

REQUEST FOR PROPOSALS

Professional Engineering Consulting Services Minnehaha Bay Wharf Design

RFP No. 2026-033

Closing: September 15th, 2026

Site Meeting: N/A

Joie de vivre



www.westnipissingouest.ca

REQUEST FOR PROPOSALS

The Municipality of West Nipissing is seeking proposals from qualified engineering consulting firms to provide professional engineering services for the design of the Minnehaha Bay Wharf Reconstruction Project located at 300 King Street, Sturgeon Falls, Ontario.

The selected Consultant will be responsible for detailed engineering design, preparation of construction drawings and technical specifications, permitting and regulatory applications, preparation of tender documents, assistance during the procurement process, contract administration, construction inspection, and project closeout, including final inspection, confirmation that the completed works conform to the approved design, and final project acceptance.

Interested proponents must submit comprehensive proposals outlining their project understanding, proposed methodology, project schedule, fees, and relevant experience. The successful proponent will demonstrate expertise in marine infrastructure design, regulatory approvals, construction administration, and project closeout.

Owner: Municipality of West Nipissing
101-225, Holditch Street
Sturgeon Falls, ON P2B 1T1
Phone: 705-753-2250
Fax: 705-753-3950

PROPOSAL SUBMISSION

- 1.0) Electronic bid submission via Merx, bid documents must be in the form of a pdf document submitted before 2:00 PM (local time) on September 15th, 2026. Subject line should include the Project Title and Bid reference number. It is the respondent's responsibility to ensure submissions are received via Merx by the submission deadline. The Municipality assumes no obligation for issues caused by electronic or telecommunications issues affecting the delivery of the submission.
- 1.1) Proposals submitted by facsimile will not be considered.
- 1.2) All pages contained in the request for proposal form an integral part of this process.
- 1.3) The lowest or any proposal will not necessarily be accepted. The owner may decide, at its sole discretion, that no proposal submitted will be accepted and no contract will be awarded pursuant to this procurement process. If the owner elects to reject all proposals, all proponents will be notified and the owner will not be liable to any proponent in preparing the proposal, damages, loss of anticipated profit in connection with the work, or any matter whatsoever.
- 1.4) Proponents are advised that the Municipality functions through its Policy No. 2006-332 "Validity of Tenders" and by its By-Law No 2016-89 (including the most current amendments), "By-law to Establish Purchasing Policies and Procedures for the Municipality of West Nipissing" (Purchasing By-Law).
- 1.5) Proponents are responsible for checking MERX for any addenda issued prior to the Proposal Closing Date and Time. Any amendments to the Request for Proposals documents will be issued by addendum through MERX.
- 1.6) Partial or incomplete proposals will not be considered.

QUESTIONS AND CLARIFICATIONS

- 2.0) Enquiries, request for explanation, interpretations or clarifications must be submitted by email to jbelanger@westnipissing.ca , only those inquiries submitted by email will be considered. Emails submitted must include the bid title and bid reference number.
- 2.1) Enquiries will be received up to noon local time August 25th, 2026. Enquiries received after the date and time noted will not receive a response.

PROPOSAL OPENING

- 3.0) Proposals will be opened privately.

ADJUSTMENT OR WITHDRAWAL OF BIDS

- 4.0) Adjustment by telephone, facsimile or letter for a proposal already received will not be considered. A proponent desiring to make adjustment to a bid must withdraw the submission and/or supersede it with another offer.
- 4.1) Proponents may withdraw its proposal at any time prior to closing provided the withdrawal:
- i) is in the form of a letter and,
 - ii) state the name of the bidder and clearly identifies the bid that is being withdrawn and;
 - iii) is signed by the proponent's duly authorized signing officer;
- 4.2) Proposals may not be withdrawn after the closing time.

EXAMINATION OF SITE CONDITIONS

- 5.0) It is the responsibility of the proponent before submitting a Proposal to carefully examine the site of the proposed work. Proponents shall fully inform themselves as to the existing site conditions and limitations to determine all factors relating to the place of work that may affect the performance of the work, conditions such as weather and availability of labour, the ground, quality and quantity of the material to be encountered, the equipment and facilities needed preliminary to and during the execution of the work, the general local conditions, and all matters which are necessary for the full and proper completion of the work and the conditions under which it will be performed.
- 5.1) Any failure to fully investigate the sites of the work or the foregoing conditions shall not relieve the proponent from his responsibility for estimating properly the difficulty or cost of successfully performing the work. Neither the owner, nor any of his representative or agents, assumes any responsibility for the accuracy of site information indicating in the bid documents and the proponents must evaluate such information relative to the actual conditions at the place of the work.
- 5.2) No formal site meeting will be held.

DOCUMENT DISCREPENCIES AND OMISSION

- 6.0) Proponents are responsible to review the request for proposal documents and to verify they are complete. If the proponent finds discrepancies or omissions from the drawings, specifications and other documents, the proponent should submit a written request for correction to the contract administrator. Written request for corrections must be received no later than August 18th, 2026. Any required correction, addition, deletion or revision to the bid documents will be by written addenda to the bid documents issued by the contract administrator by posting to the Municipality of West Nipissing website.

RESPONSE MATERIAL OWNERSHIP

- 7.0) All material submitted regarding this RFP becomes the property of the Municipality and will only be returned to the Contractor at the Municipality's discretion. Disqualification of a Contractor does not eliminate this right.

ACCEPTANCE OF PROPOSAL CONTENT

- 8.0) The contents of the proposal of the successful Contractor may become contractual obligations if the Municipality wishes to execute a contract based on the submitted proposal. Failure of the successful Contractor to accept these obligations in a purchase agreement, purchase order, contract, or similar instrument may result in cancellation of the award, and such Contractor may be removed from future solicitations.

INSURANCE

- 9.0) The successful proponent shall, within (7) calendar days after receipt of the owner's notice of award, deliver to the owner one (1) copies of certificates attesting to the fact that the required policies of insurance as outlined in the contract documents have been obtained by the proponent.
- i) General Commercial Liability in the amount of \$5,000,000 (two million)
 - ii) The Municipality of West Nipissing shall be included as additionally insured, but only in respect of and for the duration of the services to be performed under this agreement.

SCOPE OF WORK

- 1.1)** The Municipality of West Nipissing intends to reconstruct the existing Minnehaha Bay Wharf and associated infrastructure to provide a safe, functional, durable, and accessible waterfront facility that meets the Municipality's long-term operational needs. The scope of work outlined in this section describes the professional engineering services required to complete the detailed design, tendering, contract administration, construction inspection, substantial performance, and project closeout for the Project.
- 1.2)** All physical construction, demolition, supply, and installation work will be completed by a separate construction contractor procured through a competitive tender process and is not part of this Request for Proposal.
- i) Design Services:**
Design services include site review, review of available background information, design development, preparation of engineering drawings and technical specifications, preparation and administration of permit and regulatory approval applications, coordination with applicable approval agencies, and preparation of tender documents.
- ii) Tender Administration:**
Tender administration includes responding to bidder inquiries during the tender period, preparation of addenda as required, review of tender submissions, and preparation of a tender evaluation and award recommendation to the Municipality.
- iii) Contract Administration:**
Contract administration includes administering the construction contract in accordance with the CCDC 2 – Stipulated Price Contract, responding to contractor inquiries, review of shop drawings, review of progress payment applications, review of proposed change orders, coordination of site meetings, administration of permit and regulatory approval requirements during construction, and other contract administration services necessary for successful project delivery.
- iv) Site Inspection and Project Closeout:**
Site inspections include periodic site visits during construction to observe the work for general conformance with the contract documents, participation in deficiency reviews, final verification of completed work, certification of substantial performance, issuance of a final acceptance letter, and completion of all project closeout documentation.

- 1.3)** The consultant shall prepare its proposal based on the Structural Condition Assessment Report, Underwater Inspection Report, Geotechnical Investigation Report, and other information provided by the Municipality. These documents contain critical information regarding the existing site conditions and shall be reviewed and considered throughout the engineering design process.
- 1.4)** The Consultant shall prepare the engineering design, obtain all required regulatory approvals, prepare tender documents, and develop the proposed construction schedule to facilitate construction of the Project during the 2027–2028 marina off-season. The Municipality requires that the construction phase be completed outside of the marina operating season, which extends from **May 10 to October 13**. The Consultant shall recommend an appropriate construction schedule and sequencing to support contract award, material procurement, and construction within the anticipated off-season construction window.

In developing the proposed construction sequencing, the Consultant shall consider the operation of the Minnehaha Bay Restaurant, public access to the boat launch, emergency access to the dry hydrant, and winter access to the bay (ice fishing). Where practicable, the Consultant shall seek to minimize disruptions to marina operations, public access, and the restaurant operator while maintaining the safety of the public and construction personnel.

- 1.5)** The project is subject to the Buy Ontario Procurement Directive. The successful Consultant shall comply with the requirements of the Directive, where applicable during the preparation of the engineering design, technical specifications, and tender documents

PROJECT INFORMATION

- 1.6)** The completed project will include the reconstruction of the existing wharf and associated infrastructure to provide a safe, functional, durable, and accessible waterfront facility that meets the Municipality's long-term operational needs.

The project components described below establish the Municipality's design intent for the Project. The proposed design should generally follow the preliminary concept design provided by the Municipality. While the Consultant is encouraged to recommend improvements or opportunities that may reduce design and construction costs, such recommendations shall maintain the overall project objectives, functional requirements, and general design intent.

The project components include, but are not limited to, the following:

i) Project Budget:

The maximum available funding for the Project is **\$4,250,000 plus HST**. The Project Budget includes all costs associated with the Project, including design, permitting, regulatory approvals, construction, contingencies, contract administration, inspection, testing, contingencies, and project closeout.

ii) Procurement Schedule:

The anticipated procurement timeline is provided for planning purposes only and may be revised by the Municipality.

Anticipated Contract Award: November 3rd, 2026

iii) Preliminary Concept Design Information

A preliminary concept design prepared by EXP Services Inc. has been provided to illustrate the Municipality's anticipated project layout and design intent. While the concept design establishes the Municipality's anticipated project direction, the Consultant is encouraged to recommend practical design improvements or cost-saving opportunities that, in its professional opinion, better achieve the project objectives, provided the Municipality's functional requirements and overall design intent are maintained. (See Appendix A.)

A comprehensive geotechnical investigation prepared by EXP Services Inc. has also been provided and shall be reviewed and considered in the development of the proposed design. Should the Consultant determine that supplementary geotechnical investigation is necessary to support its proposed design, the requirement and associated costs shall be clearly identified within its proposal. (See Appendix A.)

iv) Design, Engineering Services

Development of detailed design plans, including structural, civil, and electrical drawings and specifications.

v) Permitting and Regulatory Approvals

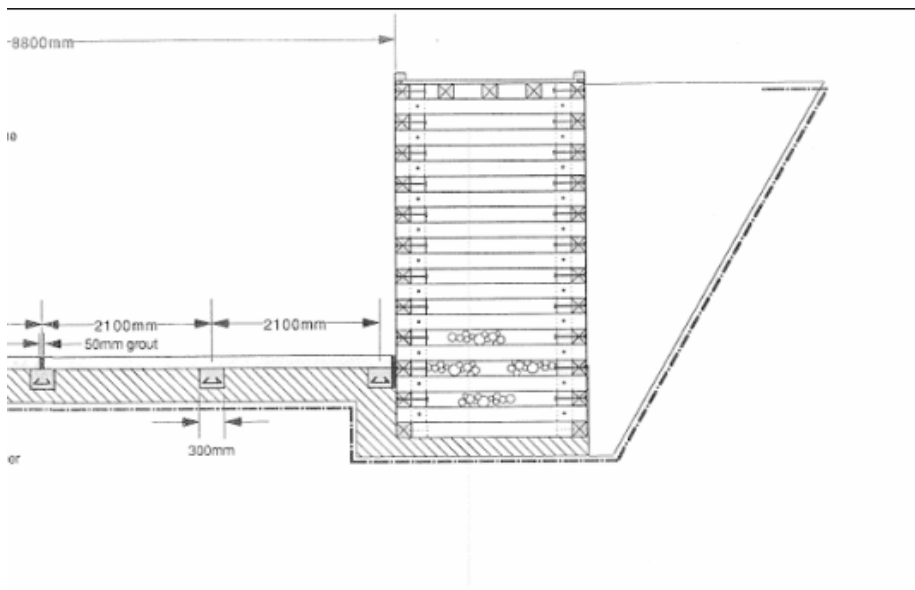
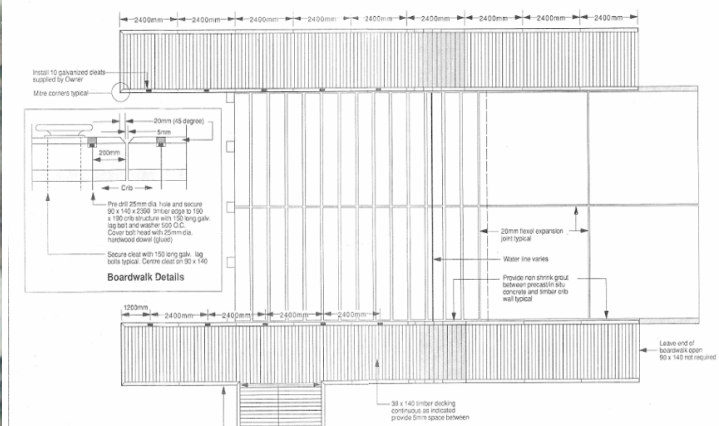
Coordination with regulatory agencies to obtain necessary permits and environmental approvals, including but not limited to MNR, DFO, and MECP, as applicable to the works. Additional information regarding Species at Risk is included. (See Appendix A).

vi) Site Inspections:

Provision of inspection and quality control services throughout construction, including periodic site visits to observe the work for general conformance with the contract documents. Documentation and reporting of inspection findings to the Municipality, including identification of deficiencies and confirmation of corrective actions. Participation in deficiency reviews, final verification of completed work, and completion of final project close-out documentation, including issuance of a final acceptance letter.

The limits of the proposed reconstruction are illustrated on the preliminary concept design drawings. The existing boat launch and associated timber cribbing are excluded from the scope of work under this project. The Consultant shall incorporate an appropriate transition between the reconstructed wharf and the existing timber cribbing at the Project limits. Refer to the figures below for the existing conditions and interface details.

This aerial photograph shows a waterfront area with a paved parking lot and a building. A red line labeled "Project Limit" runs along the shoreline. A blue arrow points to a structure labeled "Existing boat launch cribbing". The water area contains several rectangular structures. A scale bar at the top right indicates distances of 0, 10, 20, and 30 feet.



viii) Removal Design

Preparation of demolition drawings, notes, and technical specifications required for the removal of the existing wharf and associated infrastructure.

Identification of demolition sequencing, environmental protection requirements, and any project-specific constraints to be incorporated into the Contract Documents.

i) Wharf Design

The Consultant shall prepare the complete engineering design for the new wharf structure, including all structural components, foundations, decking, railings, and associated infrastructure required to achieve the project objectives.

Where changes in elevation are required, the Consultant shall incorporate ramps, landings, or other suitable means of access into the design to provide a barrier-free accessible route in accordance with the Accessibility for Ontarians with Disabilities Act (AODA).

The Consultant shall incorporate materials, finishes, railings, landscaping, and other features that enhance the waterfront character while maintaining durability, minimizing long-term maintenance requirements, and avoiding an unnecessarily industrial appearance.

ii) Floating Dock Attachments Design

Design of floating dock attachment systems and connection points to the new wharf design.

Design of aluminum access ramps from the wharf to the floating docks.

Design of an additional floating dock attachment point to accommodate a future floating dock installation.

Replacement, removal, and reinstallation of the existing floating docks are not included in the scope of work under this contract and shall be the responsibility of the Municipality.

iii) Dry Hydrant System Design

Design of a year-round functional dry hydrant system for emergency water access compliant with building code and with the Fire Department.

Testing and commissioning to ensure proper operation under emergency conditions.

iv) Utility & Infrastructure Integration Design

The Consultant shall incorporate the following existing infrastructure into the proposed design:

Electrical plug-ins servicing the floating docks.

Sewage pump-out station.

Marine fuel pump.

Wharf electrical panels.

Electrical infrastructure, including but not limited to lighting, wiring, conduits, and associated electrical components.

Restaurant drainage weeping tiles, including flushing, inspection, and confirmation of functionality following construction.

Water servicing and distribution infrastructure.

Sanitary servicing and associated infrastructure.

v) Wharf Embankment Design

Design of the wharf embankment as an integral component of the overall wharf reconstruction. The Consultant shall incorporate the rehabilitation, stabilization, or replacement of the existing embankment sheet pile wall, as required, to provide a coordinated, safe, and durable solution consistent with the design life of the reconstructed wharf. The scope shall include restoration of any disturbed embankment surfaces and adjacent municipal infrastructure directly affected by the Work to equal or better condition than existing.

vi) Security Fencing Design

Design of security fencing for the secured dock area including lockable access gate, complete with lock handle, consistent with the existing layout.

vii) Site Features Design

Proponents shall incorporate a site feature located between the roadway and the wharf similar in function and appearance to the existing post and rope system. The Municipality has found the existing manila rope and post system to be high maintenance and costly to replace and is seeking a durable, low-maintenance, long-term solution that complements the marina setting.

viii) Site Lighting Design

The project site includes existing lighting installed along the wharf. The Municipality anticipates that the existing lighting system will be retained and incorporated into the reconstructed wharf, where feasible. The Consultant shall assess the existing lighting and incorporate its removal, protection, storage, and reinstallation into the proposed design.

APPENDIX – Existing Site Information and Reference Documents

- 1.9)** The documents included within Appendix Section 4 are provided to assist Proponents in understanding the project and preparing their proposals. It is the responsibility of the Proponent to thoroughly review the information provided and satisfy itself as to its relevance and suitability for the preparation of its proposal. By submitting a proposal, the Proponent acknowledges that it has reviewed the available information and relied upon its own assessment of the project requirements.

i) Reference Documents

A1 Site Pictures and General Information

A2 Preliminary Concept Design – EXP Services Inc.

A3 Geotechnical Investigation Report – EXP Services Inc.

A4 Structural Condition Assessment Report / Underwater Inspection Report / Boat Launch Drawings

A5 Species at Risk Information

A6 Site Lighting Information

PROPOSAL SUBMISSION

- 1.10)** Proposal prices shall include all labour, supervision, travel, disbursements, overhead, and all incidental costs necessary to complete the required services outlined in this Request for Proposal. Proponents are responsible for satisfying themselves as to the full requirements of the project prior to submitting their proposal.
- 1.11) Submissions shall include, but not be limited to, the following information:**
- i) Contact information, including the firm's full name, address, telephone number, primary contact person, and email address.
 - ii) A brief description of the firm, including its history, areas of expertise, available resources, and relevant experience.
 - iii) The Proponent's understanding of the Project and proposed approach to delivering the required professional engineering services.
 - iv) A proposed work plan and project schedule, including key project milestones from project initiation through detailed design, permitting, tendering, construction, contract administration, and project closeout.
 - v) Identification of the proposed Project Manager and key personnel assigned to the Project, including their roles, qualifications, and relevant experience. The Municipality requests that Proponents provide brief summaries of the qualifications and experience of key personnel. Submission of detailed résumés is not required.
 - vi) A summary of the firm's experience on projects of similar scope and complexity, with particular emphasis on marine, waterfront, or structural infrastructure projects.
 - vii) A minimum of three (3) references for projects of similar scope and complexity, including the client name, contact person, telephone number, and email address.
 - viii) A detailed fee proposal, including a breakdown of fees by project phase, disbursements, and applicable taxes.
 - ix) Any assumptions, exclusions, or proposed deviations from the requirements of this Request for Proposal.
- 1.12)** Failure to provide the information requested in Section 1.11 may result in the proposal not being considered. A point-by-point response is requested.
- 1.13)** The fee proposal shall include a detailed breakdown of the proposed professional engineering fees and associated disbursements. The breakdown may include, but is not limited to, design, permitting and regulatory approvals, tendering, contract administration, construction inspection, and project closeout.

Signatures:

Vendor full business name:

Vendor full business mailing address:

Phone No: _____ Fax No: _____

Email: _____

Signature: _____
authority to bind this company/corporation

I have the

NAME: _____ (Please Print)

TITLE: _____ (Please Print)

Dated at _____ this _____ day of _____, 2021

CORPORATE SEAL:

PROPOSAL EVALUATION CRITERIA

	BEST VALUE EVALUATION CRITERIA	Weighted
1.	Overall Experience of Company and Demonstrated Results. Our evaluation will include an assessment of the history of your company, your experience as it relates to the requirements within this RFP, evidence of past performance, quality and relevance of past work, references and related items.	30%
2.	Design Feasibility and Schedule. Our evaluation will consider the practicality, functionality, constructability, implementation approach, proposed schedule, and overall suitability of the proposed design to meet the project requirements. (prior experience of the firm in meeting timelines will be factored in here)	20%
4.	Overall Cost. Effective and efficient delivery of quality services is demonstrated within the budget allocation. The evaluation will consider the overall cost benefit of the proposed design, including durability, maintenance requirements, expected service life, operational considerations, and long-term value to the Municipality.	30%
5.	Understanding of the Municipality needs Understanding of the requirements of the scope of work. The proposed approach of the firm to complete the project.	20%
	TOTAL	100%

In making a proposal, the Respondent hereby certifies that they have reviewed this RFP and are familiar with all conditions contained therein.



West Nipissing Quest

**MUNICIPALITY OF WEST NIPISSING
ENGINEERING CONSULTING SERVICES, WHARF DESIGN**

**SECTION 4
APPENDIX A1**

SITE PICTURES AND GENERAL INFORMATION

Minnehaha Bay Wharf and Floating Docks Layout

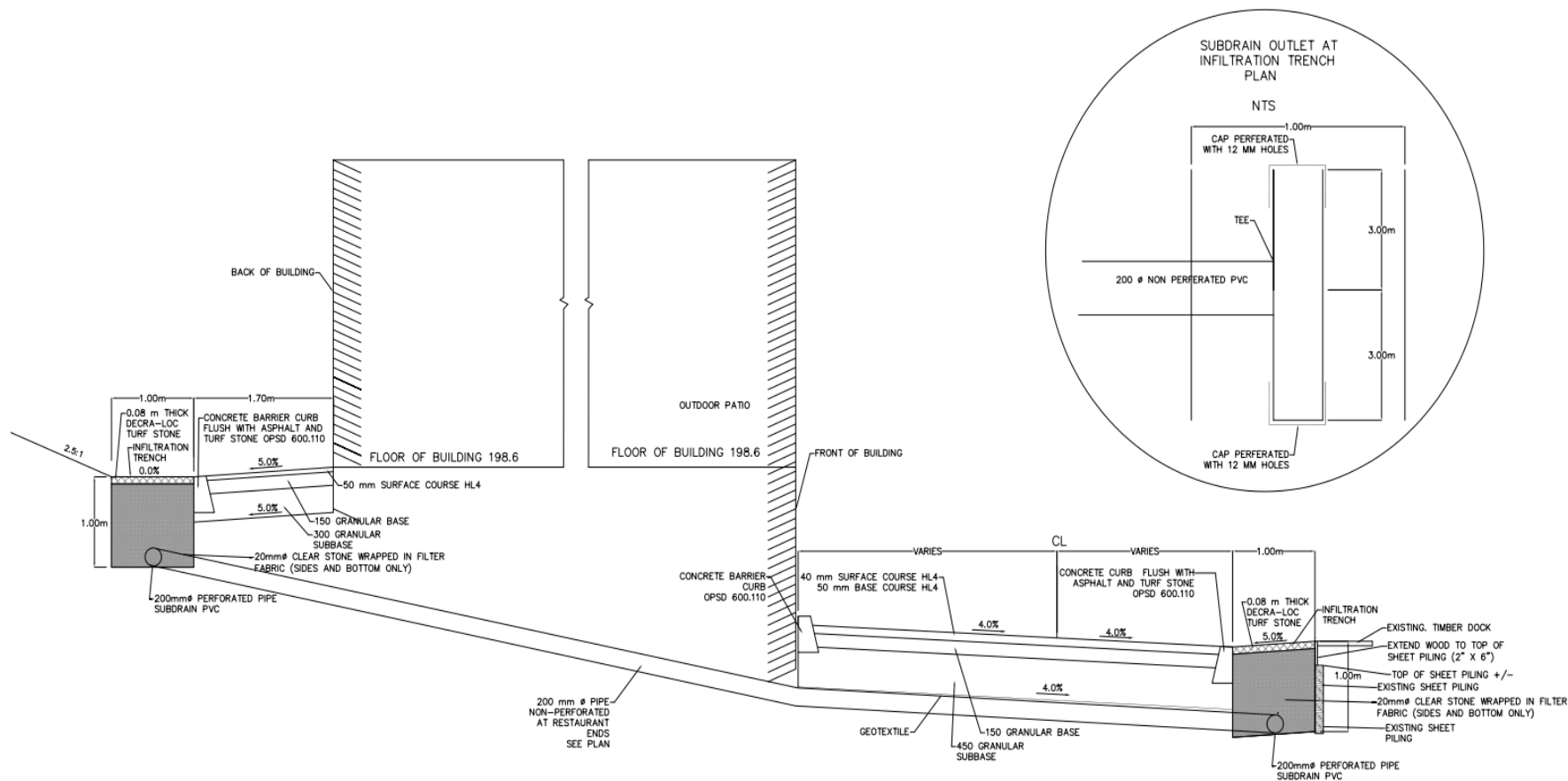




SECTION 4

APPENDIX A1

Existing Road and Drainage Detail Along Wharf





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APPENDIX A1**

Wharf Remedial Work Methodology (2009)





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APPENDIX A1**

Typical sheet pile between wharf and road





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APPENDIX A1**

Typical Electrical Connections for Pedestals



Site Feature





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SECTION 4 APPENDIX A1

Sewage and Gas Pump Out Sation



Water Level Information

The following photographs are provided for reference purposes and illustrate site conditions observed during periods of elevated water levels. The photographs are intended to provide additional context for the development of the proposed design





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ENGINEERING CONSULTING SERVICES, WHARF DESIGN**

**SECTION 4
APPENDIX A2**

PRELIMINARY CONCEPT DESIGN

ESTIMATE ITEM LIST

Municipality of West Nipissing
Minnehaha Wharf Reconstruction

Project : SUD-24006351-A0
Date : November 15, 2024

No.	Item	Unit	Qty	Unit Price	Total
Part A - Civil					
1	Environmental Protection	L.S.	1	\$ 60,000.00	\$ 60,000.00
2	Earth Excavation, Grading	cu.m.	150	\$ 40.00	\$ 6,000.00
3	Concrete Gutter Curb OPSD 600.110	m	200	\$ 100.00	\$ 20,000.00
4	Dry Hydrants	each	2	\$ 10,000.00	\$ 20,000.00
5	asphalt	tonne	260	\$ 610.00	\$ 158,600.00
6	Gran A for Road base	tonne	420	\$ 65.00	\$ 27,300.00
7	Hydrovac	m	450	\$ 100.00	\$ 45,000.00
8	Municipal Sign and Footings	L.S.	1	\$ 1,500.00	\$ 1,500.00
Civil Sub-Total					\$ 338,400.00

Part B - Structure					
9	Removal of Wharf Structure	sq.m	790	\$ 200.00	\$ 158,000.00
10	Removal of and replacement of fence	L.S.	1	\$ 10,000.00	\$ 10,000.00
11	Geotextile	sq.m	3200	\$ 5.00	\$ 16,000.00
12	Earth Excavation for Structure	cu.m	1420	\$ 50.00	\$ 71,000.00
13	Granular Backfill to Structure, B Type II	tonne	1110	\$ 90.00	\$ 99,900.00
14	Rock Backfill to Structure	tonne	2530	\$ 55.00	\$ 139,150.00
15	removal of existing sheet piles	L.S.	1	\$ 50,000.00	\$ 50,000.00
16	Supply Equipment for Installing Driving Piles (Sheet Piles)	L.S.	1	\$ 65,000.00	\$ 65,000.00
17	Sheet Piles	sq.m	1300	\$ 600.00	\$ 780,000.00
18	Deadman wall	cu.m	96	\$ 3,800.00	\$ 364,800.00
19	Reinforcing Steel Bar in Wall	tonne	21	\$ 4,500.00	\$ 94,500.00
20	Concrete in Dock	cu.m	160	\$ 3,800.00	\$ 608,000.00
21	Reinforcing Steel Bar in Dock	tonne	35	\$ 4,500.00	\$ 157,500.00
22	Sheet Pile Waler, 2-C250x37	m	185	\$ 550.00	\$ 101,750.00
23	Floating Dock Anchorage, W150x37	each	5	\$ 2,000.00	\$ 10,000.00
24	Production Anchors	each	80	\$ 1,000.00	\$ 80,000.00
25	Steel Toe Pins	each	115	\$ 1,500.00	\$ 172,500.00
26	Safety Ladder	each	4	\$ 3,000.00	\$ 12,000.00
Structural Sub Total					\$ 2,990,100.00

Municipality of West Nipissing Minnehaha Wharf Reconstruction				Project :	SUD-24006351-A0
				Date :	November 15, 2024
No.	Item	Unit	Qty	Unit Price	Total
Part C - Electrical					
27	Temporary Removal and Replacement of Electrical Equipment	L.S	1	\$ 100,000.00	\$ 100,000.00
28	Upgrading system to new code	L.S	1	\$ 100,000.00	\$ 100,000.00
Electrical Sub Total					\$ 200,000.00
Part D - Mechanical					
29	Temporarily remove and reinstall fuel system	L.S	1	\$ 15,000.00	\$ 15,000.00
30	Temporarily remove and reinstall sanitary system	L.S	1	\$ 10,000.00	\$ 10,000.00
Mechanical Sub Total					\$ 25,000.00
Part E - Contingency					
31	Contingency (20%)				\$ 710,700.00
Contingency Sub Total					\$ 710,700.00
Project Sub-Total					\$ 4,239,200.00
Part F - Contract Administration					
32	Contract Administration	L.S	1	\$ 125,000.00	\$ 125,000.00
Contract Administration Sub Total					\$ 125,000.00



West Nipissing Quest

**MUNICIPALITY OF WEST NIPISSING
ENGINEERING CONSULTING SERVICES, WHARF DESIGN**

**SECTION 4
APPENDIX A3**

GEOTECHNICAL INVESTIGATION REPORT



Geotechnical Investigation and Design Report

Municipality of West Nipissing

Type of Document:

Final Report

Project Name:

Minnehaha Bay Wharf and Road Bank Design
Sturgeon Falls, Ontario

Project Number:

SUD-24006351-A0

Prepared By:

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Date Submitted:

2024-12-12

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Further to our Proposal No. 24/125/GP_Rev.1 dated August 14, 2024 and your subsequent authorization to proceed, EXP Services Inc. (EXP) has completed the field investigation and geotechnical engineering evaluation for the proposed wharf improvements. Our comments and recommendations, based on the results of the field investigation and our understanding of the project scope, are provided in this report.

1. Introduction

It is understood reconstruction is required along the boardwalk at the Minnehaha Bay Municipal Wharf in Sturgeon Falls, Ontario, as the current wharf has a limited lifespan left. The location of the wharf and investigated area is shown on Dwg. No. A-1, included in Appendix A. The current wharf consists of a rock fill timber cribbing system, with a sheet pile wall along the road side of the cribbing that supports the roadway.

To assist with the design and construction of the proposed works, EXP has completed a geotechnical investigation, with the results of the investigation and associated recommendations included within this report.

2. Field Investigation

The field investigation for this project consisted of the advancement of eight (8) sampled boreholes and eight (8) non-sampled bedrock probes, for a total of sixteen (16) boreholes. The borehole locations were laid out in the field at locations clear of buried services and known obstructions. The borehole locations are shown on Dwg. No. A-1, included in Appendix A. The boreholes were advanced from November 4 to 11, 2024 with results shown on the attached borehole logs, Figs. B-2 to B-17 in Appendix B.

The sampled boreholes were advanced using a truck mounted CME 55 power auger drill rig equipped with 200 mm diameter Hollow Stem Augers (HSA), NW casing, and NQ core barrels. These boreholes were advanced within the existing roadway, immediately adjacent to the wharf. The boreholes were advanced to bedrock, where bedrock was then cored. The overburden soils generally contained cobbles and boulders and as such, coring procedures were required to penetrate the overburden. Where possible, samples were obtained using a 51 mm (2 inch) outside diameter split spoon sampler in conjunction with Standard Penetration Tests (ASTM D1586), at depths noted on the attached borehole logs in Appendix B. The Standard Penetration Test (SPT) "N" values were recorded and used to provide an assessment of the in-situ compactness condition of the encountered soils. Bedrock was cored a minimum of 1.5 m at each sampled borehole location, with the exception of Borehole BH-7, where the casing seized within the in-situ cobbles and boulders and the borehole could not be advanced any further.

The non-sampled bedrock probes were advanced through the existing wooden deck of the wharf at locations roughly in line with the sampled boreholes. For the probes, Dynamic Cone Penetration Tests (DCPT) were advanced until refusal was encountered on suspected very dense fill, boulders, or bedrock.

Coring procedures were utilized at each borehole location which required water to be pumped into the boreholes. As the boreholes were not left open for any significant length of time upon completion to avoid open hole conditions, groundwater levels did not stabilize within the boreholes. As such, groundwater measurements within the boreholes were not completed.

The boreholes were backfilled with auger cuttings and sealed with bentonite. The retained soil and bedrock core samples were logged in the field and then carefully packaged and transported to our laboratory for detailed examination and testing.

The borehole elevations were surveyed to a local benchmark at the location shown on Dwg. No. A-1 in Appendix A. The borehole locations were determined using a hand-held GPS. The borehole locations and elevations should only be considered accurate to degree implied by the methods used for geotechnical purposes of this report and should not be used for detailed design.

3. Laboratory Testing

A routine geotechnical laboratory testing program was performed on representative soil samples and consisted of moisture content determinations. The laboratory test results are summarized on the attached borehole logs in Appendix B.

4. Subsurface Conditions

Details of the soils encountered during the field investigation are summarized on the attached logs in Appendix B. The logs include textural descriptions of the subsoil and indicate the soil boundaries inferred from non-continuous sampling and observations during the field investigation. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. When reading this report, the explanatory notes and definitions provided in Figures B-1A and B-1B in Appendix B should be referenced.

Fence diagrams along the borehole locations and along the probe hole locations are shown on Dwg. Nos. A-2 and A-3, respectively, in Appendix A.

4.1 Sampled Boreholes

Asphalt was encountered at the surface of each sampled borehole and ranged in thickness from 100 to 125 mm. Asphalt thicknesses may further vary beyond the borehole locations.

Underlying the asphalt at each borehole was fill materials that extended to approximately 1.8 to 4.4 m depth at BH-2, -5, -6, -7, and -8, and to bedrock at 2.3 to 2.8 m depth at BH-1, -3, and -4. The fill materials consisted of brown to grey sand with some to and gravel, and trace to some silt, as well as cobbles and boulders. The cobbles and boulder ranged in size up to 750 mm diameter. Various materials were encountered throughout the fill including bricks, wood, metal, concrete, geogrids, and organics. The SPT values within the fill were highly variable and not reliable to accurately assess the compactness condition of the fill due to the foreign materials and cobbles/boulders. Measured moisture contents were also highly variable within obtained samples of the fill, ranging from 3 to 83.7%.

The soils encountered below the fill materials varied throughout, consisting of silty sand, sand, sand and gravel, cobbles and boulders, silty clay, and till. Note that encountered soils may actually be fill materials in some cases, particularly with the granular materials and boulders/cobbles, as it was difficult to assess during the investigation. Where boulders and cobbles were not encountered, the soils were generally very loose to loose/very soft to firm. The soils extended to bedrock at Boreholes BH-2, -5, -6, and -8 at 4.1 to 9.6 m depth. At Borehole BH-7, the boulders and cobbles extended to 10.7 m depth, however, the casing became seized within the boulders and the borehole could not be advanced any further. Moisture contents within the soils ranged from 9 to 46%.

4.2 Bedrock Probes

Three of the bedrock probes, PH-1, PH-2, and PH-8, encountered refusal on suspected very dense fill without encountering the water or underlying lakebed soils.

The water surface of Minnehaha Bay was encountered within PH-3 to PH-7 and was noted at Elev. 195 m. At these probe hole locations, the water depth ranged from 0.6 to 5.3 m, with the underlying lakebed soil layer ranging from 0.9 to 4.6 m in thickness.

4.3 Bedrock and Refusal Depths

Bedrock was cored approximately 1.5 to 2.2 m at Boreholes BH-1 to BH-6, and BH-8. The bedrock depths from the sampled boreholes and the refusal depths from the bedrock probes are summarized on Table 4-1 below.

Where bedrock was cored, core recovery ranged from 83.6 to 100%. Water return was highly variable ranging from 0 to 80% and was brown in colour. Rock Quality Designation (RQD) values generally ranged from 53.6 to 100%, indicating a fair to excellent quality rock. At Boreholes BH-4 and BH-8, RQD's of 0% were encountered in the upper layers of the bedrock indicating very poor quality rock. Subsequent coring runs at these locations had higher RQD values, suggesting the upper bedrock at these locations is fractured and improves with depth.

Table 4-1: Bedrock/Refusal Depths

Borehole No.	Surface Elevation (m)	Depth to Bedrock/Refusal (m)	Bedrock/Refusal Elevation (m)	Notes
BH-1	196.5	2.8	193.7	Bedrock cored 2.0 m
BH-2	196.5	4.1	192.4	Bedrock cored 1.5 m
BH-3	196.5	2.5	194.0	Bedrock cored 1.7 m
BH-4	196.4	2.3	194.1	Bedrock cored 2.2 m
BH-5	196.6	4.7	191.9	Bedrock cored 2.2 m
BH-6	196.5	7.4	189.1	Bedrock cored 1.5 m
BH-7	196.5	> 10.7	--	Borehole terminated due to seized casing
BH-8	196.5	9.6	186.9	Bedrock cored 2.0 m
PH-1	196.3	1.2	195.1	Refusal on suspected very dense fill
PH-2	196.4	1.2	195.2	Refusal on suspected very dense fill
PH-3	196.3	4.6	191.7	Refusal on suspected boulders or bedrock
PH-4	196.4	4.5	191.9	Refusal on suspected boulders or bedrock
PH-5	196.4	3.4	193.0	Refusal on suspected boulders or bedrock
PH-6	196.3	8.4	187.9	Refusal on suspected boulders or bedrock
PH-7	196.4	9.7	186.7	Refusal on suspected boulders or bedrock
PH-8	196.5	0.8	195.7	Refusal on suspected very dense fill

5. Recommendations

Please note that the proposed design, loading conditions, and final site grades have not been provided to EXP at the time of this report. EXP should be retained to review the final design and specifications to confirm that they are in general agreement with the assumptions on which our recommendations are based. If not accorded the privilege of making this review, EXP will assume no responsibility for interpretation of the recommendations in this report.

5.1 Discussion

As noted on the borehole logs, the site consists of varying depths of fill materials, native soils, and boulders/cobbles overlying bedrock/suspected bedrock that ranges from 2.3 m to greater than 10.7 m in depth.

It is understood that the existing wharf, which is currently bearing on rock filled timber cribs, is to be reconstructed. It appears that the timber cribs are likely supporting the sheet pile system as well. As such, any proposed works will need to incorporate retention of the roadway structure and underlying soils. It is understood that the timber cribbing and support beams below the wharf are close to reaching their lifespan. It is unknown however, what shape the sheet pile wall system is in. It is understood that previously completed structural inspections did not assess the state of the sheet pile wall system.

Replacement of the wharf will be quite challenging based on the conditions encountered. Replacing the wharf with new shallow foundations such as concrete spread footings or new timber cribs will require removal of the existing structure foundations and construction of the new foundations in dry conditions. This will likely require the use of a temporary cofferdam and dewatering in order to allow for demolition/construction in dry conditions. This will likely carry a significant associated cost.

As noted above, the state of the existing sheet pile wall system is unclear. If the sheet pile wall system requires replacement at a similar location to existing, installation will be challenging. Driving new sheet piles at this location would not likely be possible as the old sheet pile system is generally surrounded by boulder/cobble fill. This fill would likely damage the new sheet piles or ultimately prevent new sheet piles from being driven. The boulder/cobble fill can be removed and replaced to allow new sheet piles to be installed, however, as with new replacement foundations above, a temporary cofferdam and dewatering will likely be required so that work can proceed in dry conditions, which would carry a significant cost.

Five of the rock probes through the existing wharf (PH-3 to PH-7) did not appear to encounter boulders or cobbles, and the probes encountered roughly 0.9 to 4.6 m of lakebed soils overlying suspected bedrock. Based on this, sheet piles can likely be installed along the outer side (Bay side) of the existing wharf to hold back the overall roadway, underlying soils, and replacement wharf. As the lakebed soils are quite thin at areas, socketed pins will likely be required to hold the toe of the sheet piles in place at these locations. The top of the sheet piles can be tied back with buried deadman anchors. At probe holes PH-1, PH-2, and PH-8, the boulders likely extended further out into the Bay below the existing wharf, causing the shallow refusal. As such, the sheet pile wall may need to be located further into the Bay, beyond the toe of the boulders/cobbles at these locations.

With a new sheet pile wall system holding back the insitu fills and old wharf structure, the area behind the wall can be infilled with new granular fill around the existing cobbles/boulders and old crib structures to allow for a new concrete pad or pavers, etc., to be constructed at the surface in lieu of a new wharf structure. The wall can also be designed to support a new concrete pad.

To support a new wharf structure, deep foundations consisting of micropiles can be considered. The advantage with micropiles is that installation can be completed from surface and advanced through the insitu boulders/cobbles, without the need for significant excavation or removal of the current wharf structure. The disadvantage of deep foundations, however, is that they typically carry a higher cost.

If budget is not available to replace the wharf and roadway retention system, the remaining alternative would be to perform spot repairs on the existing wharf, replacing sections as needed. This will likely provide a minor extension to the lifespan of the wharf, however, would not be an overall solution. There may be challenges if repairs are necessary below the water surface, or if large portions of the boulders need to be excavated to allow for repairs. Further intrusive review by a structural engineer would be required to assess if spot repairs can be completed.

Based on the above discussion, reconstructing a new wharf and sheet pile wall system at the current locations is likely not economical due to the need for significant boulder excavation, a cofferdam, and significant dewatering. As such, recommendations have not been provided by EXP for this option.

A sheet pile wall constructed on the outside (Bay side) of the existing wharf appears to be feasible, and as such, general recommendations for this option have been provided in this report. In addition, micropile recommendations have been provided as they are a relatively straightforward option to support a new wharf structure.

5.2 Sheet Pile General Recommendations

The lakebed soils, where encountered within the probe holes, ranged in thickness from 0.9 to 4.6 m, however, were generally less than 1.5 m thick, with thicker soils at Probe Hole PH-7. As such, the thickness of the lakebed soils for the most part is likely insufficient to provide the necessary toe restraint for the sheet pile wall system. As such, socketed rock dowels will likely be required to restrain the toe of the sheet piles from slipping. Recommendations are provided in the subsequent section.

Buried concrete block, “deadman”, anchors can be utilized to restrain the top of the sheet pile wall. Capacity for deadman anchors are assumed to be resisted by the dead weight of the foundation and the overlying soil. A unit weight of 24 kN/m³ can for concrete be used for the resistance calculations. Assuming the deadman anchors are backfilled with free draining engineered fill materials, the parameters outlined in Table 5-1 (Section 5.6) can be used to determine the resistance. The anchors should be constructed on a pad of Granular “A” (OPSS 1010), compacted to 98% SPMDD. For resistance to lateral forces/sliding, a coefficient of friction, $\tan \delta$, may be taken as 0.65 (unfactored) between the concrete and the granular pad for construction in the dry.

The selected sheet pile wall will need to be robust enough to withstand various loads from wave forces, ice loading, etc. Particularly if the back of the wall is not backfilled. It is recommended, however, to backfill behind the wall with granular fill materials (See Section 5.4). The existing boulders/cobbles, and old wharf structure can likely remain in place, but will likely need to be cut down if any new surface concrete pads or pavers are to be constructed, to allow for a uniform engineered fill pad to be constructed below the new concrete pads or pavers.

5.2.1 Rock Dowels

Dowels are anticipated to restrain the toe of the recommended sheet pile wall system. The structural engineer normally designs the length and diameter of the steel dowels, based on the type of bedrock and its strength parameters.

For bedrock in the Sturgeon Falls area, failure typically occurs between the dowel and the grout, or between the grout and the rock, and not from a quasi-conical rock mass failure, provided sufficient dowel bond lengths have been designed. Empirical methods of analysis, such as pull-out tests have shown that the bond developed between the grout and the dowel are typically twice that of the bond developed between the grout and the bedrock. Therefore, the design analysis should be based on failure occurring between the grout and the bedrock interface. For straight-shafted dowels, the anchor force, which can be developed, is dependent on the ultimate bond stress of the bedrock or the grout material.

The ultimate bond stress is typically taken as 10% of the unconfined compressive strength of the bedrock or the compressive strength of the grout material, whichever is less, but not more than 3.0 MPa. As unconfined compressive strengths are quite high for bedrock in the area, 3.0 MPa should be used for the ultimate bond stress assuming a minimum 30 MPa grout is used.

The allowable bond stress, “ τ_b ” taken between the rock and the grout is normally 50% or less of the ultimate bond stress, (i.e. Safety Factor of 2.0 for competent rock in the Sturgeon Falls area).

The required bond length (L, in metres) for the anchor is a function of the core hole diameter (d), and can be calculated as follows:

$$L = P / (\pi \times d \times \tau_b)$$

where

P = working capacity of anchor (kN)

τ_b = working bond stress

d = core hole diameter (m)

The upper portion of the bedrock is not normally considered part of the bond length, since this area is usually weathered/fractured, and as a result does not usually develop the ultimate bond stress assumed in the above calculations. As noted by the low RQDs at Boreholes BH-4, BH-5, and BH-8, suspected weathered/fractured rock may be present at the surface of the bedrock. As such, the upper 1.0 m of bedrock should not be considered part of the bond length.

Should anchors be used as part of the design, during construction, pullout tests equal to the design loads must be performed by a qualified geotechnical engineer to confirm the strength of the anchors. This work can be performed on a representative number of anchors by EXP.

5.3 Micropile Foundations

For micropile foundations, a specialized contractor should be retained to design and install the micropiles. Although several contractors are capable of designing and installing micropiles, a contractor with experience in Northern Ontario should be utilized. EXP can be contacted to provide a recommendation for a qualified contractor.

The micropiles will need to be socketed into the bedrock in order to achieve their capacity as the micropiles derive their capacity from the friction between the grout and the bedrock with a central reinforcement (Dywidag Bar) to transfer the load. As such, the available capacity is a function of the drill hole diameter and the bond length within the bedrock. On previous projects, one diameter drill hole is typically used and the embedment length is varied to obtain various required capacities. However, if loading will vary considerably, different diameter drill holes could be used. Micropile diameters typically range from 150 to 300 mm. A summary of typical grout-to-ground bond values has been included in Appendix C. EXP would recommend a grout bond value of 1,723 kPa (250 psi) in the Sturgeon Falls Area.

A typical micropile embedded into bedrock can support loads ranging from 800 to 3800 kN in compression pending final micropile size and embedment length.

Lateral loading may be resisted by installing the micropiles on a batter.

The installation and testing of Dywidag micropiles must be monitored under full-time supervision by EXP to confirm the design. The actual design must be discussed with the specialized contractor.

5.4 Backfill Recommendations

All imported backfill material used to backfill pilecaps, or to backfill behind a new sheet pile wall should consist of Granular "A", Granular "B" Type I or Granular "B" Type II (OPSS 1010) material, with a maximum aggregate size not exceeding 120 mm. The granular material must be placed in lifts no greater than 150 mm in thickness and must be generally compacted to 95% of the SPMDD. When backfilling behind the sheet pile wall, initial lifts may not be possible to compact properly, as the fill will be used to fill the voids between the existing boulders and cobbles. Care must be taken to ensure damage to the sheet pile wall or pile caps/foundations does not occur.

5.5 Frost Considerations

The freezing index in the Sturgeon Falls area is approximately 1,300 C degree-days. There is potential for up to 2.0 m of frost penetration to occur over the winter months in unprotected, unheated areas.

Foundations or pile caps, if any, for unheated structures should be provided with a minimum of 2.0 m of earth cover frost protection. As sufficient earth cover frost protection would not likely be provided for any foundations, as significant excavation is not recommended, insulation would be required.

Insulation should consist of rigid extruded polystyrene, have a minimum compressive strength of 275 kPa, and an R-Value of 5 for every 25.4 mm of thickness, (i.e. Styrofoam HIGHLOAD 40). Any exposed insulation is to be protected against sunlight and physical damage. A rough estimate for cost evaluation purposes can be made by assuming that 25.4 mm of rigid insulation designed for below grade installation is equivalent to 300 mm of soil cover. Note that insulation for heated structures should be placed both horizontally and vertically along the outside edge of the foundation. Insulation for unheated structures must extend below the entire foundation. Higher compressive strength insulation (i.e. Styrofoam HIGHLOAD 60 or 100, etc.) may be required if insulation extends below foundations, depending on foundation loading conditions.

Detailed insulation recommendations can be provided by EXP, if necessary, once the final foundation designs have been determined.

5.6 Lateral Earth Pressure

Any foundations or retaining structures should be designed to resist lateral earth pressure. The expression for calculating lateral earth pressure "p" at any depth "h" is given by the following:

$$p = K(\gamma h + q) + \gamma_w h_w$$

where	p	=	Lateral earth pressure (kPa)
	K	=	Coefficient of earth pressure
	γ	=	Unit weight of backfill (kN/m ³)
	γ_w	=	Unit weight of water (kN/m ³)
	h	=	Depth to point of interest (m)
	h_w	=	Depth of water above point of interest (m)
	q	=	Surcharge load acting adjacent to the wall at the ground surface (kPa)

Table 5-1, below, list various earth pressure properties for given materials.

Table 5-1: Earth Pressure Properties

Material	Friction Angle ϕ' (unfactored)	Coefficient of Active Earth Pressure (k_a)	Coefficient of Passive Earth Pressure (k_p)	Coefficient of Earth Pressure at Rest (k_o)	Unit Weight γ (kN/m ³)
Granular "A"	38°	0.24	4.2	0.38	22
Granular "B" Type I	35°	0.27	3.7	0.43	21
Granular "B" Type II	38°	0.24	4.2	0.38	21
Sand and Gravel Fill	35°	0.27	3.7	0.43	20
Silty Sand, Sand, Sand Fill	33°	0.29	3.4	0.45	18
Silty Clay	18°	0.53	1.9	0.69	15
Boulders and Cobbles	38°	0.24	4.2	0.38	21

Note: Values given for horizontal earth pressures are for horizontal backfill. For sloping backfill, the design requirements outlined in the Canadian Foundation Engineering Manual should be used.

The mobilization of full active or passive resistance requires a measurable and perhaps significant wall movement or rotation. Therefore, unless the structural element can tolerate these deflections, the at-rest earth pressure should be used in design.

The effects of compaction surcharge should be taken into account in the calculations of active and at rest earth pressures. The lateral pressure due to compaction should be taken as at least 12 kPa at the surface, and its magnitude should be assumed to diminish linearly with depth to zero at the depth where the active (or at rest) pressure is equal to 12 kPa. This pressure distribution should be added to the calculated active (or at rest) pressure. Notwithstanding, lighter compaction equipment and smaller lifts should be used adjacent to walls to prevent overstressing.

6. Excavations

The in-situ native soils may be classified as Type 3 soils for excavations terminating above the groundwater level and Type 4 soils for excavations terminating below the groundwater level in conformance with the Ontario Occupational Health and Safety Act (OHSA). Excavation side slopes in Type 3 soils should remain stable at a slope of 1H:1V. Excavation side slopes in Type 4 soils should remain stable at a slope of 3H:1V. The need to excavate flatter side slopes if excessively wet or soft/loose materials, or concentrated seepage zone are encountered, should not be overlooked.

Overall, anticipated excavations should be relatively shallow and will likely encounter boulder and cobbles fills and/or granular fills. Contractors must be prepared to deal with these materials.

Extreme caution must be used when excavating near existing structures or buildings so as not to undermine the existing foundations. If proposed excavations may undermine the foundations for existing structures, temporary shoring will be required. The design and construction of temporary shoring is the responsibility of the Contractor.

Water (i.e. surface water runoff) should not be permitted to enter and/or pond within the construction area.

All excavations must be completed in accordance with the most recent regulations in the Ontario Occupational Health and Safety Act. The contractor should be aware that slope height, slope inclination, or excavation depths, should in no case, exceed those specified in local, provincial or federal safety regulations. Such regulations are strictly enforced and, if not followed, the owner, the contractor or earthwork or utility subcontractor could be liable for substantial penalties.

It is important to note that soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in widely spaced explorations. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, we recommend that EXP be contacted immediately to evaluate the conditions encountered.

7. Dewatering

Groundwater levels will likely be consistent with the adjacent water levels within the Bay. At the time of the investigation, water levels were around roughly Elev. 195.2 m, or roughly 1.2 m below the surface of the current deck of the wharf. With the recommendations provided, significant excavation is not anticipated, and as such, dewatering will not likely be required. It is recommended, however, that works be completed at drier times of the year, when water levels are at their lowest.

Seasonal variations in the water table should be anticipated, with higher levels occurring during wet weather conditions (spring thaw and late fall) and lower levels occurring during dry weather conditions.

Dewatering requirements will be governed by the time of the year the construction is performed. It is the responsibility of the Contractor to propose a suitable dewatering system based on the time of construction and groundwater levels. The method used should not undermine any adjacent structures or buried services. The dewatering method is the responsibility of the Contractor and the Contractor should submit his proposal to the Prime Consultant for review and approval prior to construction.

8. Construction Constraints Under Cold Weather Conditions

For all construction activities at this site, the following applies:

- During excavations, all subgrade soils must be maintained at a minimum temperature of 5° C.
- No granular material may be placed under frozen conditions, with all fill material maintained at a minimum temperature of 5° C prior to and during installation. If granular fill is to be placed in freezing conditions, the granular fill must be restricted to Granular “B” Type II material. Since Granular “B” Type II has a larger aggregate size, care should be taken to prevent point loading on the underside of the concrete.
- Soils and granular fill material that are in direct contact with fresh concrete must be at a minimum temperature of 5° C prior to pouring the concrete and must be free of snow and ice fragments.
- All granular fill, prior to placement of concrete, must be reviewed by this office to ensure that it is free of frost, buried ice and snow.
- All reinforcing steel in the concrete forms must be free of ice and snow, and must be maintained at a minimum temperature of 5° C.
- During the placement of concrete in cold weather conditions, a field cured cylinder should be placed beside the heated form for a period of 6 days. The field cured cylinder should be returned to a designated laboratory on the sixth day for 7-day compressive strength testing.

- All heated and tarped areas should be monitored for temperature using a max/min thermometer.
- All concrete is to have a minimum of 6% to 8% air entrainment to prevent cracking and shall be maintained at a minimum temperature of 10° C for a period of 4 to 7 days.

The 6% to 8% air entrained concrete during cold weather placement is to prevent significant strength loss of concrete as a result of freezing and thawing. The air entrainment will provide the capacity to absorb stresses during freeze/thaw action.

9. Construction Quality Control

Construction quality control of the “earthworks” should be provided throughout the project by a representative of EXP to verify all design assumptions, recommendations, and confirmation of the subsurface soil conditions. This includes inspection of the excavation and subgrade prior to the placement of any structural fill and foundations, to ensure that any and all deleterious materials have been removed and to ensure that the actual conditions are not markedly different than those on which the recommendations made herein are based. Compaction control of structural fill is also recommended as standard practice, as is sampling and testing of aggregates and concrete.

10. Design Review

The recommendations made in this report are considered preliminary and in accordance with our present understanding of the project and are provided solely for the design team responsible for the project. If there are any changes, such as relocation of any structures or other features which may affect our analysis, the information obtained during this investigation may be inadequate and additional field work and reporting may be required.

EXP Services Inc. should be retained to review the final design and specifications to confirm that we are in general agreement with the assumptions on which our recommendations are based. If not accorded the privilege of making this review, EXP will assume no responsibility for interpretation of the recommendations in this report.

11. Limitations

A subsurface investigation is a limited sampling of a site. Should any conditions at the site be encountered that differ from those reported at the test locations, we require that we be notified immediately in order to allow reassessment of our recommendations.

Whereas this investigation has estimated the groundwater level at the time of the fieldwork, and commented on general construction problems, the presence of conditions, which would be difficult to establish from our test holes, may affect the type and nature of dewatering procedures which should be used in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile between the tests, and thin layers of soil with large or small permeabilities compared with the general soil mass, etc.

The comments given in this report are intended only for the guidance of the design team responsible for the project. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for preliminary design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual test hole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The investigation and comments are necessarily ongoing as new information of underground conditions becomes available. For example, more specific information is available with respect to in-situ subsurface conditions between test locations once construction is underway. Subsurface soil interpretation between test holes, as well as the recommendations of this report, should be verified through field inspections provided by EXP to validate the current information for use during the construction stage.

Virtually no scope of work, no matter how exhaustive, can identify all contaminants or all conditions above or below ground. For example, conditions elsewhere on the property may differ from those encountered, and conditions may change with time. Therefore, no warranty is provided that the entire site condition is represented by those identified at specific borehole locations.

This report in no way reflects onsite environmental considerations.

12. Closure

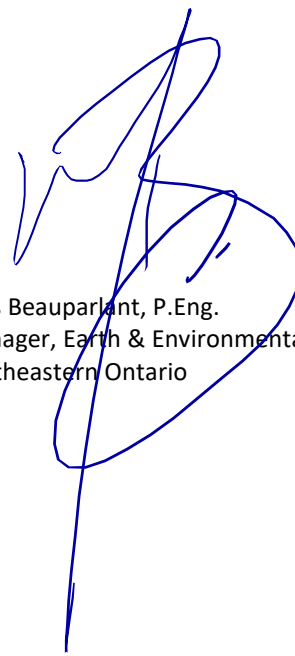
We trust that these comments provide you with sufficient information to proceed with design. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

EXP Services Inc.



Ian MacMillan, P.Eng.
Project Manager, Earth & Environmental Services
Northeastern Ontario



Yves Beauparlant, P.Eng.
Manager, Earth & Environmental Services
Northeastern Ontario

Project Number: SUD-24006351-A0
Date: December 12, 2024

Appendix A – Drawings

Dec 10, 2024 - 11:25am \\exp\pda\SUD-24006351-A0\00 Location\63 Drawings\Survey\SUD-24006351-A0 Minnehaha Bay Wharf Survey 11-12-2024 Bf's.dwg



KEYPLAN - N.T.S.

LEGEND

- EXP SAMPLED BOREHOLE
- EXP BEDROCK PROBE
- BENCHMARK – SURVEY NAIL

– NOTES –

- 1) The boundaries and soil types have been established only at Test Hole locations. Between Test Holes, they are assumed and may be subject to considerable error.
- 2) Do not use Test Hole elevations for design purposes.
- 3) Soil samples will be retained in storage for 3 month and then destroyed unless client advises that an extended time period is required.
- 4) Quantities should not be established from the information provided at the Test Hole locations.
- 5) This drawing forms part of the report, project number as referenced, and should be used only in conjunction with this report.

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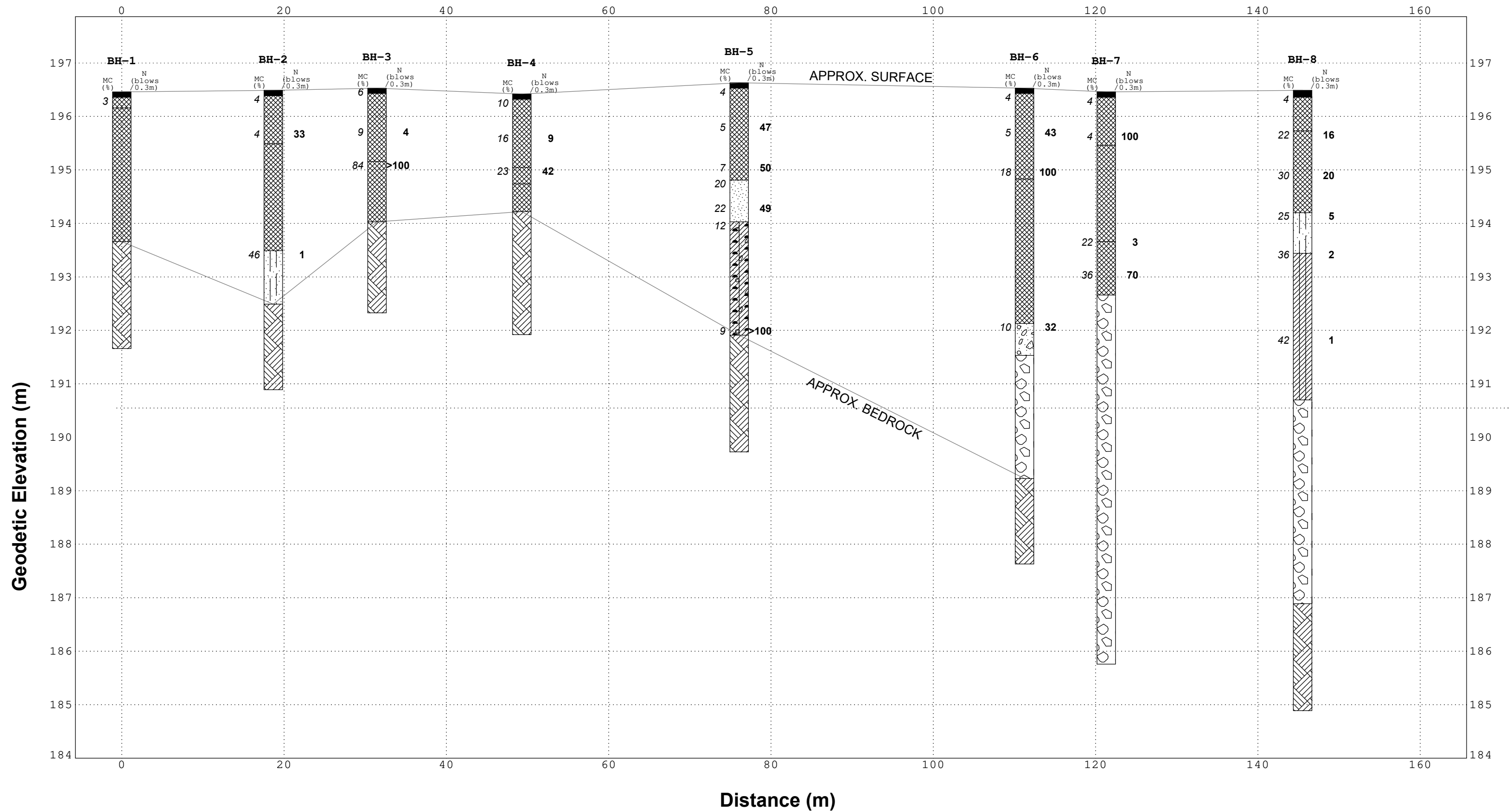


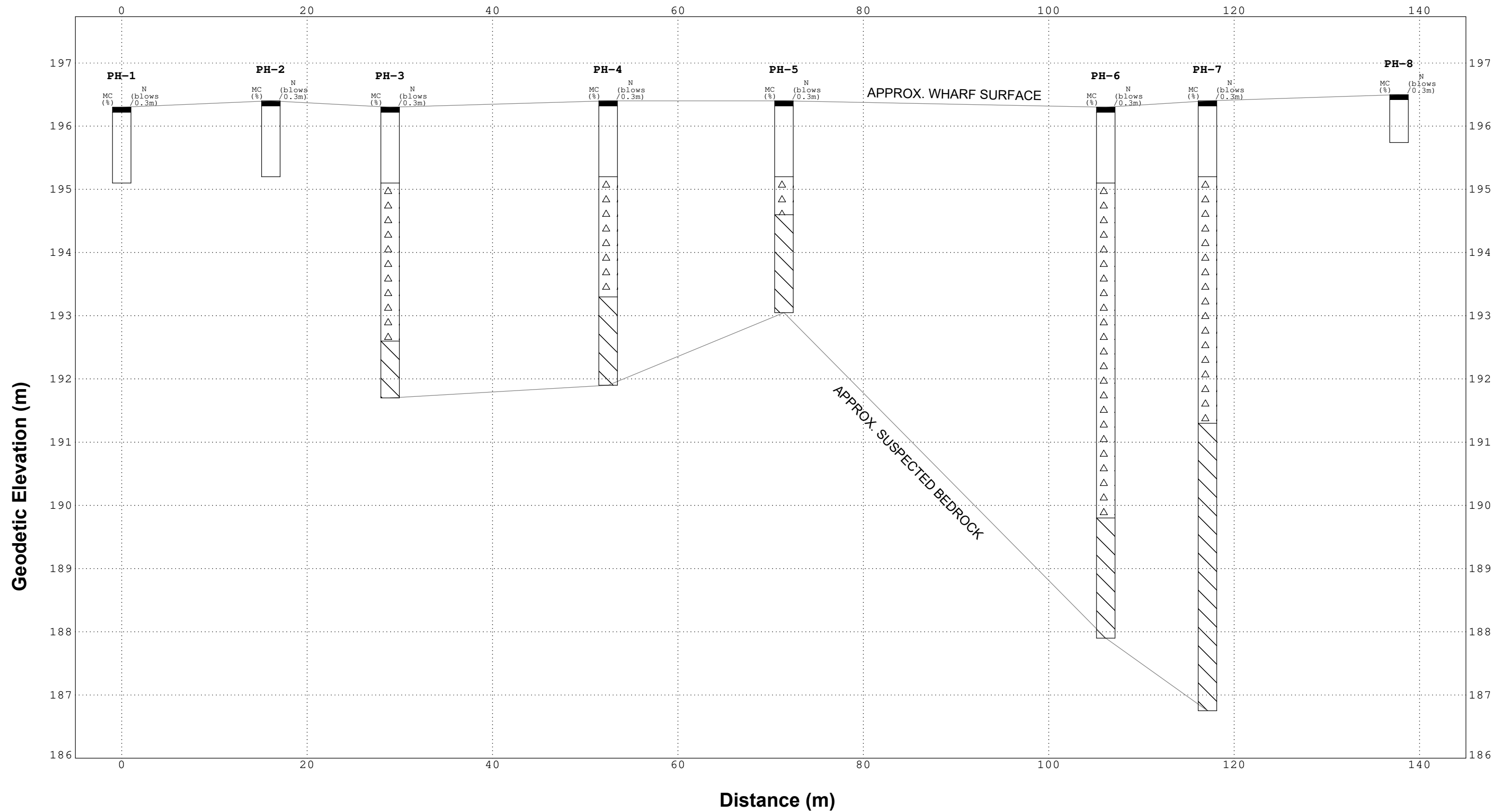
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REVISIONS		
No.	DESCRIPTION	DATE

CLIENT	MUNICIPALITY OF WEST NIPPISSING
PROJECT	MINNEHAHA BAY WHARF DESIGN SUDBURY, ONTARIO
PROJECT NO.	SUD-24006351-A0

TITLE: BOREHOLE LOCATION PLAN		
DATE NOVEMBER 2024	SCALE: NTS	DWG NO. A-1



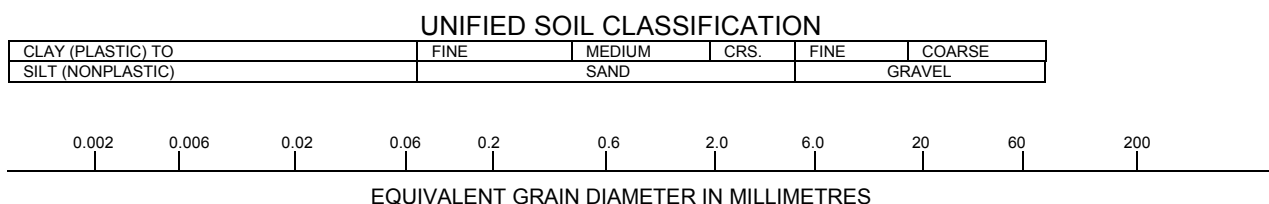


Project Number: SUD-24006351-A0
Date: December 12, 2024

Appendix B – Borehole Logs

Notes on Sample Descriptions

1. All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.



ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

2. **Fill:** Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.
3. **Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.060 mm	"trace" (e.g. Trace sand)	1% to 10%
Sand	0.060 to 2.0 mm	"some" (e.g. Some sand)	10% to 20%
Gravel	2.0 to 75 mm	adjective (e.g. sandy, silty)	20% to 35%
Cobbles	75 to 200 mm	"and" (e.g. and sand)	35% to 50%
Boulders	>200 mm		

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	Standard Penetration Resistance "N" Blows / 0.3 m	Consistency	Undrained Shear Strength (kPa)	Standard Penetration Resistance "N" Blows / 0.3 m
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

5. ROCK CORING

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

Log of Borehole BH-1

Project No. SUD-24006351-A0

Figure No. B-2

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135015 N, 582280 E

Date Drilled: November 4, 2024

Auger Sample



SPT (N) Value



Dynamic Cone Test



Shelby Tube



Field Vane Test



Combustible Vapour Reading



Natural Moisture



Plastic and Liquid Limit



Undrained Triaxial at



% Strain at Failure



Penetrometer



GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLE NUMBER
					20	40	60	80	25	50	75	
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)			
					50	100			10	20	30	
		ASPHALT , ~ 100 mm thick	196.50	0								
		FILL , sand and gravel, trace silt, brown, moist	196.4									
		FILL , boulders and cobbles, 150 to 450 mm diameter	196.2									
				1								
				2								
				3								
				4								
		BEDROCK	193.7									
		Run 1:										
		Start/End: 2.8 m to 3.6 m										
		Recovery: 100%										
		RQD: 80%%										
		Water Colour & Return: 0%										
		Run 2:										
		Start/End: 3.6 m to 4.8 m										
		Recovery: 100%										
		RQD: 87.5%										
		Water Colour & Return: 0%										
		BOREHOLE TERMINATED AT ~ 4.8 m DEPTH	191.7									

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-2

Project No. SUD-24006351-A0

Figure No. B-3

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135011 N, 582300 E

Date Drilled: November 4, 2024

Auger Sample



SPT (N) Value



Dynamic Cone Test



Shelby Tube



Field Vane Test



Combustible Vapour Reading



Natural Moisture



Plastic and Liquid Limit



Undrained Triaxial at



% Strain at Failure



Penetrometer



GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value		Combustible Vapour Reading (ppm)			SAMPLE NUMBER	Sample Number
					20	40	25	50	75		
		ASPHALT, ~ 100 mm thick	196.50	0							
		FILL, sand, some gravel, brown to grey, moist, dense	196.4								AS1
			195.5	1							SS2
		FILL, boulders and cobbles, 100 to 150 mm diameter									
			193.5	3							
		SILTY SAND, with organics (wood), black, wet, very loose	192.5								SS3
			190.9	5							SS4
		BEDROCK									
		Run 1:									
		Start/End: 4.1 m to 5.6 m									
		Recovery: 100%									
		RQD: 70.0%									
		Water Colour & Return: 0%									
		BOREHOLE TERMINATED AT ~ 5.6 m DEPTH									

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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-3

Project No. SUD-24006351-A0

Figure No. B-4

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135003 N, 582310 E

Date Drilled: November 8, 2024

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

Natural Moisture

Plastic and Liquid Limit

Undrained Triaxial at

% Strain at Failure

Penetrometer

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Datum: Geodetic

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value		Combustible Vapour Reading (ppm)			SAMPLES	Sample Number		
					20	40	60	80	25			50	75
					Shear Strength kPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
					50	100		10	20	30			
		ASPHALT, ~ 100 mm thick	196.50	0									
		FILL, sand, some gravel, some silt, brown, moist, loose	196.4	0								AS1	
				1								SS2	
			195.1										
		FILL, wood debris										SS3	
				2									
			194.0										
		BEDROCK, Run 1: Start/End: 2.5 m to 4.2 m Recovery: 85.0% RQD: 82.0% Water Colour & Return: Brown, 60 to 80%		3									
			192.3	4									
		BOREHOLE TERMINATED AT ~ 4.2 m DEPTH											

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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-4

Project No. SUD-24006351-A0

Figure No. B-5

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134999 N, 582329 E

Date Drilled: November 8, 2024

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

Natural Moisture

Plastic and Liquid Limit

Undrained Triaxial at
% Strain at Failure

Penetrometer

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Datum: Geodetic

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLES	Sample Number
					Shear Strength	50	100	25	50	75			
								Natural Moisture Content % Atterberg Limits (% Dry Weight)					
								10	20	30			
		ASPHALT, ~ 100 mm thick	196.40	0									
		FILL, sand, some silt, some gravel, some red brick, brown, moist, loose some organics below ~ 0.8 m depth	196.3										AS1
		wood below ~ 1.2 m depth	195.0										
		FILL, wood debris	194.7										SS2
		FILL, boulders and cobbles, some gravel, 150 to 450 mm diameter	194.2										
		BEDROCK											SS3
		Run 1: Start/End: 2.3 m to 2.9 m Recovery: 100% RQD: 0.0% Water Colour & Return: Brown, 40 to 60%											
		Run 2: Start/End: 2.9 m to 4.5 m Recovery: 100% RQD: 85.7% Water Colour & Return: Brown, 60 to 80%	191.9										
		BOREHOLE TERMINATED AT ~ 4.5 m DEPTH											

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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-5

Project No. SUD-24006351-A0

Figure No. B-6

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134988 N, 582354 E

Date Drilled: November 6, 2024

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

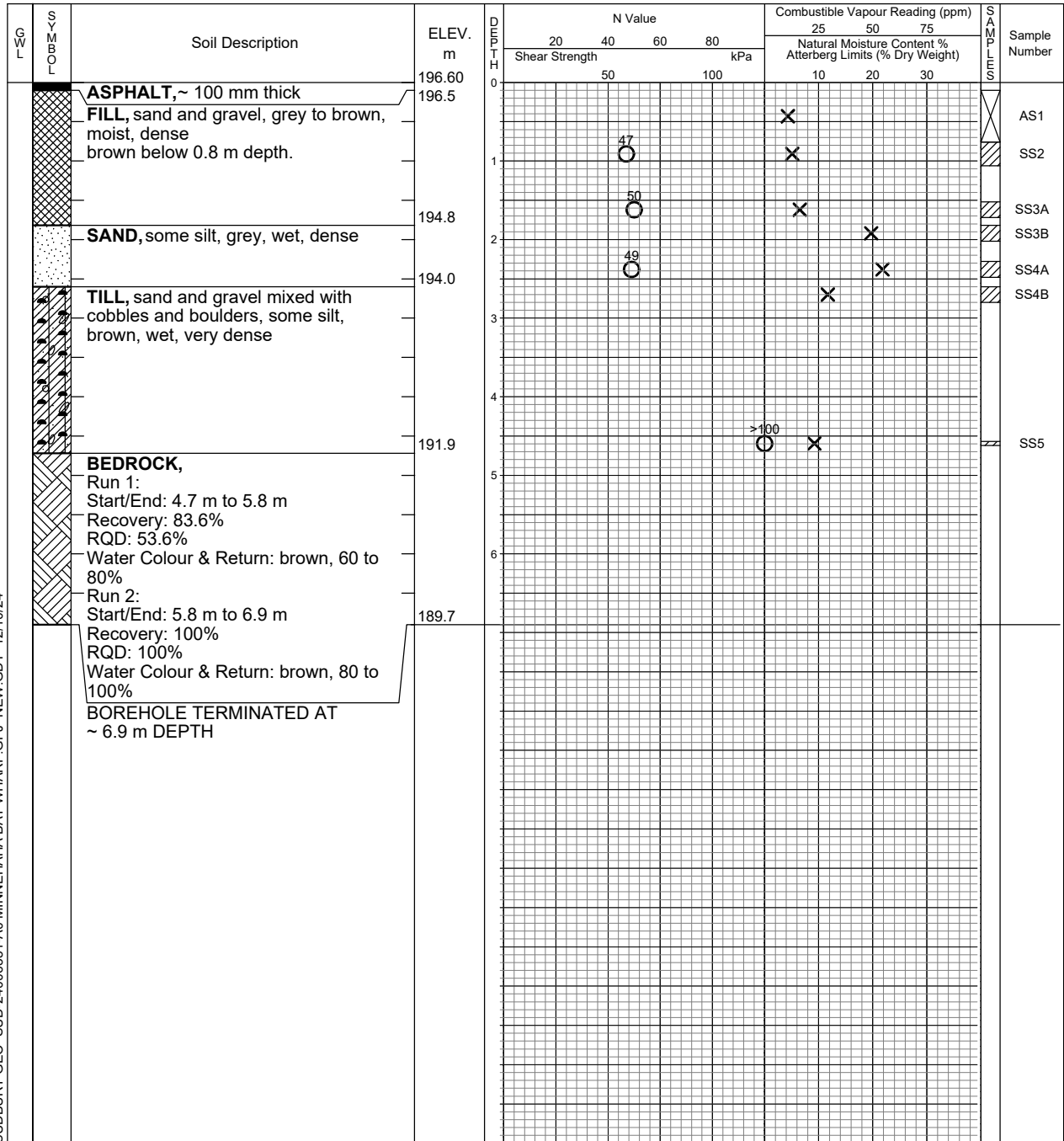
Natural Moisture

Plastic and Liquid Limit

Undrained Triaxial at
% Strain at Failure

Penetrometer

Datum: Geodetic



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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-6

Project No. SUD-24006351-A0

Figure No. B-7

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134961 N, 582378 E

Date Drilled: November 6, 2024

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

Natural Moisture

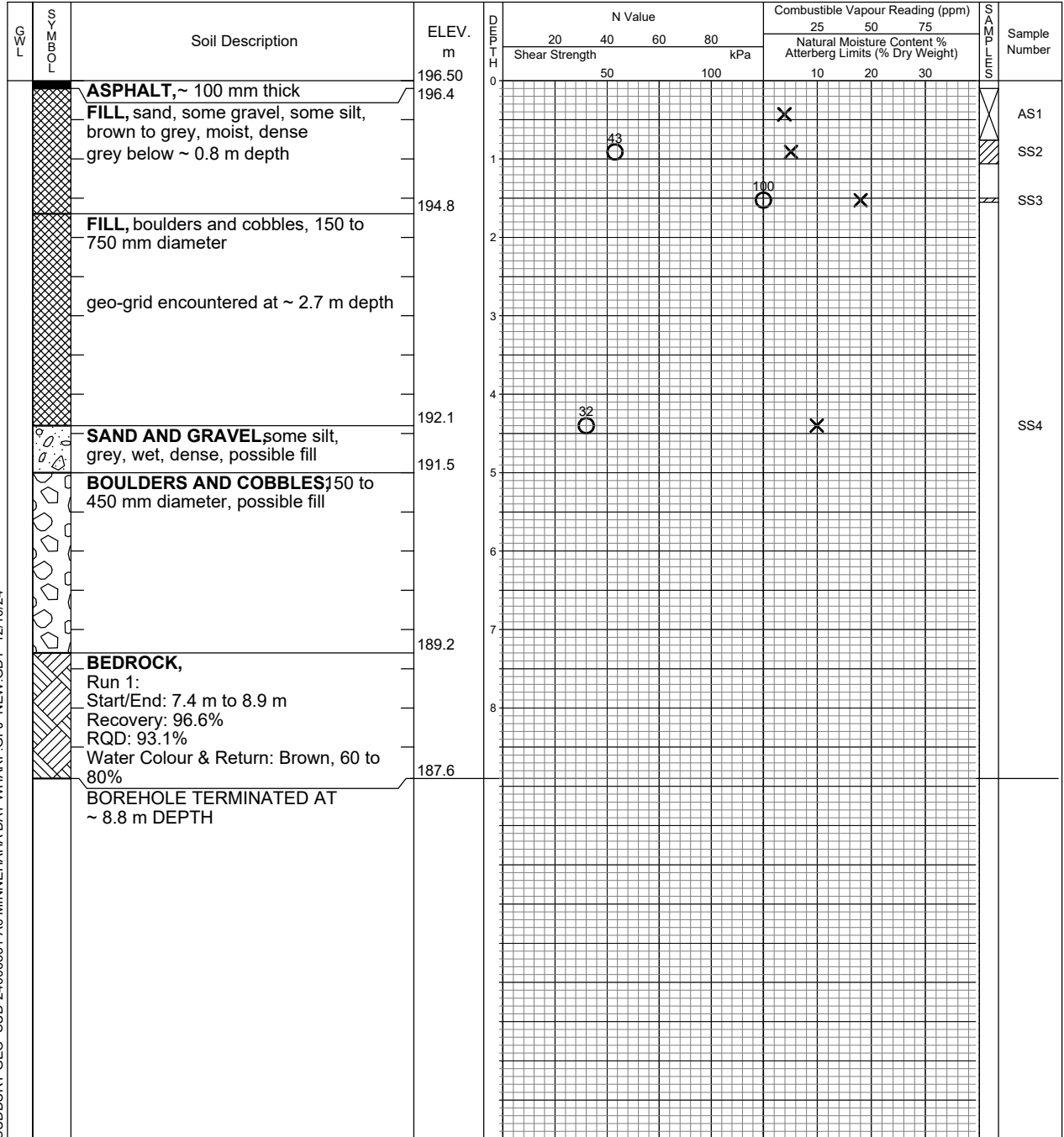
Plastic and Liquid Limit

Undrained Triaxial at

% Strain at Failure

Penetrometer

Datum: Geodetic



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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-7

Project No. SUD-24006351-A0

Figure No. B-8

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134952 N, 582384 E

Date Drilled: November 7, 2024

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

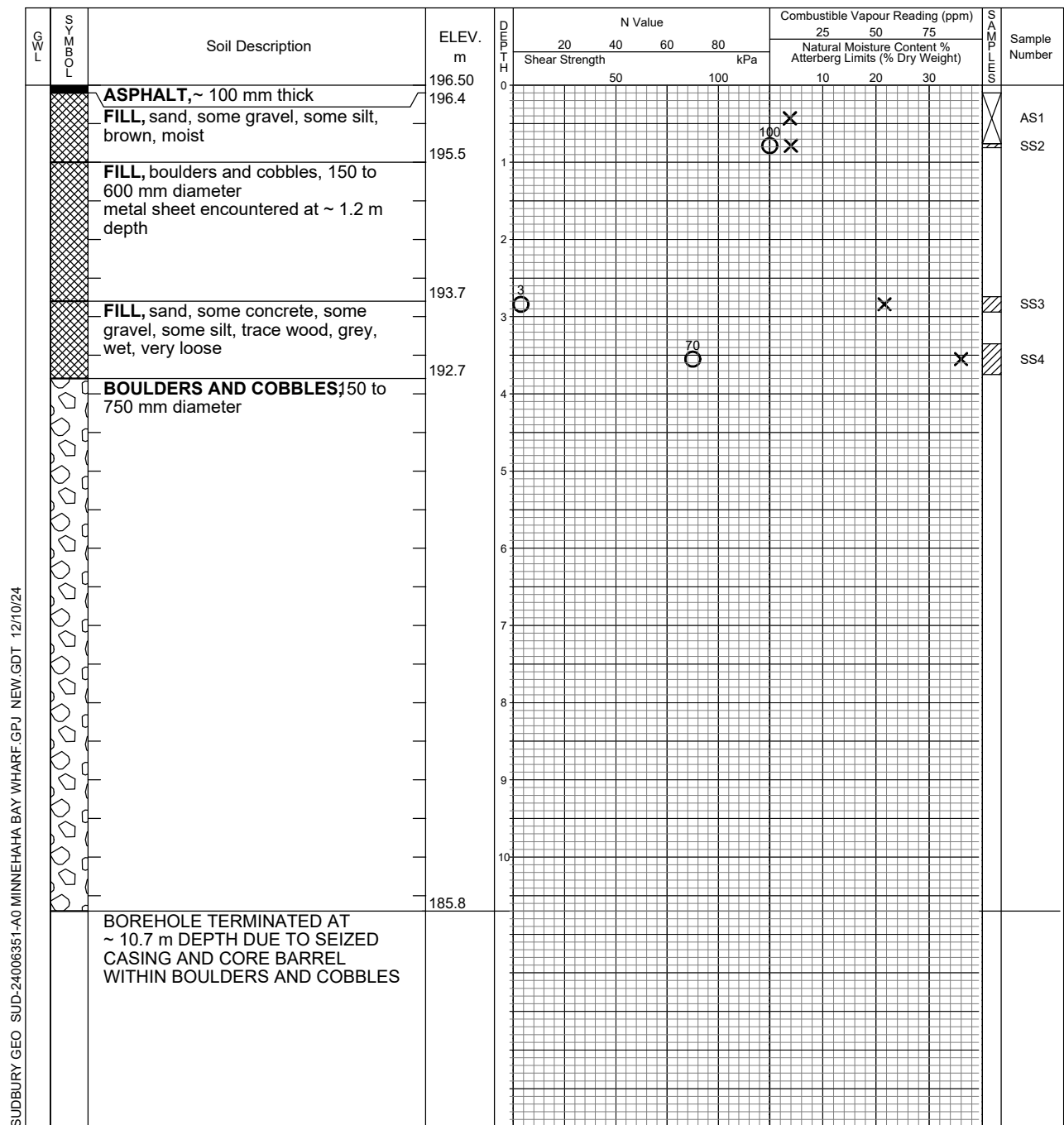
Combustible Vapour Reading ☐

Natural Moisture ✕

Plastic and Liquid Limit 

Undrained Triaxial at
% Strain at Failure

Penetrometer ▲



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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole BH-8

Project No. SUD-24006351-A0

Figure No. B-9

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134927 N, 582396 E

Date Drilled: November 11, 2024

Auger Sample

Combustible Vapour Reading ☐

SPT (N) Value

Natural Moisture

Drill Type: CME55 Truck Mount

Dynamic Cone Test

Plastic and Liquid Limit

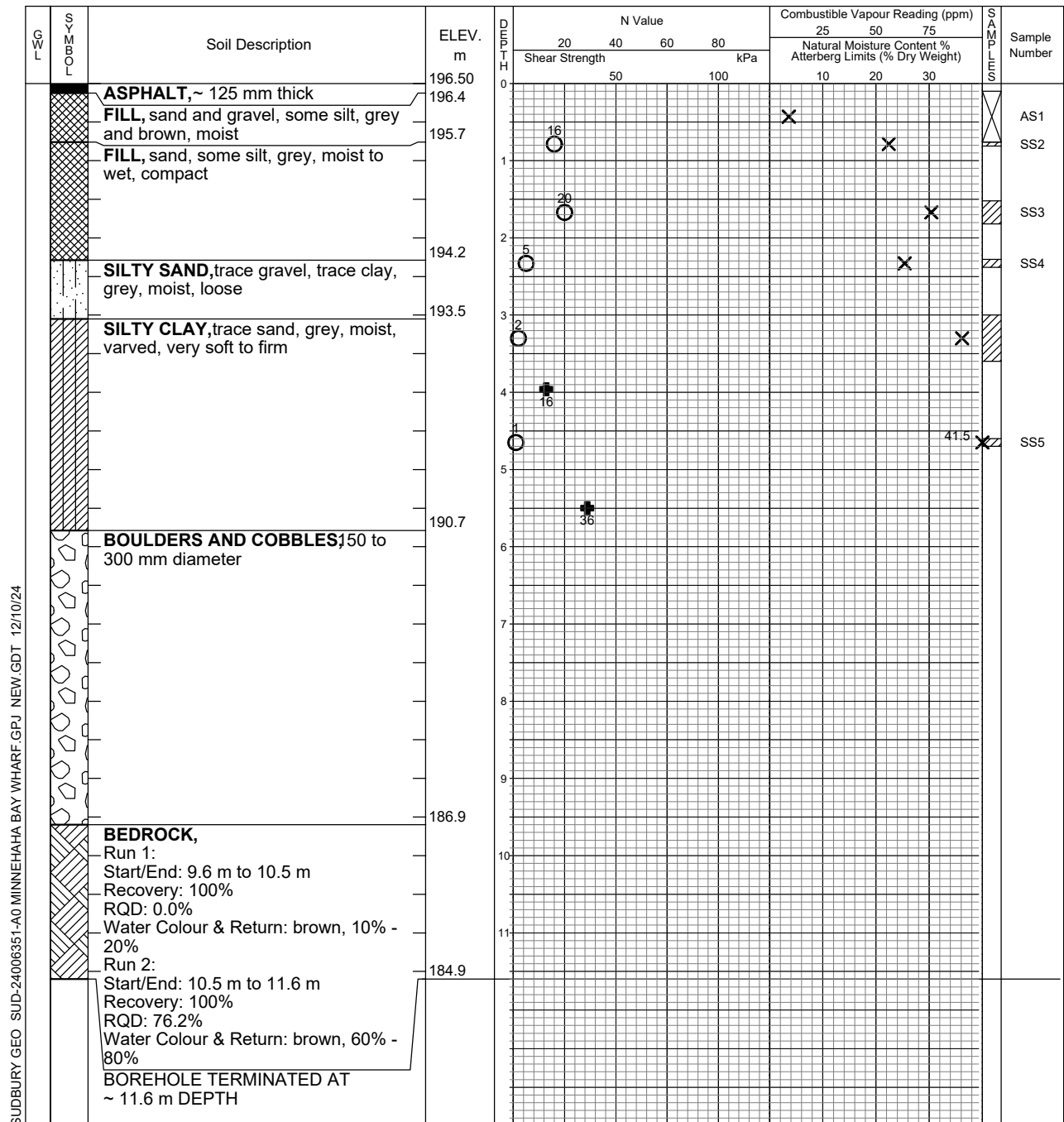
Datum: Geodetic

Shelby Tube

Undrained Triaxial at
% Strain at Failure

Field Vane Test

Penetrometer



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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	n/a	

Log of Borehole PH-1

Project No. SUD-24006351-A0

Figure No. B-10

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135010 N, 582280 E

Date Drilled: November 5, 2024

Auger Sample ☒

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Drill Type: Portable Equipment

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Datum: Geodetic

Shelby Tube ☐

Undrained Triaxial at ☐

Field Vane Test ☐

% Strain at Failure ☐

Penetrometer ☐

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLE NUMBER	Sample Number
					20	40	60	80	25	50	75		
		WOOD DECK, ~ 75 mm thick	196.30	0	Shear Strength kPa				Natural Moisture Content %				
		VOID BELOW DECK	196.2						Atterberg Limits (% Dry Weight)				
					50			100	10	20	30		
		PROBE TERMINATED AT ~ 1.2 m DEPTH DUE TO REFUSAL ON SUSPECTED VERY DENSE FILL	195.1	1									

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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-2

Project No. SUD-24006351-A0

Figure No. B-11

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135006 N, 582297 E

Date Drilled: November 5, 2024

Auger Sample ☒

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Shelby Tube ☐

Undrained Triaxial at ☐

Field Vane Test ☐

% Strain at Failure ☐

Datum: Geodetic

Penetrometer ☐

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLE NUMBER	Sample Number
					20	40	60	80	25	50	75		
		WOOD DECK, ~ 75 mm thick	196.40	0	Shear Strength kPa				Natural Moisture Content %				
		VOID BELOW DECK	196.3						Atterberg Limits (% Dry Weight)				
					50	100			10	20	30		
		PROBE TERMINATED AT ~ 1.2 m DEPTH DUE TO REFUSAL ON SUSPECTED VERY DENSE FILL	195.2	1									

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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-3

Project No. SUD-24006351-A0

Figure No. B-12

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5135002 N, 582310 E

Date Drilled: November 5, 2024

Auger Sample

Combustible Vapour Reading ☐

SPT (N) Value

Natural Moisture

Drill Type: Portable Equipment

Dynamic Cone Test

Plastic and Liquid Limit

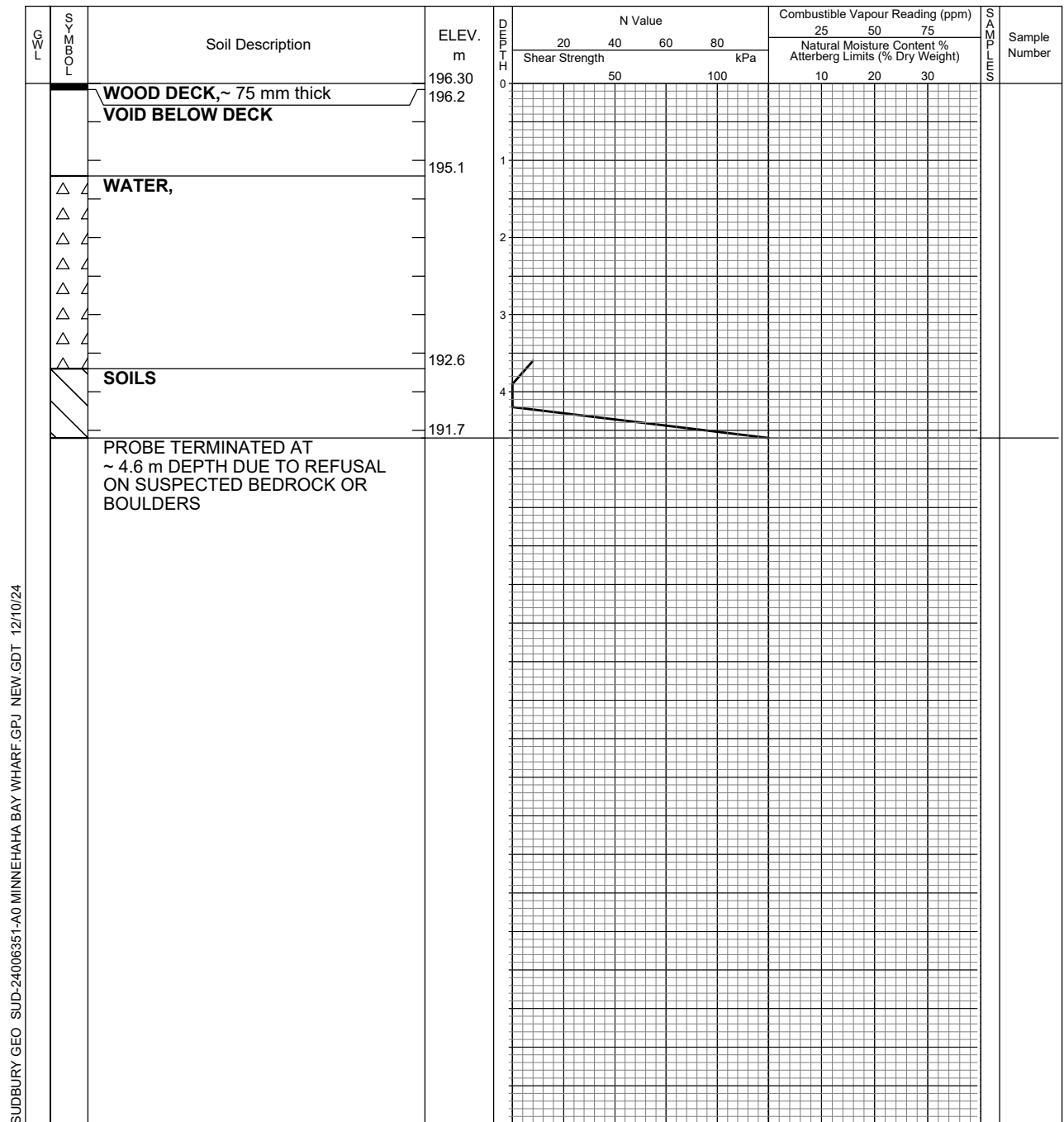
Datum: Geodetic

Shelby Tube

Undrained Triaxial at
% Strain at Failure

Field Vane Test

Penetrometer



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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-4

Project No. SUD-24006351-A0

Figure No. B-13

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134995 N, 582334 E

Date Drilled: November 5, 2024

Auger Sample ☒

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Shelby Tube ☐

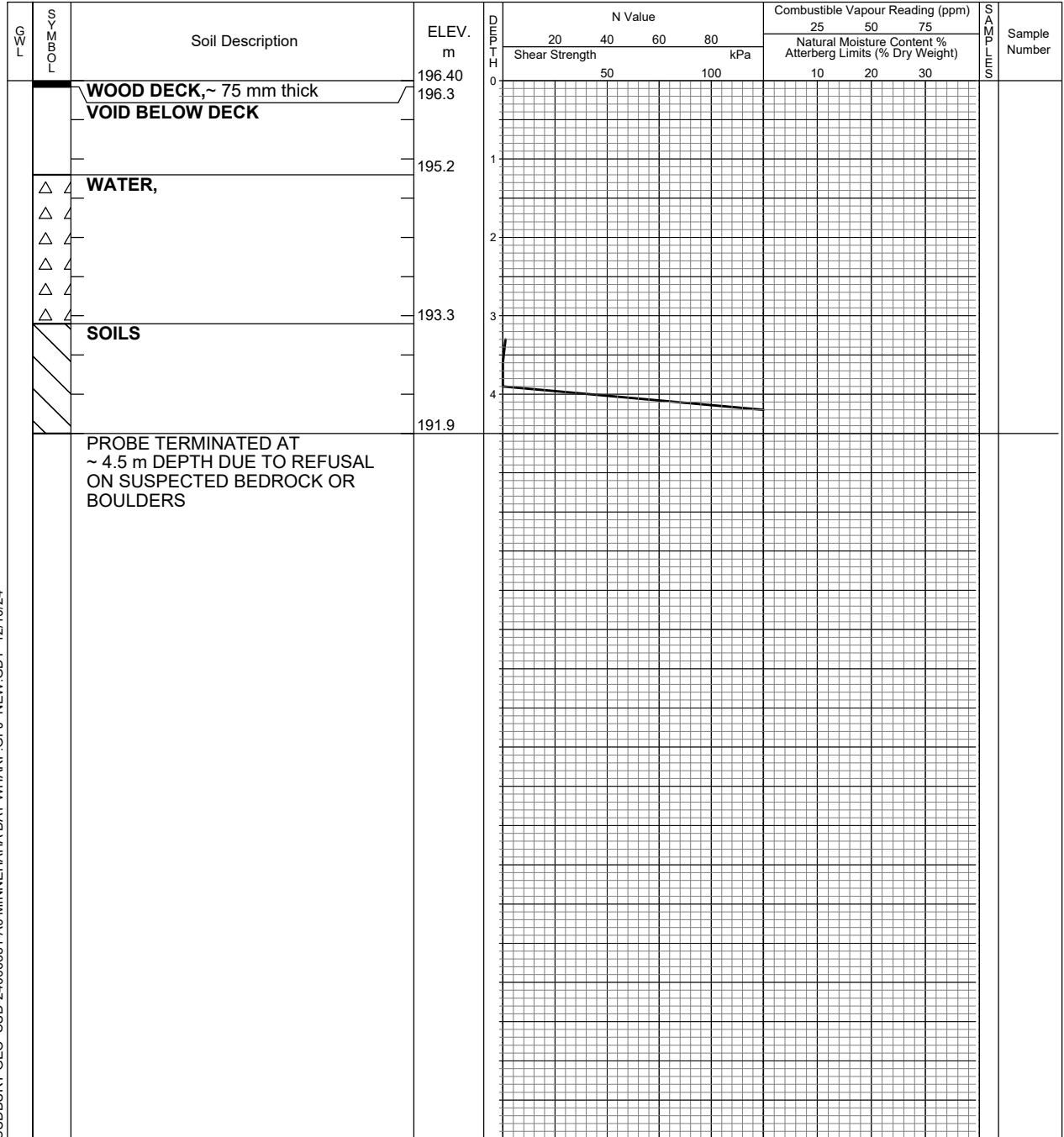
Undrained Triaxial at ☐

Field Vane Test ☐

% Strain at Failure ☐

Penetrometer ☐

Datum: Geodetic



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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-5

Project No. SUD-24006351-A0

Figure No. B-14

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134982 N, 582348 E

Date Drilled: November 5, 2024

Auger Sample ☒

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Shelby Tube ☐

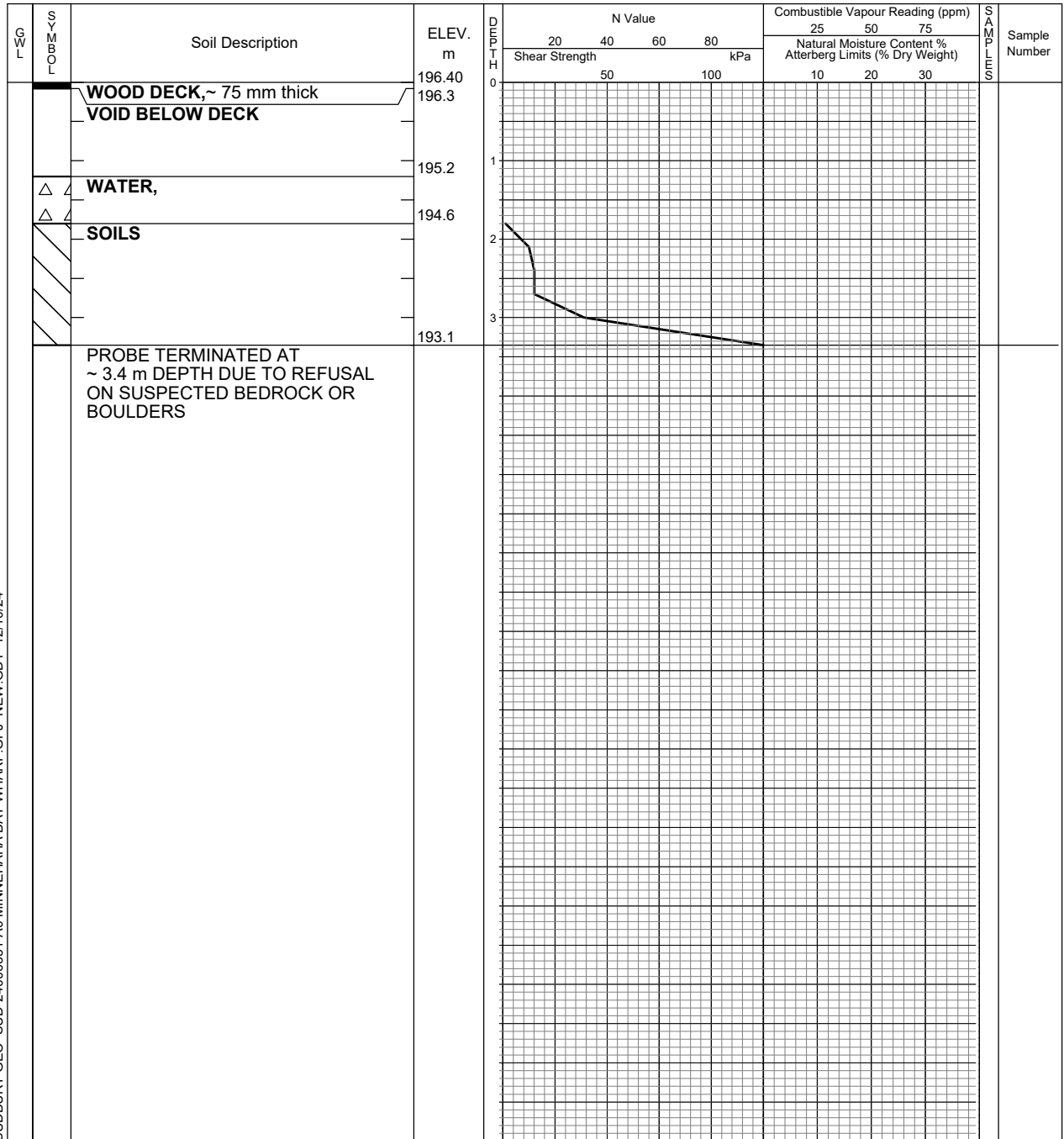
Undrained Triaxial at ☐

Field Vane Test ☐

% Strain at Failure ☐

Datum: Geodetic

Penetrometer ☐



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See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-6

Project No. SUD-24006351-A0

Figure No. B-15

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134956 N, 582372 E

Date Drilled: November 5, 2024

Auger Sample

Combustible Vapour Reading ☐

SPT (N) Value

Natural Moisture

Drill Type: Portable Equipment

Dynamic Cone Test

Plastic and Liquid Limit

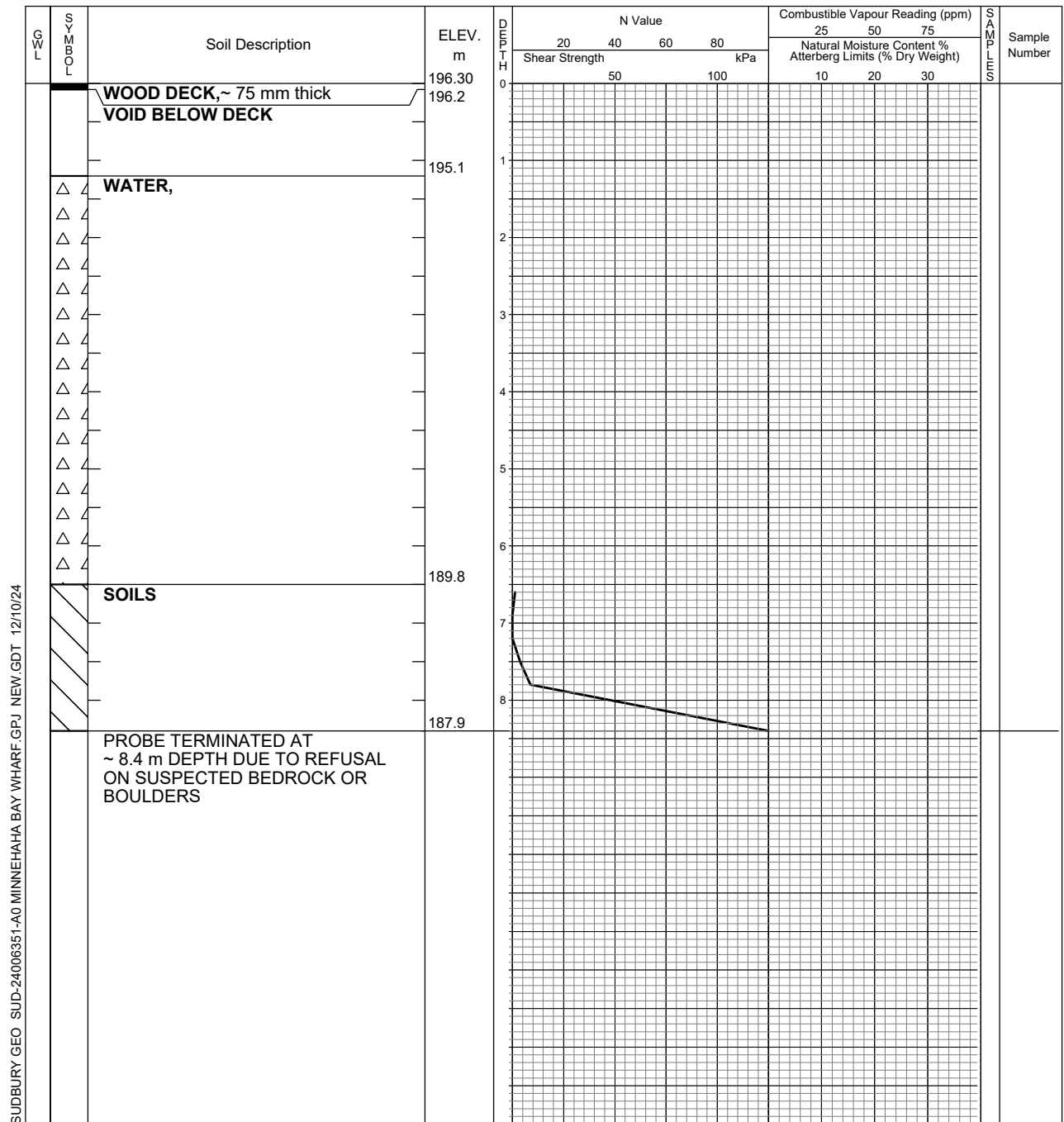
Datum: Geodetic

Shelby Tube

Undrained Triaxial at
% Strain at Failure

Field Vane Test

Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-7

Project No. SUD-24006351-A0

Figure No. B-16

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134947 N, 582379 E

Date Drilled: November 5, 2024

Auger Sample



SPT (N) Value



Dynamic Cone Test



Shelby Tube



Field Vane Test



Combustible Vapour Reading



Natural Moisture



Plastic and Liquid Limit



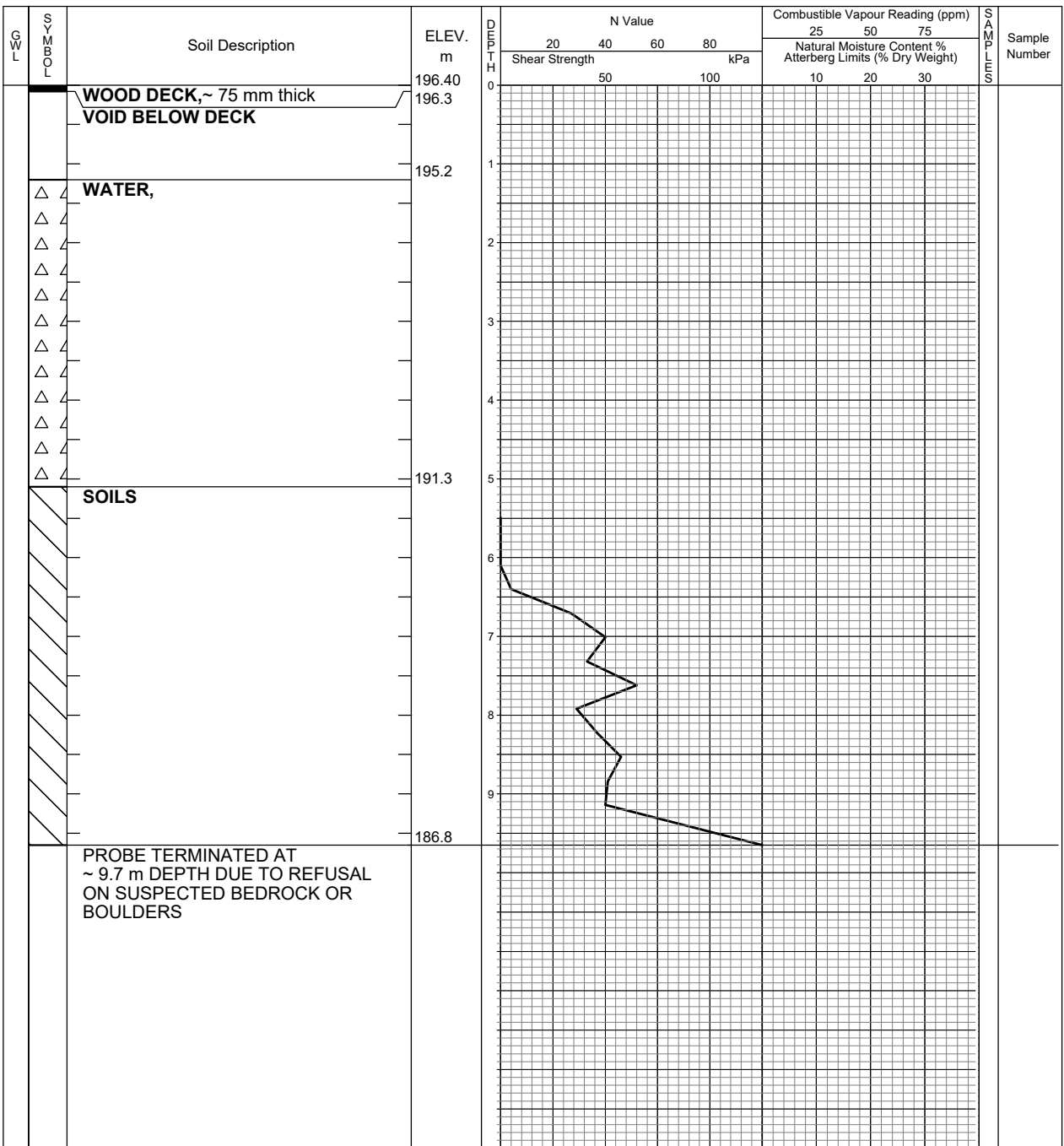
Undrained Triaxial at



% Strain at Failure



Penetrometer



SUDBURY GEO SUD-24006351-A0 MINNEHAHA BAY WHARF GPJ NEW GDT 12/10/24



EXP Services Inc.
885 Regent Street
Sudbury, ON P3E 5M4
CANADA
t: +1.705.674.9681
f: +1.705.674.5583

Borehole data requires
interpretation assistance from
EXP before use by others.

See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole PH-8

Project No. SUD-24006351-A0

Figure No. B-17

Project: Minnehaha Bay Wharf and Road Bank Design

Sheet No. 1 of 1

Location: Sturgeon Falls, Ontario

5134927 N, 582390 E

Date Drilled: November 5, 2024

Auger Sample ☒

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Shelby Tube ☐

Undrained Triaxial at ☐

Field Vane Test ☐

% Strain at Failure ☐

Penetrometer ☐

Datum: Geodetic

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLE NUMBER	Sample Number
					20	40	60	80	25	50	75		
		WOOD DECK, ~ 75 mm thick	196.50	0	Shear Strength kPa				Natural Moisture Content %				
		VOID BELOW DECK	196.4						Atterberg Limits (% Dry Weight)				
			195.7										
		PROBE TERMINATED AT ~ 0.8 m DEPTH DUE TO REFUSAL ON SUSPECTED VERY DENSE FILL											

SUDBURY GEO SUD-24006351-A0 MINNEHAHA BAY WHARF GPJ NEW.GDT 12/10/24



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Borehole data requires
interpretation assistance from
EXP before use by others.

See Figures B-1A and B-1B for
Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)

Appendix C – Typical Grout-to-Ground Bond Values for Micropile Design

Summary of Typical α_{bond} (grout-to-ground bond) Values for Micropile Design

Soil/Rock Description	Grout-to-Ground Bond Ultimate Strengths, kPa (psi)			
	Type A	Type B	Type C	Type D
Silt & Clay (some sand) (soft, medium plastic)	35-70 (5-10)	35-95 (5-14)	50-120 (5-17.5)	50-145 (5-21)
Silt & Clay (some sand) (stiff, dense to very dense)	50-120 (5-17.5)	70-190 (10-27.5)	95-190 (14-27.5)	95-190 (14-27.5)
Sand (some silt) (fine, loose-medium dense)	70-145 (10-21)	70-190 (10-27.5)	95-190 (14-27.5)	95-240 (14-35)
Sand (some silt, gravel) (fine-coarse, medium-very dense)	95-215 (14-31)	120-360 (17.5-52)	145-360 (21-52)	145-385 (21-56)
Gravel (some sand) (medium-very dense)	95-265 (14-38.5)	120-360 (17.5-52)	145-360 (21-52)	145-385 (21-56)
Glacial Till (silt, sand, gravel) (medium-very dense, cemented)	95-190 (14-27.5)	95-310 (14-45)	120-310 (17.5-45)	120-335 (17.5-48.5)
Soft Shales (fresh-moderate fracturing, little to no weathering)	205-550 (30-80)	N/A	N/A	N/A
Slate and Hard Shales (fresh- moderate fracturing, little to no weathering)	515-1,380 (75-200)	N/A	N/A	N/A
Limestone (fresh-moderate fracturing, little to no weathering)	1035-2,070 (150-300)	N/A	N/A	N/A
Sandstone (fresh-moderate fracturing, little to no weathering)	520-1,725 (75.5-250)	N/A	N/A	N/A
Granite and Basalt (fresh- moderate fracturing, little to no weathering)	1,380-4,200 (200-609)	N/A	N/A	N/A

Type A: Gravity grout only

Type B: Pressure grouted through the casing during casing withdrawal

Type C: Primary grout placed under gravity head, then one phase of secondary "global" pressure grouting

Type D: Primary grout placed under gravity head, then one or more phases of secondary "global" pressure grouting

Source : FHWA-SA-97-070 (v00-06)



West Nipissing Ouest

**MUNICIPALITY OF WEST NIPISSING
ENGINEERING CONSULTING SERVICES, WHARF DESIGN**

**SECTION 4
APPENDIX A4**

STRUCTURAL CONDITION ASSESSEMENT REPEORT/UNDERWATER INSEPCTION REPORT

The underwater inspection video prepared as part of the existing conditions assessment is available at the following link:

Minnehaha Bay - Full Wharf Inspection (RFP 2026-033)

<https://www.youtube.com/watch?v=-n6KTMNFbmA>

Minnehaha Bay Wharf Inspection - Dry Hydrant Excerpts (RFP 2026-033)"

<https://youtu.be/U4o--IzwraQ>

STRUCTURAL CONDITION ASSESSMENT REPORT

Minnehaha Bay Wharf (Sturgeon Falls, ON)



Prepared for:

Municipality of West Nipissing
225 Holditch Street, Suite 101
Sturgeon Falls, ON P2B 1T1
Tel: 705-753-2250
ATTN: Jonny Bélanger

Prepared by:

Suppa Engineering
48 Exeter Street
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List of Appendices:

- Appendix A – Photographs
- Appendix B – Soderholm Maritime Inc Inspection Report
- Appendix C – Historic Photos
- Appendix D – Existing Drawings
- Appendix E – Stephenson Engineering Inspection Report

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1. INTRODUCTION

Suppa Engineering (SE) was retained by the Municipality of West Nipissing (MWN) to complete a Structural Condition Assessment (SCA) of the Minnehaha Bay Wharf (the Wharf), in Sturgeon Falls, ON.

Professional Engineers Ontario (PEO) categorizes structural condition assessments into two (2) types: *Preliminary Assessments and Detailed Assessments*. PEO defines a *Preliminary Assessment* as one that results in the preparation of a written report based on a condition survey of a structure and is qualitative rather than quantitative in nature. This means that the assessment is based on visual review. Whereas a *Detail Assessment* often includes materials testing and structural analysis/computations. Therefore, this SCA was defined as a Preliminary SCA, meaning it was based on visual review only.

The purpose of the assessment was to determine the general condition of the structural elements and main loadbearing systems, and to provide recommendations for any required remediation/repair.

Soderholm Maritime Services Inc. (Soderholm), a qualified underwater investigation firm, was engaged to assess the less accessible existing wood elements (i.e., those concealed under the wood decking and those submerged under water), and to generally assist with the overall structural assessment.

STRUCT Engineering Inc. (STRUCT), a specialty structural engineering firm, was retained to provide senior-level expertise associated with marine and dock type structures.

Deficiencies noted in this report are supported, where possible, by photographs taken during the assessment and are provided in Appendix A of this report. The report and links to the video/audio footage associated with Soderholm's investigation are included in Appendix B.

2. BACKGROUND

2.1. General Background and Discussion

The Minnehaha Bay Wharf is located at 300 King Street, in Sturgeon Falls, ON, along the shore of the Minnehaha Bay (Sturgeon River), downstream from the West Nipissing Power Generating Dam. Located to the south-west of the adjacent marina building, the Wharf is a wood quay structure extending approximately 2 ft above the water level and is approximately 600 ft in total length. The Wharf consists of various boardwalk sections constructed over the water and is accessible to the Public by foot from the adjacent roadway and parking lot, as well as from the water via water vessel.

Through discussion with the MWN and the review of historical photos provided by the MWN, it appears that the main Wharf structure was constructed circa 1980's (photos provided in Appendix C). At the time of the original construction, it is believed that the Wharf was built to provide community residents and tourists with boat launch access, docking facilities for water vessels, and a boardwalk for leisure and enjoyment of the waterway. In 2011, during the construction of the adjacent marina building, the Wharf underwent structural repairs to prolong its useful life. The exact scope of the structural repairs is not known. Perceived and assumed repairs were observed and noted during this assessment.

2.2. General Layout and Construction

A sloped concrete ramp serving as a boat launch is located at the west end of the Wharf. Steel connections are provided in various locations along the Wharf for attachment of six (6) floating docks; two (2) near the boat launch, three (3) for leasable boat slips (i.e., A Dock, B Dock, and C Dock), and one (1) for access to a gasoline pump at the south-east end.

Various wood construction methods are present; mostly consisting of wood decking over wood stringers supported onto rock-filled wood cribs or wood bent arrangements. Specific construction types and locations are discussed in the Observations section of this report.

Existing drawings of the boat launch section were available for review and are provided in Appendix D. Drawings of the main Wharf structure were not available.

2.3. Purpose of the Assessment

In 2021, the MWN had retained the services of Stephenson Engineering (Stephenson) to complete a cursory visual review of a random sampling of the Wharf and its components, as part of a Municipality-wide assessment strategy. As a result, Stephenson recommended additional structural investigation due to observed general wood decay and rot observed on stringer members. Stephenson's report is attached in Appendix E.

Therefore, the purpose of this assessment was to further review the structural elements of the Wharf, to expand on the observations and recommendations made by Stephenson in 2021, and to provide general recommendations for any required repairs/rehabilitation.

3. SCOPE OF WORK AND ASSESSMENT METHODOLOGY

3.1. Scope of Work

PEO's guide for *Structural Condition Assessment of Existing Buildings and Designated Structures* defines a "Preliminary Assessment" as one that results in the preparation of a written report based on a condition survey of a structure, and is qualitative rather quantitative in nature, and means that the assessment is based on visual review only. The scope of this SCA therefore only included a visual cursory review of the readily visible portions of the Wharf structure, those exposed by the MWN through local deck removals, as well as the areas accessed by Soderholm and communicated via video/audio footage.

A review of the Wharf's subsurface conditions and foundations (i.e., lakebed), a review of architectural elements (i.e. guards, benches, fire safety, egress requirements, and stairways, etc.), a review of mechanical/electrical equipment, and a review of civil components (i.e., roadways, bollards, fences, etc.) were not included as part of our scope and were therefore not performed. Where defects are noted in finishes or architectural/mechanical/electrical/civil elements, it is to highlight locations where this may indicate defects with the underlying structure.

A review of any adjacent structures not associated with the Wharf was not included in our scope of work, including, but not limited to, the marina building, any auxiliary buildings, floating docks, ramps, utility or flag poles, and pole bases.

For purpose of this SCA, the services of STRUCT Engineering Inc. were retained by Suppa Engineering to provide senior level peer review and expertise.

The overall scope of work for the assessment was as follows:

1. Gather any available existing information pertaining to the Wharf, including but not limited to existing drawings, previous assessment reports, photos, etc. The MWN is responsible for making these documents available to the Consultant upon award of the work.
2. Attend the site during the underwater investigation completed by the retained underwater investigation firm.
3. Following the underwater investigation, review the current conditions of readily visible structural elements, including previously identified removal of wood decking to allow visual review of stringers and cribbing as well as wood headers and bents (removals by others).
4. A visual review of the above noted elements will be carried out as follows:
 - Visually review the condition of the structural elements in order to identify types of structural defects, signs of structural distress and deformations, and signs of material deterioration.
 - Visually review and assess the loading imposed on the structure in order to identify deviations from their likely intended uses, and/or misuse and abuse, which can result in overloading.
 - Review any perceived or identified additions or alterations affecting the structure in order to identify any potential overloading or adverse effects on the structure.
 - Review any visible non-structural components that might affect the structure.
5. Upon completion of the visit, review the gathered information and prepare and submit a Structural Condition Assessment Report signed and sealed by a Professional Engineer licensed in the Province of Ontario, outlining the methodology used, observations made, and recommendations for any proposed/required repairs and/or rehabilitation.

3.2. Assessment Methodology

On October 20, 2023, Patrick Rochefort, P.Eng., from Suppa Engineering, Mark Steenhof, P.Eng., MBA, from STRUCT Engineering, and Soderholm visited the site to complete the SCA, for which the scope is described herein. General observations noted in this report were completed from the ground along the exterior of the Wharf structure, from locations where decking was removed by the MWN, as well as via the live video provided by Soderholm. A link to the dive video and recordings is included in Soderholm's report attached herein.

To ensure that the assessment meets current industry standards, the following references were used, where applicable:

- PEO Structural Engineering Assessments of Existing Buildings.
- Ontario Structures Inspection Manual (OSIM).
- National Research Council – Protocols for Building Condition Assessments.

In this report, the condition of concrete, steel, and wood deterioration has been qualified based on an adaptation of the procedures described in the OSIM. Even though the OSIM provides procedures for bridge inspections, the OSIM procedures are an industry accepted standard used to help provide a detailed ranking system for quantifying the state of deterioration (i.e. Light, Medium, Severe, Very Severe).

The following concrete deficiencies, as suggested in the OSIM, were considered during the assessment:

- Scaling – Local flaking, or loss of the surface portion of concrete or mortar because of the freeze-thaw deterioration of concrete.
- Corrosion of Reinforcement - Deterioration of reinforcement by electrolysis.
- Delamination – A discontinuity in the surface concrete, which is substantially separated, but not completely detached, from the larger concrete mass.
- Spalling – A portion of concrete that has been completely separated and detached from the larger concrete mass.
- Cracking – Linear fracturing of the concrete which may extend partly or completely through the member.
- Disintegration – Physical deterioration or breaking down of the concrete into small fragments.
- Surface Defects – A weakness or potential weakness in the concrete. Defects include stratification, segregation, cold joints, surface deposits, honeycombing, pop-outs, abrasion, and wear.

The following steelwork deficiencies, as suggested in the OSIM, were considered during the assessment:

- Corrosion – Deterioration of the steel from exposure to air, moisture, or other chemicals and contaminants in the environment.
- Permanent Deformations – Bending, buckling, twisting, elongation, or any combination of these which may be caused by overloading conditions or impact.
- Cracking – A linear fracture in the steel due to fatigue,
- Connection Deficiencies – Loose, cracked, or corroded connections, and missing connectors.

The following wood deficiencies, as suggested in the OSIM, were considered during the assessment:

- Checks, Splits, and Shakes – Longitudinal tissue separations.
- Weathering – Gradual deterioration of wood due to exposure to the weather elements.
- Rot or Decay – Biological decomposition of wood caused by microorganisms called fungi.
- Insect Damage – Defects in wood caused by insects.
- Cracking, Splintering, Crushing, and Shattering – Forms of physical damage resulting from overloading of a member.
- Fire and Chemical Damage – Damage caused by fire and/or exposure to chemicals over time.
- Connection Deficiencies – Loosened or damaged connections.

Where deemed necessary, wood elements were probed using a sharp knife, and concrete was hammer-sounded with a standard hammer. As noted in Soderholm report, the use of an awl was implemented by divers assessing wood elements.

Additionally, the following terms from the OSIM provide qualitative definitions of conditions:

Condition	Description
Excellent	a. This refers to an element (or part of an element) that is “new” (as constructed) condition. b. No visible deterioration type defects are present and remedial action is not required. c. Minor construction defects do not constitute visible deterioration type defects.
Good	d. This refers to an element (or part of an element) where first signs of “light” (minor) defects are visible. This usually occurs after the structure has been in service for several years. These types of defects would not normally trigger any remedial action since the overall performance of the elements is not affected.
Fair	e. This refers to an element (or part of an element) where medium defects are visible. These types of defects may trigger a “preventative maintenance” type of remedial action where it is economical to do so.
Poor	f. This refers to an element (or part of an element) where severe defects are visible. In concrete, any spalling or delamination would be considered “poor” since these defects usually indicate more serious underlying problems in the material. These types of defects would normally trigger rehabilitation or replacement if the extent and location affect the overall performance of that element.

4. LIMITATIONS OF REVIEW

The SCA consisted of a cursory visual review only and was limited to areas where structural elements were accessible and readily visible, as well as those reviewed by Soderholm. Therefore, the assessment did not consist of a full and/or comprehensive review of all structural elements or members, but rather included a random sampling of readily accessible elements to allow for a general condition to be attributed.

Given the inaccessibility of foundation systems, a review of these elements was not carried out, beyond a visual review of any visible foundation elements above the lake bed by divers.

The assessment did not consist of an Ontario Building Code (OBC) review, or a review of the current structure’s compliance with modern building codes (i.e. OBC, NBCC, etc.).

Review of the Wharf structure was limited to readily accessible visible areas that could be observed from the boardwalk and by Soderholm from the water. These readily available elements included wood cribbing, wood stringers, wood skirting, wood decking, wood bent arrangements (header and piers), steel sheet piles, dock attachment hardware, drainage pavers, and boat launch elements.

5. OBSERVATIONS

The following section summarizes the visual observations made by Patrick Rochefort, P.Eng., during the site visit performed on the date noted above. Observations include those made from the ground as well as via the diver's video footage. Observations are categorized by structural elements visible from above and below the boardwalk, with a brief description of each element provided. Observations are intended to be general in nature and are based on a random sampling of elements and locations. Where applicable, photos supporting the observations are referenced in the right-most column of the table and are appended in Appendix A. Where observations are made via video footage from Soderholm, time stamps are provided in the right-most column of the table with reference to the video. Format of video references is HH:MM:SS (hours, minutes, seconds). Refer to Soderholm's report for all observations made from the water. It should be noted that not all observations are provided with associated photos or video reference. Photo and video references are intended to provide general context and support to observations made.

Where appropriate, SE has described locations based on the chainage layout (i.e., stations) as described in the Soderholm Inspection Report, and summarized below (photos of locations provided by Soderholm):



Figure 1. Stations 0 to 247

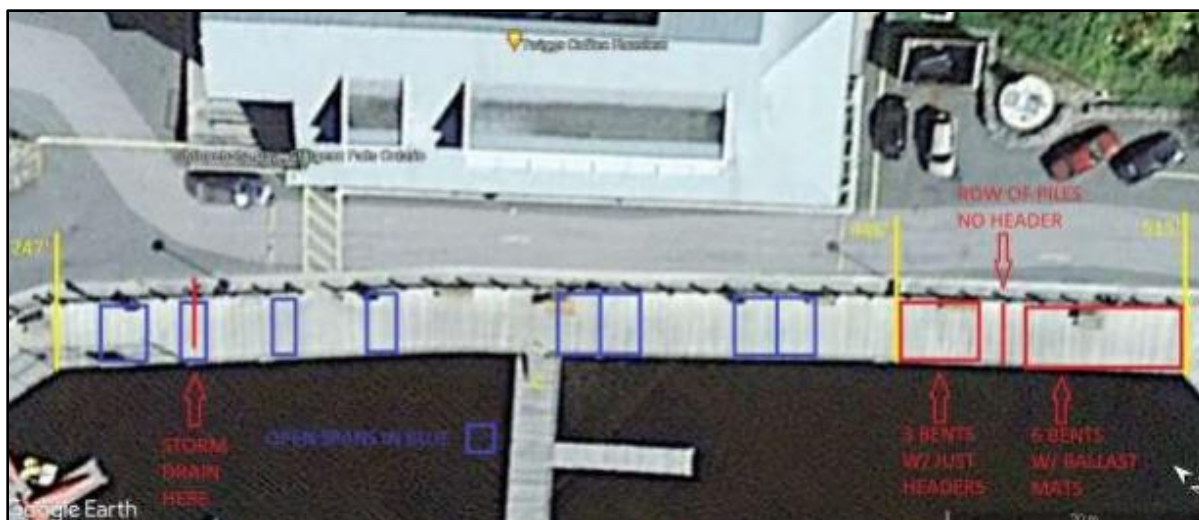


Figure 2. Stations 247 to 515



Figure 3. Stations 515 to 588

5.1. Observations – General Wharf Construction and Structural Systems

The Wharf structure is generally constructed of structural wood elements, with steel sheet pile retaining backfill soils along the delineation between the Wharf and the adjacent roadway and parking lot. The construction varies along the Wharf with different structural arrangements and appears to be grouped into different sections. These sections generally consist of the following:

- Section 1 (approximately Station 0 to Station 134):
Flat wood plank decking supported by wood stringers spanning between continuously spaced rock-filled wood cribs sitting on lakebed.
- Section 2 (approximately Station 134 to Station 445):
Flat wood plank decking supported by wood stringers spanning between open-spaced rock-filled wood cribs sitting on lakebed.
- Section 3 (approximately Station 445 to Station 588):
Flat wood plank decking supported by wood stringers spanning between wood headers on round timber piles into lakebed. Some sections of boardwalk were constructed of wood decking on wood stringers supported by suspended cribs bearing on wood piles.

5.2. Observations – Above Boardwalk

Structural Element	Description of Element	Observations	Photo/Video References
Wood decking	Wood planks (approx. 5-1/2" wide x 2-1/2" thick), laid on the flat over wood stringers. Comprises the main boardwalk deck.	• Decking partially wet at the time of review. • General medium to severe weathering throughout. • General light to medium abrasion and wear throughout. • General light to severe checks, splits, and shakes throughout. • Decking appeared to be deflecting significantly near the C Dock attachment (between Station 247 and 445).	Photos 3-16
Wood skirting	Vertical wood planks installed along the waterside of the Wharf to conceal the interior/underside.	• Limited accessibility due to location near waterline. • General water staining near waterline. • Medium weathering throughout. • Few instances of missing boards.	Photo 17
Boat launch components	Concrete apron slab	• General concrete wear and abrasion along top surface.	Photos 18, 19

	Closed-face cribbing side walls Dock attachment	- Select medium to wide longitudinal cracks along top surface. - Partially wet at the time of review. - General medium to severe weathering of cribbing timbers above waterline throughout. - Localized splitting of cribbing timbers below waterline at east side of boat launch ramp. - See Section 5.3.	Photo 20
Miscellaneous Non-Structural Items	Drainage pavers (open concrete pavers along roadside, adjacent to boardwalk)	- Loss of underlying soils at side of wood stairs near Station 563'. Potential sink hole formations. - Pooling of surface water in select locations. - Settlement of stonework in select locations. - Loss of underlying soils in select locations. Potential sink hole formations.	Photos 21-25

5.3. Observations – Below Boardwalk (primarily via Soderholm video/audio footage)

Structural Element	Description of Element	Observations	Photo References
Wood Stringers	Wood members (various sizes) supporting wood decking above, spanning between cribbing/bent support elements. <u>Note:</u> Only select examples of video references noted.	- Limited access to stringers. - Generally wet and water stained. - In select locations between Stations 0 to 247, felt paper covering top of wood stringers observed. Felt paper starting to deteriorate. - Localized locations showing signs of light to medium checks, splits, and shakes. - Several locations showing signs of medium rot/decay, with wood offering moderate resistance to penetration of a sharp object, and noticeable damage. - Several locations showing signs of severe rot/decay, with wood offering little resistance to penetration of a sharp object, and considerable damage. - Select locations showing signs of very severe rot/decay, with wood able to be crumbled with extensive damage and section loss.	Photos 26-37 See Soderholm Video 00:36:10 00:57:00 01:28:45 01:41:50 02:02:00 02:23:10

		Stringers showing signs of very severe rot/decay near C Dock attachment (corresponds with excessive deck deflection between Station 247 and 445).	
Wood Cribbing	Stacked wood timbers in box formation, filled with rip-rap rock. Timbers are connected at their corners by steel bolts or pins. Purpose of cribbing is to support stringers. <u>Note:</u> Only select examples of video references noted.	- Limited access to cribbing. - Condition of wood cribbing members varies. - Several timbers below, at, and above the waterline are showing signs of medium to very severe rot/decay, with wood offering little resistance to the penetration of a sharp object. - In select locations, it appears that timbers above/near the waterline were replaced compared to those below the waterline. Bolt types also appear different within same cribbing assemblies, suggesting a past repair. - Select locations where bolted connections of timber members are failing due to rot/decay of wood members near connections. - Cribbing member bolts are showing signs of general light corrosion.	Photos 38-40 See Soderholm Video 00:37:35 00:38:28 00:56:40 01:04:40 01:26:35 01:31:00 01:41:00 01:42:48 01:44:40 01:46:35 01:56:15 01:59:40 02:04:00 02:09:15 End of cribbing sections at 02:15:10
Wood Bents	2x lumber headers fastened to round timber piles to create bent assemblies for support of stringers, in-lieu of cribs. <u>Note:</u> Only select examples of video references noted.	- Limited access. - Apparent past repairs observed, consisting of spliced upper round timber to older lower round timber. Timbers spliced together using steel jacket sleeves and bolts. Age of repairs not known or apparent. Steel jacket sleeves appear to be in fair condition with light surface corrosion. - Round timber piles that <u>have been</u> splice repaired appear to be showing signs of light to medium rot/ decay, with wood offering full to moderate resistance to penetration of a sharp	Photos 41-42 Start of pile sections 02:15:10 See Soderholm Video 02:15:35 02:17:10 02:19:01

		object, and damage ranging from none to noticeable. - Round timber piles that <u>have not been</u> splice repaired appear to be showing signs of medium to severe rot/ decay, with wood offering moderate to little resistance to penetration of a sharp object, and noticeable/considerable damage. - Wood headers vary in condition. Some appear to be generally in fair condition with light rot/decay, while others appear to be in poor condition with medium to very severe rot/decay. - Some wood headers showing signs of medium to severe checking, splits, and shakes. - Where round timber piles are significantly deteriorated, header bolted connection to piles are failing. - See Soderholm Video and Report for pile-by-pile observations and info.	02:20:30 02:21:50 02:25:05 02:26:45 02:26:55 02:28:05 02:28:30 03:10:30 03:14:10 03:15:50 03:24:50 03:26:35 03:28:00 03:29:50
Steel sheet pile	Molded sheet metal panels interconnected and installed vertically to form a retaining wall structure. Located between the boardwalk and the adjacent roadway. <u>Note:</u> Only select examples of video references noted.	- Limited access to steel sheet pile. Only lakeside face of sheet piles accessible by divers at time of review. Roadside face not accessible. - General light to medium corrosion of visible sheet pile sections. - Select locations of suspected shallow sheet pile embedment.	Photo 43 See Soderholm Video 00:34:30 00:40:00 00:58:00 01:10:02 01:19:15 01:29:45 01:37:32 01:42:20 01:46:50 01:58:50 01:59:25 02:09:25 02:24:05 03:12:00 03:13:00

Floating dock attachments	Steel square HSS members welded to steel flat plates and bolted to Wharf structure. For connection of seasonal floating docks to Wharf.	- Floating docks removed at time of review. - General light surface corrosion of steel components. - Select attachment bolts are loose and attachment can be moved by hand.	See Soderholm Video 00:23:15 01:15:40 01:53:00 03:35:40
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6. DISCUSSION AND RECOMMENDATIONS

6.1. Structural Discussion

The purpose of the following discussion is to contextualize the perceived condition of the Wharf's structural elements and associated components, based on the visual observations noted above. Additionally, we seek to identify areas of noted concern and clarify the reasons behind their significance. The associated recommendations are provided in the Structural Recommendations section that follows.

The following primary factors were identified during the assessment and formed the basis of our opinions and recommendations, and are discussed further below:

- Deterioration of main structural elements,
- Deterioration of secondary elements,
- Expected remaining life and estimated era of original construction,
- Overall unknown/concealed conditions; and
- Overall use and occupancy of the structure.

For the purpose of this discussion, the following definitions are provided for context, and derived from PEO's guide for *Structural Condition Assessment of Existing Buildings and Designated Structures*:

- Structural Integrity**: the ability of a structure to absorb local failure without widespread collapse.
- Structurally Sound**: a building or other structure exhibiting no evidence of defects, damage, deterioration, or distress that might impair its structural function or its present occupancy and use.
- Structurally Unsafe**: A building/structure is unsafe if the building/structure is:
 - Structurally inadequate or faulty for the purpose for which it is used; or
 - In a condition that could be hazardous to the health and safety of persons in the normal use of the building, persons outside the building, or persons whose access to the building has not been reasonably prevented.

Given the age of the Wharf and its marine environment, it would be unreasonable to categorize this structure as "structurally sound". Considering the nature of aging wood elements, particularly near the water line where there is repeated exposure to wet-dry and freeze-thaw cycles, claiming the Wharf to be structurally sound would imply that it is free of any defects, damage, or deterioration, which it is not. However, not qualifying for structural soundness does not imply that something is "structurally unsafe"

or lacking integrity. Other factors must be examined to evaluate this criterion and are discussed further herein.

Typically, structural elements are designed to accommodate a reasonable life expectancy of +/- 50 years. Although it is believed that original elements of the Wharf are nearing 50 years of age and have not yet exceeded their design life expectancy, apparent signs of severe deterioration and indications of ongoing and worsening rot/decay in main structural elements are noticeable, warranting repair or replacement. Despite observed previous repairs aimed at prolonging the useful life of the Wharf, these efforts appear to have provided only temporary and/or minimal additional life expectancy and do not constitute long-term solutions. It is not uncommon for exterior structures constructed of wood to require significant repair and replacement within the standard 50-year design life. This is largely due to the harsh environmental conditions and the limited resiliency of wood.

6.1.1. Deterioration of Main Structural Elements:

The primary structural system of the Wharf consists of wood decking supported onto wood stringers spanning between either rock-filled cribs, wood bents (headers and timber piles), or suspended cribs bearing on piles. These main elements are intended to support loads from snow, persons, dead loads, superimposed loads, and their own self-weight, and are meant to transfer these loads to the founding lakebed, soils, or bedrock. In addition, steel sheet piling is present behind the Wharf to retain soil from the adjacent roadway and parking lot, essentially acting as a retaining wall. For the structure to maintain its integrity, the adequate performance and condition of these elements is imperative.

Steel Sheet Piles

In general, steel sheet pilings appear to be in fair condition overall, where limited review was possible. It should be noted that soil erosion was observed at the concrete drainage pavers near the roadway and could negatively affect the condition and performance of the steel sheet pile if not repaired. Review of the steel sheet piles along the roadway could not be performed, as they are buried under backfill soil. Only limited review from the water side was completed by Soderholm. If extensive repairs are completed to prolong the useful life of the Wharf, further assessment of the condition of the sheet piles should be completed at that time.

Wood Elements

The condition of wood elements varies along the Wharf. In select locations, wood elements are showing signs of localized and/or generalized deterioration, including significant rot/decay in some locations.

- a. Wood decking appears to have surpassed its useful life, with several locations showing signs of advanced weathering and deterioration. Sections 1, 2, and 3 appear to be in fair to poor conditions.
- b. Wood stringers are showing signs of deterioration, with some locations exhibiting signs of very severe rot/decay and significant section loss. Stringers that have undergone section loss will experience a reduction in load carrying capacity and should not be relied on. Section loss of more than 50% was observed near the attachment to C Dock. Areas where stringers are showing advanced levels of section loss are considered structurally unsafe and the MWN was previously instructed to restrict access to these areas until such time that repairs can be completed.

Section 1 stringers appear to be in fair condition, Section 2 stringers appear to be in poor condition, and Section 3 stringers appear to be in fair to poor condition.

- c. Wood cribs appear to have undergone localized repairs in select locations. It appears that the top portion of crib members may have been replaced in the past, as modern bolt assemblies and square timbers were noted, in lieu of the lower-level older bolting hardware and round timbers. In general, cribs appear to be nearing the end of their useful life, with several members showing signs of very severe rot and decay. Wood cribs generally appear to be in fair to poor condition, with Section 2 and 3 cribs exhibiting more advanced deterioration than Section 1 cribs.
- d. Wood bents consisting of wood headers fastened to round timber piles appear to have undergone previous repairs, where the top portion of the pile had been removed and a new section splice connected with steel jacket sleeves and bolts. Wood bents appear to also be nearing the end of their useful life, with several members showing signs of advanced deterioration. Wood bents generally appear to be in poor condition.

Generally, wood elements at and/or near the waterline appear to be exhibiting signs of more advanced deterioration compared to those continually submerged underwater. Members continually submerged benefit from more favorable conditions to those near or above the waterline, as well as decreased factors that contribute to rot/decay. Considering the marine environment and climate where the Wharf is situated, it is presumed that the primary wood elements at/near the surface of the water undergo repeated and constant exposure to wet-dry cycles during warmer months, and freeze-thaw cycles in colder months. Additionally, based on discussions with the MWN, it is known that the wood skirting was replaced in 2011. The new tightly spaced skirting boards replaced a previously more open system, and in combination with tightly spaced decking boards, it is believed that these aspects may have accelerated the rate of deterioration of wood elements. The tighter board spacing has restricted airflow beneath the boardwalk, allowing moisture to accumulate and limit drying of wet members over time. As described in the OSIM, rot/decay is a biological decomposition of wood caused by micro-organisms called fungi. The growth of fungi requires the presence of adequate moisture, oxygen, and a favorable climate (i.e., warm), and therefore there is a high likelihood that the lack of adequate airflow has negatively contributed to the overall condition of the primary wood elements that comprise the Wharf.

Generally, wood deterioration is cause for concern as it can reduce the wood's ability to withstand load and make structures unsafe.

6.1.2. Deterioration of Secondary Elements:

Although not all directly related to the structure itself, select secondary elements should be discussed further to provide context regarding the overall condition of the Wharf, and repairs implemented to ensure their continued use.

Drainage Pavers:

Concrete open-faced drainage pavers are located along the divide between the Wharf boardwalk and the adjacent roadway and parking lot. They are assumed to be located in close proximity to the top of the steel sheet piling along the back of the Wharf structure and are assumed to provide a permeable surface for water runoff to drain to. Although not considered a structural element, observations pertaining to the pavers were noted as being significant because of the potential impact on the adjacent

structure and roadway, as well as to the health and safety of users. Multiple locations are showing signs of perceived soil erosion (i.e., missing soil around/beneath pavers), causing concern of potential formation of sink holes. This is concerning because the formation of sink holes could negatively affect the performance of the sheet piling that retains the roadway soils, as well as pose a safety risk to users should the surrounding soils fail unexpectedly.

Boat Launch Ramp:

In general, the boat launch ramp appears to be in fair condition. General wear and transverse cracking was observed along the top surface of the slab. This deterioration is assumed to be caused by normal vehicular use and seasonal movements of the slab. The observed deterioration is not believed to be cause for structural concern. It is not known or apparent if frost-protection is provided around/beneath the slab.

Dock Attachment Hardware:

Multiple floating dock attachments were noted as being loose, or missing bolt hardware. Although not structurally significant to the Wharf overall, attention should be given to ensuring all dock attachments are maintained in good working condition to ensure adequate support of floating docks and associated ramps.

6.1.3. Expected Remaining Life and Era of Original Construction:

As previously noted, construction of the original Wharf is believed to be circa 1980's, with repairs completed in 2011. Typically, structural elements are designed and constructed to accommodate a reasonable life expectancy of +/- 50 years, and therefore, it should be recognized that this structure's normal expected life is nearing expiry. Additionally, marine structures constructed of wood are expected to reach the end of their anticipated design life sooner than other types of structures, given their proximity to water and associated harsher environment (i.e., wet-dry cycles, free-thaw cycles, etc.).

Furthermore, although the condition of a particular element may be visually rated as fair/good, it is important to understand that elements that go beyond their expected life may deteriorate at an increased rate, and elements already exhibiting signs of deterioration may experience accelerated deterioration.

Additionally, due to the era of construction, and the lack of available design information, it cannot be confirmed if the construction itself followed any formal building code or design standard. Therefore, the structural condition and integrity of the elements is being assessed based solely on visual review as well as general understanding of historical construction materials and methods. It cannot be assumed that an engineered design was followed that would provide additional confidence in the elements' original load-carrying capabilities. This is not to say that reasonable construction practices for the era and/or an engineered design were not followed, it simply suggests that it cannot be reasonably assumed for the purpose of this assessment.

6.1.4. Unknown/Concealed Conditions:

Another consideration for a structure of this type is that a large quantity of its elements are concealed underwater, making them difficult to access and visually assess. While a reasonable random sampling of

wood elements was reviewed, most below-water wood elements near the lakebed have not undergone examination. Although random sampling of elements is a common practice with most condition assessments, given the age and observed deterioration of the wood elements, the total percentage of inaccessible and therefore unassessed elements must be considered when forming an overall opinion on the condition of this structure. It would be reasonable and conservative to assume that the unseen wood elements are exhibiting similar deterioration to those observed, at a minimum.

6.1.5. Use and Occupancy:

Despite that this structure is not considered a “building” by definition of the OBC and understanding that the use of the structure is not intended for prolonged occupancy, it is important to note that this structure has often been subjected to assembly type occupancy. Additionally, the MWN noted that on occasion vehicles have been temporarily parked on the Wharf during special events.

Without original design documents, it cannot be easily confirmed if the Wharf structure was originally designed/intended to carry such loading. Until more detailed analysis is completed during the design of repairs, assembly and/or vehicular loading should be strictly prohibited.

6.2. Structural Recommendations

Based on our observations and the above commentary, the following recommendations are provided. Short-term recommendations are to be completed/enacted immediately, and long-term recommendations are to be completed/enacted within the timeframes noted. Failure to implement the recommendations within the stated timeframes could lead to structural failure and endanger the public.

6.2.1. Short-Term Recommendations:

1. General:

- a. Restrict all assembly and vehicular type loading indefinitely. Signage should be posted to ensure this is clearly communicated to the public/users. This restriction does not include the concrete boat ramp. Continued use of the concrete boat ramp is permitted.
- b. Implementation of a Monitoring Program by MWN maintenance staff to regularly inspect the Wharf structure and its associated components for further deterioration or potential safety concerns.
- c. Completion of regular yearly structural assessments by a Professional Engineer licensed in the Province of Ontario, until such time that the structure is fully replaced (see Long-Term Recommendations for recommended replacement schedule).

2. Secondary Elements:

a. Drainage pavers:

Further investigation of the soil erosion occurring under drainage pavers is recommended to better understand the cause. Continued monitoring of the perceived erosion is also recommended to ensure conditions do not worsen. Infill of potential sink holes should be completed immediately to mitigate safety hazards to the public and users.

3. Main Structural Elements:**b. Damaged/deteriorated wood stringers:**

As observed during the assessment, select locations of the Wharf structure are showing more advanced signs of wood deterioration, with some locations exhibiting significant section loss of main structural members. As discussed with MWN staff at the time of the assessment, these locations are to be cordoned off and barricaded to ensure persons cannot access these areas, with signage posted to make it known that these areas are restricted for health and safety reasons. These locations include the area delineated with orange paint at the time of the assessment visit, near the C Dock attachment and as discussed with the MWN at the time of the visit. Information/recommendations were provided via email to the MWN on October 20, 2023. This temporary measure shall remain in-place until a more permanent repair can be implemented. It should be clear that this area is deemed structurally unsafe and requires immediate action. As a temporary measure, the damaged stringers are to be replaced in-kind, and the supporting cribs closely reviewed to ensure they are not also showing signs of similar rot/decay.

c. General ventilation/airflow:

As noted in the Structural Discussion section above, the replacement of wood skirting in 2011 to a more tightly spaced system has likely restricted the airflow beneath the boardwalk, thereby allowing moisture to accumulate and restrict structural members' ability to dry over time. Therefore, it is recommended that additional means of ventilation be provided to temporarily alleviate the accumulation of moisture and encourage drying. This may include drilling holes in existing wood skirting, removing select skirting boards, or fully replacing the skirting with a more open system.

We recommend that these short-term recommendations and limitations be implemented immediately and without delay. Failure to do so could result in failure of the structure and could pose a risk to the health and safety of occupants and persons.

6.2.2. Long-term Recommendations:**4. Secondary Elements:****a. Boat launch ramp:**

Localized concrete crack repairs could be completed; however, are not considered required at this time. Future full replacement of the ramp should be considered and included in future MWN capital expenditure planning.

b. Floating dock attachments:

Local repair/maintenance, or replacement, of attachments and bolting hardware is recommended.

5. Main Structural Elements:

a. Steel Sheet Piles:

Continued monitoring of sheet piles and further investigation is recommended.

b. Wood structural elements:

Based on observations and commentary above, the level of wood deterioration throughout the Wharf structure is considered advanced and warrants the full replacement of all structural wood elements (i.e., decking, stringers, cribs, bent arrangements, etc.). New structural elements should consist of new pressure treated lumber, or another form of structural system deemed appropriate by a design professional. The design of the replacement structure shall be designed by a Professional Engineer licensed in the Province of Ontario. If further assessment by the design engineer deems any portions of the existing structure adequate for reuse, localized replacement of wood elements can be undertaken, and existing structure reused. This shall be to the discretion of the design engineer retained by the MWN.

On the basis of our general observations, including perceived variations in structural conditions of the different sections of the Wharf, we recommend the implementation of the following replacement schedule (at a minimum) as of October 1, 2023:

- i. Structural elements from Stations 0 to 134 – full replacement within 3 years.
- ii. Structural elements from Stations 134 to 247 – full replacement within 2 years.
- iii. Structural elements from Stations 247 to 588 – full replacement within 1-2 years.

Should any subsequent yearly structural assessment bring forth evidence that suggest that the perceived conditions of structural elements have worsened, the above noted replacement schedule shall be revised as required to the discretion of the reviewing engineer.

We recommend that these long-term recommendations and limitations be implemented immediately and without delay. Delaying or ignoring these recommendations could compromise the integrity of the structure and endanger the lives and well-being of the occupants and persons.

7. CONCLUSION

In conclusion, the SCA was informative and revealed useful information about the condition of the structure. Varying condition levels were observed, depending on the structural element and area under consideration. The MWN should read this report in detail, as it contains useful information for required maintenance and service life activities.

In general, the Wharf appears to be in fair to poor condition, with conditions appearing to worsen from Section 1 to 3, with select locations showing signs of significant deterioration.

It is strongly recommended that the above noted recommendations and instruction(s) be reviewed in detail and action taken as noted. Failure to implement the recommendations and instruction noted herein could result in structural failure and pose a risk to the life safety of occupants.

Our opinions are based on the information made available to us and on our visual observations during the on-site review. The visual review performed did not include the inaccessible areas of the structure. We request that should any new information pertaining to this matter become available, that we be advised immediately, in order to evaluate this new information in conjunction with the above commentary in the event that our present opinion may be affected.

If you have any questions or require any further information, please do not hesitate to contact the undersigned.

Yours truly,

SUPPA ENGINEERING

Prepared by:



Patrick Rochefort, P.Eng.

Structural Engineer, Structural Division Lead
Suppa Engineering



8. STATEMENT OF QUALIFICATIONS AND LIMITATIONS ON USE

The opinions and recommendations expressed within this report are based solely on our professional opinion of visual observations gathered during the assessment on the dates noted above.

Suppa Engineering accepts no responsibility for any events or changes in conditions that may have occurred since the dates outlined above.

This report has been prepared for the exclusive use of the Client, for the stated purpose, for the named facility. Its discussions and conclusions are summary in nature and cannot be properly used, interpreted, or extended to other purposes without a detailed understanding and discussions with the Client as to its mandated purpose, scope, and limitations. This report was prepared for the sole benefit and use of the Client and may not be used or relied on by any other party without the express written consent of Suppa Engineering.

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Appendix A
Photographs

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos



Photo 1: Aerial image of Minnehaha Bay Wharf (Sturgeon Falls, ON)



Photo 2: East exterior elevation, looking north-west.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**

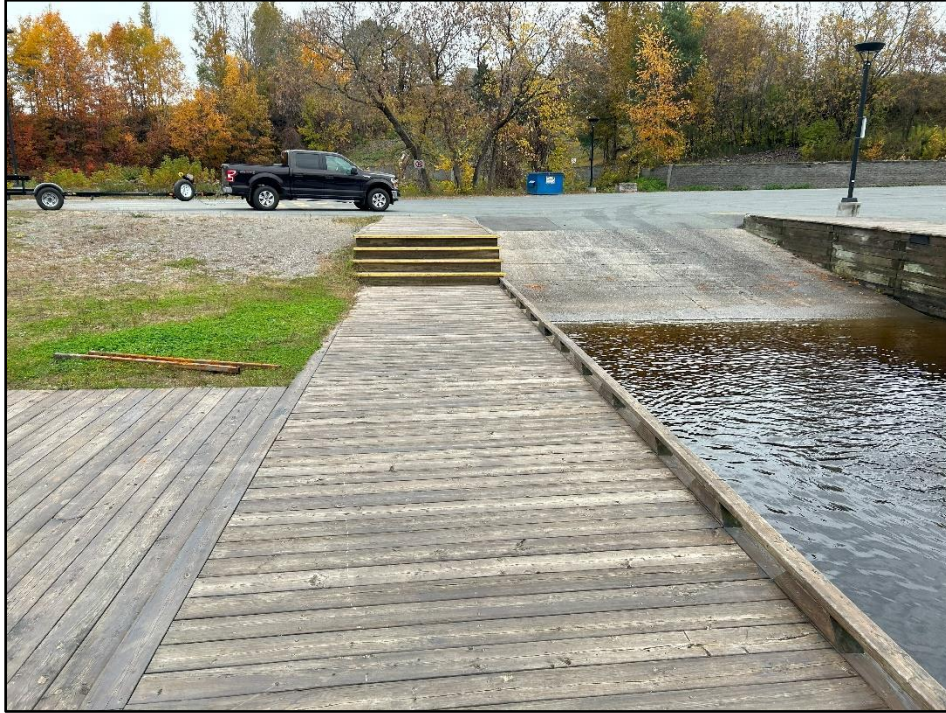


Photo 3: West end decking near boat launch ramp.



Photo 4: West end decking, near boat launch ramp.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 5: West end decking near boat launch ramp.



Photo 6: West end decking near boat launch ramp.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 7: Wood decking near Station 0.



Photo 8: Wood decking near Station 0.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**

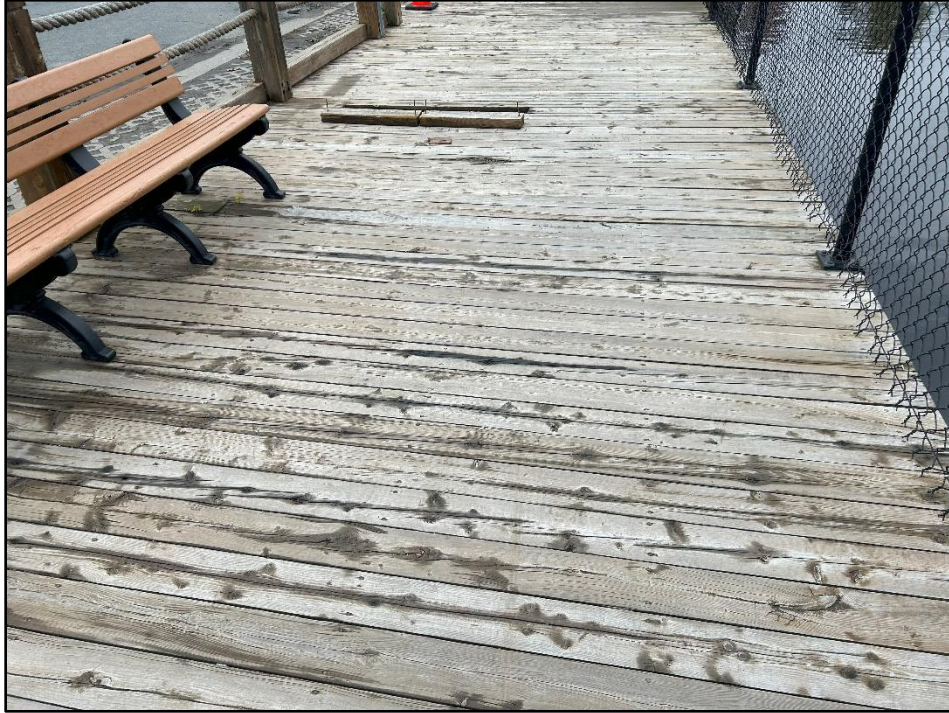


Photo 9: Wood decking, near Station 120.



Photo 10: Wood decking near Station 134.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 11: Wood decking near Station 240.



Photo 12: Wood decking near Station 250.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 13: Wood decking near Station 300.



Photo 14: Wood decking near Station 310.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 15: Wood decking near Station 445.



Photo 16: Wood decking near Station 515.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos

WOOD
SKIRTING.

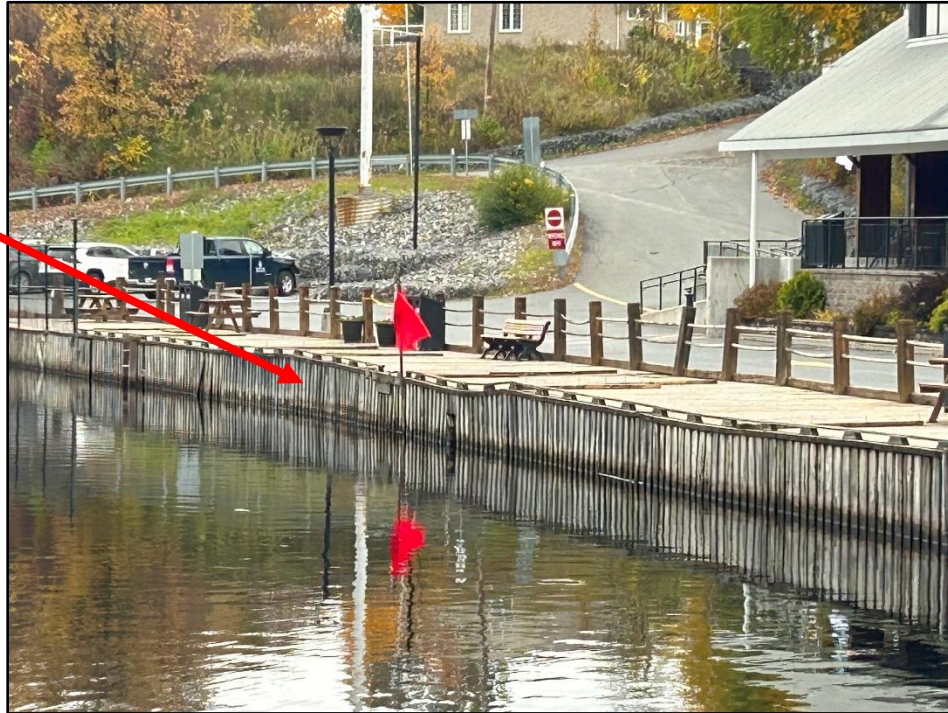


Photo 17: General view of wood skirting (looking north).



Photo 18: General view of boat launch concrete ramp.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos

CLOSED-FACE
SIDE WALL CRIBS

TRANSVERSE
CRACKS.



Photo 19: General view of boat launch concrete ramp.

CLOSED-FACE
SIDE WALL CRIBS



Photo 20: General view of boat launch side wall cribs.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos

DRAINAGE
PAVERS.



Photo 21: Pooling water on drainage pavers.



Photo 22: General soil movement at drainage pavers.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos



Photo 23: General soil movement at drainage pavers.

POTENTIAL
SINK HOLE
FORMATION.



Photo 24: General soil movement at drainage pavers.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 25: General soil movement at drainage pavers near east end stair adjacent of gas pump.



Photo 26: General stringer condition near west end.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 27: General stringer condition near west end.



Photo 28: General stringer and crib condition near Station 134.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 29: General stringer condition near Station 247.



Photo 30: General stringer condition near Station 247.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 31: General stringer condition near Station 255.



Photo 32: General stringer condition near Station 255.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos

SECTION LOSS



Photo 33: General stringer condition near Station 350.



Photo 34: General stringer condition near Station 350.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 35: General stringer condition near Station 350.



Photo 36: General stringer condition near Station 515.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos

2-1/4" KNIFE.



Photo 37: General stringer condition near Station 515.



Photo 38: General cribbing condition near west end.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 39: General cribbing condition near Station 134.



Photo 40: General cribbing condition near Station 150.

**22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos**



Photo 40: General wood bent pier and header attachment.



Photo 41: General wood bent pier and header attachment.

22-100 – Minnehaha Bay Wharf (Sturgeon Falls, ON) – SCA
Appendix A – Photos



Photo 42: General sheet pile.

Appendix B
Soderholm Maritime Inc Inspection Report
(video link at end)



41 FIMA CRESCENT, TORONTO ONT. M8W 3R1

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www.SMSI-CANADA.com

DIVERS' INSPECTION REPORT

STRUCTURE: Boardwalk Sub Structure

LOCATION: Minnehaha Bay Marina
Sturgeon Falls Ontario

CLIENT: The Corporation of the Township of West Nipissing

DATE: 20 October 2023

PREPARED BY: Paul Coulombe
pcoulombe@smsi-canada.com

SCOPE

Assist SUPPA Engineering a preliminary conditions assessment of the boardwalk support structure, by providing underwater services.

METHOD

A four person dive crew working in compliance with Ontario Regulation 629/94 carried out a visual observation of the wood structure underwater beneath the boardwalk. Testing was non-destructive and consisted of manually probing with an awl and reporting comparatively. The inspecting/probing/reporting process was recorded.

CHAINAGE LAY OUT

Station 0 was set at the East side of the boat launch, and flows East and then South. Chainages are in feet. The very South end of the boardwalk is Station 588. The inspection ends at Station 563.

DESCRIPTIONS

Cribs: The majority of the boardwalk sits atop rock filled open faced cribs. However there are some open spaces between the cribs that the board walk spans. The cribbed section ends at Station 446.

Spans: There are 10 spans between crib sections. 8 of them are single spans, 2 of them are double spans. Locations are detailed below.

Bents: From Station 446 to the end, the boardwalk sits atop round timber piles. Every row of piles joined by a header beam is a bent. Each bent has 3 to 4 piles. The first 3 bents consist of four piles and a header only. The fourth bent has no header. The rest of the bents support a timber mat and a thin layer of ballast rock above water, underneath the boardwalk.

Ballast Mats: From the 5th bent on, a timber floor supports ballast rock above the water line.

Skirting: Above the waterline, the entirety of the offshore structure is skirted with vertical boards. Below water the depth of the skirting varies along the structure. From Station 17 to Station 134, the skirting extends all of the way to the river bottom, which obscures the visual observation of the cribbing along that stretch.

Closed Faced Crib: The only closed faced cribbing in the structure are the two walls lining the boat launch.

Transitions: There are two triangle shaped transitions softening the corners between crib sections. These transitions are constructed in the same manner as the spans. Locations are Stations 8 to 17, and 134 to 143.

Docks: There are 6 dock connections along the board walk. From West to East, there are two boat launch docks, then there are three mooring docks (A thru C), then there is the fuel dock. The connection points for these docks are included in this report.

Dry Hydrants: There are two dry hydrants for emergency fire connection incorporated in the structure. Locations are Stations 239 and 500.

Sheet Pile: Steel sheet pile is visible retaining the parking lot earth at the back of the open spans. In some locations, older timber board piling is still present in front of the steel sheet pile.

Outfalls: One outfall exists, in a span, ending before the skirting. Location 280.

Bottom Crib: A lower course of cribs exist of noticeably different material from the upper cribs, in that the bottom cribs are constructed of round timber, while the upper cribs are constructed of squared timber. In the area along the coffee house building, there are bottom cribs present underneath the spans. Location from Stations 247 thru 446.

Divers' Video: The diver's video flows from West to East, and starts before Station 0 at the West tip of the board walk, before the West side of the boat launch.

STATION LOG / VIDEO LOG

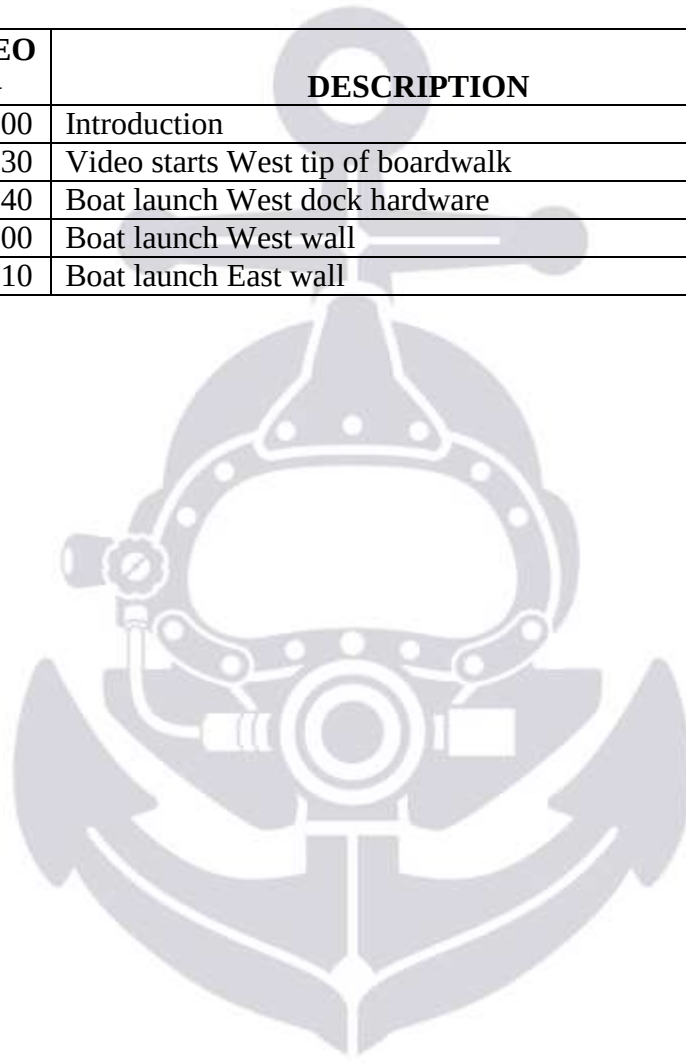
Station Location Measured in feet, starting from the East side of the boat launch

Video Log Time stamp on the divers' video, in hours : minutes : seconds

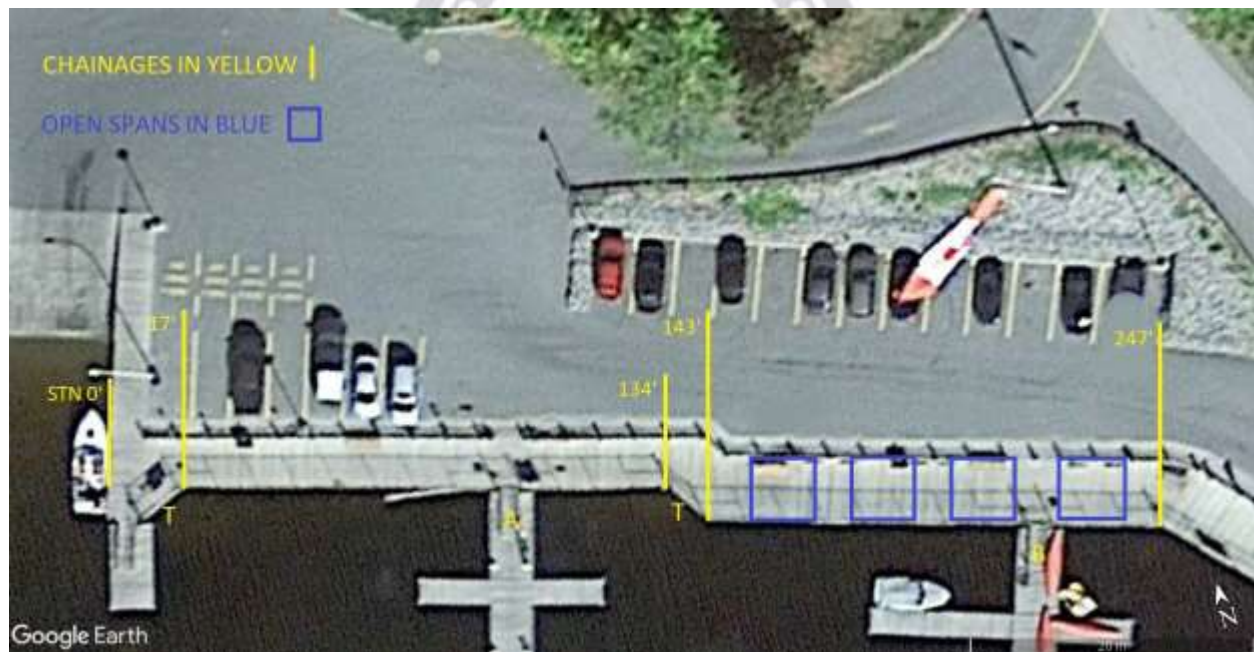
Description Description

Distance in feet Length of the described area in feet

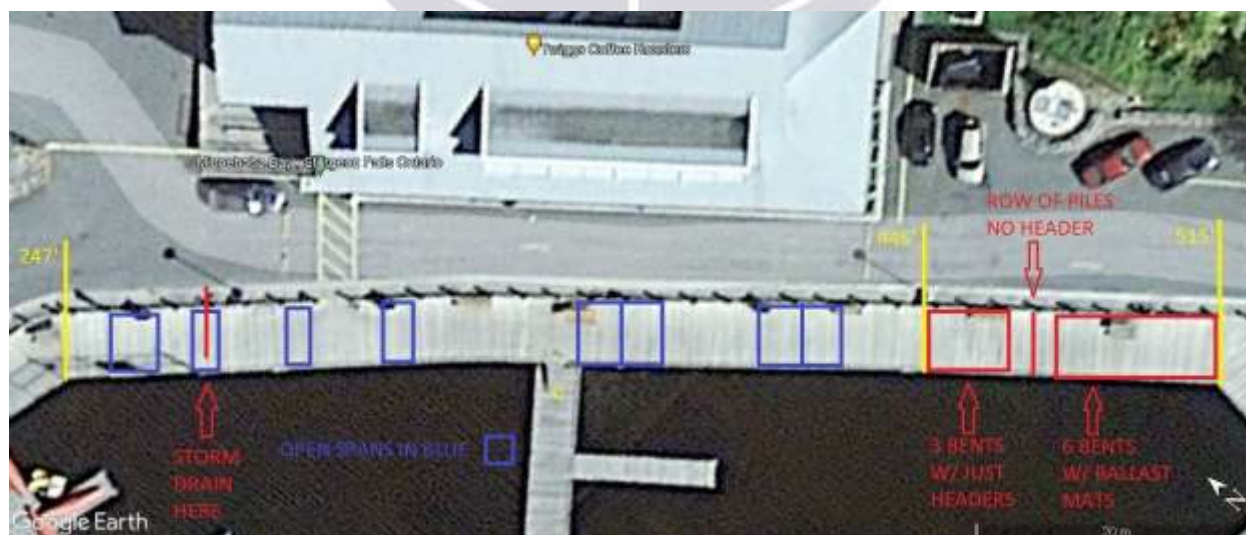
LOCATION STATION	VIDEO LOG	DESCRIPTION	DISTANCE IN FEET
	0:00:00	Introduction	
	0:00:30	Video starts West tip of boardwalk	
	0:06:40	Boat launch West dock hardware	
	0:08:00	Boat launch West wall	
	0:11:10	Boat launch East wall	



LOCATION STATION	VIDEO LOG	DESCRIPTION	DISTANCE IN FEET
0 to 8	0:13:35	Boat launch East dock hardware	
8 to 17	0:15:25	Transition	
17 to 134	0:17:05	Crib obscured by full height skirting	117
93 to 98	0:23:15	A Dock hardware	
134 to 143	0:25:25	Transition	
143 to 153	0:26:20	Crib	
153 to 167	0:34:00	Open span	14
167 to 176	0:43:35	Crib	7
176 to 192	0:56:40	Open span	16
192 to 200	1:04:35	Crib	8
200 to 216	1:09:00	Open span	16
216 to 224	1:11:50	Crib	8
217 to 223	1:15:40	B Dock hardware	
224 to 239	1:19:15	Open span	15
239	1:22:00	Dry hydrant – 8' PVC pipe transitions to stainless steel – intact and clear	
239 to 247	1:23:25	Crib	8
247	1:24:25	Bent in wall to older section	



LOCATION STATION	VIDEO LOG	DESCRIPTION	DISTANCE IN FEET
247 to 256	1:24:45	Crib	9
256 to 268	1:26:20	Open span with bottom crib	12
268 to 276	1:31:00	Crib	8
276 to 283	1:33:30	Open span with bottom crib	7
279	1:36:25	Outfall – 6” PVC pipe - intact and clear	
283 to 299	1:38:20	Crib	16
299 to 305	1:41:10	Open span with bottom crib	6
305 to 321	1:43:20	Crib	16
321 to 329	1:45:40	Open span with bottom crib	8
329 to 366	1:47:50	Crib	37
358 to 364	1:53:00	C dock hardware	
366 to 385	1:54:40	Double open span – with center header broken and fallen away	19
385 to 407	2:04:00	Crib	22
407 to 422	2:08:30	Double open span – with center header intact	15
422 to 446	2:11:20	Crib	14
446	2:15:10	End of cribbed section, start of piled section	
446 to 515	2:16:30 2:24:40 2:32:05 2:43:30 2:47:00 2:53:15 2:56:55 3:00:45 3:08:10 3:13:50	Piled section – South of coffee house 1 st bent – header thru bolted type 4 piles 2 nd bent – header thru bolted type 4 piles 3 rd bent – header thru bolted type 4 piles 4 th bent – no header 3 piles 5 th bent – header on top type w/ ballast mat 3 piles 6 th bent – header on top type w/ ballast mat 3 piles 7 th bent – header on top type w/ ballast mat 2 piles 8 th bent – header on top type w/ ballast mat 4 piles 9 th bent – header on top type w/ ballast mat 4 piles 10 th bent – header on top type w/ ballast mat 3 piles	69
500	3:02:45	Dry hydrant – 8’ PVC pipe transitions to stainless steel – intact and clear	



LOCATION STATION	VIDEO LOG	DESCRIPTION	DISTANCE IN FEET
515	3:19:30	Bend in wall 3 additional piles in triangle shape under boardwalk	
515 to 563	3:22:00 3:25:50 3:29:25 3:32:10 3:37:35 3:40:35	Piled section – fuel dock stretch 1 st bent – header on top type w/ ballast mat 3 piles 2 nd bent – header on top type w/ ballast mat 4 piles 3 rd bent – header on top type w/ ballast mat 4 piles 4 th bent – header on top type w/ ballast mat 3 piles 5 th bent – header on top type w/ ballast mat 3 piles 6 th bent – too shallow for the diver past the 1 st pile	48
548 to 553	3:35:40	Fuel dock hardware	
563	3:41:50	End of inspection area	
588		End of boardwalk	



PILES

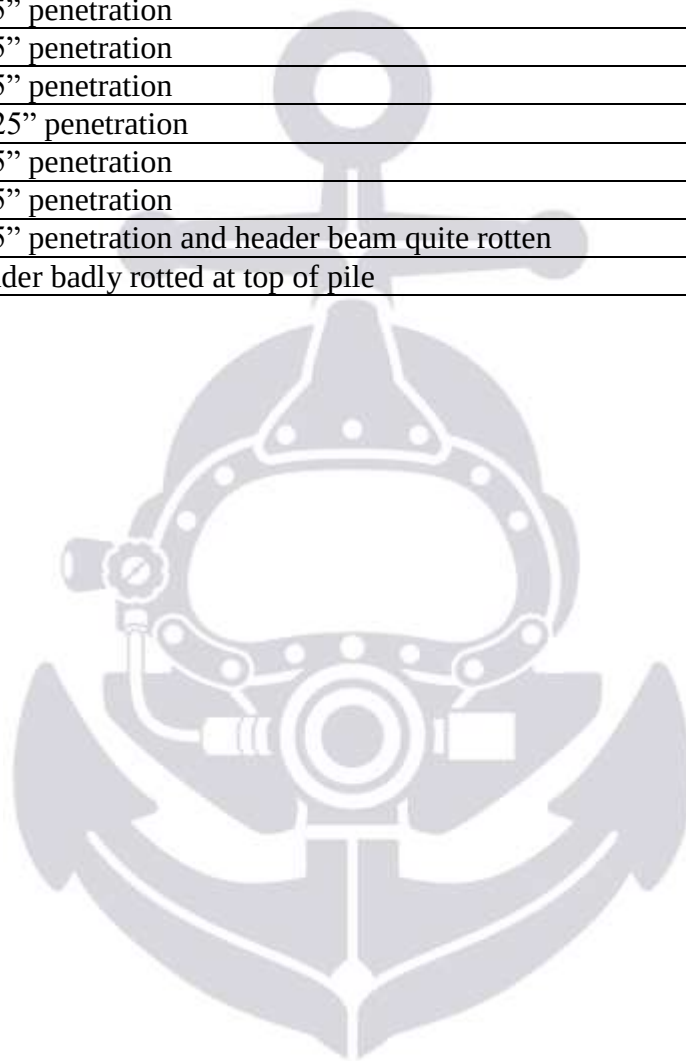
Section from Stations 446' to 515'

- Piles are numbered backwards on the 2nd bent.
- “Penetration” refers to depth an awl penetrated the wood with manual effort, speaking to the softness of the wood.
- The headers of Bents 1 thru 3 consist of two stingers bolted thru the piles. All weight bears on the thru bolts, and the deteriorated wood of the pile tops.
- Bent 4 has no header, and the tops of the piles are below water.
- The headers of bents 5 thru 10 sit on top of the piles, and the timber mats and ballast rock on top of that.



BENT	PILE	OBSERVATIONS
1	1	1" penetration above water line, 0.5" penetration below water line Has metal jacket, top replaced in previous repair
	2	0.75" penetration above water line, 0.25" penetration below water line
	3	0.75" penetration above water line and split, 0.75" penetration below water line
	4	Has been replaced with a square timber
2	5	Top is completely gone, 3/4" penetration below water line
	6	Top is completely gone, 3/4" penetration below water line
	7	Above water pile is no good, below water is typical
	8	Has metal jacket, top replaced in previous repair
3	9	Has metal jacket, top replaced in previous repair, new piece is no good
	10	Has metal jacket, top replaced in previous repair
	11	No good at top, 0.75" penetration below water line
	12	Rotted away above water, and tipped away and out of line of header
4	13	Top of pile is below water, no header. 0.75" penetration below water line
	14	Top of pile is below water, no header. 0.75" penetration below water line
	15	Top of pile is below water, no header. 0.25" penetration below water line
5	16	0.25" penetration, very misaligned. Has correcting block for misalignment
	17	0.25" penetration, very misaligned
	18	0.25" penetration, very misaligned

6	19	0.75" penetration
	20	0.75" penetration
	21	0.25" penetration
7	22	0.125" penetration
	23	0.125" penetration but badly split
8	24	0.25" penetration and badly split
	25	0.25" penetration and some splitting
	26	0.25" penetration
	27	0.25" penetration
9	28	0.25" penetration
	29	0.75" penetration
	30	0.125" penetration
	31	0.25" penetration
10	32	0.25" penetration
	33	0.25" penetration and header beam quite rotten
	34	Header badly rotted at top of pile



PILES

Section from Stations 515' to 563'

- Piles 35 to 37 form the triangle at the corner.
- Piles marked X were identified as present but unreachable by the diver.
- “Penetration” refers to depth an awl penetrated the wood with manual effort, speaking to the softness of the wood.
- The headers of bents 1 thru 6 sit on top of the piles, and the timber mats and ballast rock on top of that.



BENT	PILE	OBSERVATIONS
	35	0.25" penetration and very split
	36	0.125" penetration
	37	0.25" penetration and very split
1	38	0.125" penetration
	39	0.25" penetration and bearing flat
	40	0.25" penetration, leaning quite a bit and not bearing flat
2	41	0.75" penetration, soft and splintered
	42	0.25" penetration, splitting, misaligned, and not bearing flat
	43	0.25" penetration, 50% misaligned and not bearing flat
3	44	0.25" penetration, multiple splits
	45	0.75" penetration, soft and split
	46	0.25" penetration, some splitting and not bearing flat
4	47	0.25" penetration and split apart, no good
	48	0.75" penetration, splitting and misalignment
	49	0.25" penetration, not bearing flat, can see center pin (first evidence of pinning)
5	50	0.75" penetration, split and chunk missing
	51	0.75" penetration, split and on an angle
6	52	0.75" penetration

DOCK HARDWARE

West boat launch	1 very loose bracket, lag bolts pulling out
East boat launch	1 slightly loose bracket, lag bolts intact
A Dock	Intact
B Dock	Intact
C Dock	Intact
Fuel Dock	1 very loose bracket, wood missing



DIVERS' VIDEOS

Hyperlinks to the divers' videos are below.

[SMSI Video 4730 Minnehaha Bay Marina 20 Oct 2023 223 min](#)

[Excerpts 4730 Dry Hydrants at Minnehaha Bay West Nipissing 20 Oct 2023](#)

Appendix C
HISTORIC PHOTOS















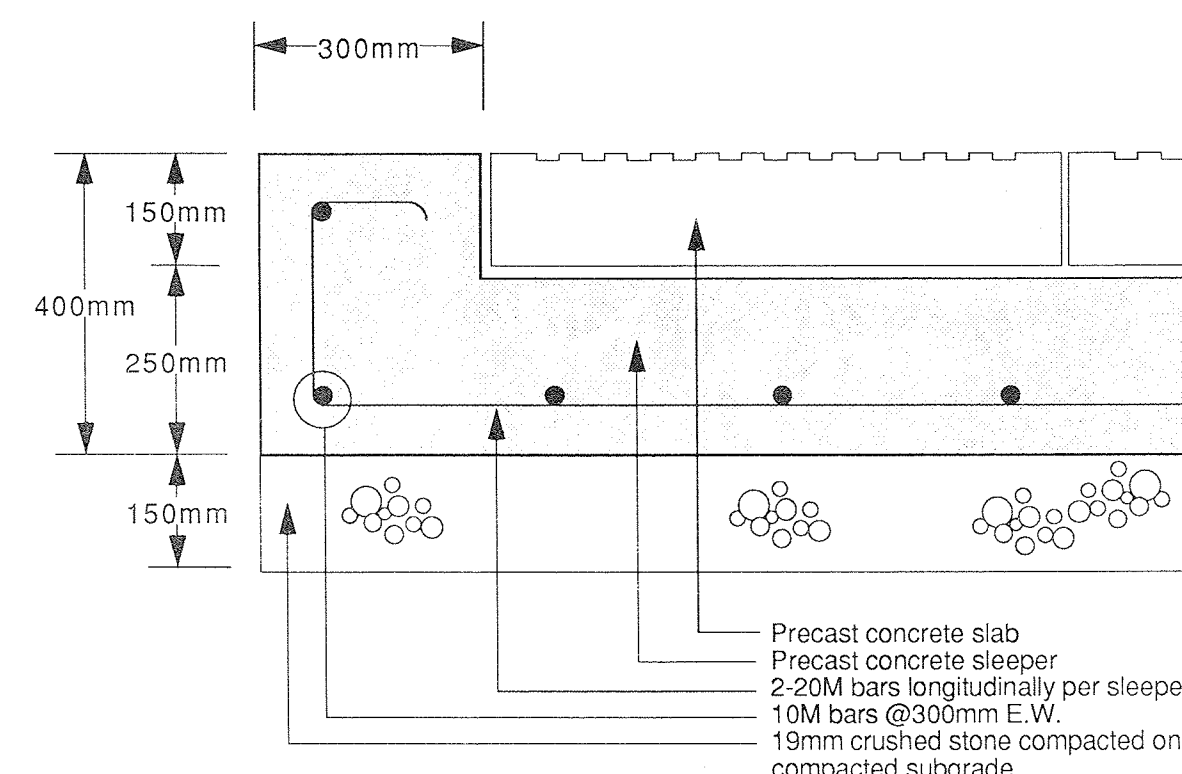
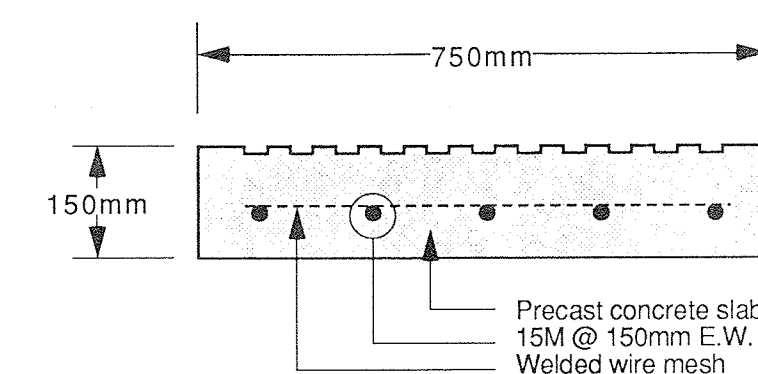
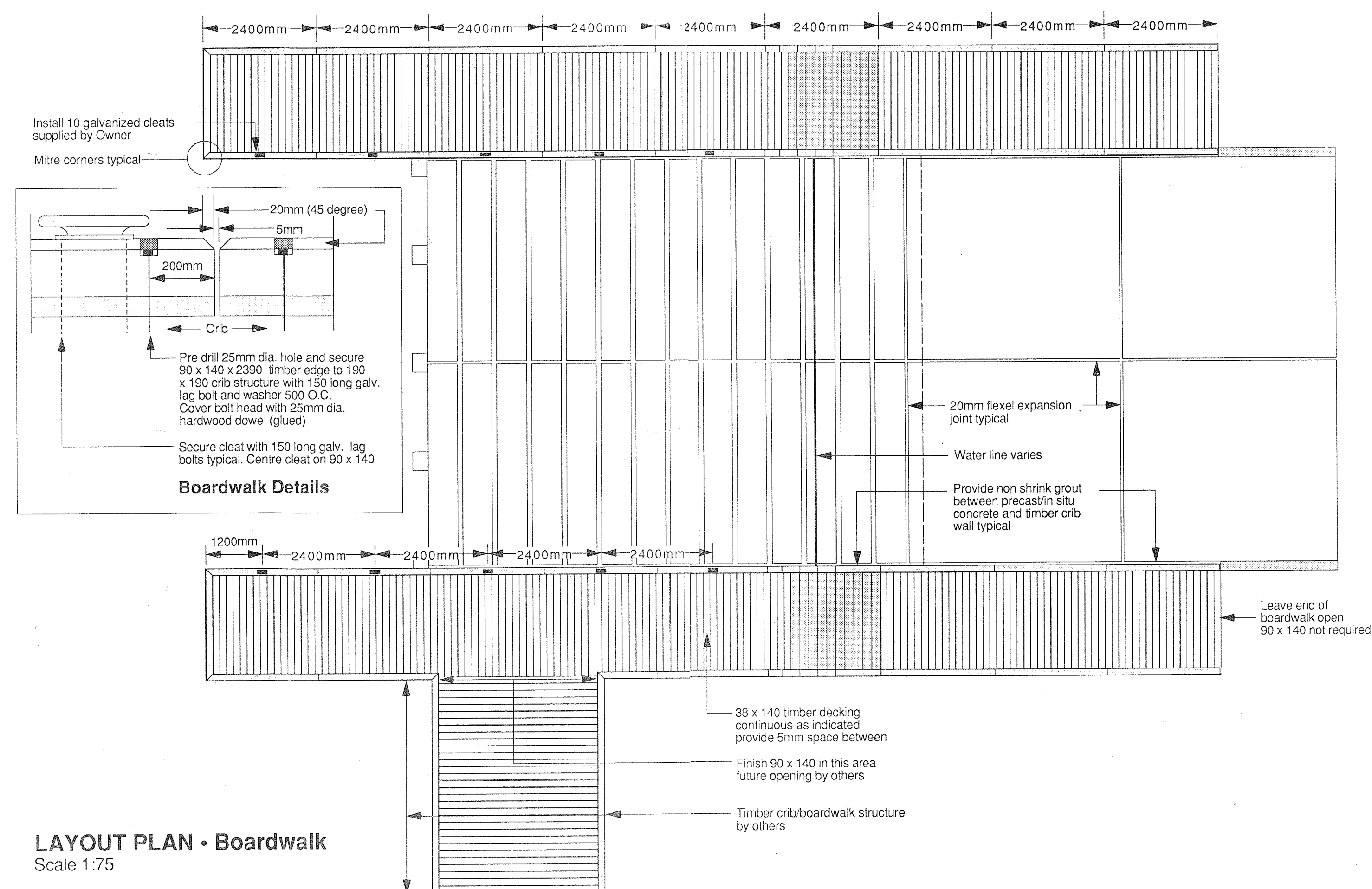
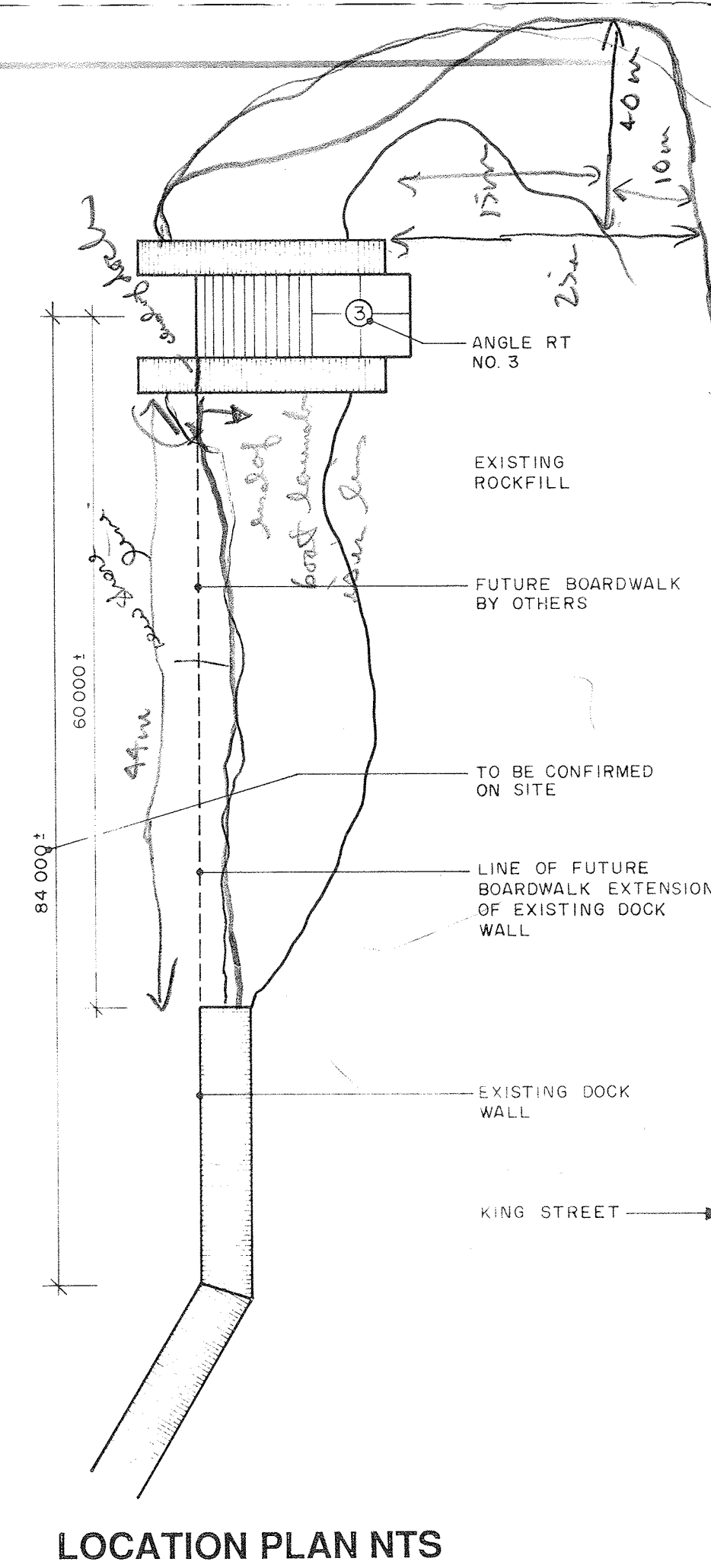
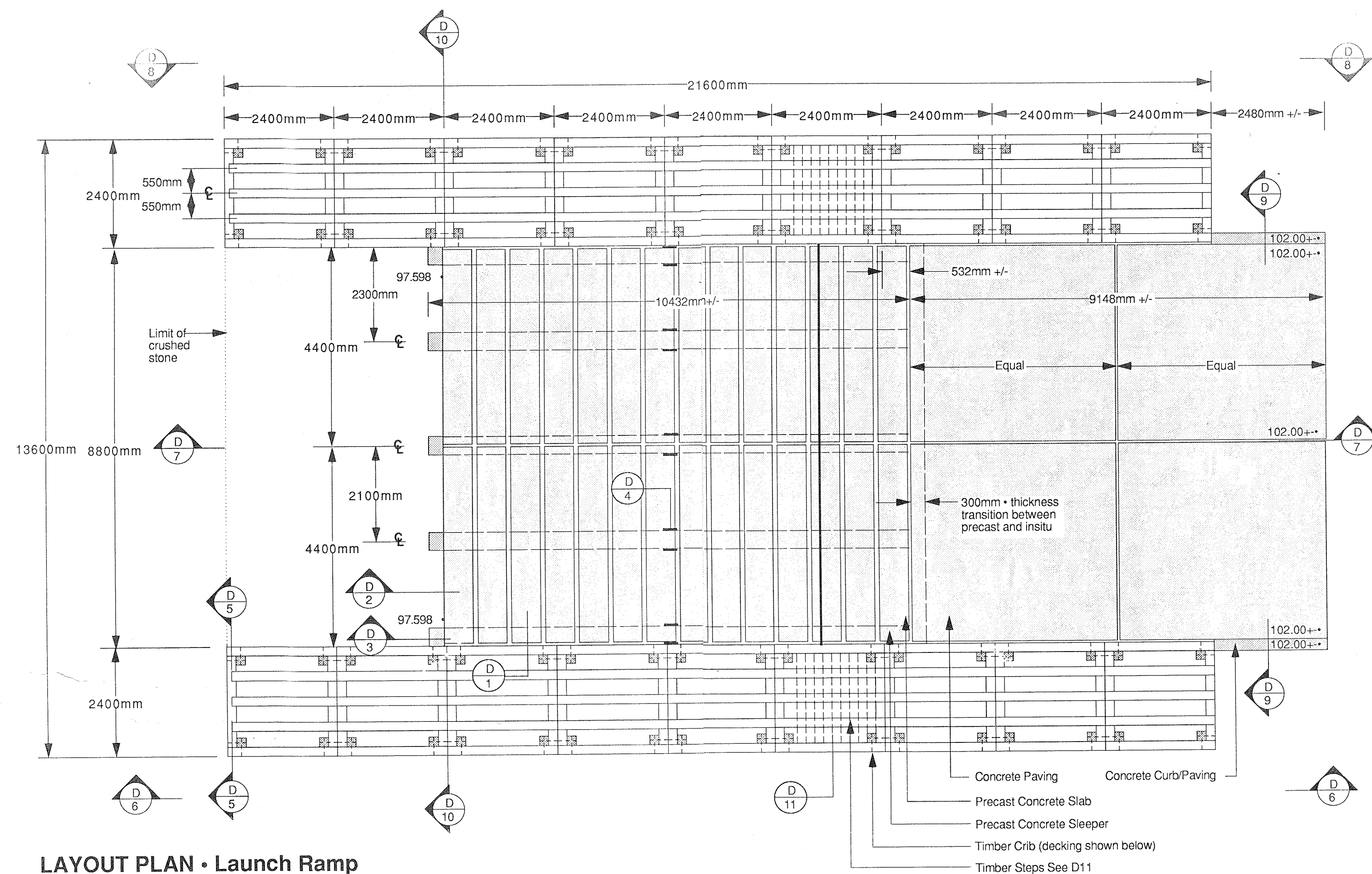








Appendix D
EXISTING DRAWINGS



REVISIONS

NO	DATE	BY	DESCRIPTION

NOTES:

Contractor to visit site to obtain exact knowledge of existing site conditions before submitting tender.

Rock fill work within area of the launch ramp construction will be ongoing by others.

Location plan indicates the launch ramp in approximate dimensions. Actual location will be field confirmed by the Owner.

Existing elevations based upon survey information prepared by A.C. Osburne Ontario Land Surveyor, North Bay, Ontario. Existing dock elevation 101.065 provides main reference point for new launch ramp construction. Confirm all dimensions and grades with the Owner prior to beginning construction.

Rock fill indicated on the drawings is to match existing rock fill prepared by the Town of Sturgeon Falls. Approval for alternate sources of material must be approved by the Owner.

Galvanized cleats will be provided by the Owner. It is the responsibility of this contract to install cleats as per the drawings.

PROJECT TITLE

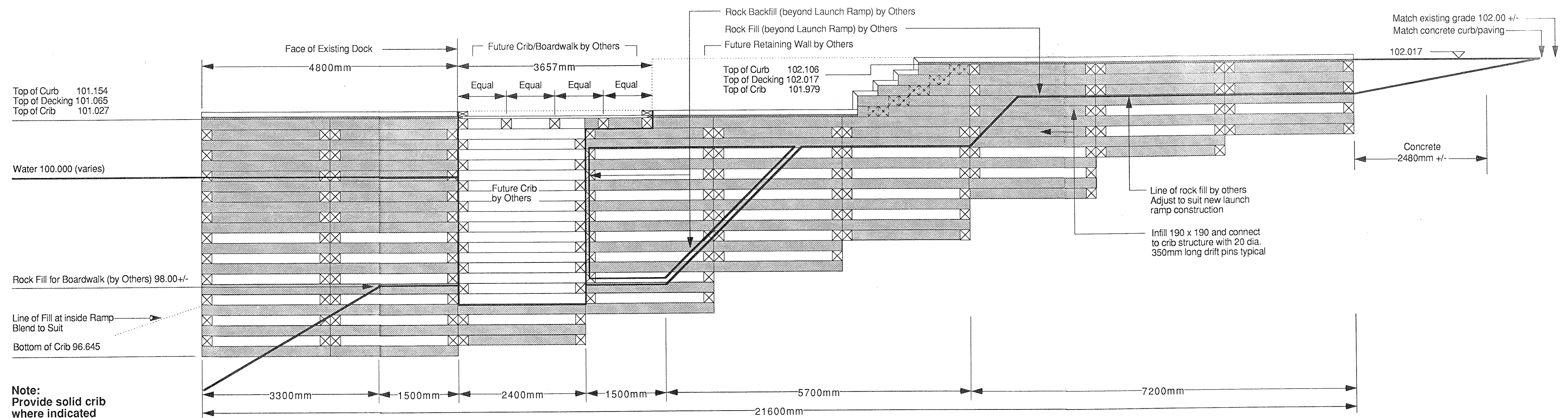
STURGEON FALLS LAUNCH RAMP

DRAWING TITLE

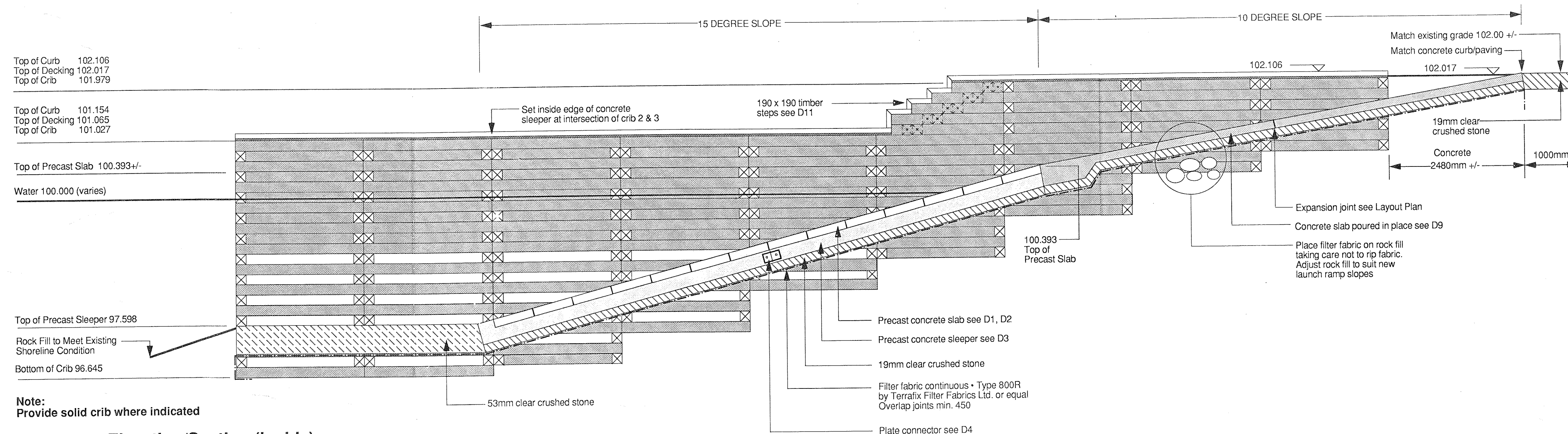
MISCELLANEOUS DETAILS

MOORE/GEORGE ASSOCIATES INC.
site planners • landscape architects • recreation planners
119 SPADINA AVENUE, SUITE 704, TORONTO, ONTARIO, M5V 2L1, 340-2466

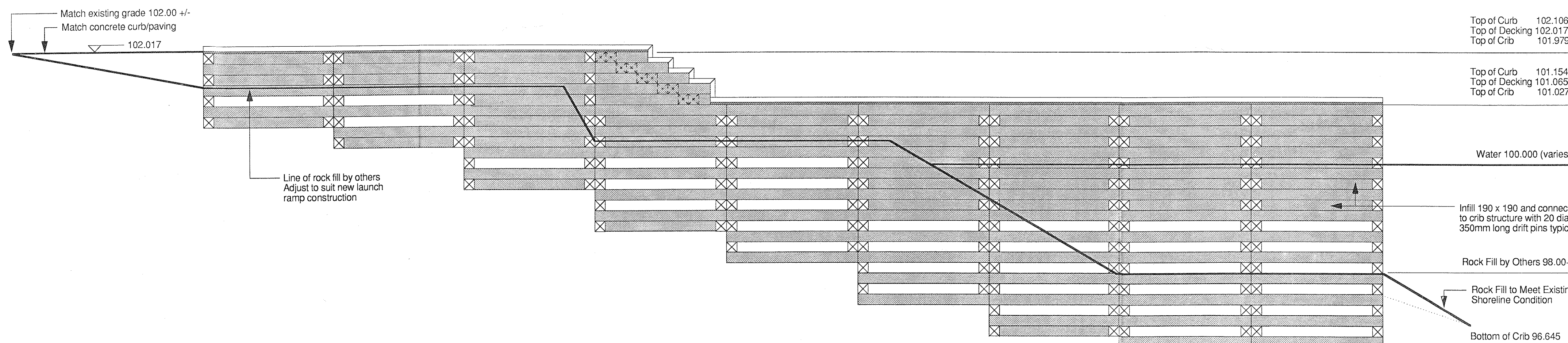
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CHECKED BY	JG	
APPROVED BY	JG	
DATE APPROVED	DEC. 8, 1988	DRAWING NUMBER
PRINT STATUS		
SCALE	AS SHOWN	



**DETAIL 6 • Elevation/Section
Crib & Future Boardwalk (Outside)**
Scale 1:50



DETAIL 7 • Elevation/Section (Inside)
Scale 1:50



DETAIL 8 • Elevation/Section (Outside)
Scale 1:50

REVISIONS

NO	DATE	BY	DESCRIPTION

NOTES:

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PROJECT TITLE

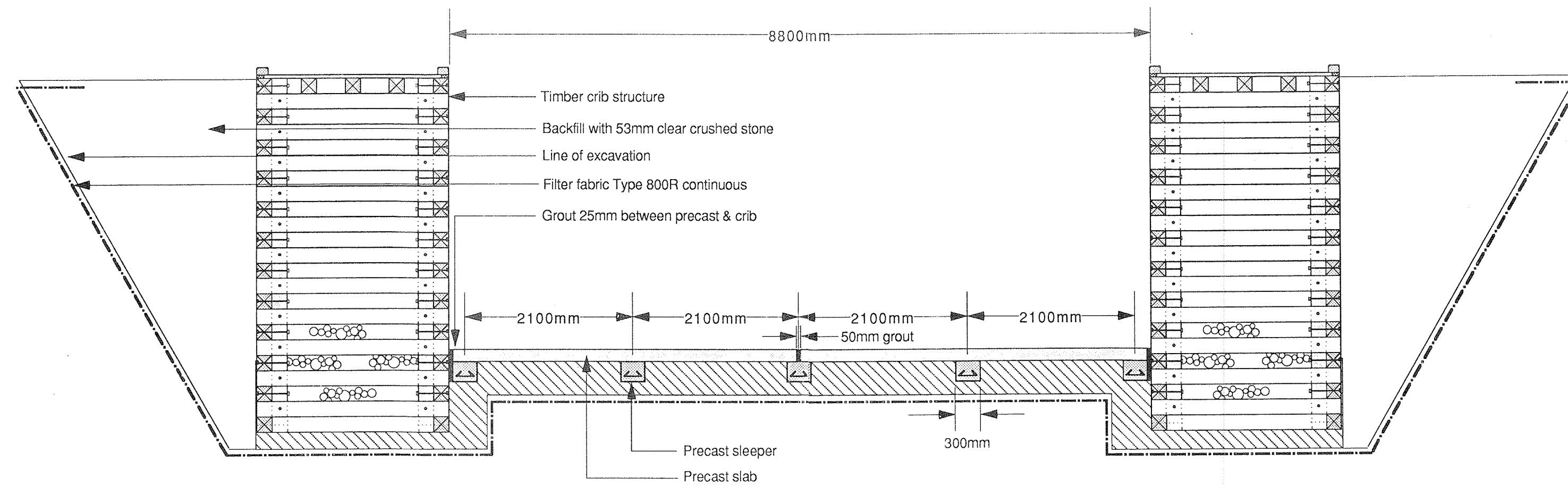
STURGEON FALLS LAUNCH RAMP

DRAWING TITLE

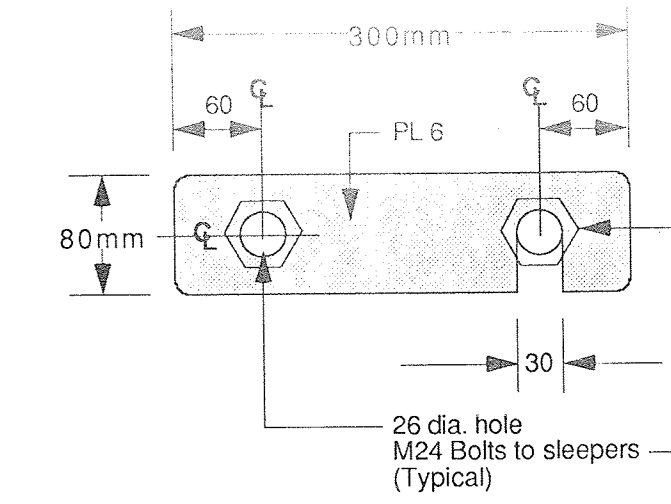
MISCELLANEOUS DETAILS

MOORE/GEORGE ASSOCIATES INC.
site planners • landscape architects • recreation planners
119 SPADINA AVENUE, SUITE 704, TORONTO, ONTARIO, M5V 2L1, 340-2466

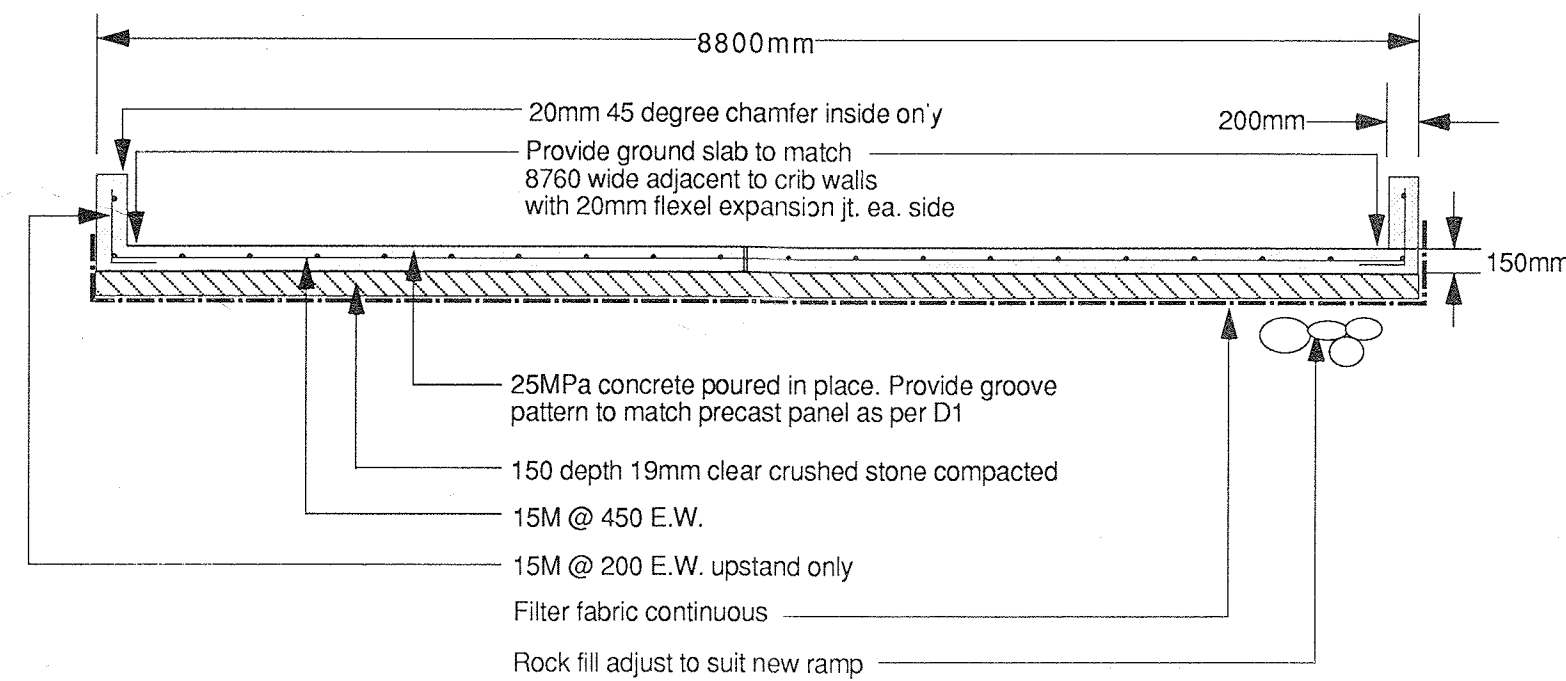
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APPROVED BY	JG	
DATE APPROVED	DEC. 8, 1988	DRAWING NUMBER
PRINT STATUS		
SCALE	AS SHOWN	L2



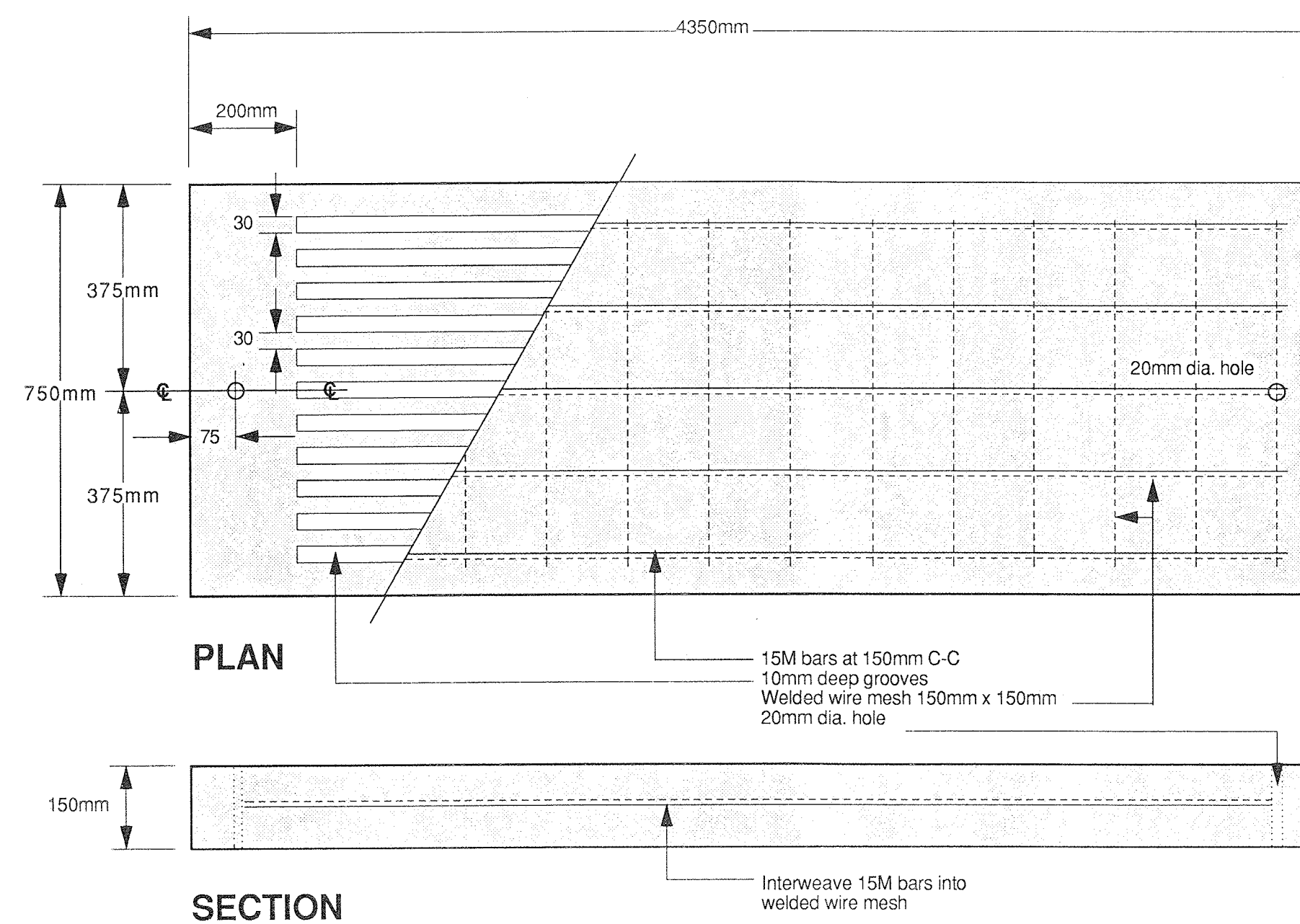
DETAIL 10 • Timber Crib & Ramp Section
Scale 1:50



DETAIL 4 • Plate Connector Detail
Scale 1:5

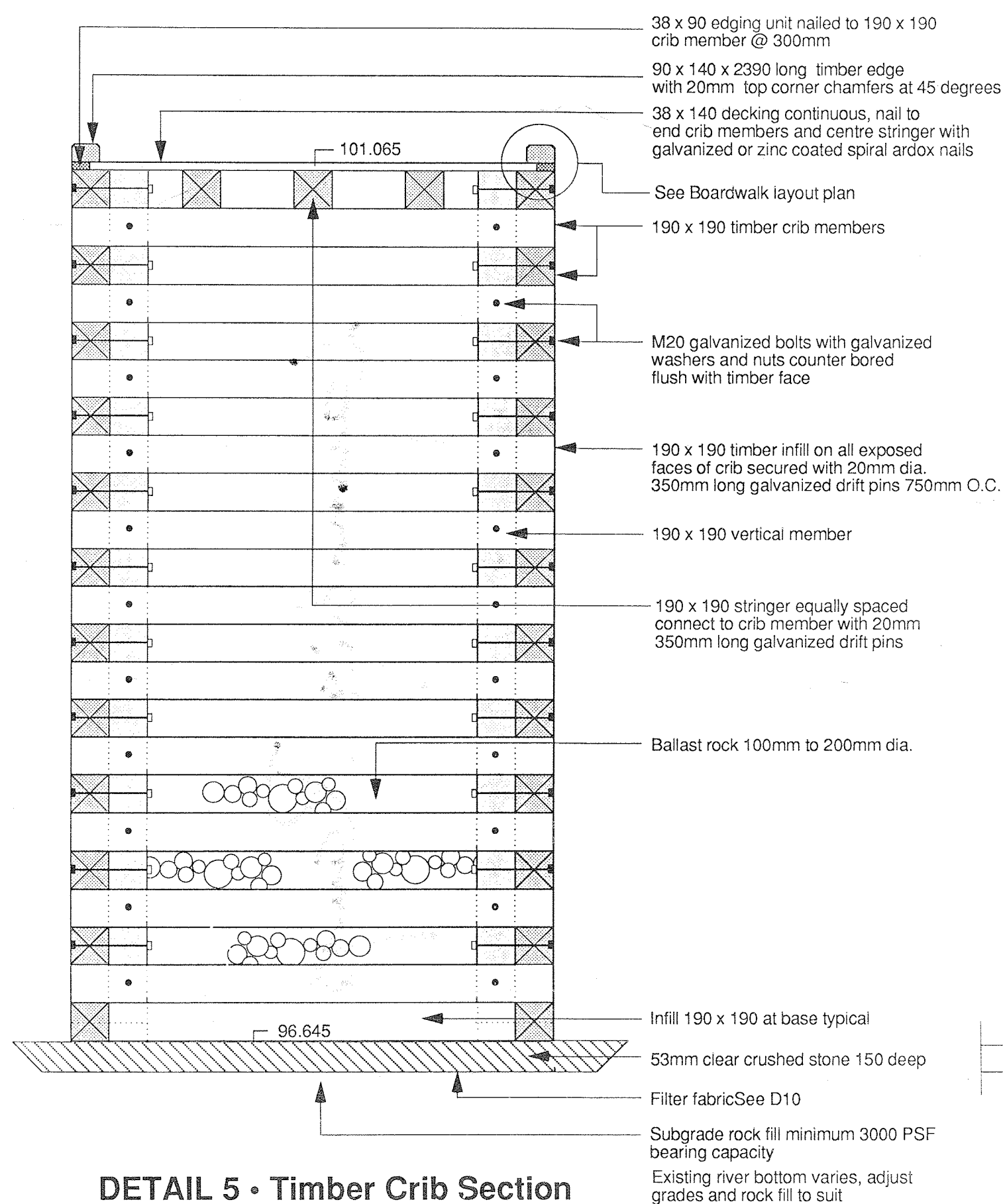


DETAIL 9 • Section Poured in Place Concrete Curb/Ramp
Scale 1:50

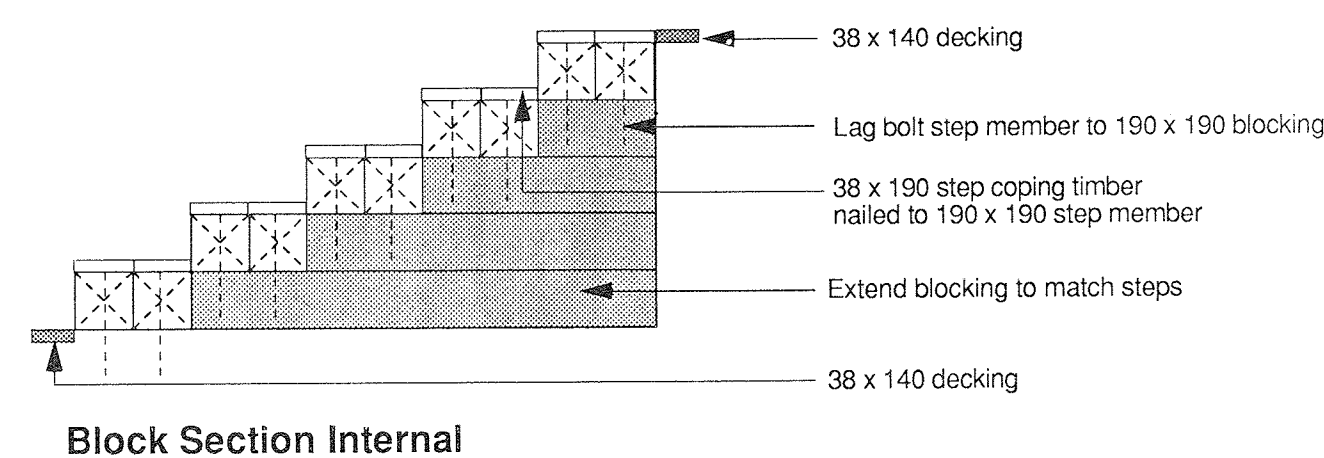


SECTION

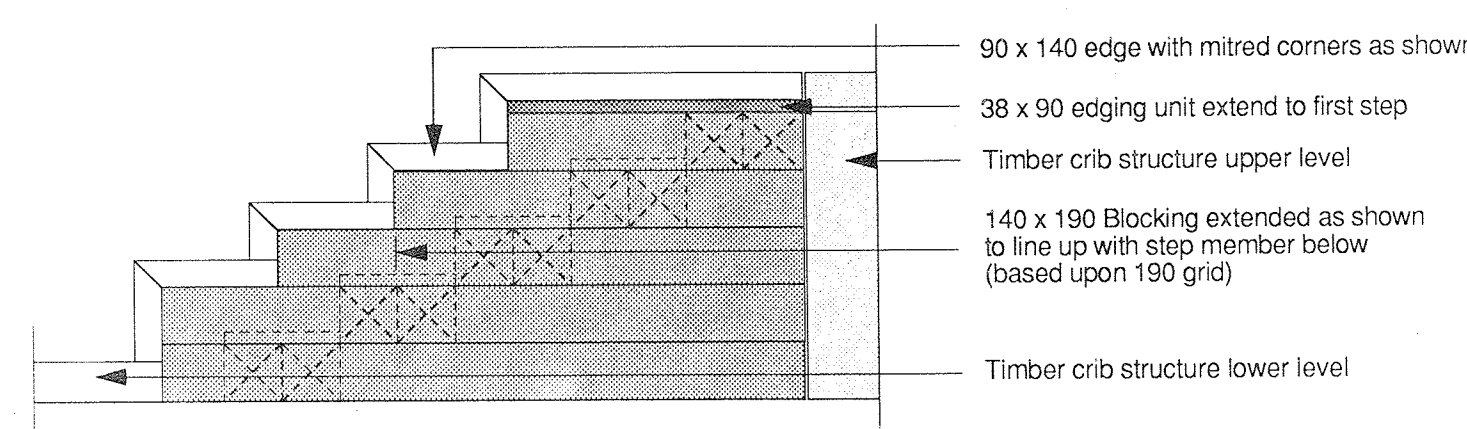
DETAIL 1 • Precast Concrete Slab
Scale 1:10



DETAIL 5 • Timber Crib Section
Scale 1:25

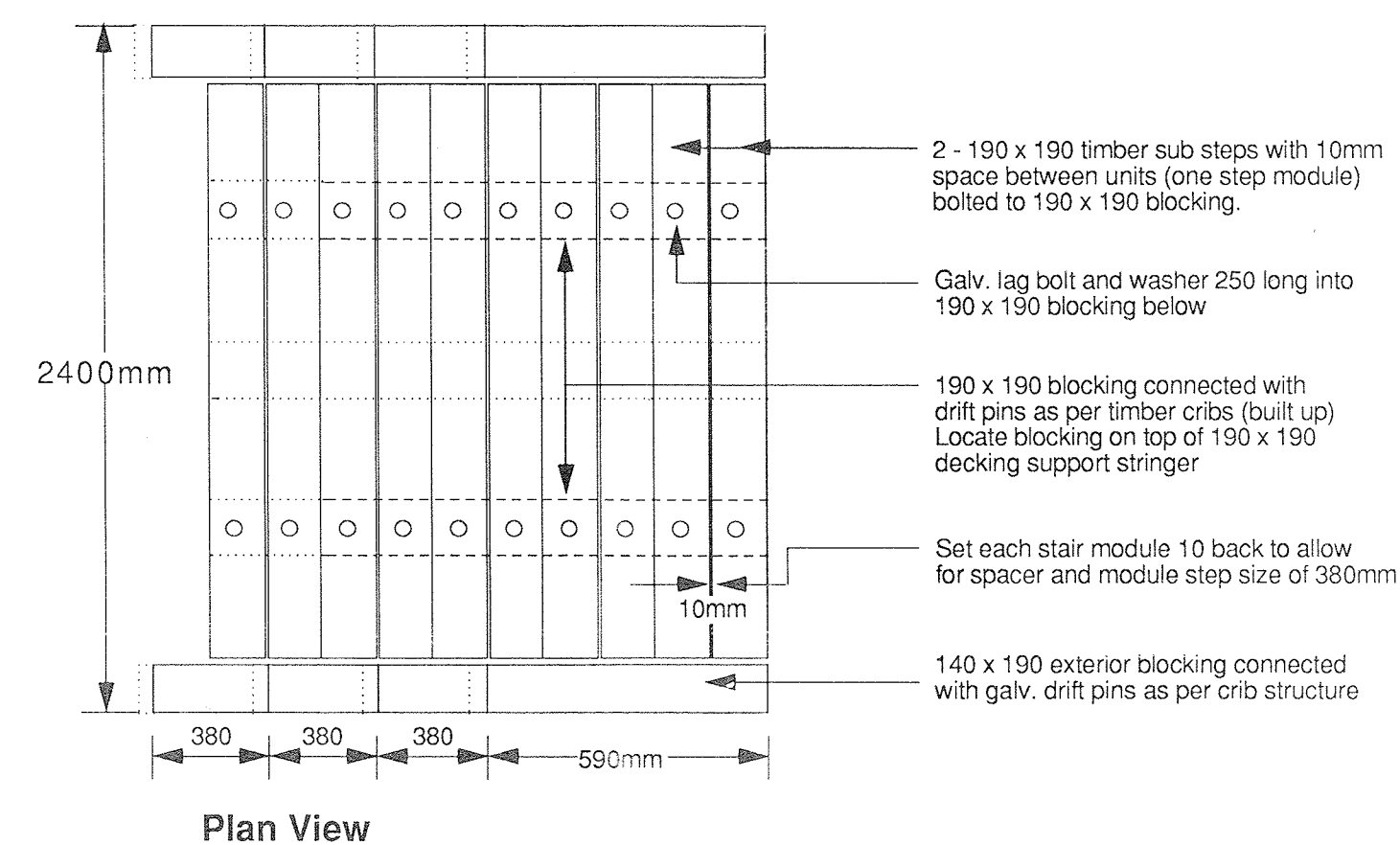


Block Section Internal



Exterior Elevation

DETAIL 9 • Timber Step Details
Scale 1:25



Plan View

NOTES:

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Galvanized cleats will be provided by the Owner. It is the responsibility of this contract to install cleats as per the drawings.

PROJECT TITLE

STURGEON FALLS LAUNCH RAMP

DRAWING TITLE

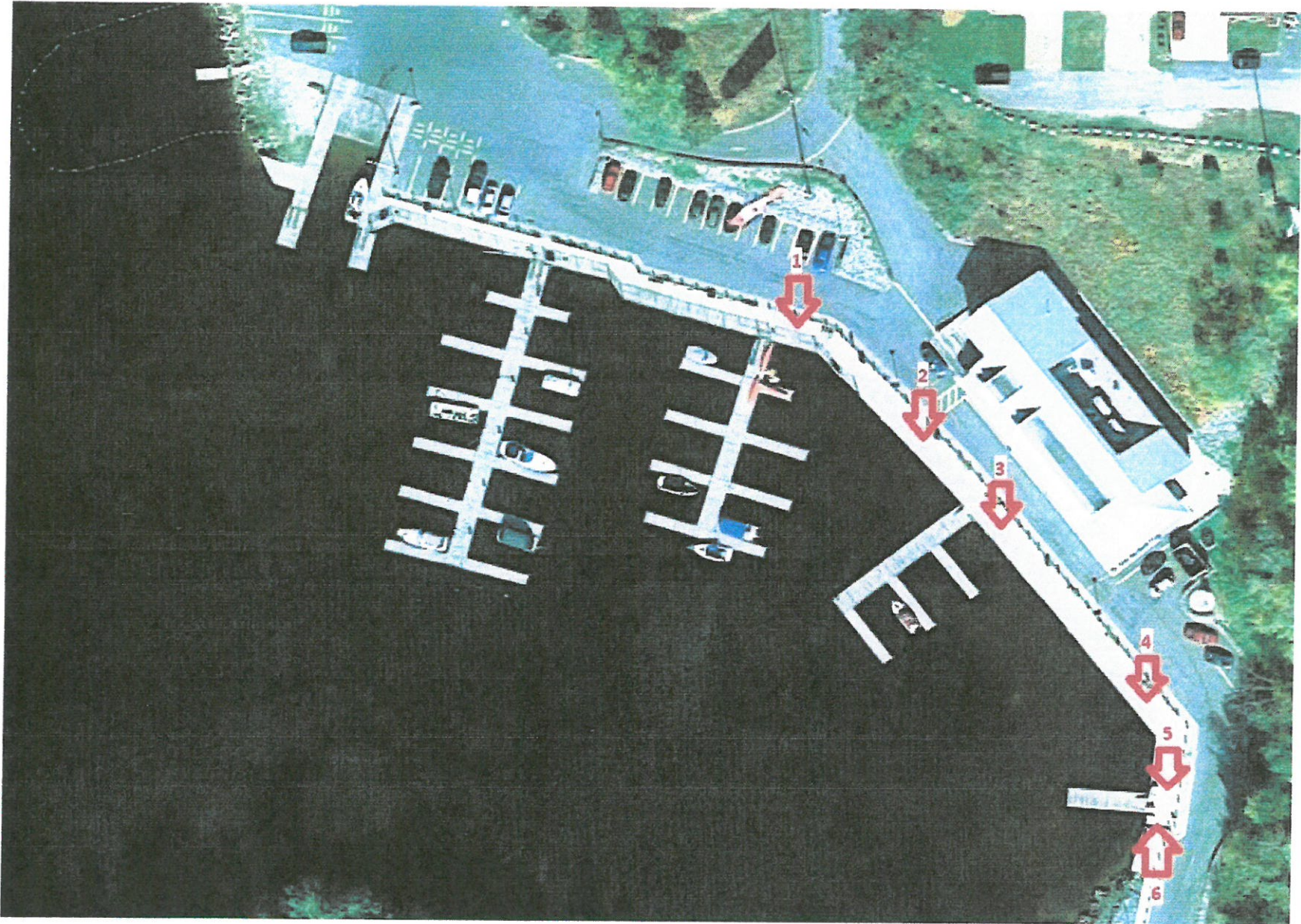
MISCELLANEOUS DETAILS



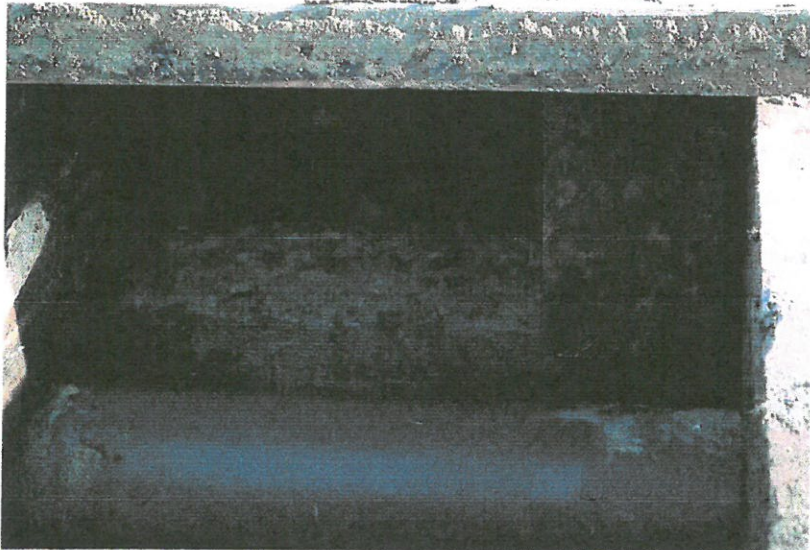
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CHECKED BY	JG	
APPROVED BY	JG	
DATE APPROVED	DEC. 8, 1988	DRAWING NUMBER
PRINT STATUS		
SCALE	AS SHOWN	L3

Appendix E
STEPHENSON ENGINEERING REPORT

Test areas



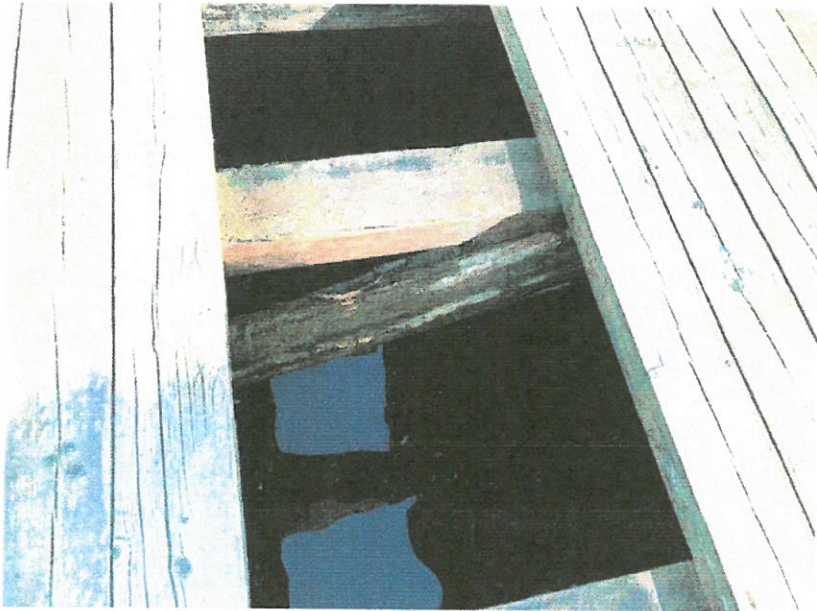
Area #1



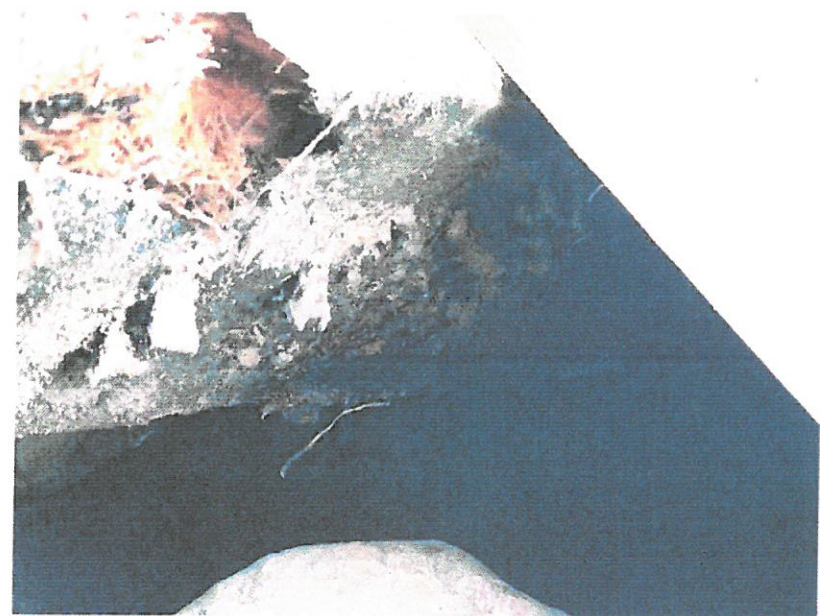
Area #2



Area #3



Area #4



Area #5



Area #6



A01.13	Retaining Walls- Gabion blocks	~2011: Gabion retaining walls and concrete block retaining walls provided in the parking lot.	4	C	The units are in overall acceptable condition. Some of the units have broken wire allowing the rock to spill out. An allowance for repair has been provided for ongoing maintenance.
A01.14	Retaining Walls - Timber	~2011: Heavy timber walls are provided at the boat ramp	4	-	No concerns observed or reported.
A01.15	Amenities - Signage	~2011: Wall mounted signage was observed on the building's south elevation. Metal traffic signs are provided in the parking and drive lanes.	4	-	No concerns observed or reported.
A01.16	Amenities - Site Furnishing	~2011: Wooden picnic tables and benches are provided in throughout the property.	4	-	No concerns observed or reported.
A01.17	Flagpole	~2011: One painted metal flagpole was provided in the parking lot.	4	C	Metal flagpole is in acceptable condition but, it was reported that the life expectancy of the painting has been shortened due to the influence of the climate, and repainting is performed every two years. We suggest replacing it with a corrosion-resistant aluminum flagpole from a long-term perspective. (See Note 4B).
A01.18	Bollards	~2011: Wooden bollards with rope sections are installed along the board walks.	4	B	Minor damages were observed at the time of the site. Periodic repairs and maintenance are assumed to be completed as part of the operational budget of the entire site. (See Note 4A).
A01.19	Handrails	~2011: painted metal handrails and guardrail were observed in the patio, stairs and ramps.	4	-	No concerns observed or reported.
A01.20	Wharf & Boardwalk	~1988: Timber wharf and boardwalks are provided along the bay south of the property.	3	C	It was reported that timber piers and beams rotted by moisture were replaced several years ago, and warped timber decking was observed in several areas due to deformed beams. On November 10, 2021, a total of 6 areas were cut and the structural assessment were conducted. Rotten and damaged piers were present at all test areas. The beams were wet and easily broken when the hammering test was performed. In area #3, it was observed that 3/4 of a beam

					was fell off. It is presumed that the top boardwalk planning does not have spaces for air flow, causing problems in the structural component. It is recommended that a structural study be performed including a redesign of the boardwalk to allow better air flow to mitigate the rot. An allowance for structural study, repair and replacement has been provided in this report. The test areas and detail photos are included in the Appendix D. (See Note 4B , RAI.2).
A01.21	Boat Launching Ramp	~1988: Boat Launching Ramp was made with CIP concrete slabs with grooved surface.	4	C	Minor cracks were observed at the time of the site. Periodic repairs and maintenance are recommended. (See Note 4B).

A02.0 EXTERIOR WALLS

I.D#	SYSTEM/COMPONENT	DESCRIPTION	CR	Cat.	COMMENTS/ASSESSMENT
A02.1	Wood siding	~2011: The building envelope is primarily clad with stained wood siding.	4	B	Wood siding is in overall acceptable condition. Several warped (bow & cup) wood sidings were observed on the exterior walls of marina store. It is recommended to replace the warped sidings and maintain it regularly to prevent further deterioration. This work can be completed at a cost below the threshold. (See Note 4A).
A02.2	Metal Cladding	~2011: Metal cladding is provided on top sections of the exterior walls.	4	-	No concerns observed or reported.
A02.3	Brick Cladding	~2011: The exterior walls of the northwest and northeast corners are finished with brick veneer.	4	-	No concerns observed or reported.
A02.4	Exterior Stain	~2011: The exterior wood siding and soffits are stained.	4	-	No concerns observed or reported.
A02.5	Joint Sealers	~2011: Urethane -based sealants are provided at openings, expansion joints and material transitions.	4	B	Joint Sealers are in overall acceptable condition. Minor failing and detaching of the joint sealers are observed in several sections. The replacement of failed sealers is

SPECIES AT RISK INFORMATION

Ministry of the Environment,
Conservation and Parks

Species at Risk Branch
40 St. Clair Avenue West, Floor 14
Toronto, ON M4V 1M2

Ministère de l'Environnement, de la
Protection de la nature et des Parcs

Direction des espèces en péril
40, avenue St. Clair Ouest
14^e étage
Toronto ON M4V 1M2



April 9, 2026

Dear Client,

On March 30, 2026, the [Species Conservation Act, 2025](#) (SCA) and several implementing regulations came into force and the *Endangered Species Act, 2007* (ESA) was repealed.

Together the SCA and the new regulations modernize species protection and implement a registration-first approach while maintaining strong environmental safeguards. The registration-first approach, a process already in use for other environmental permissions, allows most projects to begin as soon as they are registered, while requiring persons undertaking those projects follow clear, enforceable rules aimed at protecting species and their habitats. It is important to note that in some limited circumstances, some activities will require a permit and cannot be registered. At the same time, the new legislation and regulations also set out many activities that are excepted and can proceed without a registration or permit as long as the conditions and requirements associated with that exception are met.

Depending on your activity and whether it may impact a species that is protected under the SCA or its habitat, you may be required to register, or obtain a permit under the SCA, or may be eligible to proceed under an applicable exception. We would encourage you to review the SCA and its regulations and obtain independent professional advice to understand how the requirements of the SCA may apply to your activity. Contact SAROntario@ontario.ca for further information on the permit process, if applicable to you.

The following regulations are in effect as of March 30th, 2026:

- [Protected Species in Ontario List regulation](#) (O. Reg. 60/26): sets out the species that receive protections under the SCA
- [Registrable Activities regulation](#) (O. Reg. 75/26): sets out registration requirements and rules for conducting registrable activities
- [Permit Activities regulation](#) (O. Reg. 74/26): prescribes activities that require a permit and cannot proceed under a registration
- [Excepted Activities – No Permit or Registration regulation](#) (O. Reg. 61/26): prescribes activities impacting protected species or their habitat that can proceed without a registration or permit
- [Transitional Matters regulation](#) (O. Reg. 62/26): sets out transition rules that apply to existing authorizations (i.e., permits and agreements) or activities registered to conditional exemptions under the ESA, or certain exemptions under the ESA



To support the launch of the streamlined, registration-first approach, the ministry has launched a new Species Conservation Registry that must be used to register activities online, in accordance with the SCA. If your activity is a registrable activity, please visit [Species Conservation Registry | ontario.ca](https://speciesconservationregistry.ontario.ca) to learn more or begin a registration.

Activities that are excepted under the Excepted Activities regulation do not need to be registered and do not require a permit. Some exceptions have requirements that must be fulfilled. For a small number of excepted activities, an Exception Information Form must be completed through the Species Conservation Registry.

For assistance with submitting information required under the Excepted Activities regulation. Please review the Excepted Activities regulation to determine whether your activity is subject to an exception.

We recommend that, in consultation with appropriate experts and professionals, you assess the potential impacts of your project in the context of the SCA and its regulations to determine whether your proposed activities must be registered, require obtaining a permit or are excepted under the SCA.

If you have questions regarding the new requirements, please contact your current ministry representative or SAROntario@ontario.ca. If you have any questions regarding how to use the new SCR, please contact SCRRegistry@ontario.ca.



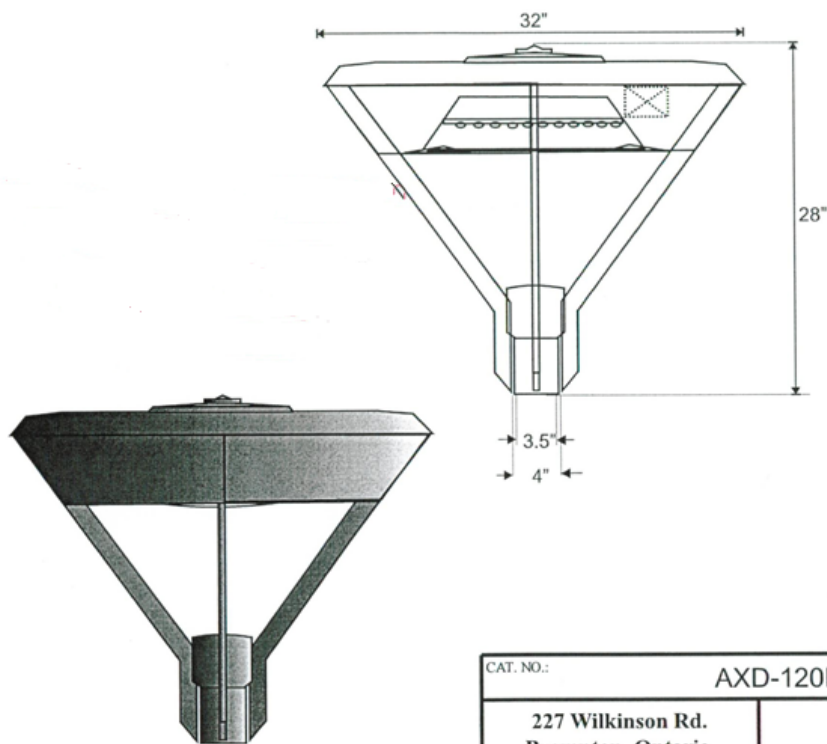
West Nipissing Ouest

MUNICIPALITY OF WEST NIPISSING
ENGINEERING CONSULTING SERVICES, WHARF DESIGN

SECTION 4
APPENDIX A6

SITE LIGHTING INFORMATION

AXD SERIES - Post Top Mount



Description:
Cast aluminum housing. Silicone gasket for performance in outdoor conditions. Painted finish.

Mounting:
PT - Post top mount

Optics:
E - Impact resistance flat tempered glass lens.
SAG - Convex shape glass lens
II - Type II distribution
III - Type III distribution
IV - Type IV distribution
V - Type V distribution

Ballast:
60 Hz, Electronic LED driver -208V, Thermally protected and with low THD

Lamp Used:
High power CREE LEDs with 50,000 hrs rated lamp life @ 70% lumen maintenance.
120LED - 120 x 1W CREE LEDs
10,800 Lumen output
5K - 5000K color temperature standard (CW).
4K - 4100 K color temperature(WW).

Options:
PC - Photocell
EM - Emergency battery pack for 12 W LED (1 strip)
IP65 - Ip65 rated

Finish: Thermally cured Polyester Powder Paint
BL - Black BZ - Bronze

Listing:
Complies with CSA, UL; approved with  label for outdoor application.

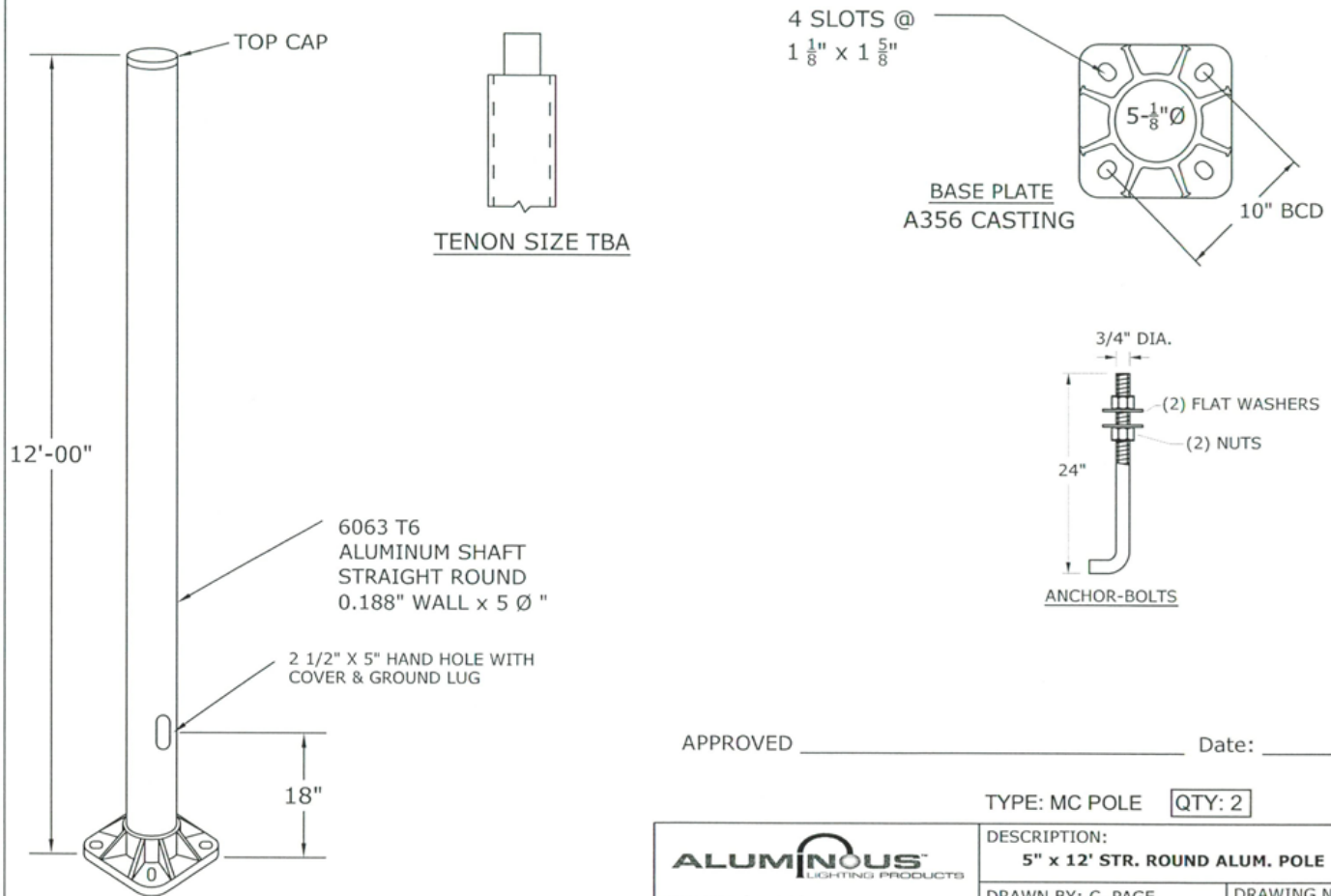
CAT. NO.: AXD-120LED-CW-208V-E-PT-V-BL	
227 Wilkinson Rd. Brampton, Ontario. L6T 4M2 Tel. 905-457-4777 Fax 905-457-1115	 www.soleracorp.com architectural lighting innovations
DWG NO. LED067-8822	PROJECT NAME: MINIHABA OUTDOORS
TYPE: MC	SCALE: NTS QTY: 2 DATED: 11/15/2010



West Nipissing Ouest

**MUNICIPALITY OF WEST NIPISSING
ENGINEERING CONSULTING SERVICES, WHARF DESIGN**

**SECTION 4
APPENDIX A6**



APPROVED _____ Date: _____

TYPE: MC POLE QTY: 2

PROJECT: MINIIHAHA OUTDOORS
FINISH: 7 POLES, BRONZE POWDER COAT

ALUMINOUS
LIGHTING PRODUCTS

114 Healey Rd.
Bolton, Ontario
L7E 5R2
Phone: (905) 857-8100
Fax: (905) 857-8131

DESCRIPTION: 5" x 12' STR. ROUND ALUM. POLE	
DRAWN BY: C. PAGE	DRAWING No.
DATE: NOV. / 2010	CATALOGUE No.
MATL: ALUMINUM	SRAL5-12-AB
	SCALE: NOT TO SCALE
	SHEET: 1 of 1