

- Addition of a 1.4 MW standby generator and installation of buried diesel storage tank adjacent to the DBPS building in 1997.
- Shaft replacement of Pumps #2 and #3 in 1999. This upgrade followed recommendations made in Pump Vibration Remediation Study Report (Associated Engineering, 1999).
- A full control upgrade in 2000. This upgrade included the addition of level transmitters (LE-801 and LE-802) and two wet wells.
- Addition of a ferrous chloride storage and feed system in 2002 to control odour and corrosion.
- Odour control upgrade in 2008. This upgrade added an ionizer system that ionizes outdoor air and disperses it throughout the wet well.
- Pump #1 upgrade in 2016. Pump #1 was replaced with a Flowserve 12MNZ24B, which has a similar capacity and model to existing pumps. As a part of this upgrade, the eddy-current drive was replaced with a variable frequency drive (VFD).

Recent studies include:

- Departure Bay Pump Station Upgrade Study (Associated Engineering, 2006).
- Departure Bay Pump Station Upgrade Study – System Head Testing (Associated Engineering, 2008).
- Departure Bay Forcemain Transient Analysis (AECOM, 2020).
- Nanaimo Interceptor Hydraulic Model Update and Capacity Analysis (GeoAdvice, 2020).

2 FACILITY DESCRIPTION

2.1 Overview

The DBPS is located on the northwest shore of Departure Bay and receives wastewater flows from the City of Nanaimo. The station pumps the wastewater to the GNPCC via a 900 mm diameter forcemain and gravity sewer. The pumping station is a key component in the overall system as it handles approximately 75% of the wastewater flow to the GNPCC. Failure of the station results in discharges of wastewater into Departure Bay. Upstream of the DBPS are five sanitary overflows along the Nanaimo Interceptor. The one directly upstream of the DBPS is Brechin Point (located at the Departure Bay Ferry Terminal), with an overflow elevation of 2.34 m.

The Departure Bay Pipeline is a 4.0 km forcemain and gravity sewer. The pipeline runs from the DBPS to Hammond Bay Interceptor. From this location, it flows to the GNPCC. The pipeline was installed in 1974, at the same time as the DBPS. The forcemain and gravity sewer comprise 900 mm (ID) steel with coal tar enamel coated and lined. The forcemain is asbestos-wrapped.

2.2 Structure

2.2.1 Superstructure and Ground Floor

The facility superstructure provides a structure and cover over most of the substructure. The superstructure provides space for storage as well as the necessary access into the substructure and dry well. The superstructure has steel framing with cinder block construction.

Record drawings for the facility show the entrance level at an elevation of 3.73 m (12.25 ft)[2].

The superstructure has two roll-up doors located on the south side of the building, which provide access for large equipment and chemicals. An additional access door is located on the east side of the building. This access door is used for personnel entrance to the DBPS.

The ground floor contains the existing unit substation, main switchgear (includes Main Breaker, Automatic Transfer Switch (ATS), etc.) and a washroom. It also provides access to the two lower floors.

The existing ventilation system for the substructure comprises an air intake and large open duct. This duct is located in the northwest corner of the building.

A floor opening is located on the east side of the building, which extends all the way down to the lowest level of the station. This opening provides access to the lower level for movement of large equipment. It also provides movement of air between the different levels.

Four square hatches above the pumps provide access to the pump motors located on the intermediate level.

[2] Elevations from the Departure Bay Pump Station are assumed to be geodetic datum. No datum is referenced in the drawings. Geodetic datum is referenced on the drawings for the Departure Bay Pipeline, which was constructed at a similar time.

2.2.2 Substructure

The substructure is a multi-level concrete structure that consists of both a wet well and dry well. The substructure extends approximately 12.1 m (39.75 ft) below grade.

2.2.2.1 Dry Well Lower Level: Pump Floor

The lower level Pump Floor is a split level with the main floor at an elevation of-5.6 m (-18.35 ft) and a trench at an elevation of -7.3 m (-24 ft). The Pump Floor houses the four wastewater pumps, suction pipes, discharge piping, valves and forcemain. On the discharge header, an air-operated pinch valve is configured to prevent pressure surges in the forcemain. Compressors that provide pressurized air are located on the south wall.

The DBPS was originally designed with four centrifugal pumps. All four pumps were provided with extended steel shafts. Pumps #1 through #3 have 350 hp induction motors. Pump #4 has a combination drive, with an induction motor and 425 hp diesel engine. Pumps #1 through #3 had eddy-current drives to provide flow variability, while Pump #4 had an across the line starter. The original pumps are Worthington model 10CFA-2.

The most notable upgrade to the pumps was the replacement of the steel shafts of Pumps #2 and #3 to composite shafts in 1999. In addition, Pump #1 was replaced in 2016 with a newer Flowserve model and VFD. These upgrades are referenced in Section 1.3.

Table 2-1 provides a summary of the pump models and major replacement and upgrades since 1974. The firm capacity of the station with the largest unit out of service is 950 L/s.

Table 2-1
Pumps at the DBPS

	Pump Model	Replacement & Upgrades
Pump #1	Flowserve Model 12MN24B	Original pump replaced in 2016
Pump #2	Worthington Model 10CFA-2	Composite shaft replacement circa 2000
Pump #3	Worthington Model 10CFA-2	Composite shaft replacement circa 2000
Pump #4	Worthington Model 10CFA-2 (c/w combination angle-drive)	Original pump, shaft and drive

The wet well suction lines penetrate from the two wet wells through to the dry well. In the dry well, the suction lines are in dedicated trenches. The penetrations between the wet well and dry well are provided as removeable bulkheads.

The Pump Floor has a work bench along the west side of the room. This area is also used for storage of spare parts.

2.2.2.2 Dry Well Intermediate Level: Motor Floor

The Motor Floor is located on an intermediate level between the Pump Floor and ground level. The Motor Floor contains the motors for all four pumps. This includes the motor drives for Pumps #1 through #3 and the combination drive for Pump #4. The diesel engine for Pump #4 is located in the southeast corner of the Motor Floor in the Diesel Room.

The Motor Floor also houses much of the electrical and controls infrastructure. This includes the original eddy current drives for Pump #2 and #3, the VFD for Pump #1, and the Motor Control Centre (MCC).

The Motor Floor also has an Office and Controls Room.

2.2.2.3 Wet Well

The wet well is split into two symmetrical sides. Each side can be isolated using gate valves that must be actuated above grade. There are two pump bays on each side, for a total of four pump bays.

The wet well shares a common wall with the dry well.

The approximate combined active storage volume of the wet well is 250 m^3. This active storage volume is based on the following wet well elevations:

- High Water Elevation – 6.2 m (20.5 ft)
- Low Water elevation – 2.4 (8.0 ft)

It should be noted that this approximate volume is a conservative approximation. This volume does not account for storage within the Nanaimo Interceptor. In addition, it was difficult to measure the exact volume of the wet well, as the wet well has complex geometry.

The wet well is ventilated using ionized air. As mentioned, this upgrade was completed in 2008. Ionizers are used to add ionized air to the wet well for odour control.

3 DESIGN CRITERIA FOR UPGRADES

The following design criteria for the DBPS Upgrades are described below:

- Flow Capacity
- Target Flood Design Level
- Regulatory Requirements
- Phased Approach and Constructability

3.1 Flow Capacity

3.1.1 Existing Station Capacity Limitations

Based on preliminary discussions with the RDN, the existing station has capacity limitations that needed to be addressed. To better understand these limitations, a review of the existing system capacity was undertaken. This review also provided an understanding of low-flow periods to the station.

Historical flowmeter data from the DBPS were reviewed for the year 2020. The effluent flowmeter is located on the forcemain discharge header downstream of the four pumps.

Figure 3-1 shows the diurnal flow pattern on an average dry-weather day through the DBPS. Under these conditions, the nighttime dry-weather flow is as low as 80 L/s. The daytime peak is about 275 L/s. This curve is typical of wastewater collection systems that experience higher water use during peak daytime hours.

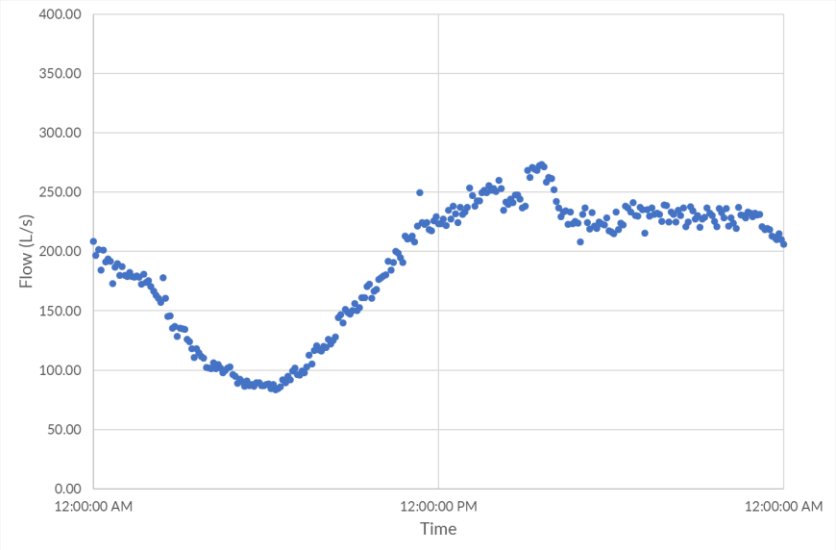


Figure 3-1
Dry Summer Flow Diurnal Trend

Figure 3-2 shows the diurnal pattern during a peak flow event in 2020 that lasted approximately one and a half days. This curve shows that the flowrate through the DBPS was sustained at 1100 L/s. This represents the maximum capacity of the system with all four pumps in operation. This sustained period lasted for over 12 hours.

AE also reviewed flow meter data from a high-flow event that occurred between the afternoon of January 28 and the early morning of January 30, 2018. During this time period (more than 24 hours), all four pumps were operating at full speed, with flows ranging from 1000 L/s to 1100 L/s. The RDN noted that the wet well flooded above the maximum high-water level during this event.

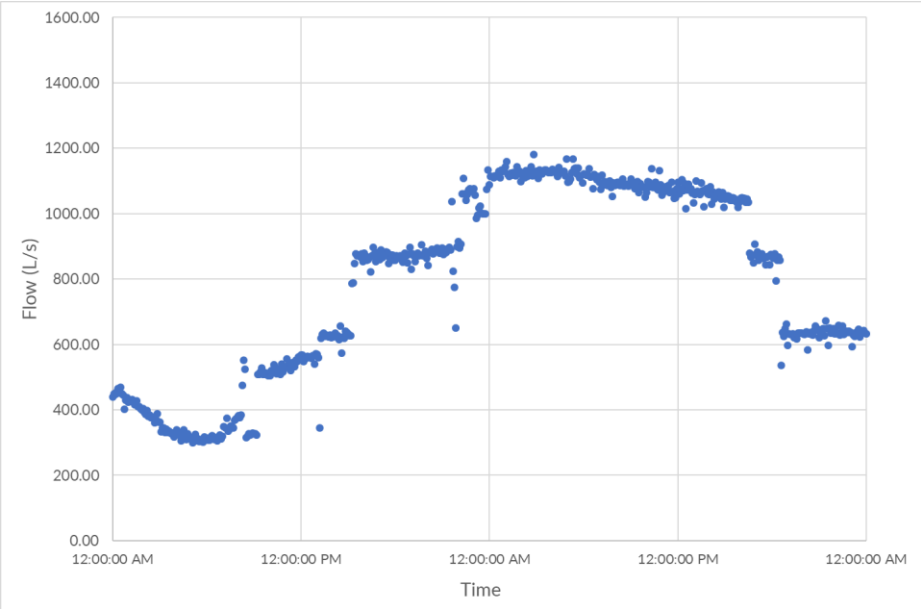


Figure 3-2
Peak Flow / Winter Week

Based on the reviewed data and the conversations with the RDN, it is apparent that the system does not have sufficient pumping capacity. Operating all four pumps in parallel was not the intended purpose of the station, as this offers no redundancy in the event of a pump failure. This lack of redundancy could increase the consequences of a peak event, if a pump were to fail during this time.

3.1.2 Design Basis for Upgrades

Previous modelling of the Nanaimo Interceptor was completed by GeoAdvice Engineering,[3] which provides the design basis for the capacity upgrades. The upgrades will be designed to the 2073 peak wet weather flow (PWWF) scenario based on the InfoSWMM model. This model incorporated the effects of a five-year 24-hour storm event with climate change impacts.

A summary of the model results is presented in **Table 3-1**. The full build-out flow capacity design basis for the upgrades is 1955 L/s.

[3] GeoAdvice Engineering Inc. (2020) Regional District of Nanaimo – Nanaimo Interceptor Hydraulic Model Update and Capacity Analysis Final Report.

Table 3-1
Flow Capacity Design Basis

Design Condition	Flow Rate	Source
2043 Peak Design Flow	1720 L/s	GeoAdvice, 2020: InfoSWMM model
2073 Peak Design Flow	1955 L/s	GeoAdvice, 2020: InfoSWMM model

It is a priority to provide consistent flow from the DBPS. This is because the DBPS accounts for over 70% of the flow to the GNPCC. Maintaining flow to the treatment processes at the GNPCC is required for optimal performance of the process units and systems. As a result, the pump selection and operating philosophy must consider the wide range of flows from the present-day summer nighttime low flow of 80 L/s to the future PWWF of 1955 L/s. The upgrades should limit start and stop operation of the pumps and should provide the ability for influent flow-matching.

3.1.3 Downstream Impacts to Increased Flow Capacity

3.1.3.1 Forcemain and Gravity Sewer

With the flow capacity of the pump station increasing, consideration must be given to downstream infrastructure, specifically the Departure Bay Pipeline.

As mentioned, the pipeline is divided into two sections, a pumped forcemain and a gravity sewer. The forcemain extends just over 2 km from the DBPS before reaching a stand pipe. From this location, gravity flow is achieved for the remainder of the alignment (approximately 2 km) to Hammond Bay Road.

At present, the gravity portion of the alignment has the potential to be the biggest restriction. The original Departure Bay Pipeline drawings show that at a flow of 1300 L/s, the hydraulic grade line will exceed the elevation of the stand pipe. At this flowrate, the dynamic losses in the gravity sewer become too high and the system has the potential to flood at the stand pipe.

An additional challenge with the existing forcemain is that the existing air valves at the high point along Sherwood Drive are not operational at this time. One of the recommendations from the 2020 AECOM Departure Bay Forcemain Transient Analysis Report was to bring these air valves back in operation.

The conceptual study considered upgrades to both the forcemain and the gravity sewer, including either twinning or replacing areas of the forcemain and gravity sewer to keep velocities within a desirable range.

The RDN has confirmed that there are future plans to either twin or replace the forcemain, depending on the results of a condition assessment. For the purpose of this study, AE assumes that upgrade work on the forcemain and gravity line will be completed as necessary to achieve the design flows, including replacement of air valves, as required. The pump selection process has considered the anticipated changes throughout the build-out.

3.1.3.2 Greater Nanaimo Pollution Control Centre

In addition to the forcemain and gravity sewer, it is important to consider how the increased capacity will affect the GNPCC.

There are two pump stations that feed the GNPCC, the Departure Bay Pump Station and the Wellington Pump Station. The Wellington Pump Station has an existing capacity of 208 L/s with a predicted maximum flow of 390 L/s in 2043.

The RDN confirmed that the existing capacity of the headworks equipment at the GNPCC is 2,240 L/s, which could be increased to 3,360 L/s through the addition of a fourth screen. Notwithstanding, the existing influent channel is limiting, and a capacity upgrade to this channel needs to be considered in parallel with the upgrades that will increase the DBPS capacity.

3.2 Flood Design Level

At the time of writing, the RDN has yet to officially adopt a flood construction level (FCL) for the project site. For the purpose of the conceptual study, the RDN has advised on a conservative future target flood design level (FDL). The target FDL is presented in **Table 3-2**.

Table 3-2
Target Flood Design Level for the Conceptual Upgrades

Parameter	Value
Target Flood Design Level	5.41 m

Assuming the 1974 drawings are at geodetic datum, the Ground Level of the DBPS is at 3.73 m (12.25 ft). This is approximately 1.68 m below the target FDL. This difference is not insignificant when the impacts of a flooding event are considered. It will be imperative that the design includes options for mitigating against flooding.

Prior to subsequent design stages, the RDN should complete a survey to confirm elevations of critical infrastructure. In addition, the RDN should confirm the official FCL.

Flooding potential of Departure Creek, which runs in a culvert beneath the access road was not considered during this study. Potential impacts to the Creek as a result of the upgrades should be considered at subsequent design phases.

3.3 Regulatory Requirements

Although the intent of this study is to provide conceptual level design of the upgrades to the DBPS, it is important to consider the impact of regulatory bodies on project design and construction. The following provides an overview (but not a complete list) of important regulations that will need to be considered during the next phases of the upgrades. It should be noted that the study has not considered these requirements in detail.

3.3.1 BC Municipal Wastewater Regulation

As mentioned, the RDN has an approved LWMP that provides management over the wastewater conveyance and treatment systems within the region. The RDN has Operational Certificates in place for its WWTPs, which provide an

alternative to registration and authorization under the British Columbia Municipal Wastewater Regulation (MWR). Notwithstanding, the MWR provides guidance for redundancy for pump stations, which should be followed.

The MWR advises the following for lift stations with multiple pumps:

- The station must have sufficient capacity to pump peak design flow when the largest pump is out of service.
- An on-site generator must be available for standby power, and standby power must be capable of being activated before the hydraulic capacity of the pump station is exceeded.

The original design of the DBPS met the pump redundancy requirements, with three pumps able to meet peak demands. Although a backup generator was not a part of the original design, the angle-drive pump provided power redundancy in the event of a sustained electrical outage. However, as wastewater flows steadily increased over time, the RDN has lost redundancy in the pumping system. At present, all four pumps are required during peak flows, and overflows are occurring.

The DBPS currently meets the requirements for standby power. As previously mentioned, the onsite backup generator was installed in 1997. This generator will likely become limited when upgrades are considered.

For the purpose of the conceptual upgrades, the MWR requirements will be used as guidance. As a result, the upgrades must provide adequate redundancy in both capacity (i.e., redundant units) and power for the future.

3.3.2 Hydraulic Institute Standards for Pump Station Design

Hydraulic Institute Standards (ANSI/HI) provide standard requirements and best practices for design, construction and commissioning elements involved with pump stations. These include specific requirements for pump intake design, pump selection and operation, and other hydraulic principals. The upgrades should follow the guidance provided by the Hydraulic Institute.

3.3.3 BC Electrical Code

The upgrades must comply with the BC Electrical Code (BCEC). Refer to the Electrical Regulations and Regulatory Notices as stipulated by Technical Safety BC.

3.3.4 Identification of Hazardous Locations

The upgrades must comply with the BC Electrical Code (BCEC). The wet well location is classified as a hazardous location in accordance with the CSA C22.1 Canadian Electrical Code, Part 1. Hazardous area classifications should consider and comply with the principles of NFPA 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities for areas not clearly defined in CSA 22.1.

3.3.5 2018 BC Building Code

The upgrades must be compliant with the 2018 BC Building Code (BCBC) and other relevant codes and bylaws. A detailed review of code compliance has not been undertaken for this study. However, for purposes of the study, assumptions have been made regarding the level of upgrades required. The two main considerations are seismic upgrades and safe access / egress.

3.3.6 Safety Regulations

The upgrades should be designed to meet all current applicable codes and safety standards in accordance with the Occupational Health and Safety Regulation and Technical Safety British Columbia.

3.3.7 Environmental Regulations

During the project construction, environmental permitting will be required to comply with applicable legislation. This may include requirements contained within the *Fisheries Act*, *Water Sustainability Act*, *Species at Risk Act*, *Migratory Birds Convention Act*, *Wildlife Act*, and any applicable municipal bylaws. Environmental services may include construction environmental management planning work, permit preparation, wildlife salvages, and environmental monitoring.

It should be noted that Departure Creek runs through the project site within a culvert beneath the main access road to the DBPS. Departure Creek is a fish-bearing watercourse that originates in the Nanaimo Golf Club area and runs southeast for 3 km down to Departure Bay[4]. Only the last 860 m of the watercourse is accessible to fish due to natural barriers further upstream[5]. Salmonids including Chum Salmon, Coho Salmon, Cutthroat Trout and Coastal Cutthroat Trout have been recorded in Departure Creek. The Departure Creek Streamkeepers & Harbour City River Stewards operate a community watershed monitoring program on Departure Creek and, in partnership with the Departure Bay Neighbourhood Association, initiated habitat restoration works in the Departure Creek watershed in 2020.

It is not anticipated that the creek will be disturbed during construction, as the extent of the upgraded area does not include the main access road. Notwithstanding, Departure Creek should be assessed during preliminary and detailed design. Any modification to the creek or work done below top of bank will require Provincial and/or Federal permits. Encroachment on the creek should be considered a potential constraint and avoided during the design phase.

3.4 Phased Approach and Constructability

A phased approach to upgrades is preferred to spread out capital spending of major works. The conceptual design should consider how phasing can be achieved.

Another important consideration is constructability. The DBPS conveys a large portion of the wastewater flow to the GNPCC. As a result, the pump station will need to be operable for the duration of the project. This may be achieved through a temporary bypass of the station when needed. However, bypassing for long durations would be challenging and onerous. Further design phases must consider construction sequencing such that impacts on operation of the existing station are minimized.

[4] Government of British Columbia. 2021. HabitatWzard Web Application. Available at: https://maps.gov.bc.ca/ess/hm/habwiz/ Accessed August 2021

[5] D.R. Clough Consulting. 2016. Departure Creek Habitat Assessment Report. Consultants report prepared for the Departure Bay Neighbourhood Association, Nanaimo BC. Available at: https://www.rdn.bc.ca/sites/default/files/inline-files/Departure%20Creek%20Habitat%20Assessement%202016.pdf

4 OPTIONS AND UPGRADE APPROACH

As outlined in Section 1.1, the three main challenges that the DBPS is facing are the lack of capacity and redundancy, the risks of climate change flooding, and the lack of compliance with regulations and code.

The following sections outline these challenges and related consequences, followed by mitigation options and the selected approach for the conceptual design.

4.1 Capacity and Redundancy

4.1.1 Challenges and Consequences

As described in Section 3.1, the DBPS does not have sufficient pumping capacity nor redundancy under peak flow conditions. The maximum capacity, with all four pumps in operation (and no redundancy), is 1100 L/s, which is less than the current peak flows that are conveyed through the Nanaimo Interceptor.

Upgrading the DBPS to the future capacity targets is not straightforward as there are many downstream and upstream impacts that require consideration. The potential limitations in the system are as follows:

- Electrical Infrastructure Limitations
  - Electrical infrastructure such as the unit substation, transfer switch, and generator may be limited if higher capacity pumps are installed.
- Wet Well Capacity Limitations
  - The wet well was originally designed for future capacity upgrades, as evidenced by the use of removal bulkheads between the dry and wet wells and the capacity for a new header on the Pump Level. Notwithstanding, the upgrades need to consider the wet well capacity.
- Pipeline Limitations
  - The forcemain and gravity line are aging, and the RDN is undertaking further investigation of its condition. As described previously, the original design shows that at flow rates above 1300 L/s, the capacity of the gravity line would be exceeded.
- GNPCC Capacity Limitations
  - Capacity of the GNPCC needs to be considered, specifically the hydraulic capacity of the headworks equipment. As noted in Section 3.1.2.3, there are plans to upgrade the GNPCC to handle future peak flows. This consideration will not be reviewed in further detail in this report but should be a consideration for future design phases.

The main consequences of lack of capacity at the DBPS are potential damage to infrastructure, risk to public safety, and negative impacts to the environment resulting from overflows. At peak flows, the sewer upstream of the DBPS has overflowed directly into Departure Bay at Brechin Point. In addition, the peak flow event in 2018 resulted in flooding of the DBPS wet well above the high-water level. These events are significant concerns of operations staff.

The lack of pumping redundancy increases the capacity risks. Without adequate standby capacity, if a pump were to fail during a peak flow event, further flooding would result. As the pumps and components age over time, it may become more difficult to maintain pumping capacity, and the risk of failure increases.

Although peak flow events mainly occur under severe winter storms, it can be anticipated that the frequency and duration of these events may continue to increase as climate changes. Overall wastewater flows are also projected to

increase over time as population density increases. This will further intensify the capacity challenges experienced at the station.

The lack of capacity and redundancy at the DBPS is problematic, and the impacts have the potential to worsen with time. The RDN has made a commitment to eliminate the use of overflows as part of their LWMP. To achieve this goal, the RDN must upgrade the capacity at the DBPS.

4.1.2 Mitigation Options and Selected Approach

To achieve the desired 2073 PWWF of 1955 L/s (presented in **Table 3-1**), it is necessary to consider how the downstream system may change over the next 50 years. In addition, a main priority is to consider how pump upgrades could be phased. This includes phasing of pumps, but also phasing of the upgrades with the forcemain and gravity sewer.

4.1.2.1 System Hydraulics

As part of this study, it was necessary to consider how the downstream forcemain and gravity sewer will have an impact on pump selection. For the purposes of this study, three forcemain scenarios were considered:

- **Option A** – The stand pipe connecting the forcemain to the gravity sewer along the Departure Bay Pipeline is removed, and the two lines are connected. This option requires the installation of wastewater air valves at the previous stand pipe location.
- **Option B** – The stand pipe is kept by twinning the gravity main (2 x 900 mm lines), thus removing the bottleneck to facilitate higher flow conditions.
- **Option C** – Building off of Option B, the upstream forcemain is also twinned (2 x 900 mm lines) to reduce friction and minor losses in the system.

Figure 4-1 presents the system curves for Options A, B and C. The three curves were produced using forcemain alignment information from the Departure Bay Forcemain Record Drawings. The Hazen-Williams equation was used to estimate friction losses in the system, which was the same approach undertaken during the previous upgrade study conducted by AE. Minor losses were estimated using standard loss coefficients for fittings, valves and other restrictions. It's important to note that the Hazen-Williams equation can be limiting in its accuracy, depending on Reynold's number. Verification using the Darcy-Weisbach equation is typically recommended but was not undertaken during the conceptual design. The previous upgrade work conducted by AE acted as a basis for the system curve development.

As seen in **Figure 4-1**, Options A and B follow the same curve for flowrates between zero and 1300-1400 L/s. This lower part of the curve follows the existing system, as neither Option A nor Option B require any updates to the existing forcemain. For Option A, the curve starts to steepen at higher flows, which is due to the increase in dynamic losses from the conversion of the previous gravity line to Hammond Bay Road. It should be noted that Option A was the original design intent back in the 1970s, and it was noted at this time that the requirement to connect the forcemain and gravity sewer would be needed at 30 MGD (1320 L/s). Option A is a low-cost option to achieving higher flows through the system, as it only requires the removal of the stand pipe, and the addition of wastewater air valves at the high point. However, this option has disadvantages. At the higher flowrates, velocities experienced are significantly more than what would be recommended. This can be noted through the steep slope of the system curve, representing the high losses in the system at the higher flow rates. With a steeper system curve, a larger sized pump would be required to achieve the required headloss of the system (in comparison to the other options), which could

add significantly to power upgrade and operation costs. In addition, this option is contingent that the existing condition of the forcemain and gravity sewer are able to accept the higher-pressure ratings required with the system.

The Option B curve is essentially an extension of the existing system curve to higher flow rates. With this option, the gravity sewer is twinned such that this portion of the alignment can remain gravity-based flow at higher flow rates. Twinning the gravity line is not a small endeavour, and it is possible that only portions may need to be twinned (note that the Option B system curve shown assumes that the entire alignment is twinned). It is recommended that the connection point to the twin line be at a higher elevation, such that flow remains through a single gravity line at lower flow rates (thus, keeping scour velocities). At higher flow rates, both lines would be used as the hydraulic grade line reaches the elevation of the twinned line connection. The use of an inverted siphon at this connection point is also recommended to allow the twinned line to flow full. Although this curve is less steep that Option A, velocities through the forcemain are still very high. This curve would likely not be a feasible option at the peak flow rates required for the final build out of the station.

Option C involves the twinning of the forcemain, which results in a reduction in the dynamic losses as evidenced by the flattening of the system curve. This option assumes that Option B (twinning of the gravity line) has already been undertaken. Although a large capital investment, twinning of the forcemain significantly reduces the system losses, which will reduce the size and number of pumps required to reach the full flow build-out. It is inevitable that the RDN will need to either upsize or twin the forcemain to achieve these higher flows in the future.

The RDN also noted that an additional fourth option (Option D) exists where a new forcemain is constructed from the DBPS along a marine alignment. The forcemain would connect to the existing gravity main at Chinook Road. Further details regarding this option are discussed in the comment log of **Appendix C**.

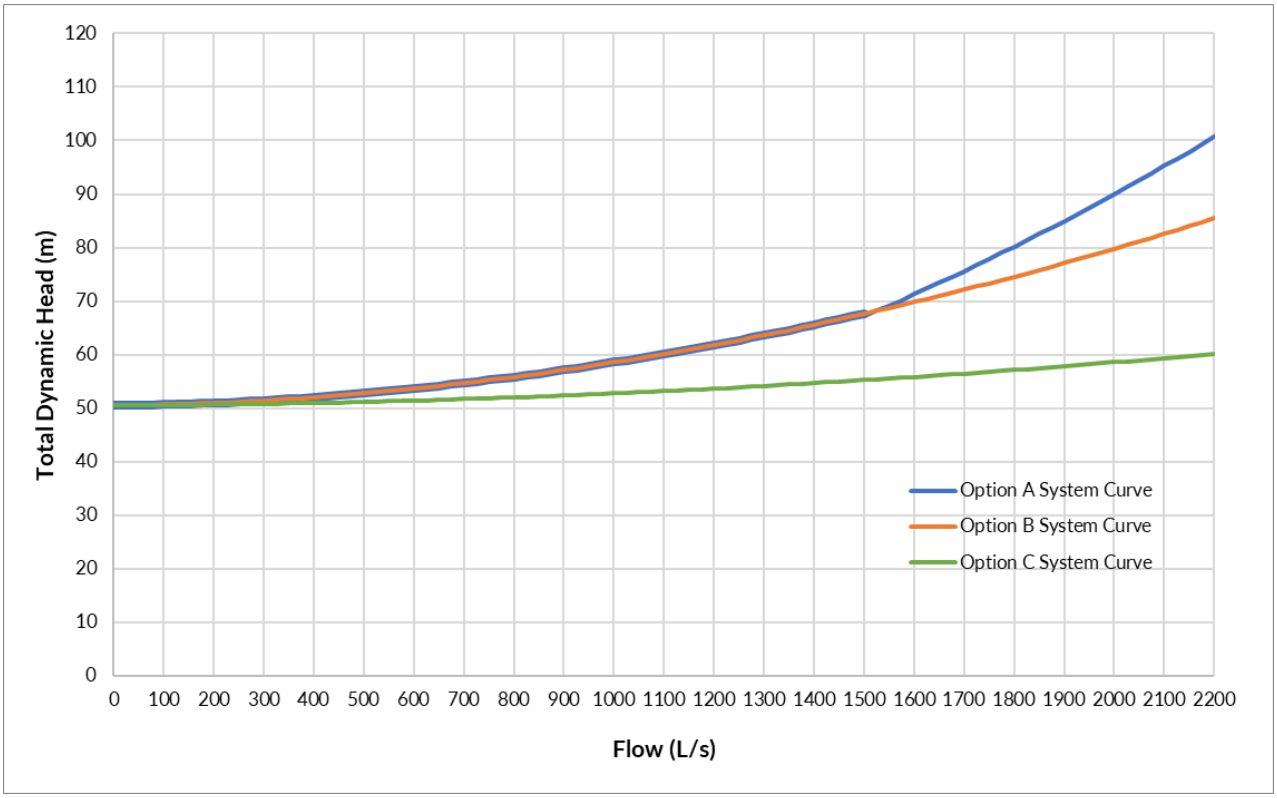


Figure 4-1
System Curve for the Departure Bay Forcemain Under Different Options

After reviewing the system curves, a phased upgrade approach was developed for the upgrades to meet the new design capacity. For the purpose of the upgrade study, the following basis is being proposed:

- **Phase 1**
  - Upgrade three of the existing pumps (Pumps #2, #3 #4) to larger capacity pumps. This will provide an increase in capacity to counter the capacity limitations of the existing system.
- **Phase 1a**
  - Twin the gravity sewer line to achieve flows above the existing bottleneck. Phase 1a follows the curve presented as Option B.
  - Complete this work concurrently with or follow the Phase 1 upgrades at the DBPS, depending on the actual capacity of the gravity sewer.
- **Phase 1b**
  - Twin the forcemain to get further capacity out of the Phase 1 pumping system by reducing head requirements. Without the need to install any additional pumps, the RDN could get further capacity of the pumping system by reducing the dynamic losses within the forcemain. Phase 1b follows the curve presented in Option C.
  - Complete Phase 1b prior to installation of additional flow capacity, as velocities through the system would become too high.

- **Phase 2**
  - Install two smaller pumps (replacing Pump #1) to bring the DBPS system to a full capacity of 1955 L/s, with full redundancy.

Although these scenarios are being used for the purpose of this study, the RDN should develop a plan for forcemain and gravity sewer improvement prior to finalizing the design of the upgrades to the DBPS.

4.2 Climate Change and Flood Target Level

4.2.1 Challenges and Consequences

Climate change is projected to impact infrastructure within the RDN. A major impact of global temperature increases is the resulting increase in sea levels. With the DBPS situated directly on the coast, it is imperative that future upgrades consider the potential impacts from sea level rise and storm surge.

As described in Section 3.2, the target design flood level is above the existing grade at the DBPS (difference of approximately 1.7 m). Under the current condition, the entire station including critical infrastructure would flood, resulting in a system-wide failure.

There is potential for severe and potentially catastrophic consequences if the DBPS flooded. Possible outcomes include:

- Mechanical and electrical equipment become damaged beyond repair.
- Irreparable structural damage to station.
- The Nanaimo Interceptor may back up to street level causing wastewater flooding in streets and/or homes.

These consequences could shut down the facility for months, and equipment will require replacement. The cost implications with such an event are severe.

4.2.2 Mitigation Options and Selected Approach

Three potential options to mitigate against floods based on the FDL were reviewed:

1. Raising only water-sensitive equipment above the FDL.
2. Constructing a dyke around the site to prevent sea level and storm surge from entering the existing structure.
3. Raising the entire superstructure above the FDL to prevent from floods entering the dry well and wet well.

Option 1 would require modifying the existing superstructure (i.e., adding an additional higher level) such that all electrical equipment can be placed above the new flood construction level. This would include new required switch gear, MCC, control panel, and standby generator(s). In addition, all pumps would need to be replaced with immersible style pumps. This is because the existing pumps would not be operable in flooded conditions as the motor is not enclosed. Immersible style pumps offer a solution, with an enclosed motor directly connected to the pump.

Option 1 may appear to be a low-cost option since it does not involve changing the substructure; however, there are some disadvantages and risks with Option 1. These disadvantages include:

- The need to construct a new higher level above the FDL would likely require replacement of the superstructure.
- None of the existing pumps could be maintained, as immersible pumps would be required in the event of a flood.
- The wet well could still be susceptible to flooding if no amendments are made.

- Access to pumps or equipment during a flooding event would not be possible. This could exasperate the problem if a pump fails while the station is flooded.

Option 2 would involve construction of a dyke around the perimeter of the site. This structure would prevent flooding of the building and substructure by containing the flood. With installation of perimeter berms, stormwater would need to be managed on site. A new drainage system would be required for this purpose.

The benefits of implementing Option 2 are that there would be minimal changes required to the existing structure. However, the disadvantages are that this option would have high maintenance for the installed drainage equipment that protects against flooding. In addition, this system has a higher risk of failure under a severe weather event or storm surge. If the berms or drainage pumps fail, the entire station would no longer be protected from the flood, resulting in catastrophic failure.

Option 3 would involve raising the entire superstructure above the FDL to prevent flooding of the entire station. The superstructure would be raised and replaced. The wet well would need to be sealed such that water could not penetrate into the structure during a flood event. This would involve sealing the wet well cover and connecting ducts.

Option 3 is the most resilient option that has the least risk of failure compared to the other two options. With this option, the risk of flood is eliminated through flood-proofing of the entire structure. With reduced risk, the RDN would have better assurance of infrastructure reliability during a severe storm event.

The main challenge with Option 3 is that it requires the most amount of disturbance to the existing facility. Capital costs are expected to be the highest in comparison to the other options. Notwithstanding, the reduction in flood and safety risks and low operational requirements associated with Option 3, could offset the initial capital investment.

For these reasons, the conceptual design will be based on Option 3 for the purpose of flood mitigation.

4.3 Code Compliance and Age of Infrastructure

4.3.1 Challenges and Consequences

The DBPS is in its fifth decade of operation, and with its age comes challenges with infrastructure condition and compliance with current best practices. If significant upgrades are required to the structure due to flood mitigation (as presented in Section 4.2), the need to achieve compliance with current codes and standards may become a requirement, and failure to do so could leave the RDN at significant risk.

To better understand the challenges with the existing station, a site investigation was conducted on February 11, 2021. During this visit, a limited assessment of the facility was undertaken. The condition assessment was limited to visual observations and discussion. No measurements or tests were conducted during this visit.

The general finding was that the existing building and process systems did not have seismic design elements that would provide resiliency following an earthquake (e.g., the lack of pipe restraints on some piping systems). Within the dry pit (**Figures 4-2** through **Figure 4-4**), the lack of seismic restraints on either of the swing arms of the one-ton cranes (**Figure 4-3**), and even lack of seismic bracing within the general framing of the superstructure.

Failure of any of these components or systems during a seismic event could lead to undesirable or irreparable damage to the DBPS. Similar to a flooding event, an earthquake could leave the station out of service for many weeks to

months, resulting in significant impact to liquid waste services within the RDN. Although the probability of such an event occurring is low, the consequences would be severe.

The general aging of infrastructure also poses a risk in terms of reliability. For example, through on-site discussions with the RDN, the operations team noted that the vertical riser on the forcemain has had some recent upgrade work due to thinning of pipe material over time. It is believed that the presence of rocks and other hard material was slowly eroding away at the steel pipe. Although no severe impacts occurred, this example provides evidence of how the aging infrastructure can become an increasing liability. This is especially true for components that are within corrosive or abrasive environments, that may experience more wear over time. It should be noted that normal wear is managed by the RDN on a regular basis through maintenance and replacement of parts. Notwithstanding, some components may be approaching their end of their service life and a condition assessment may be warranted.

The existing structure also has inherent safety concerns. One main concern is the lack of safe egress from the lower levels of the DBPS. The Pump and Motor Floors of the station only have a single point of egress, which is through an open staircase to the Ground Level. In the event of an explosion or fire, this point of egress may not provide suitable protection needed for a worker to escape.

Figure 4-2
Piping Not Restrained

Figure 4-3
Lack of Seismic Restraints on Swing Arm of the Cranes

Figure 4-4
Vertical Riser

4.3.2 Mitigation Options and Selected Approach

It is difficult to establish how codes and regulations will impact the upgrades at a conceptual level. Detailed structural analysis and a code consultant would be required at preliminary and detailed design to review the upgrade plans and determine what systems need to be upgraded.

For the purpose of this study, it is assumed that there will be significant structural and architectural work to bring the structure in closer compliance with BCBC 2018 and other best practices. It is also proposed that a new enclosed staircase be added on the north side of the building. Further discussion on proposed structural improvements is provided in Section 6.2.

5 PROCESS DESIGN

5.1 Wastewater Pumping

5.1.1 Pump Selection

Pump selection was based on the full build-out scenario at 1955 L/s. This flow rate will be achieved during the Phase 2 upgrades as presented in Section 4.1.2.1. To meet the capacity of 1955 L/s, a total of five pumps will be provided: three pumps at a nominal capacity of 650 L/s and two pumps at a nominal capacity of 325 L/s. It is suggested that all of the pumps will be provided with variable frequency drives (VFDs).

The five-pump solution will allow:

- The pump station to provide a firm capacity of 1955 L/s with any pump out of service for maintenance.
- The station to meet the full range of flows down to 80 L/s.

For the purposes of this study, Xylem immersible dry well pumps have been selected. The details on the proposed pump selections are provided in **Table 5-1**. Further details on the pumping units can be found on the pump specification sheets provided in **Appendix A**.

Table 5-1
Preliminary Pump Selection

	Model	Rated Power	Impeller Diameter	Rated Speed	No. of New Units in Phase 1	No. of New Units in Phase 2
Large Pump (56 MLD)	Flygt CT 3351/936	765 hp	625 mm	1200 rpm	3 (replacing Pumps #2, #3 and #4)	0
Small Pump (28 MLD)	Flygt NT 3312/936	385 hp	530 mm	1200 rpm	0	2 (replacing Pump #1)

5.1.2 Pump Hydraulics

The following section reviews the pump selections in relation to the system curves for each of the phases presented in Section 4.1.2.1. For the purpose of this study, it is assumed that the RDN will complete upgrades to the gravity sewer and forcemain, as required to meet capacity of the system (as presented in Section 4.1.2).

5.1.2.1 Existing System

Figure 5-1 shows the existing system, including the existing four pumps. The existing system curve stops at approximately 1400 L/s. This flow rate, as previously mentioned, is the expected capacity of the existing downstream gravity sewer line.

Pump curves for the existing installation were obtained from the original manufacturer. The manufacturer indicated that they were not able to retrieve the pump curve for the newly installed Pump #1. However, they noted that the

pump installed had the same duty point as the existing pumps, so an approximate curve was assumed. The intersection of the combined pump curve (four pumps in operation) with the system curve shows that the duty point approximates to the anticipated capacity of the existing system (i.e. 1100 L/s).

Table 5-2 summarizes the combined duty point of the system, with and without redundancy (i.e., three pumps and four pumps in operation, respectively).

Table 5-2
Capacity for the Existing System With and Without Redundancy

	Flow (L/s)	Head (m)
Capacity (largest unit out of service)	900	58
Capacity (all units in service)	1100	60

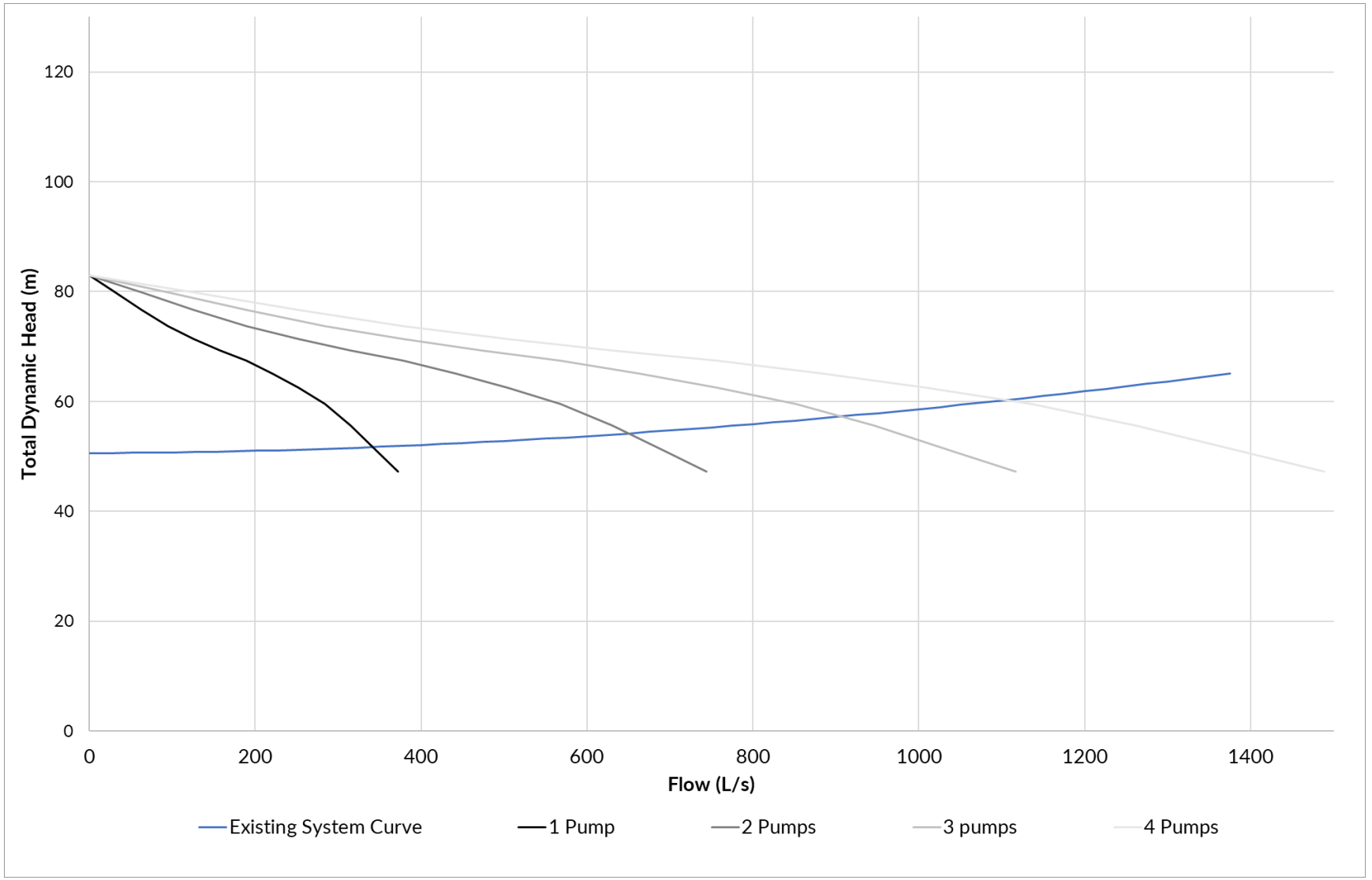


Figure 5-1
System Curve with Existing Pumps – Existing System

5.1.2.2 Phase 1 / Phase 1a

Figure 5-2 shows the Phase 1 system with three new 56 MLD units (Pumps #2, #3 and #4) and one existing unit (Pump #1). Figure 5-2 assumes that the gravity sewer is twinned (i.e. Phase 1a). This is why the system curve extends beyond 1400 L/s. This curve is Option B introduced in Section 4.1.2.1.

The pump curves for the large pumps (Flygt CT 3351/936) were provided by the manufacturer. Variable speed curves are shown for the large pumps. These curves show the high operational flexibility of the system. For low flows, the existing pump would be used as per current practice.

Table 5-3 summarizes the combined capacity of the system, with and without redundancy. This upgrade will provide additional needed capacity to meet the current limitations in the system. The maximum capacity without redundancy is up to 1600 L/s, providing relief during extreme wet-weather flows.

Table 5-3
Capacity for Phase1a

	Flow (L/s)	Head (m)
Capacity (largest unit out of service)	1400	66
Capacity (all large units in service)	1600	70

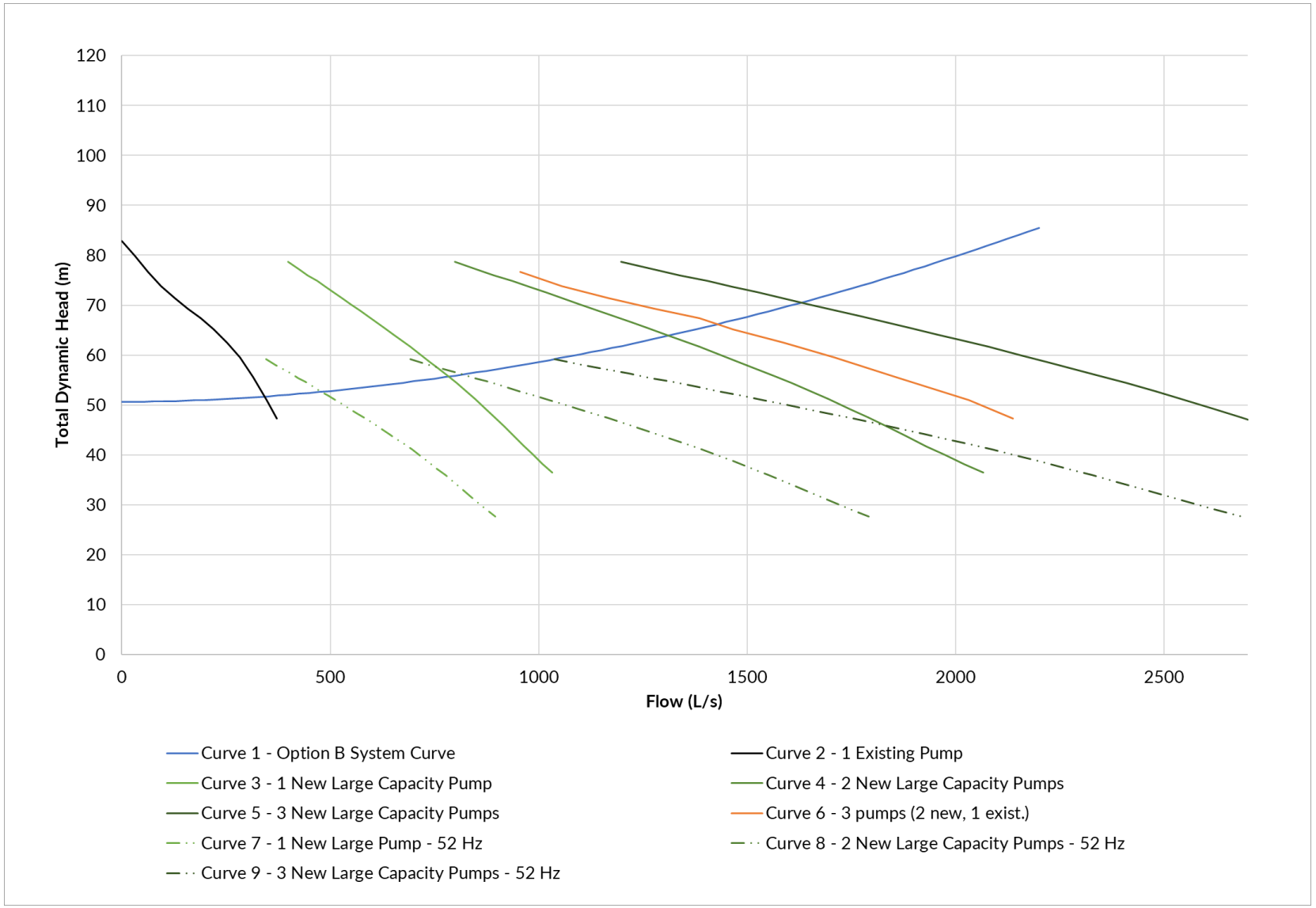


Figure 5-2
System Curve and Selected Pumps – Phase 1 / Phase1a

5.1.2.3 Phase 1b

Figure 5-3 shows the Phase 1b system. As previously stated, this intermediate phase does not involve any changes to the pumping system, but instead requires that the forcemain is either replaced or twinned. The curve presented in **Figure 5-3** shows the system with a twinned line. The system curve is Option C introduced in Section 4.1.2.1.

Table 5-3 summarizes the combined capacity of the system (extracted from **Figure 5-3**), with and without redundancy. Without adding any more pumps, this scenario shows that the RDN would be able to meet higher capacity requirements by reducing the dynamic losses in the forcemain. This interim step would likely be required within the next 20 years to meet increases in peak flow requirements. Without redundancy, this scenario should provide up to the 2073 PWWF.

Table 5-4
Capacity for Phase 1b

	Flow (L/s)	Head (m)
Capacity (largest unit out of service)	1800	58
Capacity (all large units in service)	2150	60

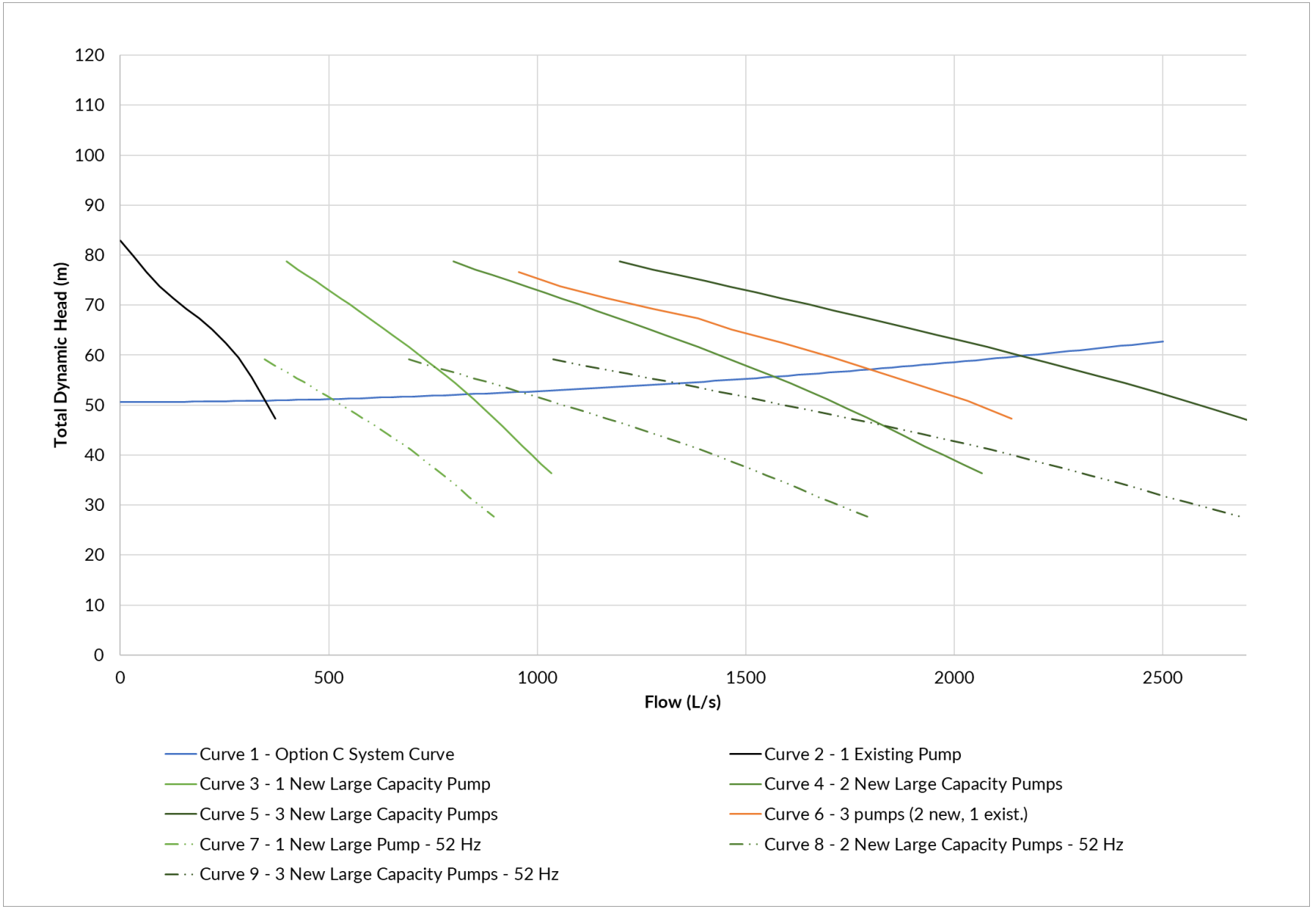


Figure 5-3
System Curve with Selected Pumps – Phase 1b (Forcemain is twinned)

5.1.2.4 Phase 2

Figure 5-4 shows the Phase 2 system, which includes the addition of the two new 28 MLD pumps (replacing Pump #1). This scenario represents the final build-out of the upgrades to the DBPS. The system curve shown in Figure 5-4 is Option C and assumes that Phase 1b (twinning of the forcemain) precedes the Phase 2 installation.

The pump curves for the two 28 MLD pumps (Flygt NT 3312/936) were provided by the manufacturer. Figure 5-4 shows the variable speed curves for the full build-out. These curves illustrate that the system has the capability to accommodate the entire flow range from 80 L/s to over 2000 L/s (with full operational redundancy).

Table 5-4 summarizes the combined duty point of the system, with redundancy (i.e., three pumps 56 MLD pumps in operation and the two 28 MLD pumps as standby). This condition exceeds the 2073 PWWF design condition.

Table 5-5
Capacity for Phase 2

	Flow (L/s)	Head (m)
Capacity (largest unit out of service)	2150	60

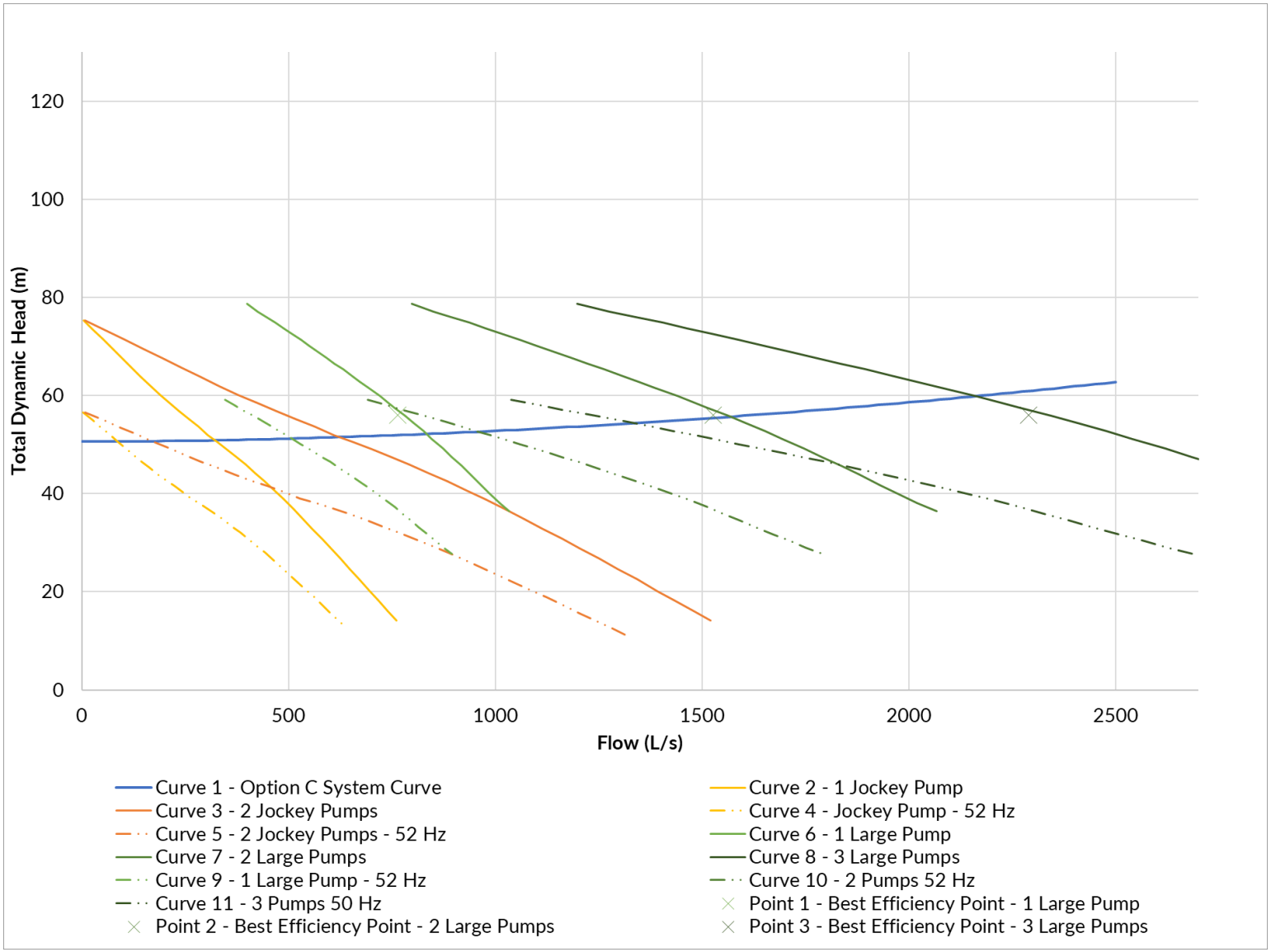


Figure 5-4
System Curve with Selected Pumps – Phase 2

5.2 General Arrangement

5.2.1 Proposed Pump Floor Plan Upgrades

Figure 5-5 shows the proposed general arrangement of the wastewater pumps on the Pump Floor for both Phase 1 and Phase 2. Phase 1 will involve most of the modifications to the floor plan, while Phase 2 includes modifications necessary for installation of the remaining pumps.

Figure 5-6 shows the proposed plan view for the intermediate Motor Floor and the Ground Floor. These arrangements are furthered referenced and discussed in Section 6.

It is important to note the proposed layouts are provided as examples of what the arrangements could look like and provides the basis for the conceptual design. Optimization of the layouts to best suit the RDN's requirements can be done during preliminary design.

The following sections review the proposed changes to the process systems during Phases 1 and 2.

5.2.2 Piping and Valves

As was the original design intent back in the 1970s, it is proposed that a new header be installed along the west wall of the building. This new header will accommodate flows from the new 56 MLD pumps. Under Phase 1, the three new 56 MLD capacity pumps (Pumps #2, #3 and #4) will be installed on this header.

Due to the installation of a new enclosed staircase at the north end of the building (to be discussed further in Section 6.2), the existing header will need to be replaced and relocated. It is proposed this upgrade will occur during the Phase 1 upgrade. During Phase 2, this header could be modified to accept the discharge lines from the two 28 MLD pumps (that will replace Pump #1).

This study assumes that the new piping will be provided as coated carbon steel. New supports and hangers for piping systems will be required. These will be designed to meet the seismic requirements. It is anticipated that stanchion supports will be required on the pump suction and discharge lines.

As shown in **Figure 5-5**, new valving will be required on the new upsized pump suction and discharge lines. This study assumes that two new check valves and five new knife-gate valves will be provided. It is proposed that main isolation and check valves continue to be located within the dry-well. For Phase 2, additional valving would be required for the installation of the remaining pumps.

The existing trench for the supply pipes and valving is considered a confined space and requires special entry requirements. The design intent is to remove the need for confined space entry for day to day operation. Options include removing the confined space classification or making changes to design such that operators do not need to access the space for regular maintenance activities.

It is proposed that the level of automation in the pump station be increased with the upgrades. This includes that all significant valves be equipped with actuators for remote control operation. In addition, the Control Philosophy can be expanded to incorporate process automation and allow operators to have more flexible control in pump operation.

A process hazard analysis must be considered in the future design stages, including valve isolation and lock-out procedures.

5.2.3 Surge Anticipation System

This study assumes that the air-operated pinch valve and compressor system that provides surge protection should be kept. New valves and assembly may be required to meet the capacity increase in the system.

Depending on condition and capacity requirements, the existing compressors may be reused, or new ones installed.

Note that the surge anticipation system is currently not shown in the general arrangement in **Figure 5-5**, however, this system could be located in the same general location as the existing system. Relocation of the compressors to the intermediate Motor Floor may be an option, with reclaimed space from the previous Diesel Room.

5.2.4 Specialty Fittings

The suction line bell mouths will require upsizing for the new larger capacity pumps. In addition, the bulk heads that separate the dry well from the wet well will need to be replaced on the new pump suction lines to accommodate the larger diameter suction pipe.

5.2.5 Chemical Dosing

AE has assumed that the existing ferric chloride dosing system will need to be replaced during the upgrades. Storage of chemicals on the Ground Floor is preferred for easy loading and access.

5.2.6 General Mechanical

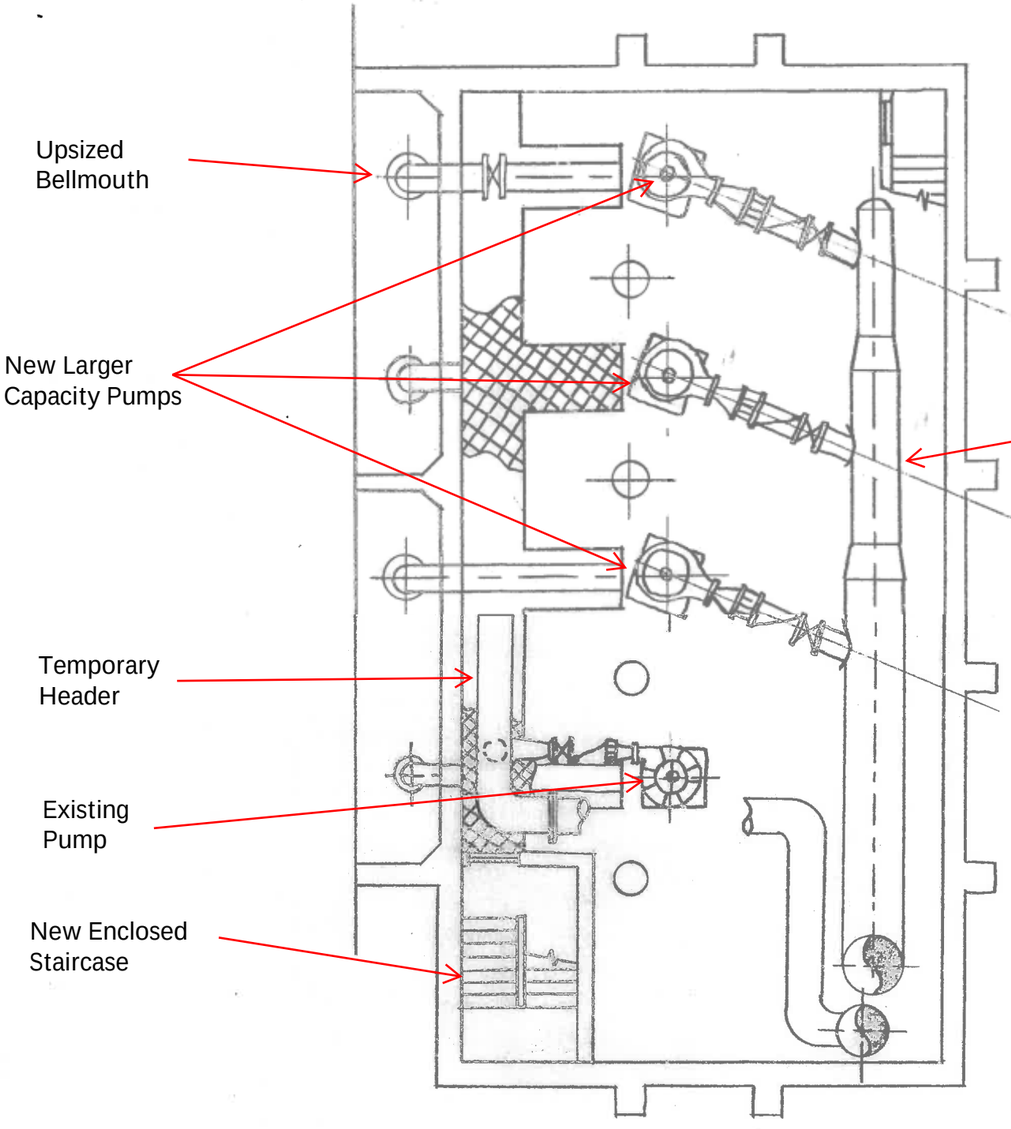
Some miscellaneous mechanical work will be required during the upgrades. This includes items such as removal and storage of old mechanical equipment, replacement of the sump pump, rotation of the two existing pumps (Pumps #1 and #3), and installation of two new larger capacity pumps (Pumps #2 and #4).

5.3 Wet Well

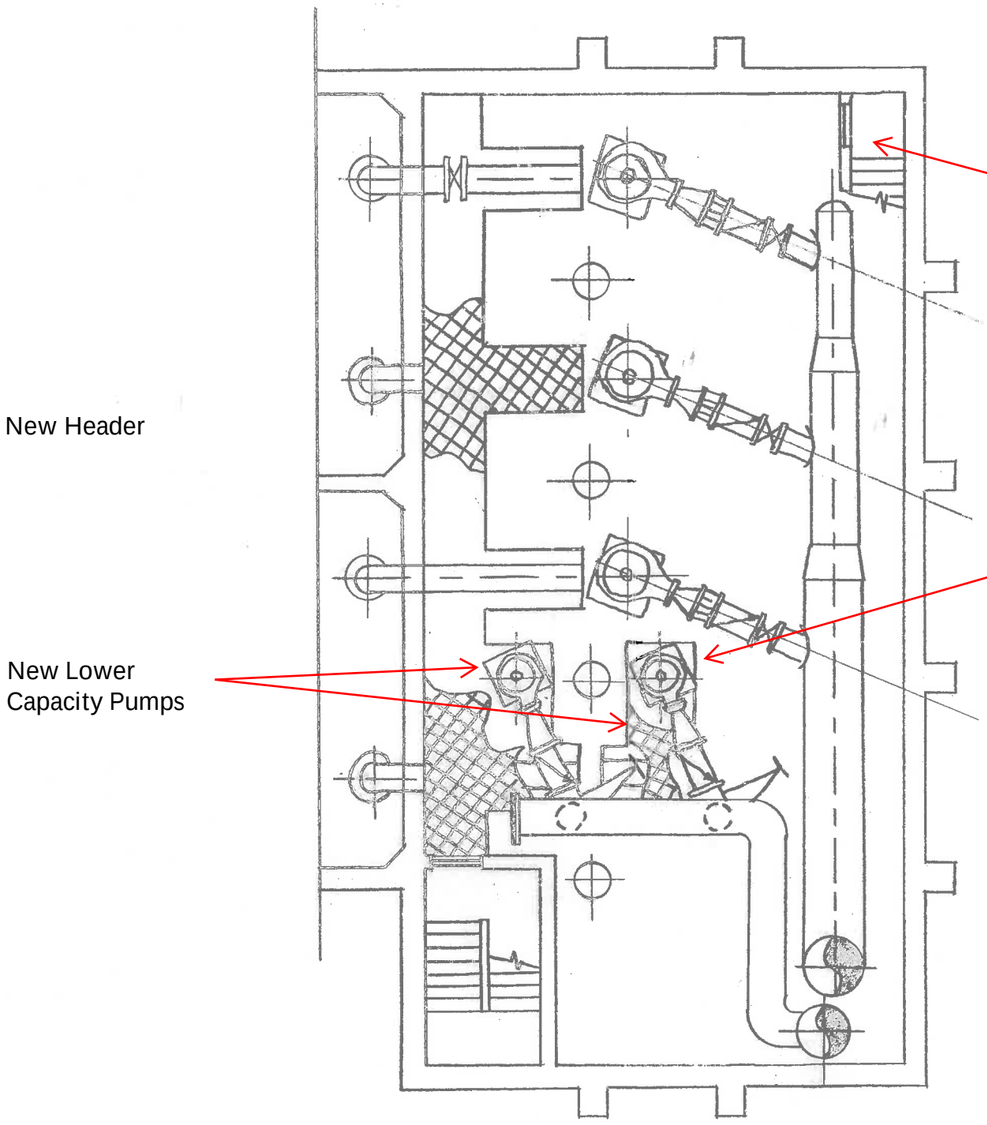
The existing wet well was assessed using principles from the Hydraulic Institute's Pump Intake Design standards. The initial investigations indicate that the wet well is likely adequate for future expansion. Desktop investigations looked at the approach velocity and submergence under current and future peak flow conditions.

Notwithstanding the above findings, the RDN should conduct hydraulic modelling of the wet well under the new peak flow condition of 1955 L/s. This modelling should be developed at the preliminary design phase to confirm these findings.

Minor upgrade works may be required in the wet well depending on the outcome of the results of the hydraulic model study. The cost estimate includes an allowance for minor modifications in the wet well.

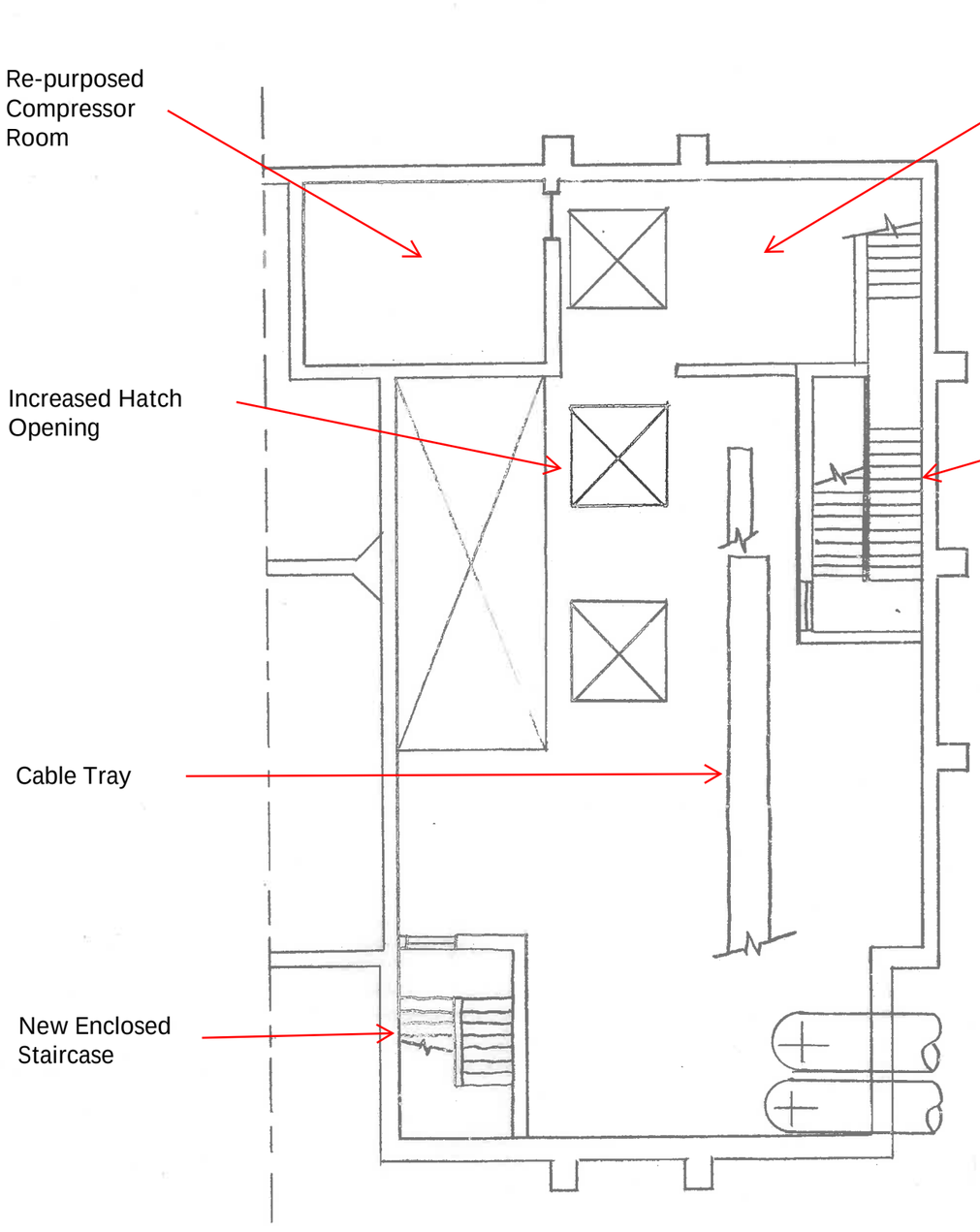


Phase 1 Layout

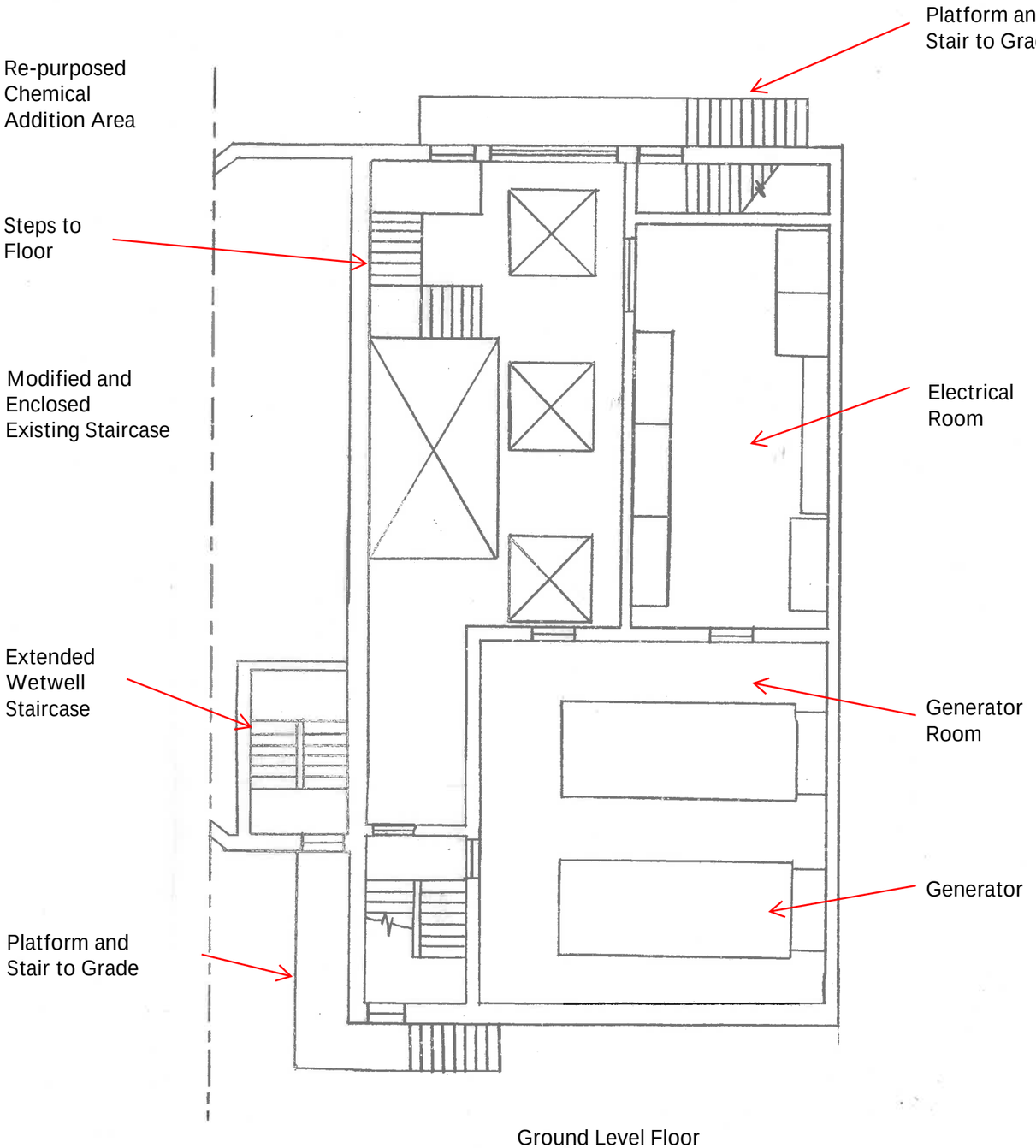


Phase 2 Layout

Figure 5-5 Proposed Layouts for Pump Floor Level for the Phase 1 and Phase 2 Upgrades



Intermediate Motor Floor



Ground Level Floor

Figure 5-6 Proposed Layouts for Intermediary Motor Floor and Ground Level Floor

6 SUPPORTING DISCIPLINES

The following sections provide an overview of the anticipated works at the DBPS during the Phase 1 and Phase 2 upgrades

6.1 Civil / Site Works

6.1.1 Demolition

The Phase 1 demolition will include the superstructure and internal components. The demolition will facilitate the proposed flood proofing and retrofits of the existing structure. In general, it is challenging to estimate demolition costs, as there may be some salvage value for components that are no longer needed by the RDN.

Demolition work will likely also be needed for the electrical service into the facility.

It is anticipated that minimal demolition will be required during Phase 2. The exception being the removal of retired pumps and process mechanical equipment.

6.1.2 Site Grading, Surfacing and Drainage

During Phase 1, some site grading will be required. This grading will be limited to areas that are impacted by the construction works. At the end of construction, some asphalt surfacing is anticipated.

A topographic site survey should first be conducted during preliminary design to confirm existing grade and elevations of structures. A site survey is also required to confirm that elevations are based on the geodetic datum.

6.1.3 Utilities and Site Flood Proofing

Existing utilities and site infrastructure need to be addressed during Phase 1 to prevent flooding of the wet well. This will include sealing of belowground ducting systems, sealing of manholes and valve operator boxes, and retrofitting the existing site drainage system.

In addition to flood proofing at the DBPS, upstream infrastructure may need flood-proofing. The RDN should investigate the elevation of offsite manholes along the Nanaimo Interceptor and conduct a flood risk evaluation within the wastewater collection system.

6.1.4 Forcemain Tie-Ins

Some work would be required to tie-in the new forcemain with the existing alignment during the Phase 1 upgrades.

6.1.5 Fencing, Landscaping and Tree Protection

Following the major upgrades to the superstructure, new fencing and landscaping will be required. In addition, protection of existing trees on site may be required during construction.

6.2 Structural and Architectural

6.2.1 Existing Substructure Retrofits for Flood Mitigation

It is proposed that the Ground Floor Elevation be lifted 1.7 m above grade to combat flooding during Phase 1. These upgrades will require significant structural analysis and design. Flood water has the potential to impose a considerable new force on the existing structure that will need to be reviewed. In addition, detailed analysis needs to be undertaken in the design of the connection between the new flood wall and the existing substructure.

The existing superstructure has masonry walls. The new superstructure should avoid heavy materials such as concrete and masonry, to minimize seismic weight and load demand on the existing substructure below. The new superstructure, including any steel columns/bracing, base plates, and anchor bolt details, would need to account for the limited curb width of the existing structure.

6.2.2 Modifications for Code Compliance

As outlined in Section 4.3, modifications to the building envelope and structure are recommended to comply with current codes, regulation and standards. **Figure 5-6** shows the proposed floor plans for the intermediate Motor Floor and the Ground Floor.

One of the most significant changes to the structure during Phase 1 is the extension of the Motor Floor and Ground Floor from Bay Line E to Bay Line F. The Pump Floor is already built out to this length. This extension will provide additional indoor capacity without the need to excavate in a new area on site. Foundation walls will be required between the Motor Floor and Ground Floor to support the new superstructure footprint. A new ground floor slab is also required in this area.

The extension of the building to this length will allow for the addition of a new staircase, as shown in **Figure 5-6**. As described previously, this enclosed egress may be required to meet compliance with the BCBC 2018 and safety regulations. A code consultant should be retained during preliminary design to confirm requirements.

The existing structure will likely not meet current seismic standards in its current condition. A detailed analysis will be required to identify the deficiencies. Prior to this analysis, a geotechnical report will be required for the site. Existing perimeter shear walls will require strengthening using fibreglass reinforced plastic (FRP) or additional reinforced concrete layer for in-plane capacity. Exterior walls may also require strengthening to enhance out-of-plane resistance against dynamic soil loads.

At the wet-well, a new enclosed stair case that is accessed above the flood design level will continue to provide operator access to the wet-well.

6.2.3 Modifications for Pump Configuration

On the Ground and Motor Floors, the grated square openings that exist for pump motor access will need to be increased to facilitate the installation and removal of the new larger capacity pumps. This structural change will require analysis to ensure that seismic diaphragm stresses can be mitigated. The slab around the openings may need strengthening to conform with seismic requirements.

Structural input and analysis will also be required for replacement of the bulk heads between the wet well and the dry well.

In addition, as shown in **Figure 5-5**, floor modifications on the Pump Floor will be required to facilitate the new suction line assembly for the two 28 MLD pumps. Since installation of the 28 MLD will occur during Phase 2, it is not recommended that this work be completed during the Phase 1 upgrades.

6.2.4 Other Structural Works

Miscellaneous structural work required during Phase 1 may include installation of new pipe and pump supports, new equipment pads, new crane equipment and restraints, new base for an outdoor unit substation, fuel tank area upgrades, and replacement of grating.

6.2.5 Other Architectural Works

The new superstructure will require architectural design and input. This includes items such as exterior and interior finishing, roofing, and doors. A new roll-up door will be required for movement of chemicals and equipment to and from the building.

In addition, the RDN may require speciality architectural features for the new structure to fit in with the existing neighbourhood, which is in a public-facing location.

The architectural works will be required during the Phase 1 upgrades.

6.3 Building Mechanical

Significant upgrades to the building mechanical systems will be required during Phase 1. The intent is to meet the BCBC 2018.

The new generator room will require a new ventilation system for the new generators. Specific air requirements for the generators should be addressed in preliminary design. Due to the installation of new VFDs, additional cooling in the electrical room will be required. For the rest of the building, a new forced air ducting system will be required to replace the existing passive system. The new ventilation system would require installation of new fans, intake louvers, dampers, ducting, and HVAC controls.

Depending on its condition and performance, the existing odour control mitigation system that ionizes air entering the wet well will need to be retrofitted or upgraded to mitigate against flooding. The existing ionizers could be replaced to a foul air treatment system such as a single-stage granular activated carbon unit.

A general plumbing upgrade will be required throughout the building; however, it is not anticipated that a fire suppression system will be required.

Depending on local bylaws, code requirements and preferences of the RDN, a noise attenuation system may consider for site features, including the generators and fans.

6.4 Electrical, Instrumentation and Controls

6.4.1 Current Pump Station Capacity

During the site visit, it was confirmed that the facility's single line diagram provides a good overview of what is installed on site. The facility is fed by a 1000 kVA unit substation that feeds a 1600Amp rated Automatic Transfer Switch (ATS) that toggles the power source between the utility feed and an onsite standby generator. The ATS ultimately feeds a 600 VAC, 3 phase, 3 wire, MCC located on the Motor floor. Nameplate information regarding the MCC could not be found on site; however, based on documentation available it is assumed that the MCC's bus is rated for 1200 Amps. The MCC is protected by a 1600Amp power circuit breaker found on the load side of the ATS. While the setpoints adjustments of the breaker are visible, the rating plug of the device could not be determined by observing the front panel, it is assumed that the breaker does not exceed a value of 1200 Amps. The MCC does not have a power meter, as such no trend data (e.g., peak demands, harmonic content) for the facility is available. Utility bills (from BC Hydro) can be utilized to determine the actual peak power demand of the facility, in particular bills from months of high use.

Supplying stand-by power to the facility is a 1400 kW, 600 VAC, 3 phase, 0.8 pf, standby diesel generator that is protected by a 1600Amp molded case circuit breaker (MCCB).

Pump #1 is driven by a 350HP Allen Bradley VFD that was installed in 2016. As previously discussed, Pumps #2 and #3 are still driven by eddy current drives while Pump #4 is started across-the-line. Based on discussions with operators on site, all motor starters are working without issue.

6.4.2 Proposed Pump Station Upgrade Options

6.4.2.1 Phase 1

To operate three 765hp pumps simultaneously, it is anticipated that the distribution system will need to accommodate a peak demand of 2460 kVA (1939 kW). To achieve this, the facility's power distribution system will need to be upgraded to support a 2500 Amp service at 600VAC. This will involve the replacement of:

- The existing unit substation with a 2500kVA unit substation,
- The existing genset, and
- The existing automatic transfer switch.

In addition to the cost of the new unit substation, there will likely be a contribution factor applied by BC Hydro to upgrade the power network to the site.

New 600VAC distribution equipment (MCC, Motor starters, etc.) and supporting infrastructure (Cables and raceway) will need to be installed. **Figure 5-6** provides an outline as to how the new system could be configured.

As the unit substation will need to be replaced, additional grounding will likely be required to reduce touch and step hazards, and to bring up the installation to BC Hydro requirements. To limit the extent of the modifications, the unit substation should be relocated to an outside area and away from the generator(s).

As the existing main bus/MCC is sized for 1200 Amps, it cannot be reused as the main bus; however, it should not be demolished as it will provide a means to keep the pumps operational during construction. As previously mentioned, new 2500 Amp, 600VAC, 3-phase, 3-wire, 42kAIC Motor Control Centre will be required to feed the three pumps and

miscellaneous station loads. Per discussions on site, best engineering practices for arc-flash mitigation should be taken into consideration. To understand the potential arc-flash hazardous of the new system, a Power System Study will need to be conducted. For the purposes of this study and the cost estimate, it is assumed the new MCC will be equipped with:

- An arc-flash maintenance mode switch on its main protective device,
- Insulated busses, and
- A means to trip and energize the main breaker away from the arc flash boundary.

Other mitigation options to consider during detailed design include:

- Arc resistant gear (we have provided anticipated cost in our estimate),
- Auto-racking, and
- Automatic Vertical Bus Shutters.

Phase 1 will require three, 765HP normal duty VFDs to be installed to provide the appropriate control over flow rates. Given the size/rating of the drives, they will need to be paired with some form of active harmonic filtering to lessen impacts to the station's generators and to meet BC Hydro's requirements. This can be achieved with either VFDs with active front end's or with a stand alone active harmonic filter. Depending on the manufacturer, the active harmonic filter could be staged in an attempt to reduce upfront costs. This decision ultimately depends on the timeline between phases and market conditions.

If the harmonics of the drives are not filtered, the generators will likely need to be up-sized to accommodate the harmonic load on the system and will increase the overall cost of the project.

The new VFDs should be separated into their own freestanding enclosures/cabinets to reduce the overall space requirements as compared to a single MCC lineup.

Under Phase 1, the existing VFD for Pump #1 will be re-used and will be relocated to the Ground Floor.

With all of the electrical equipment relocated to the Ground Floor, HVAC requirements for the building will need to be reanalyzed, in particular cooling loads as the new VFDs will dissipate approximately 29-38 kW of heat when in operation. Note that a cooling load of 120 kW was assumed in our demand calculations.

At 1400 kW, the existing generator will at most be able to run two of the 765HP duty pumps at full speed. For the purposes of this study, we have assumed that the generator will need to power all three large duty pumps during a power outage. To accomplish this, 2250 kW worth generation will need to be installed. Upon consultation with a local generator manufacturer, we estimate that either three 750kW or two 1250kW generator units will be required to provide enough power for this run case. The new generators will require a large floorspace which greatly exceeds the existing generator room. **Figure 5-6** shows the new proposed location for the new generators. For the cost estimate, we have assumed that the generators will come in skin-tight, 79 dbA sound attenuated enclosures, with a separate cabinet housing its control and distribution equipment.

To operate two 765hp and two 385hp pumps simultaneously during Phase 2, we anticipate that the distribution system will need to accommodate a peak demand of 2402 kVA (1946 kW).

6.4.3 Lighting Upgrades

New lighting throughout the building and wet well will need to be considered as apart of the Phase 1 installation. Lighting levels will need to be reviewed to ensure that the installation meets the guidelines set out by IESNA and WorkSafe BC. All lights will be replaced with energy efficient light-emitting diode (LED) fixtures to reduce maintenance requirements and improve energy efficiency.

6.4.4 Controls

The conceptual design assumes that a full upgrade to the control system will be required. This includes replacement of instrumentation, including level meters within the wet well and new flowmeters on the discharge headers. In addition, a new control panel (1 rack, 17 slot chassis) for the station has been assumed.

An allowance was made for programming of the control system as well as integration with the RDN's communication network. In addition, new software for either local or remote access may be installed.

7 OPINION OF PROBABLE COST

A Class C opinion of probable cost was prepared for the DBPS Phase 1 Upgrade. The cost estimate was based on the guidelines set out by Engineers and Geoscientists British Columbia (EGBC).

The cost estimate summary is presented in **Table 7-1**. The total capital works with direct and indirect costs are estimated at 21.3 million. A more detailed breakdown of the cost estimate is provided in **Appendix B**.

The cost estimate for the upgrades was developed using pricing quotes from equipment suppliers, and provisional sums for areas where it was not possible to obtain a quote or perform quantity take-offs at this level of design. This estimate includes an overall contingency of 30%.

The cost estimate was based on the RDN pre-purchasing major equipment including the pumps, unit substation, and generators. Contractor overhead and profit were not applied to these items.

A cost estimate for the Phase 2 upgrades was excluded from this work. Phase 2 will not likely take place within the next 10 years. In addition, the cost estimate excludes the necessary upgrade works to the downstream forcemain and gravity sewer. These costs will be significant and need to be considered independently of this assignment.

Table 7-1
Opinion of Probable Capital Cost Summary

	Capital Cost
DIRECT COSTS	
Site Development	$110,000
Site Works	$450,000
Structural and Architectural	$3,480,000
Mechanical	$1,550,000
Electrical, Instrumentation & Controls	$3,883,000
Major Equipment Supply	$2,929,000
Contractor Overhead and Profit (10%, excluding Site Development)	$937,000
Insurance and Fees (1%)	$123,000
INDIRECT COSTS	
Engineering (Design and Construction) (12%)	$1,616,000
Other Allowances and Owner Overhead	$874,000
SUBTOTAL – DIRECT+ INDIRECT	$15,952,000
Contingency (30%)	$4,786,000
Escalation to 2022 (2.5%)	$519,000
TOTAL PROJECT COST ESTIMATE	$21,257,000

8 RECOMMENDATIONS

The RDN is required to perform upgrades to the DBPS to address the major challenges at the station. AE recommends that the RDN move forward with the next phase of this project. The recommendations have been separated into four categories, summarized below. Undertaking these steps prior to or during the next phase of project development will help ensure the effective management of the project.

8.1 Capacity Increase

AE recommends that the RDN proceed forward with upgrading the capacity of the DBPS to meet current and future demands. As outlined in the study, a phased approach is recommended. The following actions are important to progress the project to the next phase:

- Develop a plan for forcemain and gravity sewer improvement prior to finalizing the design of the upgrades to the DBPS. The selection of pumps is a significant decision and should be based on current information for these alignments.
- Develop a plan for capacity upgrade work at the GNPCC that coincides with upgrades at the DBPS.
- Initiate discussions with BC Hydro regarding the expected increase in power to site and determine what the anticipated contribution factor will be for BC Hydro to upgrade power to the site.
- Complete a detailed hydraulic model on the wet well to determine if retrofits can allow for better hydraulic flow through the pump station.

8.2 Climate Change / Flood Control

AE recommends proceeding with raising the building above the target flood construction level (presented as Option 3). This option provides the most resiliency and least amount of risk, once construction is complete. The following actions are recommended to proceed with this option:

- Confirm whether the RDN is planning to adopt an official Flood Construction Level prior to the next phase of upgrades.
- Complete a detailed topographic survey of the site, including major structural points and confirm datum of drawings.
- Undertake an investigation of the elevation of offsite manholes along the Nanaimo Interceptor and conduct a flood risk evaluation within the wastewater collection system.

8.3 Building Upgrades and Code / Regulatory Compliance

As significant upgrades are required to bring the building up to the new flood construction level, undertaking actions to bring the existing structure up to code should be a priority for the RDN. The following actions are recommended to begin with this process:

- Require that a code consultant be used during preliminary and detailed design.
- Require that a noise consultant be used during preliminary and detailed design. The RDN may want to start taking background noise levels at the DBPS to better understand the noise output of the existing system. This baseline could be used to set noise targets for the upgrades.
- Undertake geotechnical investigations at the location of the building expansion (between Bay Lines E to F). A geotechnical report is required for the detailed structural analysis.

8.3.1 Planning and Financial

Internal financial and planning is required to continue to move the project through to preliminary design, detailed design and construction. The following are some of the actions the RDN should undertake prior to the next phase of the project:

- Update financial plans and determine potential sources in funding. This may include seeking out opportunities for grant funding or looking into borrowing requirements. It is not anticipated that a public referendum will be required for borrowing, since the RDN has an approved LWMP.
- Update the LWMP by following the relevant plan monitoring processes, as applicable. This may include undertaking stakeholder and public engagement for the new project or setting implementation targets.
- Consider and review procurement options for design and construction services. This includes reviewing options for overall project delivery (traditional or alternate delivery). In addition, the RDN may want to consider the use of social procurement policies and equipment pre-purchase.

CERTIFICATION PAGE

This report presents our findings regarding the Regional District of Nanaimo Departure Bay Pump Station Upgrade Study. The services provide by Associated Engineering (B.C.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Associated Engineering (B.C.) Ltd.
Engineers & Geoscientists BC Permit Number 1000163

Prepared by:

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Reviewed by:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
S. BOLONGARO
24970
Sept 10 / 2024

Sean Bolongaro, C.Eng., P.Eng.
Division Manager, Water

SW/SB/fd

APPENDIX A - PUMP DATA SHEETS

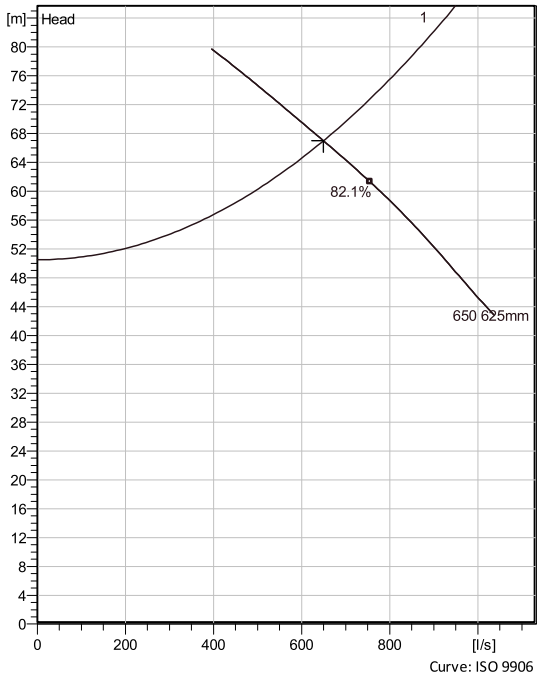
CT 3351/936 3~ 650

Shrouded single or multi-channel impeller pumps with large throughlets and single volute pump casing for liquids containing solids and fibres. Cast iron design with double sealing technology. Some models available as stainless steel versions.

FLYGT
a xylem brand

Technical specification

Curves according to: Water, pure ,4 °C,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
C0936.000 66-66-6IE-D IE3 765hp

Installation type
T - Vertical Permanent, Dry

Impeller diameter
625 mm

Discharge diameter
0.35 m

Pump information

Impeller diameter
625 mm

Discharge diameter
0.35 m

Inlet diameter
450 mm

Maximum operating speed
1195 rpm

Number of blades
3

Throughlet diameter
110 m

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Marius Bocu
Block	0	**Created on**	6/3/2021 **Last update** 6/3/2021

CT 3351/936 3~ 650

Technical specification

Motor - General

Motor number C0936.000 66-66-6IE-D IE3 765hp	**Phases** 3~	**Rated speed** 1195 rpm	**Rated power** 765 hp
Approval No	**Number of poles** 6	**Rated current** 725 A	**Stator variant** 3
Frequency 60 Hz	**Rated voltage** 600 V	**Insulation class** H	**Type of Duty**
Version code 000			

Motor - Technical

Power factor - 1/1 Load 0.78	**Motor efficiency - 1/1 Load** 96.8 %	**Total moment of inertia** 29 kg m²	**Starts per hour max.** 0
Power factor - 3/4 Load 0.72	**Motor efficiency - 3/4 Load** 96.8 %	**Starting current, direct starting** 4950 A	
Power factor - 1/2 Load 0.61	**Motor efficiency - 1/2 Load** 96.3 %	**Starting current, star-delta** 1650 A	

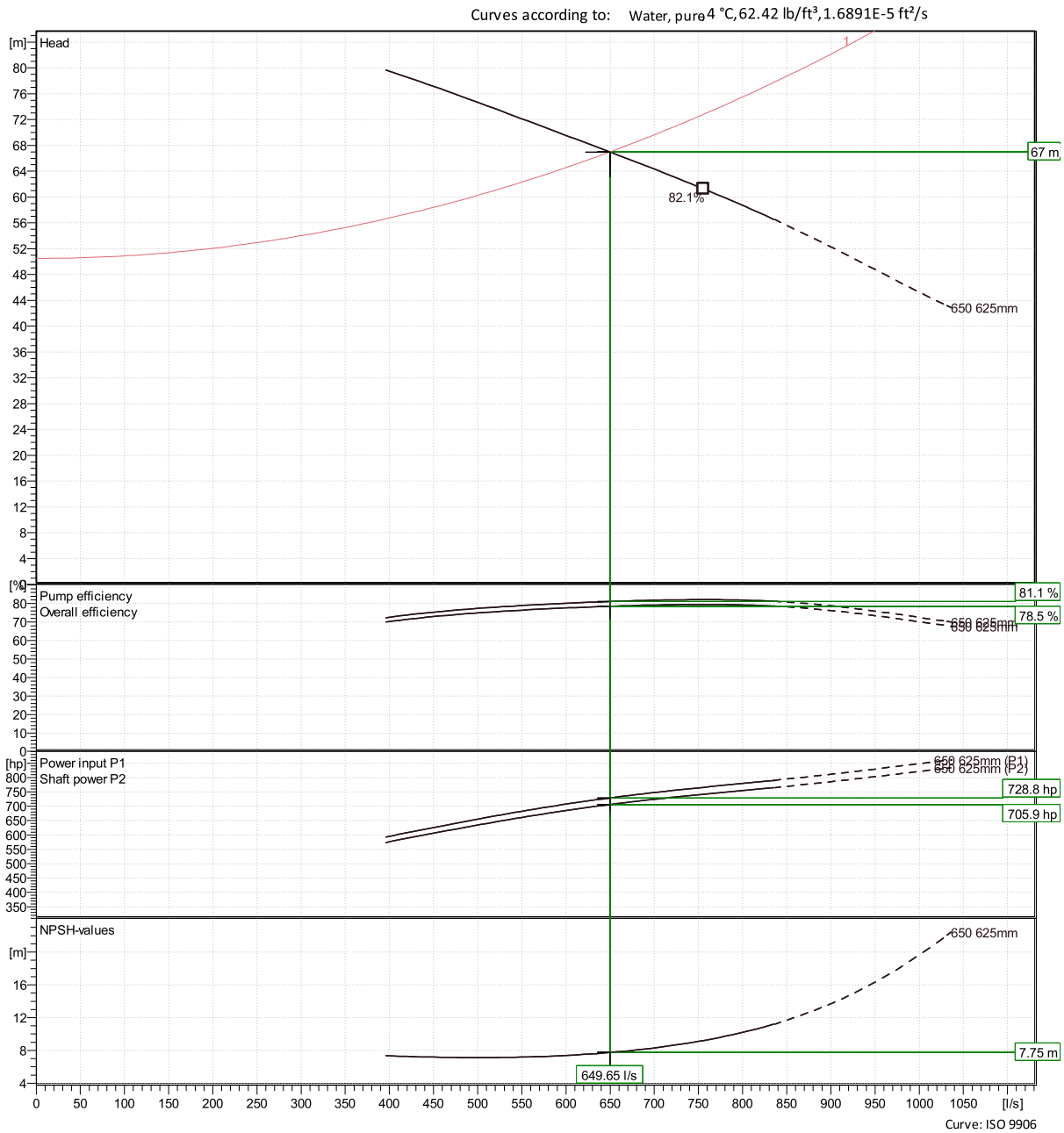
Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

CT 3351/936 3~ 650

Performance curve

Duty point

Flow	Head
650 l/s	67 m



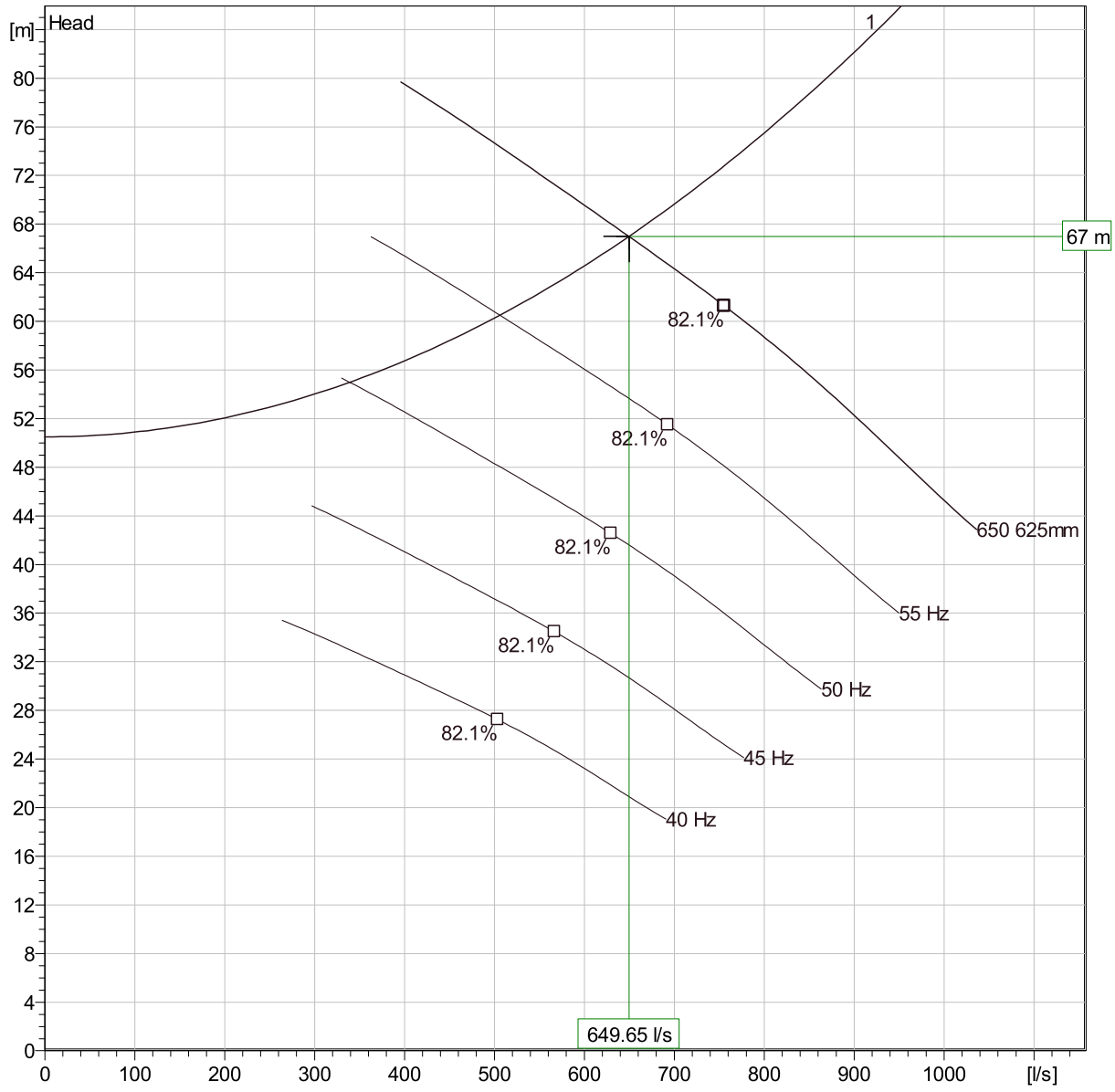
Curve: ISO 9906

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

CT 3351/936 3~ 650

Duty Analysis

Curves according to: Water, pure ,4 °C,62.42 lb/ft³,1.6891E-5 ft²/s



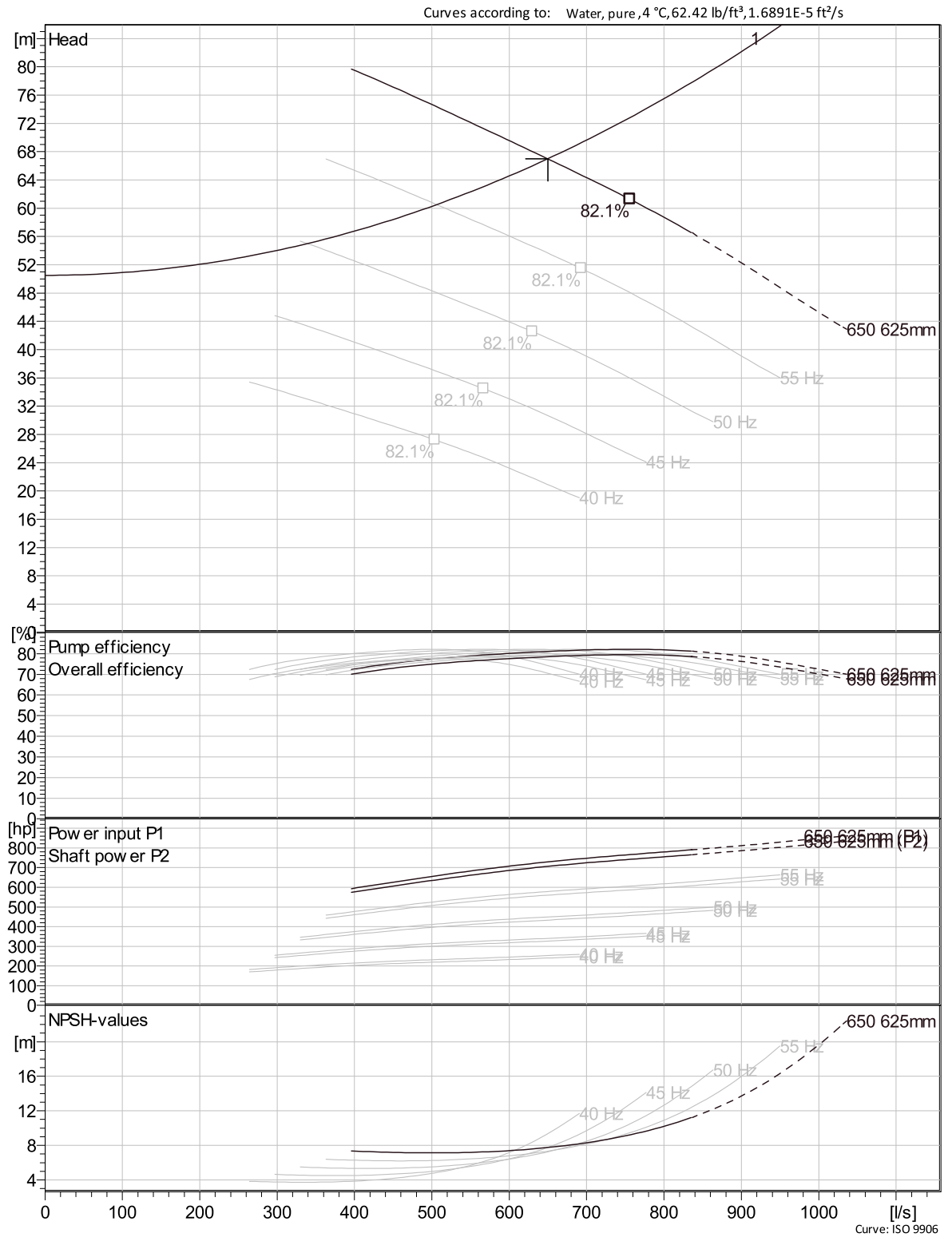
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	650 l/s	67 m	706 hp	650 l/s	67 m	706 hp	81.1 %	0.000232 kWh	7.75 m

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

CT 3351/936 3~ 650

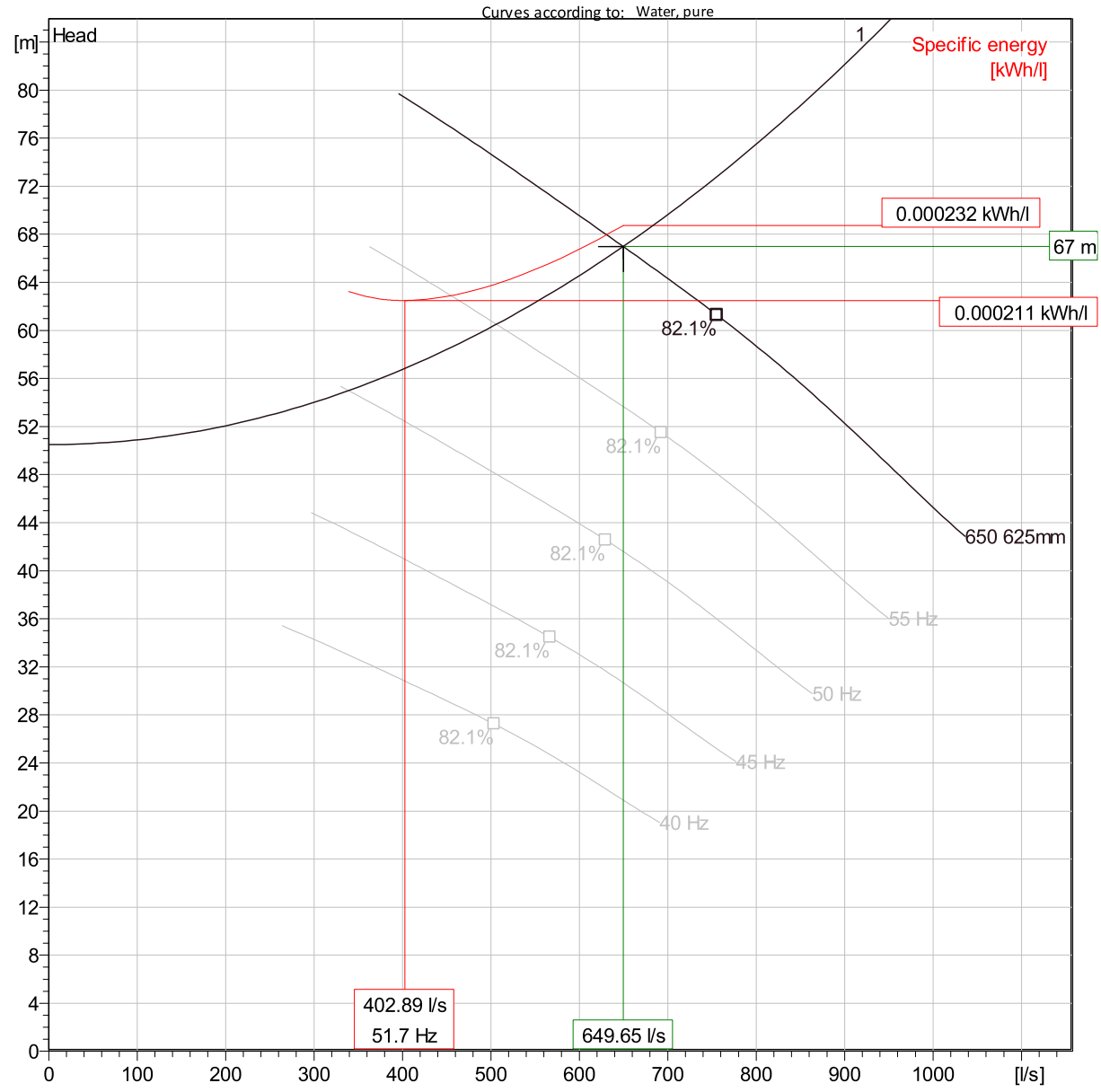
VFD Curve



Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

CT 3351/936 3~ 650

VFD Analysis



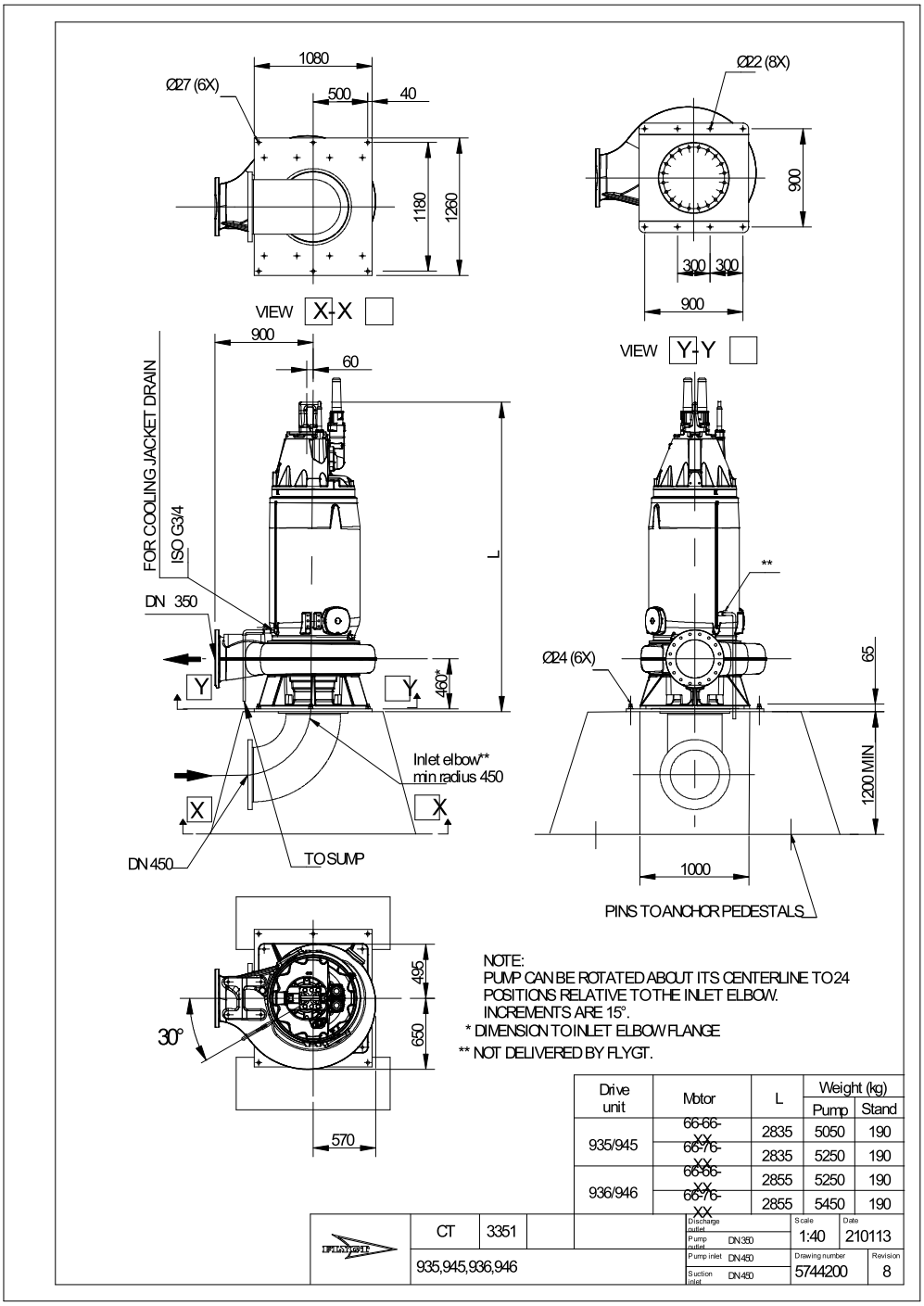
Operating characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	60 Hz	650 l/s	67 m	706 hp	650 l/s	67 m	706 hp	81.1 %	0.000232 kWh	7.75 m
1	55 Hz	507 l/s	60.5 m	511 hp	507 l/s	60.5 m	511 hp	79 %	0.000216 kWh	6.27 m
1	50 Hz	340 l/s	55 m	336 hp	340 l/s	55 m	336 hp	73.1 %	0.000214 kWh	5.46 m
1	45 Hz									
1	40 Hz									

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

CT 3351/936 3~ 650

Dimensional drawing



Drive unit	Motor	L	Weight (kg)	
			Pump	Stand
935/945	66-66-XX	2835	5050	190
	66-76-XX	2835	5250	190
936/946	66-66-XX	2855	5250	190
	66-76-XX	2855	5450	190

CT	3351		Discharge outlet	Scale	Date
			Pump outlet DN350	1:40	210113
935,945,936,946			Pump inlet DN450	Drawing number	Revision
			Suction inlet DN450	5744200	8

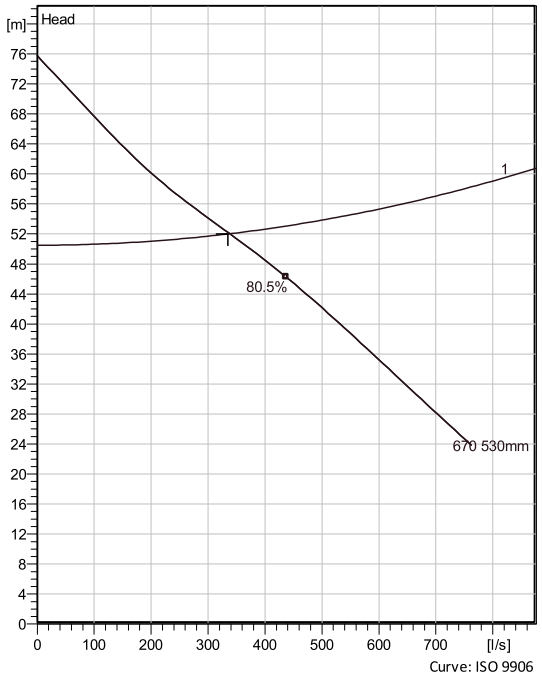
Project		**Created by**	Marius Bocu
Block	0	**Created on**	6/3/2021 **Last update** 6/3/2021

NT 3312/836 3~ 670

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure ,4 °C, 62.428 lb/ft³, 1.6889E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N0836.000 54-52-6ID-D IE3 385hp

Installation type
T - Vertical Permanent, Dry

Impeller diameter
530 mm

Discharge diameter
0.3 m

Pump information

Impeller diameter
530 mm

Discharge diameter
0.3 m

Inlet diameter
350 mm

Maximum operating speed
1190 rpm

Number of blades
3

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Marius Bocu
Block	0	**Created on**	6/3/2021 **Last update** 6/3/2021

NT 3312/836 3~ 670

Technical specification

Motor - General

Motor number N0836.000 54-52-6ID-D IE3 385hp	**Phases** 3~	**Rated speed** 1190 rpm	**Rated power** 385 hp
Approval No	**Number of poles** 6	**Rated current** 335 A	**Stator variant** 2
Frequency 60 Hz	**Rated voltage** 600 V	**Insulation class** H	**Type of Duty**
Version code 000			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 96.3 %	**Total moment of inertia** 9.02 kg m²	**Starts per hour max.** 0
Power factor - 3/4 Load 0.82	**Motor efficiency - 3/4 Load** 96.7 %	**Starting current, direct starting** 2430 A	
Power factor - 1/2 Load 0.73	**Motor efficiency - 1/2 Load** 96.7 %	**Starting current, star-delta** 810 A	

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

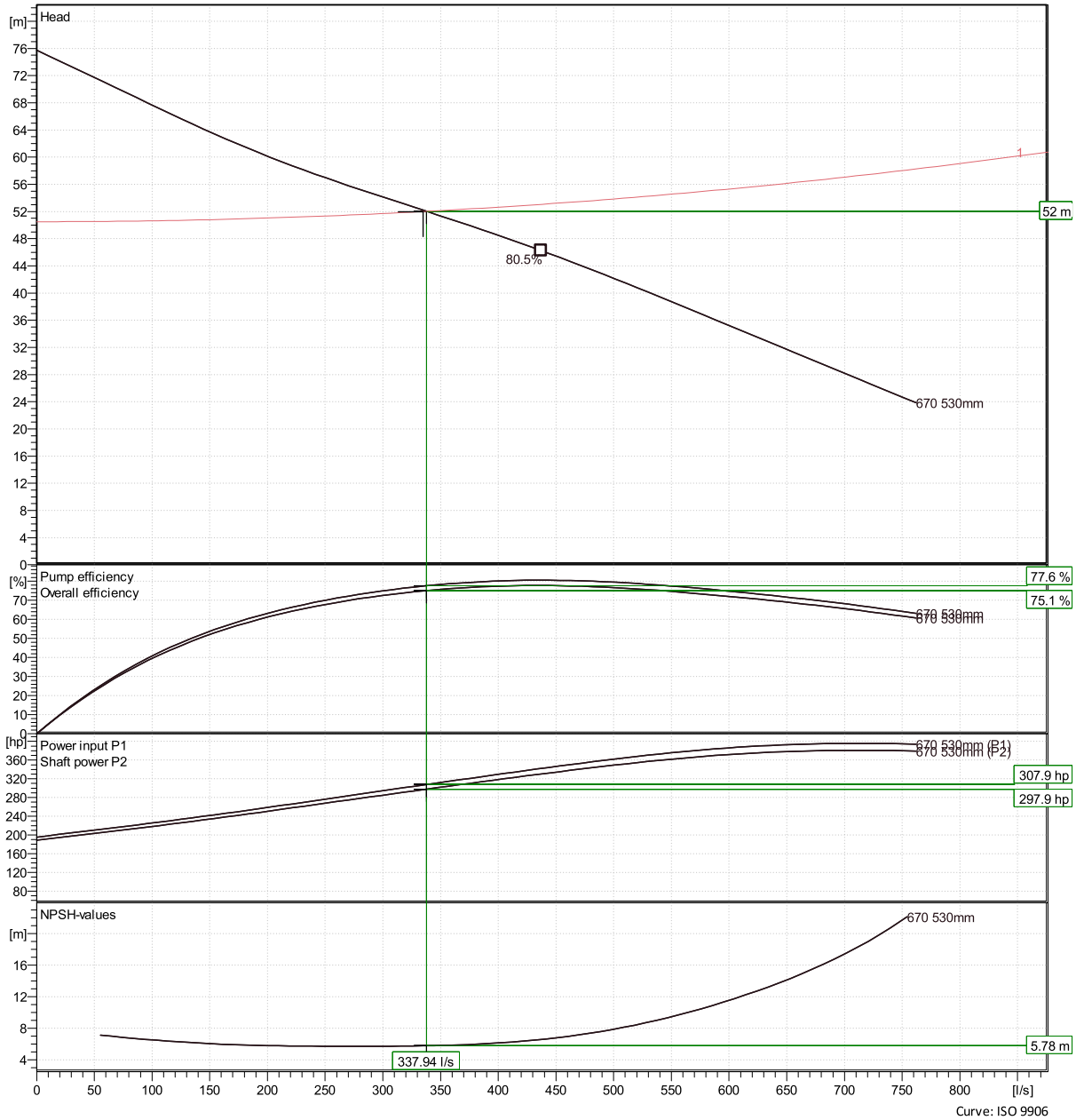
NT 3312/836 3~ 670

Performance curve

Duty point

Flow	Head
335 l/s	52 m

Curves according to: Water, pure 4 °C, 62.428 lb/ft³, 1.6889E-5 ft²/s



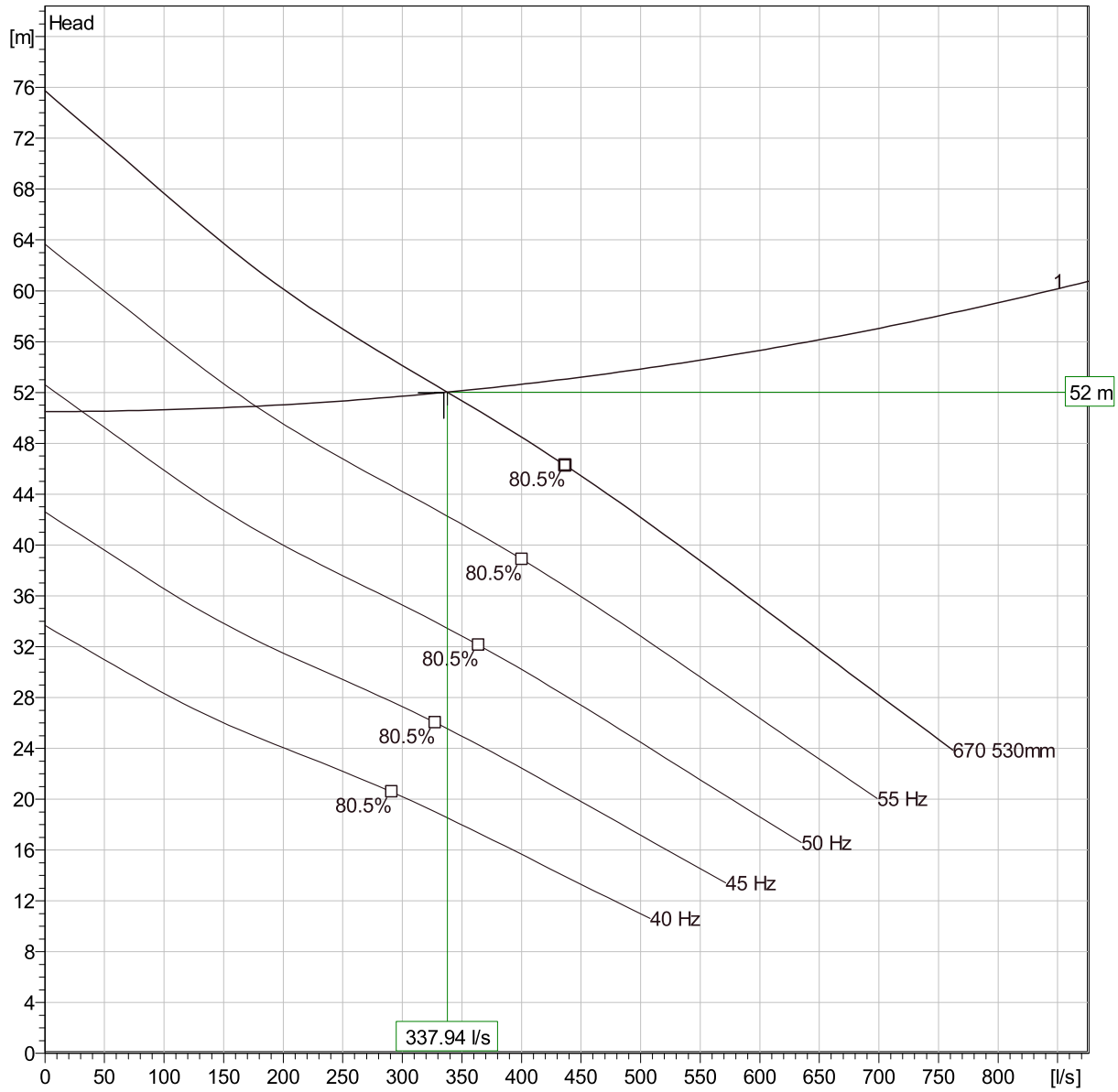
Curve: ISO 9906

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

NT 3312/836 3~ 670

Duty Analysis

Curves according to: Water, pure ,4 °C,62.428 lb/ft³,1.6889E-5 ft²/s



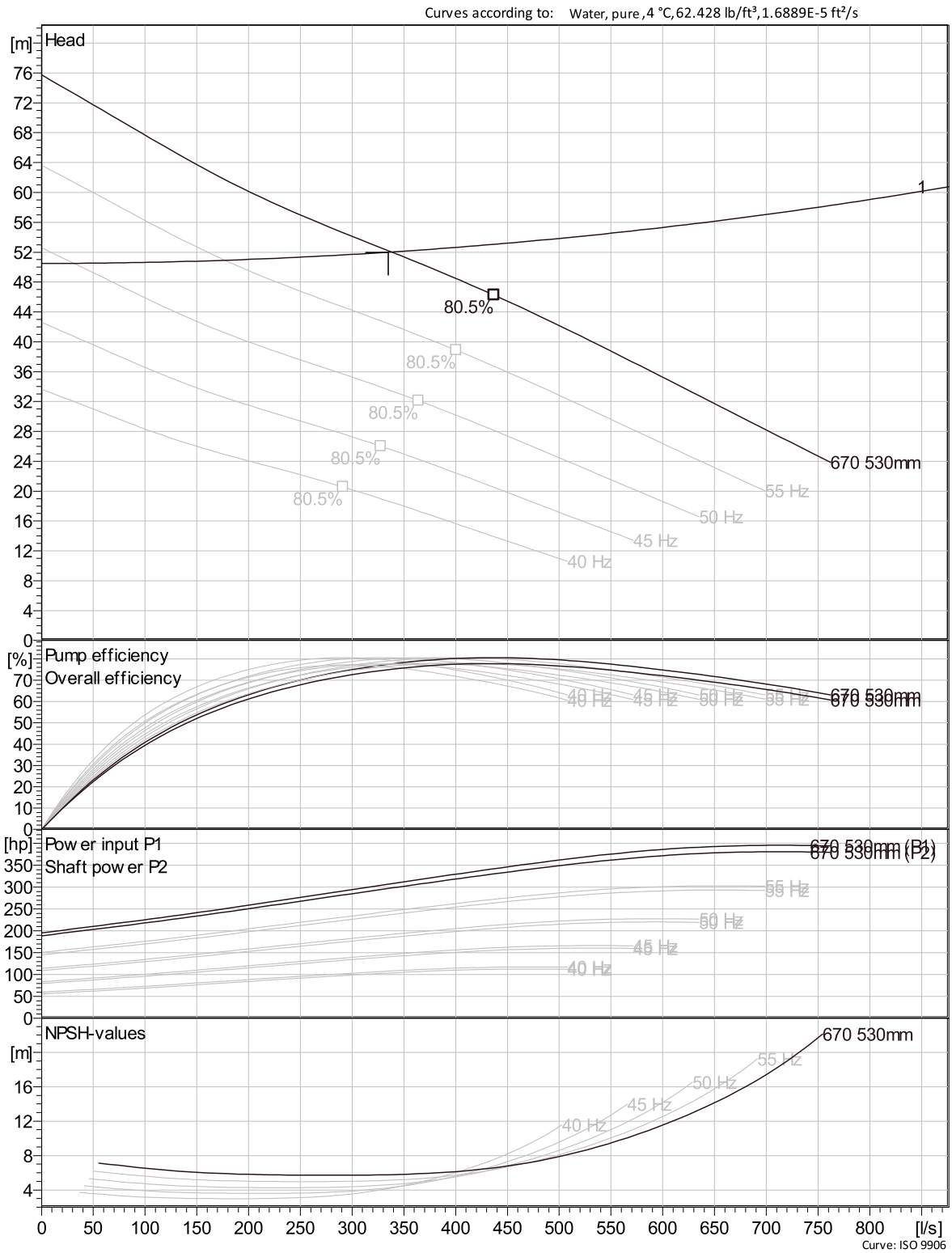
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	335 l/s	52 m	297 hp	335 l/s	52 m	297 hp	77.5 %	0.00019 kWh/	5.78 m

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

NT 3312/836 3~ 670

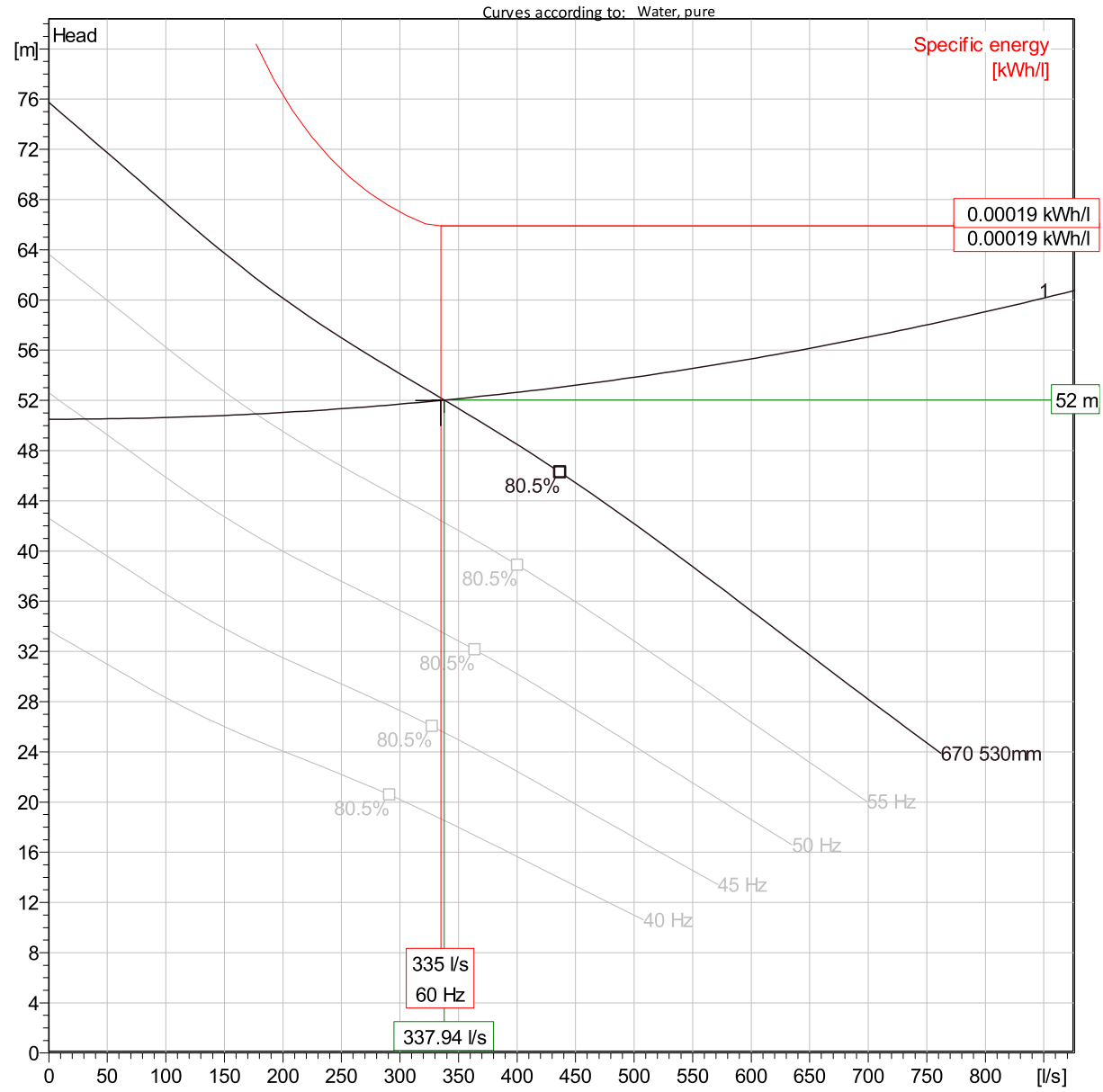
VFD Curve



Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

NT 3312/836 3~ 670

VFD Analysis



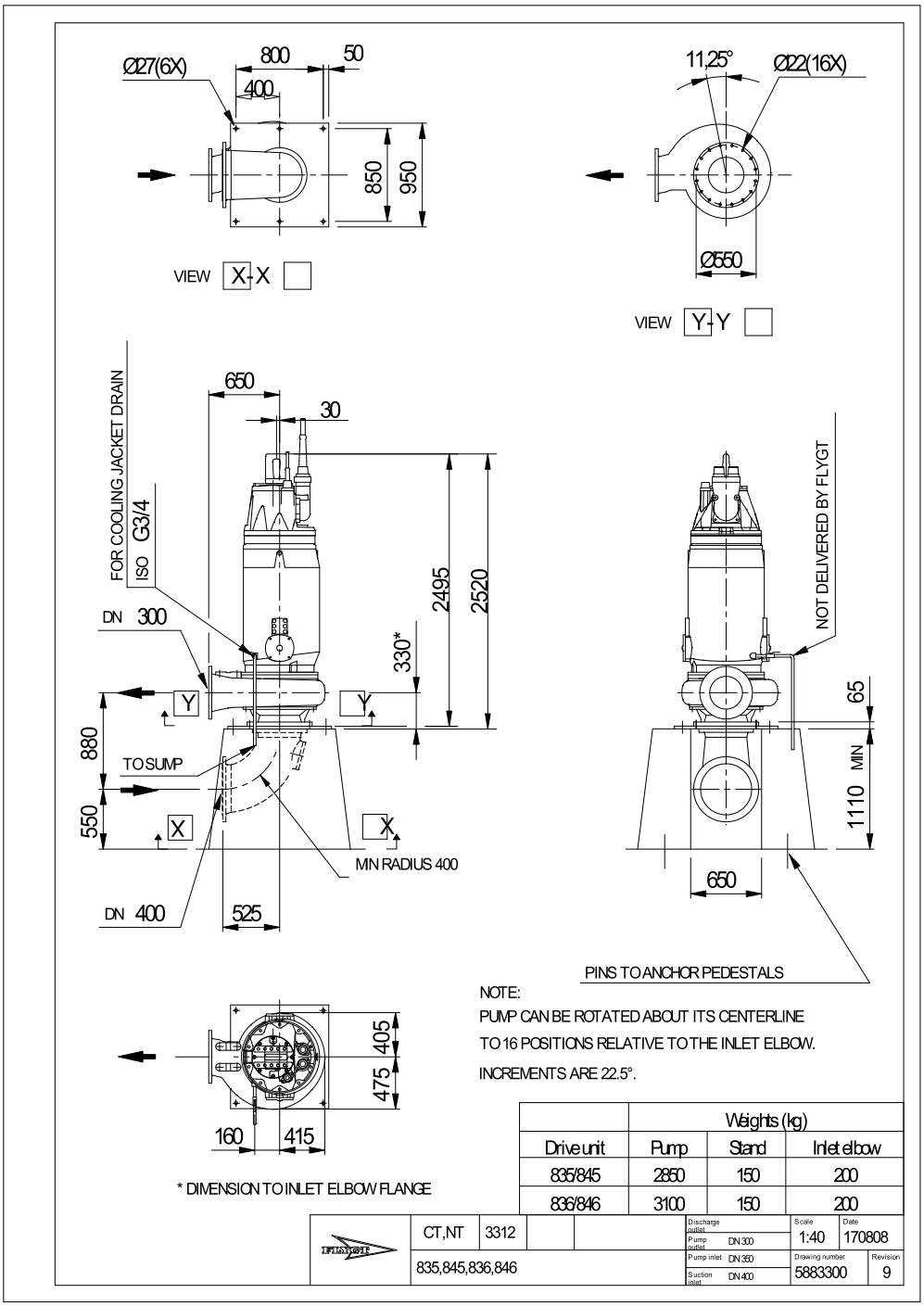
Operating characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	60 Hz	335 l/s	52 m	297 hp	335 l/s	52 m	297 hp	77.5 %	0.00019 kWh	5.78 m
1	55 Hz	177 l/s	50.9 m	191 hp	177 l/s	50.9 m	191 hp	62 %	0.000231 kWh	5.08 m
1	50 Hz	31.3 l/s	50.5 m	116 hp	31.3 l/s	50.5 m	116 hp	18 %	0.000797 kWh	
1	45 Hz									
1	40 Hz									

Project		**Created by**	Marius Bocu		
Block	0	**Created on**	6/3/2021	**Last update**	6/3/2021

NT 3312/836 3~ 670

Dimensional drawing



	Weights (kg)		
Drive unit	Pump	Stand	Inlet elbow
835/845	2850	150	200
836/846	3100	150	200

CT,NT	3312			Discharge outlet	Scale 1:40	Date 170808
835,845,836,846				Pump outlet DN300		
				Pump inlet DN350	Drawing number 5883300	Revision 9
				Suction inlet DN400		

Project		**Created by**	Marius Bocu
Block	0	**Created on**	6/3/2021 **Last update** 6/3/2021

APPENDIX B - COST ESTIMATE BREAKDOWN

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Class C Cost Estimate (Note 1)

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: 10-Sep-21
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Cost Estimate Summary

1	**DIRECT COSTS**				Note 2
1.1	**SITE DEVELOPMENT**		$	110,000	
1.2	**SITE WORKS**		$	450,000	
1.3	**STRUCTURAL AND ARCHITECTURAL**		$	3,480,000	
1.4	**MECHANICAL**		$	1,550,000	
1.5	**ELECTRICAL, INSTRUMENTATION & CONTROLS**		$	3,883,000	
1.6	**MAJOR EQUIPMENT SUPPLY**		$	2,929,000	
1.7	**CONTRACTOR OH&P**	10%	$	937,000	Note 3
1.8	**INSURANCE AND FEES**	1%	$	123,000	Note 4
	Subtotal Direct Costs		$	13,462,000	
2	**INDIRECT COSTS**				
2.1	**Engineering (Design and Construction)**	12%	$	1,616,000	
2.2	**Environmental Requirements**		$	100,000	Note 5
2.3	**Allowances for Indirect Items During Construction**		$	100,000	Note 6
2.4	**Owner Overhead**	5%	$	674,000	Note 7
2.5	**Finance Costs**	0%			Note 8
	Subtotal Indirect Costs		$	2,490,000	
	Subtotal (Indirect + Direct)		$	15,952,000	
	Contingency	30%	$	4,786,000	Note 9
	Escalation (to 2022)	2.5%	$	519,000	Note 10
	TOTAL PROJECT COST ESTIMATE		**$**	**21,257,000**	

NOTES:
1. Class C Cost Estimate defined as per Engineering and Geoscientists British Columbia (EGBC)
2. GST has been excluded from the estimate. PST has been included, where applicable.
3. A 10% rate on Items 1.2 through 1.6 was applied to cover Contractor Overhead and Profit (OH&P).
4. A 1% rate on Items 1.2 through 1.6 was applied to cover Contractor insurance, bonding and other fees.
5. Provisional sum intended for environmental professional services during the design and construction of the upgrades.
6. Indirect allowances include items such as fuel for bypass pumping, and other temporary works required by RDN during construction.
7. Costs include Owner Project Management and Coordination, Administration Services, Review of Deliverables, and Owner's Training Costs. and Owner Operations
8. Assumes that the RDN is not borrowing money for the project.
9. Percentage is per CSA recommendations for a complex Class D estimate. For many items, provisional sums have been instituted. For the pumps and VFDs, quotes were obtained from suppliers.
10. Escalation to account for inflation of the construction market between 2021 and 2022, the estimated project start.

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Site Development

Item	Description	Qty.	Units	Unit Price	Extension
1	BC Hydro Electrical Upgrade Contribution	1	LS	100,000	100,000
2	Telus / Communications Service	1	LS	10,000	10,000
3		0	ea	1	-
4		0	ea	1	-
5		0	ea	1	-
6		0	ea	1	-
7		0	ea	1	-
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 110,000**

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Site Works

Item	Description	Qty.	Units	Unit Price	Extension
1	Site Grading, surfacing (asphalt), and other site drainage	1	allowance	100,000	100,000
2	Fencing, Landscaping and Tree Protection	1	allowance	40,000	40,000
3	Demolition	1	allowance	150,000	150,000
4	Sealing / replacement of ducting systems	1	allowance	20,000	20,000
5	Sealing of manholes and valve operator boxes	1	allowance	20,000	20,000
6	Forcemain tie-ins	1	allowance	100,000	100,000
7	Venting Requirements	1	allowance	20,000	20,000
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 450,000**

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Structural and Architectural

Item	Description	Qty.	Units	Unit Price	Extension
1	Extending substructure to new FCL (dry well and wet-well access)	1	allowance	625,000	625,000
2	Structural modifications of Sub-Structure to meet code (stairs and seismic)	1	allowance	750,000	750,000
3	Structural modifications for pump configuration	1	allowance	75,000	75,000
4	Structural modifications to extend bay width	920	allowance	500	460,000
5	Misc. Structural Works	1	allowance	100,000	100,000
6	New Superstructure	1	allowance	1,020,000	1,020,000
7	Specialty Architectural Items	1	allowance	50,000	50,000
8	Grating and Steel Work	1	allowance	50,000	50,000
9	Crane Equipment	1	allowance	100,000	100,000
10	Painting and Finishing	1	allowance	30,000	30,000
11	Doors	1	allowance	40,000	40,000
12	Transformer and switchgear base	1	allowance	30,000	30,000
13	Fuel Tank Base + Corral	1	allowance	150,000	150,000
14					
15					
16					
17					
18					
19					
20					
	Subtotal				**$ 3,480,000**

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Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Process Mechanical

Item	Description	Qty.	Units	Unit Price	Extension
1	Piping	1	allowance	300,000	300,000
2	Valves	1	allowance	250,000	250,000
3	Specialty fittings	1	allowance	50,000	50,000
4	Misc. Supports and Hangers	1	allowance	55,000	55,000
5	Surge Anticipation and Other Speciality Valves	1	allowance	50,000	50,000
6	Sump Pump System	1	allowance	20,000	20,000
7	Alum Dosing system	1	allowance	30,000	30,000
8	Compressors	1	allowance	20,000	20,000
9	Misc. Mechanical Equipment	1	allowance	25,000	25,000
10	General Mechanical	1	allowance	150,000	150,000
11	Fuel Storage System Allowance	1	allowance	150,000	150,000
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 1,100,000**

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Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Building Mechanical

Item	Description	Qty.	Units	Unit Price	Extension
1	Emergency Equipment	1	allowance	10,000	10,000
2	Generator Room Venitllation System	1	allowance	100,000	100,000
3	General Ventillation System	1	allowance	180,000	180,000
4	Odour Control System	1	allowance	60,000	60,000
5	Plumbing Installation	1	allowance	25,000	25,000
6	General Building Mechanical Items	1	allowance	50,000	50,000
7	Noise attenuation system	1	allowance	25,000	25,000
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 450,000**

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Electrical

Item	Description	Qty.	Units	Unit Price	Extension
1	Motor Control Centre	1	ea	463,252	464,000
2	VFDs	1	ea	1,004,701	1,005,000
3	General Electrical Installation	1	allowance	2,203,500	2,204,000
4		0	ea	1	-
5		0	ea	1	-
6		0	ea	1	-
7		0	ea	1	-
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 3,673,000**

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Instrumentation & Controls

Item	Description	Qty.	Units	Unit Price	Extension
1	New flowmeters	2	allowance	10,000	20,000
2	Level instruments	1	allowance	20,000	20,000
3	Control Panel	1	allowance	30,000	30,000
4	Programming and Integration	1	allowance	100,000	100,000
5	Computer and Software	1	allowance	20,000	20,000
6	Misc. instruments	1	allowance	20,000	20,000
7		0	ea	1	-
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 210,000**

Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

Cost Estimate

Client: **Regional District of Nanaimo**
Subject: **Departure Bay Pump Station Phase 1 Upgrades**

Date: Sep 10, 2021
Project Number: 2020-2083
Prepared By: SW/SB
Checked by: AM
Type of Estimate: Conceptual

Equipment Supply

Item	Description	Qty.	Units	Unit Price	Extension
1	Flygt CT 3351.936 DU 650 impeller (625mm) 765HP 600V 3phase, closed	3	allowance	522,963	1,569,000
2	Generators	2	allowance	530,000	1,060,000
3	Unit Substation Upgrade	1	allowance	300,000	300,000
4		0	ea	1	-
5		0	ea	1	-
6		0	ea	1	-
7		0	ea	1	-
8		0	ea	1	-
9		0	ea	1	-
10		0	ea	1	-
11		0	ea	1	-
12		0	ea	1	-
13		0	ea	1	-
14		0	ea	1	-
15		0	ea	1	-
16		0	ea	1	-
17		0	ea	1	-
18		0	ea	1	-
19		0	ea	1	-
20		0	ea	1	-
	Subtotal				**$ 2,929,000**

APPENDIX C - COMMENT LOG

Comment Log		
Page Number (of DRAFT PDF)	Comment	Response
14/47	Please confirm with Ops if Pump #4 has an ECD	RDN confirmed that the starter for Pump 4 is a direct "across the line" starter. Associated updated the report.
19	Confirm that the GNPCC existing headworks capacity is 1,800 L/s	RDN confirmed that the headworks has a design PWWF capacity of 2240 l/s, which can be increased to 3360 l/s through the addition of a fourth screen. However, the influent channel capacity will be the limiting factor in achieving these flows. A comment was added that a capacity upgrade should be considered with the design of the upgrades at the DBPS
21	Add word "be" between to and operable	Comment Addressed.
23/24	Add Option D Twin the upstream forcemain with float and sink alignment making landfall at Chinook Road. (~32 m elevation and tie-in) This would follow twinning of the gravity main from this future connection point. How will this system curve effect required pump sizing and power requirements? Estimated GHG reductions over the lifespan of the PS? Additional permitting and other requirements?	Option D is a possible route that should be evaluated during future work by the RDN. Attached hereto is some considerations regarding Option D, as well as the benefits and disadvantages. Looking at this option in greater detail will be undertaken separate to this work.
24	Add word "of" in between use and an	Comment Addressed.
24/25	What is the recommendation for the air relief valve at Hammond Bay and Friar Tuck? Will repair of this valve in any way affect the forcemain hydraulics? Will replacing the standpipe with an air valve increase capacity as well?	The forcemain upgrade work was not looked at in great detail. Associated has added comments that these valves should be considered in future phases of work as per the 2020 AECOM Transient Analysis project.
25	Ops reports that Pump #3 needs replacing as well, in Phase 1.	Associated has updated the report text and cost estimate to reflect this change.
26/45	How does the location and potential flooding of Departure Creek get addressed in these options?	Departure Creek was not considered in great detail. A note was added that the design should consider flooding potential of Departure Creek in the context of the upgrade work. In terms of construction, language was added that environmental monitoring requirements for the creek / riparian zone need to be considered .
27	How will access to the wet well be maintained for maintenance? (in regards to raising the entire superstructure above the FCL)	New staircase from the FCL down to the wet-well would provide access for maintenance. Note was added in report.
28	Can a staircase to the lower pipe chase be added to remove the confined space classification?	It may be quite costly to do this, and actions could be undertaken to limit the need to go into this area. For example, valve operators could be brought up to floor level. Associated has added a note clarifying the design intent for this space.
28	The existing bridge crane will need to be upgraded to allow for better and safer lifting access	Yes, this was the intention and additional language has been added.
40	Primary isolation valves should be located within the PS	Yes, this was the intention and additional language has been added.
40	What kind of check valves are we proposing, and how will all the new valves be controlled?	Details for valve type to be confirmed at a later phase.
41	Remote control of the wet well gates?	We have added a general note about increasing automation and remote control of valves. We have also added a note regarding future requirement to perform a process hazard analysis in future design phases.
48	Add "e" in word separate	Comment Addressed.
48	Will air monitoring be required in this generator area?	Significant ventilation in generator room will be required. We have assumed that no air monitoring will be required. . Other options that can reduce ventilation requirements including use of water-cooled generators. We have added a comment that air requirements for the generators will be addressed in preliminary design.
48	Existing wet well lighting requires upgrade	Note added.

OPTION D – NEW MARINE FORCEMAIN TO CHINOOK ROAD

Options and Advantages and Disadvantages for Proposed New Marine Forcemain to Chinook Road

Option No. and Description	Advantages	Disadvantages

Option D1
New marine line to Chinook Road is used as the primary pumping forcemain for low to medium flows.
During peak flows, flow is split between new forcemain and existing forcemain.
	• Can size for optimum flowrates in the new forcemain for scour velocities.
	• Better hydraulics at lower flows (less static lift)
	  • Lower operational costs
	  • Lower installation costs (assumed, may not be the case)
		• May require different pumps to accommodate higher heads at peak flows (using both forcemains, both static and dynamic losses would increase)
		• Permitting requirements for marine work could be challenging. Untreated wastewater would be in the forcemain (not treated effluent like in an outfall). Environmental risk needs to be considered.
		• Failure of the forcemain (e.g. seismic event) would be very challenging. Repair would be difficult, and pumping capacity would be lost for months.

Option D2 New marine forcemain to Chinook Road is installed, but flow is split between the existing and new forcemain under normal operating conditions.	• Gives the most flexibility for operation (lower risk)	• Would lose the hydraulic advantage because the systems are coupled, and the pumps would be designed for the higher hydraulic requirements • Permitting requirements for marine work could be challenging. Untreated wastewater would be in the forcemain (not treated effluent like in an outfall). Environmental risk needs to be considered. • Failure of the forcemain (e.g. seismic event) would be very challenging. Repair would be difficult, and pumping capacity would be lost for months.
Option D3 New marine forcemain to Chinook Road would be used as the Primary Pumping forcemain for all flow conditions	• Energy savings at lower flows	• At the higher flow, TDH would be significant with the need to meet scour velocities at lower flow. Extra pumping units may be required for higher flows.

Option No. and Description	Advantages	Disadvantages
This existing forcemain would be mothballed.		• Permitting requirements for marine work could be challenging. Untreated wastewater would be in the forcemain (not treated effluent like in an outfall). Environmental risk needs to be considered. • Failure of the forcemain (e.g. seismic event) would be very challenging. Repair would be difficult, and pumping capacity would be lost for months. Risk would be higher than Options D1 and D2 since the existing system would be mothballed. • Capital costs would go up (assuming that different pumps will be required at peak flows). Pump station may need to be bigger as a result.
Option D4 Two new marine forcemains to Chinook Road (twinned). One forcemain is used under low and average flow conditions. Two forcemains are used during peak flow conditions. The existing forcemain would be mothballed.	• Energy savings at low and average flows. • One set of pumps for low, average and peak flows • Flexibility	• Capital cost would be the high (construction of two forcemains, instead of one) • Permitting requirements for marine work could be challenging. Untreated wastewater would be in the forcemain (not treated effluent like in an outfall). Environmental risk needs to be considered. • Failure of the forcemain (e.g. seismic event) would be very challenging. Repair would be difficult, and pumping capacity would be lost for months. Risk would be higher than Options D1 and D2 since the existing system would be mothballed.

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TECHNICAL MEMORANDUM

Issue Date:	August 30, 2023	**File No.:**	2022-2483.01
To:	Gerald St. Pierre, P.Eng., PMP	**Previous Issue Date:**	N/A
From:	Shane Duggan, B. Eng., M. Eng.	**Project No.:**	2022-2483
Client:	Regional District of Nanaimo		
Project Name:	Departure Bay Pump Station		
Subject:	Departure Bay Pump Station Update to Pump Selections		

1 INTRODUCTION

The Departure Bay Pump Station (DBPS) and associated force main are owned and operated by the Regional District of Nanaimo (RDN). The DBPS is a wastewater pump station located at Departure Bay, within the City of Nanaimo. The infrastructure is in its fifth decade of operation and is requiring replacement/upgrading to address the aging infrastructure and to meet current demands.

In 2021, Associated Engineering (B.C) Ltd. (Associated) prepared a Departure Bay Pump Station Upgrade Study, which proposed two phases of upgrades at the DBPS to achieve a firm capacity at peak wet weather flow (PWWF) conditions in 2073 of 1,955 L/s.

The objective of this memorandum is to revise the pump replacement selection for the DBPS with consideration of the following:

- The Nanaimo Interceptor Hydraulic Capacity Analysis (GeoAdvice Engineering Inc. 2023) has set a new design basis for the upgrades in the PWWF for the year 2076 of 2,460 L/s.
- The Hammond Bay Options Analysis Report (Associated Engineering 2022) provides updated options for the required force main upgrades that will support the pump upgrades.

With the pump updates, the RDN is interested in confirming any changes to the required power needs to support the BC Hydro power supply application process. This report will detail the revised pump selection, the reasoning for their selection, and the new pump's cost and power requirements. Please refer to **Section 4**.

2 BACKGROUND

2.1 DBPS and Previous Work

The DBPS pumps wastewater through an existing 900 mm, 4 km long force main, along Hammond Bay Road, from the Departure Bay Pump Station to the Hammond Bay Interceptor Sewer, which directs the effluent to the downstream Greater Nanaimo Pollution Control center for treatment.

The DBPS was built in 1974, and although the facility has undergone a variety of upgrades, the station is essentially in its original form. As the facility is in its fifth decade of operation, the DBPS has some underlying challenges. In recent years, the DBPS has not always been able to keep up with flow capacity during peak flow conditions. During peak events, all pumps must operate at full capacity. In addition, on some occasions, peak flow has caused overflowing of the wastewater collection system.

In 2013, AECOM evaluated routing options for a replacement line. Five routing options were developed and costed. In early February 2022, RDN evaluated and refined the 2013 options to the following:

- Twinning the force main along its existing alignment.
- Twinning the force main along an extended marine float and sink route, making landfall at Chinook Road.

Associated's 2022 Hammond Bay Option's Analysis considered both the Marine Route and Land Route. For this assessment, it was decided to proceed only with the land route due to some significant advantages – e.g., relatively easy access to the force main for operation and maintenance and lower capital construction costs.

Based on preliminary hydraulic analysis, the new force main pipe diameter of 1050 mm, and HDPE DR17 were selected, to address modifications in the alignment and capacity.

The Departure Bay Pump Station Upgrade Study proposed three 56 MLD pumps, and two 28 MLD pumps to handle the previously assessed capacity of 1,955 L/s. These pumps were rated at 765 hp and 385 hp, respectively. To operate these pumps, it was determined that the facility's power distribution system would need to accommodate a peak operating demand of approximately 2,460 kVA (1,939 kW). To achieve this, Associated recommended the following upgrades:

- Obtain a new electrical service from BC Hydro. Either a primary metered 2.5 MVA unit substation or a secondary metered, 2,500 Amp service (at 600 VAC).
- Upgrade distribution system to support a 2,500 Amp service at 600 VAC.
- Replace the existing genset with either 3 x 750 kW or 2 x 1,250 kW paralleled standby generators.

2.2 Updated Design Basis for Upgrades

The revised design criteria for the DBPS Upgrades can be summarized as follows:

- Flow Capacity.
  - The full build-out flow capacity design basis for the upgrades is 2,460 L/s. This value is based on InfoSWMM modelling of the Nanaimo Interceptor performed by GeoAdvice for the year 2076.
  - Upgrade the Departure Bay Pump Station force main to a minimum diameter of 1,050 mm and a maximum of 1,650 mm.
  - A minimum force main velocity of 1.1 m/s and a maximum force main velocity of 3 m/s is considered under the 2076-PWWF25 with Climate Change, Hydraulic Design Sizing Criteria.
- Redundancy Requirements.
  - The station must have sufficient capacity to pump peak design flow when the largest pump is out of service.

3 HYDRAULIC ANALYSIS

This section of the report describes the approach and results of hydraulic analyses conducted for the Land Route option for the new Hammond Bay Force main. The intent of the hydraulic analyses was primarily to determine and confirm appropriate pump selection and force main pipe sizing.

The analyses were conducted through SewerGems using the GVF-Convex (SewerCAD) active numerical solver, steady-state time analysis type. The pump, pump station, and wet well characteristics were inputted into the software. The 900 mm, 1,050 mm force main, and 1,350 mm gravity connector stations and corresponding pipe invert and ground elevations were also inputted. This represents a further refinement and holistic review of the conceptual force main system to obtain a reliable power supply size estimate under the updated design criteria.

The analysis considers the three large pumps installed under Phase 1, with the redundancy being provided by the two small pumps installed as part of Phase 2, both, together acting with the largest pump out of service.

3.1 Hydraulic Analysis at PWWF

This section has been revised to assess whether the 1050 mm force main operating in isolation, can meet the design basis of 2,460 L/s. The findings for the existing 900 mm force main operating in conjunction with the new land-based 1050 force main for higher flow conditions are also presented.

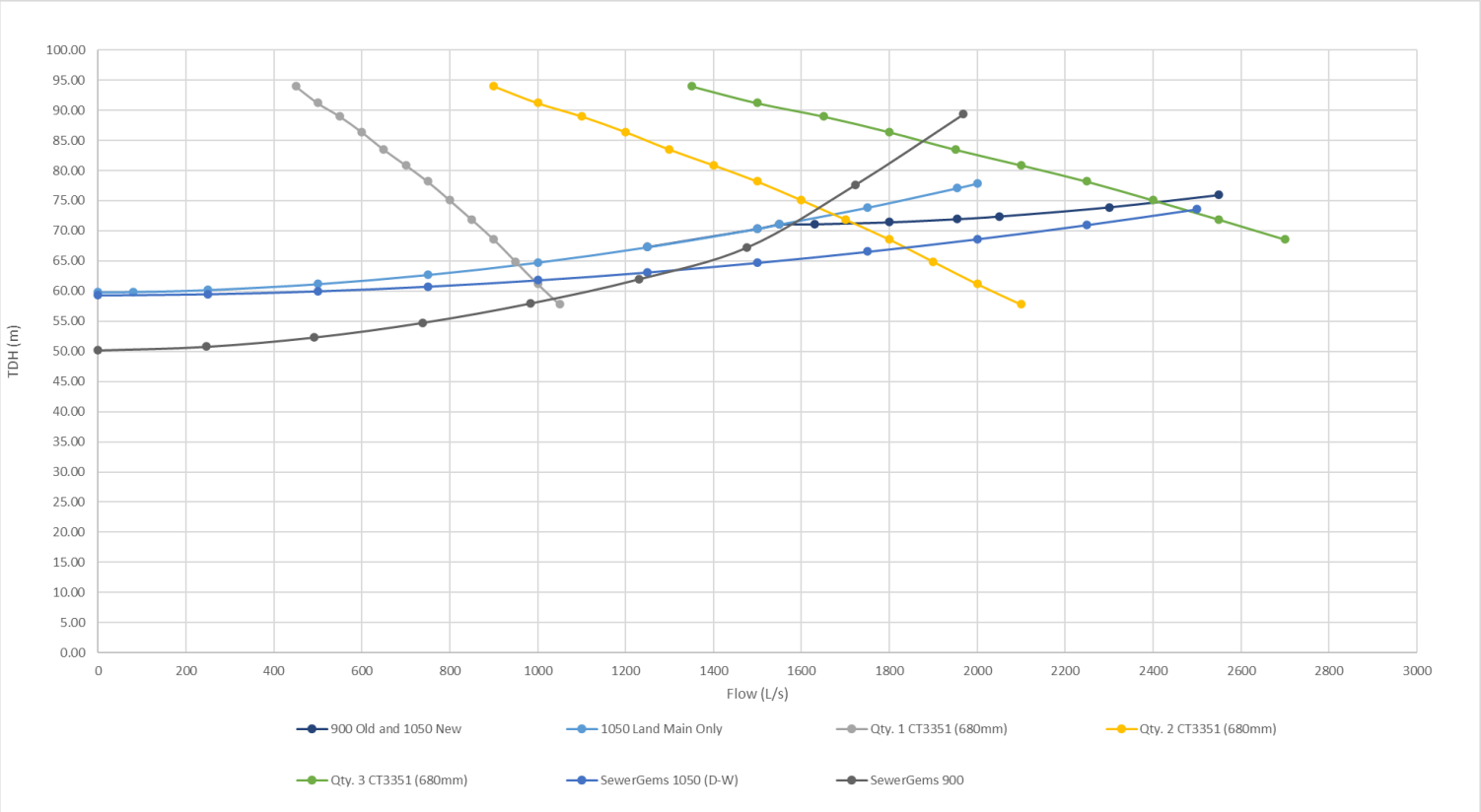
1050 mm DR17 HDPE has an inside pipe diameter of 934 mm. For this analysis, the Darcy-Weisbach gravity friction method within SewerGems was used. Operating as a single force main in conjunction with the DBPS, this new force main has the following system curve characteristics at the PWWF of 2,460 L/s:

- Static head: 59.9 m.
- Pump Station Losses: 1.65 m.
- Force main frictional losses: 16.32 m.

Refer to **Figure 3-1** for the developed system curve. Three pumps operating to deliver the PWWF of 2,460 L/s, through the 1,050 mm force main, would be sized at 820 L/s at 72 m TDH. The nominal pumping energy required would be 1,756 kW assuming a pump hydraulic efficiency of 82.8%.

The scenario in which the existing 900 mm force main would operate in conjunction with the new land-based 1,050 force main for higher flow conditions is also presented but is no longer required, given the 1,050 mm force main can meet the design basis. The value of using the two mains is limited from a hydraulics or energy efficiency perspective as the extreme high flows would be an infrequent occurance. The availability of the existing 900 mm steel force main as a backup to the new force main still provides an advantage in terms of system resiliency.

Figure 3-1 Developed System Curve for Land Routes



The hydraulic profile for the two force mains under max flow conditions are shown below. The X-axis, Station (m), indicates chainage distance along the pipe's routing. The Y-Axis, Elevation (m), accounts for the pipe invert elevation and corresponding ground elevation, at a given station.

Figure 3-2 illustrates three pumps operating through the 1,050mm force main only to overcome the high point in the system at Stn. 2,250 m. A siphon break is proposed at the high point at Stn. 2,250 m following which the pipe runs partially full between Stn. 2,250 m and 2,525 m.

Figure 3-2 HGL – 1050mm FM only with 3 Pumps Operating

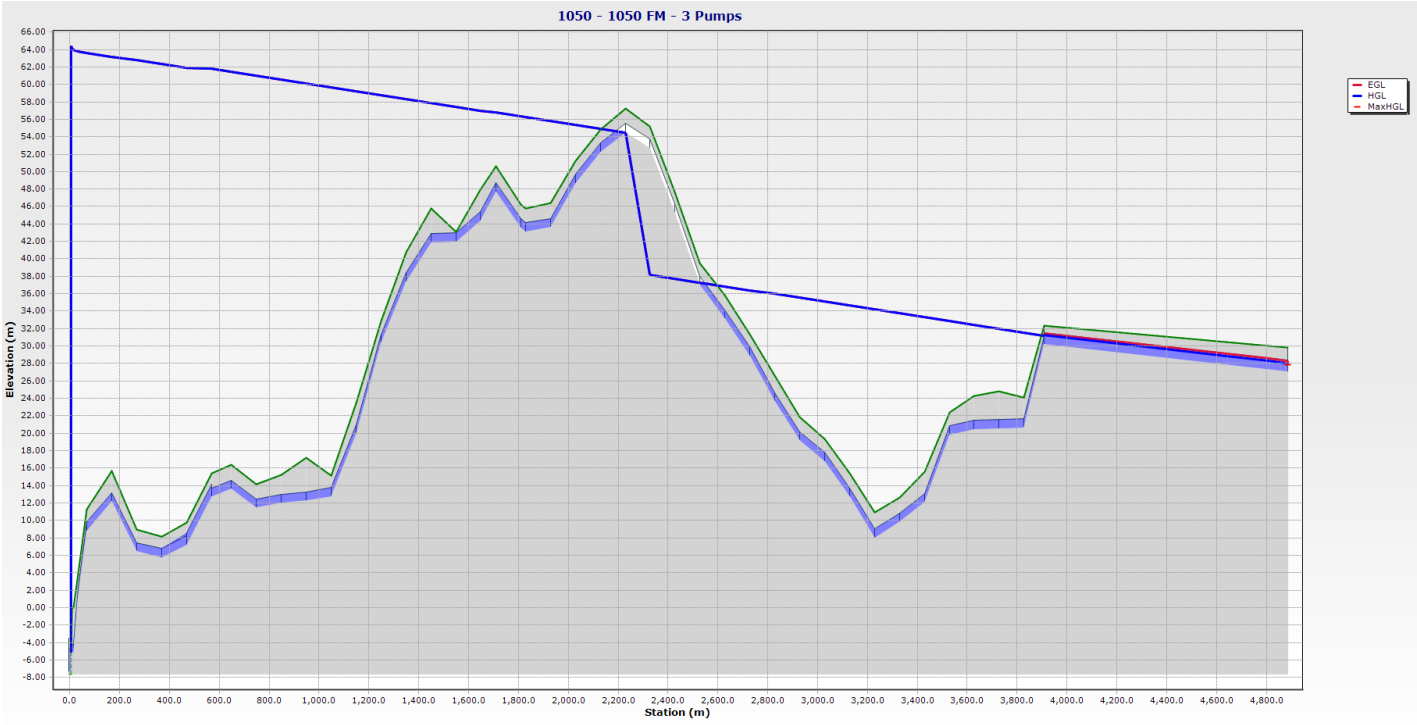


Figure 3-3 illustrates the HGL through the 1,050 mm force main for three pumps operating and both force mains open, overcoming the high point in the system at Stn. 2,250 m. A siphon break is proposed at the high point at Stn. 2,250 m following which the pipe runs partially full between Stn. 2,250 m and 2,525 m.

Figure 3-4 illustrates three pumps operating through the 900 mm force main, with both force mains open, overcoming the high point in the system at Stn. 2,050 m. A siphon break is proposed at the high point at Stn. 2,050 m following which the pipe runs partially full between Stn. 2,050 m and 2,650 m.

The 900 mm force main routing has a lower highpoint (45 m), than the proposed 1,050mm force main routing highpoint (55 m).

Figure 3-3 HGL – 1050mm FM Route w/ both Force mains open & 3 Pumps Operating

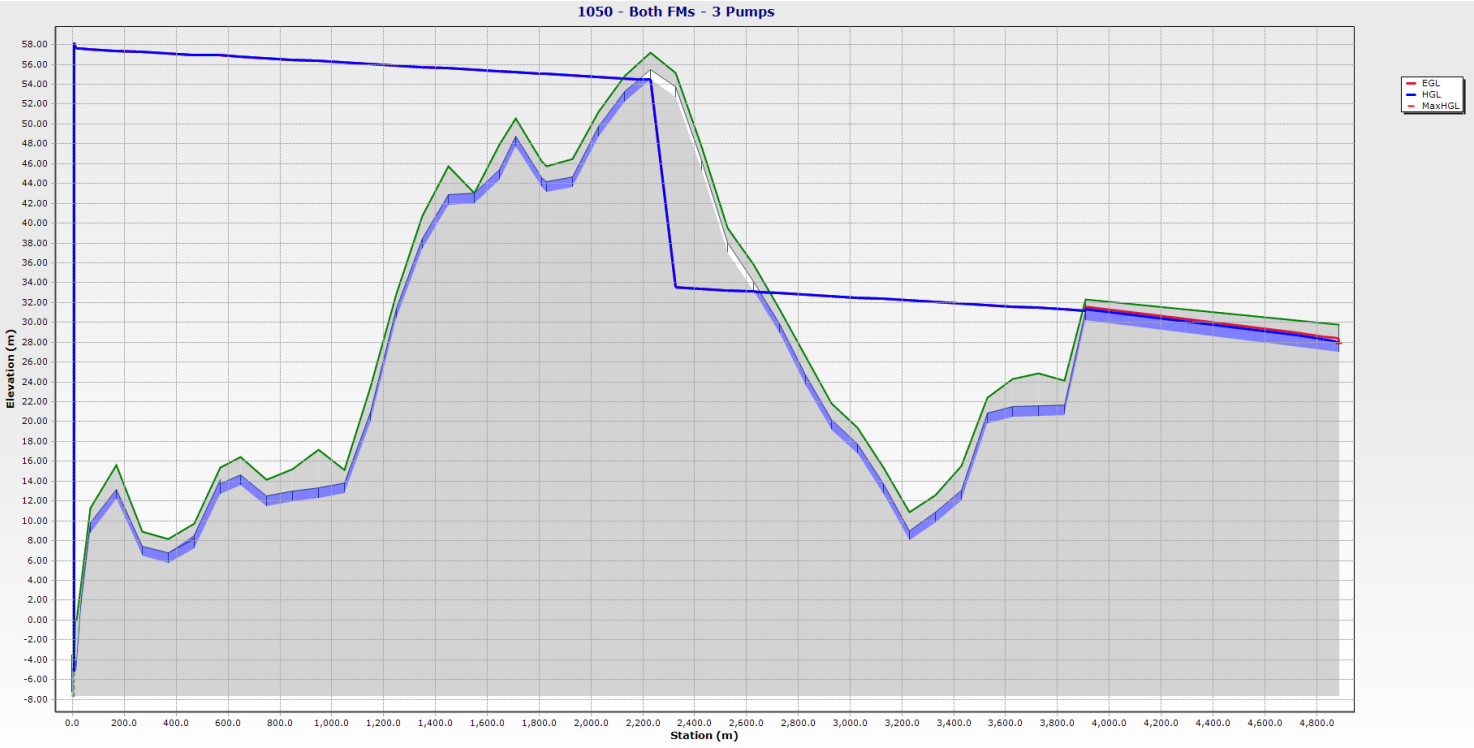
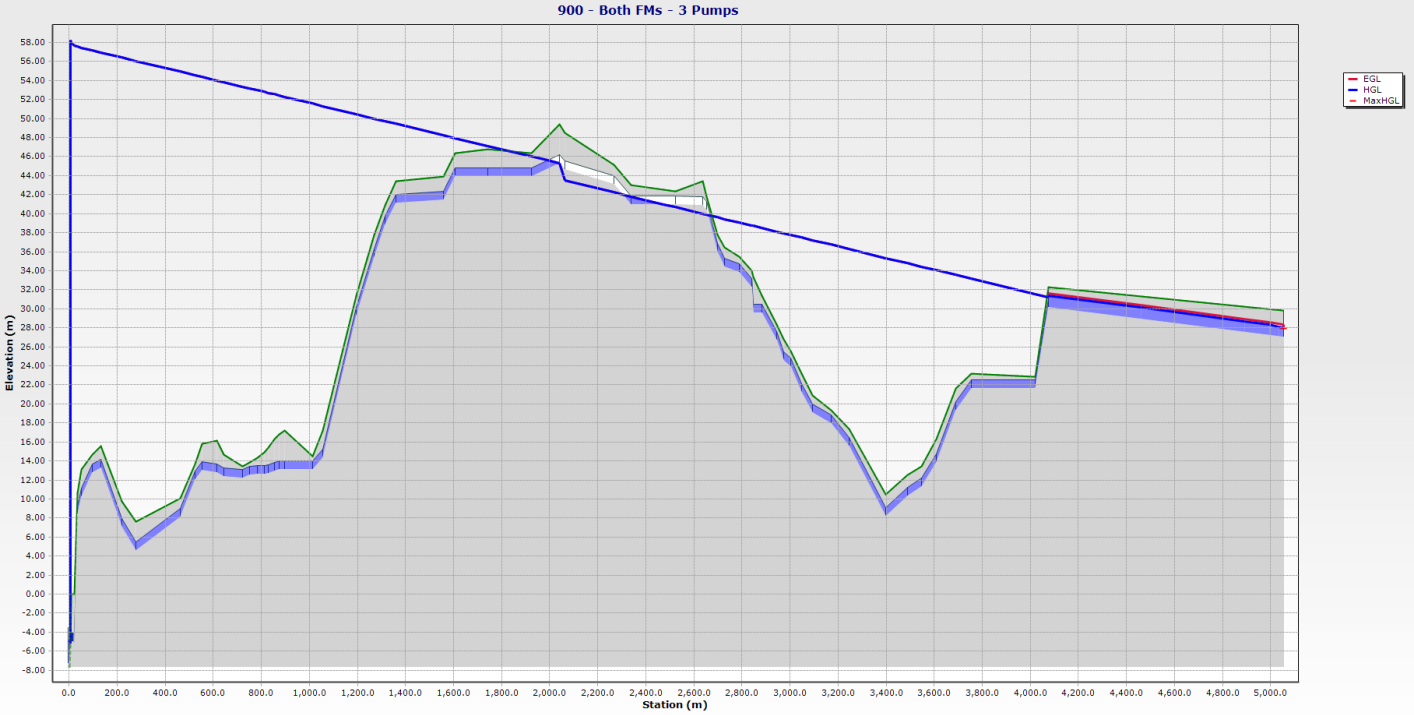


Figure 3-4 HGL – 900mm FM Route w/ both Force mains open & 3 Pumps Operating



The new 1050mm FM is able to convey the target flows, however, the 900 mm force main could be selected to operate in isolation during low flow conditions, given it is the smaller diameter pipe providing higher flow velocities for cleansing action during operation. The operational considerations of both the 900 mm and 1,050 mm force mains, individually, and/or together, are to be considered in later design stages. Further, the potential of installing two smaller pipes close together instead of one large pipe in support of preventing odour issues and maintenance concerns will also have to be assessed in subsequent design stages.

4 WASTEWATER PUMPING

4.1 Pump Selection

Pump selection was based on the full build-out scenario at 2,460 L/s. This flow rate will be achieved during the Phase 2 upgrades. To meet the capacity of 2,460 L/s, a total of five pumps will be provided: three pumps (Phase 1) at a nominal capacity of 820 L/s and two pumps (Phase 2) at a nominal capacity of 410 L/s. It is suggested that all the pumps will be provided with variable frequency drives (VFDs).

The five-pump solution will allow:

- The pump station is to provide a firm capacity of 2,460 L/s with any pump out of service for maintenance.
- The station to meet the full range of flows down to 80 L/s.

For the purposes of this study, Xylem Flygt immersible dry well pumps have been selected. The details on the proposed pump selections are provided in **Table 4-1**. Further details on the pumping units can be found on the pump specification sheets provided in **Appendix A**. Updated costing for the selected pumps is provided in **Section 4.2**.

Table 4-1 Pump Selection

	Model	Rated Power	Impeller Diameter	Rated Speed	No. of New Units Phase 1
Large Pump	CT 3351/965	1040 HP	680 mm	1195 RPM	3

*Phase 1 Pumps, only, are selected for the purpose of this analysis.

4.2 Pump Cost Comparison

Table 4-2 outlines a cost comparison between the newly selected pumps, for the purpose of this memo, and the previously selected pumps, from the 2021 Pump Station Upgrade Study.

Table 4-2 Pump Cost Comparison

Pump	Description	Qty.	Unit Price	Total
New Selection	Flygt CT3351.965 1040HP 625 mm impeller	3	$717,360	$2,153,000
Previous Selection	Flygt CT3351.936 765HP 680 mm impeller	3	$522,963	$1,569,000

4.3 Pump Layouts, Physical Size Limitations

The new CT 3351/965 pumps are of similar size to the existing Worthington model 10CFA-2 pumps, in terms of length, width, and height. The new pumps are about 300 mm and 240 mm bigger in length and width, as well as slightly taller than the existing pumps. Height constraints are not a concern as the new pumps are 3 m tall, while the pump room itself is 4 m tall.

4.4 Electrical Impact Relevant to BC Hydro Feed Application

Based on the updated pump sizes, it is anticipated that the facility will have a peak operating demand of approximately 2,900 kVA (2,600 kW), to operate all three pumps, building loads, and other miscellaneous supporting loads.

With the estimated peak operating demand in mind, a 600 V, 3-phase, 3,000 Amp service will be required from BC Hydro to power the DBPS. At this size, it is very likely that a new primary metered service with a 3 MVA unit substation, like what currently exists on site, will be required. This will increase total capital costs (installation and engineering) for the project as more engineering and coordination are required with BC Hydro. From a maintenance perspective, the RDN will also need to take on the responsibility for maintaining the unit substation.

During the Phase 2 build out, the site will see a peak power increase of approximately 266% from the existing facility, it is likely that the power utility "backbone" / transmission line to the facility will need to be upgraded with this increased demand. BC Hydro will typically pass a portion of these costs along to their consumer. It is recommended that BC Hydro is engaged at the earliest possible stage to ensure this item is coordinated and these costs are provided.

The selected pumps are also available at a voltage rating of 4,160 V with the implications of selecting a medium voltage system to be addressed during later design stages.

4.5 Other Electrical Impacts

The following electrical equipment and systems will also be impacted by the increase in pump size (based on the 2021 Concept Design):

Equipment	Impact(s) to design	Impact(s) to RDN & Facility
Standby generator(s)	Switching motors could result in significant disruptions to both the motor itself and any nearby connected load, due to their size. Additional review of motor starting is recommended.	• Increased capital costs.
Standby generator(s)	Feasibility of using existing generator for Phase 1 installation needs to be reviewed. Likely unable to run 2 large pumps off it.	• Increased capital costs.
Standby generator(s)	Increase size to meet new load requirements. Will need 3 – 1,250 kW, in parallel.	• Increased capital costs. • Increased maintenance costs. • More physical space required. • Access constraints. • Added complexity to generator control. • Fuel considerations, should look at consolidating to a single tank that could be fueled in a more accessible way.

Equipment	Impact(s) to design	Impact(s) to RDN & Facility
Main distribution equipment	Size of bus is outside of typical construction for an MCC. Solution will need to be an LV Metal Clad Switchgear.	• Increased capital costs. • More physical space required. • Access constraints.
Variable frequency drives	Increase size to meet new load requirements.	• Increased capital costs. • More physical space required. • Access constraints. • Increased bldg. heat loads.
Harmonic filters	Increase size to meet new load requirements.	• Increased capital costs.
Site grounding	Increased site grounding requirements due to unit sub-station.	• Increased capital costs. • More physical space required. A larger grid is typically required to reduce step and touch hazard.

5 CONCLUSIONS

It was concluded that a new 1050 mm HDPE force main has the capacity to carry the design flow rate of 2,460 L/s, with three pumps operating. Three Xylem Flygt shrouded impeller CT 3351/965 pumps operating at 820 L/s at 72 m head have been selected for this purpose. The hydraulic profiles presented demonstrate that the pump hydraulics can overcome the high points in each of the 900 mm and 1050 mm force mains operating individually, or with both force mains operating together.

The power requirements for the new pump selection have increased. It is anticipated that the site will have a peak operating demand of approximately 2,600 kW. At this size, a primary metered service is common. This will require the design and purchase of a unit substation that typically involves close coordination with BC Hydro. It is also likely that the RDN will see additional power utility costs from BC Hydro, as the transmission lines (utility "backbone") will need to be upgraded to accommodate the site's demand. It is recommended that the RDN engage BC Hydro on the matter as soon as possible to determine what the associated costs could potentially be.

Prepared by:

Shane Duggan
Mechanical Designer

Reviewed by:

Alexander Jancker, M.Sc., CEM, P.Eng.
Mechanical / Environmental Engineer

SD/AJ

Attachment:

- Appendix A – Pump Data Sheet

APPENDIX A - PUMP DATA SHEET

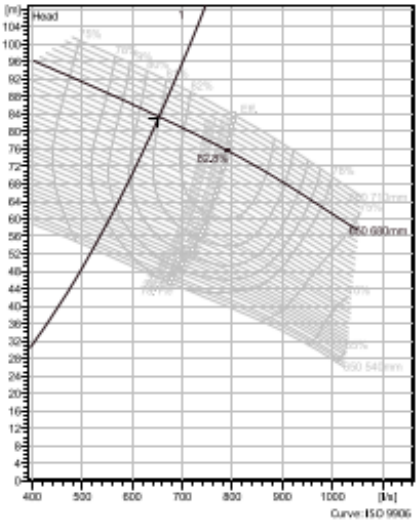
CT 3351/965 3~ 650

Shrouded single or multi-channel impeller pumps with large throughlets and single volute pump casing for liquids containing solids and fibres. Cast iron design with double sealing technology. Some models available as stainless steel versions.

FLYGT a xylem brand

Technical specification

Curves according to: Water, pure Water, pure (100%),4 °C,999.9 kg/m³,1.5702 mm²/s



Configuration

Motor number
C0965.000 66-92-6AA-D IE3 1040hp

Installation type
T - Vertical Permanent, Dry

Impeller diameter
680 mm

Discharge diameter
350 mm

Pump information

Impeller diameter
680 mm

Discharge diameter
350 mm

Inlet diameter
450 mm

Maximum operating speed
1195 rpm

Number of blades
3

Throughlet diameter
110 mm

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Markus Bocu	
Block		**Created on**	7/8/2022	**Last update** 7/8/2022

CT 3351/965 3~ 650

Technical specification

FLYGT a xylem brand

Motor - General

Motor number C0965.000 66-92-6AA-D IE3 1040hp	**Phases** 3~	**Rated speed** 1195 rpm	**Rated power** 1040 hp
ATEX approved No	**Number of poles** 6	**Rated current** 915 A	**Stator variant** 2
Frequency 60 Hz	**Rated voltage** 600 V	**Insulation class** H	**Type of Duty**
Version code 000			

Motor - Technical

Power factor - 1/1 Load 0.84	**Motor efficiency - 1/1 Load** 96.0 %	**Total moment of inertia** 40 kg m²	**Starts per hour max.** 0
Power factor - 3/4 Load 0.81	**Motor efficiency - 3/4 Load** 96.0 %	**Starting current, direct starting** 6250 A	
Power factor - 1/2 Load 0.72	**Motor efficiency - 1/2 Load** 95.5 %	**Starting current, star-delta** 2080 A	

Project		**Created by**	Marius Bocu		
Block		**Created on**	7/8/2022	**Last update**	7/8/2022

CT 3351/965 3~ 650

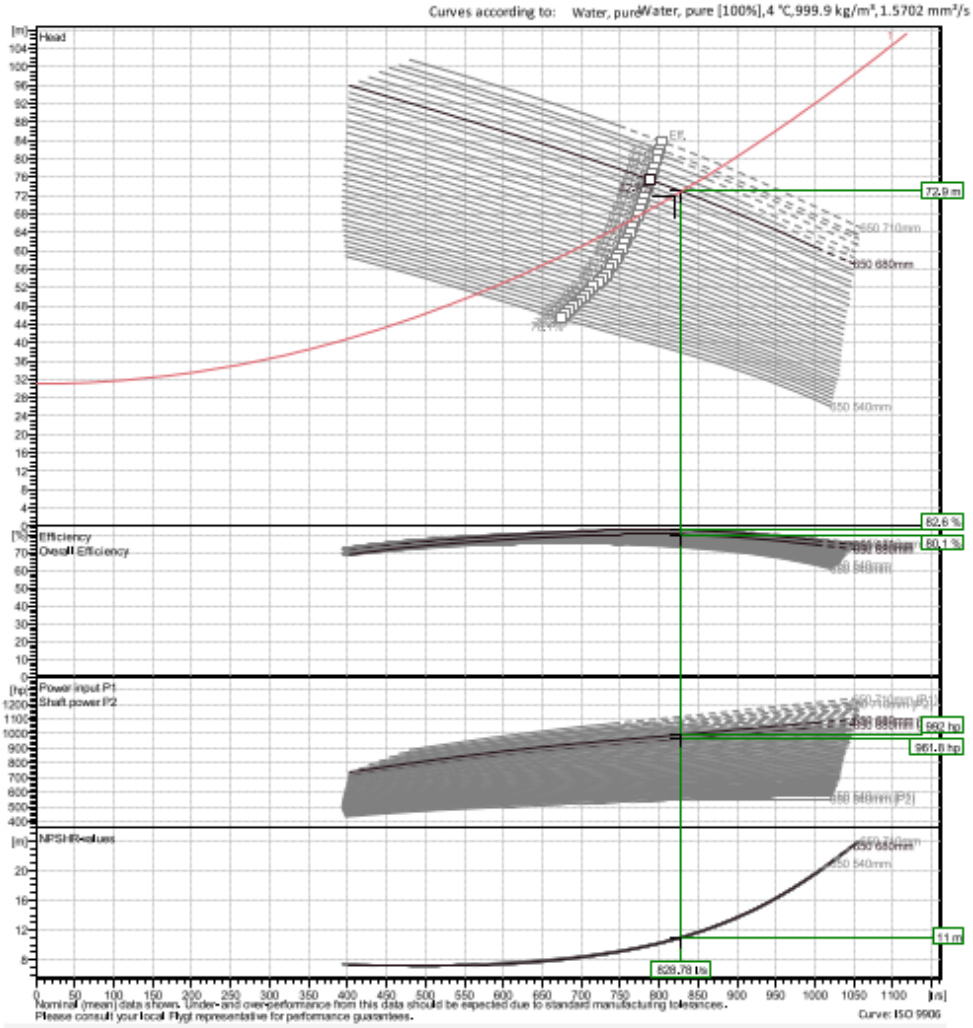
Performance curve

FLYGT a xylem brand

Duty point

Flow	Head
829 l/s	72.9 m

Curves according to: Water, pure Water, pure [100%], 4 °C, 999.9 kg/m³, 1.5702 mm²/s



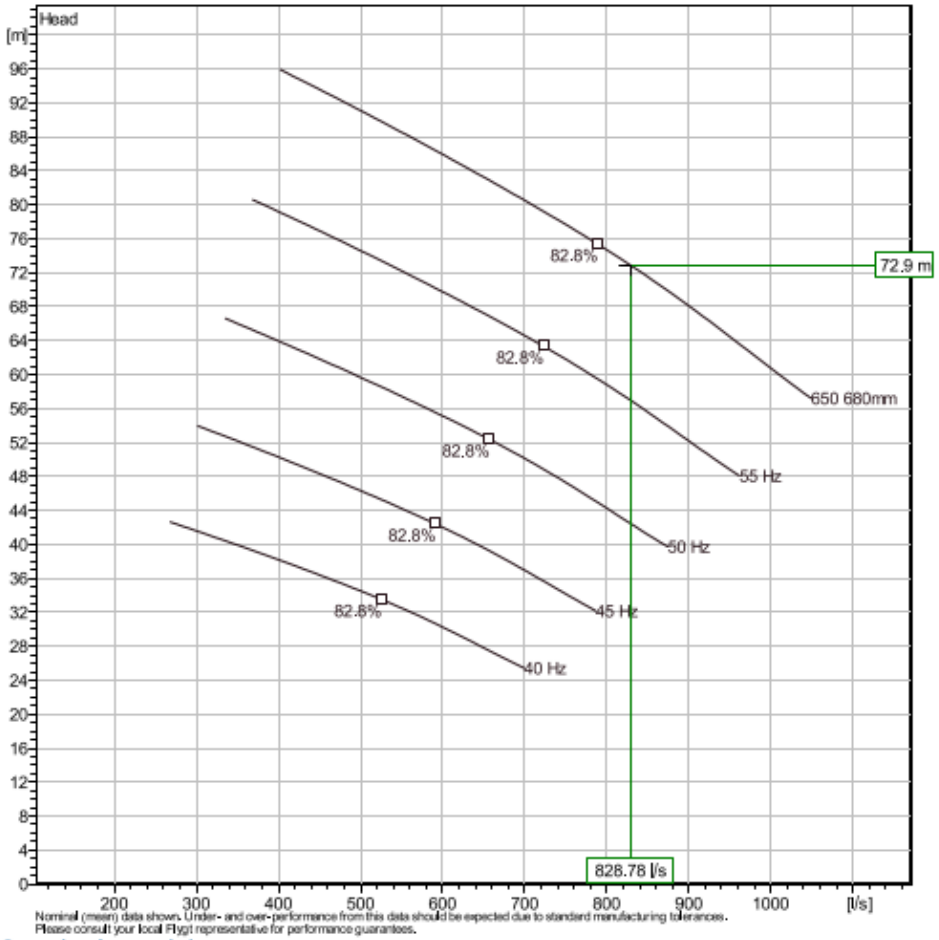
		Marius Bocu			
0	Created on	7/20/2023	Last update	7/20/2023	

CT 3351/965 3~ 650

Duty Analysis

FLYGT a xylem brand

Curves according to: Water, pure [100%] ; 4°C; 999.9kg/m³; 1.5702mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	hp	l/s	m	hp		kWh/m³	m
1	829	72.9	962	829	72.9	962	82.6 %	0.248	11

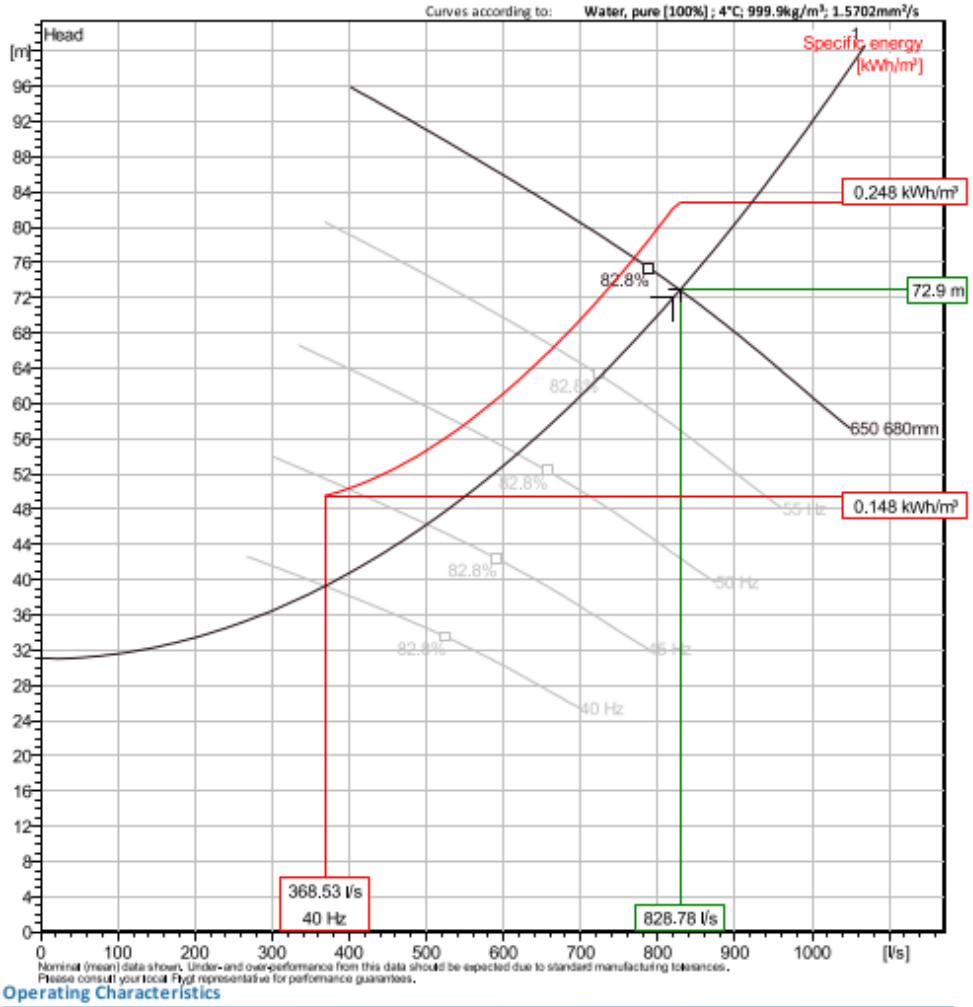
Project		Created by	Marius Bocu		
Block		Created on	7/20/2023	Last update	7/20/2023

CT 3351/965 3~ 650

VFD Analysis

FLYGT a xylem brand

Curves according to: Water, pure [100%] ; 4°C; 999.9kg/m³; 1.5702mm²/s

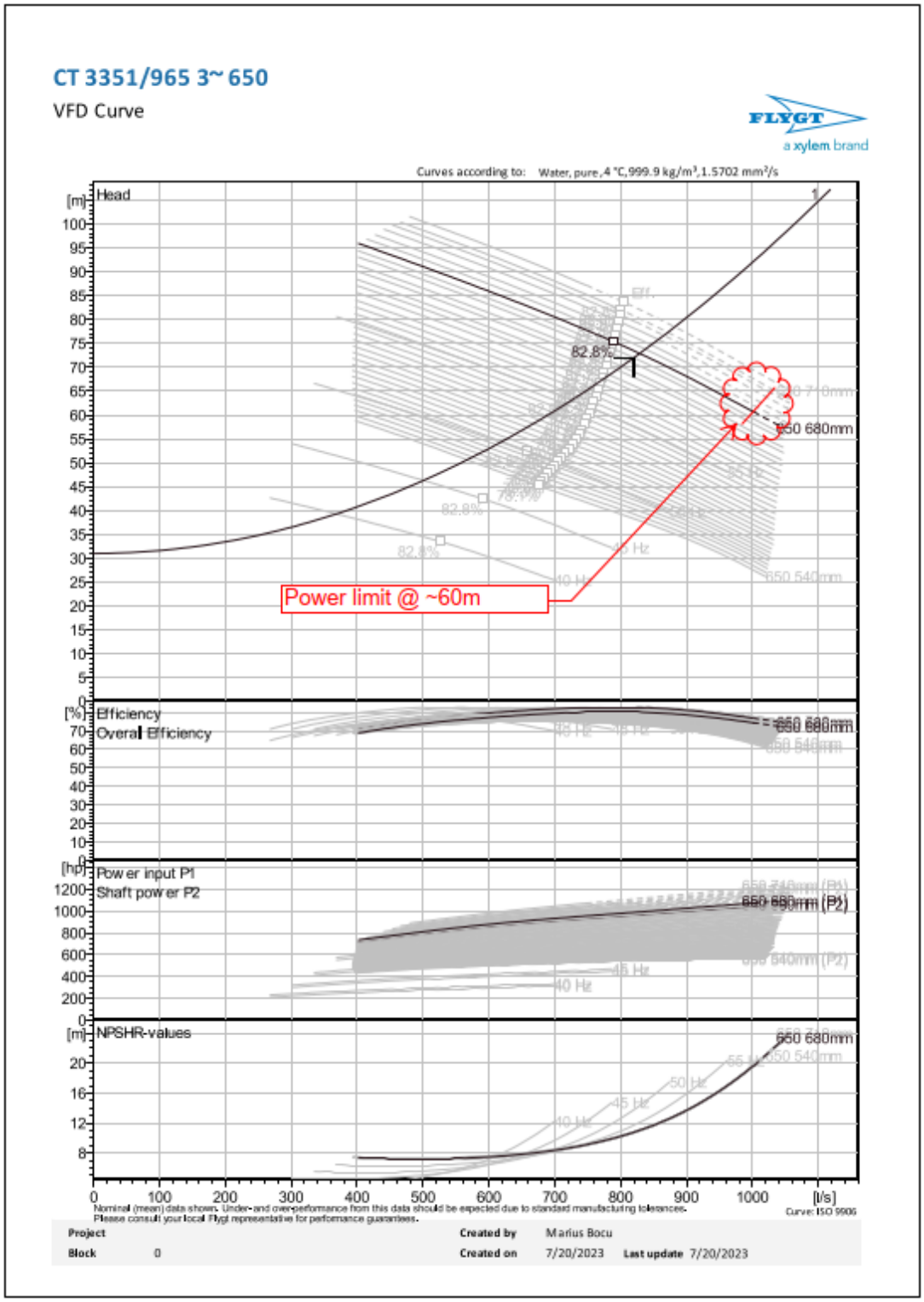


Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	hp	l/s	m	hp		kWh/m³	m
1	60 Hz	829	72.9	962	829	72.9	962	82.6 %	0.248	11
1	55 Hz	726	63.2	728	726	63.2	728	82.8 %	0.216	8.73
1	50 Hz	618	54.3	534	618	54.3	534	82.6 %	0.187	6.72
1	45 Hz	501	46.3	375	501	46.3	375	81.3 %	0.164	5.04

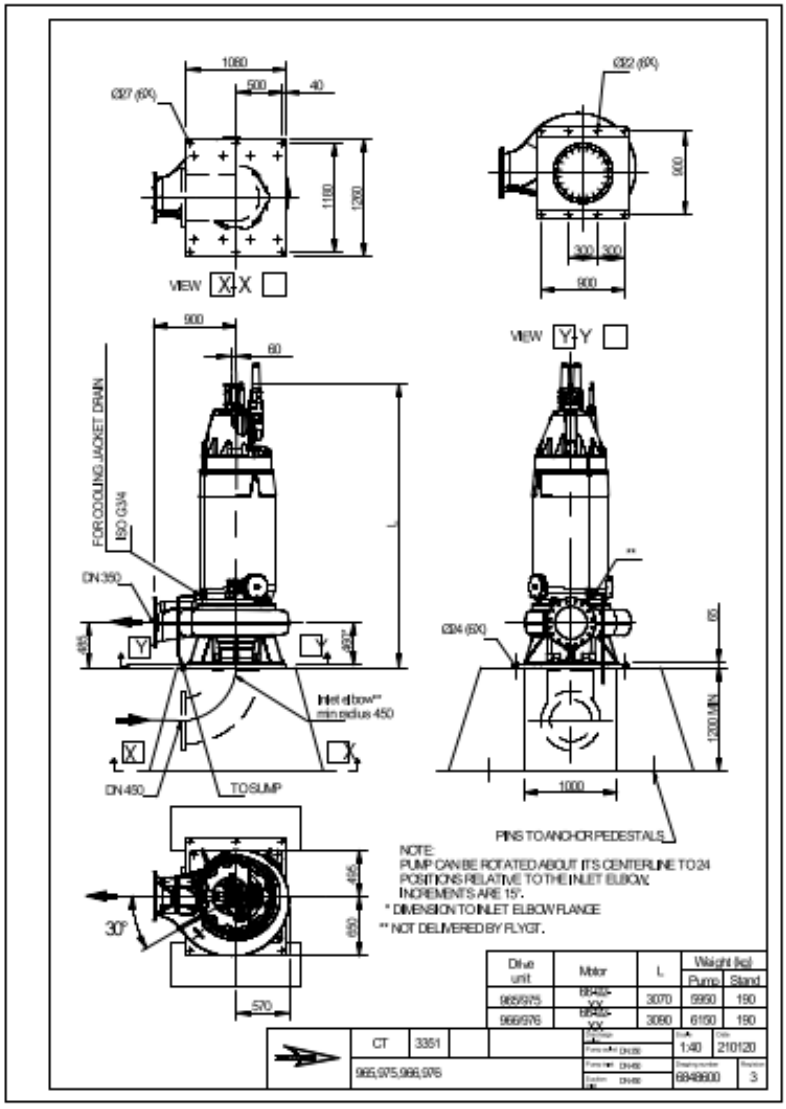
Project		Created by	Marius Bocu		
Block	0	Created on	7/20/2023	Last update	7/20/2023


CT 3351/965 3~ 650
VFD Curve
FLYGT
a xylem brand
Curves according to: Water, pure, 4 °C, 999.9 kg/m³, 1.5702 mm²/s
Head
[m]
82.8%
650 680mm
Power limit @ ~60m
Efficiency
Overal Efficiency
[%]
Power input P1
Shaft power P2
[hp]
650 680mm (P2)
NPSHR-values
[m]
650 680mm
650 540mm
40 Hz
45 Hz
50 Hz
0 100 200 300 400 500 600 700 800 900 1000 [l/s]
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.
Curve: ISO 9906
Project
Block 0
Created by Marius Bocu
Created on 7/20/2023 Last update 7/20/2023

CT 3351/965 3~ 650

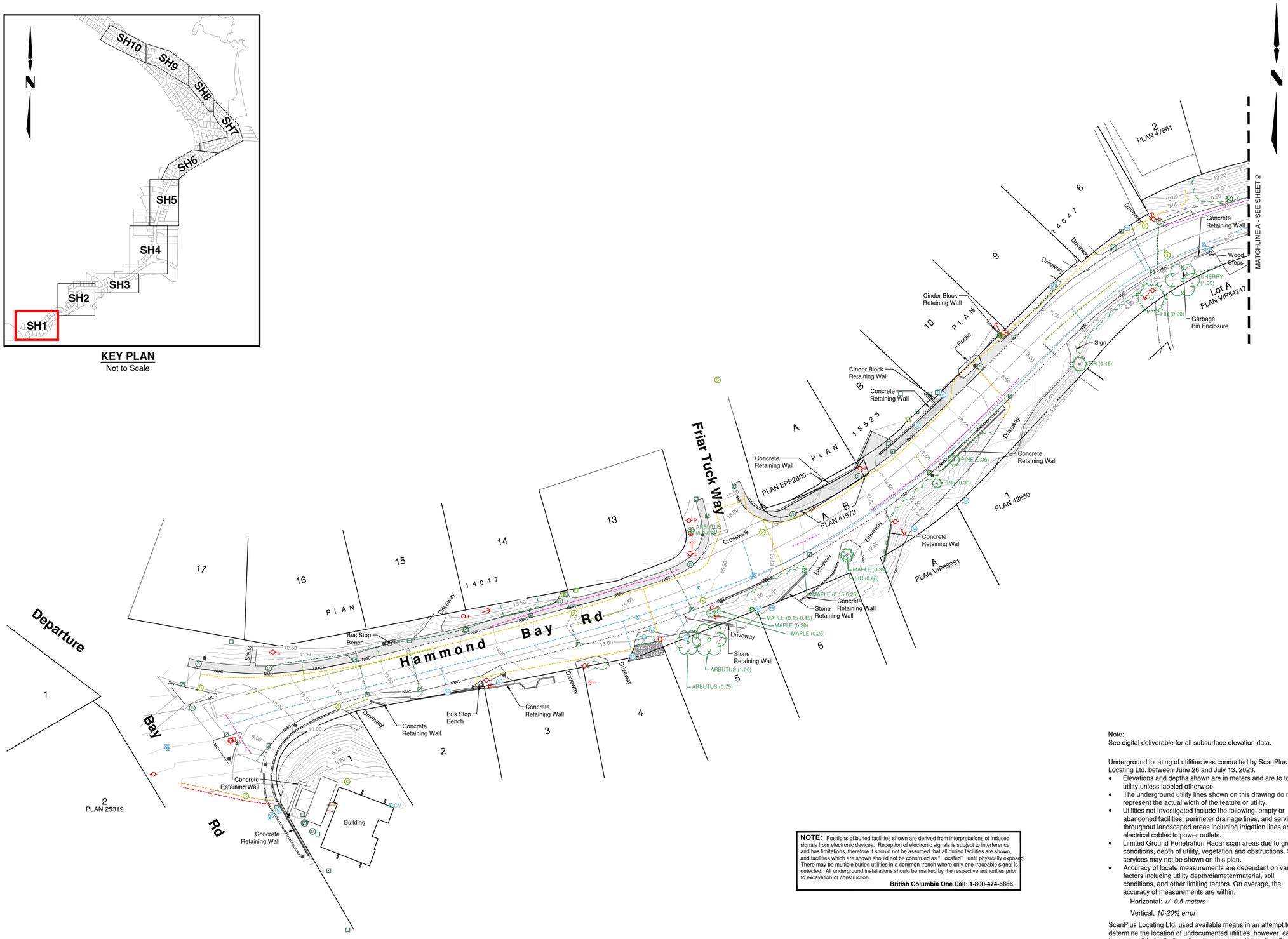
Dimensional drawing

FLYGT a xylem brand



Project		Created by	Marius Bocu
Block		Created on	7/8/2022 Last update 7/8/2022

KEY PLAN
Not to Scale



NOTE: Positions of buried facilities shown are derived from interpretations of induced signals from electronic devices. Reception of electronic signals is subject to interference and has limitations, therefore it should not be assumed that all buried facilities are shown, and facilities which are shown should not be construed as " located" until physically exposed. There may be multiple buried utilities in a common trench where only one traceable signal is detected. All underground installations should be marked by the respective authorities prior to excavation or construction.

British Columbia One Call: 1-800-474-6886

10 5 0 10 20 30

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All distances are in metres and decimals thereof.

LEGEND

- denotes catchbasin
- denotes catchbasin/manhole
- denotes drain
- denotes drain manhole
- denotes drain cleanout
- denotes culvert invert
- denotes ditch/swale direction of flow
- denotes ditch/swale
- denotes sewer manhole
- denotes sewer cleanout
- denotes sewer inspection chamber
- denotes combination storm sewer manhole
- denotes water manhole
- denotes water meter
- denotes water valve
- denotes hydrant
- denotes water well
- denotes gas valve
- denotes gas meter
- denotes communications vault
- denotes communications kiosk
- denotes hydro pole
- denotes hydro pole with light
- denotes hydro pole with transformer
- denotes anchor pole
- denotes hydro pole with pilaster
- denotes pole anchor
- denotes traffic signal pole
- denotes junction box
- denotes hydro vault
- denotes streetlight davit
- denotes lamp pole
- denotes unknown utility manhole
- denotes bollard
- denotes sign
- denotes fence gate post
- denotes fence
- denotes barrier
- denotes top of bank
- denotes bottom of bank
- denotes building overhang
- denotes sidewalk
- denotes concrete
- denotes roadside concrete barrier
- denotes non-mountable curb
- denotes curb letdown
- denotes edge of pavement
- denotes edge of gravel
- denotes center line of road
- denotes paint line
- denotes underground communications service
- denotes underground gas service
- denotes underground power service
- denotes underground sewer service
- denotes underground water service
- denotes unknown underground service
- denotes property line
- denotes interest line
- denotes tree line
- denotes deciduous tree, species and diameter
- denotes coniferous tree, species and diameter

Note:
See digital deliverable for all subsurface elevation data.

Underground locating of utilities was conducted by ScanPlus Locating Ltd. between June 26 and July 13, 2023.

- Elevations and depths shown are in meters and are to top of utility unless labeled otherwise.
- The underground utility lines shown on this drawing do not represent the actual width of the feature or utility.
- Utilities not investigated include the following; empty or abandoned facilities, perimeter drainage lines, and services throughout landscaped areas including irrigation lines and electrical cables to power outlets.
- Limited Ground Penetration Radar scan areas due to ground conditions, depth of utility, vegetation and obstructions. Some services may not be shown on this plan.
- Accuracy of locate measurements are dependant on various factors including utility depth/diameter/material, soil conditions, and other limiting factors. On average, the accuracy of measurements are within:

  Horizontal: *+/- 0.5 meters*

  Vertical: *10-20% error*

ScanPlus Locating Ltd. used available means in an attempt to determine the location of undocumented utilities, however, cannot be responsible for finding all undocumented utilities. ScanPlus Locating Ltd. is not responsible for any loss or damage arising out of the use of, or reliance on, the subsurface data collected or the report presented.

Date of Field Survey: June 26, 2023 - July 20, 2023.

Contour interval = 0.5 m.

Vertical Datum CGVD28 (HTV2.0).

Tree diameters are taken at breast height. Tree symbols are diagrammatic only to show relative sizes.

Overhead lines are diagrammatic only and may not include all connections.

Lot boundaries shown hereon are derived from ties to existing survey evidence and Land Title Office records. Lot boundaries are subject to change upon legal survey.

This plan represents the best information available at the time of survey. GeoVerra Surveys (BC) Limited Partnership and its employees take no responsibility for the location of any underground conduits, pipes, or other facilities whether shown on or omitted from this plan. All underground installations should be located by the respective authorities prior to construction.

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0	2023-07-28	ORIGINAL PLAN PREPARED	RA/BKS	JP

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t: 250-342-9767 • www.geoverra.com

PROJECT: HAMMOND BAY ROAD (23-028)

PROJECT NO: 23-01892

SCALE: As-Noted

DISCIPLINE: GEOMATICS

TITLE: CORRIDOR TOPOGRAPHIC SURVEY

DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 1 of 10

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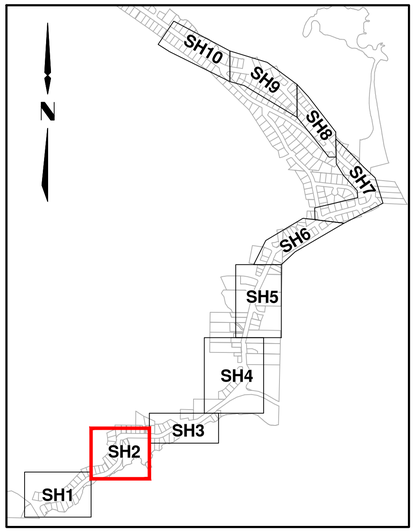

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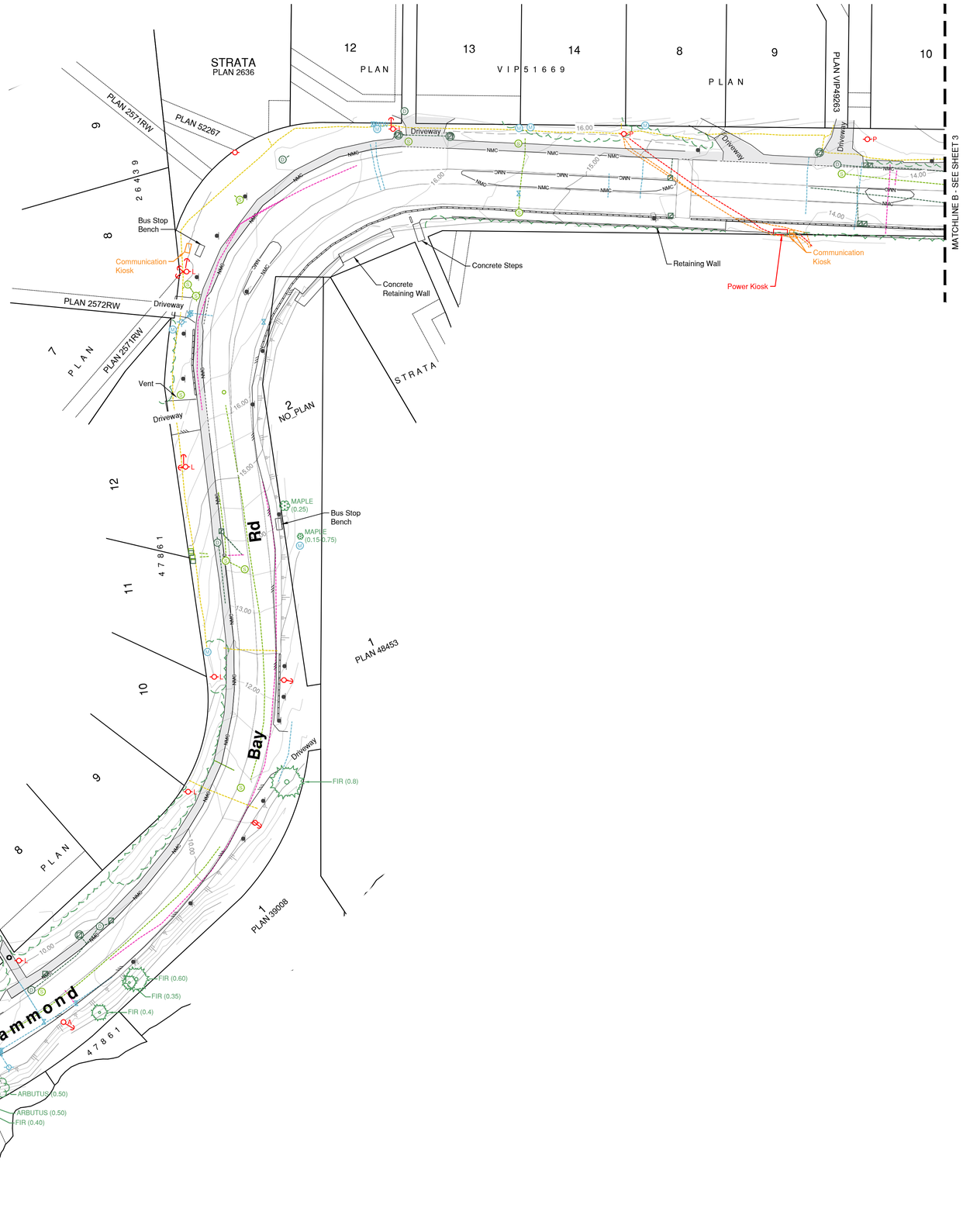

10 5 0 10 20 30

The intended plot size of this plan is 841mm in width by 594mm in height (ISO A1 size) when plotted at a scale of 1:500

All distances are in metres and decimals thereof.

See sheet 1 for legend.

Note:
See digital deliverable for all subsurface elevation data.

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TITLE: CORRIDOR TOPOGRAPHIC SURVEY

DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 2 of 10

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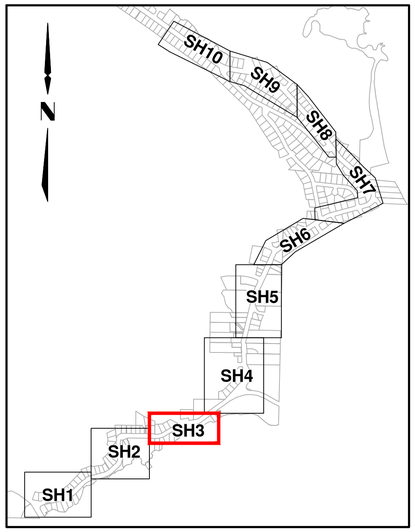

KEY PLAN
Not to Scale

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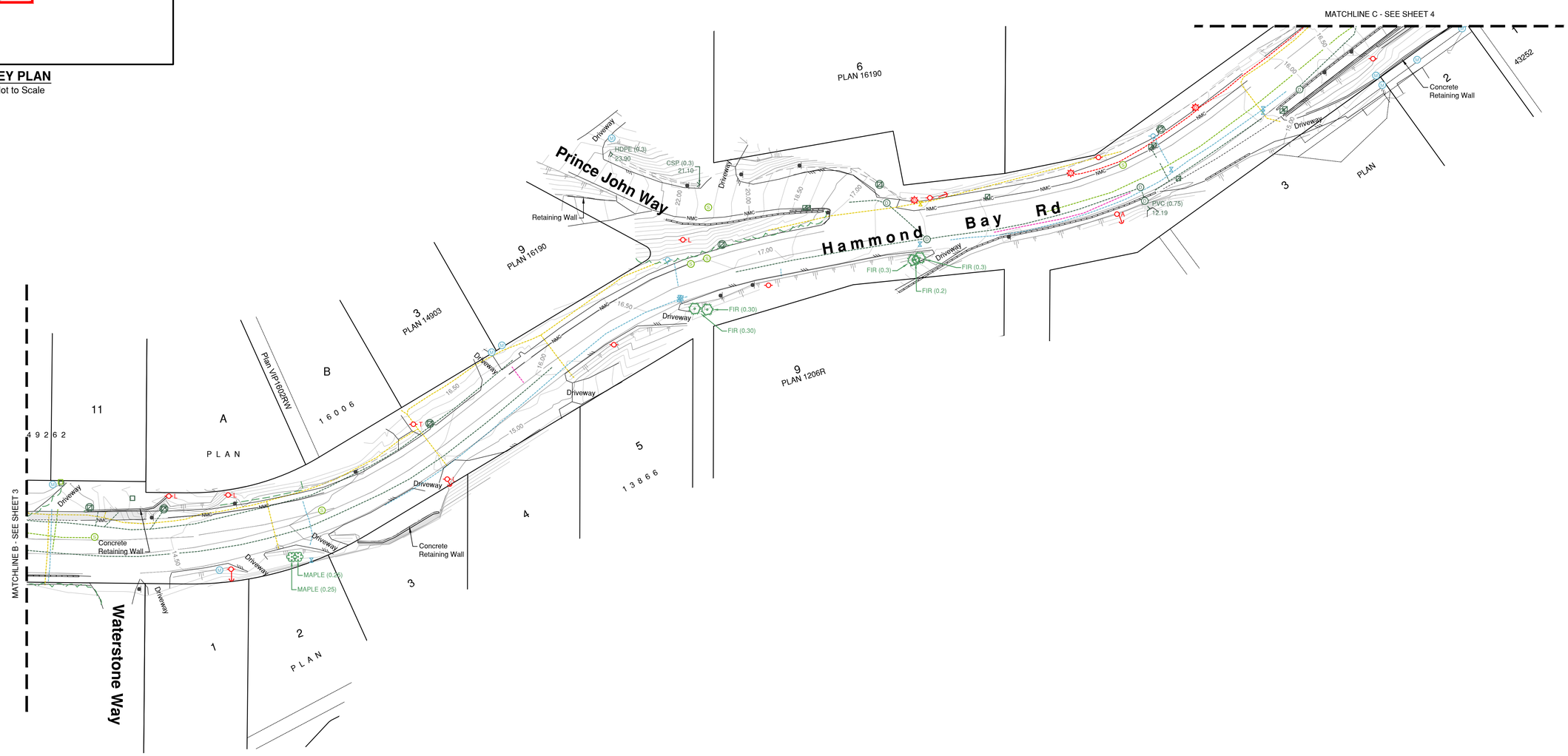

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DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 3 of 10

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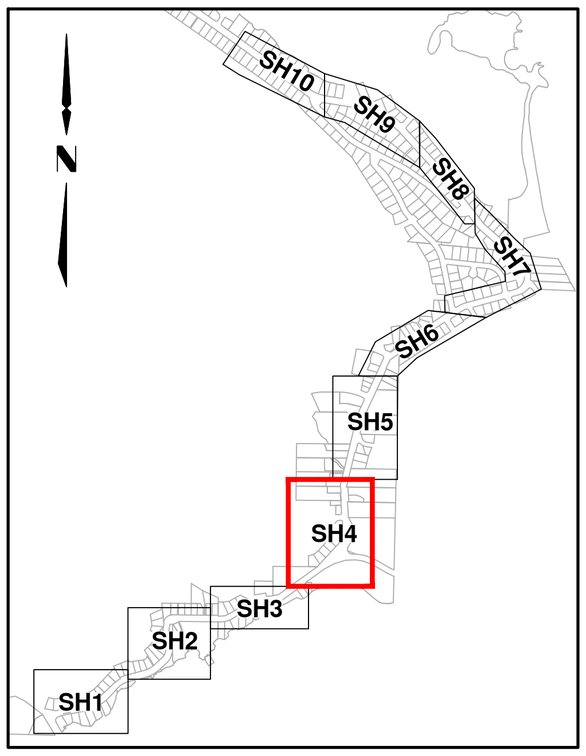

KEY PLAN
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Note:
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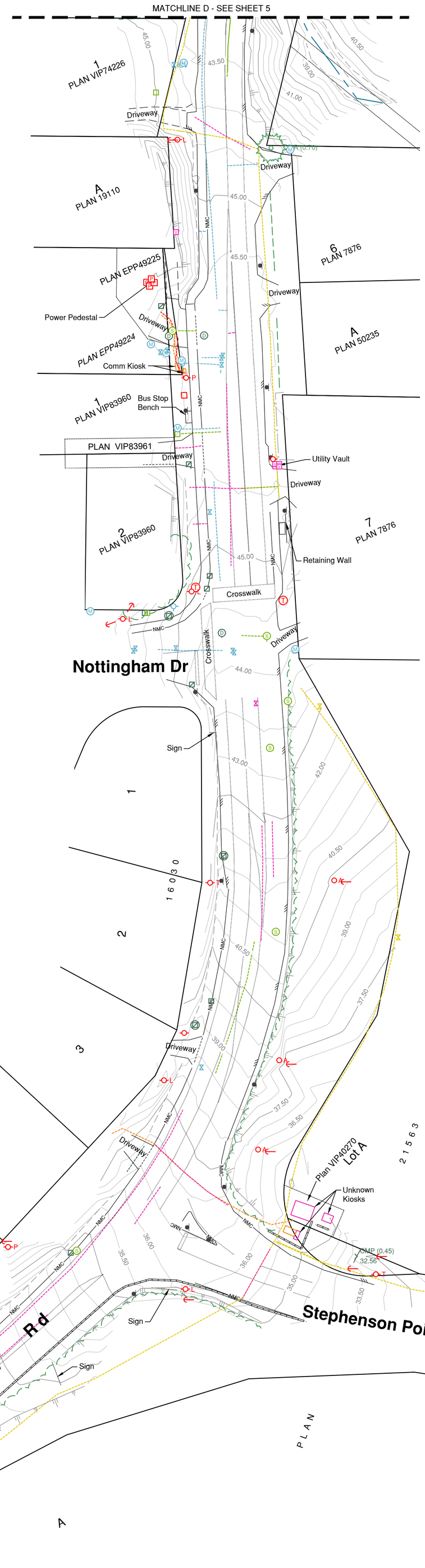

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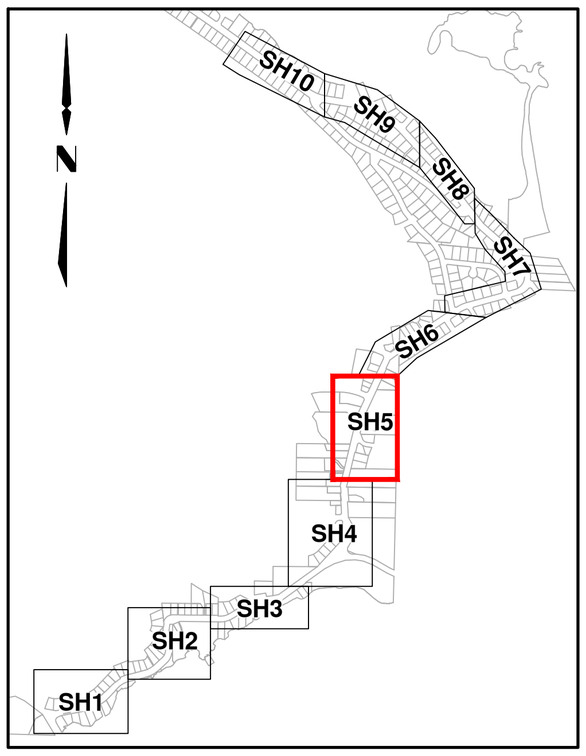
DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 4 of 10



KEY PLAN
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10 5 0 10 20 30

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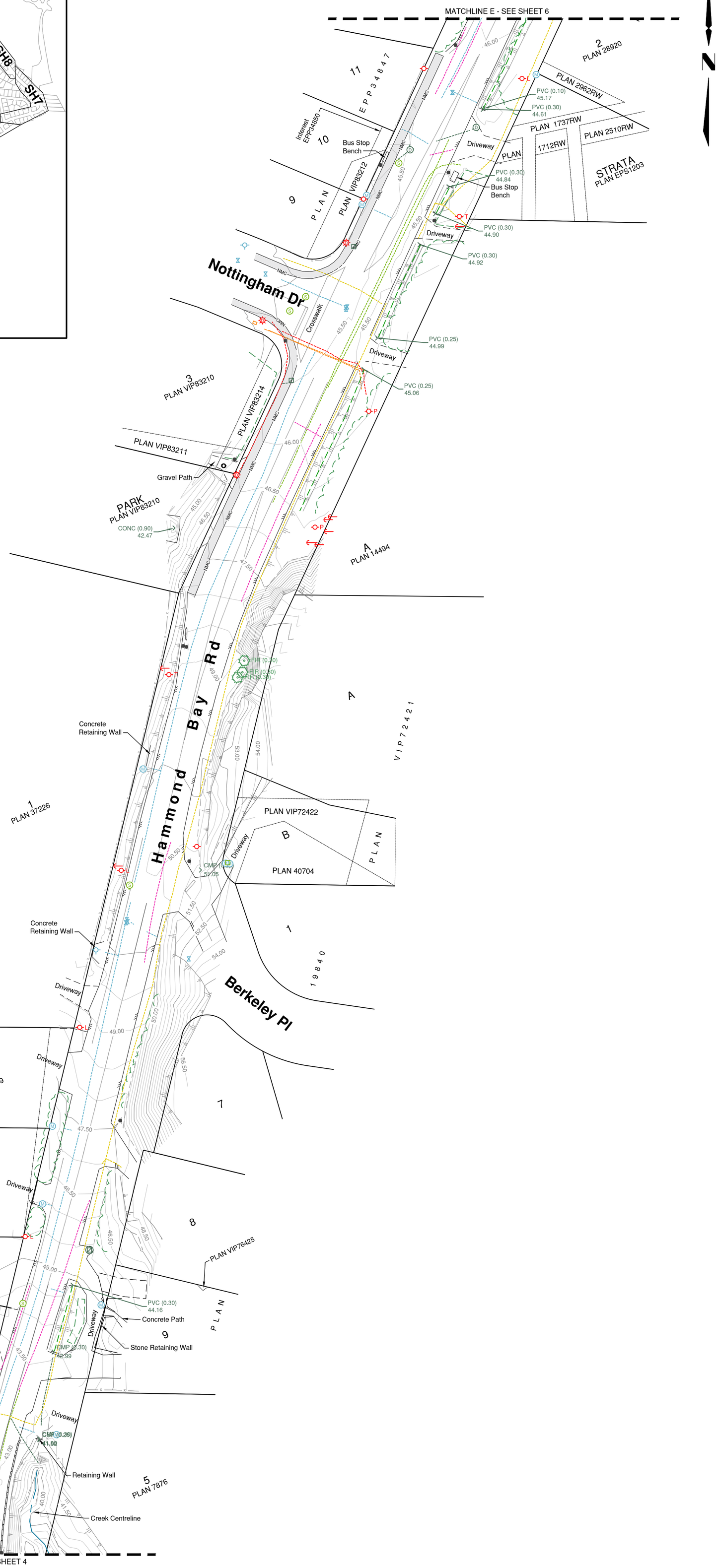

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DISCIPLINE: GEOMATICS

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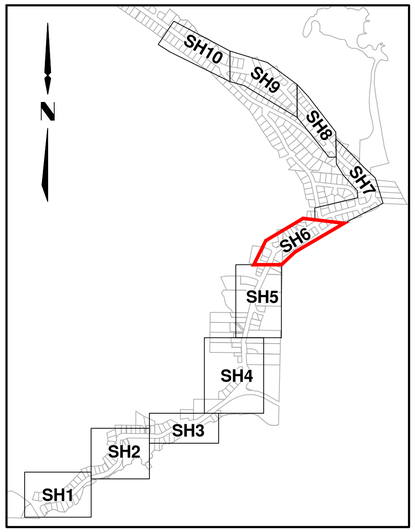
DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 5 of 10



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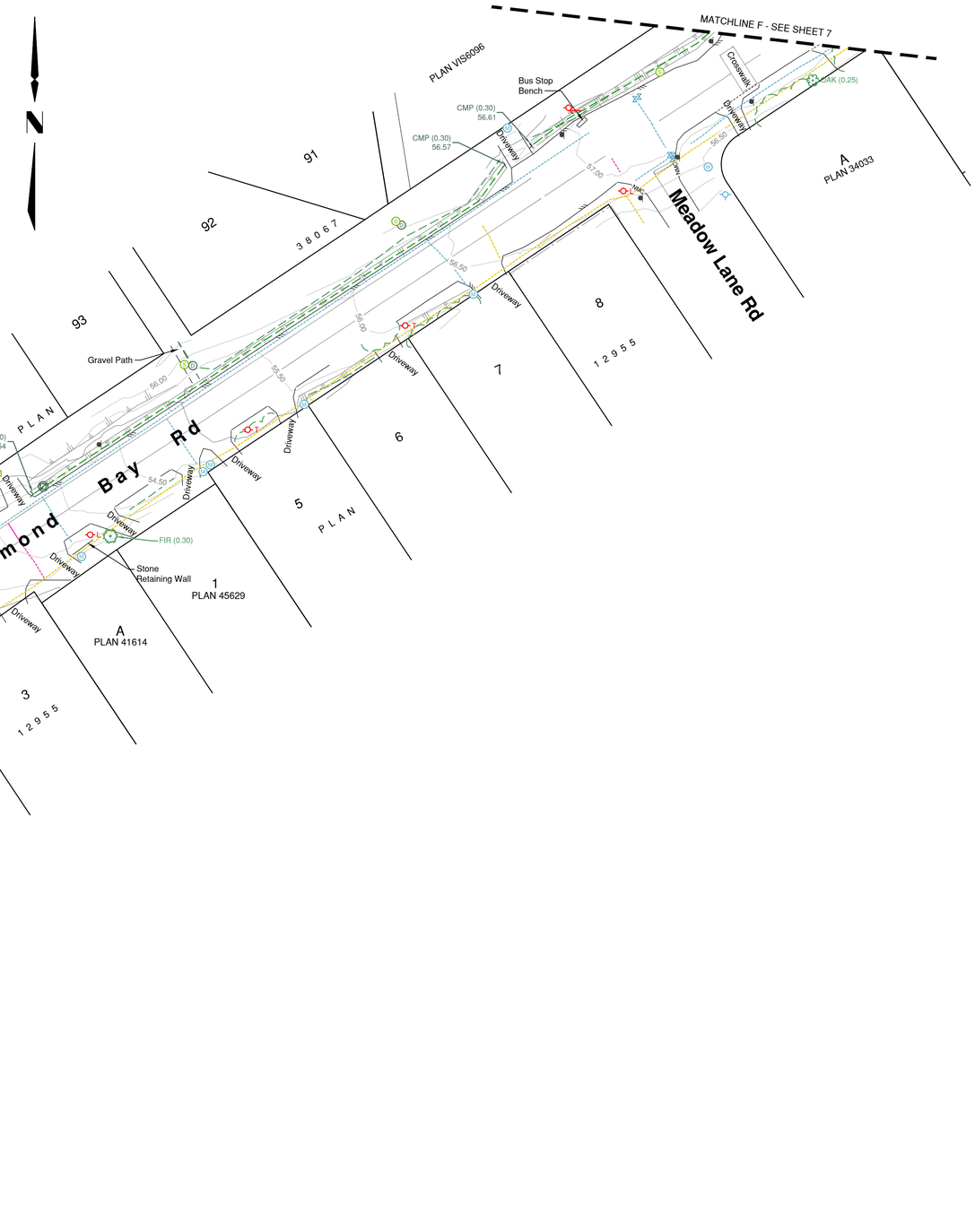

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See sheet 1 for legend.

Note:
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ISS/REV	YYYY-MM-DD	DESCRIPTION	DRN	CHK
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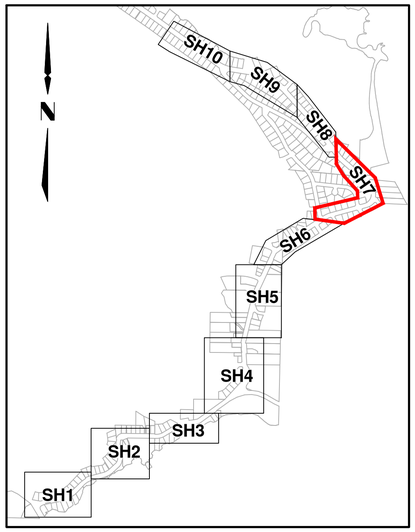
PROJECT: HAMMOND BAY ROAD (23-028)
PROJECT NO: 23-01892
SCALE: As-Noted
DISCIPLINE: GEOMATICS

TITLE: CORRIDOR TOPOGRAPHIC SURVEY
DRAWING NO: 23-01892-001-TOPO01-R02
SHEET NO: 6 of 10

Plotted: 7/31/2023 3:09 PM User: Hugo.Chisholm



KEY PLAN
Not to Scale

10 5 0 10 20 30

The intended plot size of this plan is 841mm in width by 594mm in height (ISO A1 size) when plotted at a scale of 1:500

All distances are in metres and decimals thereof.

See sheet 1 for legend.

Note:
See digital deliverable for all subsurface elevation data.

MATCHLINE H - SEE SHEET 8

MATCHLINE G

MATCHLINE F - SEE SHEET 6

Chinook Rf

Hammond Bay Rd

Oakridge Dr

McKinnon Pl

Planta Rd

Bonnie Dr

PLAN 2288RW

PLAN 2308RW

SRW NO_PLAN

Bus Stop Bench

Driveway

NMC

PVC (0.45) 25.98
CMP (0.50) 26.65
ARBUTUS (0.35)
CMP (0.45) 26.83
PVC (0.35) 28.01
MAPLE (0.45)
PVC (0.35) 33.47
PVC (0.30) 35.81
PVC (0.30) 35.87
PVC (0.10) 36.87
PVC (0.30) 36.74
PVC (0.30) 37.15
PVC (0.375) 43.70
PVC (0.15) 43.72
PVC (0.375) 44.37
CMP (0.30) 48.01
CMP (0.25) 48.47
CMP (0.25) 49.22
CMP (0.30) 47.60
HDPE (0.30) 50.71
HDPE (0.30) 50.20
CMP (0.25) 51.22
CMP (0.25) 51.69
CMP (0.25) 53.42
CMP (0.25) 53.65
PVC (0.375) 58.75

ISS/REV	YYYY-MM-DD	DESCRIPTION	DRN	CHK
0	2023-07-28	ORIGINAL PLAN PREPARED	RA/BKS	JP

CLIENT: REGIONAL DISTRICT OF NANAIMO

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PROJECT: HAMMOND BAY ROAD (23-028)

PROJECT NO: 23-01892

SCALE: As-Noted

DISCIPLINE: GEOMATICS

TITLE: CORRIDOR TOPOGRAPHIC SURVEY

DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 7 of 10

Plotted: 7/31/2023 3:09 PM User: Hugo.Chisholm

KEY PLAN
Not to Scale

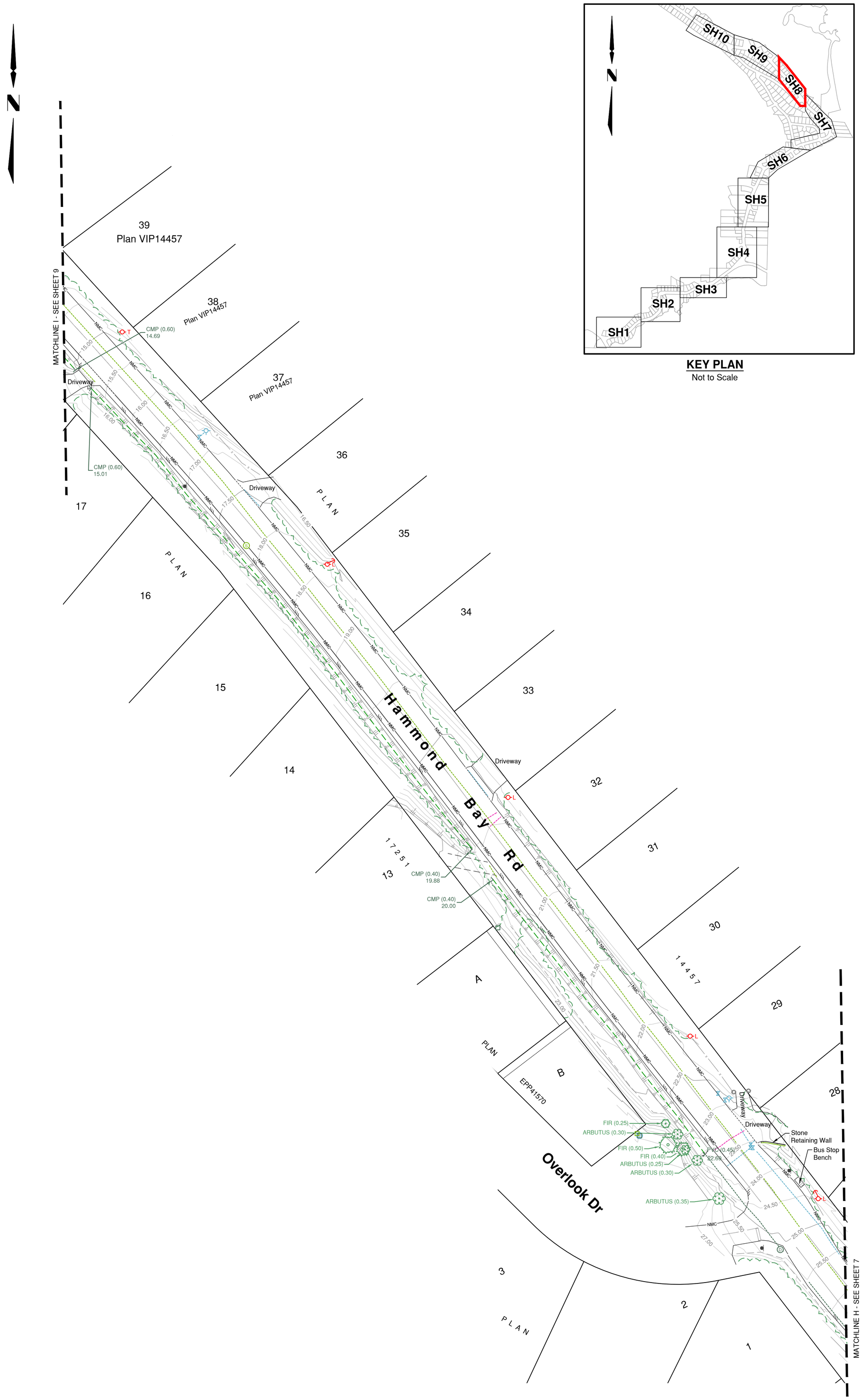
10 5 0 10 20 30

The intended plot size of this plan is 594mm in width by 841mm in height (ISO A1 size) when plotted at a scale of 1:500

All distances are in metres and decimals thereof.

See sheet 1 for legend.

Note:
See digital deliverable for all subsurface elevation data.



ISS/REV	YYYY-MM-DD	DESCRIPTION	DRN	CHK
0	2023-07-28	ORIGINAL PLAN PREPARED	JA/BKS	JP

CLIENT:
REGIONAL DISTRCIT OF NANAIMO

CLIENT REF. NO:

GeoVerra
795 Market Street
Victoria, BC • V8T 0B4
t: 250-342-9767 • www.geoverra.com

PROJECT:
HAMMOND BAY ROAD (23-028)

PROJECT NO:
23-01892

SCALE:
As-Noted

DISCIPLINE:
GEOMATICS

TITLE:
CORRIDOR
TOPOGRAPHIC SURVEY

DRAWING NO:
23-01892-001-TOPO01-R02

SHEET NO:
8 of 10

Plotted: 7/31/2023 3:09 PM User: Hugo.Chisholm

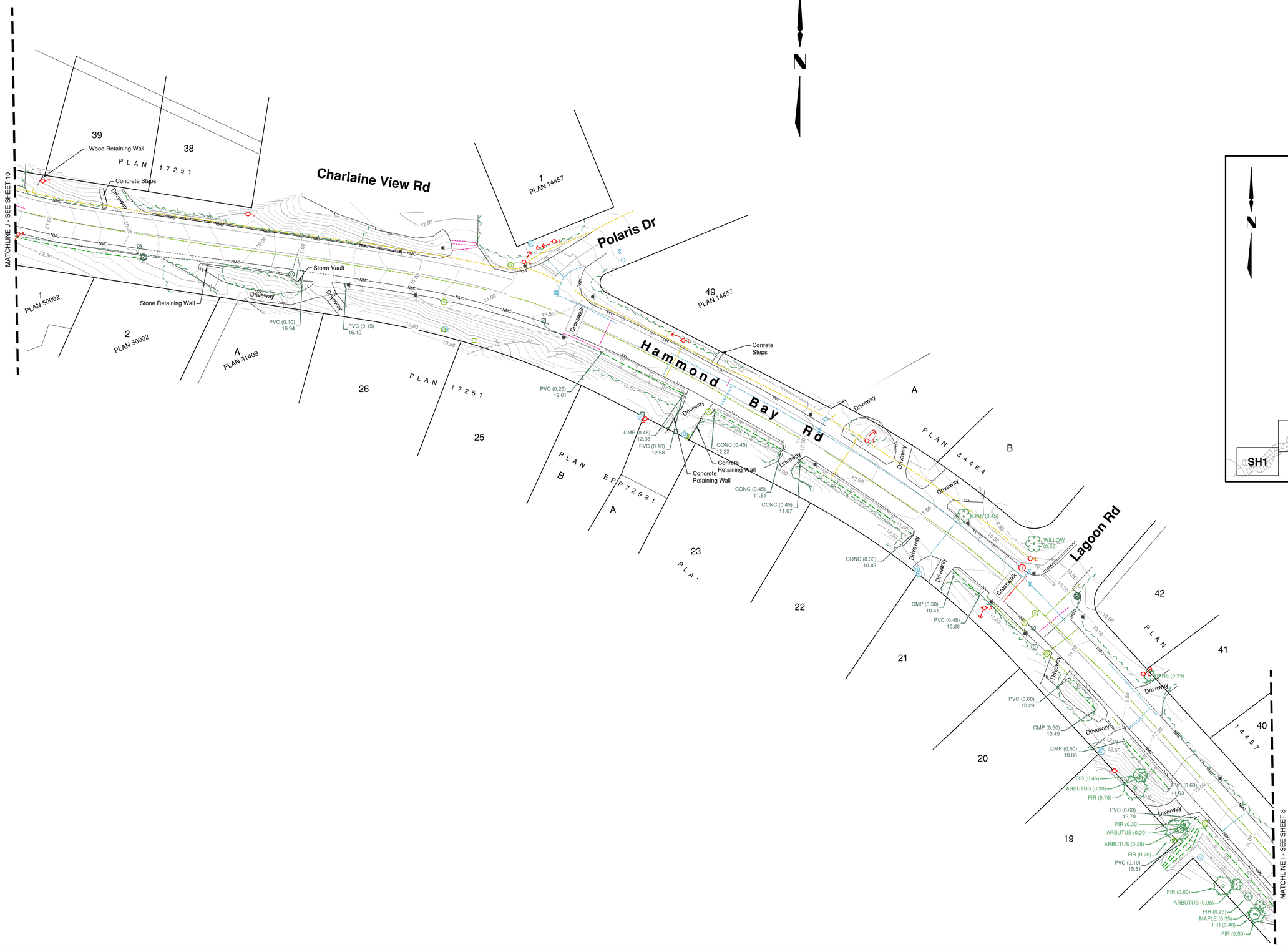
10 5 0 10 20 30

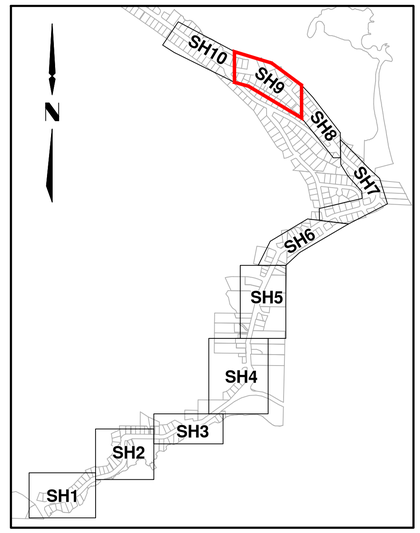
The intended plot size of this plan is 841mm in width by 594mm in height (ISO A1 size) when plotted at a scale of 1:500

All distances are in metres and decimals thereof.

See sheet 1 for legend.

Note:
See digital deliverable for all subsurface elevation data.





KEY PLAN
Not to Scale

ISS/REV	YYYY-MM-DD	DESCRIPTION	DRN	CHK
0	2023-07-28	ORIGINAL PLAN PREPARED	RA/BKS	JP

CLIENT: REGIONAL DISTRICT OF NANAIMO
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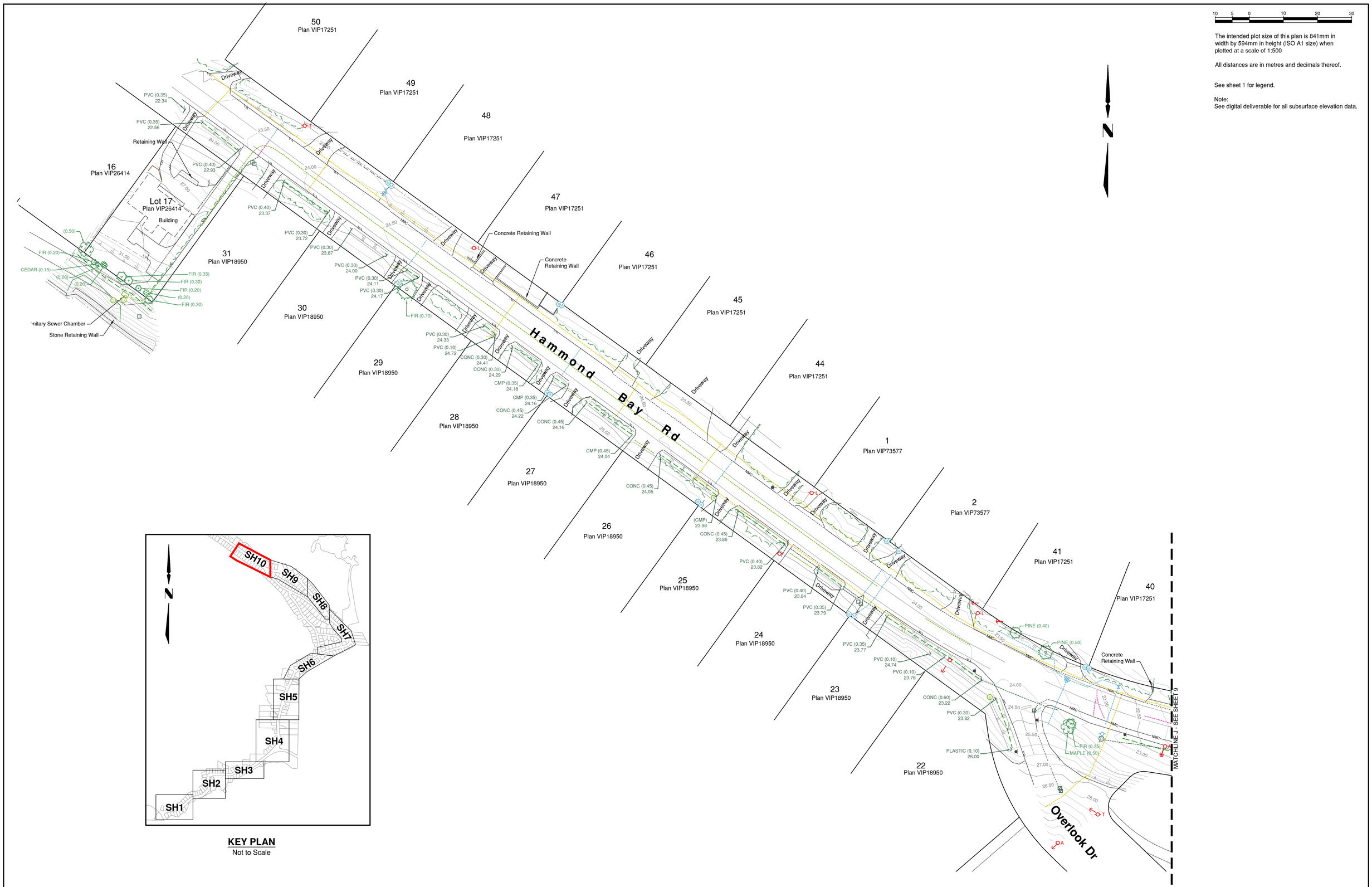
PROJECT: HAMMOND BAY ROAD (23-028)
PROJECT NO: 23-01892
SCALE: As-Noted
DISCIPLINE: GEOMATICS

TITLE: CORRIDOR TOPOGRAPHIC SURVEY
DRAWING NO: 23-01892-001-TOPO01-R02
SHEET NO: 9 of 10

Plotted: 7/31/2023 3:10 PM User: Hugo.Chisholm



KEY PLAN
Not to Scale

10 5 0 10 20 30

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PROJECT NO: 23-01892

SCALE: As-Noted

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DRAWING NO: 23-01892-001-TOPO01-R02

SHEET NO: 10 of 10

Plotted: 7/31/2023 3:09 PM User: HugoChisholm