Township of Muskoka Lakes

Burgess Dam Class EA

Bala, ON

Project File Report (PFR)

TULLOCH Document No. / Rev. 20-1051-20-2050-0003 / Rev. 1
November 17, 2022

Issued for Use

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Revision Log

Revision #	Revised By	Date	Issue/ Revision Description
1	E.G./C.S.	November 17, 2022	Re-issued for Public Review
0	E.G./C.S.	January 24, 2022	PFR Executive Summary Issued for Public Review
A	E.G./C.S.	December 21, 2021	Draft for Township Review

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EXECUTIVE SUMMARY

The Township of Muskoka Lakes (the Township) is considering rehabilitation and/or improvement of the Burgess 1 Dam facility which comprises a small two (2) turbine generating station including a concrete powerhouse and concrete gravity dam which is located in Bala, Ontario adjacent to the North and South Bala Falls Dams. Upstream of the dam is Bala Bay within Lake Muskoka and downstream of the dam is the headwaters of the Moon River.

The Burgess 1 Dam facility was originally constructed in 1917 where operations were taken over by the Ontario Hydro Commission from their purchase of the dam and generating facility in 1929. The facility was purchased by the Township of Muskoka Lakes in 1963 and has since been leased to various power generating companies up to present day. The dam consists of an approximately 59 m long concrete dam founded on bedrock with a maximum height of approximately 3 meters. A powerhouse has been built into the northern section of the dam which is currently in operation.

In the Spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the safety of the dam at risk. A Dam Safety Review (DSR) was commissioned in the Summer of 2019 to review the current state of the Burgess 1 Dam and determine any safety/structural issues with the dam facility as well as recommend proposed remediation/rehabilitation plans. The DSR determined safety concerns with respect to dam stability and capacity to withstand a similar event in the future. Recommendations were made to replace or rehabilitate the existing facility to handle higher future water levels.

TULLOCH was retained by the Township to complete a Municipal Class Environmental Assessment Schedule B Study (Class EA Study or EA) for the proposed improvements to the Burgess 1 Dam facility. The goal of the study was to evaluate and assess the various proposed alternative solutions to the problem statement generated for the project in a transparent manner while encouraging public and agency feedback for the project. This report documents the findings of the EA for the proposed improvements and includes a number of appendices that make up the varying components of the study. The assessment was undertaken starting in February of 2020.

Public and agency consultation was completed throughout the study. Due to the restrictions surrounding public gatherings imposed by the COVID-19 pandemic an online presentation (PIC) was completed and posted on the Engage Muskoka Lakes website owned and operated by the Township. In addition to the PIC a notice of project mail out in July 2020 was conducted to various stakeholders for the project include members of the public, first nations groups and regulating bodies. Public and agency feedback was solicited either via email or direct correspondence through the survey on the Engage Muskoka Lakes webpage. A FAQ page was also posted and updated regularly on the website to incorporate questions commonly received from the survey and/or email inquiries with respect to the project.

As part of the Class EA procedure a Problem/Opportunity Statement was generated for the study to identify the need for the EA. The statement was approved by the Township and is shown below:

> *In the Spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review conducted in the Summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents., furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes is considering replacement of rehabilitation of the Burgess 1 Dam*

Based on the above Problem Statement, four (4) alternative solutions were proposed to the Township and stakeholders for evaluation to address the recommendations made within the DSR.

Option 1 – Do Nothing

Option 2 – Rehabilitation of the Dam and Removal of the Power Generation Equipment

Option 3 - Rehabilitation of the Dam and Powerhouse

Option 4 - Replacement of the Facility

On October 13th, 2021, TULLOCH presented the results of the various attached studies and public input for the EA study to the Township of Muskoka Lakes Council as well as our recommendation for selection of the preferred alternative solution.

The results of the Class EA study including public and stakeholder feedback, and Township Council preference, indicates that **Option 3 – Rehabilitation of the Dam and Powerhouse is the Preferred Alternative** and should be chosen as the desired path forward to address the safety concerns provided by the DSR conducted in 2019.

1. PROJECT BACKGROUND AND PREVIOUS STUDIES

The Burgess 1 Dam facility comprises a small two (2) turbine generating station including a concrete powerhouse and concrete gravity dam, located in Bala, Ontario. The facility is located adjacent to the North and South Bala Falls Dams directly to the north of the larger facilities as shown below in Figure 1. Upstream of the dam is Bala Bay within Lake Muskoka and downstream of the dam is the headwaters of the Moon River. The dam was originally constructed in 1917. Operations were taken over by the Ontario Hydro Commission from their purchase of the dam and generating facility in 1929. The facility was purchased by the Township of Muskoka Lakes in 1963 and has since been leased to various power generating companies up to present day. The dam consists of two main elements, first, an approximately 59 m long concrete dam founded on bedrock with a maximum height of approximately 3 meters. Second, a powerhouse was built directly into the downstream side of the northern abutment/section of the dam. The powerhouse currently has two (2) turbines that currently generate power. Retrofits to the structure have occurred over the years including partial upgrades to the power generation equipment as well as various structural bracing of the existing powerhouse. The most recent renovations included the addition of a new turbine, head gate and electrical equipment. A 16 m long concrete gravity retaining wall is connected to the north wall of the powerhouse which supports River St. immediately to the North of the structure. Figure 1 shown below shows the location of the Burgess Dam facility.

Figure 1: Burges Dam Location

The need for an Environmental Assessment of the Burgess 1 Dam facility was directly linked to the flooding experienced in the Muskoka region in 2019. Due to high water levels associated with the floods in the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the safety of the dam at risk. Water was observed to breach the structure causing downstream washout of the facility grounds in addition to water being released in an uncontrolled manner on either abutment of the dam.

Due to the nature of the overtopping event caused by the flooding and the possibility of future flooding posing a safety risk to the dam, a Dam Safety Review (DSR) was commissioned in the Summer of 2019 to review the current state of the Burgess 1 Dam and determine any safety/structural issues with the dam facility as well as recommend proposed remediation / rehabilitation plans.

The DSR determined safety concerns with respect to dam stability and capacity to withstand a similar event in the future. Recommendations were made to replace or rehabilitate the existing facility to handle higher future water levels. The DSR conducted by TULLOCH Engineering Inc (TULLOCH) was issued in September of 2019 is found in Appendix B and was also posted for public review on the Township's Engage Muskoka Lakes Web Page as part of the public consultation initiatives for this study. Key findings from the Dam Safety Review are summarized below:

- Non-Overflow Structure/Retaining Wall
  - Moderate to significant washouts were found to occur due to the flooding events which impact the stability of the dam including inadequate factor of safety associated with the structure with respect to the non-overflow structure
  - No emergency spillway or overflow water control options were in place to prevent an uncontrolled release of the structure during flooding conditions
  - The gabion wall retaining river street was found to be in poor condition.
- Powerhouse Structure
  - The powerhouse was generally found to be in poor condition with large diagonal cracks observed in the concrete foundation slab. The powerhouse roof was found to be in poor condition
  - The operation of the powerhouse appears to be undermining the structure which may be leading to the cracking and/or deterioration.

As a result of the Dam safety review, it was determined that the current state of the Burgess 1 Facility was generally deficient and would require rehabilitation to withstand future flooding events as well as to improve the overall safety of the structure to modern design codes.

The Township of Muskoka Lakes (the Township) initiated a Municipal Class Environmental Assessment Schedule B Study (Class EA Study or EA) to study and evaluate alternative solutions for improvements to the Burgess 1 Dam facility to address safety concerns identified in the 2019 Dam Safety Review (DSR). A problem and Opportunity Statement was generated with proposed alternative solutions that are discussed in the following section.

2. CLASS ENVIRONMENTAL ASSESSMENT PROCESS

Municipal infrastructure projects are required to meet the requirements of the Ontario Environmental Assessment (EA) Act. The Municipal Class EA (October 2000, as amended in 2007/2011/2015) applies to a group or “class” of municipal projects which occur frequently, and which have relatively minor and predictable impacts. These projects are approved under the EA Act, as long as they are planned, designed and constructed according to the requirements of the Class EA document.

The specific requirements of the Class EA for a particular project depend on the type of project, its complexity and the significance of environmental impacts. To assist proponents in determining the status of projects, four categories of projects are identified in the Municipal Class EA document, including Schedule “A”, “A+”, “B” and “C” projects.

2.1. Schedule A

These projects are limited in scale, have minimal adverse environmental effects, and typically consist of normal maintenance and operational activities. These projects are considered pre-approved and may proceed without following the full Class EA planning process.

2.2. Schedule A+

These projects are also limited in scale, have minimal adverse environmental effects, and are considered pre-approved, but there is a requirement for public notification prior to construction or implementation of the project. The purpose of the notification is to inform the public of projects occurring in their local area. Although the public is informed of the project, there is no appeal mechanism to the Ministry of the Environment and Climate Change (MOECC); any concerns raised can be addressed at the municipal council level. There is no defined cost limit for a Schedule A or A+ project.

2.3. Schedule B

These projects have the potential for some adverse environmental effects, thus requiring a screening process involving mandatory contact with directly affected public and relevant review agencies. If all concerns can be adequately addressed, the project may proceed. These projects generally include improvements and minor expansions to existing facilities. The construction cost limit for a Schedule ‘B’ project of this type is less than $2.7 million. There is an appeal mechanism to the MOECC. If all public and agency comments and issues are resolved during the public review period, the project may proceed.

2.4. Schedule C

These projects have potential for significant environmental effects and are subject to the full planning and documentation procedures specified in the Class EA document. All five phases of the Class EA process must be completed including Phase 3 (Alternative Design Concepts for Preferred Solution) and a Phase 4 (Environmental Study Report). The Environmental Study Report is submitted for review by the public and relevant review agencies. If all public and agency comments and issues are resolved during the public review period, the project may proceed. These projects generally include construction of new facilities or major expansions to existing facilities. The construction cost limit for Schedule C projects of this type is greater than $2.7 million.

2.5. Selected Schedule

Based on the above, the Burgess 1 Dam project was completed as a Phase 2, Schedule B activity under the Municipal Class EA process due to the need for improvements to the existing facility where there are potential for adverse environmental effects. As noted in the MEA Class EA document, the divisions between schedules are often not distinct, and the proponent is responsible for customizing it to reflect the complexities and needs identified. It is documented here that the Class EA process was followed for each bridge including consultation with stakeholders throughout each step of the process

3. PROBLEM/OPPORTUNITY STATEMENT

As part of the Class EA procedure a Problem/Opportunity Statement was generated for the study with consultation from the Township to present to the various stakeholders for the project as well as to determine the need for the EA process. The statement was approved by the Township and is shown below:

> *In the Spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review conducted in the Summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents., furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes is considering replacement of rehabilitation of the Burgess 1 Dam*.

The above statement was included in the Notice of Project that was sent out in the initial mail out to various stake holders for the project. The Notice identified the Burgess area as well as introduced the engage Muskoka lakes landing page for stakeholders to follow updates on the project as it developed. Finally, the problem/opportunity statement and proposed alternative solutions were included in the correspondence to help guide the decision-making process and solicit public and agency feedback. A copy of the Notice of Project is attached to this report and can be found in Appendix A. The alternative solutions and the decision-making process for selecting the preferred alternative solution is discussed in more detail in Section 4 of this report.

4. DESCIPTION OF THE STUDY AREA ENVIRONMENT

As part of the EA, a series of assessments were completed to address potential impacts of the proposed project on the environment. These assessments were used to evaluate the alternatives and select the Preferred Alternative Solution for the study. This included viewing the project through various lenses including cultural/archaeological, environmental, as well as a condition assessment of the turbine equipment within the generating station. Each study is summarized below in the following sub-sections.

4.1. Archeological Assessment and Cultural Heritage Evaluation

A Stage 1 Archaeological Assessment and Cultural Heritage Evaluation were conducted by Horizon Archaeology Inc. to support the requirements of the EA with respect to the heritage value associated with the Burgess 1 Dam facility. The Archaeological Assessment of the area found no archaeological potential, with no further archaeological concerns. The Cultural Heritage Evaluation found that the Burgess Dam should be added to the Ontario Heritage Act Register, and the structure’s façade or shell should be preserved if possible. Further, the original turbine still housed within the structure should be preserved, preferably in place or somewhere which might share its history. Both reports completed by Horizon can be found in Appendix C.

4.2. Environmental Impact Assessment

An Environmental Impact Assessment of existing conditions found at the Burgess Dam facility was conducted by TULLOCH which provides environmental impacts and context for the proposed alternative solutions listed below. The Environmental Impact Assessment found that clearing of vegetation, and replacement or refurbishment of the dam and powerhouse should occur outside of the General Nesting Period. While no evidence of roosting bats, or migratory bird nests on the structure were found, all active bird nests and roosting bats should be avoided. Potential habitat for Barn Swallow, a species at risk, exists within the project area. In-water work will be required for replacement and refurbishment options, with longer work times for dam replacement increasing the chance of sediment transfer downstream and impacts to fish. Further, excavation required for dam replacement is more likely to result in changes to sensitive fish spawning habitat upstream and downstream of the dam, as a result in-water work if required should be minimized and MNRF in-water timing windows should be followed. The Environmental Impact Assessment can be found in Appendix D.

4.3. Turbine Condition Assessment

Norcan Hydraulic Turbine Inc. was contracted by TULLOCH to perform a site assessment of the current conditions and operational characteristics of the power generating equipment found at the facility. The goal of this study was to determine the current state of the mechanical and electrical equipment of the facility to aide in determine if there was a need for replacement or costs associated with replacement and/or maintenance of the rehabilitated facility. The site assessment found that original Francis turbine may have surpassed it manufacturer's life expectancy with repairs completed in the past to maintain generation capability, and the retrofitted axial flow machine appeared to be in good condition from a surface assessment. No evaluation of the existing machine performance was possible at time of site assessment as the turbine was not in operation. The report provides a preliminary assessment for the possibility for continued power generation with rehabilitation or replacement of the turbine equipment in the facility. Ultimately the study found that reinvestment into the generating station could remain an economically viable option. The site assessment report can be found in Appendix E.

5. ASSESSMENT OF ALTERNATIVE SOLUTIONS

5.1. Alternative Solutions

Based on the Problem Statement, four (4) alternative solutions were proposed to the Township and stakeholders for evaluation to address the recommendations made within the DSR. They are summarized below:

5.1.1. Option 1 – Do Nothing

As required by the Class EA process, the "Do Nothing" alternative solution was considered and includes completing minimal maintenance on the dam structure. Under this alternative the status quo would be maintained, and the dam would continue to function as it has in the past. This solution was not recommended as it does not address the fundamental safety issues addressed in the DSR.

5.1.2. Option 2 – Rehabilitation of the Dam and Removal of the Power Generation Equipment

This alternative solution would involve repairing the deficiencies of the dam and reducing the risk of overtopping and/or failure of the facility in the future. Rehabilitation of the dam structure along with additional works to increase the safety of the dam which could extend its design life and reduce the risk to public safety and the upstream water levels in Lake Muskoka. Based on the findings of the DSR, the powerhouse section of the dam was identified as requiring the most effort to retrofit and rehabilitate and it may be considered preferable to decommission and remove the power generation system altogether. The powerhouse structure which is considered integral to the dam would be decommissioned to the maximum extent possible and a passive water retaining dam would take the place of the hydro generation facility and enter a care and maintenance state.

The dam would then receive regular inspection and maintenance as required to ensure proper function.

5.1.3. Option 3 - Rehabilitation of the Dam and Powerhouse

Similar to Option 2, the dam would be rehabilitated to address the safety and stability concerns discussed in the DSR. However, under this alternative solution the powerhouse section would also be rehabilitated along with the power generation equipment. Active generation would continue as before with upgraded equipment. The non-overflow section of the dam would be rehabilitated in a similar fashion as Option 2 to extend the life of the dam and increase the safety and stability of the structure. However, for Option 3 the powerhouse would remain intact and would be upgraded including the mechanical and electrical equipment to meet modern design codes. This option would allow for the continued operation of the Burgess 1 Dam facility for power generation into the future. The intent at this time would be for the overall output of the facility to remain the same without increased capacity due to the water allotments dedicated to burgess for power generation purposes.

5.1.4. Option 4 - Replacement of the Facility

The current age of the Burgess 1 Dam facility is in excess of 100 years (constructed in 1917), the infrastructure has exceeded its design life in its current state. This alternative solution would involve the construction of a new dam facility with or without power generation capabilities. Construction of a new dam would likely be targeted in a similar footprint of the existing dam and would likely involve temporary dam structures while the existing dam could be deconstructed, and construction of a new facility would take its place using modern design methodology. Replacement of the dam may provide a longer design life than repairs and rehabilitation of the facility and may require less continued care and maintenance in the future.

5.2. Evaluation of Alternative Solutions

The four alternative solutions were assessed using a weighted evaluation matrix. The evaluation criteria included Public Input/Social Environment, Cultural Heritage, Natural Environment, Public Safety, Economic Impact, and Physical Environment. Criteria were ranked for each option from 1 to 4 using information available in the various assessments completed as part of the EA, as well as based on public feedback including the results of the survey published on the Engage Muskoka Lakes webpage. In the ranking system options ranked with the value of 4 had the highest positive impact for each criteria. Total scoring was calculated for each option by summation of the product of weight and rank for each of the evaluation criteria. The weighted evaluation matrix used to determine the preferred alternative solution is shown below in Table 5-1.

Table 5-1: Weighted Evaluation Matrix for Burgess Dam EA Alternatives

Evaluation Criteria	Weight	Option 1: Do Nothing	Option 2: Rehab Dam Remove Power	Option 3: Rehab Dam & Powerhouse	Option 4: Replacement
Public Input/Social Environment	15	1	2	4	3
Cultural Heritage	10	2	3	4	1
Natural Environment	15	4	2	3	1
Public Safety	30	1	3	2	4
Economic Impact	20	4	3	2	1
Physical Environment	10	1	3	4	2
TOTAL	**100**	**215**	**270**	**285**	**230**

5.3. Preferred Solution

Based on the results of the weighted evaluation matrix it was determined that **Option 3 – Rehabilitation of the Dam and Powerhouse is the Preferred Alternative.** This option should be selected and implemented to address the safety concerns provided by the DSR conducted in 2019. It should be noted that Option 3 was found to be in alignment with the majority of the public and stakeholder feedback in addition to the Township Council.

5.3.1. Estimated Costs for the Preferred Solution

Preliminary costing for Option 3 was completed, with an estimated $2,599,680.00 required to complete the rehabilitation and upgrades to the structure which will prevent future adverse effects to the environment. The cost estimate is provided in Appendix J. The estimated cost is less than $2.7 million and thus does not surpass the construction cost limit for Schedule B projects, confirming that the selected schedule is appropriate for the Burgess 1 Dam. It should be noted that the costing excludes third party construction quality assurance, site inspection, land acquisition, financing, owner costs, and bonding and insurance.

6. FOLLOW-UP COMMITMENTS

As a result of the EA the Township has begun the design process associated with the rehabilitation of the structure. A preliminary design is currently being conducted by TULLOCH to further the design of the Conceptual options proposed in the DSR in the spirit of the preferred alternative solution discussed above in Section 4.2. Upon completion of the Preliminary design a Detailed Design process including issuing of an IFC drawing packages should be conducted. Once completed appropriate permitting through applicable agencies will be required prior to tendering and beginning the work.

The required follow-up commitment for the Burgess 1 Dam structures is a review of the Hazard Potential Classification (HPC) of the Dam every 10 years as required by the LRIA given the HPC classification of Low. Further, any significant change affecting the dam area triggers a DSR or appropriate investigations. Significant changes include, but are not limited to, discovery of unusual conditions, new dams on the river system, new developments downstream of the dam, new knowledge of safety analysis, new standards of safety and extreme hydrologic or seismic events. Furthermore, it is recommended that annual Dam Safety Inspections be completed by a qualified engineer on the facility as a best management practice for the structure, particularly until the rehabilitation can be completed. In addition to annual Dam Safety Inspection, to regular documented inspections by the Township or the current Tennant is recommended given the age of the structure.

7. PUBLIC CONSULATION PROCESS

Public and agency consultation was completed throughout the study. Due to the restrictions surrounding public gatherings imposed by the COVID-19 pandemic an online presentation (PIC) was completed and posted on the Engage Muskoka Lakes website owned and operated by the Township as well as a notice of project mail out in July 2020. In addition to the presentation posted on-line a survey was created to engage and solicit feedback from members of the public which was discussed in the presentation and posted to the webpage.

Public and agency feedback was solicited either via email or direct correspondence through the survey on the Engage Muskoka Lakes webpage. Public feedback solicitation included businesses, residents, and other addresses within a 250 m radius of the dam, and Indigenous communities including Beausoleil First Nation, Chippewas of Georgina Island, Chippewas of Rama First Nation, Wahta Mohawks, Moose Deer Point First Nation, Metis Nation of Ontario, Wasauksing First Nation, Shawanaga First Nation, and Metis Nation of Ontario Lands. Many responses were received from Bala residents, and one response was received from an Indigenous community. Consultation with agencies included the MECP, MNDMNRF, Transport Canada, MTCS and others. An FAQ page was also posted and updated regularly on the website to incorporate questions commonly received from the survey and/or email inquiries with respect to the project to allow for transparent dialogue and honest feedback.

General comments during public consultation included a desire to rehabilitate and continue power generation if economically responsible, a general support for green energy, and expectation that safety related issues of the dam would be resolved was also a common theme. The presentation, results and response to the PIC, public and stakeholder survey, and the most up-to-date FAQ page is provided in Appendix F. All public and agency correspondence received throughout the execution of the EA are provided in Appendix G. It should be noted that personal information and names of the correspondents in all emails within the project file and associated appendix have been redacted to respect the privacy of those involved in the study. As discussed in the above section generally the public consensus was in general alignment with the recommended preferred alternative solution of rehabilitating the dam and maintaining power generation.

Finally, upon conclusion of the public consultation program, On October 13th, 2021, TULLOCH presented the results of the various studies and public input for the EA study to the Township of

Muskoka Lakes Council as well as the recommendation for selection of the preferred alternative solution. This was generally agreed upon by council members and the preferred alternative solution recommendation was supported. A copy of the slide deck for the presentation is provided in Appendix H.

8. PRELIMINARY DESIGN FOR PREFERRED ALTERNATIVE SOLUTION

Upon acceptance of the preferred alternative solution a preliminary design was completed by TULLOCH through the fall of 2022 for the civil and structural rehabilitation of the Burgess 1 Dam. A design brief memo outlining the proposed rehabilitation and design of the structure is provided in Appendix I which can then be furthered in the Detailed Design phase for the project. The design brief memo includes preliminary design drawings and the cost estimate referenced in section 5.3.1.

9. NOTICE OF STUDY COMPLETION AND PROVISION OF PROJECT FILES FOR PUBLIC REVIEW

The completion of this Project File Report (PFR) and filing of the Notice of Study Completion concludes the Class EA process for this project. The PFR is made available to the public for review upon request for thirty (30) calendar days. If concerns regarding the project cannot be resolved in discussion with the Township of Muskoka Lakes, a person or party may request that the Minister of the Environment and Climate Change make an order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which requires an Individual Environmental Assessment. Requests must be received by the Minister within the 30-day review period. If no new or outstanding concerns are brought forward during the review period, the Township may complete detailed design and construction of the project.

10. CLOSURE

The findings of the Municipal Class Environmental Assessment (EA) Study for the improvement of the Burgess 1 Dam located in Bala, Ontario have been prepared by TULLOCH Engineering in consultation with the Township of Muskoka Lakes.

Under the Schedule ‘B’ Class EA, the project can proceed from Phase 2 (alternative Solutions to Phase 5 (implementation of the Class EA process). Design and construction can follow completion of this study. Phase 3 (alternative Design Concepts for Preferred Solution) and Phase 4 (Environmental Study Report) are not required for Schedule B projects.

We trust that the information in this report will be sufficient to allow the Township to proceed with the project. Should further elaboration be required for any portion of this project, we would be pleased to assist.

Sincerely,

Chris J. Stilwell

Erik Giles P. Eng.
TULLOCH Engineering Inc.

Chris Stilwell P.Eng.
TULLOCH Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
E. K. GILES
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Nov 17/2022
PROVINCE OF ONTARIO

APPENDIX A

Notice of Project and Problem and Solution Statement

TOWNSHIP OF MUSKOKA Lakes

TULLOCH

Notice of Public Information Centre

Municipal Class Environmental Assessment Study

Burgess 1 Dam

The Study:

The Township of Muskoka Lakes has initiated a Class Environmental Assessment (EA) Study for the replacement or rehabilitation of the Burgess 1 Dam facility located in Bala, Ontario. (see map)

The Process:

A key component of the study is consultation with interested stakeholders (public and review agencies). Please visit:

www.engagemuskokalakes.ca

At the above link, a presentation will be made available regarding the Class Environmental Assessment process, the proposed works, possible alternative solutions and the identification and mitigation of any adverse impacts as a result of the project. After viewing the presentation there will be a section for comments and questions. Upon completion of the study, a Project File will be prepared for public review and comment. Subject to comments received and the receipt of necessary approvals, The Township intends to proceed with the detailed planning and design of the preferred solution. The Township wants to ensure that anyone interested in this study has the opportunity to get involved and provide feedback and input prior to design and implementation. To allow for the continuation of the study, the feedback period will end on September 9th 2020.

Alternatively:

If you are unable to view the presentation or do not have access to the Township of Muskoka Lakes website, you may request a hard copy form of the presentation to be sent via mail to your address along with a comment card to mail back to the Township. If you require a mailed copy or would like more information. please contact:

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20-1051
December 20, 2021

Township of Muskoka Lakes
1 Bailey Street
Port Carling, ON
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Attention: Ken Becking

CC: Tim Sopkowe, Chris Stilwell

Re: Burgess Dam Schedule B EA – Problem Statement and Alternative Solutions

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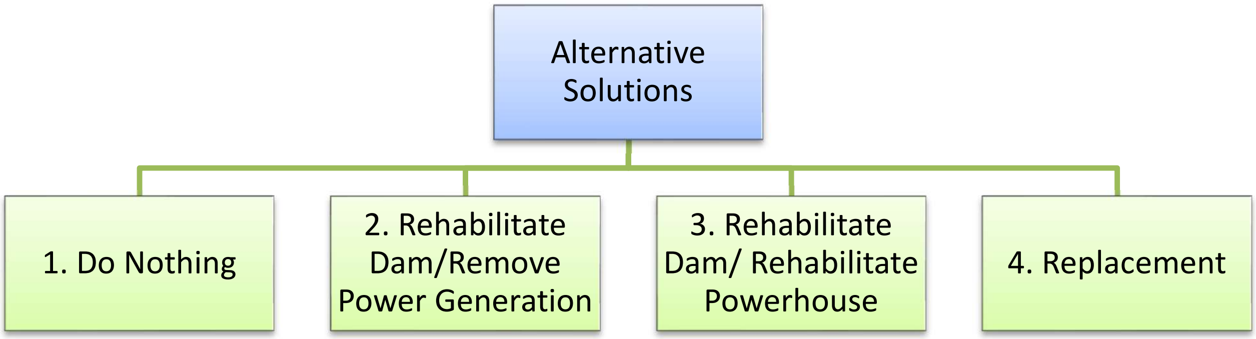
Please find below the problem and opportunity statement as well as potential alternative solutions in preparation for the Burgess 1 Dam Schedule B EA for your review. The purpose of this letter is to clearly define the problem regarding the aging infrastructure and briefly detail alternate solutions at a high level to commence Phase 1 of the EA.

Problem Statement

The Burgess 1 Dam located in Bala, Ontario was originally constructed in 1917 where operations were taken over by the Ontario Hydro Commission from their purchase of the dam and generating facility in 1929. The facility was purchased by the Township of Muskoka Lakes in 1963 and has been leased to various power generating companies up to present day. The dam consists of an approximately 59 m long concrete dam founded on bedrock with a maximum height of 3 meters. A powerhouse has been built into the northern section of the dam which is currently in operation. In the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review (DSR) conducted in the summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents, furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes (The Township) is considering replacement or rehabilitation of the Burgess 1 Dam.

Alternative Solutions

The Township has determined it is important to engage the public in the decision making process and has decided to follow the Class EA process for Municipal Projects. Alternative solutions have been identified and will be reviewed through the Municipal Engineer's Class Environmental Assessment (Class EA) process. The outcome of the Class EA will be to select a preferred solution based on input from stakeholders including the Township and the public. The following flow chart indicates the proposed alternative solutions to the problem statement outlined above. The options below are based on recommendations from the Dam Safety Review and discussion with the Township. Each solution will be briefly described below.



1. Do Nothing

This option would involve doing-nothing and leaving the dam and powerhouse as-is in the current condition after the overtopping event in spring of 2019. Safety issues with respect to stability of the dam and state of the powerhouse would not be addressed to ensure the dam is in a safe condition for use.

2. Rehabilitation of the Dam and Removal of the Power Generation

Rehabilitate the dam with the goal of repairing deficiencies and reducing the risk of overtopping and/or failure of the facility in the future. Rehabilitation of the dam structure along with additional works to increase the safety of the dam could extend its design life and reduce the risk to public safety and upstream water levels in Lake Muskoka. Based on the findings of the Dam Safety Review it was shown that the powerhouse section of the dam was identified as requiring the most effort to retrofit and rehabilitate it may be considered preferable to decommission and remove the power generation system altogether. The powerhouse structure is an integral part of the dam and cannot be removed in its entirety. The powerhouse would be decommissioned to the maximum extent possible and the dam would then enter a care and maintenance state and act as a water control dam requiring inspection and as-needed maintenance.

3. Rehabilitation of the Dam and Powerhouse

This alternative solution is similar to the previous solution with the exception that the powerhouse section would also be rehabilitated along with the power generation equipment. Active generation would continue. The non-overflow section of the dam would be rehabilitated in a similar fashion as Option 3 to extend the life of the dam and increase the safety and stability of the structure. However, it is possible and may be preferable to keep the powerhouse intact. Rehabilitation would entail completing work necessary to meet modern design codes and address the stability issues raised in the 2019 Dam Safety Review. This option would allow for continued operation of the Burgess 1 Dam facility for power generation.

4. Replacement

Based on the current condition and age of Burgess Dam 1 (constructed in 1917), the current infrastructure has exceeded its design life in its current state. Repairs and rehabilitation of the facility may not extend the life of the dam to an acceptable level and would require continued care and maintenance even in a state of closure. This alternative involves the construction of a new dam facility with or without a power generating facility. This would likely involve the construction of a temporary dam while the existing dam was deconstructed and the construction of a new facility in its place using modern design methodology.

The above Problem Statement and Alternative Solutions have been prepared by TULLOCH Engineering in consultation with the Township of Muskoka lakes and will be used as the basis for the Schedule B EA for the Burgess 1 Dam facility.

Sincerely,

Erik Giles P. Eng.
TULLOCH ENGINEERING INC.

APPENDIX B

Burgess DSR Report

DAM SAFETY REVIEW
BURGESS 1 DAM

for

Township of Muskoka Lakes



September 6, 2019

TULLOCH Project No.: 19-1493

2019-09-06	0	Issued for Use	E. Giles	F. Palmay	G. Liang
2019-08-14	A	Issue for Draft	E. Giles	F. Palmay	G. Liang
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**
TULLOCH					

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CDA	Canadian Dam Association
DSD	Dam Safety Deficiency
DSI	Dam Safety Inspection
D/S	Downstream Side of Dam
EPRP	Emergency Preparedness and Response Plan
EWL	Existing Water Level
FOS	Factor of Safety
HPC	Hazard Potential Classification
HWL	Headwater Level
ICC	Incremental Consequence Category
IDF	Inflow Design Flood
IEL&D	Incremental Economic Loss and Damage
ILOL	Incremental Loss of Life
NOL	Normal Operating Water Level
MDE	Maximum Design Earthquake
MNRF	Ontario Ministry of Natural Resources and Forestry
PAR	Population at Risk
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RFP	Request for Proposal
SFI	Scope for Improvement
U/S	Upstream Side of Dam

EXECUTIVE SUMMARY

ES-1 OVERVIEW

This report presents the results of a Dam Safety Review (DSR), performed by TULLOCH Engineering (TULLOCH) for the Burgess 1 Dam structure associated with the powerhouse at Bala, Muskoka, Ontario. The DSR was triggered by an overtopping event in the spring of 2019.

The DSR included a site visit On July 4th, 2019 by Frank Palmay, P. Eng. and Erik Giles, P. Eng., where existing conditions of the structure were observed and recorded along with site measurements. This report summarizes the results of the DSR and has been prepared according to CDA (2007, 2014) and MNRF (2011) guidelines.

Based on this DSR, the Burgess 1 Dam is in “poor to fair safe condition”. However, some deficiencies and non-conformances were identified as summarized in Tables ES-1 and ES-2, respectively. The following summarizes the DSR findings.

E-2 HYDROTECHNICAL ASSESSMENT

The following is a summary of the hydrotechnical assessment of the Burgess 1 Dam based on the available information provided in MRWMP.

- The Inflow Design Flood at the MNRF Bala Dams was established as the 100 years event with a maximum lake of El. 226.5m. The identical IDF (1/100yrs) with a water level of El. 226.5 m applies to Burgess 1 Dam;
- The Normal Operating Level (NOL) is also defined by Bala North and South dam. The NOL is in the range of El. 224.6 m to El. 225.75 m (Acres, 2006).
- Based on document review, the existing dam crest elevation is at El. 226 m (to be confirmed by survey). TULLOCH recommended that the reservoir level upstream of the Burgess 1 Dam should be kept within the operating levels as per the MRWMP of El. 225.75 m (upper bound) in order to ensure a minimum freeboard of 0.25 m during operation.
- The current dam does not have enough freeboard to store the IDF at present. Design measures for proper management of overflows should be developed for IDF event.
- The reservoir water level was at about El. 225.3 m at the time of TULLOCH’s dam safety inspection (DSI) conducted July 4th, 2019. This level is inferred to be the normal operating water level (NOL) of the facility.

- Based on the incremental consequences of dam failure during the IDF and sunny day breach (i.e. non-flood) conditions, the Burgess 1 Dam is classified as having a LOW HPC according to both MNRF and CDA guidelines.

E-3 GEOTECHNICAL STABILITY

The following table summarizes the results of the calculated factor of safety for the existing Burgess 1 Dam section under various loading conditions compared to the MNRF required minimum FOS.

Table ES-1: Calculated FOS for Stability of Burgess Dam Structures

Dam	Case[1]	Water Level (m)	FOS-Sliding	FOS - Overturning	Required FOS – Sliding/Overturning
Non-overflow Dam Section	Static Loading with NOL	El. 225.75	2.7	1.4	1.5 / 2.0
	Pseudo-static α=0.01g and NOL	El. 225.75	2.7	1.4	1.1 /1.1
	Static Loading with IDF	El. 226.49	2.3	1.1	1.3 / 1.3
Powerhouse Dam Section	Static Loading with NOL	El. 225.75	1.2	1.0	1.5 / 2.0
	Pseudo-static α=0.01g and NOL	El. 225.75	1.2	1.0	1.1 / 1.1
	Static Loading with IDF	El. 226.49	1.1	1.0	1.3 / 1.3

Note: [1]- NOL is the Normal Operating Level

Based on the geotechnical stability assessment, Repair or mitigation measures have to be developed for both the non-overflow dam section and powerhouse dam section to improve the FOSs to meet the criteria.

E-4 DAM MANAGEMENT AND PUBLIC SAFETY CONCLUSIONS

Based on the site inspection it was determined that there are a number of concerns towards public safety that need to be addressed such as upgrading and adding signage on the site, repairing and extending broken fencing, burying exposed ground wires and the creation of a Public Safety Plan. Further details can be found in table ES.2.

E-5 SUMMARY TABLES

Tables ES-2 and ES-3 summarize the recommended remedial actions to address the observed deficiencies and non-conformances at the Burgess 1 Dam site.

Table ES.1: Dam Safety Recommendations

Dam Structure	Issue	Category	Recommended Action	Recommended Schedule
Non-overflow dam section	**Moderate to significant washouts along the dam toe area caused from 2019 flooding** The FOS of the concrete dam section depends on the remaining fill material on the d/s toe area for the post-overflow event in 2019 flooding. Significant washout /scouring was observed along the downstream toe area with a scoring depth in excess of 1.0 - 1.5 m. The observed lake level in 2019 spring was about El. 226.45 m, is comparable to an IDF event for the Bala Falls Dams. Under the current site condition, the calculated FOSs against sliding and overturning are inadequate and do not meet required minimums.	Deficiency	Replace/reinstate the d/s fill material with rockfill/rip rap erosion protection to improve the FOS to meet the criteria	Spring/Summer 2020 High Priority
	No emergency spillway	Deficiency	A spillway option or the alternative overflow control options should be designed and constructed to pass the IDF conditions during a flood event.	Within 5 years
	Inadequate water level monitoring program	Deficiency	Install permanent water level gauges and / or other reliable monitoring measures tied to the Bala North and South Dams and monitor the water level regularly.	Spring/Summer 2020

Dam Structure	Issue	Category	Recommended Action	Recommended Schedule
Powerhouse Dam Section	**The powerhouse structure is in poor condition.** The dam and powerhouse are integrated into one structure. Large diagonal cracks observed in the concrete foundation slab likely caused by undermining from long-term scouring during powerhouse operation have compromised the load path of the structure and have limited the slabs ability to uphold the structure. In its current state the FOS of the powerhouse does not meet required minimums. The current site condition, the calculated FOSs against sliding and over-turning for the powerhouse dam section are inadequate to meet the required minimum FOSs.	Deficiency	Repair or mitigation measures must be developed for the powerhouse dam section (including the foundation treatment) to improve the FOS to meet required minimums.	Fall 2020 High Priority
	Powerhouse operation Under current condition, the powerhouse needs to cease operation to prevent further scouring and undermining of the foundation which are causing stability issue of the powerhouse.	Deficiency	Stop the units running or extend the tailrace pipeline to a safe distance d/s.	Spring/Summer 2020

Table ES.2: Maintenance and Surveillance Recommendations

Dam Structure	Deficiency or Non-Conformance	Category	Recommended Action	Recommended Schedule
Non-Overflow and Powerhouse dam Section	**Lack of record drawings**	Non-conformance	Compile the following records and keep them on file for Dam Safety Purposes: • Existing dam as-built drawings and design reports • As-built records for dam modifications/repairs.	Within 2 years after completion of the dam upgrade.
	OMS document	Non-conformance	Develop an OMS Manual for the facility. The normal operating water level and maximum operating water level should be defined in the OMS.	Within 1 year after completion of the detail design of the dam upgrade.
	Emergency Preparedness and Response Plan (EPRP)	Non-conformance	Develop an EPRP	Within 1 year after completion of the detail design of the dam upgrade.
	A survey of the dam structures and associate facilities	Non-conformance	A survey of the existing dam structures should be conducted for the design of dam structure upgrade to meet the CDA and MNRF guidelines	Complete by end of 2019
	Dense vegetation present at the dam site	Non-conformance	The vegetation should be removed within 3-5 m footprint of the selected option for the dam upgrade	Prior to the construction of the dam upgrade.
	Grouting or concrete patching the cracks in the existing dam sections	Non-conformance	Grouting or concrete patching is recommended to repair the existing cracks in the dam.	Complete by Spring/Summer 2020

Dam Structure	Deficiency or Non-Conformance	Category	Recommended Action	Recommended Schedule
Non-Overflow and Powerhouse dam Section (con't)	**There is no signage at the dam sites, upstream from or downstream from the dams, or at the access points**	Non-conformance	Safety and warning signage should be posted at both entrances to the site. Signage should be installed on the dams indicating hazards, including presence of deep water in the lake approaching to the dam, required PPE, hazards of working at or around dam and signage at the discharge facilities indicating unexpected release of flows or fast-moving water. Signage should be posted upstream and downstream of facility to warn the public of fast-moving water and the presence of the dam	Complete by Spring/ summer 2020
	Public Safety Plan (PSP)	Non-conformance	A Public Safety Plan (PSP) should be drafted to address the safety issues and ensure they are properly managed, and controls are properly maintained.	Complete by Spring 2020
	The existing boom line is in a poor condition	Non-conformance	Upgrade the boom line and adjust the safety distance to the powerhouse inlet; Regular maintenance is recommended.	Complete by Spring / Summer 2020
	Exposed grounding wire along site	Non-conformance	Backfill all exposed wires	Complete ASAP High Priority
	The existing fence / gate to constrain the public access to the dam site	Non-conformance	Upgrade the fence / gate to constrain the public access to the dam site without permits. Regular maintenance is recommended.	Complete by Spring / Summer 2020

Dam Structure	Deficiency or Non-Conformance	Category	Recommended Action	Recommended Schedule
River Street Concrete Retaining Wall and Embankment	**River Street Concrete Retaining Wall is in a fair safe condition**	Non-conformance	Retaining wall drainage efficiency upgrade design and construction are recommended; survey and geotechnical investigation and assessment are required.	Prior to the construction of the dam upgrade.
	River Street Embankment with Gabion Wall is in poor condition The embankment to the west of the retaining wall was in poor to fair safe condition during 2019 DSI. There exists a potential slope failure risk for River Street adjacent to the tailrace of the dam.	Non-conformance	A slope stability evaluation of the embankment along River Street is recommended. Detailed geotechnical investigation and assessment are strongly recommended.	Complete by Spring / Summer 2020

1. INTRODUCTION

1.1 Purpose and Objectives

TULLOCH Engineering Ltd. (TULLOCH) was retained by the Township of Muskoka Lakes (the Township) to carry out a Dam Safety Review (DSR) for the Burgess 1 Dam structures in Bala, Ontario within the District of Muskoka. Appendix A shows the site the location.

A DSR is an independent and systematic review and evaluation of the design, construction, maintenance, operation, and management systems affecting dam safety. For this DSR, the Burgess 1 Dam and associate structures were assessed in accordance with the Canadian Dam Association (CDA) Dam Safety Guidelines (2007, 2014) and Ontario Ministry of Natural Resources (MNR) Best Management Practices and Technical Bulletins (2011). Prior to this report, a formal DSR has not been carried out for the Burgess 1 Dam structures.

The overall objective of the DSR is to provide the Township with an independent and comprehensive assessment of the adequacy of the current Burgess 1 Dam facility to meet or exceed the applicable dam safety requirements. This review is intended to identify and categorize all dam safety issues that require remedial attention. Further, the issues identified are prioritized in Table ES-1 to ES-2 to assist the Township in setting priorities and developing an action plan to deal with the safety related deficiencies identified for the Burgess 1 Dam.

The scope of the work for the DSR was detailed in the TULLOCH Proposal dated May 31st, 2019 (Proposal #19-0001-179). The process commenced with The Township providing historical documents relating to the project to TULLOCH for review. Next, a DSI was performed by TULLOCH engineers accompanied by Mr. Steve Dursley a representative of KRIS Renewable Power the current lease and operator of the facility on July 4th, 2019. The DSI was limited to the civil/geotechnical, hydrotechnical and structural aspects of the facilities. Following the site inspections, a detailed DSR was completed including:

- Background data review
- Key/critical findings and preliminary recommendations
- Geotechnical, Structural and Hydrotechnical assessments
- Preliminary study for the mitigation/repair options
- Conclusion and recommendations
- DSR Report

Th following sections provide details of the DSR completed for the Burgess 1 Dam Structures. A Key Location Plan for the site can be found in Appendix A.

2. BACKGROUND INFORMATION

2.1 Document Review

The DSR process began with a review of available background information. The following documents were reviewed and formed the basis of this DSR.

- MRWMP Final Plan Report by Acres international, dated 2006
- Bala – Small Hydro Development Burgess Dam Site – Report on Proposals for Development by Totten Sims Hubicki Associates, not dated (circa 1987)
- Township of Muskoka Lakes Small Hydro Development Bala Tender Documents by Totten Sims Hubicki Associates, dated 1987
- Structural Report Bala Dam and Power Building Township of Muskoka Lakes by Totten Sims Hubicki Associates, dated 1986
- A Proposal for Historic Site Development of The Bala Power Generating Facility by Integrated Resource Group, dated 1984
- Feasibility Study for The Restoration of the Bala Power Generation Station by Integrated Resource Group, (not dated circa. 1984)

2.2 General Site Layout

The Burgess 1 Dam mainly consists of the following structures:

- Concrete dam structure (Water Retaining structure, Non-overflow dam section);
- Concrete dam with downstream (d/s) powerhouse structure;
- River Street Retaining Wall and Embankment;
- Other ancillary structures including the access road, fence, gates, tailrace and walkways.

A key location plan can be seen in Appendix A which shows the Burgess 1 Dam general site layout.

2.3 Organization and Responsibilities

Originally the dam was built by J.W. and A.M. Burgess between 1917 and 1922 and the dam/generating station was purchase by the Ontario Hydro Commission in 1929. Burgess 1 Dam was owned and operated by Ontario Hydro from 1929 to 1957 and was then sold to the Township in 1963 who currently owns the facility.

Based on Township records the facility was largely unused for a long period of time until it was partially refurbished and leased to Marsh Power in 1988 for the purpose of power generation until

1999. The facility was then leased to Algonquin Power (Fund) Canada Inc. and operated by Algonquin Power Systems Inc. until 2011. Upon expiry of the lease KRIS Renewable Power Ltd (KRIS). Began to lease and operate the generating station. The current Lease started in August of 2012 and expires in 2022. KRIS currently operates the facility employs a part time care and maintenance operator who works e at the facility to run the generating station, remove debris from the headwaters/spillway inlet and generally maintain the property. KRIS has also partially upgraded the facility by adding new metal sluicegates and a new turbine on the north inlet of the headwaters.

2.4 Burgess 1 Dam Facilities

The Burgess 1 Dam was built and began operation in 1917. The facility consists of a 59 ± meter long concrete dam founded on bedrock with a maximum height of approximately 3 meters. Fill has been placed on the downstream face of the dam to provide resistance against the overturning and sliding of the structure. The powerhouse is approximately 9 m x 14 m in dimension including the turbine, generator and associated electrical equipment. Finally, a 16 m long retaining wall connected to the north wall of the powerhouse supports River St immediately to the north of the facility. The tail race is armored with gabion baskets sitting atop a historic boulder rock wall on the north bank of the facility. The dam and powerhouse are integrated into one structure, which is situated in a constructed channel on the existing bedrock. Table 2-1 below summarizes the main features of the dam structures on site:

Table 2-1: Summary of the In-situ Features of the Burgess 1 Dam

No.	Dam	Main Features	Reference
1	Non-overflow Dam Section	Concrete Retaining Structure on Bedrock supported by d/s fill embankment.	• TSHA Structural Report, 1986 Drawing P-1 and P-2
2	Powerhouse Dam Section	Concrete gravity dam and powerhouse are integrated into one structure and founded on the bedrock	• TSHA Structural Report, 1986 Drawing P-1 and P-2
4	Dam Crest Elevation (m)	• El. 226.0 m	• TSHA Structural Report, 1986 Drawing P-1 and P-2
5	Maximum Dam Height (m)	• Max. 3 m (non-overflow section) • Max. 6 m (Powerhouse Section)	• TSHA, Structural Report 1986 Drawing P-1 and P-2
6	Crest Width (m)	• Approx. 0.6 m	• TSHA, 1986 Drawing P-1 and P-2
7	Dam Length (m)	• 59 m (total length of dam) • 14m (Powerhouse Section)	• TSHA, 1986 Drawing P-1 and P-2

No.	Dam	Main Features	Reference
8	Spillway	• No Spillway	• MRWMP, 2006
9	Reservoir Levels	• NOL Range between 224.6 and 225.75 m • IDF El. 226.49m	• MRWMP, 2006
10	Powerhouse	• 0.14MW, 2 Units • Max. flow rate 4m^3/s	• MRWMP, 2006

For further information/details of the features of the Burgess 1 Dam, relevant historic drawings/site plans can be viewed in Appendix F. The aforementioned plans along with field measurements formed the bases for the modelling and the figures presented in this report. It is strongly recommended that a detailed survey of the site be undertaken to verify dimensions and elevations.

3. SITE CONDITIONS

3.1 Site Surficial Geology

Based on review of Bedrock Geology and Surficial Geology of Southern Ontario mapping as published by the Ontario Geological Society (OGS), the site surficial geology is comprised of Canadian Shield with formations of Precambrian Bedrock typical within the Muskoka region. The bedrock on site was located close to ground surface and comprised of typical geologic formations for the Bala area including hard and smooth pink to grey migmatitic rocks as well as quartzofeldspathic gneisses (OGS 2019). The Burgess 1 Dam is located at the lower section of the Muskoka river watershed near the bottom of Lake Muskoka where regional topography is typically mapped as low local relief varying from plains to undulating hummocky conditions (Acres 2006). Overburden in the Bala area is typically sandy and shallow in depth with thick organic deposits found in low lying wetland areas. Overburden observed on site was typically shallow and sandy in nature.

3.2 Site Seismicity

The site seismicity is based on the 2015 National Building Code seismic peak ground acceleration (PGA). Based on the DSR, the Burgess 1 Dam has been classified as a dam structure with LOW flood and earthquake hazards, indicating the return period of the design earthquake to be 1/100 according to CDA Guidelines (2013 Edition). Accordingly, the PGA seismic coefficient for the dam sites has a 40% probability of exceedance in 50 years corresponding to a return period of 1 in 100 years, based on the 2015 National Building Code. Appendix B shows the PGA data obtained from the 2015 National Building Code Seismic Hazard Calculation Index which is specific to the site. This corresponds to a PGS value of 0.01.

3.3 Site Hydrology

Located on the lower tier of the Muskoka Watershed, the Burgess 1 Dam generating facility along with the North and South Bala Falls Dams hold back most of the water collected from the Muskoka River Watershed sharing a drainage area of 4683 km^2 and a lake surface area of 120 km^2 (Acres 2006) . Generally, flood events for the watershed occur in two basic types, a spring freshet from melted snow along with increased precipitation and major storm events.

The Burgess Dam is largely controlled by the larger North and South Bala Falls Dams located ~ 300m south of the facility which typically handles the flood flow through the watershed. Water from the Burgess Dam flows south west into the Moon and Musquash Rivers eventually into Georgian Bay. The majority of the watershed meets in Bala forming a bottle neck that must handle significant flows during flooding conditions from the majority of the watershed. Recorded river flow data at the Bala Reach of the Muskoka river indicate a long-term average stream flow of approximately 76.7 m^3/s (Acres 2006).

The allocated maximum flow to the Burgess Generating Station is 4 m^3/s and there is no spilling capacity. As a result, all flood flows passing from Lake Muskoka are routed through the North and South Bala Dams. The facility has two turbine units and is rated at 0.14 MW. Power is generated at the facility only when Lake Muskoka water levels are within an acceptable range.

4. DAM SAFETY GUIDELINES

This DSR was executed in accordance with the following guidelines from both the MNRF (2011) and Canadian Dam Association (2007, 2011, 2013):

- The Ontario MNRF Guidelines including Ontario Ministry of Natural Resources and Forestry Lakes and Rivers Improvement Act Administrative (LRIA) Guide (dated August 2011),
- Associated Technical Bulletins and Best Management Practices.
- Canadian Dam Association, 2007 Dam Safety Guidelines, including 2013 Revisions.
- Canadian Dam Association, Guidelines for Public Safety Around Dams, 2011.

Dam classification and design criteria for the DSR are based on the MNRF (2011) Hazard Potential Classification (HPC) system, the CDA (2007) dam classification category and associate Inflow Design Flood (IDF) and Earthquake Hazards. Appendix C includes the dam classification and criteria used in this study from the CDA and MNRF guidelines.

5. DSR PROCEDURES

5.1 DSI and Interviews

A DSI in support of the DSR were carried out on July 4th, 2019 by Mr. Frank Palmay, P.Eng. and Mr. Erik Giles, P.Eng. of TULLOCH Engineering. The DSI personnel were accompanied by Mr. Steve Dursley, who was a KRIS representative. The inspected areas included the Burgess 1 Dam structures, powerhouse and associate equipment, u/s reservoir, the downstream tailrace, River Street retaining wall structures and the surrounding areas.

The details of the DSI field report and findings are in Appendix D and the previously issued Key Findings Memorandum can be found in Appendix E.

5.2 DSR Assessments

The following technical assessments were carried out in support of this DSR:

- Hydrotechnical assessment to determine the Hazard Potential Classification (HPC) and Inflow Design Flood (IDF) for the structures
- Geotechnical assessment to evaluate the stability of the existing dam under various loading conditions
- Development of a preliminary options for Dam mitigation/repair including baseline cost estimation
- DSR report

6. DAM SAFETY INSPECTIONS

6.1 General

The site inspections at the Burgess 1 Dam were completed on July 4th, 2019, based on the following sequence:

- The site DSI was undertaken with an emphasis on the nature, extent and condition of the contained material(s), reservoir levels, upstream (U/S) and downstream (D/S) areas and abutment contacts, the geotechnical environment, and included the flow discharge facilities as well as the structural condition of the existing powerhouse structure and retaining wall attached to the dam;
- Walk-arounds and visual inspections at the dam site included observations of components such as dam crests, U/S and D/S slopes, abutments, toe areas, and a record of relevant details indicative of the stability and potential risk of instability of the structures. The recorded information includes facility name, height of structure, approximate slope gradients, activity status and physical condition (i.e. visible depressions, cracking,

deformation, surface erosion, freeboard, signs of past flooding, overtopping, internal erosion, piping, sand boils etc.);

- Inspections of the appurtenant structures were done to assess their condition, functionality and adequacy;
- Inspection forms were completed for each of the significant structures, including the gathering of other relevant information such as GPS data (georeferenced using UTM co-ordinates), digital photographs of all pertinent features, and area characterization (refer to Appendices D and E);
- Where background information was not available, the dimensions of the structures were estimated with a measuring tape or by pacing;
- No underwater inspections were proposed nor were any inspections of high steep slopes carried out when accessibility was limited.
- Assessment was based on exposed physical condition only and did not include destructive testing of any element of the structure. No samples were collected and therefore no laboratory analysis of the concrete or soils was conducted.

The objective of the inspections was to identify and address any deficiency findings and recommend associated mitigation measures. The key points of the findings for the facility are summarized below. As noted above, the field inspection checklist for the dam facility is included in Appendix D of this report. Recommendations with respect to the findings in the report are presented in Sections 9.0 through 11.0.

6.2 Access, Safety and Security

Access to the site was via Portage Street located south of the main downtown area of the Town of Bala. The dam was built adjacent to River Street and there are both full year and seasonal residents located on both Portage and River Streets. The main access to the dam is through a locked entrance gate from Portage Street, with a second locked man gate that exits onto River Street. A Chain-link fence runs across the south side of the property and connect to the south abutment of the dam. A small length of chain-link fence also ties into the guardrails west of the River Street retaining wall. However, the fencing located to the south of the dam has fallen into disrepair and needs to be replaced. Furthermore, the man gate and locking system to the River Street entrance along the north side of the powerhouse also should be upgraded. Fencing should be extended along the dam crest to prevent boaters from accessing the facility from the headwaters.

No significant signage is present along the facility either at the headwaters or tailrace locations. A small faded sign warning of moving water is located overtop of the sluicegates however it is difficult to read and should be replaced. There is no signage posted on either gate. For the purpose of public safety warning signs should be posted in all aforementioned locations.

The sluice gate of the dam appeared to be outfitted with warning lights however they were not in use or tested during the DSI, visual and auditory warnings should be implemented if not already and tested frequently to ensure they are in good working order.

The boom-line for the dam is comprised of historic timbers which are half sunken and the setback distance is too close to the dam. The line is poorly visible from the headwaters of the dam and does not provide an ample barrier for the public. The boom line should be upgraded to modern standards and setback further from the dam.

6.3 Observations

Generally, the dam structure was found to be in fair condition considering the age of the structure. However, the powerhouse section of the dam is in poor overall condition from both a structural and dam safety perspective and will require remediation due to the presence of failed or failing structural members and a large transverse crack through the floor slab of the dam. Furthermore, significant washout of the downstream fill from another future flooding event has the potential to cause the structure to fail. As such there are dam safety issues associated with this site that will require remediation. Detailed observations for the DSI can be found in Table 1 of the Key Findings memo issued on July 24, 2019 which can be found in Appendix E. Preliminary recommendations were also made in this document but have since been refined and will be addressed below in Section 11.0.

7. HYDROTECHNICAL ASSESSMENT

7.1 Methodology

A hydrotechnical assessment was carried out mainly based on literature data review and desktop study. As described in the preceding sections, the Burgess 1 Dam facility is currently rated at 0.14 MW, operates when Lake Muskoka water levels are within an acceptable range. The facility has no spill capacity as upstream water level control is provided by the Bala North and Bala South dams. The hydrotechnical assessment mainly consist of the following steps:

- Compile the lake levels taken from Environment Canada hydrometric data measured from the nearest upstream station near the inflow of the Bala dams (Station ID:02EB015);
- Compile the operating lake levels of the Burgess dam as outlines in the MRWMP (2006);
- Determine the IDF for Burgess dam based on available data;
- Determine the Hazard Potential Classification (HPC) based on the MNRF and CDA criteria;
- Assess if the existing Burgess Dam has adequate freeboard for IDF event.

7.2 Water Levels

Figure 7-1 shown below illustrates the water levels at Burgess 1 Dam Site in 2019 and compares it to critical water levels associated with the structure according to the MRWMP. Table 7-1 summarizes the critical water levels. Summarizing:

- The maximum measured water level in 2019 during the flood event was at El. 226.1m at Gauge Station 02EB015, which occurred on May 1st, 2019;
- The IDF value provided by the MNRF and illustrated in the Muskoka River Dam Operation Manual for both the Bala Falls Dams is 226.49 masl and corresponds to the 100-year flooding event. The observed maximum water level at Burgess 1 Dam during overtopping in 2019 spring was at approximate El. 226.45m, which is very close the IDF (1/100yrs return) level of El. 226.49m;
- The facility has no spill capacity as upstream water level control is provided by the Bala North and South Falls Dams. Based on their proximity and virtually parallel positioning along the watershed it has been determined that the design IDF for the Bala South and North Dams is the most appropriate value for use at the Burgess 1 Dam location.
- The existing Burgess 1 Dam crest is at El. 226 m. During the determined IDF event water levels are above the dam crest by 0.39 m. Therefore, it can be determined that the Burgess dam does not have sufficient freeboard nor was the existing facility designed to handle IDF in its current state.

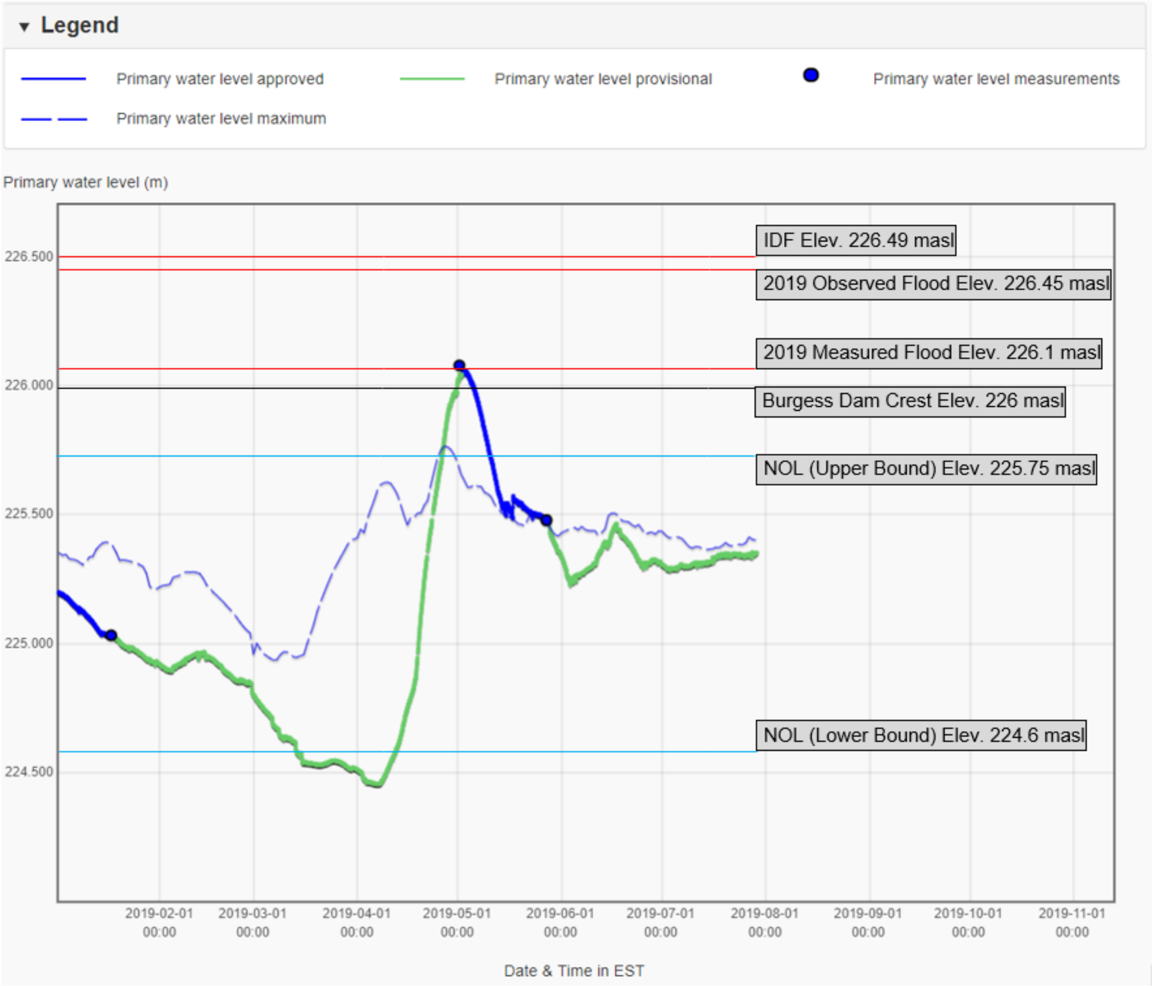

Figure 7-1: Burgess Dam 1 - 2019 Water Levels vs. NOL and IDF

Table 7-1: Water Levels Associated with Burgess 1 Dam

Parameter	Elevation (masl)
Burgess Dam Crest Elevation (to be confirmed by survey data)	226.00
2019 Flooding Measured Maximum Level at nearest Gauge Station 02EB015	226.10
2019 Observed Flooding level at the dam site	226.45
NOL Burgess Dam 1 (Upper Bound)	225.75
NOL Burgess Dam 1 (Lower Bound)	224.60
IDF – 100-year Lake Muskoka Flood Level	226.49

7.3 Hazard Potential Classification (HPC)

Table 7-2 summarizes the hazard potential classification (HPC) based on MNRF guideline (as provided in Appendix C). Given the above criteria, the HPC of the Burgess 1 Dam is LOW.

Table 7-2: Burgess 1 Dam Classification Summary

Category	Burgess 1 Dam	
	Flood	Non-Flood
Incremental Loss of Life (LOL)	0	0
	Low	Low
Economic Damages	<$300,000	<$300,000
	Low	Low
Environmental	Low	Low
Cultural / Heritage	Low	Low
Governing Criteria	Economic / LOL	Economic / LOL
Overall Classification (HPC)	**LOW**	**LOW**

8. GEOTECHNICAL ASSESSMENT

As part of the DSR, the stability analyses for the existing dam sections were carried out to assess the Factor of Safety (FOS) for both Non-overflow and powerhouse dam section under various loading conditions. The following sections summarize the geotechnical assessment.

8.1 Criteria

Table 8-1 summarizes the analyzed cases, u/s water levels and the applicable stability criteria based on CDA and MNRF Guidelines.

Table 8-1: Analyzed Cases and Applicable Stability Criteria

Case	Description	Water Level (m)	FOS-Sliding	FOS-Overturning
1	Static Loading NOL	El. 225.75	1.5	2.0
2	Seismic Loading with NOL	El. 225.75	1.1	1.1
3	Static Loading with IDF	El. 226.49	1.3	1.3

8.2 Methodology

The FOS calculation for stability analysis of the dam sections involved the following Equations:

FOS against sliding failure:

$$FOS = \frac{\sum Resisting\ Froce}{\sum Driving\ Force} \qquad [8\text{-}1]$$

FOS against overturning failure:

$$FOS = \frac{\sum Resisting\ Moment}{\sum Driving\ Moment} \qquad [8\text{-}2]$$

FOS against bearing Failure

$$FOS = \frac{q_{allowable}}{q_{maximum}} \qquad [8\text{-}3]$$

Bearing failure for the facility was calculated for both sections and found to have an FOS greater than 3.0 using a conservative allowable bedrock capacity of 1 MPa. Considering that the facility has a short dam height and is founded on bedrock it was determined that the focus of the analysis will be on failure against sliding and overturning.

Therefore, the FOS against foundation bearing failure is considered to be sufficient and no further calculation is included in the geotechnical assessment. Table 8-1 summarizes the geotechnical parameters used in the stability calculation.

Table 8-2: Summary of Geotechnical Parameters Stability Calculation[1]

No.	Type of Material	Cohesion, c' (kPa)	Internal Friction Angle,φ' (Degree)	Unit Weight, γ' (kN/m^3)
1	Dam Unreinforced Concrete	0	50	24
2	D/S Fill Material	0	35	19
3	Concrete-to-Bedrock Interface[1]	0	45	20

Note: [1]-Geotechnical parameters are assumed for the DSR based on TULLOCH's engineering experience.

8.3 Stability - Seismic Event

Based on Section 7, the Burgess 1 Dam has been classified as a LOW HPC rating, indicating that the return period of the design earthquake is 1/100 according to CDA Guidelines (2013 Edition). The following site-specific PGA has been used to perform pseudo-static stability analysis of these dams:

- For 1/100-year return period, the PGA for the site is 0.01 g, corresponding to a Class 'C' site classification. Appendix C shows the PGA data obtained from the 2015 National Building Code Seismic Hazard Calculation.

- For pseudo-static analysis, the horizontal PGA value was multiplied by 2/3 giving 0.7(0.01g) = 0.007 g. Considering the shallow bedrock present at dam site, two thirds of the horizontal PGA on bedrock is considered to replicate the sustained ground motion. Correspondingly, a ground acceleration of 0.005 g was applied for the pseudo-static seismic assessment of the dam structures at this site.

8.4 Results

Table 8-3 summarizes the results of the stability analysis calculations. The results are discussed in the following sections of this report. Figures 8-1 and 8-2 show representative sections of the dam that were analyzed which are show below.

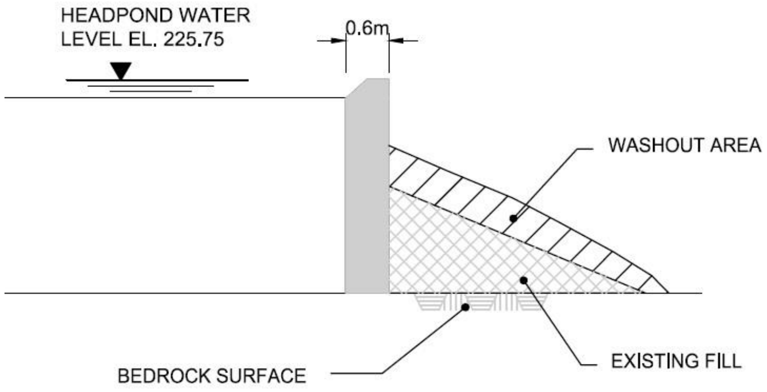

Figure 8-1: Typical Non-overflow Dam Section for Stability Analysis

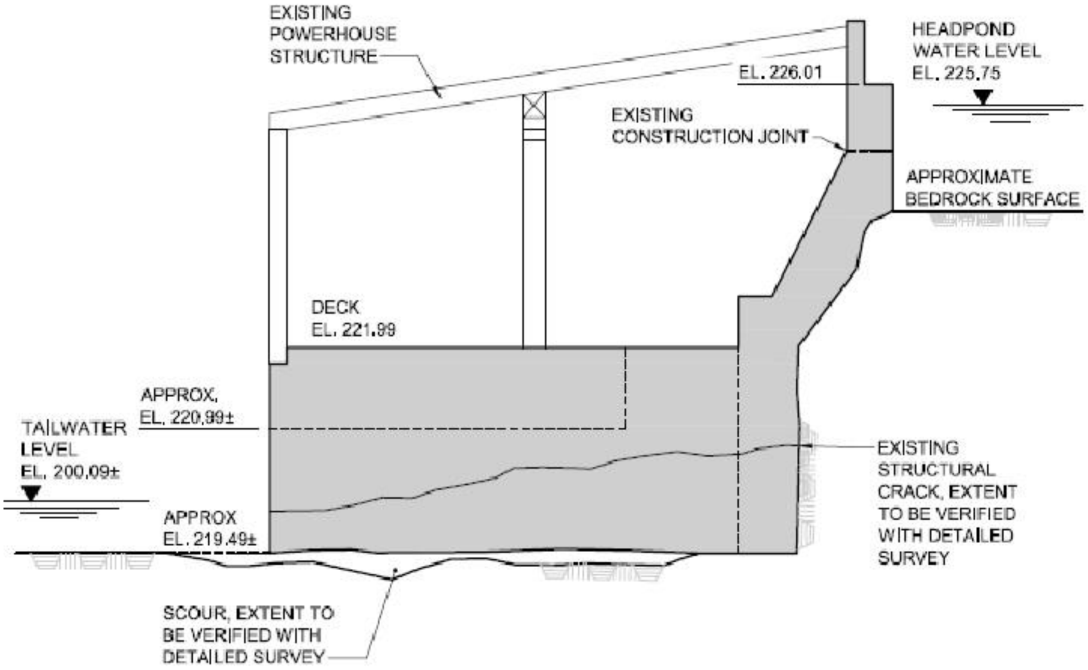

Figure 8-2: Typical Powerhouse Dam Section for Stability Analysis

Factor of Safety calculation results are summarized below for the various loading conditions under each section mentioned above:

Non-overflow Dam Section

- Under static loading condition with NOL at El. 225.75 m, the calculated FOS against sliding is 2.7, which meets the required minimum FOS of 1.5; The calculated FOS against overturning is 1.4, which does not meet the required minimum FOS of 2.0.
- Under seismic loading condition with NOL at El. 225.75 m, the calculated FOSs against sliding and overturning are 2.7 and 1.4, respectively. The calculated FOSs meet the required minimum FOSs of 1.1. Due to a short dam height and low PGA value at the site, the seismic loading has a negligible impact on the stability of Burgess dam.
- Under static loading condition incorporating the IDF water level, the calculated FOS against sliding is 2.3, which meets the required minimum FOS of 1.3; The calculated FOS against overturning is 1.1, which does not meet the required minimum FOS of 1.3.

Powerhouse Dam Section

- Under static loading condition with NOL at El. 225.75 m, the calculated FOS against sliding is 1.2, which does not meet the required minimum FOS of 1.5; The calculated FOS against overturning is 1.0, which does not meet the required minimum FOS of 2.0.
- Under seismic loading condition with NOL at El. 225.75 m, the calculated FOS against sliding is 1.2, which meet the required minimum FOS of 1.1; the calculated FOS against overturning is 1.0, which does not meet the required minimum FOS of 1.1. Due to a short dam height and low PGA value at the site, the seismic loading has a negligible impact on the stability of Burgess dam.
- Under static loading condition incorporating the IDF water level, the calculated FOS against sliding is 1.1, which meets the required minimum FOS of 1.3; The calculated FOS against overturning is 1.0, which does not meet the required minimum FOS of 1.3.

Based on the geotechnical stability assessment, Repair or mitigation measures must be developed for both the non-overflow dam section and powerhouse dam section to improve the FOS to meet the minimum acceptable criteria.

Table 8-3: Calculated FOS for Stability of Burgess Dam Structures

Dam	Case	Water Level (m)	FOS-Sliding	FOS - Overturning
Non-overflow Dam Section	Static Loading with NOL	El. 225.75	2.7	1.4
	Pseudo-static α=0.005g and NOL	El. 225.75	2.7	1.4
	Static Loading with IDF	El. 226.49	2.3	1.1
Powerhouse Dam Section	Static Loading with NOL	El. 225.75	1.2	1.0
	Pseudo-static α=0.005g and NOL	El. 225.75	1.2	1.0
	Static Loading with IDF	El. 226.49	1.1	1.0

8.5 River Street Concrete Wall and Embankment

Based on site inspection, the concrete retaining wall along River Street is in a Fair condition. The presence of the vertical cracks in the wall encountered during the DSI indicated drainage efficiency of the retaining wall may not be adequate. The inadequate drainage likely caused water pressures to build up behind the retaining wall. This could be alleviated by implementing better drainage and water management through and around the wall. Preliminary recommendations will be discussed further in Section 11.0.

The Embankment along River Street downstream of the site is very steep and appears to be eroding at the toe where there are newer gabion baskets placed on a historic boulder/stone wall.

There is a concern for the slope failure of the embankment due to the erosion/ scour caused by water flows during power generation activity. The slope stability evaluation of the embankment along the River Street is not included in the scope of this DSR, however, a detailed geotechnical investigation and assessment are strongly recommended.

9. DAM MANAGEMENT CRITERIA

9.1 Operation, Maintenance, and Surveillance

It is our understanding that there is currently no OMS Manual for the Burgess 1 Dam facility. However, Operating levels for all control dams in the Muskoka watershed can be found in the Muskoka River Dam Operation Manual. The manual does not provide the necessary detail for the site-specific operation, maintenance and surveillance for the Burgess 1 Dam site. Therefore, it is TULLOCH's recommendation that an OMS manual be drafted for the Burgess 1 Dam.

9.2 Emergency Preparedness and Response Plan

There is no formal Emergency Preparedness and Response Plan for the dam in the event of failure. The Muskoka River Dam Operating Manual describes typical operating levels but does not describe issues relating to a response of a failure/emergency event.

It is recommended that an Emergency Preparedness and Response Plan be prepared for the facilities now that a DSR has been completed for the site which should include the anticipated effects of a dam failure under the selected IDF.

10. PUBLIC SAFETY

10.1 Review

The Burgess 1 Dam main access gate is located off Portage Street and is typically locked when site personnel are not present. The man gate located on the south bank of River Street is poorly secured with a thin chain and padlock, although it is kept locked upgrades to the gate would improve security. Fencing around the property is damaged in some places and could allow for access to the general public. Although not generally accessible a cottager has also built a dock on the south abutment of the dam. The site is generally inaccessible by foot, but it is possible to access the site by boat or by walking up the tailrace due to poor signage and an inadequate boom line. There is no signage for the Burgess 1 Dam warning the public of the dangers associated with active hydro generation except for one badly faded poorly sized sign located on the top of the sluicegate. The boom line for the dam is poorly visible, dated, and does not have appropriate clearance from the dam.

10.2 Recommendations

- Signage should be added for the Headwaters and Tailrace of the facility indicating danger and the unexpected release of flows/fast moving water

- The faded sign should be replaced on the dam
- Fencing should be expanded along the dam crest and repaired where broken
- The dock on the south abutment should be removed
- The north access gate should be repaired, and the locking system upgraded

11. MITIGATION RECOMMENDATIONS

Recommended mitigation measures are outlined below for the Non-overflow, Powerhouse and River Street Retaining Wall sections of the Burgess 1 Dam site. TULLOCH has provided improvement options for each section of the structure with a brief discussion on each option. It should be noted that these recommendations are at a conceptual level and quantities/cost estimations need to be verified with a detailed survey of the property. Conceptual figures of the facility upgrades can be seen in Appendix G.

11.1 Non-Overflow Dam Section

11.1.1 Option N1 – Downstream Rip Rap Placement and Toe Berm

Option N1 is to reinstate the fill of the existing dam by replacing rockfill/ rip rap over a non-woven geotextile for erosion protection d/s of the existing dam site. Fill should be replaced in washout section and then covered with a geotextile. The addition of rip rap will provide added erosion protection in the event of overtopping to avoid excessive washout of fill similar to the 2019 event. In order to collect overflow water during flooding events a toe-berm could be constructed along the downstream property line to channel water down to the in-situ river channel. A similar berm would be constructed along the south wall of the powerhouse to keep flows away from the building foundation. Figures 19-1493-C-01 and 02 in Appendix G show the conceptual design for Option N1. Highlights of the N1 design include:

- Downstream; clear and strip organics as required;
- Reinstate washed-out sections of downstream fill
- Place Non-woven geotextile and rip rap (500mm thick); grade back toward the tailrace for erosion protection;
- build toe berms along the existing property line and the south wall of the powerhouse to manage and divert the overflow (if it occurs) toward the river;
- Extend the existing dam to the south end to accommodate toe berm and flow management (about 8m in length);
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;

11.1.2 Option N2 – Partial Dam Raise and Emergency Spillway

Option N2 is to partially raise sections of the Non-overflow area of the dam and install and emergency spillway to control overflow during flooding events.

The spillway invert could be kept at the current dam crest elevation and the remainder of the dam would subsequently be raised 0.5m to meet the minimum freeboard criteria during the operation of the spillway during a flood event. The final spillway invert elevation and grade as well as the dam raise will need to be determined based on a detailed survey and hydrotechnical assessment. Figures 19-1493-C-04 and 05 in Appendix G show the conceptual design for Option N2. Highlights of the N2 design include:

- Downstream; clear and strip organics as required;
- Partially raise the dam 0.5 m for the dam section about 20 m in length south of the proposed spillway invert and 6 m in length north of the invert;
- Build an emergency spillway channel with rip rap placed a minimum of 500 mm thick over non-woven geotextile with a total approximate width of about 18m through the middle of Non-overflow section of the dam;
- The spillway should be angled such that water is directed into the existing tailrace and away from the River Street embankment;
- Re-instate the fill south of the spillway that has been washed away during the flooding event and tie into the spillway;
- Extend the existing dam abutment south to accommodate a higher elevation (about 8m in length);
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;

11.2 Powerhouse Dam Section

11.2.1 Option P1 –Demolish Powerhouse and Replace with New Dam

Given the relatively poor condition of the existing powerhouse, Option P1 is to demolish the existing powerhouse dam section and build a new replacement concrete dam section upstream of the existing powerhouse. Figures 19-1493-C-08 and C-10 in Appendix G show the existing condition of the section and a conceptual design for Option P1. Highlights of the P1 design include:

- Installation of u/s and d/s cofferdams;
- Removal of the old dam section and associate powerhouse structures;

- Construction of a new concrete gravity dam (about 2.5m high) on excavated bedrock for water retention (i.e. to maintain the lake level); the new dam section will be tied into the existing non-overflow section.
- Removal of cofferdams after construction is complete.

11.2.2 Option P2 – Powerhouse Refurbishment and Reinforcement

It may be advantageous to keep the powerhouse section of the dam intact given its historic value and the potentially prohibitive cost of decommissioning and deconstruction. Furthermore, the possibility of continued power generation may be appealing to the Township. As such, given that the current FOS of the existing powerhouse dam section is marginally stable a refurbishment of the facility is possible to meet current standards. Option P2 entails the structural reinforcement of the existing building as well as to remediate and reinforce the dam section and foundation of the powerhouse. Figure 19-1493-C-09 in Appendix G shows the conceptual design for Option P2. The highlights of Option P2 include:

- Fill the scour areas (i.e. undermined holes) in the foundation the powerhouse with mass pour concrete;
- Grout the cracks developed in the existing concrete piers;
- Reinforce the powerhouse structures with 9 rock anchors (Φ35mm, 8m long) to be installed to a minimum depth of 6 m into the bedrock; Grout the existing crack through the foundation once bolts are installed;
- Repair/Replace the Roof;
- Add shear struts and additional structural bracing in the powerhouse building;
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;
- Extend the existing tailrace pipes for the turbine units d/s to keep them a safer distance away from the powerhouse to avoid scour and undermining of the foundation.

11.3 River Street Concrete Retaining Wall

Based on review of site photos and field findings, the following mitigation actions should be considered to improve the performance of the existing concrete retaining wall structure:

- Install a drainage ditch u/s of the retaining wall to divert the surficial run-off water from River Street;
- Drill drainage holes and install drainage pipes along the base of the existing concrete retaining wall;

It should be noted that all options described above are conceptual in nature. Verification of design elements, dimensions and quantities and associated costs will require topographical survey, geotechnical investigation and further geotechnical/structural analysis to move towards detailed design.

11.4 Cost Estimation

Preliminary costs and material quantities were estimated based on historical design drawings (seen in Appendix F) provided by the Township and an assumed ground profile. Table 11-1 shows a summary of the cost estimation for the options discussed above. It should be noted that the costing and quantities are considered preliminary for the purpose to help select a preferred option for detailed design. Costs and quantities should be verified with a detailed ground survey and confirmed with further geotechnical and structural analysis. Tables H-1 through H-4 in Appendix F show the details of the preliminary cost estimation for each option discussed above.

Table 11-1 Summary of the Preliminary Cost Estimates (FEL1 Level)

Area	Option	Cost Estimation ($)
Non-overflow Dam Section	N1	$ 171,535.00
	N2	$ 227,570.00
Powerhouse Dam Section and River Street Concrete Retaining Wall	P1	$ 1,884,400.00
	P2	$ 535,150.00

11.5 Preliminary Remediation Recommendations

Based on the assessment above, the following option combinations are feasible considering both technical and economic aspects, including:

- Option N1 and Option P2 (total cost: $ 706,685.00)
- Option N2 and Option P2 (total cost: $ 762,720.00)

TULLOCH recommends Option N2 and P2 for the proposed remediation of the facility the decision was made given the following considerations:

- Although the total cost for Option N2 / P2 is about 8% higher than Option N1/P2 combination, Option N2 will allow the dam to handle large flows more predictably and ensure that water flow is controlled and directed down the tailrace.
- By channeling the water down a dedicated spillway there is less likelihood of irregular erosion and scour and the risk of property damage is significantly reduced, as well it will reduce the likelihood of large flows against the River Street embankment.

- Based on the cost estimates and constructability for the powerhouse dam section, it may be more advantageous to leave the powerhouse in place. Option P1 (i.e. Removal of the powerhouse and replaced by a new dam) is the most expensive option and would present considerable difficulties in construction. In addition, due to the historic significance of the structure it may be advantageous to maintain a refurbished structure.

Ultimately the decision on the future of the Burgess 1 Dam facility will be up to the Township and TULLOCH would be pleased to offer any further services towards the rehabilitation of this structure.

12. CLOSURE

This DSR report has been prepared by TULLOCH for the exclusive use of the Township of Muskoka Lakes and their authorized agents for the evaluation of the performance and safety of the Burgess 1 Dam located in Bala, Ontario.

We trust that the information in this report will be sufficient to allow the Township of Muskoka Lakes to better understand the risks associated with the Burgess 1 Dam Facility and provide a clear path forward towards rehabilitation of the structure. Should further elaboration be required for any portion of this project, we would be pleased to assist.

George Liang, Ph.D., P.Eng.
Senior Geotechnical Engineer

Erik Giles., P.Eng.
Geotechnical Engineer

LICENSED PROFESSIONAL ENGINEER
E. K. GILES
100206670
SEPTEMBER 6 2019
PROVINCE OF ONTARIO

Frank Palmay P.Eng.
Structural Design Engineer, Project Manager

REFERENCES

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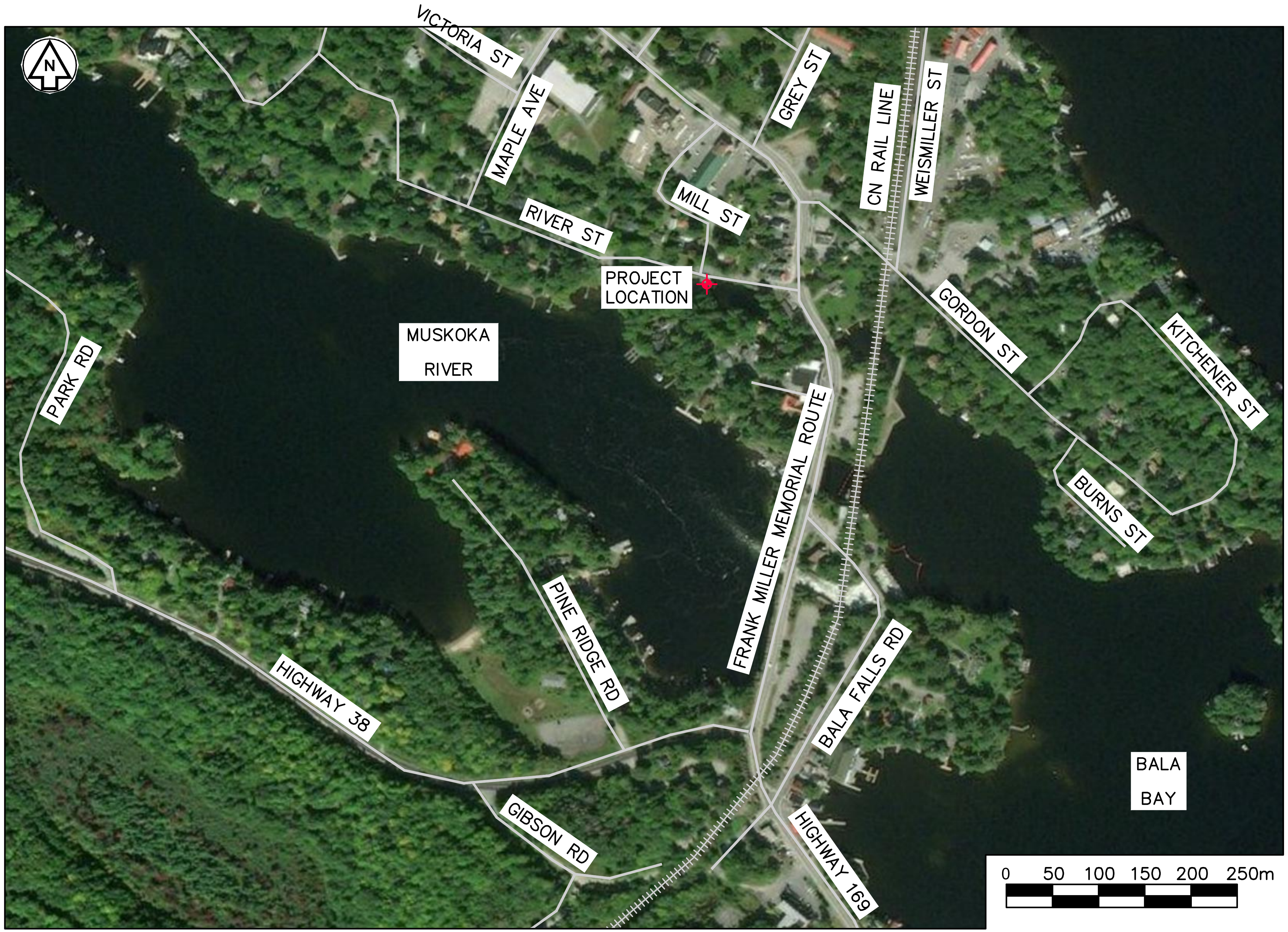
Totten Sims Hubicki Associates. (1987). Township of Muskoka Lakes Small Hydro Development Bala Tender Documents by Totten Sims Hubicki Associates

Totten Sims Hubicki Associates. (circa 1987). Bala – Small Hydro Development Burgess Dam Site.

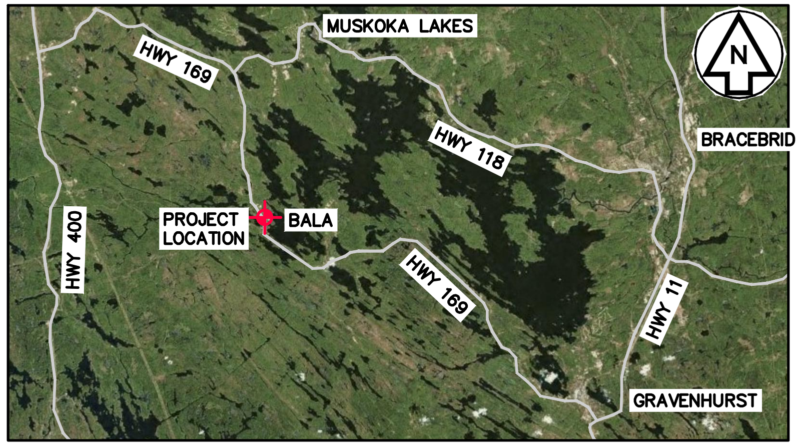
APPENDIX A

KEY LOCATION PLAN



PLAN - BALA, ONTARIO

N.T.S.



PROJECT LOCATION

N.T.S

No.	DATE	BY	ISSUES / REVISIONS
A	2019-08-13	KK	ISSUED DRAFT FOR CLIENT REVIEW

TULLOCH
ENGINEERING

DRAWING:
PROJECT LOCATION
KEY PLAN

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS
CHECKED BY: E. GILES
DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG
SCALE: AS NOTED
DATE: 2019-08-07
DRAWING No. 19-1493-C-00
REVISION No. A

H:\2019\ENGINEERING\191493 - Bala Dam Safety Review_DRAWINGS\191493-C-00.dwg

APPENDIX B

NBCC SEISMIC HAZARD VALUES

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Site: 45.015N 79.616W

2019-08-13 17:41 UT

Probability of exceedance per annum	0.000404	0.001	0.0021	0.01
Probability of exceedance in 50 years	2 %	5 %	10 %	40 %
Sa (0.05)	0.078	0.049	0.032	0.011
Sa (0.1)	0.109	0.071	0.048	0.018
Sa (0.2)	0.109	0.074	0.051	0.020
Sa (0.3)	0.095	0.065	0.045	0.018
Sa (0.5)	0.080	0.054	0.037	0.014
Sa (1.0)	0.049	0.033	0.022	0.007
Sa (2.0)	0.026	0.016	0.011	0.003
Sa (5.0)	0.006	0.004	0.002	0.001
Sa (10.0)	0.003	0.002	0.001	0.000
PGA (g)	0.064	0.041	0.028	0.010
PGV (m/s)	0.067	0.042	0.027	0.008

Notes: Spectral (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s. Values are for "firm ground" (NBCC2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are highlighted in yellow. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. **These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.**

References

National Building Code of Canada 2015 NRCC no. 56190; Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information

APPENDIX C

CDA AND MNRF TECHNICAL RESOURCES

1. DAM CLASSIFICATION AND DESIGN CRITERIA

According to the Technical Bulletin of the MNRF Guidelines, dams are classified us the following classification system which is based on four classification categories that define incremental losses due to dam failure based on increasing level of magnitude. Similarly, the CDA has five classification categories. Tables 1.1 and 1.2 outline the 2011 MNRF and the 2013 CDA criteria for determining the classification for individual dams. Table 1.3 and Table 1.4 identify the range of based on MNRF and CDA criteria.

Table 1.1: Dam Classification based on CDA Guidelines (2013)

Dam Class	Population at Risk [1]	Incremental Losses		
		Loss of Life [2]	Environmental and cultural values	Infrastructure and economics
LOW	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
SIGNIFICANT	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
HIGH	Permanent	10 or fewer	Significant loss or deterioration of important fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
VERY HIGH	Permanent	100 or fewer	Significant loss or deterioration of critical fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)
EXTREME	Permanent	More than 100	Major loss of critical fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances)

Note 1: Definitions for population at risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.
Temporary – People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).
Permanent – The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2: Implications for loss of life:

Unspecified – the appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

Table 1.2: Hazard Potential Classification based on MNRF Guidelines (2011)

	Hazard Categories – Incremental Losses[1]			
Hazard Potential	**Life Safety[2]**	**Property Losses[3]**	**Environmental Losses**	**Cultural – Built Heritage Losses**
LOW	No potential loss of life.	Minimal damage to property with estimated losses not to exceed $300,000.	Minimal loss of fish and/or wildlife habitat with high capability of natural restoration resulting in a very low likelihood of negatively affecting the status of the population.	Reversible damage to municipally designated cultural heritage sites under the Ontario Heritage Act.
MODERATE	No potential loss of life.	Moderate damage with estimated losses not to exceed $3 million, to agricultural, forestry, mineral aggregate and mining, and petroleum resource operations, other dams or structures not for human habitation, infrastructure and services including local roads and railway lines. The inundation zone is typically undeveloped or predominantly rural or agricultural, or it is managed so that the land usage is for transient activities such as with day-use facilities. Minimal damage to residential, commercial, and industrial areas, or land identified as designated growth areas as shown in official plans.	Moderate loss or deterioration of fish and/or wildlife habitat with moderate capability of natural restoration resulting in a low likelihood of negatively affecting the status of the population.	Irreversible damage to municipally designated cultural heritage sites under the Ontario Heritage Act. Reversible damage to provincially designated cultural heritage sites under the Ontario Heritage Act or nationally recognized heritage sites.
HIGH	Potential loss of life of 1-10 persons	Appreciable damage with estimated losses not to exceed $30 million, to agricultural, forestry, mineral aggregate and mining, and petroleum resource operations, other dams or residential, commercial, industrial areas, infrastructure and services, or land identified as designated growth areas as shown in official plans. Infrastructure and services includes regional roads, railway lines, or municipal water and wastewater treatment facilities and publicly-owned utilities.	Appreciable loss of fish and/ or wildlife habitat or significant deterioration of critical fish and/ or wildlife habitat with reasonable likelihood of being able to apply natural or assisted recovery activities to promote species recovery to viable population levels. Loss of a portion of the population of a species classified under the Ontario Endangered Species Act as Extirpated, Threatened or Endangered, or reversible damage to the habitat of that species.	Irreversible damage to provincially designated cultural heritage sites under the Ontario Heritage Act or damage to nationally recognized heritage sites.
VERY HIGH	Potential loss of life of 11 or more persons.	Extensive damage, estimated losses in excess of $30 million, to buildings, agricultural, forestry, mineral aggregate and mining, and petroleum resource operations, infrastructure and services. Typically includes destruction of, or extensive damage to, large residential, institutional, concentrated commercial and industrial areas and major infrastructure and services, or land identified as designated growth areas as shown in official plans. Infrastructure and services includes highways, railway lines or municipal water and wastewater treatment facilities and publicly-owned utilities.	Extensive loss of fish and/ or wildlife habitat or significant deterioration of critical fish and/ or wildlife habitat with very little or no feasibility of being able to apply natural or assisted recovery activities to promote species recovery to viable population levels. Loss of a viable portion of the population of a species classified under the Ontario Endangered Species Act as Extirpated, Threatened or Endangered or irreversible damage to the habitat of that species.	

Notes:

1. Incremental losses are those losses resulting from dam failure above those which would occur under the same conditions (flood, earthquake or other event) with the dam in place but without failure of the dam.
2. Life safety. Refer to Technical Guide – River and Streams Systems: Flooding Hazard Limits, Ontario Ministry of Natural Resources, 2002, for definition of 2 x 2 rule. The 2 x 2 rule defines that people would be at risk if the product of the velocity and the depth exceeded 0.37 square meters per second or if velocity exceeds 1.7 meters per second or if depth of water exceeds 0.8 meters. For dam failures under flood conditions the potential for loss of life is assessed based on permanent dwellings (including habitable buildings and trailer parks) only. For dam failures under normal (sunny day) conditions the potential for loss of life is assessed based on both permanent dwellings (including habitable dwellings, trailer parks and seasonal campgrounds) and transient persons.
3. Property losses refer to all direct losses to third parties; they do not include losses to the owner, such as loss of the dam, or revenue. The dollar losses, where identified, are indexed to Statistics Canada values Year 2000.
4. An HPC must be developed under both flood and normal (sunny day) conditions.
5. Evaluation of the hazard potential is based on both present land use and on anticipated development as outlined in the pertinent official planning documents (e.g. Official Plan). In the absence of an approved Official Plan the HPC should be based on expected development within the foreseeable future. Under the Provincial Policy Statement, '*designated growth areas*' means lands within *settlement areas* designated in an official plan for growth over the long-term planning horizon (specifies normal time horizon of up to 20 years), but which have not yet been fully developed. *Designated growth areas* include lands which are *designated and available* for residential growth in accordance with the policy, as well as lands required for employment and other uses (Italicized terms as defined in the PPS, 2005).
6. Where several dams are situated along the same watercourse, consideration must be given to the cascade effect of failures when classifying the structures, such that if failure of an upstream dam could contribute to failure of a downstream dam, then the HPC of the upstream dam must be the same as or greater than that of the downstream structure.
7. The HPC is determined by the highest potential consequences, whether life safety, property losses, environmental losses, or cultural-built heritage losses.

Table 1.1: Range of Minimum Inflow Design Floods

Hazard Potential Classification (HPC)	**Range of Minimum Inflow Design Floods** [1]			
	Life Safety [3]		**Property and Environment**	**Cultural – Built Heritage**
LOW	25 year Flood to 100 year Flood			
MODERATE	100 year Flood to 1000 year Flood or Regulatory Flood whichever is greater			
HIGH	1-10	1/3 between the 1000 Year Flood and the PMF	1000 Year Flood or Regulatory Flood, whichever is greater, to 1/3 between the 1000 Year Flood and the PMF	1000 Year flood or Regulatory Flood, whichever is greater
VERY HIGH	11-100	2/3 between the 1000 Year Flood and the PMF	1/3 between the 1000 Year Flood and the PMF to the PMF	
	Greater than 100	PMF		

Notes

1. The selection of the IDF within the range of flows provided should be commensurate with the hazard potential losses within the HPC Table. The degree of study required to define the hazard potential losses of dam failure will vary with the extent of existing and potential downstream development and the type of dam (size and shape of breach and breach time formation).
2. As an alternative to using the table the IDF can also be determined by an incremental analysis. Incremental analysis is a series of scenarios for various increasing flows, both with and without dam failure that is used to determine where there is no longer any significant additional threat to loss of life, property, environment and cultural – built heritage to select the appropriate IDF.
3. Where there is a potential for loss of life the IDF may be reduced provided that a minimum of 12 hours advanced warning time is available from the time of dam failure until the arrival of the inundation wave, provided that property, environment, or cultural – built heritage losses do not prescribe a higher IDF.

Table 1.2: Floods and Earthquake Hazards, Standard-Based Assessments (CDA)

Dam Class	Annual Exceedance Probability – Floods[1]	Annual Exceedance Probability – Earthquakes[4]
LOW	1/100 year	1/100
SIGNIFICANT	Between 1/100 and 1/1000 year[2]	Between 1/100 and 1/1000
HIGH	1/3 between 1/1000 and PMF[3]	1/2475[5]
VERY HIGH	2/3 between 1/1000 and PMF[3]	½ between 1/2475[5] and 1/10,000 or MCE[3]
EXTREME	PMF[3]	1/10,000 or MCE[3]

Notes

1. Simple extrapolation of flood statistics beyond 10^{-3} AEP is not acceptable.
2. As an alternative to using the table the IDF can also be determined by an incremental analysis. Incremental analysis is a series of Selected on basis of incremental flood analysis, exposure, and consequences of failure.
3. PMF and MCE have no associated AEP.
4. Mean values of the estimated range in AEP levels for earthquakes should be used. The earthquake(s) with the AEP as defined in this table is then input as the contributory earthquake(s) to develop Earthquake Design ground Motion (EDGM) parameters as described in Section 6.5 of the CDA Guidelines.
5. This level has been selected for consistency with seismic design levels given in the National Building Code of Canada.

APPENDIX D

DSI FIELD INSPECTION REPORT

TULLOCH
ENGINEERING

FIELD INSPECTION REPORT

Site Identification: Burgess Dam
Structure Identification: Burgess Dam
Location: Bala, Ontario
Inspection Date: 04-07-2019
Inspection Time: 09:10
Inspected By: E. Giles, F. Palmay
Accompanied By: Steve Dursley
Inspection Type: Dam Safety Assessment

Atmospheric Conditions

Inspection Day: Clear
Temp: 27
Previous Week: 26 - 32
Temp Range: 26-32
Current Pond Level: Unknown
Current Freeboard: 0.7 m

Dam Structure

1.1 Surface Cracking, Displacement, etc.	Yes
Comments	Cracks apparent on concrete upstream and downstream surface, ranging from hairline tonarrow expected with age of dam, efflouressence observed on cracks. Some cracks evidence of historic repairs
1.2 Concrete Deterioration, Spalling, etc.	No
Comments	Minor to moderate Spalling on concrete on dam and along u/s face of Dam, small delaminated section ~ 1.0m long on dam crest
1.3 Evidence of Scouring	Yes
Comments	Scouring evident typical of age of structure, the worst section observed was along south side of powerhouse on the dwonstream face of the dam where significant deterioration was observed.

1.4 Evidence of Seepage	Yes
Comments	Seepage along d/s face at south edge of power station, as well as ~ 10m downstream of the dam near the joint between section DC/CB. Significant was observed at east wall of powerstation/downstream face of dam. In discussion with operator, seepage had improved since applying cold patch repairs to upstream and
1.5 Unusual or Special conditions	Yes
Comments	Powerhouse still in operation, original roof with bracing, joists failing, corrosion of bracing observed particulalry on the floor
1.6 Undesirable Vegetation, Debris, etc. at toes	Yes
Comments	Significant vegetation along downstream toe including trees/stumps, debris from flooding, and significant washouts were observed caused by the flooding.

View of downstream dam face, note concrete degradation on cold joint

View of upstream face, note broken fence and vegetation build up along downstream toe of dam

Seepage observed along downstream face of dam built into powerhouse

Abutments

2.1 Surface Cracking, sinkholes, etc.	No
Comments	Minor cracking and deterioration evident typical with age of structure, good contact at abutment observed
2.2 Evidence of Settlement, movement, etc.	No
Comments	No evidence of movement on the dam
2.3 Gap, Leakages, etc. at Contact.	No
Comments	South abutment contact observed to be good some cracks visible expected with age of structure
2.4 Evidence of Repairs	Yes
Comments	Evidence of repair on larger cracks of dam, cold patch concrete placed over large cracks plus cracks were also filled upstream near the generating station dring low water levels. Cold patch placed thorughout powerhouse on downstream face of dam to curtail seepage
2.5 Unusual or Special Conditions.	Yes
Comments	There is a dock built into the south abutmentand of

the dam by a local cottager. The north abutment is buillt into river street and terminates at the road shoulder guard rail.

South abutment of dam, note dock built into dam crest at tie-in, good contact

North abutment of dam, concrete ends at guard rail at embankment of Riiver Street, good contact observed

Historically repaired crack with cold patch concrete on downstream face of dam near south abutment

Pond Level and Perimeter

3.1 Concerns with pond level.	Yes
Comments	Minimal freeboard observed with approximately 0.7m,

	measured at time of inspection. Based on discussion with operator the dam was close to overtopping during the flooding events of 2013 and overtopped for the first time 2019.
3.2 Concerns with pond perimeter	Yes
Comments	Risk of property damage from overtopping, the retaining wall on the north side of the powerhouse was observed to be cracked through the wall and moving, steep embankment observed on north side of tail race holding up River Street
3.3 Other concerns with pond area	Yes
Comments	River Street berm at north edge of the pond with low freeboard (<1.0 m) poor/insufficient erosion protection

View of pond and sluicegate, note road embankment on pond, insufficient erosion protection

Area of washout where water was spilling over the dam and down to tail race, site of temporary ditch excavated to channel water away from properties

Upstream pond note ~0.7m of free board at time of site visit

4. Other Unusual Conditions

Yes

Comments

The embankment north of the dam and located west of the powerhouse is eroded and very steep, washout in 2019 observed at toe of concrete retaining wall. Rock fill wa splaced back in the area of the washout by the township

Steep embankment on north side of dam, photo taken downstream at tailrace note retaining wall

Large crack through retaining wall, note movement of wall

Large transverse crack running through powerhouse foundation, hole in wall at outlet of power house with significant seepage of ~ 2.0 L/s, possible outlet of historic box drain

5. Instrumentation	No
Comments	Water level is monitored just inside of the sluice gate to detect debris build up at spillway entrance, remnants of staff guge observed.

Spillway, Discharge Structure, Etc.

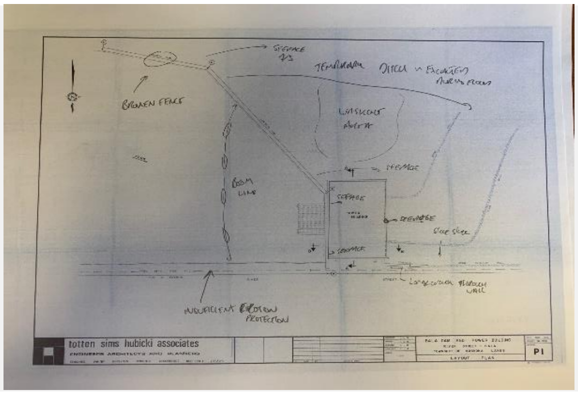
6.1 Concern for Discharge Control Structure	Yes
Comments	There is no emergency spillway for the dam and properties on both sides of the dam were effected during flooding of 2019.
6.2 Concern for Adequacy & Reliability of Emergency	Yes
Comments	See comments 6.1 there is no emergency spillway for this facility
7. Environmental Concerns	Yes
Comments	According to Steve Dursley downstream of the dam in the tail raace fish can spawning is observed

8. Safety Concerns	Yes
Comments	Poor guarding for turbine/ moivng parts wtihin the power house, broken fence on dam crest, expose grounding wire, washouts/debris and uneven ground caused from flooding

Signature:

General Dam Information

Structure Type:	Concrete hydro electric dam
Spillway:	Sluice gate leading to two turbines, no emergency spillway
Foundation:	Bedrock
Crest Elev. (Current):	226.93
Abutments:	Concrete on bedrock
Max Height (Current):	~6m
Crest Length:	~59.2 m
Decants & Outlets:	Sluicegate into two turbines, outlet in two openings at generating station
Catchment Area:	Unknown
Normal Pond Elev:	224.6 - 225.61 (Bala Falls Dam)
Fetch Length & Direction:	~140 m
Max/Min OWL:	225.75 (Bala Falls Dam)
Construction History:	Built in 1917, minor rehabilitations through the years, Large rocks added to tail race to prevent erosion of properties downstream, Upgrade to south turbine in late 80s by Marsh Power and upgrade of north turbine and sluicegate in 2010s by current leasor KRIS power. Property owned by Township of Muskoka Lakes, leased to Kris Power, currently actively generating power
Last DSIs:	Unknown
Additional Notes:	



Site sketch with notes

APPENDIX E

KEY FINDINGS MEMORANDUM

MEMORANDUM

Date: Wednesday, July 24, 2019

To: Ken Becking

CC: George Liang; Sean Hinchberger

From: Erik Giles; Frank Palmay

Re: KEY / CRITICAL FINDINGS FOR BURGESS 1 DAM IN BALA, ONTARIO

1. DATE

- July 4th, 2019

2. PERSONNEL AT SITE

- KRIS Power: Steve Dursley (Care and Maintenance Operator)
- TULLOCH: Frank Palmay (P.Eng.), Erik Giles (P. Eng.)

3. SUMMARY OF THE KEY/CRITICAL FINDINGS

The dam safety inspection (DSI) for the Burgess 1 Dam took place on the morning of July 4th, 2019. Steve Dursley (KRIS Power) met the TULLOCH team on site and permitted entrance to the facility. The inspected structures included the following:

- Concrete dam structure (Water Retaining structure, Non-overflow dam section);
- Concrete dam with downstream (d/s) powerhouse structure;
- River Road Retaining Wall and Embankment;
- Downstream erosion and scouring conditions during 2019 flooding;
- Upstream (u/s) reservoir (within 500m approaching to the Burgess 1 Dam);
- Other ancillary structures including the access road, fence, gates, tailrace and walkways etc. where accessible.

Table 1 summarizes the key/critical findings during the site inspection. The detailed field inspection checklist and comments including selected photographs are presented in Appendix A.

Section 4 presents the discussion based on the key findings and the preliminary engineering assessment; Section 5 summarizes the three preliminary recommendations for remediation with respect to the scope of work.

Table 1: Key/Critical Findings During the DSI

Site	Site Segment	Observation Criteria	Key/Critical Findings
Burgess 1 Dam	Concrete Dam (Water Retaining Structure, Non-overflow section)	Structural	• Cracking in dam – hairline to narrow, no to minimal movement based on observation; • Sections of delamination on dam crest; • Evidence of historic crack repairs with cold patch concrete; • Concrete degradation observed with moderate spalling – worst section south of powerhouse near tie-in with powerhouse walls; • Minor to moderate pitting and scour observed along structure and on visible sections of u/s face of dam, expected given age of structure.
		Geotechnical	**General** • Abutment contacts sound at each end of the dam; ○ South abutment has a dock built on top of it by a cottager ○ North abutment ties into River Street • Moderate to significant washouts along the dam toe area caused from flooding; • Freeboard at time of inspection was ~0.7m from dam crest; • Significant vegetation builds up on d/s toe of dam including large trees ~ 0.3m in diameter, evidence of historic vegetation clearing i.e. stumps; • Debris from flooding piled on and around dam section.
			Seepage • Minor seepage observed ~ 15m d/s of the dam near the access gate, ponded water visible; • No evidence of boils or piping beneath the dam section; • Cold patch concrete has been placed on the d/s and u/s sections of dam to reduce the seepage/leakage since KRIS power has taken up the operation of the dam facility, this has reduced the seepage/leakage according to Mr. Dursley.

Site	Site Segment	Observation Criteria	Key/Critical Findings
			Geotechnical Stability • Moderate to significant washouts were observed caused by flood waters at the d/s of the concrete dam, a ~ 1.0m depth of the d/s toe fill material along the concrete dam have been washed away; a ~ 2.0m depth of the d/s fill materials have been eroded/washed out at the south end of the powerhouse section. The erosion of the d/s toe fill materials may cause dam stability issue; • Upstream slope/River Road embankment has insufficient erosion protection/armouring; • Based on visual inspection, the concrete dam and the powerhouse section have not experienced obvious moving or shifting at the time of DSI.
			Water Control/Spillway • There is no emergency spillway for this facility, a temporary trench was excavated to channel flood waters during the 2019 flooding event and diverted the water to the south of the property near the access gate and down into the tailrace area; • A new sluicegate was installed by KRIS power.
			Instrumentation • There is no monitoring program or instrumentation installed for the lake levels at the dam site, remnants of a staff gauge were observed on the outlet of the powerhouse • KRIS power does monitor water levels at the sluicegate invert to determine if blockages are accumulating, this data was not available on site.

Site	Site Segment	Observation Criteria	Key/Critical Findings
	Powerhouse Section	Structural	- Roof of powerhouse is overstressed; joists are cracking at midspan; - Roof of powerhouse is not watertight and has polyethylene vapor barrier placed overtop, this is trapping moisture and not allowing the roof to dry out, likely causing accelerated deterioration of members; - Steel frame installed in powerhouse is corroding at the bottom as a result of continued exposure to standing water, significant section loss noted; - Carpenter ants or termites present (observed sawdust in powerhouse); - Diagonal cracks in powerhouse indicating foundation of structure may be compromised; - Water leaking through rear wall of powerhouse; - Efflorescence present on walls and floor slab of powerhouse indicating seepage is passing through concrete.
		Geotechnical	- Generally moderate seepage observed along the d/s of the powerhouse dam section, a significant seepage was observed at south and north ends of powerhouse. In conversation with Steve Dursley, the seepage is relatively unchanging throughout the course of the year in 2019. And remains in a steady state; - Large hole ~ 0.2m in diameter leaking a significant amount of water ~ 2.0 l/s, this has been a known issue, and has remained unchanged. This may be the outlet to a historic box drainage system installed in the dam, again indicating a steady state condition; - Moderate seepage observed along downstream toe concentrating outside of south end of powerhouse, likely through worn section of dam; - Transverse crack through powerhouse as noted above indicate potential foundation failure and reduced capacity of floor slab to act as ballast for the gravity dam section.

Site	Site Segment	Observation Criteria	Key/Critical Findings
Other Associated Infrastructure	River Road Retaining Wall and Embankment	Structural	• Undermining of stone retaining wall supporting River Street; • Crack in cast in place wall supporting River street and portion of wall now leaning away from the road indicating movement;
		Geotechnical	• Embankment along River Street upstream of the Burgess Dam is very steep and appears to be eroding at the toe where there are newer gabion baskets placed on a historic boulder/stone wall. There is a concern for the slope failure of the embankment due to the erosion/ scour caused by the water flows. The slope stability evaluation of the embankment along the River Street is not included in the scope of this DSR. Detailed geotechnical investigation and assessment are strongly recommended; • Evidence of slope movement based on guardrail; • Sediment build-up observed within tail race due to washout material.
Burgess 1 Dam Site	Dam Site	Public Safety	• Inadequate/ no signage for safety warning at the u/s dam for the potential hazards of the vortex/swirl caused by the running flow during operation of the powerhouse; • Inadequate boom line, poorly visible and half sunken logs; the boom line is in a poor condition and the distance to the inlet of the powerhouse is inadequate; • Broken fencing on dam crest allows for access from public, lack of physical barriers along dam crest to prevent access; • Inadequate gating/locking system, easily accessed.

4. DISCUSSION

The following sections discuss the key findings and preliminary structural / geotechnical assessment for the Burgess 1 Dam.

4.1 Structural

Based on the DSI, it is believed that the roof of the powerhouse has failed in several locations. Broken roof joists were noted in several locations with failure along the midspan of the beams. The joists had been reinforced in the past; however, the current bracing is providing inadequate support for snow loads as detailed in the Ontario Building Code. Furthermore, the roof membrane has failed and has been temporarily repaired with polyethylene vapor barrier weighted on the roof with various cobbles and debris. The vapor barrier is currently trapping condensation and moisture on the roof which is expediting deterioration.

It was also noted during the inspection that there had been previous attempts to rehabilitate the structure by evidence of a steel frame constructed on the interior of the powerhouse, however, moisture present along the base of the columns as a resultant of the seepage has left the bracing with severe corrosion, which significantly reduces the structural capacity of the steel frame.

Finally, a large/wide crack along the powerhouse foundation walls was observed running through the entire structure. The cause of this may have been a result of losing the foundation material over time below the walls during the powerhouse operation, which may have caused the foundation to drop, or excessive pressure brought on from the hydrostatic forces acting on the dam. This large crack also poses a risk to the stability of the dam which will be discussed in Section 4.2.

Based on the above evidence, major rehabilitation or replacement of the building would be required.

4.2 Geotechnical

4.2.1 General Dam Conditions

Inspection of the concrete dam indicated that the concrete wall of the dam area was generally in a fair condition. Seepage was noted at various areas under the dam sections, however, there was no indication of boiling or piping through the dam foundation and the observed seepage rate was relatively stable. Significant seepage was observed in the powerhouse, however, the amount of the seepage was reported to remain steady in recent years.

Generally, the condition of the concrete was found to be expected with the age of the structure, some hairline to narrow cracks were observed in the dam with a small section of delamination at the crest on the southern side. Areas of scour / erosion were observed particularly around the south side of the powerhouse where aggregate was observed. Evidence of historic repairs with cold patch concrete were evident along some sections of the dam including the powerhouse dam section. The contacts at both abutments for the powerhouse dam sections were generally in a good condition with no evidence of seepage. However, a large crack observed under the powerhouse floor slab (discussed in Section 4.1) indicated that the d/s support for the concrete gravity dam (i.e. the powerhouse dam section) has been compromised.

4.2.2 Factor of Safety for Dam Stability

Based on the review of the available documents and drawings provided by the Client, it is understood that the as-built concrete dam (non-overflow section) was constructed on the in-situ bedrock and supported by the downstream fill placed against the dam; at the powerhouse section, the d/s powerhouse structure with a massive concrete floor slab are likely to work together with the concrete gravity dam structure to take the loads. The typical dam sections are included in Appendix B.

Preliminary stability calculations were carried out for both non-overflow concrete dam section and the powerhouse dam section (see Appendix B). Table 4-1 is a summary of the preliminary results of the calculated factor of safety for the dam under current condition.

Table 4-1: Summary of the Calculated FOS (Static)[1]

Dam Section	Maximum Height (m)	Calculated FOS		Required Min FOS
Non-overflow Section	3	Against Sliding	2.2 to 2.4	1.5
		Against Overturning	1.2 to 1.4	2.0
Powerhouse Dam Section	6	Against Sliding	2.4-3.3	1.5
		Against Overturning	1.6-1.9	2.0

Note:[1]- The water level is assumed to be 30cm below the dam crest.

Based on Table 4-1, it can be seen that:

- For non-overflow dam section, the calculated FOS is depending on the remaining fill material at d/s toe area for the post-overflow event in 2019 flooding. Significant washout /scouring was observed along the downstream toe area with a scoring depth in excess of 1.0 - 1.5 m. Under the current site condition, the calculated FOS against sliding is in the range of 2.2 to 2.4, which meet the required minimum required FOS of

1.5; The calculated FOS against overturning is in the range of 1.2 to 1.4, which does not meet the required FOS of 2.0. Repair or mitigation measures have to be developed for the non-overflow dam section to improve the FOS to meet the criteria;

- For the powerhouse dam section, a large longitudinal crack that was observed through the floor slab/foundation of the dam during DSI. The presence of the crack likely indicated that both the dam section and the powerhouse structure worked together carrying loading. Under the current site condition, the calculated FOS against sliding is in the range of 2.4 to 3.3, which meet the required minimum FOS of 1.5; The calculated FOS against overturning is in the range of 1.6 to 1.9, which does not meet the required FOS of 2.0. Repair or mitigation measures need to be developed for the powerhouse dam section to improve the FOS to meet the criteria.
- For the powerhouse dam section, caution should be taken if/when the powerhouse is considered to be removed. If the powerhouse is to stay intact it is recommended that the floor slab be repaired by anchoring the two pieces together and seating the anchors into bedrock to ensure that the slab can act as one unit. Furthermore, to achieve an acceptable safety factor the slab should be anchored into the bedrock to prevent overturning or sliding. Further geotechnical investigation and engineering assessment may be required.

4.2.3 Overflow Water Management

There is no emergency spillway installed at the dam site to manage the overflow. The overflow water was largely reported to the south side of the dam near the right abutment and was then channeled down to the tailrace through a temporary trench during 2019 overtopping event. Significant scour and washout for the downstream fill materials were caused by the random overflow. Furthermore, the current dam is at risk of failure due to the severe erosion/scouring at the downstream toe area. To improve the dam safety condition, replacement of the d/s fill material, the overflow water management facility and the d/s erosion protection measures should be developed.

4.2.4 Vegetation Control

Significant vegetation was observed on the downstream edge of the dam with large trees growing directly downstream of the dam. Vegetation should be removed within 3 – 5 m of the footprint of the selected repair/mitigation option.

5. PRELIMINARY RECOMMENDATIONS

The following sections briefly discuss the preliminary recommendations for the rehabilitation of the Burgess 1 Dam facilities. The preliminary recommendations are based on the consideration of the following factors:

- The key findings of 2019 DSI and dam safety;

- Preliminary structural / geotechnical assessment;
- Impact on the environmental and permitting for the construction at the dam site;
- Technical and economic feasibility and constructability;

Several preliminary options for the rehabilitation of the Burgess 1 Dam facilities are evaluated at an FEL 1 level (i.e. preliminary design). However, for the purpose of this Memoranda, three (3) primary feasible options will be briefly discussed. The further engineering assessment of the feasible rehabilitation options are in progress, the final recommended option will be presented in the DSR report.

5.1 Option #1 Re-instate downstream Fill and add Erosion Protection

The objective of the Option #1 is to reinstate the FOS of the existing dam by replacing d/s fill material and manage the overflow by re-grading the d/s slope associate with rockfill/ riprap for erosion protection. A small toe berm is required to divert the overflow (if it occurs). Option #1 mainly consists of the following (see Appendix B-Option #1):

- Downstream vegetation removal as required;
- Strip the top organic soil as required;
- Replace the d/s fill materials to reinstate the FOS of the dam;
- Regrade the d/s fill materials and build a toe berm to manage and divert the overflow (if it occurs) toward d/s main river; The finish grade should be generally higher grade at the North side and progressively lower to the south side approaching the d/s river channel;
- Add appropriate rockfill/riprap for erosion protection if overtopping occurs;
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;
- At the powerhouse the slab should be repaired and anchored to the bedrock, or if the powerhouse is to be decommissioned then fill could be placed over-top of the slab to compensate for the compromised slab.

5.2 Option #2 Partially Dam Crest Raise without Spillway

The objective of the Option #2 is to partially raise the dam on both left and right abutment sides and direct the overflow (if occur) through the middle existing dam section toward the d/s river channel. Option #2 mainly consists of the following (See Appendix B-Option 2):

- Downstream vegetation removal as required;
- Strip the top organic soil as required;

- Partially raise the dam crest on the north and south dam sections; the middle section of the existing dam will be maintained to pass and divert the overflow to the d/s river channel;
- Replace the d/s fill materials to reinstate the FOS of the dam;
- For the area between the middle dam section and the d/s existing river channel, regrade the d/s fill and add appropriate rockfill/riprap for erosion protection to divert the overflow (if occur)
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;
- At the powerhouse the slab should be repaired and anchored to the bedrock, or if the powerhouse is to be decommissioned then fill could be placed over-top of the slab to compensate for the compromised slab.

5.3 Option #3 Dam Crest Raise plus Spillway Construction

The objective of the Option #3 is to raise the entire dam and install an emergency spillway to manage and control any overflow for flood event.

The installation of a spillway to the Burgess Dam facility would be highly advantageous. In the flood event, the overflow would be safely controlled and channeled to d/s river channel that would not affect the u/s lake operation level and the existing d/s facilities/ properties. Given that the overtopping occurred along the south section of the dam, the proposed spillway location would be at the south side of the dam, which has the shortest distance to the existing river channel. Furthermore, based on the topography of the site the most direct route to connect back to the tailrace would be along the southern edge of the property south of the existing water course. This would avoid unnecessary flows running against the River Street embankment. The spillway invert could be kept at the current dam crest elevation and the remainder of the dam could be raised minimally to meet the minimum freeboard criteria during the operation of the spillway in the flood event. The final spillway invert elevation and dam raise will be determined based on the hydrotechnical assessment. Option # 3 mainly consists of the following (see Appendix B-Option 3):

- Downstream vegetation removal as required;
- Strip the top organic soil as required;
- Raise the dam crest as per design;
- Install the emergency spillway as per design (e.g. Geomembrane Lined Rockfill Channel);
- Replace the d/s fill materials to reinstate the FOS of the dam;
- Grouting or concrete patching the cracks in the existing dam to limit the leakage;

- At the powerhouse the slab should be repaired and anchored to the bedrock, or if the powerhouse is to be decommissioned then fill could be placed over-top of the slab to compensate for the compromised slab.

For all three options, appropriate topographical survey of the existing dam and surrounding area is required.

5.4 River Street Embankment and Retaining Wall

Visual inspection of the retaining wall and downstream embankment of River Street indicates that there is significant risk posed to the road.

River street currently sits on an embankment at an approximate 2H:1V on which the toe is supported by a more recent gabion basket retaining wall sitting on a historic boulder retaining wall. There is also a concrete retaining wall that abuts the south side of River Street and connects to the north wall of the powerhouse. A large crack through the retaining wall was observed and a large section of the wall has failed and has shown signs of movement.

There was also evidence of washout at the toe of the retaining wall. If a flood event were to occur again, and water were to make its way along the toe of the River Street embankment, there is a significant risk of a slope failure which could result in loss of the road and surrounding property damage. The existing concrete retaining wall is in a poor condition and should be replaced.

The embankment to the west of the wall should be better reinforced including the addition of erosion/scour protection to prevent future washout and slope instability. While this is not considered a direct risk to the dam, the observations on site deemed it necessary to be brought to the Township's attention as there exists a risk to River Street adjacent to the tailrace of the dam. The slope stability evaluation of the embankment along the River Street is not included in the scope of this DSR. Detailed geotechnical investigation and assessment are strongly recommended.

5.5 Public Safety and Access

The following summarize the recommendations regarding the public safety and access based on the DSI, including:

- A Public Safety Plan (PSP) should be drafted to address these issues and ensure they are properly managed.
- Install adequate safety signage at the dam site for warning of flow, deep water, the potential hazards of the vortex/swirl etc.
- Upgrade the boom line and adjust the safety distance to the powerhouse inlet;
- Upgrade the fence / gate to constrain the public access to the dam site without permits;

- The sluicegate of the dam appeared to have overhead flashing lights, however, they were not able to be tested during the site visit. Visual and audio warnings if not installed should be implemented and tested regularly to ensure that during startup/operation adequate warning can be given to members of the public.
- Grounding wire is currently exposed due to the washout. Exposed wire should be backfilled as soon as possible as this poses a significant hazard currently on the site. Furthermore, debris that has washed up on and over the dam crest should be removed.
- The south abutment currently has a dock from the neighboring resident built on the dam crest which should be removed.

6. CLOSURE

We hope that this draft memo helps frame the critical issues and proposed remediations for the Burgess 1 Dam facility. The detailed dam safety assessment is in progress and the final results will be presented in the final DSR report. If you have any questions, please feel free to reach out to the undersigned.

Sincerely,

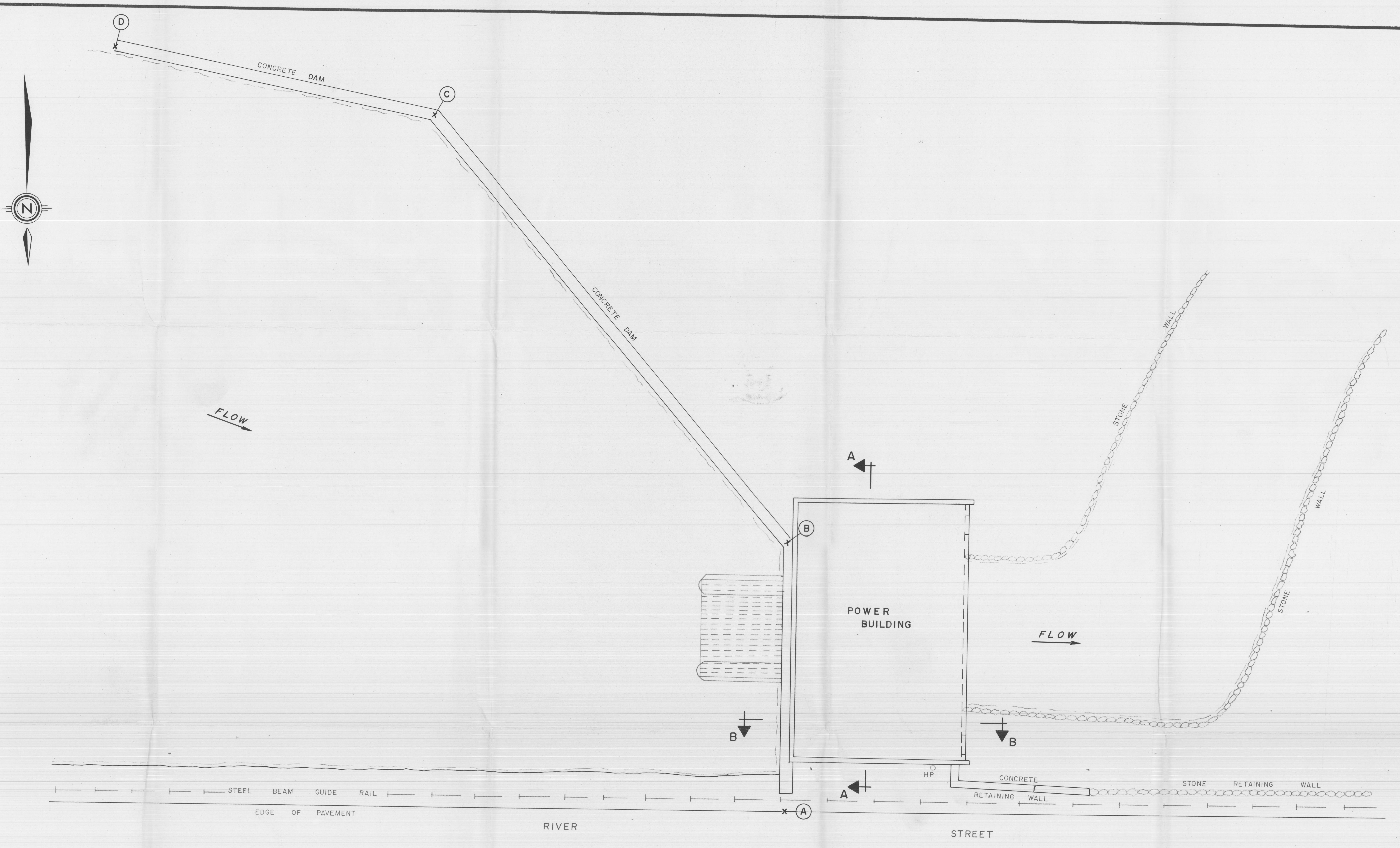
Erik Giles, P.Eng
Geotechnical Engineer

Frank Palmay P.Eng
Structural Design Engineer

Attachment(s)/Enclosure: Field Inspection Reports

APPENDIX F

HISTORIC SITE PLANS



totten sims hubicki associates

ENGINEERS ARCHITECTS AND PLANNERS

COBOURG WHITBY KINGSTON TORONTO BRACEBRIDGE BROCKVILLE OTTAWA

No.	DATE	BY	REVISIONS

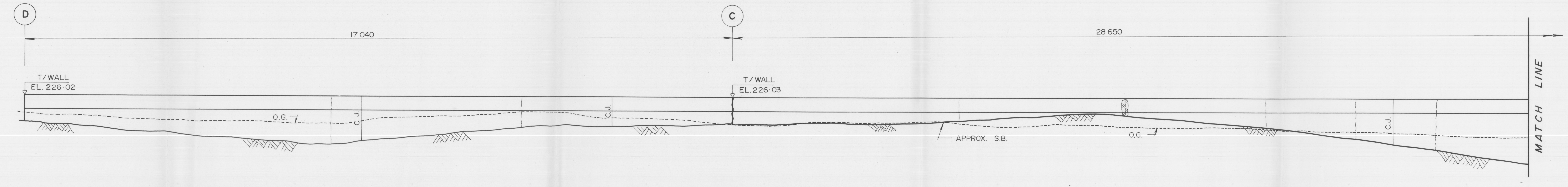
DESIGNED: D. L. B.
DRAWN: R. G. W.
CHECKED: D. L. B.
APPROVED: G. L. A.
SCALE: 1:100

BALA DAM AND POWER BUILDING
RIVER STREET - BALA
TOWNSHIP OF MUSKOKA LAKES

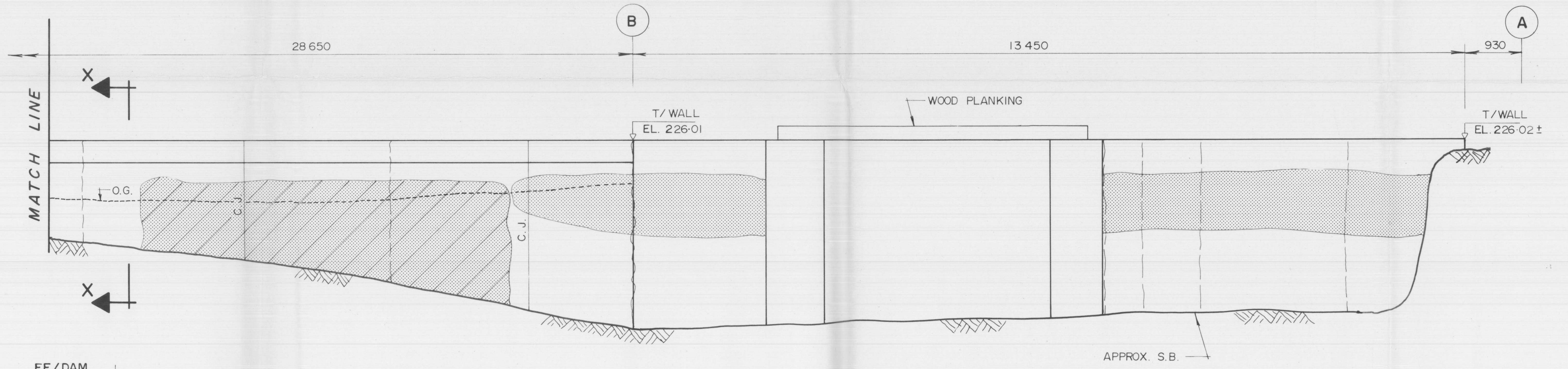
LAYOUT PLAN

DATE: AUG., 1986
PROJECT: 36-7058
DRAWING: P1

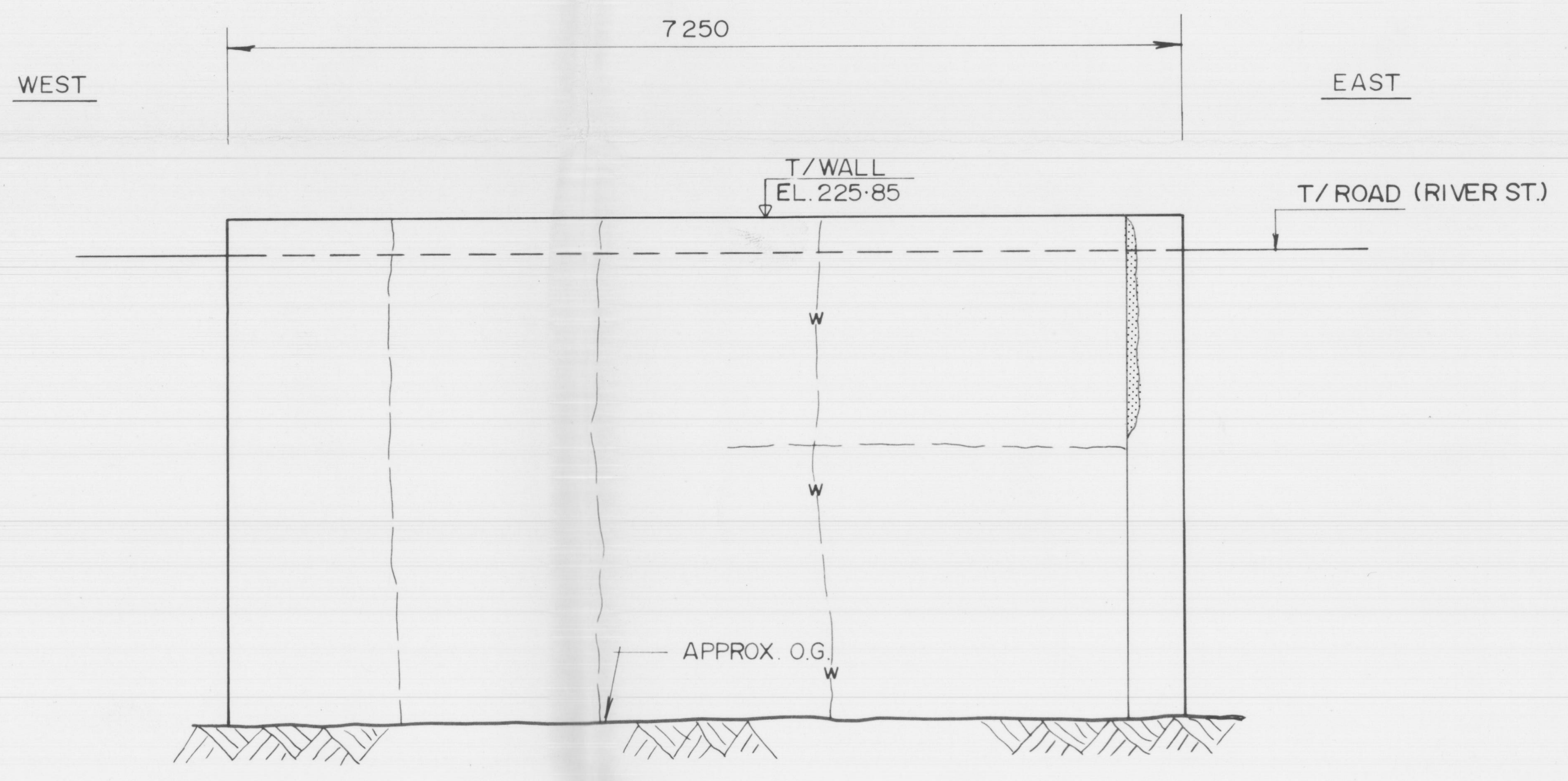
TRANSTEX 15 250-4-79



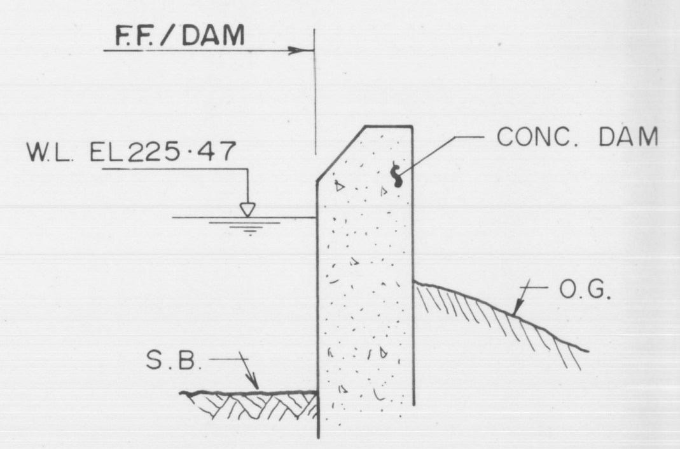
ELEVATION – CONCRETE DAM



ELEVATION – CONCRETE DAM



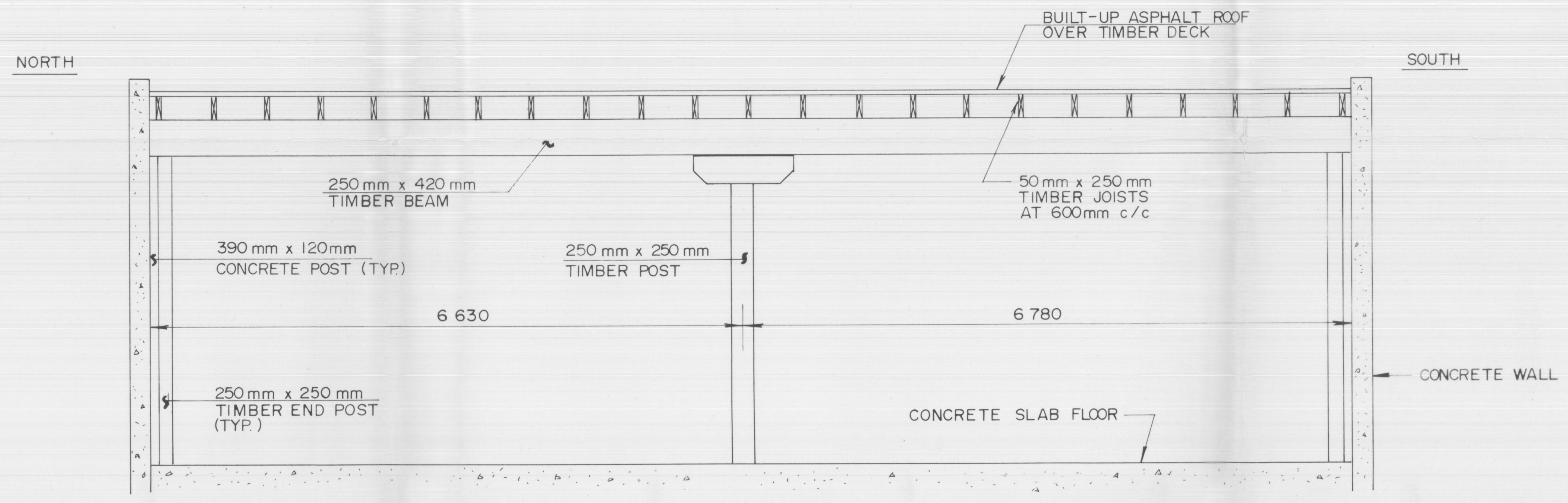
ELEVATION – CONCRETE RETAINING WALL



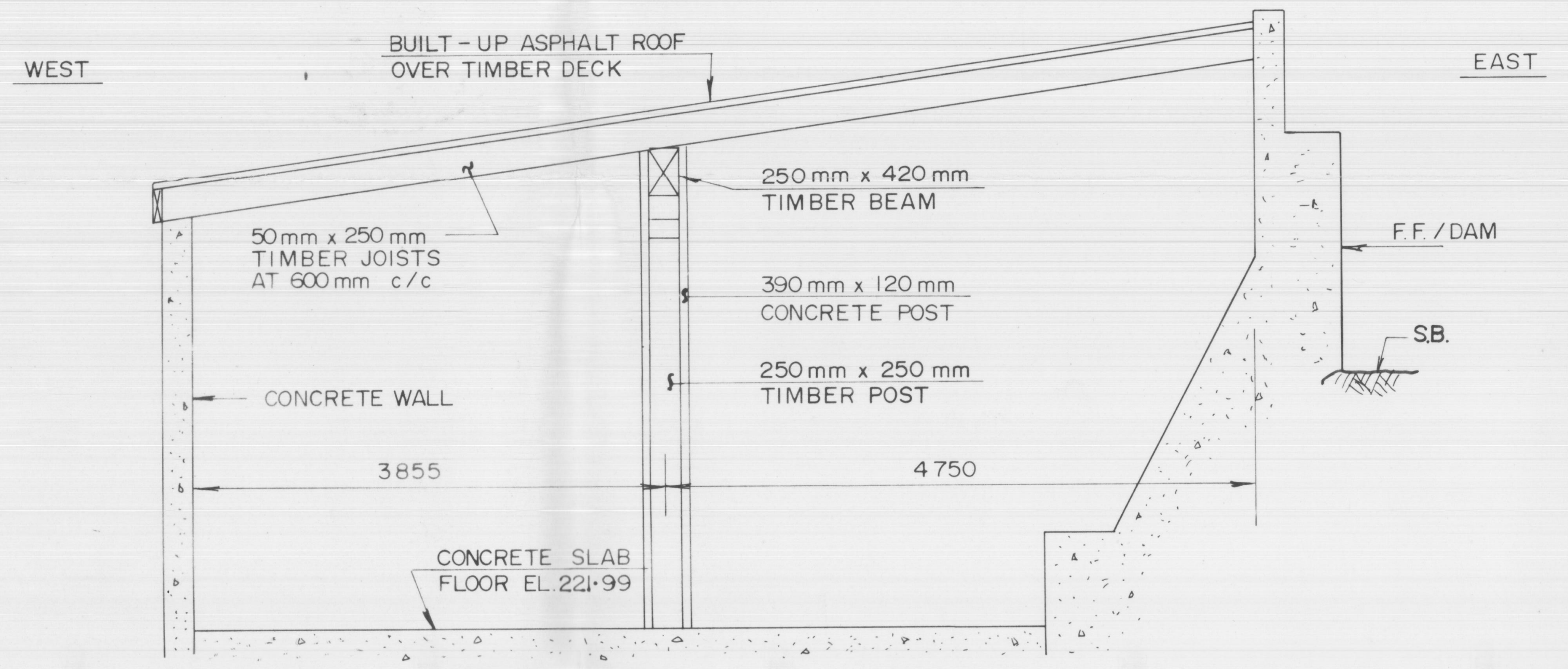
SECTION X-X

LEGEND

- – – – DENOTES MINOR CRACK
- —→— DENOTES WIDE CRACK
- ▩ DENOTES SPALLED AREA
- ▨ DENOTES MINOR SPALLED AREA
- - - - - DENOTES ORIGINAL GROUND (O.G.)



SECTION A – A



SECTION B – B

POWER BUILDING

totten sims hubicki associates

ENGINEERS ARCHITECTS AND PLANNERS

COBOURG WHITBY KINGSTON TORONTO BRACEBRIDGE BROCKVILLE OTTAWA

No.	DATE	BY	REVISIONS

DESIGNED: D. L. B.
DRAWN: R. G. W.
CHECKED: D. L. B.
APPROVED: G. L. A.
SCALE: 1 : 50 UNLESS NOTED

BALA DAM AND POWER BUILDING
RIVER STREET – BALA
TOWNSHIP OF MUSKOKA LAKES

SECTIONS & ELEVATIONS

DATE: AUG. 1986
PROJECT: 36-7058
DRAWING: **P2**

DATE	AMBIENT NOISE LEVEL MEASUREMENT STATIONS (dB)						
	1	2	3	4	5	6	
FEB. 3, 1988	46	39	52.5	41	46	56.5	
MAR. 22, 1988	42	36	44	36	38	40	
MAR. 24 1988	40	38	48	39	38	40	
APR. 5, 1988	46	42	45	45	43	56	
APR. 8, 1988	52	40	50	42	40	43	WINDY
MAY 10, 1988	52	44	62	50	54	57	WINDY
MAY 30, 1988	55	48	65	53	52	49	
JUL. 11, 1988	52	50	60	50	52	48	
JUL. 26, 1988	53	48	58	50	53	54	
AUG. 3, 1988	50	40	72	48	54	55	WINDY REDUCED DIVERSION
SEP. 7, 1988	55	42	48	50	53	50	

EXISTING SITE PLAN

RESTORATION
BY
MARSH HYDROPOWER LTD.
PORT COLBORNE ONTARIO

REVISION			
NO.	DESCRIPTION	DATE	APP'D
A	PROPERTY LINES CHANGED	23SEPT88	F.M.N.

DRAWN BY G.K.
DESIGNED BY B.R.
CHECKED BY F.N.
APPROVED BY
DATE FEB. 1988
SCALE 1:250

CCL Cumming Cockburn Limited
Consulting Engineers and Planners

TOWNSHIP OF
MUSKOKA LAKES
J.H. Davidson
CLERK – ADMINISTRATOR
BALA ONTARIO

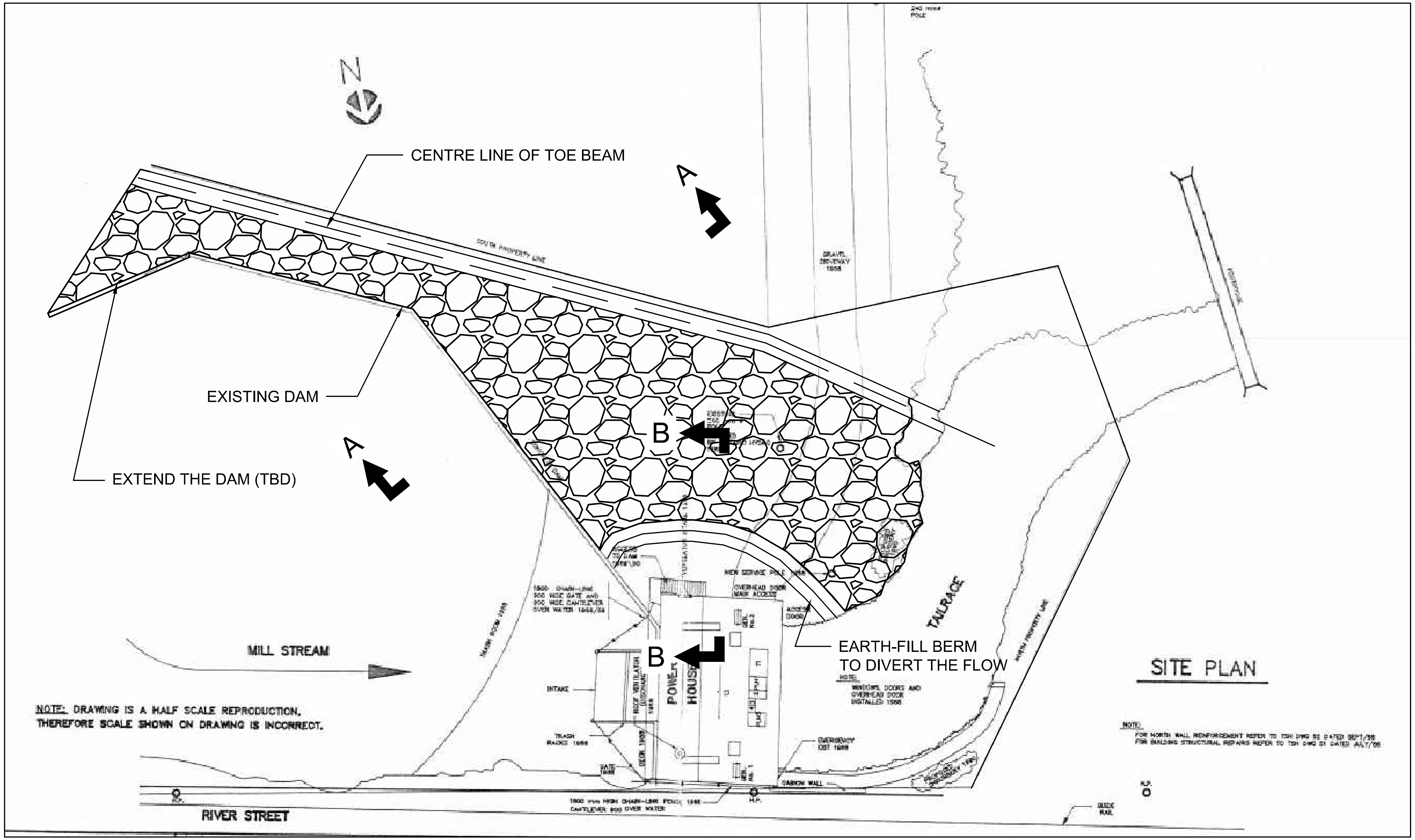
LITTLE BURGESS
GENERATING STATION
BALA ONTARIO

EXISTING SITE PLAN
DRAWING NO. 4383–S1
REV. A

4383 BALA PLOT SCALE 1:0.25 BALA1.DWG

APPENDIX G

REMEDIATION OPTIONS FIGURES



PLAN

N.T.S

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No.	DATE	BY	ISSUES / REVISIONS
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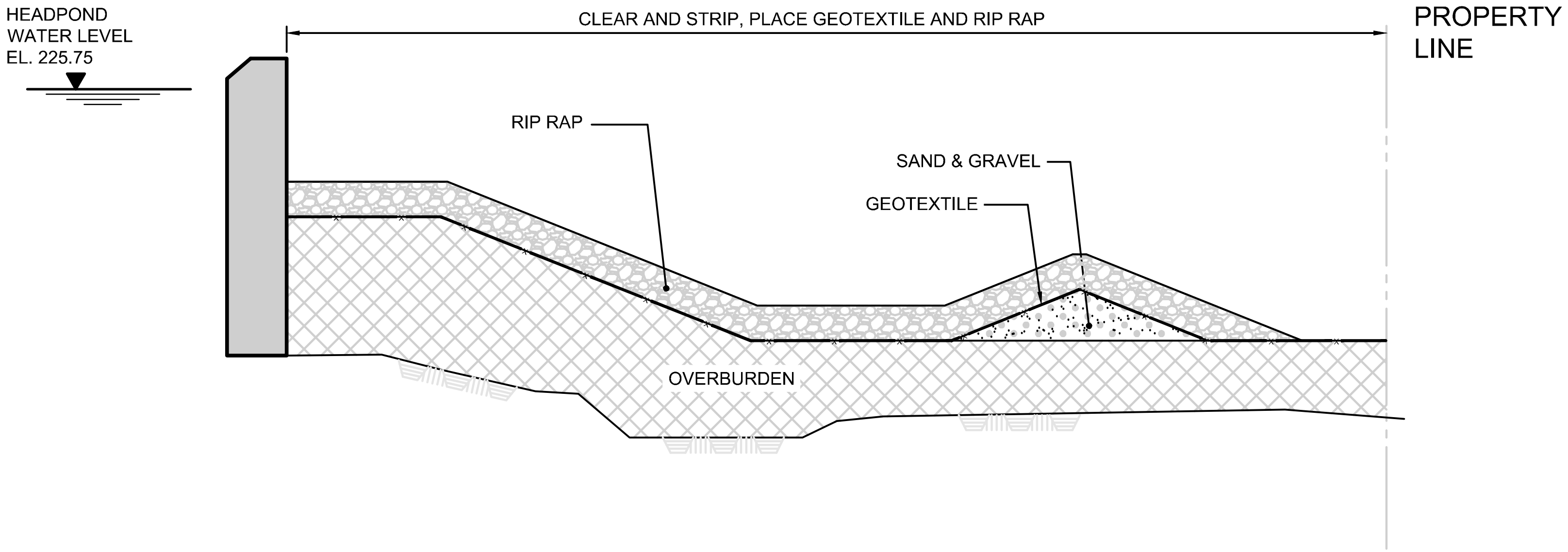
TULLOCH
ENGINEERING

DRAWING:
NON-OVERFLOW DAM SECTION
OPTION N1
UPGRADED DOWNSTREAM FILL
WITH TOE BERM - PLAN

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

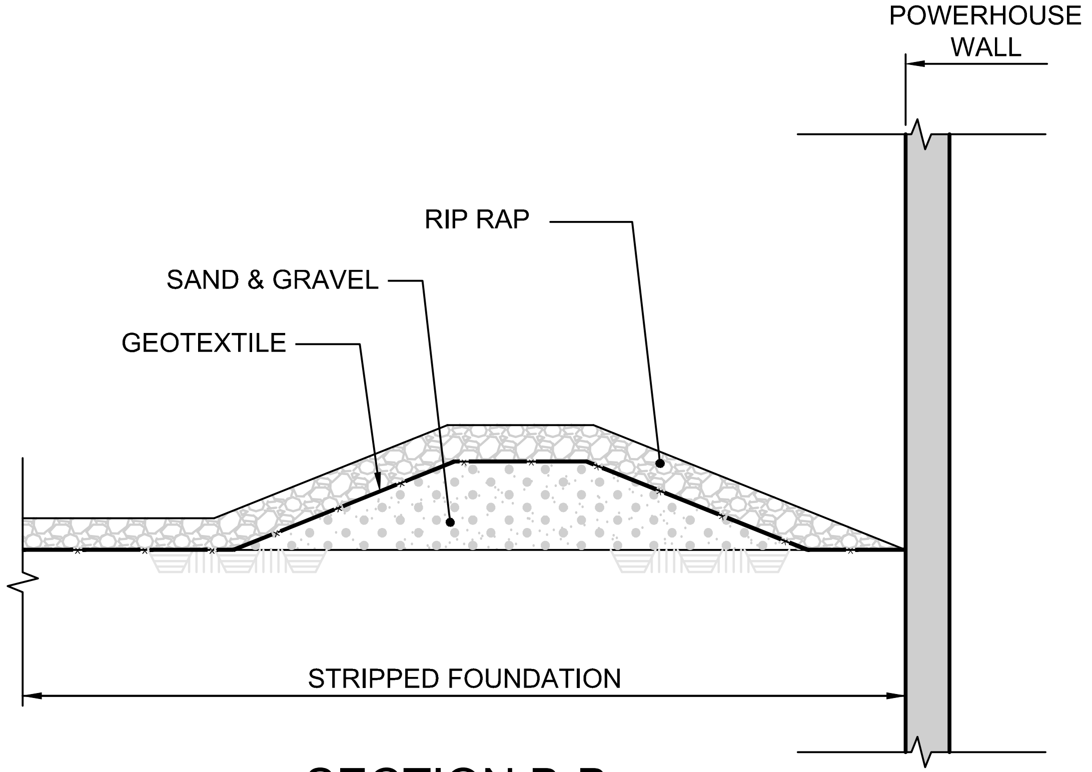
PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS
CHECKED BY: E. GILES
DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG
SCALE: AS NOTED
DATE: 2019-08-07
DRAWING No. 19-1493-C-01
REVISION No. A



SECTION A-A

N.T.S



SECTION B-B

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TULLOCH
ENGINEERING

DRAWING:
NON-OVERFLOW DAM SECTION
OPTION N1
UPGRADED DOWNSTREAM FILL
WITH TOE BERM - SECTIONS

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS	CHECKED BY: E. GILES	DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG	SCALE: AS NOTED	DATE: 2019-08-07
DRAWING No. 19-1493-C-02		REVISION No. A

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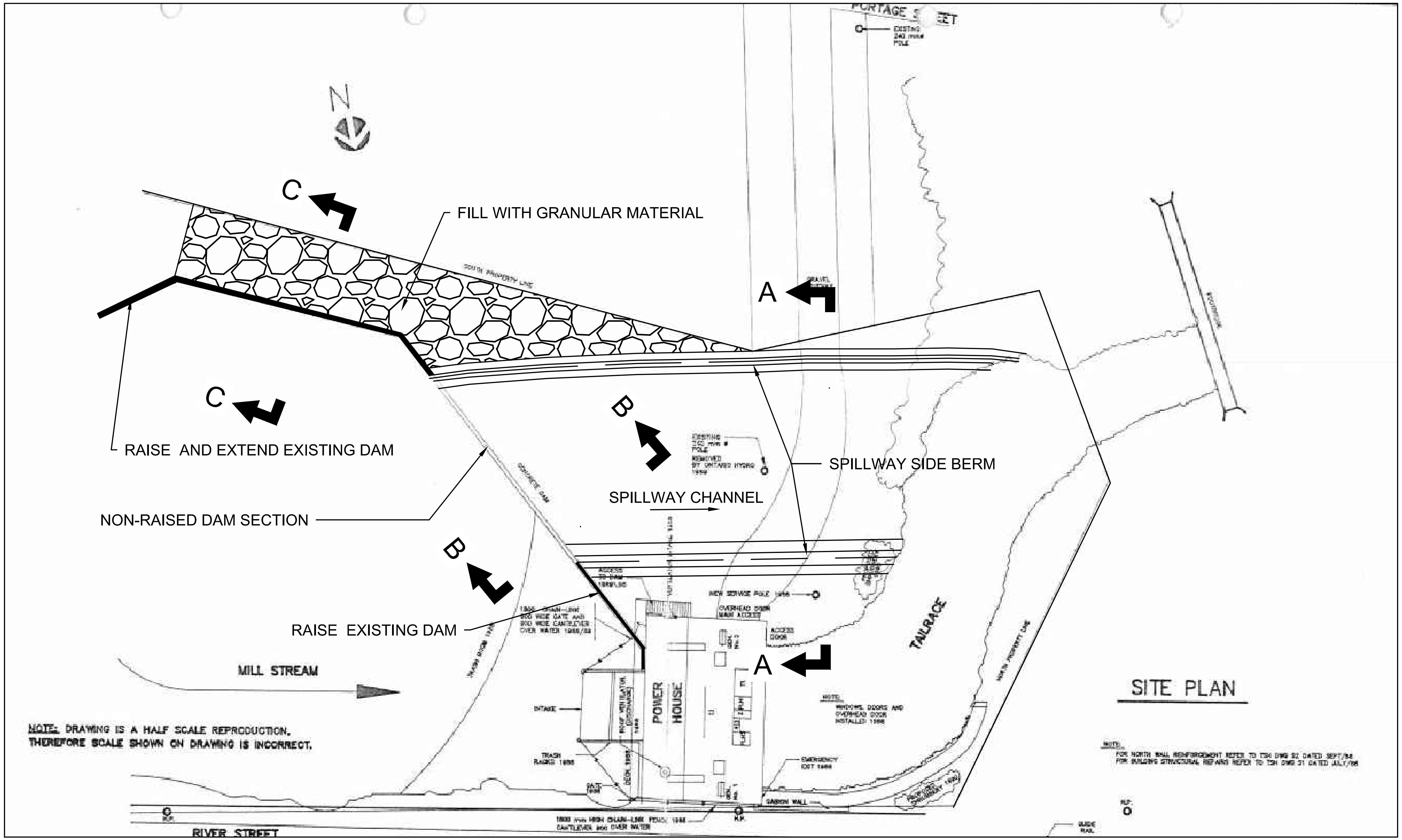

PLAN

N.T.S

No.	DATE	BY	ISSUES / REVISIONS
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TULLOCH
ENGINEERING

DRAWING:
NON-OVERFLOW DAM SECTION
OPTION N2
UPGRADED DOWNSTREAM FILL
WITH SPILLWAY -PLAN

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS
CHECKED BY: E. GILES
DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG
SCALE: AS NOTED
DATE: 2019-08-07
DRAWING No. 19-1493-C-04
REVISION No. A

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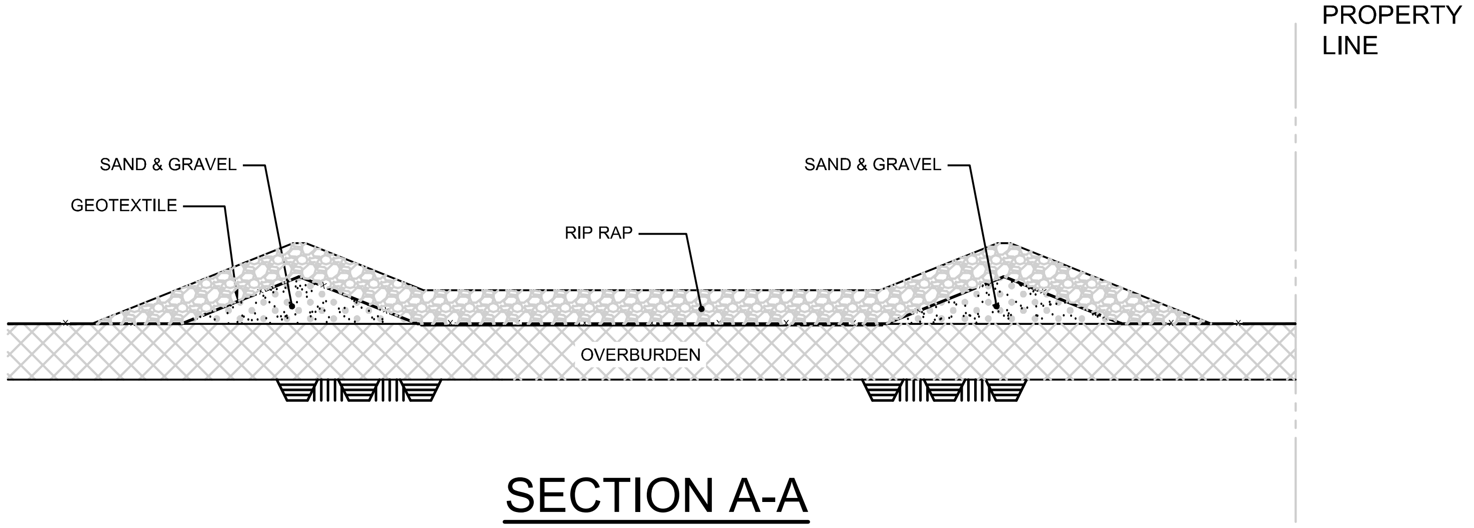
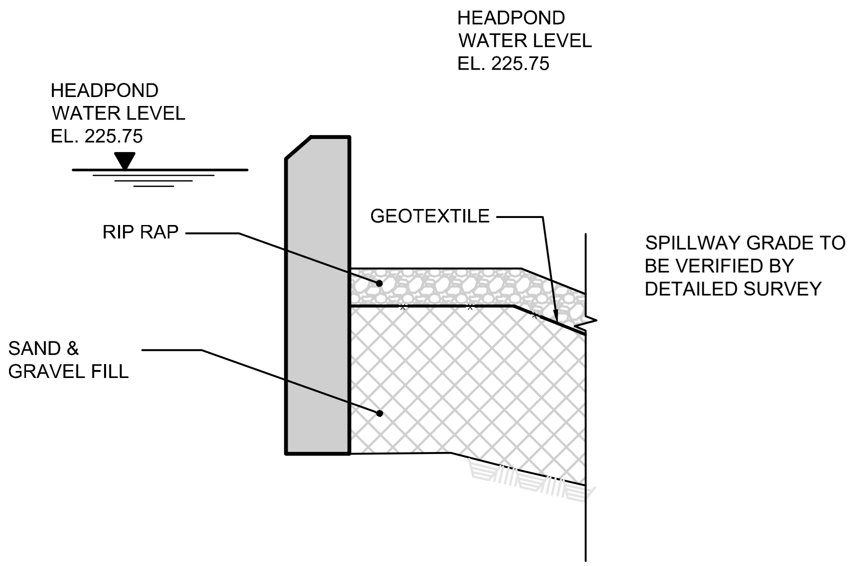


SECTION A-A

N.T.S



SECTION B-B

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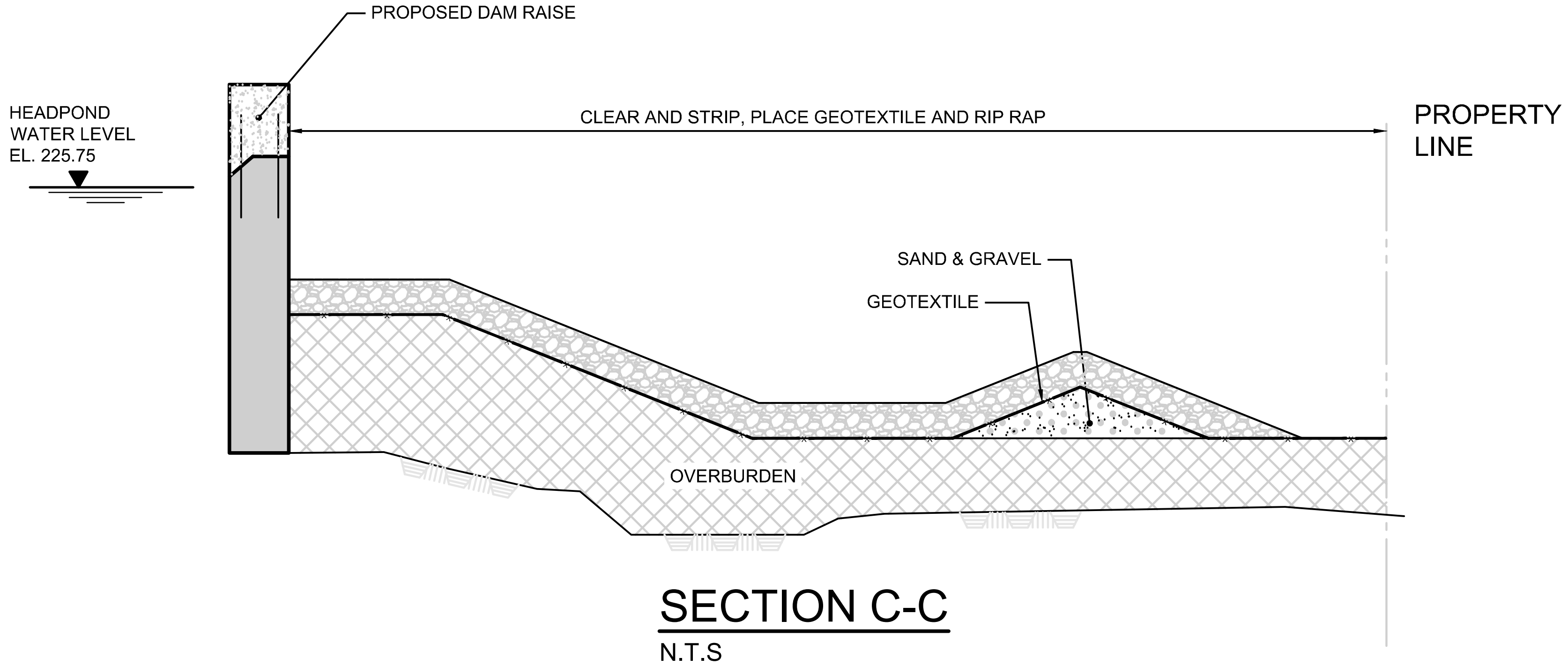

SECTION C-C

N.T.S

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TULLOCH
ENGINEERING

DRAWING:
NON-OVERFLOW DAM SECTION
OPTION N2
UPGRADED DOWNSTREAM FILL
WITH SPILLWAY - SECTIONS

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY:	CHECKED BY:	DESIGNED BY:
K. KORTEKAAS	E. GILES	G. LIANG
APPROVED BY:	SCALE:	DATE:
G. LIANG	AS NOTED	2019-08-07

DRAWING No.
19-1493-C-05

REVISION No.
A

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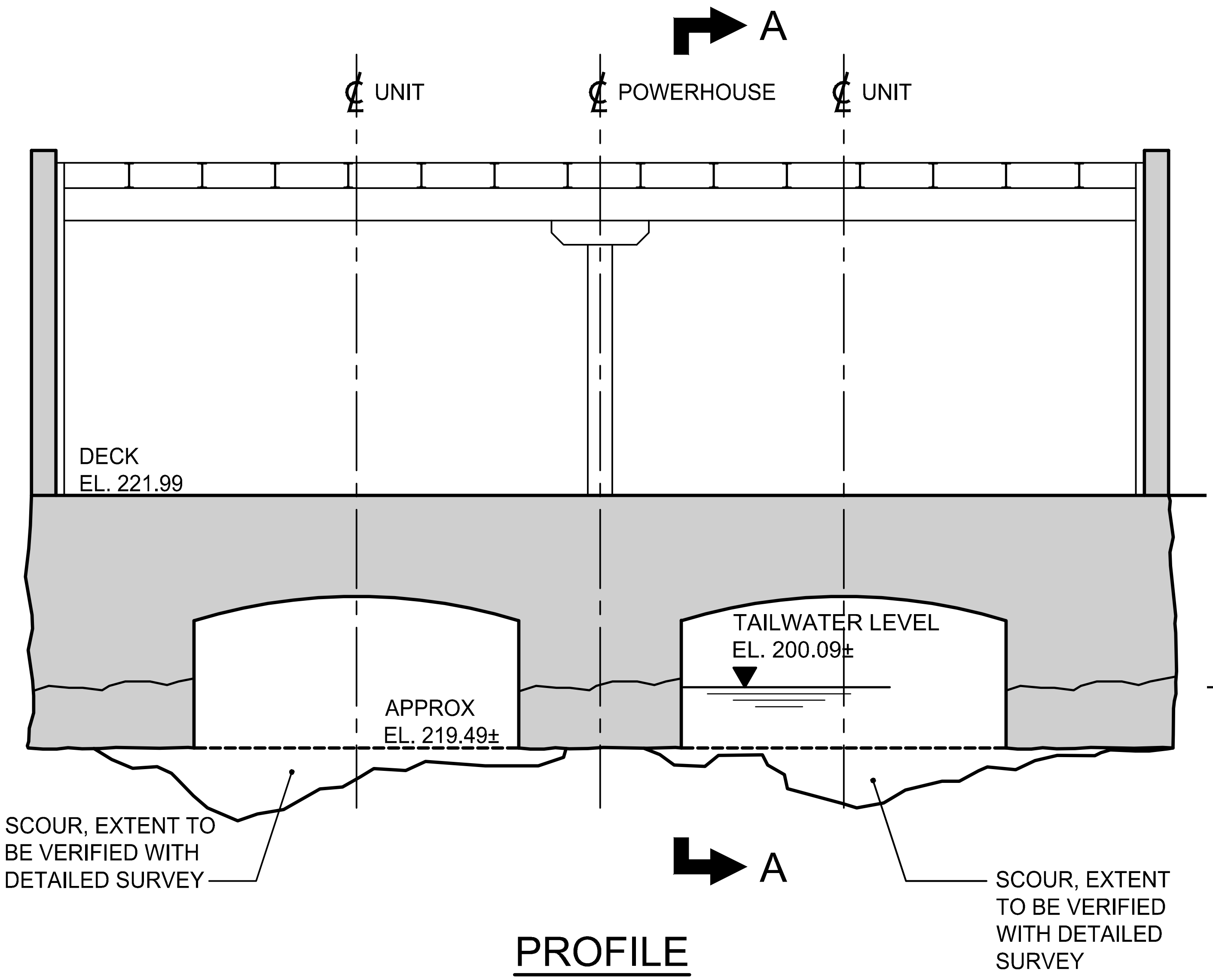
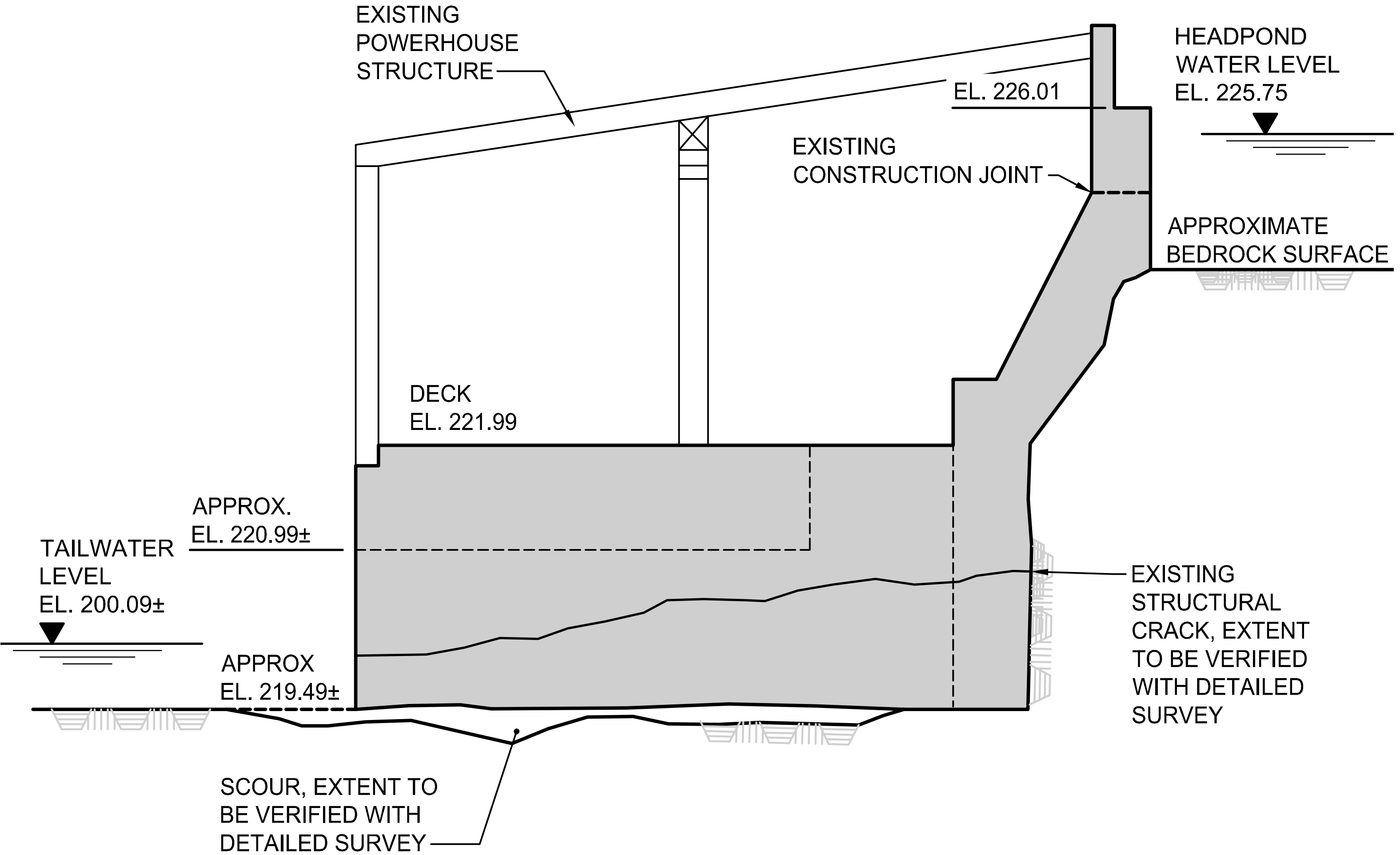


PROFILE

DOWNSTREAM FACE

N.T.S



SECTION A-A

N.T.S

No.	DATE	BY	ISSUES / REVISIONS
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TULLOCH
ENGINEERING

DRAWING:
POWERHOUSE REMEDIATION
EXISTING CONDITIONS
PROFILE AND SECTION

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS	CHECKED BY: E. GILES	DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG	SCALE: AS NOTED	DATE: 2019-08-07
DRAWING No. 19-1493-C-08		REVISION No. A

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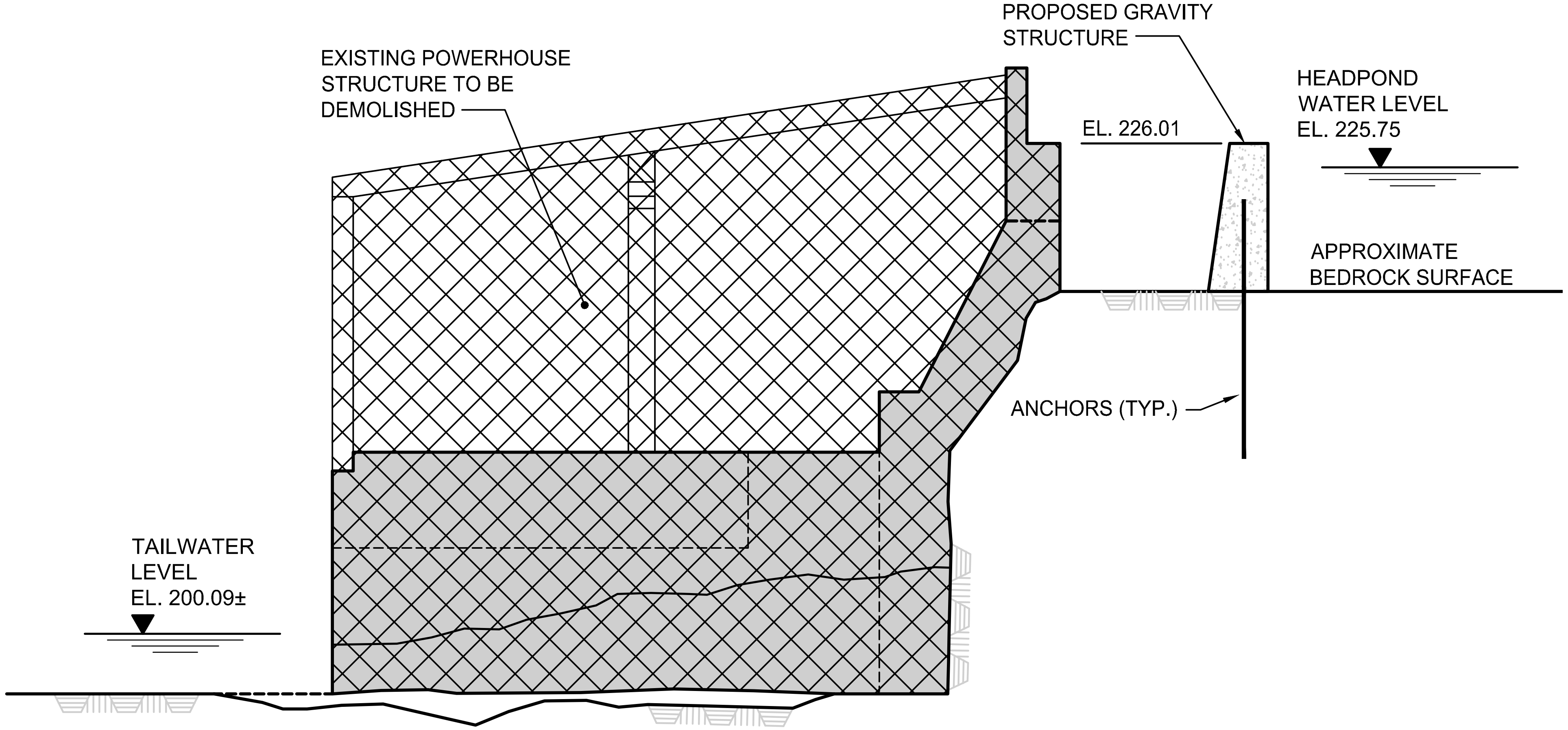

SECTION A-A
N.T.S

A	2019-08-13	KK	ISSUED DRAFT FOR CLIENT REVIEW
No.	DATE	BY	ISSUES / REVISIONS

TULLOCH
ENGINEERING

DRAWING:
POWERHOUSE REMEDIATION
OPTION P1
POWERHOUSE REMOVAL
SECTION

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS	CHECKED BY: E. GILES	DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG	SCALE: AS NOTED	DATE: 2019-08-07
DRAWING No. 19-1493-C-10		REVISION No. A

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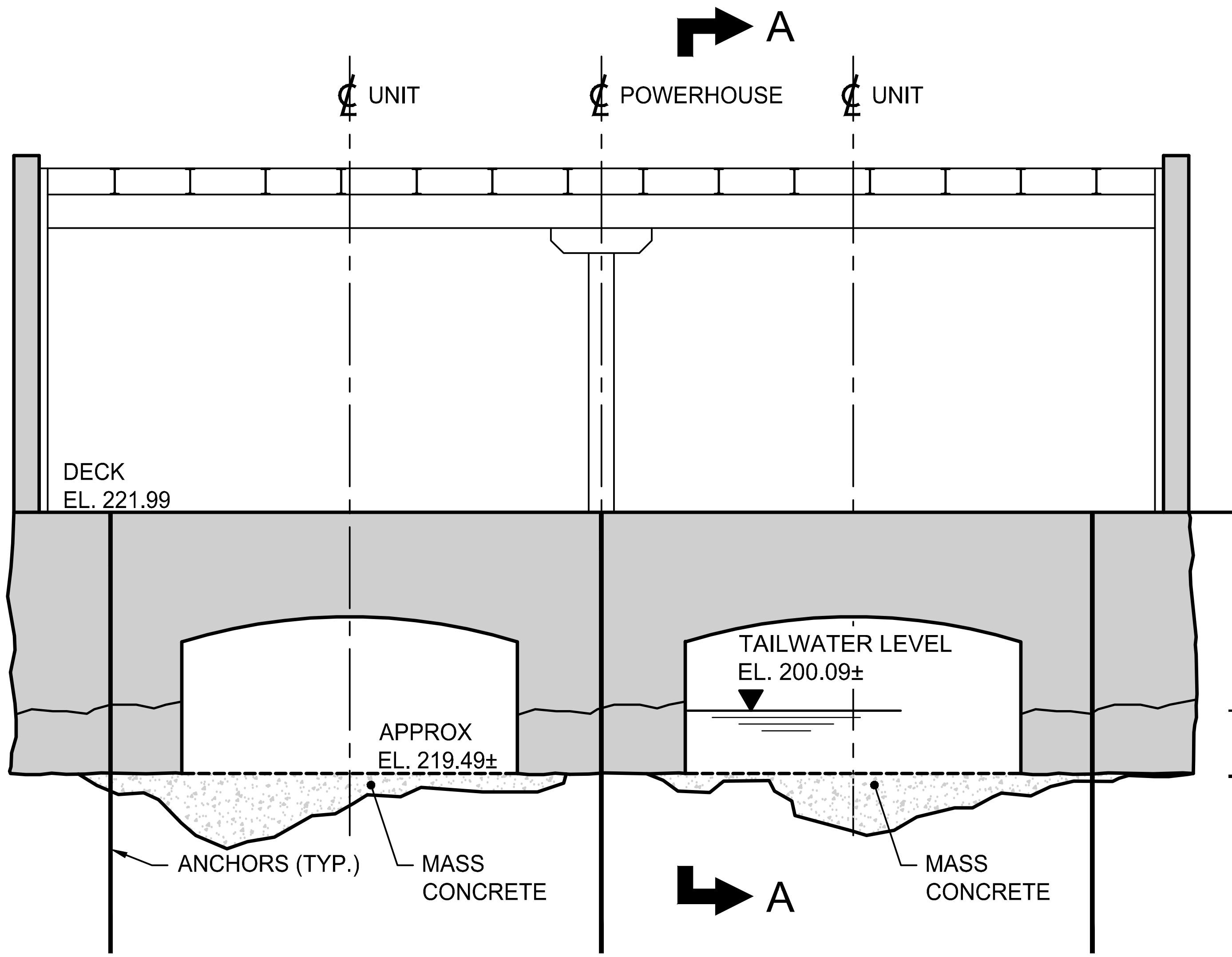
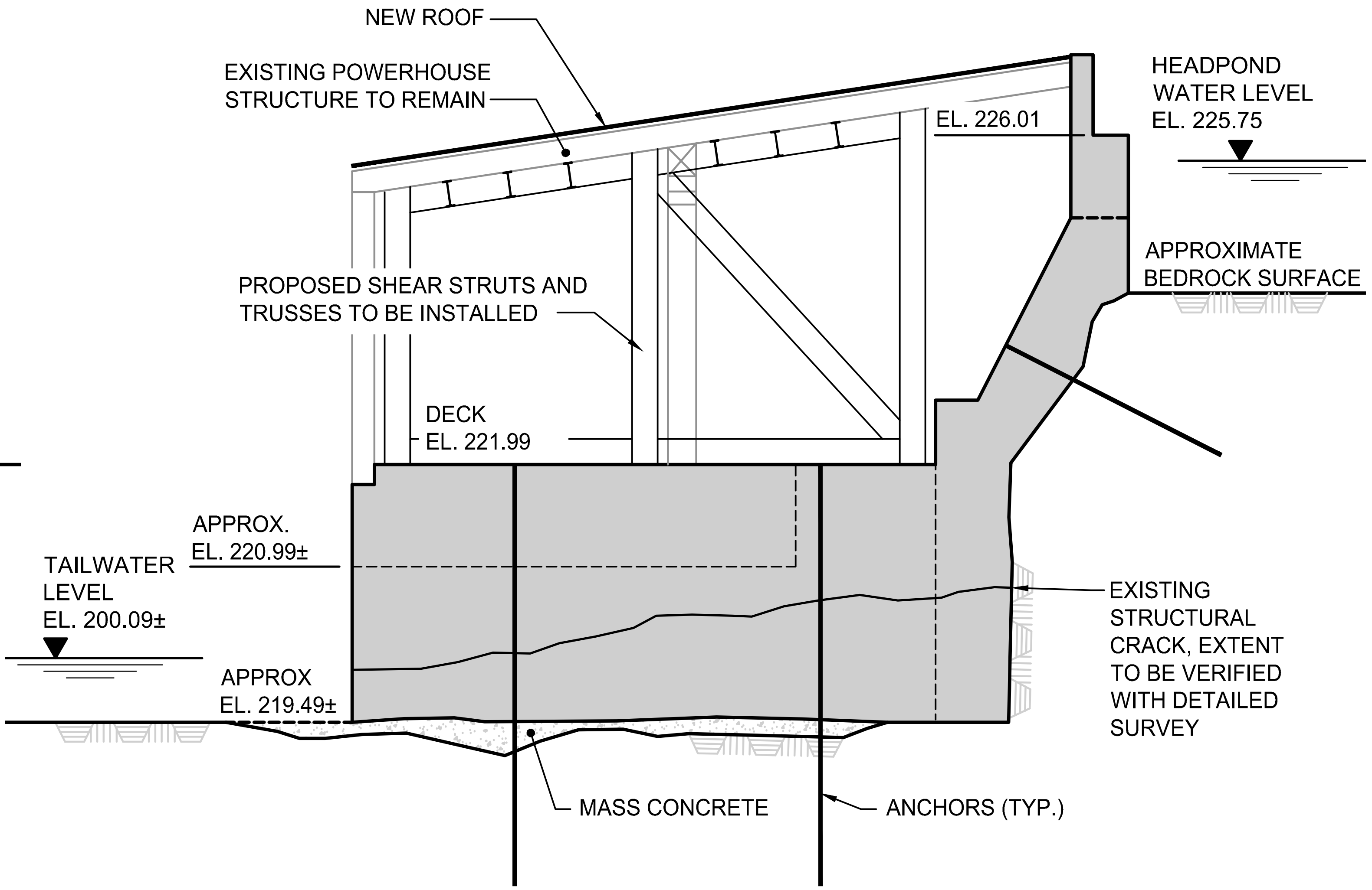


PROFILE

DOWNSTREAM FACE
N.T.S



SECTION A-A

N.T.S

No.	DATE	BY	ISSUES / REVISIONS
A	2019-08-13	KK	ISSUED DRAFT FOR CLIENT REVIEW

TULLOCH
ENGINEERING

DRAWING:
POWERHOUSE REMEDIATION
OPTION P2
POWERHOUSE REFURBISHMENT
SECTION

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS
CHECKED BY: E. GILES
DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG
SCALE: AS NOTED
DATE: 2019-08-07
DRAWING No. 19-1493-C-09
REVISION No. A

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APPENDIX H

PRELIMINARY COST TABLES

Table H-1: Burgess 1 Dam Repair

Cost Estimate - Option N1: Downstream Rip Rap Placement and Toe Berm

August, 2019

Item	Description	Estimated	Unit	Unit Price	Total
		Quantity		($/Unit)	($)
1	**Dam Rehabilitation**				
1.1	Stripping	900	m2	$15.00	$13,500
1.2	Sand and Gravel	150	m3	$50.00	$7,500
1.3	Riprap/rockfill	330	m3	$75.00	$24,750
1.4	Geotextile	825	m2	$7.00	$5,775
1.5	Concrete (dam extension to the south end)	6	m3	$1,000.00	$6,000
1.6	Grouting existing dam cracks	40	LS	$50,000.00	$50,000
1.7	Anchor Φ25, 1m @ spacing 2m for dam raise	10	LS	$5,000.00	$5,000
2	**Construction Access Road**	1	LS	$10,000.00	$10,000
Subtotal					$122,525
Contingencies					
		40%			**$49,010**
	Subtotal Contingencies				**$49,010**
Total Estimated Construction Cost					**$171,535**

Exclusions:

-Third Party Construction Quality Assurance (CQA)
- Environmental, Engineering, Administration & Site Inspection
- Land acquisition
- Financing / IDC
- Owner's costs
- Bonding and Insurance

Table H-2: Burgess 1 Dam Repair

Cost Estimate - Option N2: Partial Dam Raise and Emergency Spillway

August, 2019

Item	Description	Estimated Quantity	Unit	Unit Price ($/Unit)	Total ($)
1	**Dam Rehabilitation**				
1.1	Stripping	1,500	m2	$15.00	$22,500
1.2	Sand and Gravel	550	m3	$50.00	$27,500
1.3	Riprap/rockfill	250	m3	$75.00	$18,750
1.4	Geotextile	675	m2	$7.00	$5,000
1.5	Concrete (dam extension to the south end and partial raise 0.5m)	14	m3	$1,000.00	$13,800
1.6	Grouting existing dam cracks	40	LS	$50,000.00	$50,000
1.7	Anchor Φ25, 1m @ spacing 2m for dam raise	35	LS	$15,000.00	$15,000
2	**Construction Access Road**	1	LS	$10,000.00	$10,000
	Subtotal				162,550
Contingencies					
		40%			**$65,020**
	Subtotal Contingencies				**$65,020**
	Total Estimated Construction Cost				**$227,570**

Exclusions:

-Third Party Construction Quality Assurance (CQA)
- Environmental, Engineering, Administration & Site Inspection
- Land acquisition
- Financing / IDC
- Owner's costs
- Bonding and Insurance

Table H-3: Burgess 1 Dam Repair

Cost Estimate - Option P1: Demolish Powerhouse and Replace with New Dam

August, 2019

Item	Description	Estimated Quantity	Unit	Unit Price ($/Unit)	Total ($)
1	**Powerhouse Removal**				
1.1	D/s and u/s Coffer Dam	1,000	m2	$500.00	$500,000
1.2	Removal of Powerhouse/Decommisioning	1	L.S	$150,000.00	$150,000
1.3	Removal of the old dam concrete (dam section)	130	m3	$1,000.00	$130,000
2	**Build New Dam Section**				
2.1	New concrete dam section (ONLY, No powerhouse)	55	m3	$10,000.00	$550,000
3	**Construction Access Road**	1	LS	$10,000.00	$10,000
4	**Right Bank Concrete Retaining wall**				
4.1	Drill Drainage holes	1	LS	$5,000.00	$5,000
4.2	Excavate Drainage Ditch	1	LS	$1,000.00	$1,000
4.3	Granular Material lined Ditch	25	m3	$50.00	$1,250
	Subtotal				1,346,000
Contingencies					
		40%			**$538,400**
	Subtotal Contingencies				**$538,400**
	Total Estimated Construction Cost				**$1,884,400**

Exclusions:

- Third Party Construction Quality Assurance (CQA)
- Environmental, Engineering, Administration & Site Inspection
- Land acquisition
- Financing / IDC
- Owner's costs
- Bonding and Insurance

Table H-4: Burgess 1 Dam Repair

Cost Estimate - Powerhouse Option P2: Powerhouse Refurbishment and Reinforcement

August, 2019

Item	Description	Estimated Quantity	Unit	Unit Price ($/Unit)	Total ($)
1	**Powerhouse Retrofit**				
1.1	Mass Concrete to fill the undermine area of the powerhouse foundation	30	m3	$2,500.00	$75,000
1.2	Foundation Grouting	36	LS	$50,000.00	$50,000
1.3	Anchorage the existing concrete slab to bedrock,Φ36mm, 8m long with 6m in rock	1	LS	$50,000.00	$50,000
1.4	New powerhouse roof	1	LS	$100,000.00	$100,000
1.5	Additional frame and column for powerhouse structure	1	LS	$50,000.00	$50,000
1.6	Dam Crack grouting repair	40	m2	$1,000.00	$40,000
2	**Construction Access Road**	1	LS	$10,000.00	$10,000
3	**Right Bank Concrete Retaining wall**				
3.1	Drill Drainage holes	1	LS	$5,000.00	$5,000
3.2	Excavate Drainage Ditch	1	LS	$1,000.00	$1,000
3.3	Granular Material lined Ditch	25	m3	$50.00	$1,250
	Subtotal				$382,250
Contingencies					
		40%			**$152,900**
	Subtotal Contingencies				**$152,900**
	Total Estimated Construction Cost				**$535,150**

Exclusions:

- Third Party Construction Quality Assurance (CQA)
- Environmental, Engineering, Administration & Site Inspection
- Land acquisition
- Financing / IDC
- Owner's costs
- Bonding and Insurance

APPENDIX I

NOTICE TO READER

NOTICE TO READER

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a) the report being read in the context of and subject to the terms of the Engineering Services Agreement for the Work (see Proposal #19-0001-179), including any methodologies, procedures, techniques, assumptions and other relevant terms or conditions specified or agreed therein;

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APPENDIX C

CHER and Archeology Reports

CULTURAL HERITAGE EVALUATION REPORT
Burgess Dam 1 Safety Assessment
Part Lot 14, Concession A, Medora Township, Township of Muskoka Lakes, District Municipality of Muskoka

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Date: June 15, 2020
Type of Report: Original

EXECUTIVE SUMMARY

Horizon Archaeology Inc. was contacted by Tulloch Engineering to conduct a Cultural Heritage Evaluation Report of the proposed rehabilitation of the Burgess Dam. This report describes the methodology and results of the Cultural Heritage Evaluation Report which took place on May 06, 2020. This assessment was undertaken in order to recover and assess the cultural heritage value or interest of the bridge within the project boundaries.

Horizon Archaeology Inc. was engaged by the proponent to undertake a Cultural Heritage Evaluation Report of the study area and was granted permission to carry out the assessment and site visit. This included a property inspection to observe the current conditions. Due to this assessment taking place during the Covid-19 pandemic, local sources such as libraries, archives and museums were not available for consultation. As such all research was conducted using online sources. Further information would not change the results of the Cultural Heritage Evaluation Report

The Burgess Dam, constructed in 1917, provided power to Bala, MacTier and Port Carling. The outside facade of the dam has not been altered, except for new windows. The inside has been altered to allow for modern safety standards as well as energy needs. One of the original William Hamilton turbines is located within the Burgess Dam, bu it is unknown if it is still functional.

As the Burgess Dam meets the criteria for being included in the register, it is recommended that the Burgess Dam be added to the Ontario Heritage Act Register. The structure's facade or shell should be preserved if possiblebut the interior has already been altered beyond any historic or cultural value. Additionally, the William Hamilton turbine should be preserved if possible, either in place or somewhere which might be able to use it.

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1.0 PROJECT CONTEXT

1.1 Objectives

The objective of the Cultural Heritage Evaluation Report (CHER) is to establish the cultural heritage value or interest of the property area. Any built heritage, cultural landscape or bridge can be subject to a CHER study.

1.2 Development Context

Under a contract awarded in Spring 2020, Horizon Archaeology Inc. carried out a Cultural Heritage Evaluation Report to determine the potential cultural heritage significance of the Burgess Dam Hydro-Electric Dam. Burgess Dam is located on Part Lot 14, Concession A, Township of Medora, now part of the Township of Muskoka Lakes, District Municipality of Muskoka . The project was conducted under contract to Tulloch Engineering as part of their Class Environmental Assessment Study.

Due to the Global Covid-19 pandemic some sources were not available. Due to the shut down of many places, the Archives of Ontario and the Bala Museum were unavailable as research aids. As such, more information may become available if and when the Covid-19 pandemic comes to an end. While more information is always invaluable, it would not change the outcome of the present study.

1.3 Location

The Burgess Dam Hydro-Electric Dam is located on Part Lot 14, Concession A, Township of Medora, now part of the Township of Muskoka Lakes, District Municipality of Muskoka.

2.0 METHODOLOGY

The present study was designed to examine individually, and as a whole, the heritage elements of the bridge and those of the surrounding landscape, as well as the relationship between the subject bridge and other structures in the region. Data collection was based on historical research and a field assessment of the study area. Background information was gathered from the local archives, the land registry and/or local history collections at the public library. Where possible, further information was obtained from the Ministry of Tourism, Culture and Sport. Historical research was followed by field investigations in which photographic documentation, site analysis and evaluations were carried out.

The identification of cultural heritage resources within the study area is based on the following definitions and concepts:

Heritage value:

- "the aesthetic, historic, scientific, cultural, social or spiritual importance or significance for past, present or future generations. The *heritage value* of a *historic place* is embodied in its character-defining materials, forms, location, spatial configurations, uses and cultural associations or meanings" *(***Standards and Guidelines for the Conservation of Historic Places in Canada** 2003).

Cultural Heritage Landscape:

- "any geographical area that has been modified, influenced, or given special cultural meaning by people" (**Parks Canada Guiding Principles and Operational Policies** 1994)

- "a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. A landscape involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways and industrial complexes of cultural heritage value" (**Provincial Policy Statement** 2005).

Built Heritage Feature:

- "one or more *significant* buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to a community. These resources may be identified through designation or heritage conservation easement under the Ontario Heritage Act, or listed by local, provincial or federal jurisdictions" (**Provincial Policy Statement** 2005).

This document is supported by the guidelines and policies provided by the following:

- the **Ontario Heritage Act** (R.S.O. 1990)
- the **Ontario Planning Act** (R.S.O. 1990) and the **Provincial Policy Statement** (Ministry of Municipal Affairs and Housing 2005)
- The **Environmental Assessment Act** (R.S.O. 1990)
- **Ontario Heritage Bridge Guideline** (Ministry of Transportation and Communications & Ministry of Culture, 1983, revised 1991)
- **Ontario Heritage Bridge Guidelines for Provincially-Owned Bridges (Interim) -** *Bridge Evaluation and Scoring Form* (Ministry of Culture and Ministry of Transportation, 2008)
- **Ministry of Transportation, Environmental Reference for Highway Design** (2006)
- **Environmental Guide for Built Heritage and Cultural Heritage Landscape** (2007)

The Evaluation of Built Heritage and Cultural Landscapes

Criteria for the identification and evaluation of a cultural heritage site are subject to the following values. These values form the basis for assigning heritage significance to a site.
- association with an historic event or person
- architectural, artistic or cultural meaning
- context, siting, landmark status
- original materials and workmanship
- areas of natural or cultural landscapes

The generally accepted and approximate age for the preliminary identification of cultural heritage resources is forty years. However, this does not necessarily exclude resources less than forty years in age that demonstrate significant heritage value or design significance.

3.0 HISTORICAL RESEARCH

Due to the Global Covid-19 pandemic some sources were not available. Due to the shut down of many places, the Archives of Ontario and the Bala Museum were unavailable as research aids. As such, more information may become available if and when the Covid-19 pandemic comes to an end. As such research was done using sources available online or within the author's files. Further research would, however, not change the recommendations and findings of this study.

Various families of the Mnjikaning First Nations from Rama on Lake Couchiching, such as the Bigwin family, the Yellowhead family, the Menominee family, as well as members of the Muskoka band, and a number of families from Lake Rosseau lived and exploited resources in northern Muskoka in the 19th Century. The area was used for farming, trapping, trading, and red ochre was gathered from Paint Lake. Guides from Mnjikaning were in great demand for 19th and early 20th Century Euro-Canadian hunters, trappers, and tourists in Muskoka, owing to their familiarity with the area.

The Bigwin Family as part of their traditional seasonal rounds had a summer settlement and farmland at what is now Dorset and Bigwin Island on Lake of Bays southeast of the project area. Bigwin Island was also the site of a burial ground (ASI 1994b: 3-8, Table 1). They also had a sugar bush located in what is now Ridout Township (ASI 1994b: 11). The Yellowhead family exploited an area from Lake of Bays to Lake Muskoka, and had a settlement at Bracebridge (ASI 1994b: 8). The M'ngikaning family had a settlement around Paint Lake to the south of Lake of Bays which was also a source of red ochre (ASI 1994b: Figure 7).

Lake Rosseau families considered Brunel Township an important fall and winter hunting ground with two to three families living there during those seasons. They also utilised the area north of Fairy and Peninsula Lakes to hunt beaver, however there were no permanent settlements, as these were located at Obagawanung / Port Carling (ASI 1994b: 3-8, 14 Table 1).

The Menominee family lived and exploited an area that was bordered on the east by Lake of Bays, Mary Lake on the west, and Lakes Vernon, Fairy and Peninsula on the north. Menominee had a farm on Menominee Lake to the southwest of Lake of Bays. There was also a small settlement on Menominee Point, on the southeast corner of Lake Vernon. The territory was abandoned by the early 1870's and the family joined the Muskoka Band on Parry Island (ASI 1994b: 3-7, Table 1, Figure 10).

Muskoka has been known for its holiday resorts, and cottage life almost from the beginning of Euro-Canadian settlement. The first resorts in Muskoka opened in the 1870's, focussing on Lakes Muskoka, Rosseau, and St. Joseph, and accessed via railway or steamship. Lack of access to northern Muskoka meant that the first resorts did not begin operation until nearly twenty years after, with the arrival of the railway. Deerhurst Resort on Lake of Bays, constructed in 1896 was the first large resort in northern Muskoka. While few new resorts were opened after World War I in southern Muskoka, a number of resorts on some smaller lakes north of Huntsville were built, focussed not on railways but rather on automobiles being used to access the resort properties (ASI 1994a: 107-8).

While early descriptions of the land available for settlement presented the conditions for farming in glowing terms, many early settlers abandoned their agricultural pursuits first for jobs in the lumber industry, then for employment in the growing tourist trade.

The Bala area was first explored in 1829 by Alexander Shirreff. Two years later he wrote a report about his expedition, in which he mentions a 16 to 20 foot high falls at the outlet of Muskoka Lake. In 1853 J.W. Bridgland surveyed the area and reported that the region was destitute of everything to make settlement desirable (ASI 2008: 11).

The baseline survey of Medora Township was completed in 1865 by surveyor S. James. The interior lots were laid out by Thomas Bryne four years later in 1869. It was also in 1869 that Medora Township received its name. It is believed to be named after Calcina Medora Buell, daughter of Norton Buell of Brockville and wife of Toronto lawyer Alexander Cameron. She was also the niece of Stephen Richards, the Commissioner of Crown Lands from 1867 to 1871. In the early 1870s Medora and Humphrey Township were joined for administrative purposes, and had a combined population of 582 inhabitants living in 120 dwellings, with two under construction (ASI 2008: 12).

The first settler to Bala was Thomas Burgess, who arrived in 1868. He had travelled by boat from Belle Ewart to Washago and then by stage coach or foot to Gravenhearst. He then took a boat to the Bala area and stopped at an abandoned lumber camp. He obtained a Crown Land Grant for 1000 acres (404.686 hectares) and settled on the land between what is now known as Bala Bay and Lake Muskoka (MHBC 2014: 9). He constructed a sawmill at the rapids, now known as the Mill Stream. The settlement at Bala was first known as Musquosh Falls and then Muskoka. The post office opened in 1870, with Thomas Burgess acting as postmaster. He held that post until 1900 when he retired. In 1871 it was renamed Bala, after Bala Lake in Wales (ASI 2008: 16). In Welsh, the word Bala means 'the place of the river out flowing to a lake' (MHBC 2014:9). The first plan of subdivision for Bala was surveyed for Burgess in 1890 with the community developing around Lot 15, Concession A. In 1914 Bala was incorporated as a town with Dr. A.M. Burgess, son of Thomas Burgess, acting as the first mayor (ASI 2008: 16). In 1873 Bala contained 30 inhabitants, with a school, hotel, post office, general store, blacksmith shop, mill and three churches.

In 1902 Thomas Burgess died and the sawmill was taken over by his son, Thomas Burgess Junior. The sawmill closed in 1910 (Historica Research Limited 2009: 22). In 1916 Thomas Burgess' other son, Dr. Alexander Burgess, formed the Bala Electric Light and Power Company. The company purchased the mill stream and mill site and built the Burgess Dam in 1917 (ASI 2008: 17). When it was constructed the structure operated a small, 245 kilowatt generating station. The two turbines were horizontal shaft, Francis-type turbines built by William Hamilton and each rated as 160 horsepower (Historica Research Limited 2009: 23). The William Hamilton Company was incorporated in 1883 but existed as early as 1873. They were in business until approximately 1920. The company was based out of Peterborough and made parts for foundries, mills and engine parts (Jeff Joslin 2020).

In 1929 the generating station was acquired by Ontario Hydro at which time it served 99 customers. The station was retired in 1957 due to the high operating costs and repair needs. The building and dam were transferred to the Town of Bala in 1962 (ASI 2008: 18). The Township of Muskoka Lakes passed By-law #84-109 on September 24, 1984. This by-law designated the Burgess Dam as historically significant under the Ontario Heritage Act. This was due to its supplying of power to Port Carling, Bala and the MacTier area as well as it being situated on the original inlet race of the town's first sawmill which runs through the centre of the community. In 1986 the Township of Muskoka Lakes passed by-law #86-182 which repealed the by-law which designated the Burgess Dam as historically significant. This was due to the Burgess Dam being re-established as an electric power producing facility, or the structure being moved should it be unable to be reused. In 1989 the generating station was purchased and restored by a corporation which sells its power back to Ontario Hydro.

4.0 ANALYSIS

The Burgess Dam Hydro-Electric Dam is located on Part Lot 14, Concession A, Township of Medora, now part of the Township of Muskoka Lakes, District Municipality of Muskoka. The dam structure is 14m in length, and 9m wide. It was constructed in 1917 and operated a small, 245 kilowatt generating station. The two turbines were horizontal shaft, Francis-type turbines built by William Hamilton and each rated as 160 horsepower (Historica Research Limited 2009: 23).

The outside of the structure appears to not have changed since its construction in 1917 (**Figures 1-6, Image 1**). However, the interior has been updated (**Figures 7-11**), probably to bring it up to modern safety and energy standards. However, one of the original Francis-type turbines built by William Hamilton is still located within the structure, although it is unknown if it us functioning or simply sitting in place (**Figure 12**).

The evaluation criteria for determining cultural heritage value or interest is found in O.G. Regulation 9/06 and O.G. Regulation 10/06 of the Ontario Heritage Act (RSO 1990). Under O.G. Reg 9/06 the criteria for determining the cultural heritage value or interest lists three areas under which a heritage property/structure may be designated. These three areas are: design or physical value, historic or associative value, and contextual value. If the property meets any one of these criteria it may be entered into the heritage.

The Burgess Dam contains all three criteria required to be entered into the heritage register. It is one of three hydro electric dams which were constructed in Bala, and the last of which to be built. However, this was due to the sawmill still being in use by Thomas Burgess Jr until 1910. The other two dams, the North Dam and the South Dam both were constructed in the mid 1870s but have been replaced since their initial construction. They were both replaced in 1958. Despite the replacements, when completing their Heritage Impact Assessment, Historica Research Limited concluded that "The Bala Falls area extending from the park on the south shore of the Muskoka River to the park on the north side is a distinct cultural heritage landscape of water management, power generation, tourism, and transportation. An extension of this landscape includes the Mill Stream Channel" (Historica Reseach Limited 2008: 27). The Burgess Dam also appears on the Ontario Heritage Trust's Ontario Heritage Act Register, although a by-law removed it in 1986 as it was re-established as a functioning dam.

In terms of O.G. Regulation 9/06 of the Ontario Heritage Act, the Burgess dam contains design or physical value as research has not been able to find a hydro dam of a similar age and situation. This small family built dam is unlike the other two large scale dams nearby, which were government projects. As such it can be viewed as a unique and representative of a possible "cottage industry" of hydro dam building, similar to the construction of early mills in the New World. This property also contains historical value, as it was constructed on the site of the sawmill, owned by the first settler and founder of Bala, Thomas Burgess. Additionally, the Burgess Dam was constructed by his son Dr. A.M. Burgess, who was also the first mayor of the Town of Bala. Finally, the Burgess Dam has contextual value because it is important in maintaining and supporting the character of the area. It is located in the heart of Bala, on the Mill Stream, near to Highway 169. It is also historically linked to its surroundings. Being at the heart of the town, the Burgess Dam is located where Bala began.

Under O.G. Reg 10/06 a property can be deemed to have cultural heritage value if it meets one or more of the criteria listed. These criteria are:
1) The property represents or demonstrates a theme or pattern in Ontario's history,
2) The property yields, or has the potential to yield, information that contributes to an understanding of Ontario's history,
3) The property demonstrates an uncommon, rare or unique aspect of Ontario's cultural heritage,
4) The property is of aesthetic, visual or contextual importance to the province,
5) The property demonstrates a high degree of excellence or creative, technical or scientific achievement at a provincial level in a given period.
6) The property has a strong or special association with the entire province or with a community that is found in more than one part of the province. The association exists for historic, social, or cultural reasons or because of traditional use.
7) The property has a strong or special association with the life or work of a person, group or organization of importance to the province or with an event of importance to the province.
8) The property is located in unorganized territory and the Minister determines that there is a provincial interest in the protection of the property. O. Reg. 10/06, s. 1 (2).

The Burgess Dam demonstrates a unique aspect and theme of Ontario's cultural heritage, that of the electrification and harnessing of water power to produce electricity, in Ontario. When it was constructed it provided not only electricity to Bala, but also to MacTier and Port Carling. Once hydro was taken over by the government, the Burgess Dam still continued to operate and provide power to Muskoka until it was deemed too expensive to operate and repair. Additionally, the Burgess Dam is not only important to the community of Bala, as evidenced by it being selected to be part of the Ontario Heritage Trust's register, but to others in Muskoka, as it provided them with the means to have electricity as well.

5.0 RECOMMENDATIONS

The Burgess Dam, constructed in 1917, provided power to Bala, MacTier and Port Carling. The outside facade of the dam has not been altered, except for new windows. The inside has been altered to allow for modern safety standards as well as energy needs. One of the original William Hamilton turbines is located within the Burgess Dam, but it is unknown if it is still functional.

As the Burgess Dam meets the criteria for being included in the register, it is recommended that the Burgess Dam be added to the Ontario Heritage Act Register. The structure's facade or shell should be preserved if possible but the interior has already been altered beyond any historic or cultural value. Additionally, the William Hamilton turbine should be preserved if possible, preferrably in place or somewhere which might be share its history.

6.0 BIBLIOGRAPHIC SOURCES

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2008 **Stage 1 Archaeological Assessment of the North Bala Hydroelectric Development, Town of Bala, Ontario,** on file with MHSTCI Pif# P264-042-2008 Government of Canada
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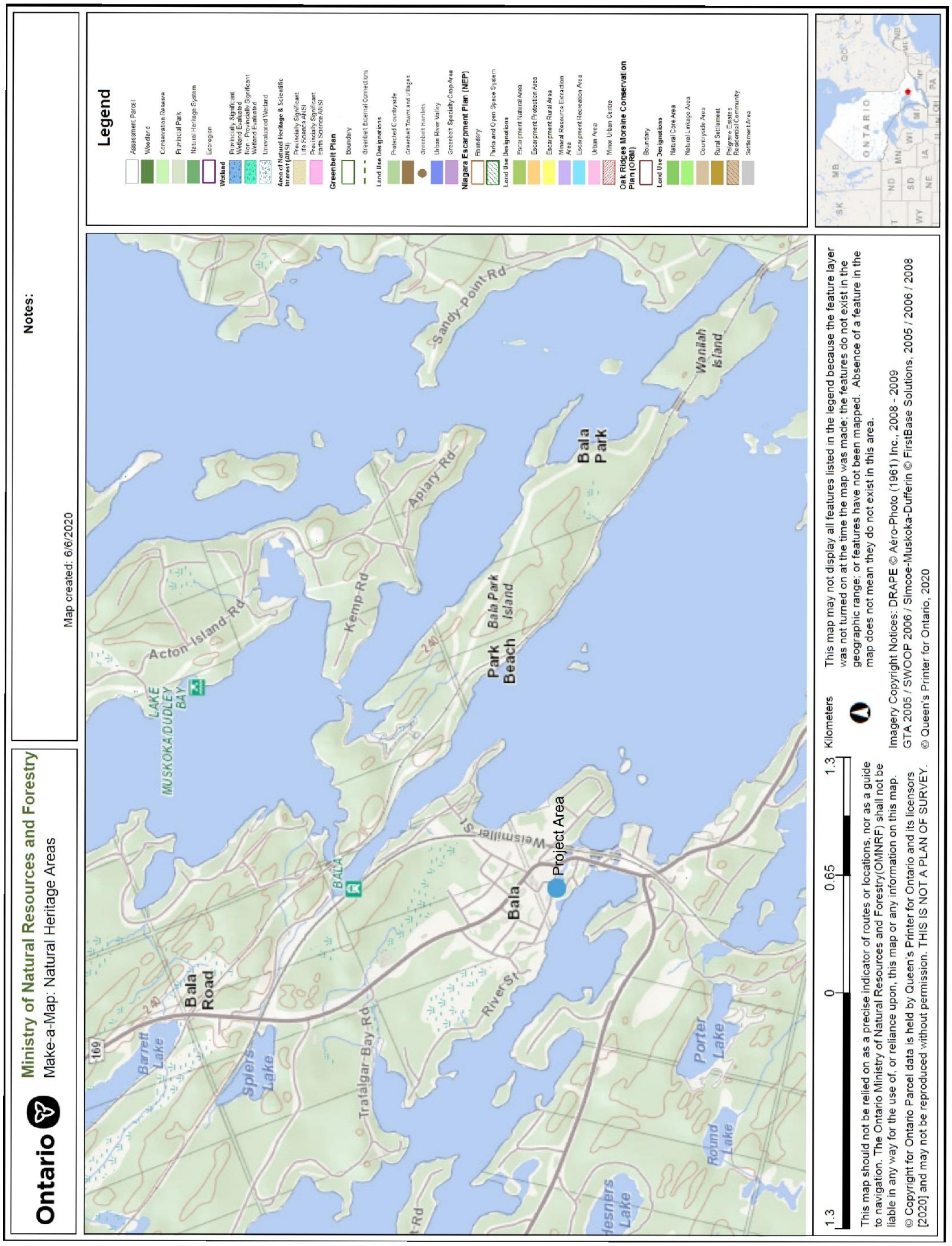
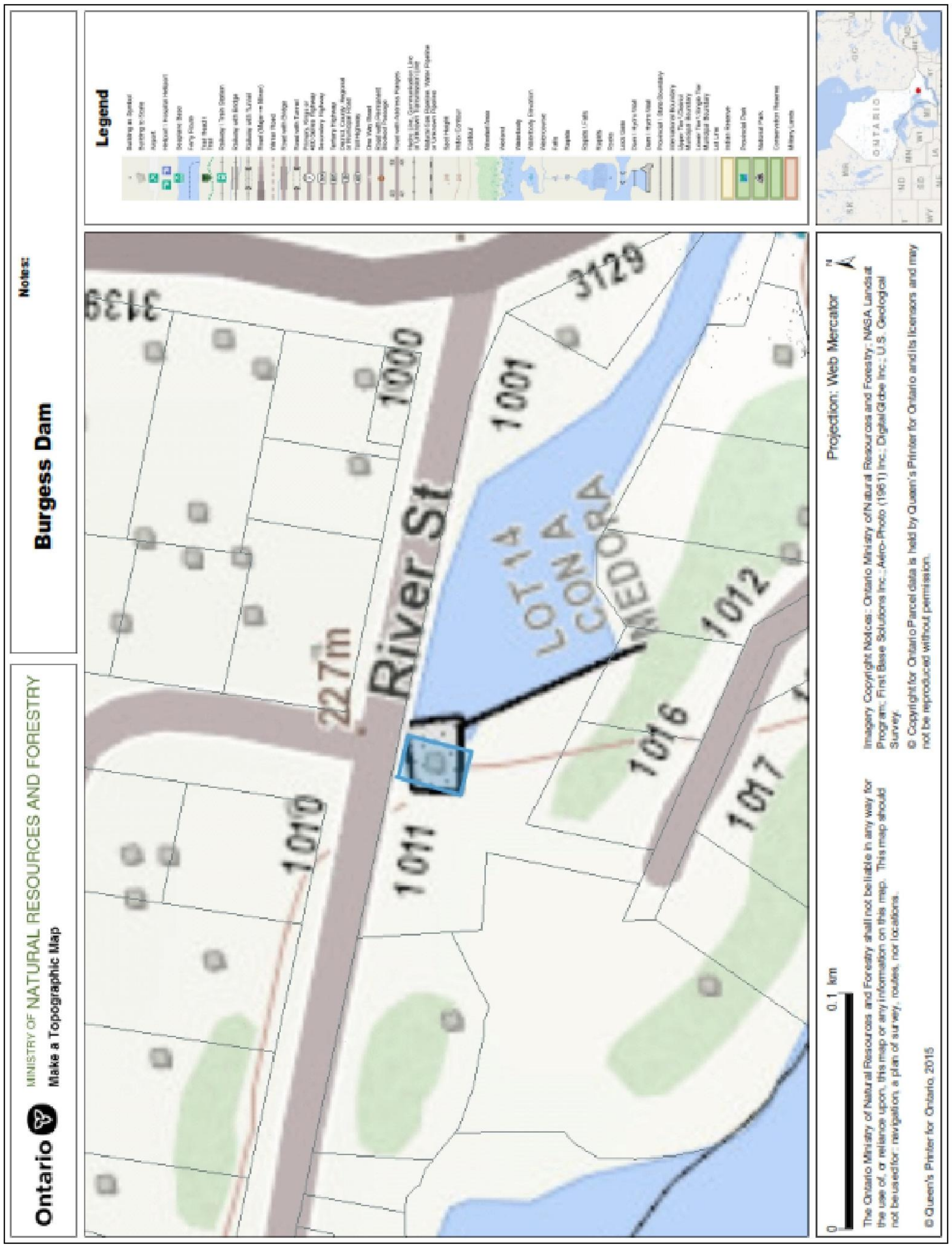
2004 **Parks Canada Guiding Principles and Operational Policies**. Accessed at http://www.pc.gc.ca/docs/pc/poli/princip/preface_E.asp.

7.0 MAPS



Map 1: Regional map showing the location of the Burgess Dam



Map 2: Location of Burgess Dam within Bala

8.0 HISTORIC DOCUMENTS

Image 1: Photograph of Burgess Dam from 1917

Image 2: Section of 1831 Andrew Shirreff Map showing the Bala area

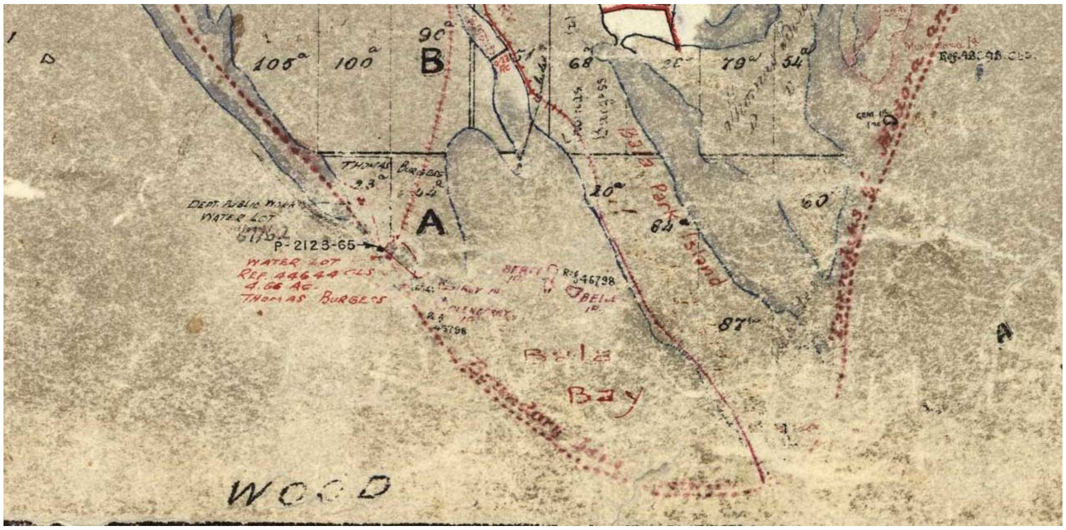


Image 3: Segment of 1869 Crown Lands Map

Image 4: Segment of 1879 Map from the Historic Atlas of Muskoka

9.0 FIGURES

Figure 1: West facade of the Burgess Dam from River Road

Figure 2: West facade of the Burgess Dam from the south shore of the Mill Stream

Figure 3: Southern side of the Burgess Dam from Portage Road.

Figure 4: East side of the Burgess Dam which abuts the hydro pond.

Figure 5: North side of Burgess Dam

Figure 6: Roof of Burgess Dam

Figure 7: Interior of Burgess Dam, looking north.

Figure 8: Interior of Burgess Dam, facing east.

Figure 9: Interior of Burgess Dam, facing south

Figure 10: Interior of Burgess Dam, facing west

Figure 11: New windows on west facade.

Figure 12: Original William Hamilton turbine

Appendix: Rationale for CHER

Ontario Regulation 9/06		
Criterion	**Yes/No/ Undetermined**	**Rationale**
1. The property has design value or physical value		
i. Is a rare, unique, representative or early example of a style, type expression, material or construction method	Yes	Small, privately constructed hydro-dam
ii. Displays a high degree of craftsmanship or artistic merit	Unknown	No other examples of a similar structure were found
iii. Demonstrates a high degree of technical or scientific achievement	Unknown	No other examples of a similar structure were found
2. The property has historical value or associative value		
i. Has direct associations with a theme, event, belief, person, activity organization or institution that is significant to a community	Yes	Association with the electrification of Ontario, and the founding family of Bala
ii. Yields, or has the potential to yield, information that contributes to an understanding of a community or culture	Yes	Within the heart of Bala, on land owned by the first settler to Bala, and constructed by his son, the first mayor.
iii. Demonstrates or reflects the work of ideas of an architect, artist, builder, designer or theorist who is significant to a community.	Unknown	No information was found regarding the construction of the Burgess Dam
3. The property has contextual value		

i. Is important in defining, maintaining or supporting the character of an area	Yes	located within the centre of Bala, constructed by the first mayor and son of the first settler
ii. Is physically, functionally, visually or historically linked to its surroundings.	Yes	Sits in same location as original saw mill, and is situated within the centre of Bala
iii. Is a landmark	Yes	The Burgess Dam was listed as a heritage structure in 1984, but this was repealed in 1986 so that the structure could be used again
Ontario Regulation 10/06		
1. The property represents or demonstrates a theme or pattern in Ontario's history	Yes	Represents the electrification of Ontario
2. The property yields, or has the potential to yield, information that contributes to an understanding of Ontario	Yes	Can add information regarding how hydro dams evolved in Ontario
3. The property demonstrates an uncommon, rare or unique aspect of Ontario's cultural heritage	Yes	The Burgess dam was a privately constructed dam, later bought by Ontario Hydro
4. The property is of aesthetic, visual or contextual importance to the province.	Unknown	It is unknown if the visuals are unique or important due to being unable to completed further research at the archives

5. The property demonstrates a high degree of excellence or creative, technical or scientific achievement at a provinical level in a given period.	Unknown	Further research could be completed once the Covid-19 pandemic is over
6. The property has a strong or special association with the entire province or with a community that is found in more than one part of the province. The association exists for historic, social or cultural reasons or because of traditional use.	Yes	Special association for several areas in Muskoka, where the Burgess Dam provided them with electricity
7. The property has a strong or special association with the life or work of a person, group or organization of importance to the province or with an event of importance to the province.	No	Not important to the province, but important at the local level. Owner was the first mayor and son of the first settler.
8. The property is located in an unorganized territory and the Minister determines that there is a provincial interest in the protection of the property.	No	Located within the District of Muskoka

Stage 1 Archaeological Assessment of Burgess Dam 1 Safety Assessment Part Lot 14, Concession A, Medora Township, Township of Muskoka Lakes, District Municipality of Muskoka

P335-0088-2020

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Date: June 03, 2020
Type of Report: Original

Executive Summary

This report describes the methodology and results of the Stage 1 Archaeological Assessment of the Earl's Road Subdivision development, on Part Lot 17, Concession 3, Township of Chaffey, now part of the Town of Huntsville, District Municipality of Muskoka. This study was triggered by the Planning Act, and conducted under the Professional Archaeological Consulting License P-335 issued to Dayle A. Elder by the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) for the Province of Ontario.

Horizon Archaeology Inc was engaged by the proponent to undertake a Stage 1 Archaeological Assessment of the study area and was granted permission to carry out archaeological fieldwork by the proponent. The study area was subject to a Stage 1 site inspection on May 6th, 2020. As per Section 1.1.2 of the Standards and Guidelines for Consultant Archaeologist the mapping provided by the proponent represents the best available (MHSTCI 2011).

The Stage 1 Site Inspection found that the project area does not contain any archaeological potential. The Burgess Dam project area should be considered cleared of further archaeological concerns.

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Project Personnel

Project Director:	Dayle A. Elder, MA (P335)
Field Director:	Victoria Brooks-Elder, MA (P387)
Photographs:	Victoria Brooks-Elder
Report Preparation:	Victoria Brooks-Elder Dayle A. Elder
Maps:	Proponent Victoria Brooks-Elder

1.0 Project Context

1.1 Objectives

The objectives of a Stage 1 archaeological assessment, as outlined by the Standards and Guidelines for Consultant Archaeologists (2011), are as follows:

1) To provide information about the property's geography, history, previous archaeological fieldwork and current land conditions
2) To evaluate in detail the property's archaeological potential, which will support recommendations for Stage 2 survey for all or parts of the property
3) To recommend appropriate strategies for Stage 2 survey

1.2 Development Context

This report describes the methodology and results of the Stage 1 Archaeological Assessment of the Burgess Dam 1 Safety Assessment, on Part Lot 14, Concession A, Township of Medora, now part of the Township of Muskoka Lakes, District Municipality of Muskoka (**Maps 1 & 2**). This study was triggered by the Planning Act, and conducted under the Professional Archaeological Consulting License P-335 issued to Dayle A. Elder by the Ministry of Heritage, Sport, Tourism, Culture Industries (MHSTCI) for the Province of Ontario.

Horizon Archaeology Inc was engaged by the proponent to undertake a Stage 1 Archaeological Assessment of the study area and was granted permission to carry out archaeological fieldwork by the proponent. The study area was subject to a Stage 1 site inspection on May 6th, 2020. As per Section 1.1.2 of the Standards and Guidelines for Consultant Archaeologist the mapping provided by the proponent represents the best available (MHSTCI 2011).

All records, documentation, field notes and photographs related to the conduct and findings of the these investigations are held at the office of the licensee with copies at the Horizon Archaeology Inc office in North Bay until such time that they can be transferred to an agency or institution approved by the Ontario Ministry of Heritage, Sport, Tourism, Culture Industries on behalf of the government and citizens of Ontario. The documentary record generated in the field comprises of one page of field notes, GPS points, and 34 digital photographs.

1.3 Historical Context

1.3.1 Heritage Documentation

The Official Plan for the District of Muskoka, Section G- Traditions of Muskoka, deals with archaeological and heritage resources within the municipality (District of Muskoka 2019). As stated in Section G2, the plan's objectives include:

a) Preserving and building upon the cultural heritage and traditions of Muskoka.
b) Conserving protected heritage properties, cultural heritage landscapes and archaeological resources;
c) Conserving and mitigating impacts to all **significant** (emphasis theirs) cultural heritage resources, when undertaking public works;
d) Respecting the heritage resources recognized or designated by Federal and Provincial agencies; and,
e) Respecting the heritage designations and other heritage conservation efforts by the Area Municipalities.

Section G4 deals with archaeological resources, both on land and marine, the Archaeological Master Plan, and First Nations Consultation and collaboration. Section G4.1- Context: states that
a) The District of Muskoka recognizes that there are archaeological resources of pre-contact and early historic habitation as well as areas of archaeological potential within the District that may be adversely affected by future development.
b) Development and site alteration shall not be permitted on lands containing archaeological resources unless significant archaeological resources have been conserved.

Section G4.2 Master Plan of Archaeological Resources states that the municipality will consider updating the 1994 Master Plan of Archaeological Resources. This would involve First Nation communities and other stakeholders, and deal with the locations of "significant or potentially significant archaeological resources", and protocols for their protection and management (District Municipality of Muskoka 2019: 69-71).

Section G4.3- Implementation indicates that an archaeological assessment will be required when major developments are proposed in areas identified as being "moderate, high, very high, or specific archaeological potential." If an assessment recovers archaeological resources, preservation his the municipality's preferred means of mitigation of development impacts; excavation being permitted only when it has been demonstrated that preservation is not possible. Mitigation plans, either excavation or preservation must be approved by the District Municipality as well as the Area Municipality (District Municipality of Muskoka 2019: 70)

In order to preserve archaeological sites, the Area Municipalities are encouraged to enact zoning or community planning permits that would under the Planning Act prevent development of land that not only contains archaeological sites, but merely has the potential to do so . Area Municipalities are also encouraged to acquire archaeological sites as part of condition of development (District Municipality of Muskoka 2019: 70).

The Township of Muskoka Lakes Official Plan Section B Waterfront: 5.35-45 contains the municipality's requirements for archaeological assessments and site preservation as well as heritage structures and landscapes. Much of this section deals with built heritage, and the two parts dealing with archaeology defer to the District Municipality of Muskoka's Archaeological

Master Plan (Township of Muskoka Lakes 2013: 17-18)

1.3.2 Pre-Contact Period

Palaeo-Indian sites date 10,000 to 5,000 B.C. , and inhabited a tundra like environment as the glaciers retreated northward. In such an environment, fruits, nuts and other sources of food harvested from trees or other plants are rare, and it is thought that the Palaeo-Inidans subsisted largely by hunting, trapping and fishing (Ellis 2013: 36). Palaeo-Indian sites are most often located on relic beach ridges associated with glacial lakeshores (Stork 1984). They have also been located at ancient river crossings, places where modern caribou hunters often assemble as the animals my slow and file through a narrow area making them easier to hunt (Ellis 2013: 36). The predominance of sites being located on ancient strandlines may be more indicative of the survey methodology employed to find them rather than an actual preference for site situation on the part of the Palaeo-Indian peoples of Ontario, as a number of sites have been recovered away from ancient shorelines (Ellis & Deller 1990: 50)

Most Palaeo-Indian sites are small, indicating campsites that were inhabited briefly as its occupants followed the seasonal routes and cycles of their prey. Larger sites seem to be associated with animal migration routes, primarily at river crossing as mentioned above (Ellis 2013: 35-6).

Large, fluted spear points define an Early Palaeo-Indian site. While one of the earliest artefacts in North America, they are also one of the most technologically advanced stone tools on the continent (Ellis 2013: 37-8). Other artefacts encountered include hammerstones, and large choppers, knives / cutting tools, lunate bifaces, and piece esquillée's, possibly employed as wedges for wood or bone working, unifacial triangular end scrapers, beaked scrapers, spokeshaves, burins or gravers (Ellis & Deller 1990: 43, 47-9).

Late Palaeo-Indian points do not exhibit the same fluting that is present on Earlier assemblages. Two point types are found on Late Palaeo-Indian sites, one group having a concave base with either rounded or pointed ears, and the other group comprising lanceoloate forms (Ellis 1990: 57-8). Most of the lithic tool kit continues from the Early Palaeo-Indian Period, however there a few new forms or tools that appeared, including: drills, and small thumbnail or fan shaped end scrapers replace the unifacial triangular end scraper (Ellis & Deller 1990: 59).

The toolstone recovered from Palaeo-Indian sites in Ontario has been sourced to have been quarried from sites up to 200 km away. The tool stone was likely at least roughed out at the quarry site and carried to the site on seasonal routes. Other sources originated further afield from sources in Ohio or Michigan, and were likely obtained through trade (Ellis & Deller 1990: 43).

The Archaic peoples were still nomadic hunter-gatherers, however the greater range of tools has caused some to hypothesise that this indicated a shift from exploiting large-game over a large area to a more extensive, localised range (Ellis et al 1990: 67). This could also be a factor of preservation of perishable materials, which is also a factor from the earlier Palaeo-Indian period.. There is also evidence, through presence of imported / exotic cherts, that great distances were still covered during seasonal rounds (Ellis et al 1990: 78).

In southern Ontario, the Archaic is subdivided into Early, Middle, and Late periods, which in turn are further subdivided into horizons based upon point types (Ellis et al 1990). In northern Ontario, there is no such subdivision and the entire period is known as the Shield Archaic (Wright 1972, Hamilton 2013). Areas around the north shore of the Great Lakes, and along the southern border between northwestern Ontario and Minnesota could possibly have been part of the Middle Archaic "Laurentian Archaic" group found in southern Ontario (Hamilton 2013, Ellis et al 1990).

The Archaic period also witnessed the rise of the "Old Copper" culture centred around Lake Superior."Old Copper" culture is a name given to the people from this area who exploited the available copper veins or outcroppings, and not a distinct Archaic group separate from others based upon material culture, settlement patterns etc. Copper artefacts from this area have been recovered from sites in Southern Ontario, west to into Saskatchewan, and south of Lake Michigan into Illinios (Hamilton 2013: 89). Copper artefacts include spear points, knives, chisels, and celts (Dawson 1966). Most of these artefacts have been found by collectors or out of context and their role in society is open for debate.

A major change in the Archaic tool-kit from that of the Palaeo-Indian period is the appearance of smaller, notched points that replace the large lanceolate forms. This has been thought to indicate a technological advance; the adoption of the spear-thrower, or *atl atl* . Other artefacts typical of the Archaic period include those associated with wood-working such as axes, gouges and adzes (Ellis et al 1990: 65). These woodworking tools have been thought to indicate that the dug-out canoe was introduced during this period.

Archaic houses are rare, however the Davidson Site (AhHk-54) along the Ausable River inland from Lake Huron has revealed a number of features that have been identified as pit-houses, dating to the Late Archaic, predating 3000 BP based upon dates from carbonised remains found in flood deposits above the floor (Ellis et al 2010).

The house was circular, approximately 5 metres in diametre, had a sloping entrance, interior hearth, posts, and a bench surrounding the edges of the structure, and likely possessed a soil or sod roof. It was hypothesised that this structure was a cold weather domicile, owing to the greater insulating properties of pit-houses (Ellis et al 2010: 10). The labour involved in construction of such a house is also believed to indicate a more-or-less sedentary lifestyle, those occupying it relying on stored foodstuffs (Ellis et al 2010: 10).

Burials from southern Ontario date to the Late Archaic, and have been divided into two complexes, the Haldimand and Glacial Kame. While it has been hypothesised that the Haldimand Complex groups interred their dead in what could be the first cemeteries in the province, it is fairly certain that the Glacial Kame culture had deliberate cemeteries to bury their deceased, possibly in an annual ritual or celebration (Ellis et al 1990: 116-8). Haldimand Complex burials included projectile points, chert bifaces, red ochre, copper artefacts including beads and awls, and beaver incisor grave goods (Ellis et al 1990: 116). Glacial Kame burials were composed both of inhumations as well as cremations. Grave goods were rather elaborate, and included bannerstones, bird stones, stone pipes, copper artefacts including adzes, awls and beads, bear maxilla masks, exotic sea shells, and gorgets (Ellis et al 1990: 116-8).

In southern Ontario the Woodland, like the Archaic period, has been subdivided into three phases, Early, Middle and Late, dating between ca. 1000-900 BC to and AD 1650-1700. This period is marked by the introduction of pottery. The Late Woodland period begins ca. AD800 with the widespread adoption of agriculture.

The Early Woodland people still maintained seasonal routes similar to those from the preceding period. The adoption of pottery seem to indicate an increasing exploitation of plant resources (Williamson 2013: 48). These seasonal rounds were likely focussed around watersheds with families living separately in autumn and winter, coming together in the spring and summer to exploit seasonal resources such as fish spawning. While these larger groups had their own territories, they were not isolated and did not isolate themselves.

Across most of southern Ontario, Quebec and western New York State the people of the Early Woodland shared a similar culture known as “Meadowood”. Common artefacts from this time period include: Vinette 1 ceramics, distinctive side-notched “Meadowood” projectile points, and the “Meadowood Cache Blades”, trapezoidal gorgets, and bar and expanded bodied pop-eyed birdstones. Also common on Meadowood sites are drills and scrapers made from Meadowood preforms, other gorget types, pendants, copper beads and awls, and fire making kits of iron pyrite. These artefacts are believed to have developed from the preceding Glacial Kame culture of the Late Archaic (Spence et al 1990: 128-9). This could be indicative of the extension or continuance of the Archaic period type lifeways into the Early Woodland in the region like has been hypothesised for other regions of northern Ontario.

Most of what is known about the Meadowood culture stems from cemeteries, domestic sites often yield little in the way of house plans, often only hearths and pits are recovered. People were buried in individual graves, often coated with imported red ochre with varying quantities and types of grave goods. Long-distance trade items recovered from both cemetery and domestic sites are numerous, but also less so compared to the preceding period (Spence et al 1990: 136).

The Early Woodland Middlesex Complex indicates increasing influence from Adena and

Hopewell Complexes in the mid-west United States, what is now Ohio and Indiana. These include both finished artefacts and raw material that originate in this area. Burial mounds also appear on the Ontario landscape, and are also believed to be a result of influence or increasing contact from this region (Spence et al 1990: 138-42).

The Middle Woodland period in southern Ontario has revealed three separate complexes or cultures: the Couture in the southwest, the Saugeen in the northwestern portion of southwestern Ontario, and Point Peninsula in the central and eastern parts of southern Ontario. Owing to the still nomadic nature of these groups, 'borders' are not clearly defined, and within these groups there is still variability. There is also the possibility that there exist other complexes that owing to the lack of research that have so far been classified as belonging to Point Peninsula and Saugeen especially (Spence et al 1990: 143-8).

Common Middle Woodland artefacts include psuedo-scallop shell followed by dentate stamp decorated ceramics, and Vinette 2 ware. Other artefacts recovered from Middle Woodland sites include bone and antler harpoons, antler combs with incised decorations, antler hafted beaver incisors, bone fish hooks, and a wide variety of projectile point forms (Spence et al 1990: 158). The construction of burial mounds continued into the Middle Woodland period.

Settlement patterns indicate a gathering of family groups between the spring and autumn at or near river mouths to fish, then to harvest wild rice, hunt deer and gather nuts. In the winter, the groups would disperse and travel inland to each families' winter camping territory (Spence et al 1990: 164).

In northern Ontario, the Woodland period has been divided into 2 periods, known as Initial and Terminal Woodland. The Initial Woodland period coincides with the Middle Woodland of southern Ontario. Laurel Tradition artefacts define the Initial Woodland period in northern Ontario. Early and Late manifestations of this tradition have been identified, the early phase dating between 200 BC and 500 AD, and the late 500 to 1000 AD. The Laurel Tradition occupies nearly all of the northern parts of the province, save for the very far north, and as far south in Ontario as Lake Nipissing and the French River. The Laurel Tradition spans north and eastern Manitoba, and a small part of Saskatchewan in the west, and extends into northern Quebec to the east, and into northern Minnesota and Wisconsin. Initial Woodland sites are often located along river banks or on the shores of lakes.

Burial mounds were constructed in the Middle/Initial Woodland period throughout. The best known and most researched group is the Manitou Mounds near Rainy River. The mounds were constructed of relatively clean fill or sod over top of wooden cribbing or scaffold that contained the initial burials (Dawson 1981: 34, Wright 1986: 63-4). Remains of birch bark baskets have been recovered from the mound fill (Dawson 1981: 34, Wright 1986: 34). Subsequent burials, either primary inhumations or secondary burials, interred alone or in a mass burial have been recovered from the mound, and at its base (Wright 1986: 63). Some of the burials were coated with powdered red ochre, and grave goods included such items as lithic bifaces, ceramics, and exotic imports such as a monitor pipe, and an Ohio pipestone sucking tube (Dawson 1981:34, Wright 1986:64). Closer to the project area, a burial ground containing artefacts from the Meadowood Complex was excavated near Kilarney on the north shore of Lake Huron (ASI 1994: 8).

Laurel ceramics were produced from either a single lump of clay or by coil manufacture, grit tempered, a smoothed exterior, rims relatively straight with the lip either flattened or rounded (Wright 1967, Wilford Laboratory of Archaeology 2012). There are a variety of decorative techniques utilised on these vessels including a variety of incised, stamped, punctated, embossed, and cord-wrapped stick decorations (Wright 1967, Wilford Laboratory of Archaeology 2012).

Early in the Laurel sequence, projectile points continue to resemble the notched points of the Archaic period (Dawson 1981:3). These are later superceded by stemmed points (Dawson 1980: 55). Side scrapers dominate scraper types in the early phases, and end scrapers assume prominence in the later phases (Dawson 1980: 33). Other typical tools include stone biface blades, abraders, pottery decorating tools, and net sinkers, copper beads, awls, barbs, fragments, nuggets, pendants, projectile points, chisels, and bone awls, needles, knives which are usually manufactured from beaver incisors, pottery decorating tools, and beads (Wright 1967: 152, Dawson 1980:33, 1981: 34).

The Late Woodland period in southern Ontario saw the widespread adoption of agriculture and increasing sendentarisation. This period has numerous cultural and temporal subdivisions within it: commencing ca. AD 600 with the Princess Point complex, and culminating with the Huron, Neutral, Petun, Odawa and other groups encountered by explorers, missionaries and traders.

Settlement size increases in southern Ontario, especially in the later Late Woodland period, with people living in large palisaded villages in locations that may have been chosen with defence at least partly in mind. Ossuary burials become common, where the dead were communally interred in pits along with grave goods.

The Late (Terminal) Woodland in Northern Ontario is composed of numerous ceramic assemblages; Blackduck, Selkirtk Composite, and the Sandy Lake /Psinomani Complex. The last two assemblages are restricted to areas of northwestern Ontario, and unlikely to be recovered in the study region. Blackduck, out of all the northern Ontario Terminal Woodland groups is the most likely to be found in Muskoka.

Blackduck ceramics are globular, and are more rounded than the other Late Woodland ceramics from northern Ontario, with a more constricted neck, and often have out-flaring rims. They are produced by the paddle and anvil technique, and tempered with grit. Decoration is usually limited to the interior and exterior of the rim, and the exterior neck. Decorative techniques include cord-wrapped stick stamping, "comb" stamping, punctuations of various kinds, and vertical brushing on the exterior rim surface. Distinctive of early Blackduck vessels is bossed decoration, a motif that appeared late in the Laurel sequence (Wilford Laboratory of Archaeology 2010, Wright 1967). Pottery of typical Blackduck manufacture but with Laurel design motifs have been recovered, and these have been dated to very early in the sequence, as early as 700 AD (Dawson 1982:32).

Non-ceramic artefacts considered typical of the Blackduck people include: clay pipes, stone oval and lunate chipped knives; side scrapers; trapezoidal, oval, and thumbnail end scrapers; tubular-shaped drills; steatite pipes; bone awls and needles; unilaterally barbed harpoon; spatulas antler flakers; beaver incisor knives; bear canine ornaments; and native copper fishhooks, gorges, and beads (Gibbon & Anfinson 2008).

Woodland period archaeology in the surrounding regions indicates that rather than be viewed as being part of a large homogeneous "Northern Ontario", it would appear that the Late Woodland occupants of areas such as Muskoka, Haliburton, and Parry Sound Districts had a material culture more related to those from Southern Ontario. Pottery recovered from the Late Woodland Curtin Site (BfGp-2) in Haliburton could be classified as "Iroquoianesque", with more traits connecting it to the Iroquoian Benson Site in Victoria County. Similar pottery displaying both Algonkian and Iroquoian traits was also recovered in the District of Muskoka, near the eastern shore of Georgian Bay at the mouth of the Severn River (Elder 2016). Even further north, Huron-like pottery seems to replace local Blackduck ceramics in the Lake Abitibi region.

1.3.3 Post-Contact

Various families of the Mnjikaning First Nations from Rama on Lake Couchiching, such as the Bigwin family, the Yellowhead family, the Menominee family, as well as members of the Muskoka band, and a number of families from Lake Rosseau lived and exploited resources in northern Muskoka in the 19th Century. The area was used for farming, trapping, trading, and red ochre was gathered from Paint Lake. Guides from Mnjikaning were in great demand for 19th and early 20th Century Euro-Canadian hunters, trappers, and tourists in Muskoka, owing to their familiarity with the area.

The Bigwin Family as part of their traditional seasonal rounds had a summer settlement and farmland at what is now Dorset and Bigwin Island on Lake of Bays southeast of the project area. Bigwin Island was also the site of a burial ground (ASI 1994b: 3-8, Table 1). They also had a sugar bush located in what is now Ridout Township (ASI 1994b: 11). The Yellowhead family exploited an area from Lake of Bays to Lake Muskoka, and had a settlement at Bracebridge (ASI 1994b: 8). The M'ngikaning family had a settlement around Paint Lake to the south of Lake of Bays which was also a source of red ochre (ASI 1994b: Figure 7).

Lake Rosseau families considered Brunel Township an important fall and winter hunting ground with 2 to 3 families living there during those seasons. They also utilised the area north of Fairy and Peninsula Lakes to hunt beaver, however there were no permanent settlements, as these were located at Obagawanung / Port Carling (ASI 1994b: 3-8, 14 Table 1).

The Menominee family lived and exploited an area that was bordered on the east by Lake of Bays, Mary Lake on the west, and Lakes Vernon, Fairy and Peninsula on the north. Menominee had a farm on Menominee Lake to the southwest of Lake of Bays. There was also a small settlement on Menominee Point, on the southeast corner of Lake Vernon. The territory was abandoned by the early 1870's and the family joined the Muskoka Band on Parry Island (ASI 1994b: 3-7, Table 1, Figure 10).

The first “settler” around Huntsville is believed to be William Cann, of Orillia. He hunted and trapped every winter from 1860 until 1869. He constructed a log cabin on the banks of the Vernon River. Upon survey of Chaffey Township, Cann had land on both sides of the River and constructed the area’s first hotel. Financial difficulties caused him to sell his hotel to Thomas Birtch, and all the land he had acquired in the township. His holdings on the east side of the River were sold to Captain George Hunt for $50.00 in 1869. While Cann was the first settler, and the first business owner in town, and loaned the Municipal Council $300.00 interest free until the first taxes came in, it is George Hunt that the town of Huntsville is named after (Rice 1964:6-7).

Hunt pushed for the extension of both roads and rail to Chaffey Township, and was responsible for the laying out of the town’s main street. Hunt was the Superintendent of Construction for the Colonization Road through the area. The town of Huntsville began to grow mostly on the western lands formerly owned by Cann, not on the land to the east belonging to Hunt, as he banned the sale of liquor on the lots he was offering for sale. Hunt was responsible for the construction of the first church in the town in 1872, built on land he donated, and the first school, and attracting a doctor to the new town as well (Rice 1964: 8-9).

While northern Muskoka was opened for settlement in 1869, and the Muskoka Colonization Road had reached Huntsville in 1870, large-scale growth did not occur until the arrival of the railroad in the late 1880's. The early roads were often impassable, and between 1873 and 1876, the Brunel locks were constructed to facilitate travel to the northern Muskoka Lakes, and by the next year, navigation was possible from Port Sydney to the west end of Lake Vernon. Other improvements were made to the transportation system in northern Muskoka, such as a canal to Peninsula Lake in 1888, and the Portage Railway, built between 1903 and 1904 which replaced stage coach service to Lake of Bays from Peninsula Lake near Huntsville (ASI 1994a: 96-105).

With the opening of land and water access to northern Muskoka, numerous saw mills were shortly in operation in the area. The arrival of the railway in 1886, caused an increase in size and scale of the lumber industry in the region. By 1900, however, timber stocks had been depleted, and the industry switched to hardwood processing, as well as hemlock harvesting for tanneries in Bracebridge, but even these could not prevent a steep decline, and most mills had closed by the beginning of World War I (ASI 1994a: 91-6).

Muskoka has been known for its holiday resorts, and cottage life almost from the beginning of Euro-Canadian settlement. The first resorts in Muskoka opened in the 1870's, focussing on Lakes Muskoka, Rosseau, and St. Joseph, and accessed via railway or steamship. Lack of access to northern Muskoka meant that the first resorts did not begin operation until nearly twenty years after, with the arrival of the railway. Deerhurst Resort on Lake of Bays, constructed in 1896 was the first large resort in northern Muskoka. While few new resorts were opened after World War I in southern Muskoka, a number of resorts on some smaller lakes north of Huntsville were built, focussed not on railways but rather on automobiles being used to access the resort properties (ASI 1994a: 107-8).

While early descriptions of the land available for settlement presented the conditions for farming in glowing terms, many early settlers abandoned their agricultural pursuits first for jobs in the lumber industry, then for employment in the growing tourist trade.

1.3.4 Study Area Specific History

The Bala area was first explored in 1829 by Alexander Shirreff. Two years later he wrote a report about his expedition, in which he mentions a 16 to 20 foot high falls at the outlet of Muskoka Lake. In 1853 J.W. Bridgland surveyed the area and reported that the region was destitute of everything to make settlement desirable (ASI 2008: 11).

The baseline survey of Medora Township was completed in 1865 by surveyor S. James. The interior lots were laid out by Thomas Bryne four years later in 1869. It was also in 1869 that Medora Township received its name. It is believed to be named after Calcina Medora Buell, daughter of Norton Buell of Brockville and wife of Toronto lawyer Alexander Cameron. She was also the niece of Stephen Richards, the Commissioner of Crown Lands from 1867 to 1871. In the early 1870s Medora and Humphrey Township were joined for administrative purposes, and had a combined population of 582 inhabitants living in 120 dwellings, with two under construction (ASI 2008: 12).

The first settler to Bala was Thomas Burgess, who arrived in 1868. He had travelled by boat from Belle Ewart to Washago and then by stage coach or foot to Gravenhearst. He then took a boat to the Bala area and stopped at an abandoned lumber camp. He obtained a Crown Land Grant for 1000 acres (404.686 hectares) and settled on the land between what is now known as Bala By and Lake Muskoka (MHBC 2014: 9). He constructed a sawmill at the rapids on the Musquash River, also known as the Mill Stream. The settlement at Bala was first known as Musquosh Falls and then Muskoka. The post office opened in 1870, with Thomas Burgess acting as postmaster. He held that post until 1900 when he retired. In 1871 it was renamed Bala, after Bala Lake in Wales (ASI 2008: 16). In Welsh, the word Bala means 'the place of the river out flowing to a lake' (MHBC 2014:9). The first plan of subdivision for Bala was surveyed for Burgess in 1890 with the community developing around Lot 15, Concession A. In 1914 Bala was incorporated as a town with Dr. A.M. Burgess, son of Thomas Burgess, acting as the first mayor (ASI 2008: 16). In 1873 Bala contained 30 inhabitants, with a school, hotel, post office, general store, blacksmith shop, mill and three churches.

In 1902 Thomas Burgess died and the sawmill was taken over by his son, Thomas Burgess Junior. The sawmill closed in 1910 (Historica Research Limited 2009: 22). In 1916 Thomas Burgess' other son, Dr. Alexander Burgess, formed the Bala Electric Light and Power Company. The company purchased the mill stream and mill site and built the Burgess Dam in 1917 (ASI 2008: 17). When it was constructed the structure operated a small, 245 kilowatt generating station. The two turbines were horizontal shaft, Francis-type turbines built by William Hamilton and each rated as 160 horsepower (Historica Research Limited 2009: 23). In 1929 the generating station was acquired by Ontario Hydro at which time it served 99 customers. The station was retired in 1957 due to the high operating costs and repair needs. The building and dam were transferred to the Town of Bala in 1962 (ASI 2008: 18). In 1989 the generating station was purchased and restored by a corporation which sells its power back to Ontario Hydro.

1.3.4.1 Maps

Early Maps do not depict Muskoka or the project area in any great detail. Alexander Sherrif's map of 1831 shows Lake Muskoka with the notation "Good Land" neat to the project area. The 1869 Crown Land Map of Medora Township does not show any settlement in the area which would become Bala. The Muskoka Atlas Map of 1879 shows Bala Post Office on the map, but no details of the village (**Figures 1-3**).

1.3.5 Summary of Historical Context

Northern Muskoka was surveyed and opened for settlement in 1869. The first settler to Bala was Thomas Burgess who arrived in the area in 1868. He built a saw mill on the Musquosh River, now known at the Mill Stream. This saw mill was located where the present Burgess Dam stands today. Thomas Burgess died in 1902 and his mill remained in operation until 1910. In 1916 his son established the Bala Electric Light and Power Company and in 1917 he constructed the hydro-electric generating station where the mill used to be.

1.4 Archaeological Context

1.4.1 Current Conditions

The project area is located on Part Lot 14, Concession A, Township of Medora, now part of the Township of Muskoka Lakes, District of Muskoka (**Map 1 and 2**). It is bounded to the west by a private residence and the Moon River, to the north by River Road, to the east by Highway 169 and a private business, and to the south by Portage Road, and several private homes which front on to Portage Road. The project area is approximately 100m north-south at its longest and 55m east-west at its widest. Approximately 70% of the project area consists of the hydro dam, which is filled with water (**Map 3**). The remaining 30% of the project area consists of 15% disturbed and 15% steeply sloped.

This hydro dam, known as the Burgess Dam, was once part of the Musquosh River, which became known as the Mill Stream when Thomas Burgess built his sawmill in the later 19th Century (ASI 2008: 16). The pond flows into the Burgess Dam and down into the Moon River. The remaining section consists of the Burgess Dam, a driveway with two small broken up lawn areas to the driveway's east and west as well as steeply sloped triangular lawn area on the east side of the river (**Figures 4-9**). The broken up lawn area is approximately 10m by 5m on the east side of the driveway and approximately 5m by 5m on the west side of the driveway. The driveway is approximately 41m long and 6m wide. The steeply sloped triangular lawn area is approximately 20m at it's widest and longest.

1.4.2 Physiography

The project area is part of the Georgian Bay Fringe Physiographic Region (Putnam and Chapman 1984: 214). This region extends along the east shore of Georgian Bay and is characterized by shallow soil with rock knob outcroppings and ridges. The thin till cover was removed from the rock outcrops by wave action associated with glacial Lake Algonquin. The vegetation found in the area is a mix of red oak, maple, birch, ash, white pine, red pine, hemlock and other conifers. Soils are a Montaggle sandy loam (Hoffman et al 1964).

1.4.3 Previous Archaeological Assessments

Archaeological Services Incorporated developed an archaeological master plan in 1994 for the District Municipality of Muskoka and the Wahta Mohawks (1994a, b, & c). The master plan was a three volume work, the first dealing with background research, the second involved First Nations' traditional land use and discussions of the archaeological survey that tested the hypotheses formed in the first volume. The third volume was a conservation management guide that will not be dealt with in this report.

Apart from archaeological data the first volume also gives an accounting of the geology, physiography, flora, and fauna of Muskoka, which are invaluable when attempting to discern the probability of archaeological sites being present in any particular local. Archaeological sites known up to the time of writing are also discussed. Built and "Intangible" heritage is also discussed in the first volume. No potential mapping was provided for the project area.

The second volume contains information on historical Ojibway and Mohawk land-use in the district. Of particular interest in the discussion about the Muskoka and Rama bands and their exploitation of their lands in around the project area,. The two groups discussed in the master plan initially lived around Matchedash, but split after the abandonment of their settlement at Coldwater. The two groups would use the Severn and Muskoka Rivers for travel into the interior to sites on Lake Muskoka, Lake Rosseau, Lake St. Joseph, Lake of Bays etc.

The archaeological survey conducted to test hypothesises generated in the first volume visually inspected the area around Huntsville, Fairy and Peninsula Lakes from the water but did not conduct any test-pitting or surface survey to recover any artefacts. Figure 28 of the master plan shows the route taken for the visual inspection.

The lakes were described as being surrounded by "high, wooded, bedrock hills, the exceptions being the north shore of Fairy Lake and the Canal. Fairy and Peninsula Lakes were classified as possessing moderate to high potential: "in addition to serving as major transportation corridors, the major lake chains would have provided all of the resources necessary to sustain year-round occupation." The visual inspection caused them to conclude "not surprisingly, the highest archaeological potential exists in those areas where land development is heaviest, since these have been the prime settlement locations for millennia. (ASI 1994b: 65)."

No archaeological assessments have taken place within 50m of the project area.

1.4.4 Registered Archaeological Sites

A request of the MHSTCI data base showed that there were two archaeological sites with 2km of the project area. The first site is the Whitehead Site (BgGv-1) which is a pre-contact site found in 1975 by L. Jackson. The site consisted of a lithic scatter, which included one white quartz uniface blade, one scraper, and one white quartz flake.

The second site is the Jewitt Site (BgGv-5) which is a Middle Archaic site found by R. Williamson in 1993. The site consisted of a single Brewton Side Notched projectile point.

2.0 Field Methods

Stage 1 assessment included a site inspection, with no ground being disturbed, nor collection of archaeological resources if any were encountered. Aside from the review of the available literature to discern archaeological potential and previous historic land use, the assessment hoped to determine the areas which may have been too badly disturbed to still potential contain cultural values. This information was used to determine what survey strategies would be appropriate for a Stage 2 assessment, should it be required.

An optional property inspection took place on May 8, 2020. In keeping with Section 1.2.2 of the Standards and Guidelines for Consultant Archaeologists (MHSTCI 2011) the property inspection was completed when weather conditions permitted good visibility of land features. Inspection did not take place when weather conditions could reduce the chances of observing features of archaeological potential. The high for May 8 was 15 degrees Celsius and the sky was sunny with cloudy periods.

In keeping with Section 1.2 *Property Inspection* of the Standards and Guidelines for Consultant Archaeologists (MHSTCI 2011) the entire property was systematic inspected, due to the small size of the project area. The site consists of a pond, a relic Mill Pond, which belonged to the first Thomas Burgess and was reused by his son in 1917 when the Burgess Dam was first built (**Figure 4**). There is a thin amount of property around the pond, less than 5m wide. The eastern part of the project area consists of a small open space, approximately 15m by 20m with the 1917 hydro electric generating station located on the northeast corner. This 15m by 20m area is undulating, and has been broken up, presumably by work being done in and around the Burgess Dam and the driveway being installed (**Figures 5-7**). There is a small triangular section of project area is located to the north of the 1917 Burgess Dam, and is steeply sloped (**Figure 8**).

Although located on the Mill Stream the project area does not contain any archaeological potential. The Burgess Dam (**Figure 9**) has been updated by its present owner, and River Road to the east of the project area has been built up against the structure. Historic research shows that the pond which feeds the hydro station was built by Thomas Burgess and reused for the hydro station by his sons in 1917. As such the property around the pond, which is less than 5m in width, has been disturbed by the construction of the pond. Additionally, the open area to the south of the Burgess Dam building, which is approximately 15m by 15m is undulating and show evidence of being disturbed by recent human activity. In keeping with Section 1.2.3 *Features indicating that archaeological potential has been removed* in the Standards and Guidelines for Consultant Archaeologists (MHSTCI 2011), archaeological potential has been removed due to building footprints and sewage and infrastructure development

3.0 Analysis and Recommendations

3.1 Features Indicating Archaeological Potential

A number of factors are employed in determining archaeological potential. Criteria for pre-contact archaeological potential is focussed on physiographic variables that include distance from the nearest source of water; the nature of that source; distinguishing features in the landscape (e.g., ridges, knolls, eskers, wetlands); the types of soils found within the area of the assessment and resource availability. Also considered are known archaeological sites within or the vicinity of the study area.

Land registry records , assessment rolls, census, historic maps and aerial photographs as well as a property inspection all assist in determining historical archaeological potential. Additionally, the proximity of historic transportation corridors such as roads, rail and water courses also affect the historic archaeological potential.

3.2 Conclusions

The Stage 1 assessment of the Burgess Dam found that there are no areas of archaeological potential. The majority of the project area is taken up with the hydro electric dam pond, approximately 85%. The remaining parts include a driveway with two sections of lawn on either side of it. The driveway is gravel, and is disturbed. The areas to the north and south of the driveway are broken up, with pipes running under them. They show sings of disturbance. The final piece of lawn is to the east of the river, and north of the hydro dam. This is a triangular lawn, and is steeply sloped, and does not require further archaeological assessment. The conclusion that the study area does not require further assessment is based on *Section 1.3.2 Features Indicating that archaeological potential has been removed ('disturbed')* in the Standards and Guidelines for Consultant Archaeologists (MHSTCI 2011)

4.0 Recommendations

Based upon the background research and the results of the property inspection, it is recommended that the Burgess Dam project area be cleared of further archaeological concerns.

5.0 Advice on Compliance with Legislation

This report is filed with the Ministry of Tourism, Culture, and Sport as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c. 0.18. The report is reviewed to ensure that is complies with the standards and guidelines that are issued by the Ministry, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matter relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism and Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Section 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such a time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.

Should previously unknown or deeply buried archaeological resources by uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The Proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologists to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act.

The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

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7.0 Images

Figure 1: Segment of 1831 Map by Alexander Shirreff

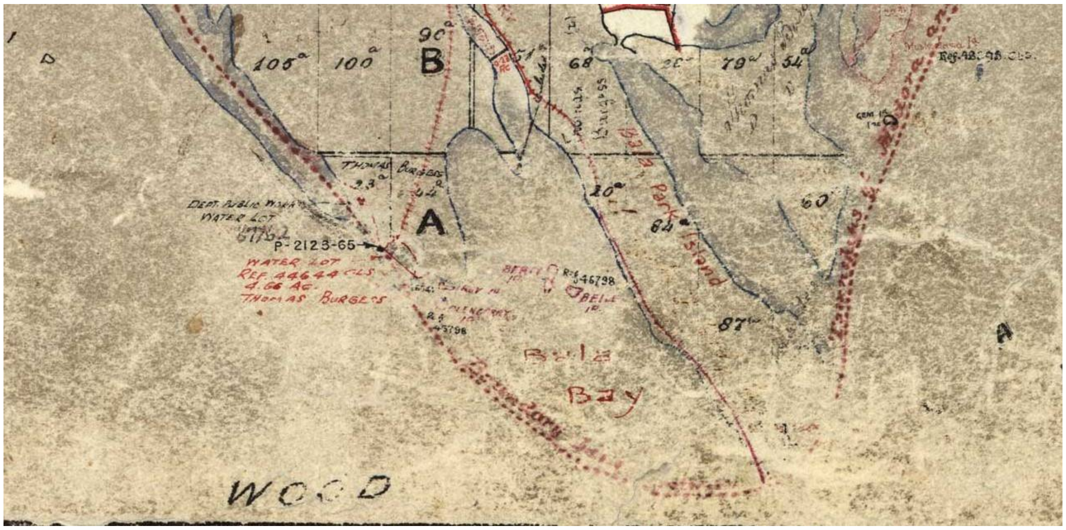


Figure 2: Segment of 1869 Crown Lands Map

Figure 3: Segment of Map from the 1879 Historic Atlas of Muskoka

Figure 4: View of hydro dam pond from River Road, facing south.

Figure 5: Driveway of Burgess Dam, facing north.

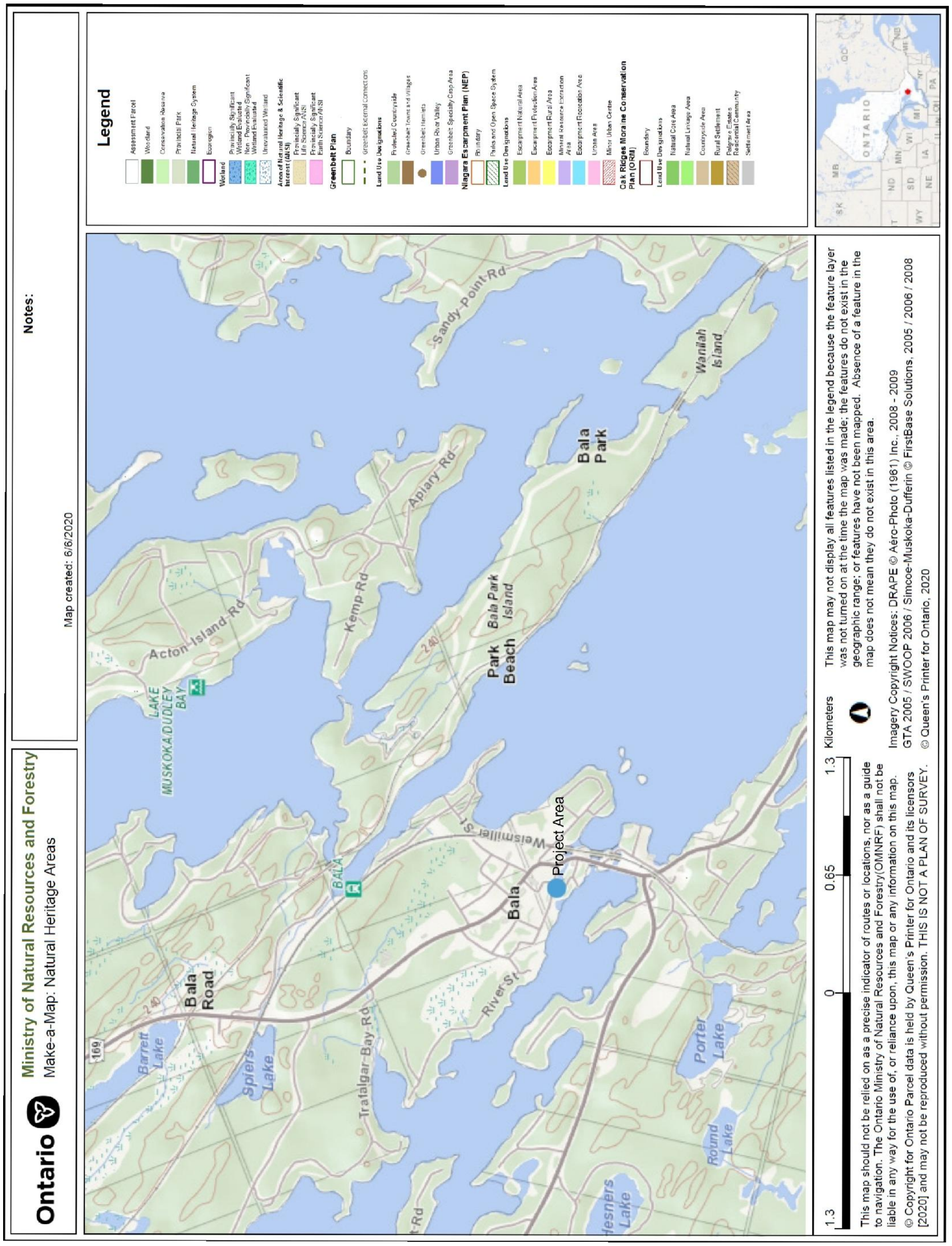
Figure 6: Disturbed lawn area east of the driveway, facing south.

Figure 7: Small disturbed area to the west of the driveway, facing west.

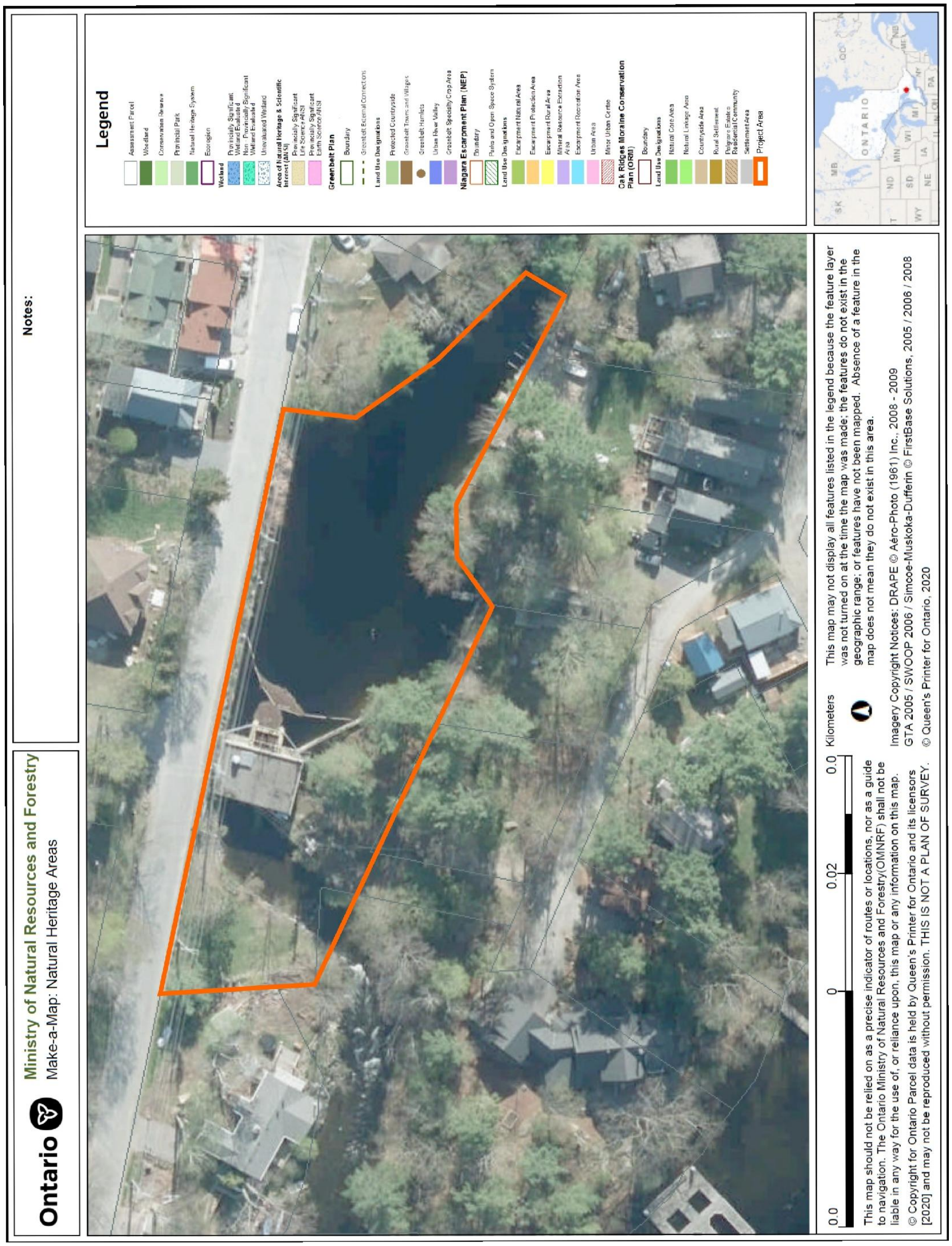
Figure 8: Sloped triangular area west of the Burgess Dam, facing southwest

Figure 9: Burgess Dam, built in 1917, facing southeast.

8.0 Maps



Map 1: Project Location Map



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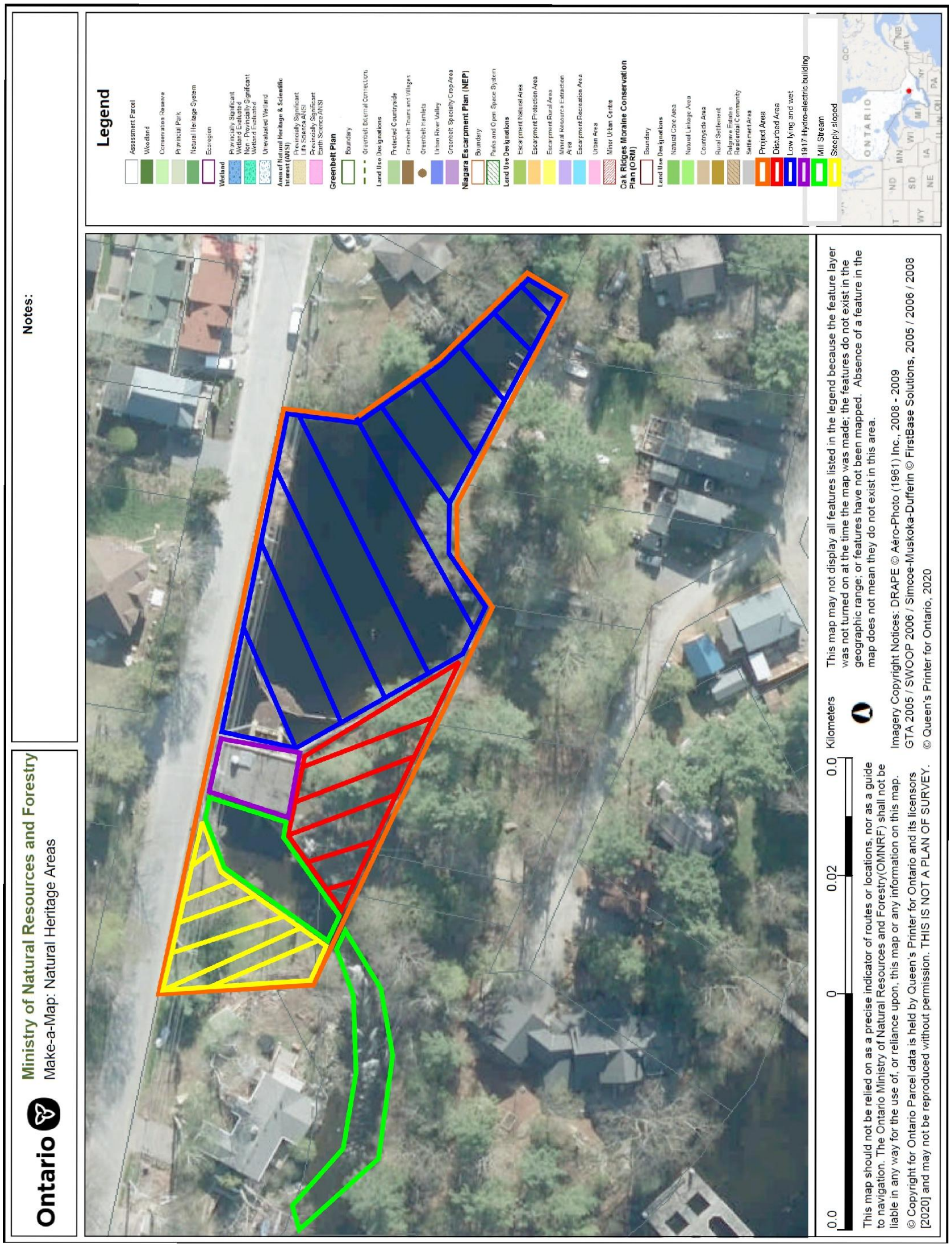
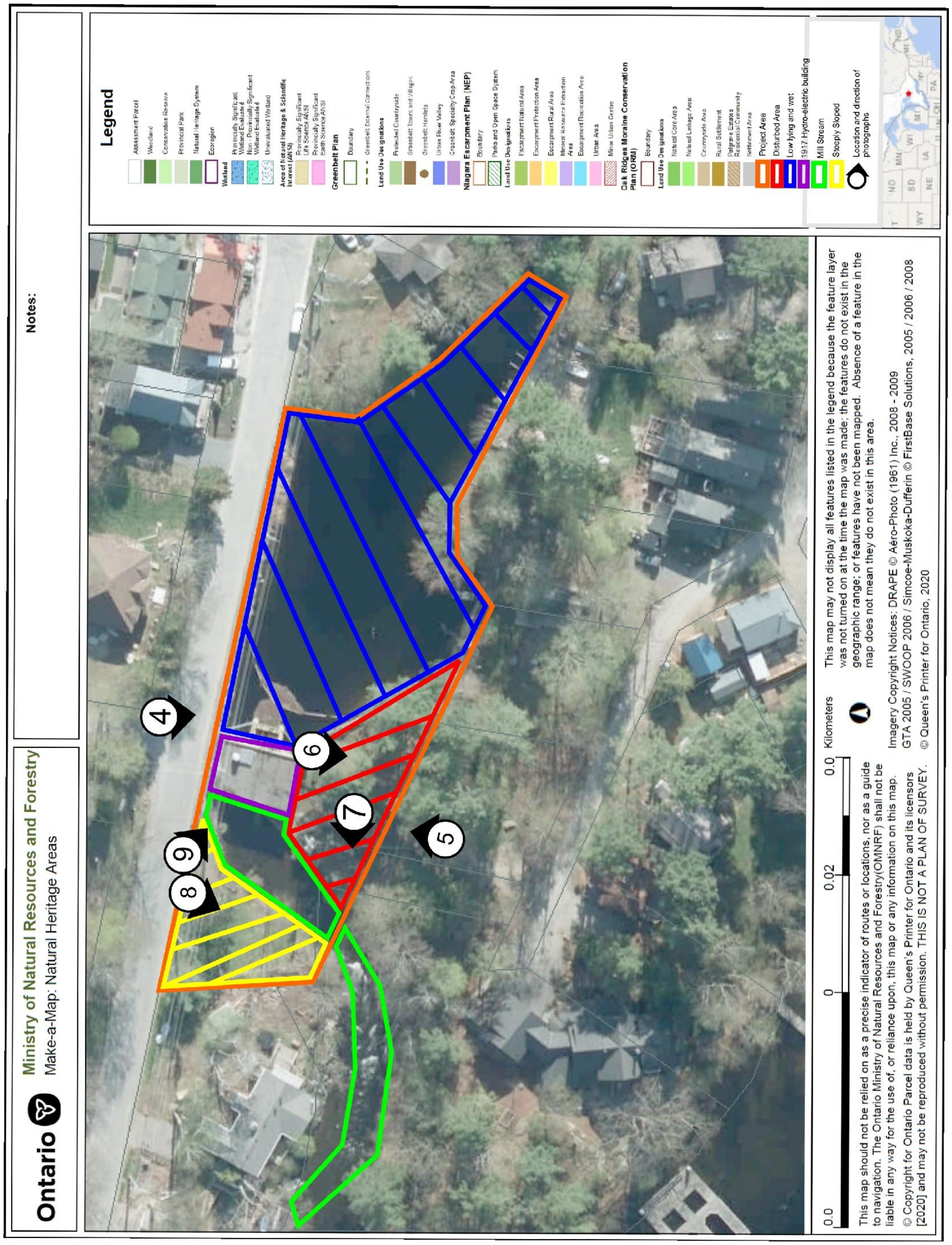
Map 2: Map of Project Area



Map 3: Results of the Stage 1 Site Inspection



Map 4: Map showing the direction and location of photographs

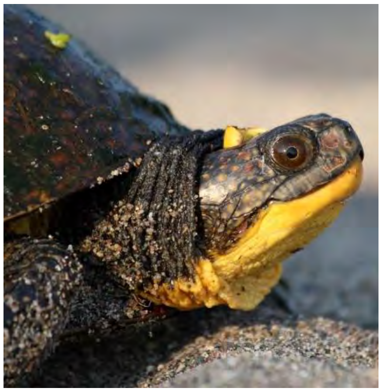
APPENDIX D

Environmental Impact Assessment

Burgess Dam Safety Assessment Existing Conditions and Impact Assessment

Township of Muskoka Lakes, Bala, ON.
Project # 201051

29 July 2020 Version 1.0



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APPENDICES

29 July 2020

The Township of Muskoka Lakes
1 Bailey Street
P.O. Box 129
Port Carling, ON
P0B 1J0

Re: Existing Conditions and Impact Assessment (EC/EIA) for the Burgess Dam Rehabilitation / Replacement EA, Township of Muskoka Lakes, Ontario; Tulloch Project # 191493

1. BACKGROUND

1.1 General

Tulloch Environmental, a division of Tulloch Engineering Inc. (Tulloch), was retained by the Township of Muskoka Lakes to complete an Existing Conditions and Environmental Impact Assessment (EC/EIA) in support of the Municipal Class EA for the Burgess Dam and Generating Station rehabilitation / replacement in Bala, ON (henceforth the Site). This report outlines the results of a Natural Heritage Desktop Review and field studies performed at the Site. It also provides assessment of impacts anticipated by the alternative solutions outlined in the Municipal Class EA. Avoidance and mitigations strategies to alleviate the anticipated impacts for each solution are provided.

1.2 Study Area and Project Description

The existing structure (henceforth referred to as Burgess Dam) is an approximately 59 m long and 3 m high concrete dam (Figure 1). The powerhouse is approximately 9m x 14m including the turbine, generator and associated equipment. A retaining wall 16m in length connects the north wall of the powerhouse and supports River St. immediately North of the powerhouse. The Burgess Dam runs across the north channel of the outlet from Lake Muskoka to the Moon River in Bala, Ontario; UTM (NAD83) 17T 609163 4985226.

1.3 Scope

The Township has identified a need to complete an Environmental Impact Assessment to determine the best option for the Burgess Dam repair and or/ replacement. To assess the existing conditions and potential impacts of the proposed alternative solutions (Appendix A), Tulloch has performed a Natural Heritage Desktop Review of the site and surrounding area as well as an on-site field assessment. The Natural Heritage Desktop Review included areas within 1000 m of the proposed solution footprint. The Study Area for on-site assessments was defined as areas within 120 m of the proposed solution footprints. The information collected was used to identify impacts and appropriate mitigation measures for the proposed design alternatives.

Burgess Dam Rehabilitation/Replacement Environmental Impact Assessment

Site Investigations

Legend

🟥 Site (Approx.)

⬚ Study Area (120m)

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 100 200 Meters

Coordinate System: NAD 1983 UTM Zone 17N

Figure 1

PROJECT: 191493

DATE: 23/06/2020

SCALE: 1:1,500

TULLOCH ENVIRONMENTAL

Document Path: J:\2020 Projects\Environmental\191493 Burgess Dam Safety Assessment\5_Maps\Figure 1 - 191493 - Burgess Dam Rehab - 23June2020.mxd

User Name: Kelly.Major

2. NATURAL HERITAGE DESKTOP REVIEW

2.1 Sources Reviewed

The Natural Heritage Desktop Review was conducted to determine which natural heritage features exist, or have the potential to exist, within 1000 m of the Site. Records and resources searched as part of the background review are listed in Table 1. Communications with regulatory authorities are provided in Appendix B.

2.2 Land Use

The existing structure is currently located on private land and is surrounded by privately owned land.

2.3 Ecodistrict and Ecoregion

This Site is located in Ecodistrict 5E-7 of Ecoregion 5E (the Georgian Bay Ecoregion). The Georgian Bay Ecoregion is characterized by a cool-temperate and humid climate with a mean annual temperature range of 2.8 to 6.2ºC (MNR 2009). This Ecoregion is situated on the southern edge of the Precambrian shield. It is typically underlain with gneissic bedrock as well as deposits of ground moraine till and glaciofluvial materials. This Ecoregion is part of the Great Lakes Watershed. Land cover is predominantly mixed forest, deciduous forest, and coniferous forest of the Great Lakes – St. Lawrence Forest Region (MNR 2009).

2.4 Protected Areas

Protected areas included federal, provincial, and municipal parks as well as Conservation Reserves, Enhanced Management Areas (EMAs), Provincially Significant Wetlands (PSWs) and Areas of Natural and Scientific Interest (ANSI). A review of data provided by Land Information Ontario (LIO) in conjunction with communications with the Ministry of Natural Resources and Forestry (MNRF) have identified no protected areas within 1000 m of the project site.

Table 1 - Records and resources searched during the Natural Heritage Desktop Review.

Record Source		Records Requested and/or Reviewed
Ministry of Natural Resources and Forestry (MNRF) Parry Sound District	**Date of Request:** 03 February 2020 **Date of Data Receipt:** 12 February 2020	**Jeremy Rouse** Management Biologist Existing environmental values information, including any sensitivities and environmental constraints.
Natural Heritage Information Centre (NHIC)	**Accessed:** 28 January 2020	Natural Heritage Mapping Tool queried for records of provincially tracked species (e.g. SAR and rare species), ANSI and other protected areas in vicinity to the Site.
MNRF Species at Risk in Ontario (SARO) List	**Accessed:** 28 January 2020	Determine SAR within range and their status.
MNRF Fish ON-line	**Accessed:** 28 January 2020	Reviewed known fish species present in Lake Muskoka and Moon River.
DFO Species at Risk Mapping Tool	**Accessed:** 28 January 2020	Query for records of SAR fish or critical habitat in vicinity to the Site.
Atlas of the Breeding Birds of Ontario (Ontario Nature; ABBO)	**Accessed:** 28 January 2020	Determine migratory birds, including SAR within block #s: **17PK08**
Bat Conservation International	**Accessed:** 28 January 2020	Reviewed SAR bat ranges associate with the Site and surrounding area.
eBird.org Cornell Lab of Ornithology	**Accessed:** 28 January 2020	Query for records of selected SAR bird species in vicinity to the Site.
iNaturalist – Herps of Ontario Project	**Accessed:** 28 January 2020	Reviewed recorded reptile and amphibian sightings in the area.
Ontario Butterfly Atlas Online (Toronto Entomologists' Association; OBAO)	**Accessed:** 28 January 2020	Query for records of SAR butterflies in vicinity to the Site.
Land Information Ontario (LIO)	**Accessed:** 30 January 2020	Accessed GIS spatial data regarding known significant habitats including: • Significant Wildlife Habitats • Wildlife Nesting Areas • Provincially Significant Wetlands • Areas protected federally, provincially or municipally.

2.5 Species at Risk

Species at Risk (SAR) include species identified federally under the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) and provincially under the *Committee on the Status of Species at Risk in Ontario* (COSSARO). Species and their habitat listed as Endangered or Threatened are regulated federally under the *Canadian Species at Risk Act* (SARA S.C. 2002 c.29) and provincially under the *Ontario Endangered Species Act* (ESA S.O. 2007 c.6). In some instances, species listed as Special Concern may also receive habitat protection under the *2014 Provincial Policy Statement* (PPS; MMAH 2014); see Section *2.6 Significant Wildlife Habitat*.

The NHIC identified records of Massasauga Rattlesnake (*Sistrurus catenatus*; Threatened), the Rusty-Patched Bumblebee (*Bombus affinis*; Endangered), Blanding's Turtle (*Emydoidea blandingii;* Threatened) and Eastern Wood-pewee (*Contopus virens;* Special Concern) within 1000m of the Site. A restricted species was also identified. The MNRF has requested that the name of this species is not released, however, the impact assessment and respective mitigations have accounted for the possible presence of this species on the Site.

ABBO Records indicated that ten (10) species have been observed within the 10 x 10km atlas block associated with the site:

- Barn Swallow (*Hirundo rustica*;Threatened)
- Bobolink (*Dolichonyx oryzivorus*; Threatened)
- Canada Warbler (*Cardellina Canadensis*; Special Concern)
- Chimney Swift (*Chaetura pelagica*; Threatened)
- Common Nighthawk (*Chordeiles minor*; Special Concern)
- Eastern Meadowlark (*Sturnella magna*; Threatened)
- Eastern Wood-pewee (Special Concern)
- Golden-winged Warbler (*Vermivora chrysoptera*; Special Concern)
- Olive-sided Flycatcher (*Contopus cooperi*; Special Concern)
- Wood Thrush (*Hylocichla mustelina*; Special Concern).

Queries of Cornell Lab's eBird atlas identified records of the following 13 SAR birds:

- Bald Eagle (*Haliaeetus leucocephalus*; Special Concern; records within 7km)
- Bank Swallow (*Ripari riparia*; Threatened; records within 4km)
- Barn Swallow (records at the Site)
- Canada Warbler (records within 1km)
- Chimney Swift (records at the Site)
- Eastern Whip-poor-will (*Antrostomus vociferous*; Threatened; records within 1km)
- Eastern Wood-pewee (records within 1km)
- Evening Grosbeak (*Coccothraustes vespertinus*; Special Concern; records within 1km)
- Golden-winged Warbler (records within 100m)
- Olive-sided Flycatcher (records within 8km)
- Red-headed Woodpecker (*Melanerpes erythrocephalus;* Special Concern; records within 11km)
- Rusty Blackbird (*Euphagus carolinus*; Special Concern; records within 5km)
- Wood Thrush (records within 4.5km)

The ORAA indicated that Blanding's Turtle, Massasauga Rattlesnake, Snapping Turtle (*Chelydra serpentine;* Special Concern), Five-lined Skink (*Plestiodon fasciatus*; Endangered) and the restricted species identified in the NHIC records is associated with the Site (Block 17PK08).

BCI indicated that three (3) Endangered bat species have ranges which include the Site:

- Little Brown Bat (*Myotis lucifugus*)
- Northern Long-eared Bat (*Myotis septentrionalis*)
- Eastern Small-footed Bat (*Myotis leibii*)

The Butterfly Atlas of Ontario identified that Monarch Butterfly (*Danaus plexippus*; Special Concern) is associated with the Site.

A review of iNaturalist for citizen science records, the Royal Ontario Museum Collections, the Canadian National Collection of Insects, Arachnids and Nematodes and University Collections from McMaster University returned no records of SAR species at the Site, or in areas within 1000m of the Site

Table 2 – Species at Risk with Potential to Occur in the Study Area.

Source	Species	Scientific Name	SARA	ESA
eBird.org	Bald Eagle	*Haliaeetus leucocephalus*	-	SPC
eBird.org	Bank Swallow	*Ripari riparia*	THR	THR
ABBO (Record) / eBird.org	Barn Swallow	*Hirundo rustica*	-	THR
MNRF / ORAA	Blanding's Turtle	*Emydoidea blandingii*	THR	THR
ABBO (Record)	Bobolink	*Dolichonyx oryzivorus*	-	THR
ABBO (Record) / eBird.org	Canada Warbler	*Cardellina canadensis*	THR	SPC
ABBO (Range) / eBird.org	Chimney Swift	*Chaetura pelagica*	THR	THR
ABBO (Record)	Common Nighthawk	*Chordeiles minor*	THR	SPC
ABBO (Record)	Eastern Meadowlark	*Sturnella magna*	-	THR
BCI (Range)	Eastern Small-footed Bat	*Myotis leibii*	END	END
eBird.org	Eastern Whip-poor-will	*Antrostomus vociferous*	THR	THR
ABBO (Record) / MNRF / eBird.org	Eastern Wood-pewee	*Contopus virens*	SPC	SPC
eBird.org	Evening Grosbeak	*Coccothraustes vespertinus*	SPC	SPC
ORAA	Five-lined Skink	*Plestiodon fasciatus*	END	END
ABBO (Range) / eBirg.org	Golden-winged Warbler	*Vermivora chrysoptera*	THR	SPC
BCI (Range)	Little Brown Bat	*Myotis lucifugus*	END	END
MNRF / ORAA	Massasauga Rattlesnake	*Sistrurus catenatus*	THR	THR

Source	Species	Scientific Name	SARA	ESA
OBAO	Monarch Butterfly	*Danaus plexippus*	SPC	SPC
BCI (Range)	Northern Long-eared Bat	*Myotis septentrionalis*	END	END
ABBO (Record) / eBird.org	Olive-sided Flycatcher	*Contopus cooperi*	THR	SPC
eBirg.org	Red-headed Woodpecker	*Melanerpes erythrocephalus*	THR	SPC
eBird.org	Rusty Blackbird	*Euphagus carolinus*	SPC	SPC
MNRF	Rusty-patched Bumblebee	*Bombus affinis*	END	END
ORAA (Record)	Snapping Turtle	*Chelydra serpentine*	SPC	SPC
ABBO (Record) / ebird.org	Wood Thrush	*Hylocichla mustelina*	-	SPC

*ABBO = Atlas of the Breeding Bird of Ontario; BCI = Bat Conservation International; MNRF = MNRF Species at Risk by Area Web Application; OBAO = Ontario Butterfly Atlas Online; ORAA = Ontario Reptile and Amphibian Atlas.

**END = Endangered; THR = Threatened; SC = Special Concern

***SARA = Species at Risk Act (Federal); ESA = Endangered Species Act (Provincial)

2.6 Significant Wildlife Habitat (SWH)

Significant Wildlife Habitat (SWH) is defined in the *Significant Wildlife Habitat Technical Guide* (OMNR 2000) as natural heritage areas that are "*ecologically important in terms of features, functions, representation and amount and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System*". Development within and adjacent SHW is only permissible provided no negative impacts to the feature or its ecological functions. Habitat may be considered SWH according to four broad categories:

- Seasonal concentration areas (i.e., winter deer yards, colonial bird nesting sites, reptile hibernacula);
- Rare vegetation communities or specialized habitat for wildlife (i.e., alvars, rare forest types, moose aquatic feeding areas, amphibian woodland breeding ponds, turtle nesting habitat);
- Habitat of species of conservation concern (i.e., species identified as special concern federally or provincially, and species listed as rare or historical in Ontario based on records kept by the NHIC (i.e. S1- Critically Imperiled, S2- Imperiled, S3- Vulnerable and SH - Historic ranks); These ranks are not legal designations but are assigned in a manner to set protection priorities); and,
- Animal movement corridors (i.e., naturally vegetated corridors or man-made features such as power transmission and pipeline corridors that provide animal movement from one habitat to another).

No records of SWH or candidate SWH were found within 1000 m of the existing structure. Records of five locally rare species were identified by the NHIC:

- Redtop Panicgrass (*Panicum rigidulum*)
- Cyrano Darner (*Nasiaeschna pentacantha*)
- Giant Lacewing (*Polystoechotes punctatus*)
- Ridged Yellow Flax (*Linum striatum*)
- Sand Panicgrass (*Dichanthelium spretum*)

2.7 Migratory Birds

The *Migratory Birds Convention Act* (MBCA S.C. 1994, C.22) and the Ontario Fish and Wildlife Conservation Act (FWCA S.O. 1997, C.41) prohibits the disturbance and destruction of most birds, their nests and eggs. Environment and Climate Change Canada has developed a number of tools, including the general nesting calendars (http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1) and avoidance guidelines (http://ec.gc.ca/paom-itmb/default.asp?lang=En&n=AB36A082-1) to support compliance with the Act.

The General Nesting Period for this site (Nesting Zone C3) is considered by Environment Canada to be from 08 April to 28 August in forested habitats, 12 April to 28 August in open areas, and 08 April to 16 August in wetlands.

2.8 Fisheries and Fish Management Objectives

The Burgess Dam runs across the north channel of the outlet from Lake Muskoka to the Moon River. Lake Muskoka has a surface area of 12,040 ha, and a maximum depth of 73 m. There is intense urban shoreline development with residential and commercial properties. The water level in Lake Muskoka is controlled by MNRF-owned and operated dams in Bala. The flows and levels are governed by the Muskoka River Water Management Plan. The lake supports a large diversity of sport fish including Brook Trout (*Salvelinus fontinalis*), Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeaformis*), Cisco (*Coregonus artedi*), Northern Pike (*Esox lucius*), Burbot (*Lota lota*), Smallmouth Bass (*Micropterus dolomieu*), Largemouth Bass (*Micropterus salmoides*), Walleye (*Sander vitreus*), Pumpkinseed (*Lepomis gibbosus*), Black Crappie (*Pomoxis nigromaculatus*) and Yellow Perch (*Perca flavescens*). Current stocking initiatives include annual Lake Trout stocking to supplement populations. A disjunct population of Margined Madtoms (*Noturus insignis*) are present in Lake Muskoka. Margined Madtoms are considered rare in Ontario.

The MNRF refers to the section of the Moon River between the outlet of Lake Muskoka to the Swift Rapids downstream as the Bala Reach. This section of the Moon River is “lake-like” and has a surface area of 307 ha. The water levels are regulated by the Ontario Power Generation owned and operated dams at Swift Rapids Generating Station and Moon River Control Dam. This section of the Moon River supports Northern Pike, Smallmouth Bass, Largemouth Bass, Black Crappie, Walleye, Brown Bullhead (*Ameiurus nebulosus*), Emerald Shiner (*Notropis atherinoides*), Hornyhead Chub (*Nocomis biguttatus*), Logperch (*Percina caprodes*), Longnose Dace (*Rhinichthys cataractae*), Pumpkinseed, Rock Bass (*Ambloplites rupestris*), White Sucker (*Catostomus commersonii*), Yellow Perch and Rainbow Smelt (*Osmerus mordax*). Efforts to successfully re-establish the Walleye population in the Bala Reach began in the early 2000s and included stocking and habitat enhancement. Night-lighting and egg collection was completed in May 2008 by Hatch Energy, where they identified adult Walleye and Walleye eggs downstream of the Burgess Dam (Hatch 2009).

The MNRF has identified that there is a known Walleye spawning area from the Burgess Falls downstream towards the main Bala Falls. Smelt and suckers may also be expected to spawn in the area. A map of the identified Walleye spawning area is shown in Appendix B. The **MNRF stated that work which may require plant shutdown should be scheduled to avoid the spring spawning period (01 April to 01 June).** Lake Muskoka is a cold-water system, and the Moon River is warmwater. This prohibits work below the natural high-water mark from **October 1 through July 15** (of the following year).

Any work below the high-water mark must be assessed for whether it needs to be submitted to DFO for review. If the development has a potential to result in the death of fish or the harmful alteration, disruption, or destruction of fish habitat the project may require an Authorization under the Fisheries Act. To determine whether the proposed development is required to be submitted to DFO and assistance in submitting a project request for review to DFO see: https://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/request-review-demande-d-examen-001-eng.html. Assistance by a qualified Fisheries Scientist is recommended for DFO permitting support.

3. FIELD INVESTIGATION METHODS

The Study Area (Figure 1) was investigated using general reconnaissance methods performed on foot. Aerial imagery of the Study Area was evaluated prior to field assessments to identify priority areas. Survey effort varied across the Study Area depending on the potential for an area to possess Natural Heritage features, as well as the topography and homogeneity of the site.

3.1 Terrestrial Habitat Assessment

The Study Area was walked by Kelly Major, Terrestrial Ecologist and Certified Environmental Professional on 06 May 2020. Mr. Major’s qualifications are provided in Appendix C.

Existing terrestrial conditions were established throughout the Study Area through the description of the plant community structure, composition, and condition. Terrestrial habitat was assessed for suitability to support Natural Heritage features, including Species at Risk, Significant Wildlife Habitat and Significant Wetlands. Emphasis was placed on assessing site suitability for species identified within the Natural Heritage Desktop Review, but the site assessment was not limited to these species.

Any habitat found to be suitable for nesting by Barn Swallow (which includes porous vertical surfaces secluded from the rain) was searched with a flashlight for evidence of current or historical nesting. Evidence of Barn Swallow nesting includes the presence of intact nests, remnant nesting scars, whitewash and adults foraging in vicinity. This habitat was also search for evidence of nesting by migratory bird species with similar nesting habits as Barn Swallow (e.g. Eastern Phoebe; *Sayornis phoebe*). Tall trees on (and overhanging) the Site were search for evidence of raptor stick nests.

Several restrictions applied to the terrestrial habitat assessment, specifically (1) unless otherwise stated, all observations were visual assessments of the site exterior (2) areas were not assesses that could not be seen from the exterior, (3) only the subject facility and public lands within 120m were assessed; no assessments were performed on adjacent private lands

3.2 Aquatic Habitat Assessment

Moon River and Lake Muskoka were investigated to determine the potential to provide fish habitat. Emphasis was placed on habitat potential to support important or critical habitat to the known (or likely) fish community upstream and downstream of the crossing. The area of investigation focused on the existing structure and the Study Area upstream and downstream. Areas downstream were searched for evidence of recent nesting or spawning activity. A MNRF License to Collect Fish for Scientific Purposes (License No.1095458) was received, however, no fish sampling occurred during the on-site field assessment.

4. FIELD INVESTIGATION RESULTS

Field Assessments were performed on 06 May 2020 by Bill Tibble (Senior Aquatic Ecologist) and Kelly Major (Terrestrial Ecologist). The qualifications of site investigators can be found in Appendix C. Field photographs are provided below.

4.1 Terrestrial Habitat

Both the north and south sides of the Site are cleared and dominated by manicured domestic grasses (lawn) and disturbance tolerant forbs such as Common Plantain (*Plantago major*), Common Dandelion (*Taraxacum officinale*), Wild Strawberry (*Fragaria vesca*), Common Mullein (*Verbascum thapsus*) and Common Burdock (*Arctium minus*); see Photos A to D. This area is also fringed by scattered shrubs, including Honeysuckle (*Lonicera* sp.), Common Blackberry (*Rubus allegheniensis*), Pin Cherry (*Prunus pensylvanica*), Showy Mountain Ash (*Sorbus decora*) and Red Elderberry (*Sambucus racemosa*). Several large White Pines (*Pinus strobus*) are located in the southeast corner of the site and low Red Maple (*Acer rubrum*) saplings were observed along the south shore.

The Site is bordered on the south and northwest by residential properties, and to the north by the River Street road embankment. These properties support a mix of native and ornamental tree and shrub species. Residential lands south of the site include semi-naturalized woodlot fragments dominated by White Pine, Eastern Hemlock (*Tsuga canadensis*), Red Maple, White Birch (*Betula papyrifera*) and Eastern White Cedar (*Thuja occidentalis*).

Habitat suitable for nesting by Barn Swallow and certain migratory bird species exists at the dam outlets (Photo E) and under decking at the powerhouse man-door entrance (Photo F). This habitat was searched and no evidence of active or past nesting was found. There was no Barn Swallow or migratory bird nesting on the outside of powerhouse and dam structure at the time of the field investigation.

Woody vegetation (trees and shrubs) scattered around the Site and surrounding Study Area all have the potential to support nesting by migratory bird species. No active bird nests were observed on the Site but thorough searches were not performed and several migratory bird species were observed in within the Study Area, including: Black-capped Chickadee (*Poecile atricapillus*), Palm Warbler (*Setophaga palmarum*) and American Robin (*Turdus migratorius*). No evidence of raptor nesting was found in trees on / overhanging the Site.

The powerhouse could support day roosting by bats, including up to three Endangered bat species: Little Brown Bat, Eastern Small-footed Bat and Northern Long-eared Bat (taxa). Males and non-gravid females of many bat species, including the endangered *Myotis* species, will make use of vertical surfaces sheltered from the sun and rain, crevices on built structures (e.g. cracks in masonry, eves, gaps in facia) as well as uninhabited building interiors for transient daytime roosting. No evidence of bat occupation (e.g. adult bats, holes / cracks discoloured by grease and urine, feces) was observed from the outside of the facility, however the facility interior was not searched.

No other candidate terrestrial SAR or SWH habitat was observed within the Study Area.


2020. 5. 6 12:14

Photo A – Dam structure and south bank including access road and staging area as seen from the north bank.


2020. 5. 6 11:23

Photo B – South side of the Study Area including dam access road and staging area.


2020. 5. 6 12:14

Photo C – Dam structure and north bank including River Street (left of frame).


2020. 5. 6 12:14

Photo D – Open habitat south of River Street and west of the dam structure.


2020. 5. 6 11:30

Photo E – Dam outlets were searched for nesting by bird species, including Barn Swallow.


2020. 5. 6 11:53

Photo F – The undersides of decking on site was searched for nesting by bird species.

4.2 Aquatic Habitat

Directly downstream of the dam outlet there is a plunge pool (Photo G). Old gabion baskets line the right downstream bank immediately downstream of the dam (Photo H) which were slightly unstable. Further downstream the right downstream bank is stabilized with an installed boulder wall, transitioning to a boulder bank which was likely historically placed for bank protection. The left downstream bank immediately downstream of the dam is stabilized with a boulder wall. Gravel extends from the wall into the channel. Undermining was identified on the left downstream bank, and the bank eventually becomes exposed boulders with debris scattered throughout the gradually sloping banks. The habitat downstream transitions from cobble riffles (Photo I) and runs (Photo J), to shallow bedrock cascades. The watercourse widens into the Bala Reach and flows downstream to the Moon River. Spawning habitat for Walleye and Sucker species was identified from the base of the dam downstream until the substrate transitions from cobble to bedrock. While completing the site assessment, staff observed White Sucker spawning in the gravel and cobble habitat 5-10m downstream of the dam.

The watercourse upstream of the dam is dominated by deep pool habitat (Photo K), with the highest flow evident along the right downstream bank. Substrate upstream of the dam is predominately sand, silt, gravel and detritus (Photo L). Directly upstream of the powerhouse the right upstream bank is undercut and slightly unstable. A floating barrier is in the watercourse upstream of the powerhouse. A culvert enters the watercourse from under River Road on the right downstream bank upstream of the powerhouse. The right downstream bank upstream of the dam is composed of cobbles and boulders. The MNRF has indicated that upstream of the dam provides spawning habitat for Margined Madtom. Madtoms prefer structure for spawning, including large boulders and sunken logs. The water level was deep, and in-water structure was difficult to identify.

Photo G – Directly downstream of the dam

Photo H – Gabion baskets and placed boulders on the right downstream bank downstream of the dam

Photo I – Boulder cascade downstream of the dam

Photo J – Run habitat and cobble / gravel bed directly downstream of the dam

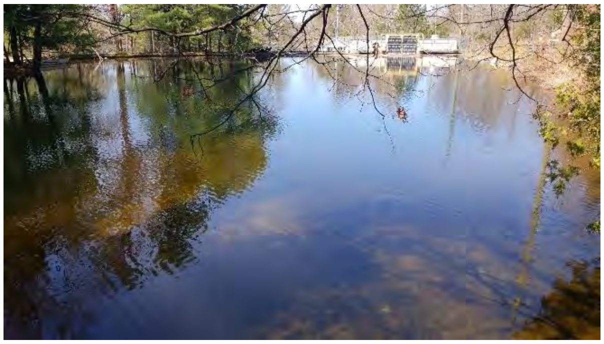

Photo K – Deep pool habitat upstream of the dam

Photo L – Water levels and substrate abutting the concrete dam face upstream

5. ALTERNATIVE WORK OPTIONS WITH IMPACT ASSESSMENT

The Burgess Dam is an approximately 59m long and 3m high concrete dam. A retaining wall 16m in length runs along the North wall of the powerhouse and supports River St. in Bala, ON. The Township has identified the need to complete the rehabilitation / replacement of Burgess Dam. The following summarizes the observations from the Tulloch Engineering Dam Safety Review Report (Tulloch 2019).

- The powerhouse section of the dam is in poor overall condition from both a structural and dam safety perspective and will require remediation due to the presence of failed or failing structural members and a large transverse crack through the floor slab of the dam. Furthermore, significant washout of the downstream fill from another future flooding event has the potential to cause the structure to fail.
- The facility has no spill capacity as upstream water level control is provided by the Bala North and Bala South dams. It can be determined that the Burgess Dam does not have sufficient freeboard nor was the existing facility designed to handle inflow design flood in its current state
- Repair or mitigation measures must be developed for both the non-overflow dam section and powerhouse dam section to improve the FOS to meet the minimum acceptable criteria.
- The Embankment along River Street downstream of the Site is very steep and appears to be eroding at the toe where there are newer gabion baskets placed on a historic boulder/stone wall. There is a concern for slope failure of the embankment due to the erosion / scour caused by water flows during power generation activity.

A Municipal Class EA was initiated and assesses the impacts of alternative solutions for the rehabilitation / replacement (Appendix A). All impacts and mitigation measures herein are separated according to the alternative solution identified.

5.1 Alternative Work

The proposed design alternatives are outlined in detail in the Tulloch Engineering Dam Safety Review Report (Tulloch 2019). A summary of the key considerations for each design alternative are provided below.

5.1.1 Option N1 – Downstream Rip Rap Placement and Toe Berm

Reinstate the fill of the existing dam by replacing rockfill / riprap over a non-woven geotextile for erosion protection downstream of the existing dam site. Fill should be replaced in washout section and then covered with a geotextile. The addition of riprap will provide added erosion protection in the event of overtopping to avoid excessive washout of fill similar to the 2019 flooding event. In order to collect overflow water during flooding events a toe-berm could be constructed along the downstream property line to channel water down to the *in-situ* river channel. A similar berm would be constructed along the south wall of the powerhouse to keep flows away from the building foundation.

- Downstream clear and strip organics
- Reinstate washed-out sections of downstream fill
- Place non-woven geotextiles and rip rap; grade back toward the tailrace for erosion protection
- Build toe berms along the existing property line and the south wall of the powerhouse to manage and divert the overflow toward the river
- Extend the existing dam to the south end to accommodate toe berm and flow management
- Grouting or concrete patching the cracks in existing dam to limit leakage

5.1.2 Option N2 – Partial Dam Raise and Emergency Spillway

Partially raise sections of the non-overflow area of the dam and install an emergency spillway to control overflow during flooding events. The spillway invert could be kept at the current dam crest elevation and the remainder of the dam would subsequently be raised 0.5m to meet the minimum freeboard criteria during the operation of the spillway during a flood event.

- Downstream clear and strip organics as required
- Partially raise dam 0.5m for the dam section about 20m in length south of the proposed spillway invert and 6m in length north of the invert
- Build an emergency spillway channel with rip rap placed a minimum of 500 mm thick over non-woven geotextile with a total approximate width of about 18m through the middle of non-overflow section of the dam
- The spillway will be angled such that water is directed towards the existing tailrace and away from River Street embankment
- Re-instate the fill south of the spillway that has been washed away during the flooding and tie into the spillway
- Extend the existing dam abutment south to accommodate a higher elevation (about 8m in length)
- Grouting or concrete patching the cracks in the existing dam to limit the leakage

Options for the Powerhouse Dam Section (P)

5.1.3 Option P1 – Demolish Powerhouse and Replace with New Dam

Demolish the existing powerhouse dam section and build a new concrete dam section upstream of the existing powerhouse

- Installation of upstream and downstream cofferdam
- Removal of the old dam section and powerhouse structure
- Construction of a new concrete gravity dam (2.5m high) on excavated bedrock for water retention
- Removal of cofferdams

5.1.4 Option P2 – Powerhouse Refurbishment and Reinforcement

Structural reinforcement of the existing building as well as to remediate and reinforce the dam section and foundation of the powerhouse.

- Fill scour areas in foundation with mass pour concrete
- Grout the cracks developing in concrete piers
- Reinforce the powerhouse structure with 9 rock anchors
- Repair / Replace the roof
- Add shear struts and additional structural bracing in the powerhouse building
- Grouting or concrete patching the cracks in the existing dam to limit the leakage
- Extend the existing tailrace pipes for the turbines units downstream to keep them a safer distance away from the powerhouse to avoid scour and undermining of the foundation

5.1.5 River Street Concrete Retaining Wall

- Install a drainage ditch upstream of the retaining wall to divert the surficial run-off water from River Street
- Drill drainage holes and install drainage pipes along the base of the existing concrete retaining wall.

5.2 Impact Assessment and Mitigation

Table 3 – Impact Assessment and Mitigations for Construction Options

Options	Consists Of	Potential Impacts (in the absence of Mitigation)	Mitigations
Options for Non-Overflow Dam Section			
Re-Instate Downstream Fill and Add Erosion Protection *Option N1*	• Downstream veg removal • Strip top organic soil • Replace DS fill materials • Regrade fill materials and build a toe berm to divert flow to river • Add rock/riprap for erosion protection • Grouting or patching of cracks in existing dam • Concrete slab at powerhouse repaired and anchored	• **Harm to migratory birds.** Removal of woody vegetation, if performed while migratory birds are nesting, could result in harm to active migratory bird nests, eggs and young. • **Change in fish habitat.** Placement of rip-rap below the high-water mark will alter fish habitat. • **Harm to fish.** Development may result in increase of erosion or sediment transport, or the introduction of deleterious substances to the River. Construction may result in direct mortality to fish or their eggs or offspring. • **Future sediment transport.** The placement of rip-rap may result in future transport of sediment into the River. If flood events occur, accumulated materials caught in the rip-rap slope will be re-suspended and transported downstream to the River. *This potential impact cannot be eliminated through mitigation efforts.*	• **Avoid active migratory bird nests.** Avoid clearing vegetation during the General Nesting Period: avoid clearing from 12 April to 28 August. Alternatively, inspect woody vegetation immediately prior to removal and retain any tree or shrub that is supporting an active migratory bird nest. • **Minimize the clearing of vegetation.** Clear only what is necessary to accomplice the undertaking. Incorporate existing vegetation into the final plan where possible. Regreen de-vegetated areas where feasible. • **Avoid changes to fish habitat.** Retain in-water and riparian vegetation as much as possible. Avoid placing material below the high-water mark if possible. All work below the high-water mark must be submitted to DFO for review. • **Erosion and Sediment Control.** ESC measures should be implemented prior to construction to prevent entry of sediment into the waterbody. All banks should be stabilized following construction. • **Control deleterious substances.** Waste materials should be stabilized. Construction materials and equipment should arrive on site clean. Filling and storage of fluids should be >30m from the watercourse. • **Minimize in-water work.** MNRF in-water timing windows must be followed. All in-water work must be isolated from the watercourse and a fish salvage must be completed.
Dam Crest Raise and Spillway Construction *Option N2*	• Downstream veg removal • Strip top organic soil • Partially raise dam crest on north and south dam sections • Install emergency spillway (geomembrane rockfill channel) • Replace DS fill materials • Regrade middle dam section DS and add rock/riprap for erosion protection • Grouting or concrete patch cracks in existing dam • Concrete slab at powerhouse repaired and anchored	• **Harm to migratory birds.** Removal of woody vegetation, if performed while migratory birds are nesting, could result in harm to active migratory bird nests, eggs and young. • **Change in sensitive fish habitat.** Diverting overflow downstream may result in alteration to sensitive fish habitat required for critical life functions. • **Change in fish habitat.** Placement of rip-rap below the high-water mark will alter fish habitat. • **Harm to fish.** Development may result in increase of erosion or sediment transport, or the introduction of deleterious substances to the River. Construction may result in direct mortality to fish or their eggs or offspring.	• **Avoid active migratory bird nests.** Avoid clearing vegetation during the General Nesting Period: avoid clearing from 12 April to 28 August. Alternatively, inspect woody vegetation immediately prior to removal and retain any tree or shrub that is supporting an active migratory bird nest. • **Minimize the clearing of vegetation.** Clear only what is necessary to accomplice the undertaking. Incorporate existing vegetation into the final plan where possible. Regreen de-vegetated areas where feasible. • **Direct spillway to non-sensitive habitat.** Direct the outlet of the spillway downstream of the cobble / gravel spawning bed. The outlet should be located at the bedrock cascade as to prevent scour and resuspension of soft sediment. • **Avoid changes to fish habitat.** Retain in-water and riparian vegetation as much as possible. Avoid placing material below

			the high-water mark if possible. All work below the high-water mark must be submitted to DFO for review. - **Erosion and Sediment Control.** ESC measures should be implemented prior to construction to prevent entry of sediment into the waterbody. All banks should be stabilized following construction. - **Control deleterious substances.** Waste materials should be stabilized. Construction materials and equipment should arrive on site clean. Filling and storage of fluids should be >30m from the watercourse. - **Minimize in-water work.** MNRF in-water timing windows must be followed. All in-water work must be isolated from the watercourse and a fish salvage must be completed.
Options for Powerhouse Dam Section			
Demolish Powerhouse and Replace with New Dam *Option P1*	- Installation of upstream and downstream cofferdam - Removal of the old dam section and powerhouse structure - Construction of a new concrete gravity dam (2.5m high) on excavated bedrock for water retention - Removal of cofferdams	- **Harm to Barn Swallow or migratory birds.** No evidence of Barn Swallow or migratory bird nesting was found on the powerhouse, but habitat is suitable. Should nesting occur in the future, demolition of the powerhouse could result in harm to active nests, eggs and young. - **Harm to bats.** Bats could day-roost within the existing powerhouse. If present, demolition of the structure could harm endangered species. - **Change in fish habitat.** Excavation and placement of fill below the high-water mark will alter fish habitat. - **Change in sensitive fish habitat.** Potential changes in sensitive fish habitat both upstream and downstream which are required for critical life functions. - **Harm to fish.** Development may result in increase of erosion or sediment transport, or the introduction of deleterious substances to the River. Construction may result in direct mortality to fish or their eggs or offspring. - **In-water work.** The replacement of the dam and powerhouse will result in extensive time spent working below the high-water mark. Fish habitat will be isolated. *This impact cannot be eliminated.* - **Changes in flow.** Complete isolation of the dam and powerhouse for removal may result in long- or short-term changes to flow downstream.	- **Avoid Barn Swallow and nests.** No evidence of Barn Swallow nesting was found on the existing powerhouse, but habitat is suitable. Inspect the structure again immediately prior to undertaking the work. Endangered Species Act registration is required if Barn Swallow nests are found on the powerhouse and if any activity is to be undertaken that will harm the nests or harm / harass Barn Swallows. A Barn Swallow Mitigation Plan would need to be prepared by a qualified person in support of registration under this Act. - **Avoid active migratory bird nests.** No evidence of migratory bird nesting was found on the existing powerhouse, but habitat is suitable. Avoid demolition during the General Nesting Period: from April 12 to August 28. Alternatively, inspect the exterior and interior of the existing powerhouse prior to demolition and only proceed if active migratory bird nests are not present. The proponent may choose to inspect the interior of the powerhouse prior to April 12 for evidence of past nesting. If nesting has occurred in the past, the proponent can exclude migratory birds from re-entering the structure. - **Avoid roosting bats.** Avoid demolition while bats are active: from April 15 to September 30. Alternatively, inspect the powerhouse interior prior to demolition and proceed only if bats are absent. The proponent may choose to inspect the interior of the powerhouse prior to April 15 for evidence of past bat roosting. If roosting has occurred in the past, the proponent can exclude bats from re-entering the structure. - **Avoid changes to sensitive areas.** Avoid disturbance to downstream cobble / gravel spawning areas. Avoid disturbance to structure (large rocks, submerged logs) upstream as much as possible. - **Avoid changes to fish habitat.** Retain in-water and riparian vegetation as much as possible. Reinstate in-water cover after construction is complete. All work below the high-water mark must be submitted to DFO for review.

			• **Erosion and Sediment Control.** ESC measures should be implemented prior to construction to prevent entry of sediment into the waterbody. Cofferdams used should result in complete isolation of the in-water work area. All banks should be stabilized following construction. • **Control flow.** Use by-pass pumps to control water discharge from upstream around the isolated area. Use DFO approved fish screens at inlet and outlet of pipes. Ensure areas of discharge are stable, and that discharging will not result in scouring. • **Control deleterious substances.** Waste materials should be stabilized. Construction materials and equipment should arrive on site clean. Filling and storage of fluids should be >30m from the watercourse. • **Minimize in-water work.** MNRF in-water timing windows must be followed. All in-water work must be isolated from the watercourse and a fish salvage must be completed. Reduce in-water work as much as possible.
Powerhouse Refurbishment and Reinforcement *Option P2*	• Fill scour areas in foundation with mass pour concrete • Grout the cracks developing in concrete piers • Reinforce the powerhouse structure with 9 rock anchors • Repair / Replace the roof • Add shear struts and additional structural bracing in the powerhouse building • Grouting or concrete patching the cracks in the existing dam to limit the leakage • Extend the existing tailrace pipes for the turbines units downstream to keep them a safer distance away from the powerhouse to avoid scour and undermining of the foundation	• **Harm to Barn Swallow or migratory birds.** No evidence of Barn Swallow or migratory bird nesting was found on the powerhouse, but habitat is suitable. Should nesting occur in the future, maintenance and upgrades to the powerhouse could result in harm to active nests, eggs and young. • **Harm to bats.** Bats could day-roost within the existing powerhouse. If present, renovations within the structure could harm endangered species. • **Change in fish habitat.** Excavation and placement of fill below the high-water mark will alter fish habitat. • **Harm to fish.** Development may result in increase of erosion or sediment transport, or the introduction of deleterious substances to the River. Construction may result in direct mortality to fish or their eggs or offspring. • **In-water work.** The replacement of the dam and powerhouse will result in work below the high-water mark. *This impact cannot be eliminated; however, refurbishment will result in a shorter duration of in-water impacts compared to full replacement (Option P1).* • **Changes in flow.** Complete isolation of the dam and powerhouse for removal may result in long or short term changes to flow downstream.	• **Avoid Barn Swallow and nests.** No evidence of Barn Swallow nesting was found on the existing powerhouse, but habitat is suitable. Inspect the structure again immediately prior to undertaking the work. Endangered Species Act registration is required if Barn Swallow nests are found on the powerhouse and if any activity is to be undertaken that will harm the nests or harm / harass Barn Swallows. A Barn Swallow Mitigation Plan would need to be prepared by a qualified person in support of registration under this Act. • **Avoid active migratory bird nests.** No evidence of migratory bird nesting was found on the existing powerhouse, but habitat is suitable. Avoid maintenance and upgrades during the General Nesting Period: from April 12 to August 28. Alternatively, inspect the exterior and interior of the existing powerhouse prior to maintenance and upgrades and only proceed if active migratory bird nests are not present. The proponent may choose to inspect the interior of the powerhouse prior to April 12 for evidence of past nesting. If nesting has occurred in the past, the proponent can exclude migratory birds from re-entering the structure. • **Avoid roosting bats.** Avoid renovations while bats are active: from April 15 to September 30. Alternatively, inspect the powerhouse interior prior to renovations and proceed only if bats are absent. The proponent may choose to inspect the interior of the powerhouse prior to April 15 for evidence of past bat roosting. If roosting has occurred in the past, the proponent can exclude bats from re-entering the structure. • **Avoid changes to fish habitat.** Retain in-water and riparian vegetation as much as possible. Reinstate in-water cover after construction is complete. All work below the high-water mark must be submitted to DFO for review.

			• **Erosion and Sediment Control.** ESC measures should be implemented prior to construction to prevent entry of sediment into the waterbody. Cofferdams used should result in complete isolation of the in-water work area. All banks should be stabilized following construction. • **Control flow.** Use by-pass pumps to control water discharge from upstream around the isolated area. Use DFO approved fish screens at inlet and outlet of pipes. Ensure areas of discharge are stable, and that discharging will not result in scouring. • **Control deleterious substances.** Waste materials should be stabilized. Construction materials and equipment should arrive on site clean. Filling and storage of fluids should be >30m from the watercourse. • **Minimize in-water work.** MNRF in-water timing windows must be followed. All in-water work must be isolated from the watercourse and a fish salvage must be completed. Reduce in-water work as much as possible.
River Street Concrete Retaining Wall			
Drainage ditch and holes	• Install a drainage ditch upstream of the retaining wall to divert the surficial run-off water from River Street • Drill drainage holes and install drainage pipes along the base of the existing concrete retaining wall.	• **Harm to migratory birds.** Removal of woody vegetation, if performed while migratory birds are nesting, could result in harm to active migratory bird nests, eggs and young. • **Harm to fish.** Development may result in increase of erosion or sediment transport, or the introduction of deleterious substances to the River. Construction may result in direct mortality to fish or their eggs or offspring	• **Avoid active migratory bird nests.** Avoid clearing vegetation during the General Nesting Period: avoid clearing from 12 April to 28 August. Alternatively, inspect woody vegetation immediately prior to removal and retain any tree or shrub that is supporting an active migratory bird nest. • **Minimize the clearing of vegetation.** Clear only what is necessary to accomplice the undertaking. Incorporate existing vegetation into the final plan where possible. Regreen de-vegetated areas where feasible. • **Control deleterious substances.** Waste materials should be stabilized. Construction materials and equipment should arrive on site clean. Filling and storage of fluids should be >30m from the watercourse. • **Erosion and Sediment Control.** ESC measures should be implemented prior to construction to prevent entry of sediment into the waterbody. All banks should be stabilized following construction.

6. SUMMARY

The potential impacts of each design alternative and mitigation strategies which should be adopted to control these impacts are presented in Table 3.

The potential impacts of each construction option, and mitigation strategies which should be adopted to control these impacts are presented in Table 3. Both options for the non-overflow dam section require the removal of woody vegetation, which could result in harm to migratory birds. To minimize these impacts, it is advised that clearing of vegetation be kept to a minimum, and that vegetation should only be cleared outside of the General Nesting Period. Both, re-instating downstream fill for erosion protection, and constructing a spillway, may result in changes to fish habitat. Impacts should be controlled through minimizing in-water work, implementing proper isolation techniques and ESC measures, controlling deleterious substances, and abiding by all DFO and MNRF guidelines and permitting requirements. The option of re-instating the downstream fill may result in future transport of sediment, as flood events could resuspend debris and sediment which has settled in the rip-rap over time. The spillway construction option should be designed as to not discharge to sensitive fish habitat. Any discharge should be directed downstream towards the bedrock cascade, preventing scouring, suspension of soft substrate and changes to spawning habitat in the cobble / gravel beds directly downstream of the dam.

Replacing or refurbishing the dam and powerhouse both could result in impacts to nesting birds, specifically Barn Swallow, and roosting bats. Although there was no evidence of roosting bats, or migratory bird nests on the structure during the field assessment, all active bird nests and roosting bats should be avoided. Work should be avoided during the General Nesting Period or while bats are active (April 15 to September 30). In-water work is required for both powerhouse / dam section options. The replacement of the dam and powerhouse is likely to result in a longer in-water work construction time than the refurbishment option. Longer in-water work times increases the chance of sediment transfer downstream and impacts to fish. The excavation required for the dam replacement is also more likely to result in changes to sensitive fish spawning habitat upstream and downstream of the dam. Both the refurbishment and replacement options must be submitted to DFO for approval, and in-water work must be isolated, fish must be salvaged, and MNRF in-water timing guidelines should be followed.

The construction proposed on the River St. retaining wall is not likely to result in impacts to fish and fish habitat. If work is being completed within 30m of the River, erosion and sediment control measures should be used to control any sediment from entering the River. If any clearing is required, it should occur outside of the General Nesting Period.

7. CLOSING

Tulloch Environmental, a division of Tulloch Engineering Inc. (Tulloch), was retained by The Township of Muskoka Lakes to complete an Existing Conditions and Environmental Impact Assessment (EC/EIA) in support of the Municipal Class EA for the Burgess Dam and Generating Station rehabilitation / replacement in Bala, ON. This report outlines the results of a Natural Heritage Desktop Review, field investigations on the Site and an assessment of anticipated environmental impacts. It also provides mitigation strategies to avoid or minimize project impacts.

We the undersigned are pleased to provide this report as a record of our services and findings. If you have any questions or if we can be of further assistance in this matter, please do not hesitate to contact us.

Sincerely,

Tulloch ENVIRONMENTAL

Report Prepared By:

Emelia Myles-Gonzalez, M.Sc.
Aquatic Ecologist

Kelly Major, M.Sc., E.P.
Terrestrial Ecologist

Report Reviewed By:

Bill Tibble, M.Sc., E.P.
Environmental Team Lead

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Tulloch. 2019. Dam Safety Review Burgess 1 Dam. Township of Muskoka Lake.

APPENDIX A

Proposed Alternative Solutions

APPENDIX B

Natural Heritage Review and Communications with Regulators

TULLOCH
ENVIRONMENTAL

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03 February 2020

Karine Beriault | Management Biologist
7 Bay St, Parry Sound,
ON, P2A 1S4
Tel: 705-773-4240

Dear Karine Beriault,

Re: Natural Heritage Background Information Request: A Class Environmental Assessment on Burgess Dam for the Township of Muskoka Lakes, Bala, Ontario, Canada.

Tulloch Environmental, a division of Tulloch Engineering Inc. (Tulloch), has been retained by the Corporation of the Township of Muskoka Lakes to conduct a review of Natural Heritage Background Information available for an existing Dam across the north channel of the outlet from Lake Muskoka into the Moon River in Bala, Ontario. This review is in support of the proposed rehabilitation and/or replacement of the Burgess 1 Dam and Generating Station.

The focus of this review is located at an existing Dam, which can be accessed from River Street and Portage Street in the Village of Bala, ON. The facility consists of a 59m long concrete dam approximately 3m in height. A 16m long retaining wall connects to the north wall of the powerhouse and runs along River St. UTM Coordinates (NAD83) for the site are: 17T 609163 4985226. A map of the project location is provided in the attachments. The scope of this review includes the site and areas within 1000m.

Tulloch has reviewed information obtained from Land Information Ontario (LIO) regarding land uses and natural heritage features known (or believed) to occur within 1000m of the site. These data included sites of domestic, recreational, commercial and industrial land uses as well as known environmental sensitives (e.g. Significant Wildlife Habitat, nesting sites, fish spawning sites) and areas of enhanced protection (e.g. parks, conservation reserves, ANSI). A series of maps indicating LIO findings are provided in the attachments.

Tulloch has also reviewed natural heritage information provided by the Ministry of Natural Resources and Forestry via the Natural Heritage Information Centre (NHIC) Make-a-map, Crown Land Use Atlas and Fish ON-Line web applications. This information was supplemented with records obtained from authoritative atlases, including; the Atlas of the Breeding Birds of Ontario, Bat Conservation International and the Ontario Reptiles and Amphibians Atlas. A summary of notable information is provided below:

- **Four (4)** NHIC records of Species at risk were returned within 1000m of the study area.
    - Massasauga – Great Lakes / St. Lawrence population (Threatened)
    - Rusty-patched Bumble Bee (Endangered)
    - Blanding’s Turtle (Threatened)
    - Eastern Wood-pewee (Special Concern)

- **Five (5)** NHIC records of locally rare species were returned within 1000m of the study area
    - Redtop Panicgrass
    - Cyrano Darner
    - Giant Lacewing
    - Ridged Yellow Flax
    - Sand Panicgrass

- Records of restricted species were returned within 1000m of the study area.

- **Ten (10)** ABBO records of species at Risk were returned within 1000m of the study area.
    - Barn Swallow (OBBA 1985 & 2005)
    - Bobolink (OBBA 1985)
    - Canada Warbler (OBBA 1985 & 2005)
    - Chimney Swift (OBBA 1985 & 2005)
    - Common Nighthawk (OBBA 1985 & 2005)
    - Eastern Meadowlark (OBBA 1985)
    - Eastern Wood-pewee (OBBA 1985 & 2005)
    - Golden-winged Warbler (OBBA 1985)
    - Olive-sided Flycatcher (OBBA 1985 & 2005)
    - Wood Thrush (OBBA 1985 & 2005)

- One Natural Area, BALA was identified from NHIC records

- Environment and Climate Change Canada considers the General Nesting Periods for this area (Nesting Zone C3) to be 8 April to 28 August for Forests, 12 April to 28 August for open habitats and 8 April to 16 August for Wetlands.

- Lake Muskoka outlets to the Moon River through the Burgess Dam. The Moon River outlets to Georgian Bay approximately 40km downstream.

    - Lake Muskoka is 120.4 ha with a mean depth of 15m and a max depth of 66m. The thermal regime is unknown but is assumed to be cool-cold. Lake Trout stocking has occurred every year since 2013, and once in 2010. Known fish species in the lake include:

        - Black Crappie
        - Brown Bullhead
        - Burbot
        - Cisco
        - Lake Trout
        - Lake Whitefish
        - Largemouth Bass
        - Northern Pike
        - Pumpkinseed
        - Rainbow Smelt
        - Rock Bass

        - Smallmouth Bass
        - Walleye
        - White Sucker
        - Yellow Perch

    - Moon River thermal regime is cool-water. Fishing is restricted at Freeman Twp. Lots 33, 34, 35, 36 in Concessions VIII, IX, and X. No fishing from Apr 1 - Fri before the 3rd sat in May. Fish species are unknown; however, online fishing atlases suggest Muskie, Pike, Walleye and Bass are all present in the River.

Tulloch is requesting the following information and guidance from the OMNRF:

- A SAR list for the district.

- The identification of the Restricted Species (proof of medium sensitivity data training can be provided).

- Terrestrial data pertaining to the site and areas within 1000m, such as:
    - Records of provincially tracked species associate with the planning areas.
    - Known Significant Wildlife Habitat and other areas of critical habitat associate with the planning areas.
    - The General Nesting Periods for the area (if different from that recommended by Environment and Climate Change Canada, above)
    - Other terrestrial timing windows and restrictions

- Fishery data for water bodies adjacent to the project area including:
    - Known fish community species
    - Thermal regimes (if different than above)
    - Areas of known critical habitat (spawning, etc.)
    - Aquatic species at risk (records, local knowledge)
    - Barriers to passage

- OMNRF fishery management information:
    - In-water work timing window
    - Areas of concern (e.g. known sources of sediment and erosion, sources of pollution)
    - Fishery management objectives (e.g. rehabilitation or protection goals, etc.)
    - Known commercial fishing licenses (i.e. commercial baitfish licenses) in the area

- Adjacent areas of protection not listed above (ANSI, Parks, Conservation Reserves, etc.)

If you have any questions or require additional information, please do not hesitate to contact the undersigned at (705) 522-6303.

Thank you for your time and assistance.

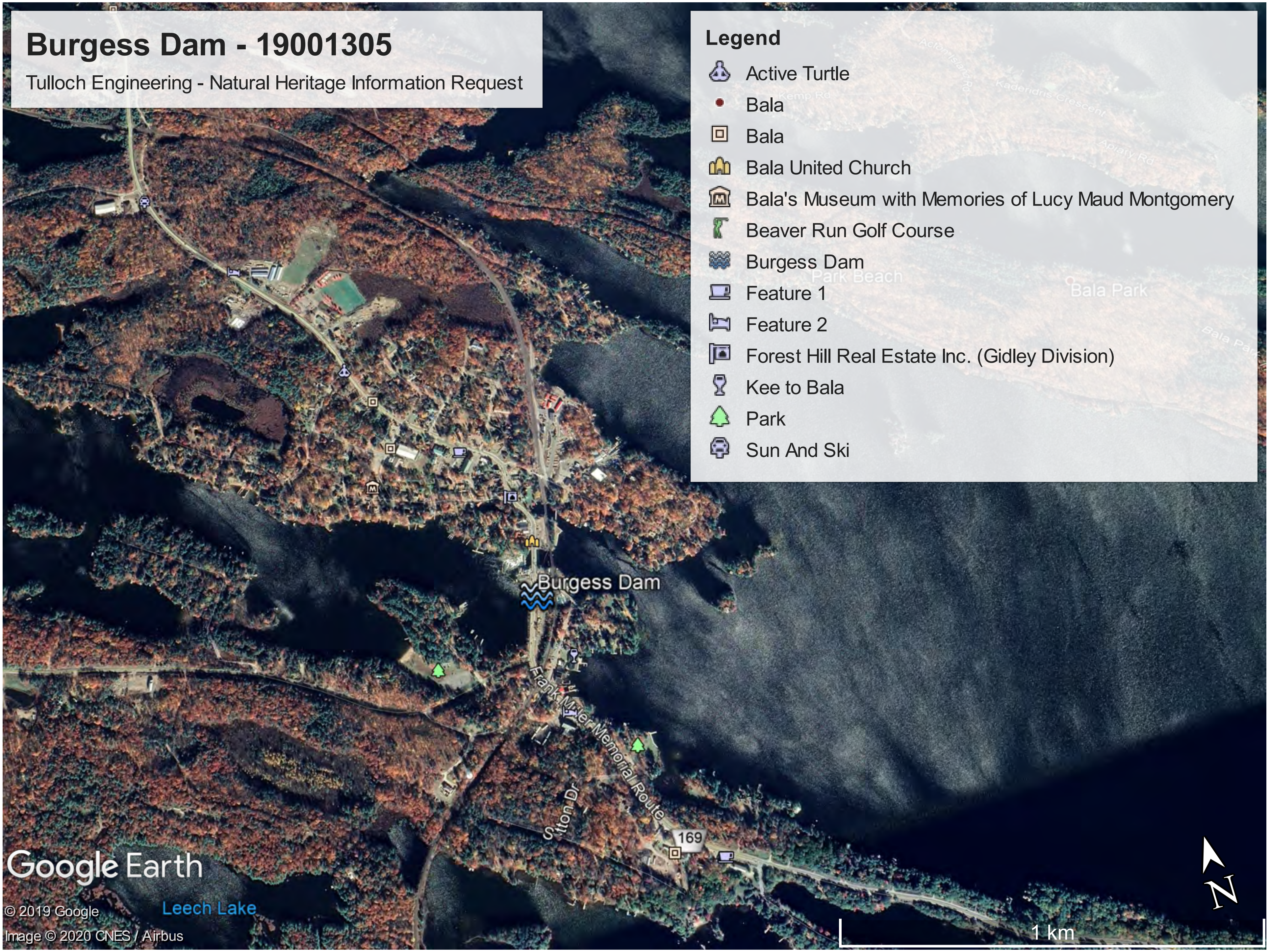
Sincerely,

Emelia Myles-Gonzalez
Aquatic Ecologist
Tulloch Environmental, a division of Tulloch Engineering
emelia.myles-gonzalez@tulloch.ca
(705) 522-6303 x 624

Attachments

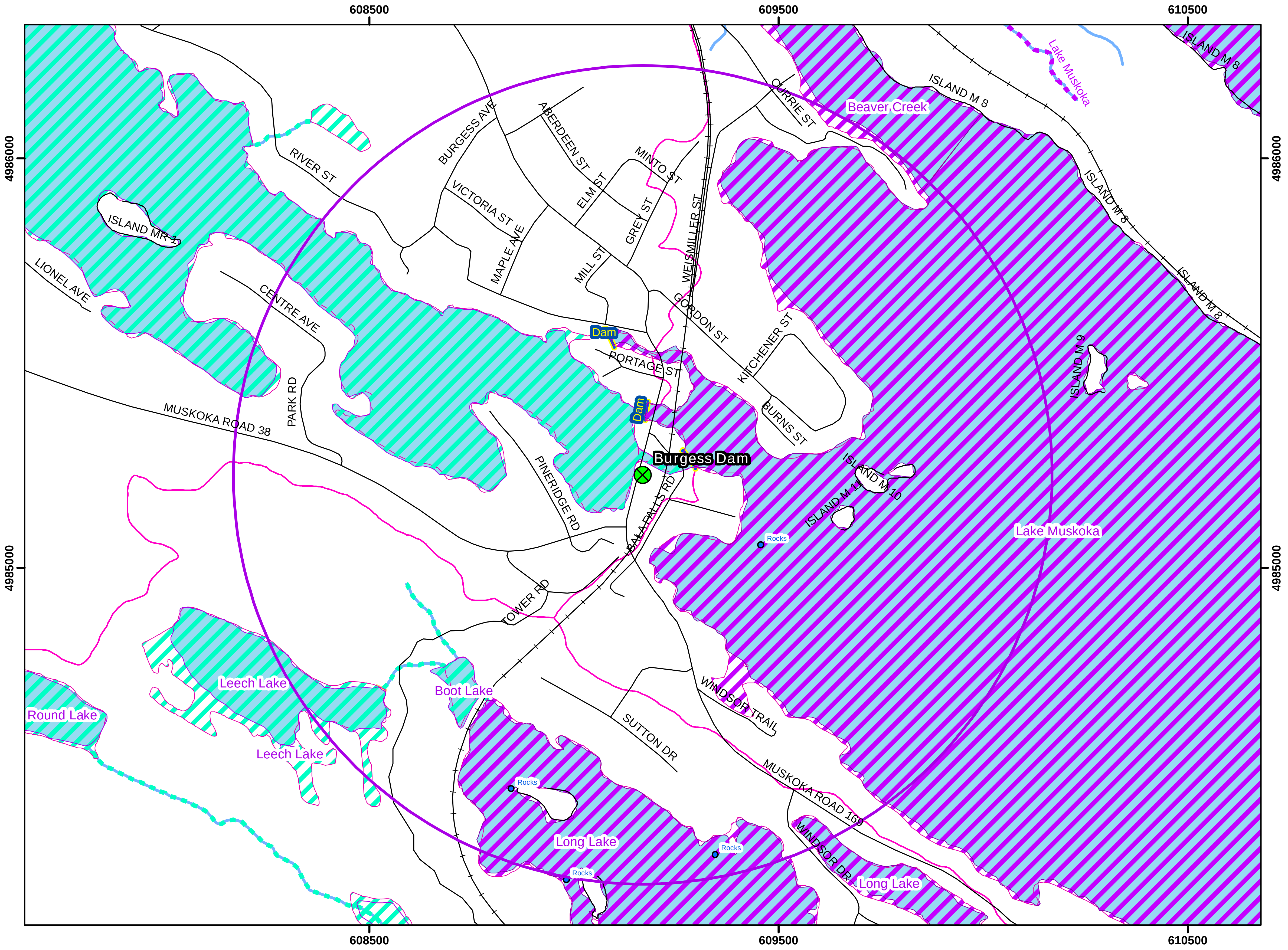
Burgess Dam - 19001305

Tulloch Engineering - Natural Heritage Information Request



Burgess Dam
Project # 191493

Natural Heritage
Background Review
- Aquatic Habitat -



Coordinate System: NAD 1983 UTM Zone 17NTransverse Mercator

0 0.2 0.4 0.8 1.2 1.6 Kilometers

User Name: Kelly.Major

Legend

- Local Road
- Rail Line
- ● OHN Hydrographic Points
- OHN Hydrographic Line
- Beaver Dam
- OHN Hydrographic Poly
- OHN Waterbody
- OHN Watercourse
- Primary Watershed
- Secondary Watershed
- Tertiary Watershed
- Quarternary Watershed

ARA Waterbody Regime

- ▨ Unknown Regime
- ▨ Cold Water
- ▨ Cool Water
- ▨ Warm Water

ARA Watercourse Regime

- Cold Water
- Cool Water

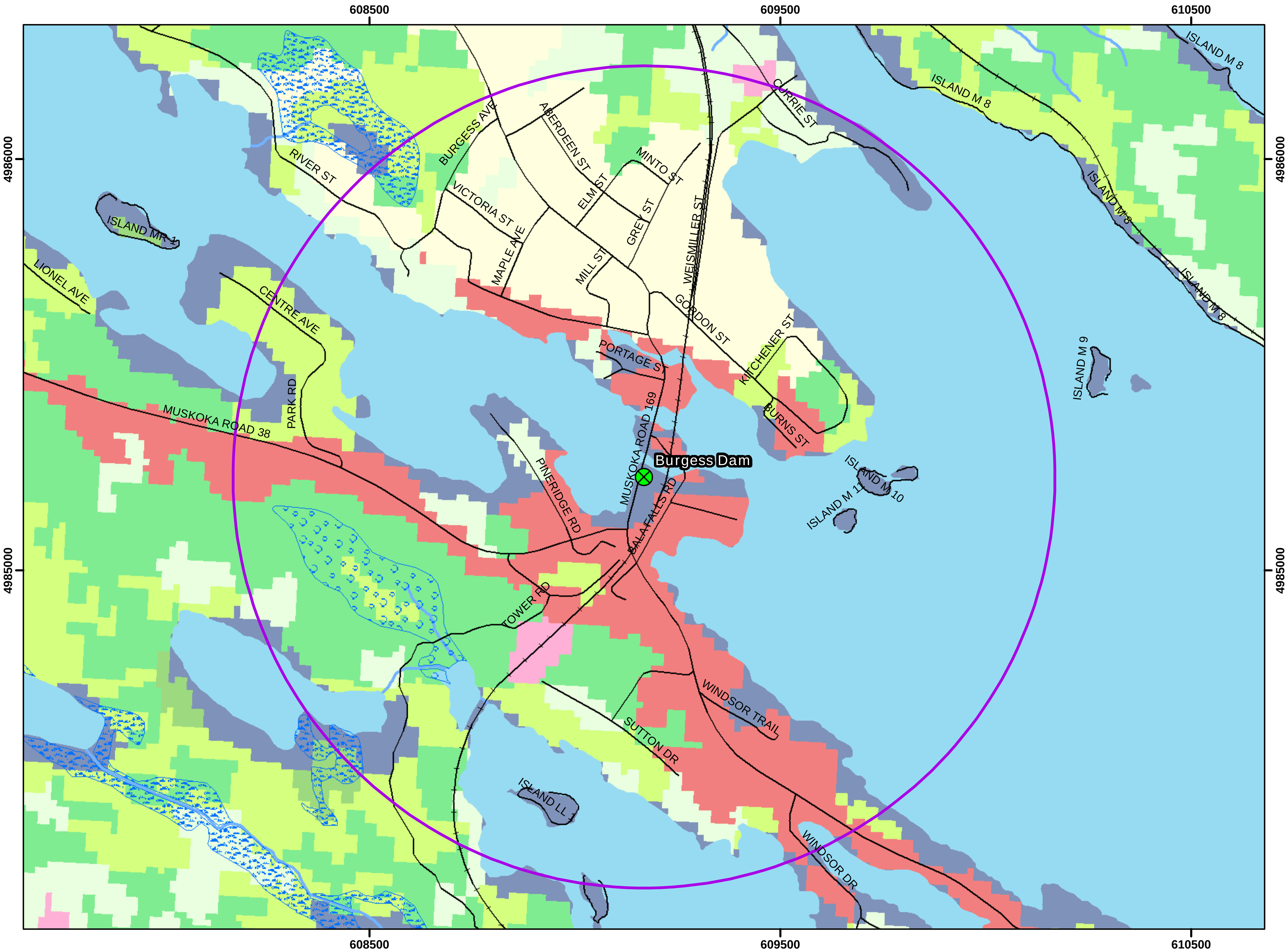
SCALE: 1:10,000

DATE: 30/01/2020

Data Provided by Land Information Ontario:
Data updated as of February 2018.

N

TULLOCH
ENVIRONMENTAL



Coordinate System: NAD 1983 UTM Zone 17NTransverse Mercator

0 0.2 0.4 0.8 1.2 1.6 Kilometers

User Name: Kelly.Major

Burgess Dam
Project # 191493

Natural Heritage
Background Review
- Terrestrial Habitat -

Legend

— Local Road
┼ Rail Line
▨ FRI Wetland (Open)
▨ FRI Wetland (Treed)
🟦 OHN Waterbody
— OHN Watercourse

Ontario Land Cover Compilation Version 2

■ 1 - Clear Open Water
■ 11 - Sparse Treed
■ 13 - Deciduous Treed
■ 14 - Mixed Treed
■ 15 - Coniferous Treed
■ 26 - Bedrock
■ 27 - Community/Infrastructure
■ 28 - Agriculture and Undifferentiated Rural Land Use

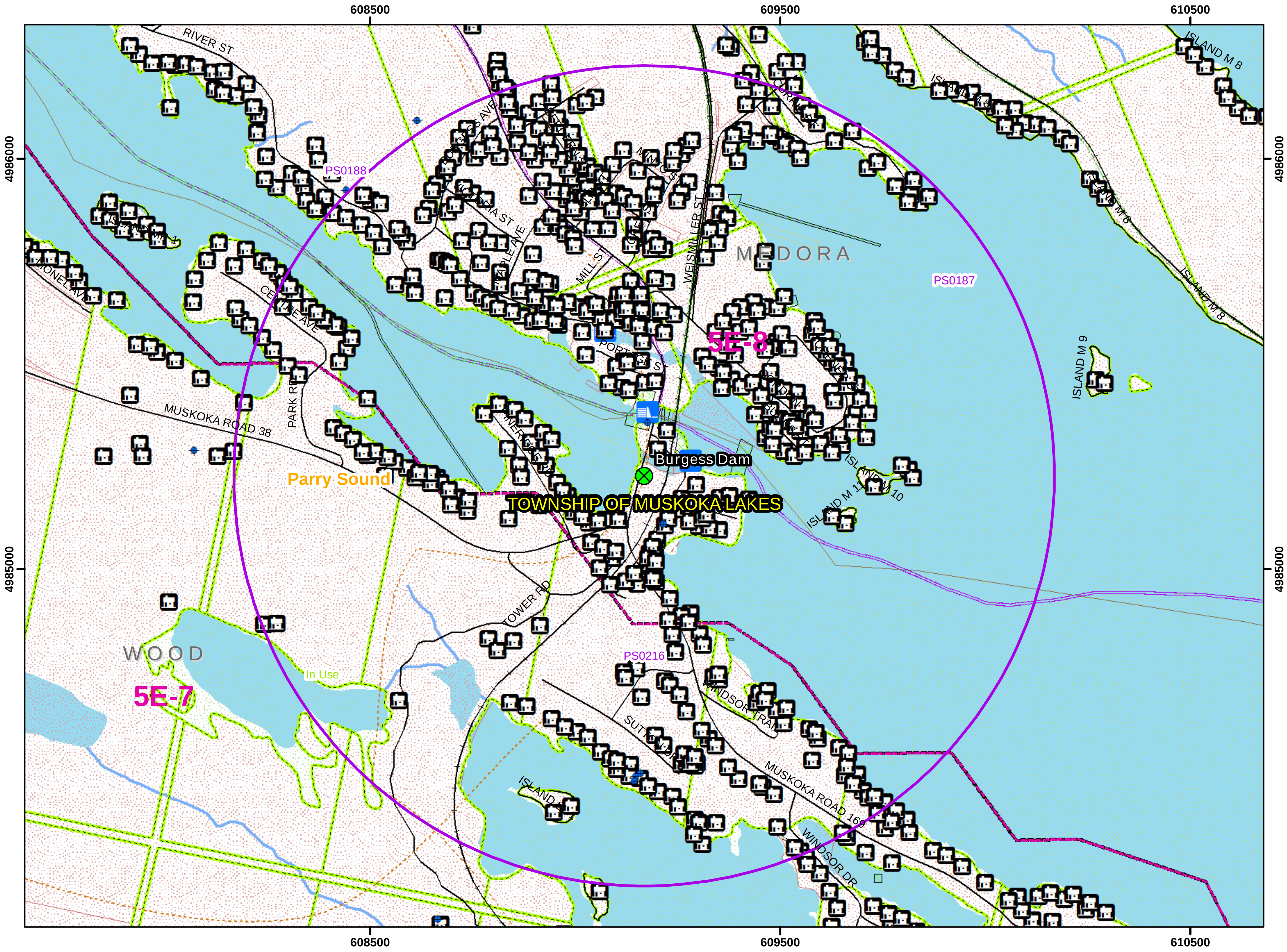
SCALE: 1:10,000

DATE: 30/01/2020

Data Provided by Land Information Ontario:
Data updated as of February 2018.

N

TULLOCH
ENVIRONMENTAL



Coordinate System: NAD 1983 UTM Zone 17NTransverse Mercator

0 0.2 0.4 0.8 1.2 1.6 Kilometers

User Name: Kelly.Major

Burgess Dam
Project # 191493

Natural Heritage
Background Review
- Land Uses -

Legend

- Groundwater Well
- Building
- Dam
- Trail Segment
- Local Road
- Rail Line
- Township
- Ecodistrict
- Municipalities
- Geographic Lot Fabric
- Trapline License Area
- Bait Harvest Area
- MNRF District
- Crown Land Non-freehold Disposition
- Patent Land
- Crown Land
- OHN Waterbody
- OHN Watercourse

SCALE: 1:10,000

DATE: 30/01/2020

Data Provided by Land Information Ontario:
Data updated as of February 2018.

N

TULLOCH
ENVIRONMENTAL

Coordinate System: NAD 1983 UTM Zone 17NTransverse Mercator

Kilometers
0 0.2 0.4 0.8 1.2 1.6

User Name: Kelly.Major

Burgess Dam
Project # 191493

Natural Heritage Background Review - Protected Areas -

Legend

— Local Road
┼ Rail Line
▨ OHN Waterbody
— OHN Watercourse

CLUPA Designation

▨ General Use Area

SCALE: 1:10,000

DATE: 30/01/2020

Data Provided by Land Information Ontario:
Data updated as of February 2018.

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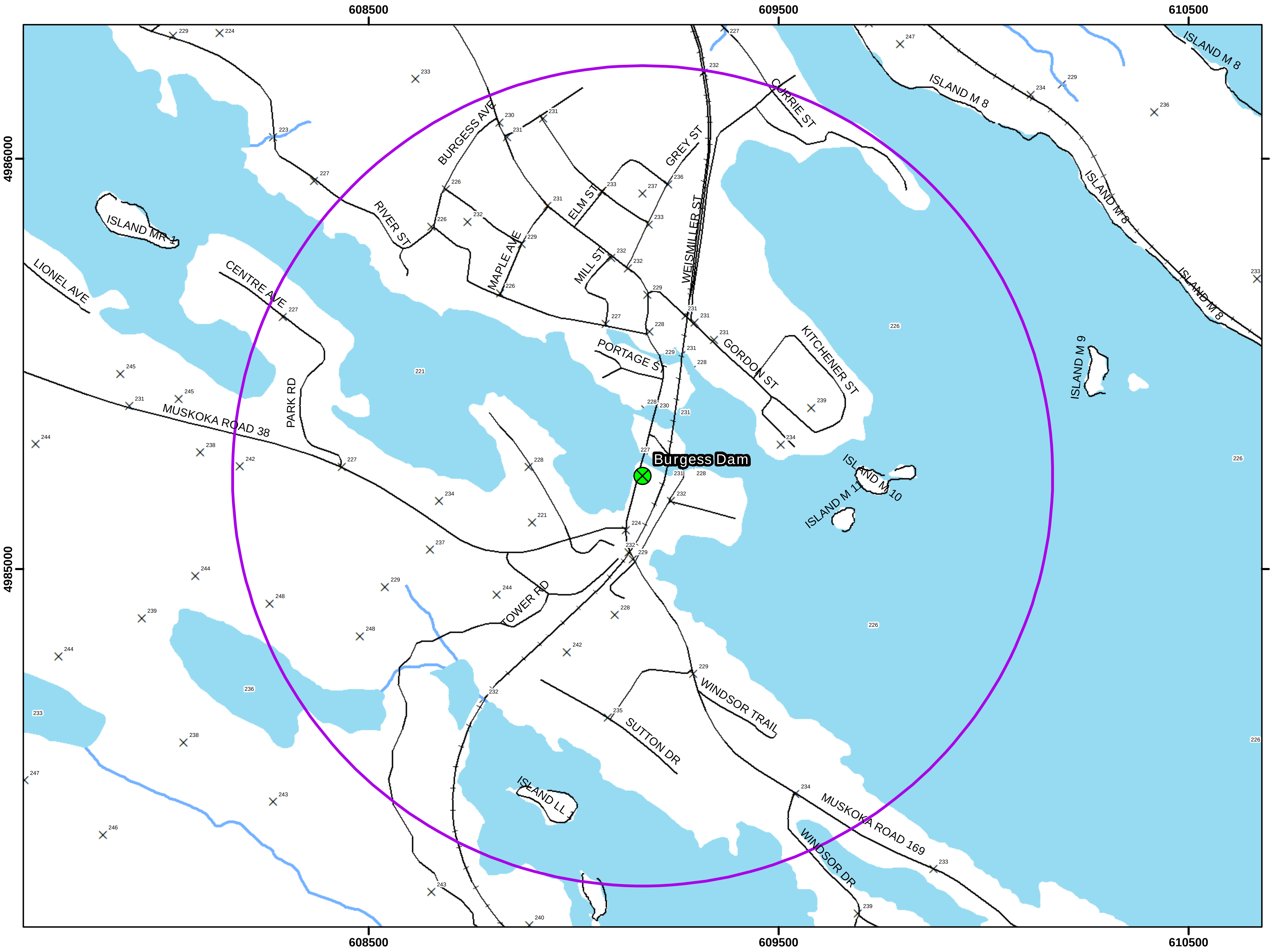
Burgess Dam
Project # 191493

Natural Heritage
Background Review
- Surficial Geology -

Legend

—	Local Road
┼	Rail Line
🟦	OHN Waterbody
─	OHN Watercourse
×	Spot Height



SCALE: 1:10,000

DATE: 30/01/2020

Data Provided by Land Information Ontario:
Data updated as of February 2018.

Coordinate System: NAD 1983 UTM Zone 17NTransverse Mercator

0 0.2 0.4 0.8 1.2 1.6 Kilometers

User Name: Kelly.Major

TULLOCH
ENVIRONMENTAL

Emelia Myles-Gonzalez

From: Emelia Myles-Gonzalez
Sent: February 12, 2020 9:50 AM
To: NHI ParrySound (MNRF)
Subject: RE: Natural Heritage Information Request - Tulloch - Burgess Dam in Bala, ON

Thank you Jake.

I will review your information and let you know if I have any questions.

Regards,

Emelia Myles-Gonzalez
Aquatic Biologist

TULLOCH
ENGINEERING

Tel: 705 522 6303
Cell: 613 985 6961

TULLOCH Engineering Inc
1942 Regent St, Sudbury, ON P3E 5V5
emelia.myles-gonzalez@TULLOCH.ca | TULLOCH.ca

From: NHI ParrySound (MNRF) <NHI.ParrySound@ontario.ca>
Sent: February 12, 2020 9:48 AM
To: Emelia Myles-Gonzalez <emelia.myles-gonzalez@tulloch.ca>
Subject: RE: Natural Heritage Information Request - Tulloch - Burgess Dam in Bala, ON

Hi Emelia,

Please see information below:

All SAR information is to be request from MOE.

The location of the Burgess dam is incorrectly marked on the maps.

You seem to be relying on fish online rather than direct LIO data which is more complete.

Lake Muskoka is ~12040 ha not 120.4 and is considered coldwater.
Lake Muskoka fact sheet is attached – is somewhat out of date but may have some useful info.

Bala Reach. Fact sheet attached and data is in LIO (ARA summary), not fish online.

There is a walleye spawning area - mapped as an area that includes the Burgess tailrace all the way over to the main Bala Falls. Other typical species that spawn in that type of habitat can be expected as well, such as smelt and suckers. The Burgess plant has normally run as a run-of river plant and there has not been any flow requirements in the water management plan. Work that requires plant shutdown (shutting off of flow through the dam/plant) should be scheduled to avoid the spring spawning period (April 1 – June 1). Same recommendation applies for work in water.

There is also a potential spawning area mapped on the upstream, Lake Muskoka, side between Burgess and North Bala dam. It must have been mapped based on habitat as it does not seem to be a great location.

Margined madtom may be present as they do occur in Lake Muskoka and they like that rocky kind of habitat that is in the tailrace.

The EA documents for the Bala Falls project which may have some material of interest are on the Swift River web site (balafalls.ca).

If there are any other questions please give me a call.

Jake Rouse

Jeremy Rouse
Management Biologist
Parry Sound District
Ministry of Natural Resources and Forestry

Office: 705-773-4205

From: Emelia Myles-Gonzalez <emelia.myles-gonzalez@tulloch.ca>
Sent: Monday, February 3, 2020 2:33 PM
To: NHI ParrySound (MNRF) <NHI.ParrySound@ontario.ca>
Subject: Natural Heritage Information Request - Tulloch - Burgess Dam in Bala, ON

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hello,

On behalf of Tulloch Environmental, a branch of Tulloch Engineering, I am seeking any Natural Heritage Information you may have for the proposed rehabilitation of the Burgess Dam and Generating Station in Bala, Ontario. All information gathered from online resources is summarized in the attachment, as well as a site map and maps showing Aquatic Features, Terrestrial Features, Protected Areas and Land-use Features.

A list of the requested information is outlined in the letter attached above. We understand that MNRF does not provide information on SAR, but would appreciate any additional information on tracked or locally rare species. A restricted species was retrieved in our background review. If you require proof of Sensitivity training for this information please let me know.

Thank you for any information you can provide. I look forward to hearing back from you,

Emelia Myles-Gonzalez
Aquatic Biologist

TULLOCH
ENGINEERING

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Cell: 613 985 6961

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Ministry of Natural Resources

Ontario

Natural. Valued. Protected.

Lake Fact Sheet – Parry Sound District

Lake Muskoka

Location

Official Name:	Lake Muskoka	*Local Names:*	
County/District:	Muskoka	*Geographic Twp:*	Muskoka
Municipality:	Township of Muskoka Lakes	*MNR Admin. Area:*	Bracebridge
Lat./Long:	45.054 N -79.475 W	*UTM (NAD83):*	17 620081 4990037
Topographic Map (1:50,000):	31E03	*Drainage Basin:*	Muskoka River

Physical Features

Surface Area (ha):	12,100	*Maximum Depth (m):*	73	*Mean Depth (m):*	18
Elevation (m asl):	225	*Perimeter (km):*	269	*Island Shoreline (km):*	209
Volume (10^4 m^3):	183,000	*Watershed (km^2):* (excludes area of lake)	4,600	*Water Clarity:* (varies across the lake)	3.5

Land Use and Development

Crown Land (%): 0 *Provincial Parks:* Hardy Lake Provincial Park

Shoreline Development:	Intense; urban, shoreline residential, commercial,
Access:	Public launches: Bracebridge - George Road, Beaumont Drive; Gravenhurst – Muskoka Wharf; Bala; Milford Bay and others; private access through several marinas.
Water Level Management:	Regulated; water level is controlled by MNR-owned and operated dams at Bala. Flows and levels are governed by the Muskoka River Water Management Plan.

Fish Species

Major Fish Species:	brook trout (E), lake trout (S), lake whitefish (R), Cisco (R), rainbow smelt (I), northern pike, burbot, smallmouth bass (I?), largemouth bass (I?), walleye (I?),
Other Fish Species:	longnose sucker, white sucker, lake chub, golden shiner, common shiner, blacknose shiner, spottail shiner, spotfin shiner (I), bluntnose minnow, black bullhead (?), brown bullhead, margined madtom (I?), trout-perch, rock bass (I), pumpkinseed, black crappie (I 1989), yellow perch, Iowa darter, logperch, cisco, Slimy Sculpin, Spoonhead Sculpin

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Parry Sound Area office: (705) 746-4201
Bracebridge Area office: (705) 645-8747

Other Species:	spiny water flea (I 1989), freshwater jellyfish (I 2002)

Notes: E: extirpated, I: introduced – intentional or accidental, O: occasional, R: remnant, S: currently stocked, ?: status uncertain, 2009: year of first record or introduction if known, blank: presumed native

Fisheries Management

Fisheries Management Zone:..15

Designation for Lake Trout Management: designated; natural reproduction; not at development capacity

Fishing Regulation Exceptions:	No lake-specific exceptions (2009); Muskoka River; Bracebridge Falls and South Falls to Lake Muskoka: Fish sanctuary - no fishing from Apr. 1 - June 15 (2009)
Current Stocking:	Lake trout – supplemental, some natural reproduction occurs, stocked every year with yearlings.
Historic Stocking (last year stocked):	brown trout (1933), smallmouth bass (1949), walleye (1989), rainbow trout (1983), brook trout (1961), splake (1961)
Contaminants:	Species tested: lake trout, northern pike, walleye, smallmouth bass, yellow perch, rock bass, brown bullhead, rainbow smelt

Assessment: Completed Projects:

1988	contaminant sampling
1989	benthic invertebrate sampling
1989-94	zooplankton sampling
1990	critical habitat mapping
1990-91	vegetation mapping
1992-93	winter creel survey
1993	summer creel survey
1993-94	substrate mapping
1993-94	contaminant sampling
1993-95	small fish survey
1995	development mapping
1995	cisco study
1995-96	spring littoral index netting
1998	summer creel survey
1998	lake trout spawning observations
1998	contaminant sampling
1998-99	spring littoral index netting
2001	near shore community index netting
2003	Summer Profundal Index Netting (targets lake trout) (SPIN)
2005	SPIN
2002-06	Fall Walleye Index Netting
2007	Broad-scale Monitoring (BsM)– large mesh (generalized fish community assessment
2008	BsM – small mesh
2010	BsM – large mesh
2014	Broad-scale Monitoring (large and small mesh netting)
Annual	ice hut count

Lake Fact Sheet – Parry Sound District

Lake Muskoka

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Bracebridge Area office: (705) 645-8747

Lake Fact Sheet – Parry Sound District

Lake Muskoka

Synopsis

Lake Muskoka is the largest inland lake in the District of Muskoka and MNR’s Parry Sound District. It supports a large diverse sport fishery. The lake is highly developed and has been greatly perturbed by water management, contaminants, shoreline development and species introductions.

Lake trout were the primary native sport fish species. The population went into serious decline in the 1970’s at least partly due to reproductive failure from DDT contamination. The population has not fully recovered; supplemental stocking still occurs. Lake whitefish and lake herring (cisco) populations have been severely depressed as well and are currently present in low numbers, but believed to be increasing. The walleye population crashed as well. Rehabilitation efforts including water level control, habitat improvement, harvest regulation and stocking have largely restored the population.

A disjunct population of margined madtom, a small, secretive member of the catfish family, occurs in Lake Muskoka. It is not known if the population is native or introduced. Margined madtoms are rare in Ontario and are listed as Data Deficient by the Committee on the Status of Species Endangered Wildlife in Canada (COSEWIC 2002).

Fish habitat features along the shoreline of Lake Muskoka have been mapped and provided to municipalities for use in municipal planning. Inquiries regarding the application of this information should be directed to the relevant municipality.

Lake Muskoka is a ‘fixed’ lake for the provincial Broad-scale Monitoring Program. Repeated sampling on a five year cycle is planned to monitor long-term trends in water quality, fish community and sport fish abundance in randomly selected lakes across the province.

2014 Broad-scale Monitoring

Lake Muskoka was sampled in 2014 as a “trend” lake for the Cycle 2 of the provincial Broad-scale monitoring program. Results will be reported through that program. Two species not previously documented were captured; Slimy Sculpin and Spoonhead Sculpin. Both species are thought to be native to the lake.

Updated: 2018

Refer to Lake Fact Sheet Interpretation document for explanation of content.

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Lake Fact Sheet – Parry Sound District

Bala Reach

Location

Official Name:	Moon River	*Local Names:*	Bala Reach
County/District:	Muskoka	*Geographic Twp:*	Medora, Wood
Municipality:	Township of Muskoka Lakes	*MNR Admin. Area:*	Bracebridge
Lat./Long:	45.025 N 79.642 W	*UTM (NAD83):*	17 607002 4986580
Topographic Map (1:50,000):	31E04	*Drainage Basin:*	Moon River, Musquash River

Physical Features

Surface Area (ha):	307	*Maximum Depth (m):*		*Mean Depth (m):*	
Elevation (m asl):	225	*Perimeter (km):*		*Island Shoreline (km):*	
Volume (10^4 m^{3}):		*Watershed (km^2):*	4700 (excludes area of lake)	*Water Clarity (m):*	

Land Use and Development

Crown Land (%): 10 *Provincial Parks:* None

Shoreline Development: High

Access: Public; boat launch and public docks in Bala

Water Level Management: . Regulated; Ontario Power Generation owned and operated dams at Swift Rapids Generating Station and Moon River control dam
Water level is managed in accordance with the Muskoka River Water Management Plan

Fish Species

Major Fish Species: Northern Pike, Smallmouth Bass, Largemouth Bass, Black Crappie (I 2004)), Walleye

Other Fish Species: Brown Bullhead, Emerald Shiner, Hornyhead Chub (I), Logperch, Longnose Dace Pumpkinseed, Rock Bass, White Sucker, Yellow Perch, Rainbow Smelt (I 1980)

Other Species: Spiny Water Flea

Notes: E: extirpated, I: introduced – intentional or accidental, O: occasional, R: remnant, S: currently stocked, ?: status uncertain, 2009: year of first record or introduction if known, blank: presumed native

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Parry Sound District office: (705) 746-4201
Bracebridge Area office: (705) 645- 8747

Lake Fact Sheet – Parry Sound District

Bala Reach

Fisheries Management

Fisheries Management Zone: 15

Designation for Lake Trout Management: .... not designated

Fishing Regulation Exceptions .... no lake-specific exceptions

Current Stocking: .... none

Historic Stocking (last year stocked): .... Walleye (1943-1954, 1997-2000)

Contaminants (species tested): .... Walleye, Smallmouth Bass, White Sucker

Assessment: Completed Projects:

1980	Fish Community Survey (trap net and gill net)
2004	ESTN Trap Net Survey
2017	MOE Contaminant Sampling

Synopsis

Bala Reach is a lake-like section of the Moon River located between Bala and Swift Rapids. It has not had a complete inventory conducted but several fish community surveys have been done.

In the early 2000s, efforts were made by the local community, supported by MNRF, to rehabilitate the Walleye population. Like Lake Muskoka, upstream, the Walleye population had collapsed decades previously, probably due to a combination of water level fluctuations, introduced Rainbow Smelt and pesticide use. Habitat enhancement, stocking and possibly downstream movement of fish from the previously rehabilitated Lake Muskoka population resulted in successful re-establishment of a population and fishery.

Updated: 2018

Refer to Lake Fact Background Information document for explanation of content.

APPENDIX C

Project Staff

PROJECT STAFF

Kelly Major, M.Sc. EP is a Terrestrial Ecologist at Tulloch Engineering. He has worked professionally throughout Ontario for seven years in consulting, government and academic sectors. His areas of specialization include Species at Risk, habitat assessment, wetland evaluation and biostatistics. As an academic, Kelly has acted as principal investigator for various studies in community ecology, plant invasion and silviculture. His research has been peer-reviewed and published. With the Ministry of Natural Resources and Forestry (MNRF), he surveyed wildlife biodiversity across the province and built statistical models forecasting forest succession for Boreal Ontario. As a consultant with Tulloch, Kelly leads Species at Risk surveys, wetland evaluations (Ontario Wetland Evaluation Systems) and terrestrial habitat description (e.g. Ecological Land Classification). He performs impact assessments at sites of proposed development and prepares site specific mitigation strategies appropriate to the nature of the habitat alteration and the sensitivities present. He also serves as data analyst for Tulloch's environmental department; managing and mapping spatial data in ArcGIS and modeling quantitative data using univariate and multivariate statistical techniques.

Emelia Myles-Gonzalez, M.Sc. is an Aquatic Biologist for TULLOCH Engineering. She has extensive knowledge of aquatic habitats and ecosystems. She has worked as an aquatic biologist at Tulloch for 2 years, and previously worked in academic sectors. Emelia's focus is on aquatic habitat assessments, cause-effect monitoring, community composition assessments and environmental baseline and contaminant monitoring. Emelia has excellent oral and written communication skills, preparing reports, scientific papers, permit and grant applications, and presenting at numerous international conferences. She has experience collecting, organizing and reporting on data from water, soil and sediment quality measurements, habitat assessments, fisheries/macroinvertebrate collections and environmental impact assessments. Emelia has played an integral role in study design, sample collection, statistical analyses, interpretation and reporting on numerous projects. Emelia has acted as a principle investigator on projects involving the Department of Fisheries and Oceans and the Great Lakes Fisheries Commission.

Bill Tibble, M.Sc. is the Environmental Department Lead at Tulloch Engineering. He has worked professionally throughout Canada for 15 years as an Aquatic Biologist/Ecologist in the environmental consulting, government, and academic sectors. His areas of specialization include environmental effects monitoring, environmental assessment, environmental baseline studies, and aquatic habitat characterization. He has taken part in each stage of project development, including study design, data collections and interpretation, permitting, reporting and post-construction monitoring. Bill has acted as the principle investigator for various projects requiring liaising with regulators such as Fisheries and Oceans Canada and the Ministry of Natural Resources and has obtained the required advice, authorizations and permits for numerous projects involving in-water work.

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APPENDIX E

Burgess Turbine Assessment

SITE ASSESSMENT REPORT

RESULTS AND RECOMMENDATIONS

BURGESS 1 DAM

TULLOCH
ENGINEERING

TOWNSHIP OF
MUSKOKA
Lakes™

ATTENTION: Erik Giles, P.Eng

REVISION SUMMARY			
REVISION	**DATE**	**PREPARED BY**	**APPROVED BY**
A	2021-04-03	Ian Shea	Henk de Ridder
B	2021-04-20	Ian Shea	Henk de Ridder
C	2021-05-11	Ian Shea	Henk de Ridder

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REPORT SUMMARY

Introduction

Norcan Hydraulic Turbine Inc. was contracted by Tulloch Engineering with the Township of Muskoka Lakes to perform a site assessment at the Burgess 1 hydroelectric generating station, located in Bala, Ontario. The purpose of the site assessment was to identify the current condition and operational characteristics of the station's existing equipment and provide a recommendation for continued power generation, in consideration of Tulloch Engineering's concurrent Municipal Class Environmental Assessment Study. The assessment was completed on March 18, 2021 and the results have been summarized to reflect the purpose of the evaluation.

Building Condition

Previously, Tulloch completed a Dam Safety Review (DSR) in September of 2019, triggered by a flood event in the spring of 2019. The Burgess 1 facility was considered to be in "poor to fair safe condition". Based on the assessment observations, the previous evaluation is considered accurate. Access to the station is unobstructed and points of egress are adequately maintained. The building structure appears sound from the exterior, but the roof façade is unfinished and structural supports weave throughout the station footprint and existing hydroelectric equipment. The interior is typical of low-output generating stations of similar vintage, where consistent reinvestment has been redirected to maintain other aspects of the municipal budget. Concrete segments of the walls and floors are cracked, broken, oil soaked, and built up with grime and dirt. Minimal to no leakage through the concrete dam was observed and the underside of the roof was dry and free of debris. Structural additions and access platforms are rudimentary in construction but functional. Missing safety features surrounding platforms, exposed junction boxes, and electrical equipment should be a concern for immediate remedy. Currently, no site safety plan or enforcement was noted and the plant operation safety protocols were unknown. The plant operator's limits of responsibilities were unidentifiable and leads to the assumption that the plant operation is likely controlled remotely, off site. Integration of a Job Safety Analysis (JSA) program in the future would help identify and control all of the hazards and conditions related to the operations, duties, and environments of the hydroelectric power station.

Intake/Discharge Canal

The exterior upper mezzanine houses the intake head gate and trash rack system. The upstream channel is narrow and a vehicle overpass reduces the channel width substantially. The head gate appears to be in good condition while the visible sections of the trash racks appeared clear and maintained. No conclusions could be drawn regarding the condition of the intake pipe and stream base without the complete facility dewatered. There are two separate turbines with two separate draft tubes. The modified machine's draft tube was visible from the best access point but the OEM Francis machine's draft tube was not. The outlet of the draft tube of the modified turbine is obstructed by rocks from the nearby wall embankment. Localized excavation under the draft tube and surrounding discharge area is recommended to reduce flow restrictions and the wall should be repaired to prevent further erosion. Access into the discharge canal was not possible, so observations on the condition of the original draft tube could be made during the inspection.

Hydro-Mechanical Equipment

The life expectancy of the existing mechanical equipment is difficult to address considering access wasn't available to the interior of the hydraulic passage and turbine equipment. Both machines were not operational during the inspection so limited information surrounding current generation capacity and operational characteristics were obtainable. Generally, the original Francis turbine poses a greater risk for failure due to the vintage of the machine and a thorough mechanical inspection should be completed. It could be suggested that the Francis turbine has surpassed its manufacturer's life expectancy and has likely undergone repairs in the past to maintain generation capability. Other equipment owners have classified the operation of similar turbines as a "run-to-fail" mode, where an equipment failure could result in replacement costs that could be substantially covered by their insurance companies. Based on the results, an increased maintenance schedule or considerations to replace in-kind with new materials for continued generation could be required.

The retrofitted axial flow machine and equipment appeared to be in good condition but detailed information on the equipment capacity and efficiency are unavailable. The outer surfaces were in fair to good condition, by visual examination. If properly maintained since it's installation, and assuming sound engineering and design, the machines should be designed with a minimum 20-year lifespan on major components. With any machine, an operation and maintenance manual that defines the scheduled maintenance requirements, based on the type of equipment installed is normally included with the equipment. Further assessment would aid in developing more substantial conclusions but would require a more detailed inspection of the machine with the station safely dewatered. Once completed, a period of testing should be conducted to evaluate the existing machine's performances.

Further Inspection

There are two tiers of inspections that can be typically be done, on site and in shop. Depending on the type and size of the machine, on site inspections may not be appropriate for the scope of work. For example, inspecting the incline machine on site would result in a dependable assessment of the condition of the turbine, as a whole. Typical findings could include a buildup of debris, damage to the turbine (caused by debris, cavitation, or erosion due to a high particulate count (sand) in the river water quality analysis) and increased/asymmetrical bearing wear. Misalignment of the turbine is a major contributor to a reduced lifespan and should be the greatest concern when performing the inspection. Disassembly of the turbine assembly and inspecting internal components on site is typically not recommended but can be done. Removing the turbine from the station and performing a Condition Assessment in a controlled shop environment would allow all critical diameters, clearances, and fits of the full assembly to be evaluated, but wouldn't be recommended unless results from an initial inspection justified the increased attention. An on-site inspection could cost between $30K-$40K, under minimum assumptions and conditions. From an estimate of that magnitude, it is easy to infer the difficulty and risk of owning and operating a small hydro facility that doesn't produce a substantial amount of generation. A typical shop inspection would go into further detail and provide an opportunity to replace major components if necessary. The costs are dependent on the scope of work but would be assumed to be greater than the on-site inspection due to the removal, logistics, and installation costs associated with it.

Continued Operation and Generation

Many influences have significant merit in the construction, operation, and maintenance of a hydroelectric facility. Environmental factors, safety, financial, political, and among others, need to be addressed and weighted in any decision for a long-term investment. In consideration of the generation revenue alone, a modern replacement turbine and generator rated for the available energy could have a capital cost of between $400,000 - $600,000 before including civil costs of a new power station. Assuming the major electrical equipment is reusable (switchgear, transformer, protection relays, excitation system, control system, etc.), the modern replacement turbine would include a thrust bearing, HPU, brake assembly, and additional instrumentation for condition monitoring. Cost estimates for the remaining equipment for a 200kW machine could vary between $80K-$150K, depending on the level of technology and integration. Other costs related to condition monitoring, operation, and maintenance would be need to be included on an annual basis. Estimated costs for typical consumables (oil, brake pads, grease, spare instrumentation, filters, etc.) shouldn’t exceed $3K/year. Each 10-year milestone could involve replacing bearing pads, seals, HPU components, etc. that wouldn’t necessarily carry a large material cost (around $5K) but could vary between $10K-$20K to cover the replacement labour costs. Maintenance inspection costs will depend on the nature of the plant management. Often the equipment supplier will provide operator training in addition to the OEM warranty period. Outsourcing to a local mechanical outfit is an option but may carry a higher cost. If replacement was considered or required, a single turbine with a wide operating range would be ideal. A double regulated, axial-flow Kaplan turbine would provide the most efficient generation over the largest operating range for low-head sites. This would likely require removal of most of the existing equipment, modifications to the civil structure’s floor and excavation in the discharge canal. If repairs to the dam structure were required, replacing the turbine at the same time would be the most cost-effective.

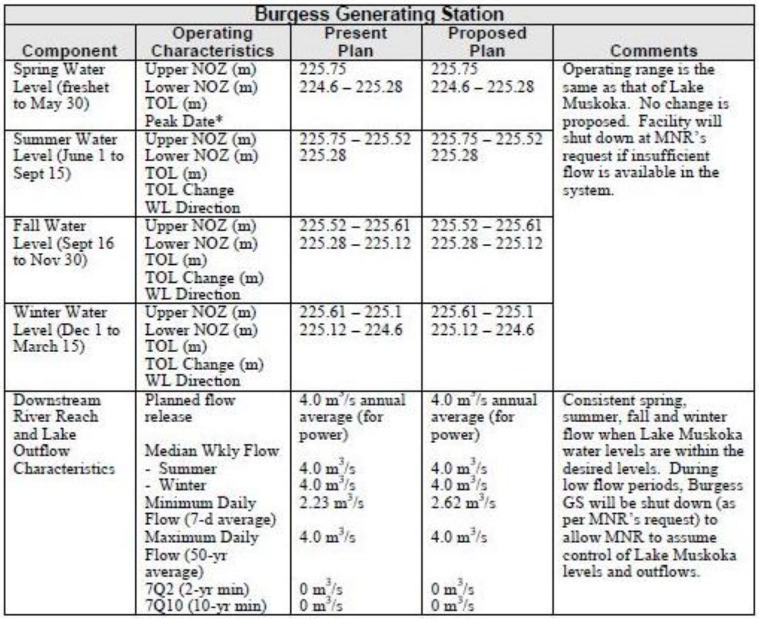
In consideration of the information available from the Muskoka River Water Management Plan, the average available head of 5.25 meters and the maximum available discharge rate of 4.0 m^3/s should produce nearly 185 kilowatts under ideal conditions, using a modern turbine design arrangement and high efficiency generator. Maximum potential generation could reach as high as 210 kilowatts under maximum head levels and discharge rates. Increased generation capacities would require a greater pond elevation and/or increased discharge rates, which would require further study on any upstream channel restrictions and surrounding public properties. At a modest $0.08/kW, operating at the upper bound normal operating limit (NOL El. 225.75 masl) and an average annual flow of 2.62 m3/s, the average annual revenue could be upwards of $90,000. Considering a 20% annual reinvestment schedule for operation and maintenance, a ten-year return on investment of the capital cost of the turbine equipment could be achievable. Under the assumption that the major equipment will be designed for a 50-year life expectancy, replacing the existing station with a modern hydroelectric generating solution could be considered favourable. Additional estimates and schedules would need to be measured to develop a sound conclusion, based on further due diligence. No information surrounding the current generation production or revenue was available for review and providing a valuation on the existing equipment is outside the scope of this report. With the available energy and a sufficient power purchase agreement, reinvesting into the generating station could remain an economical decision for the Township. Ultimately, the generation potential is dependent on the Ministry of Natural Resources (MNR), as the discharge allowances must satisfy watershed requirements and maintain the lake levels for local residents and the large tourism industry during the summer season.

1. INTRODUCTION

The Township of Muskoka Lakes owns and operates, under contract, the Burgess 1 Dam located in Bala, Ontario. It was constructed between 1917 and 1922 and was purchased by the Ontario Power Commission in 1929 who operated the dam until 1957. The Township purchased the dam in 1963 and in recent years the Township has leased it to various companies who have operated it as an active hydroelectric generating station.

The Township has retained the services of Tulloch Engineering to conduct a Municipal Class Environmental Assessment Study for the rehabilitation or replacement of the Burgess 1 Dam facility. The EA Study is currently ongoing, and has completed the first public consultation on September 9, 2020, which included a public survey on the interest of the future of the generating station.

The facility is located on Lake Muskoka adjacent to the MNR controlled Bala North and Bala South dams, and provides a flow of 0.5 to 4 m3/s into the Bala Reach. The facility is advised (by MNR) when there is sufficient water to operate, and when it must shut down (typically when both Bala North and Bala South dams are closed and water levels on Lake Muskoka are falling below the NOZ). The facility will cease operations within 24 hrs of the notification by MNR to shut down. The upper and lower limits are typically within the normal operating zone (NOZ) of Lake Muskoka, but these are not a compliance zone for the facility. As outflow from Lake Muskoka increases, flow is sequentially allocated to Burgess GS, then Bala South and lastly Bala North dam. Under declining flows, the priority of flow sequence is reversed.



Burgess Generating Station				
Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date*	225.75 224.6 – 225.28	225.75 224.6 – 225.28	Operating range is the same as that of Lake Muskoka. No change is proposed. Facility will shut down at MNR's request if insufficient flow is available in the system.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	225.75 – 225.52 225.28	225.75 – 225.52 225.28	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.52 – 225.61 225.28 – 225.12	225.52 – 225.61 225.28 – 225.12	
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.61 – 225.1 225.12 – 224.6	225.61 – 225.1 225.12 – 224.6	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.23 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.62 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	Consistent spring, summer, fall and winter flow when Lake Muskoka water levels are within the desired levels. During low flow periods, Burgess GS will be shut down (as per MNR's request) to allow MNR to assume control of Lake Muskoka levels and outflows.

Figure 1: Burgess 1 Dam – Water Levels

Norcan Hydraulic Turbine Inc. was approached by Tulloch Engineering to perform a site visit at the Burgess 1 Dam generating station, located in Bala, Ontario. The purpose of the site visit was to conduct a generalized site assessment, which included identifying the existing hydromechanical and hydroelectrical equipment installed in the generating station, making qualitative observations surrounding the hydro system, and develop a recommendation based on the available information and the results of the assessment.

2. ASSESSMENT & OBSERVATIONS

Access to the station is unobstructed and provides ample space for laydown and mobile crane access. The upstream channel surrounds neighbouring public properties and narrows substantially at a vehicle overpass. The headgate is fabricated in steel and appears to be in good condition and trashrack system appeared clean and maintained.

Figure 2: Burgess 1 Dam – Generating Station Access

Figure 3: Upstream Channel and Intake Headgate System

The roof is partially unfinished and covered in construction polypropylene sheets to maintain the moisture barrier. Snow loads and heavy rainfalls could have significant impact on the structure if not properly maintained and inspected on a regular basis.

Figure 4: Unfinished Roof Surface

The station had originally installed two horizontal, Francis turbines inside a pressure case. Each turbine shaft was coupled to a high-speed generator by a large belt driven system on the end of the shaft.

Figure 5: Original Turbine Equipment (Right-Hand Side)

A recent modification to the machine on the left-hand side (looking upstream) was completed where a new turbine has been retrofitted to one side of the pressure case. Limited information is available, but the turbine appears to be an inclined propeller turbine operating with the original belt driven generator

Figure 6: Recent Machine Modification (Left-Hand Side)

The generators and electrical system are assumed to be original and in fair condition, but should be cleaned to remove dirt and debris. Since the units were not in operation, no further observations could be made.

Figure 7: Generator Nameplate and Electrical Cabinet

The draft tube and discharge area were not accessible, other than visually from near the bay door entrance to the station. The outlet of the draft tube of the modified turbine is obstructed by rocks from the nearby wall embankment. No visible observations were able to be made on the other machine's draft tube, which is assumed to be vertically conical in design.

Figure 8: Draft Tube and Discharge Area

Improvements to the station's general cleanliness and organization would be beneficial. Dirt and grime are prevalent throughout the station and coat much of the stationary equipment. Sections of the concrete in the floor and walls have been cracked and broken or appear oil-stained and should be maintained consistently.

Figure 9: Station Cleanliness and Concrete Degradation/Oil Saturation

3. HISTORY OF BURGESS DAM FROM MARSH HYDROPOWER

Historical observations were uncovered by an original operator from Marsh Hydropower. The original plant was leased by Marsh Hydropower and brought on line in June 1989 and was listed with Ontario Hydro as Bala G.S. The existing Francis runners were 35" William Hamilton running at 180 rpm and geared up to 900 RPM. Efficiency estimates are based on condition of existing equipment and losses due to belt driven generator.

Based on data available at that time:

Head of plant per dwg.: 16 feet (4.87 M)
Flow per MNR: 150 cfs (4.25M/ cu sec)
9.81 * 4.87 * 4.25* 80% = 162 Kilowatts

In review of the outputs on avg. KW output for plant for each month was as follows:

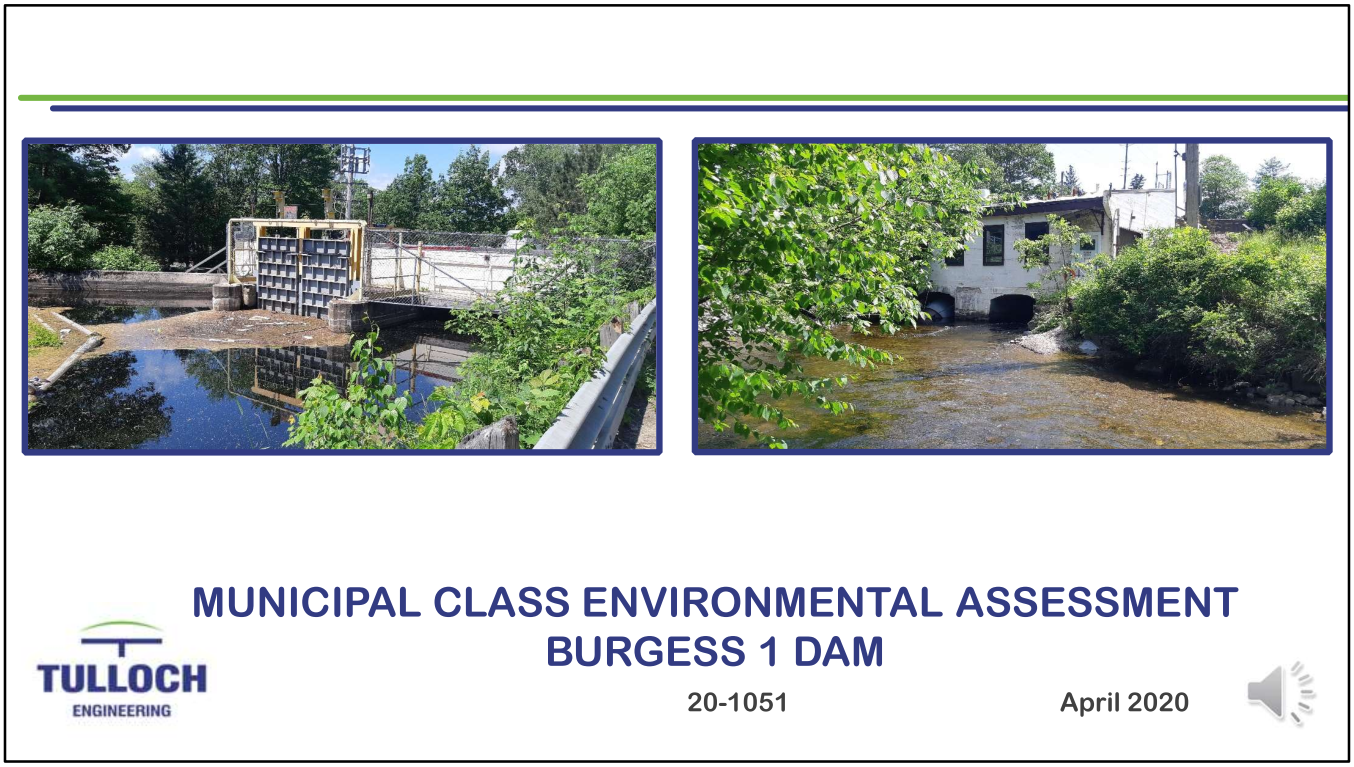
January	120	February	74	March	41
April	96	May	139	June	146
July	143	August	143	September	142
October	120	November	124	December	124

Reference Maintenance/Failures from Historical Information

- Existing runners were coated with Belzona due to poor condition of castings
- Unit near door had a major failure before going on line due to anchor bolts coming out of floor
- Found that there was a secondary pour of concrete over original floor due to existing floor was in poor shape and oil saturated.
- Flywheel, elbow and shaft damaged and either replaced or repaired
- Forebay was drag lined and two dump truck loads of stumps, logs were pulled out
- Review at that time regarding dam safety Marsh Hydropower was told that no excavation on dam face permitted as may comprise powerhouse dam structure.
- Was recommended to monitor amount of leakage through dam structure.

APPENDIX F

PIC Results and Responses



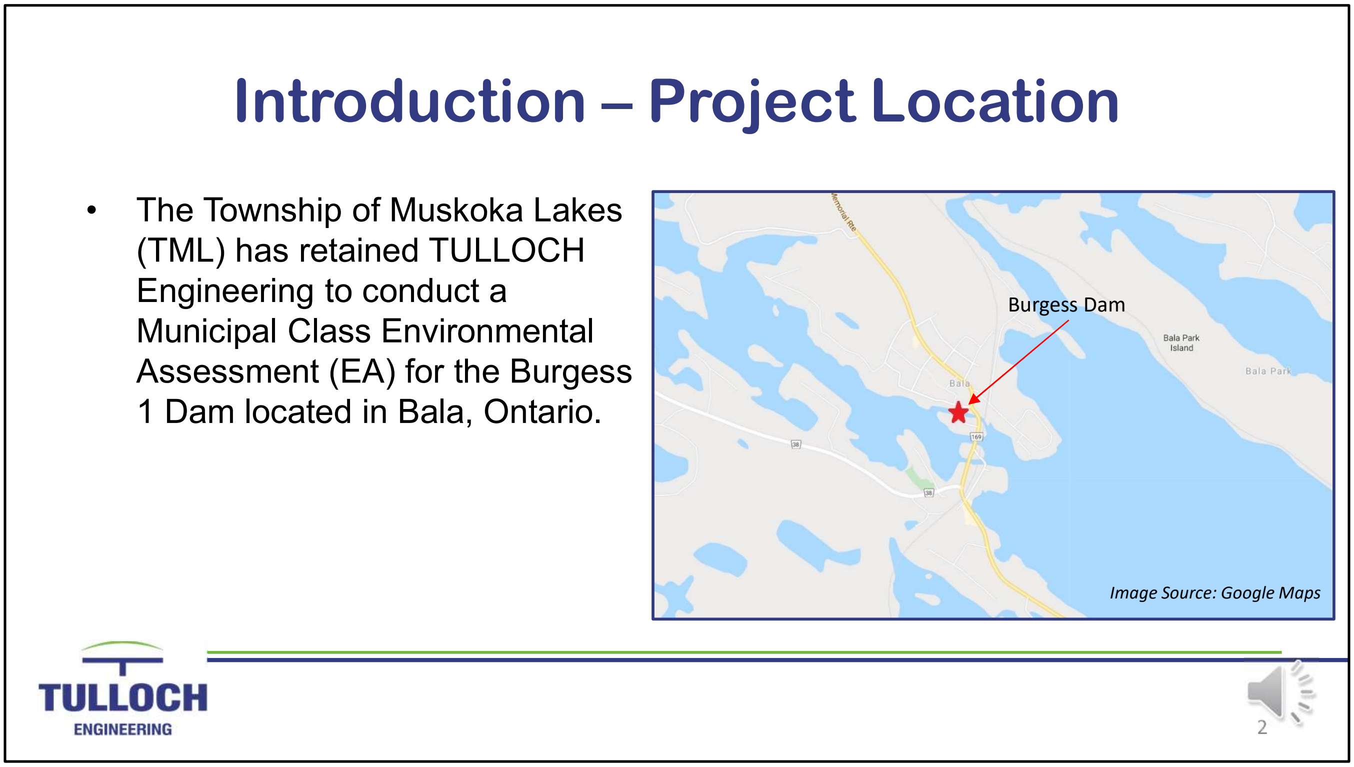
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
BURGESS 1 DAM

TULLOCH ENGINEERING

20-1051

April 2020

Hello and welcome to the Public Consultation Presentation regarding the Municipal Class Environmental Assessment of the Burgess 1 Dam located in Bala, Ontario. Given the recent public health initiatives with respect to the COVID-19 Pandemic including physical distancing and the elimination of large gatherings, this presentation has been put together in lieu of an open house style event where members of the public have the opportunity to learn about the project and provide feedback and input to the planning process. This presentation seeks to educate the public about the proposed rehabilitation and/or replacement of the Burgess 1 Dam.



Introduction – Project Location

- The Township of Muskoka Lakes (TML) has retained TULLOCH Engineering to conduct a Municipal Class Environmental Assessment (EA) for the Burgess 1 Dam located in Bala, Ontario.

Image Source: Google Maps

The Township of Muskoka Lakes has retained TULLOCH to conduct a Municipal Class Environment Assessment for the rehabilitation/replacement of the Burgess 1 Dam located in Bala, Ontario. Pictured to the right is the location of the Burgess 1 dam facility. The dam is currently a small active hydroelectric generating station located west of Highway 169 between Portage and River Streets. The Burgess 1 Dam is owned by the Township. The hydroelectric facility is operated by a contracted third party. The dam is located north of the North Bala Falls Dam and is not associated with that facility. In conjunction with the North and South Bala Falls Dams, the Burgess 1 dam acts as a water control structure between Lake Muskoka located upstream of the dam and the Moon River located downstream of the dam. This places the Burgess 1 Dam at a critical point along the Muskoka River Watershed. More history on the Burgess 1 Dam as well as the purpose of the project will be described later in the presentation.

Introduction – Presenter/Purpose

- **Presenter – Erik Giles, P.Eng.**
  - 7 years of practice, graduate from Queen's University Class of 2012
  - Experience with dam projects including Dam Safety Review and Inspections, design and construction of dam facilities large and small
- **Purpose**
  - Approximate Run Time 30 min
  - Create a transparent and open environment where the public is informed and feedback is welcomed at planning stage of study process.

My name is Erik Giles, I am a professional engineer who currently works for TULLOCH engineering based out of the Huntsville, Ontario office. I graduated in 2012 with a civil engineering degree from Queen's university. Since graduation I have worked in the engineering consulting field for over 7 years including projects that have spanned across Canada. I have been involved with the design and construction of multiple dams. I have also conducted a number of dam safety inspections and was a member of the team responsible for the Dam Safety Review conducted for this dam in the summer of 2019. In addition TULLOCH engineering has had extensive experience in local projects including public consultation for various municipal infrastructure projects including bridges, roads, underground infrastructure and dams.

This presentation has an anticipated running time of approximately 30 minutes and will cover a variety of topics including the EA process, the history of the project as well as proposed alternative solutions. The purpose of this presentation is to inform members of the public of the project and to create an open and transparent environment where feedback is welcomed and incorporated into the decision making process at an early stage in the planning for the Burgess 1 Dam project. The Township of Muskoka Lakes invites you to get involved and wants to ensure that your voice is heard. At the end of this presentation I will discuss ways in which you can get involved with the study and provide feedback.

Presentation Goals

- EXPLAIN ENVIRONMENTAL ASSESSMENT (EA) PROCESS
- HISTORY OF PROJECT SITE
- EXPLANATION OF PROBLEM STATEMENT
- WALKTHROUGH OF PROPOSED ALTERNATIVE SOLUTIONS
- REQUEST FOR FEEDBACK/INPUT AND QUESTIONS

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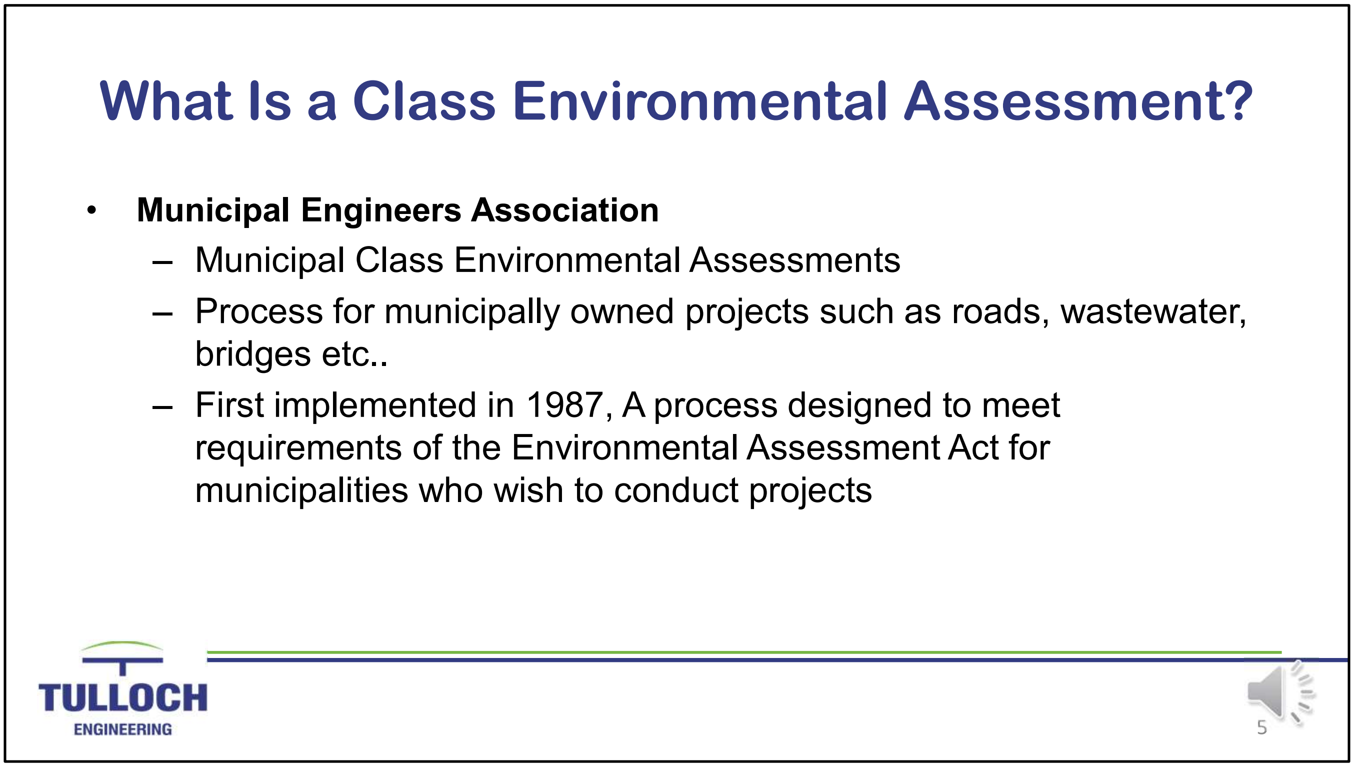
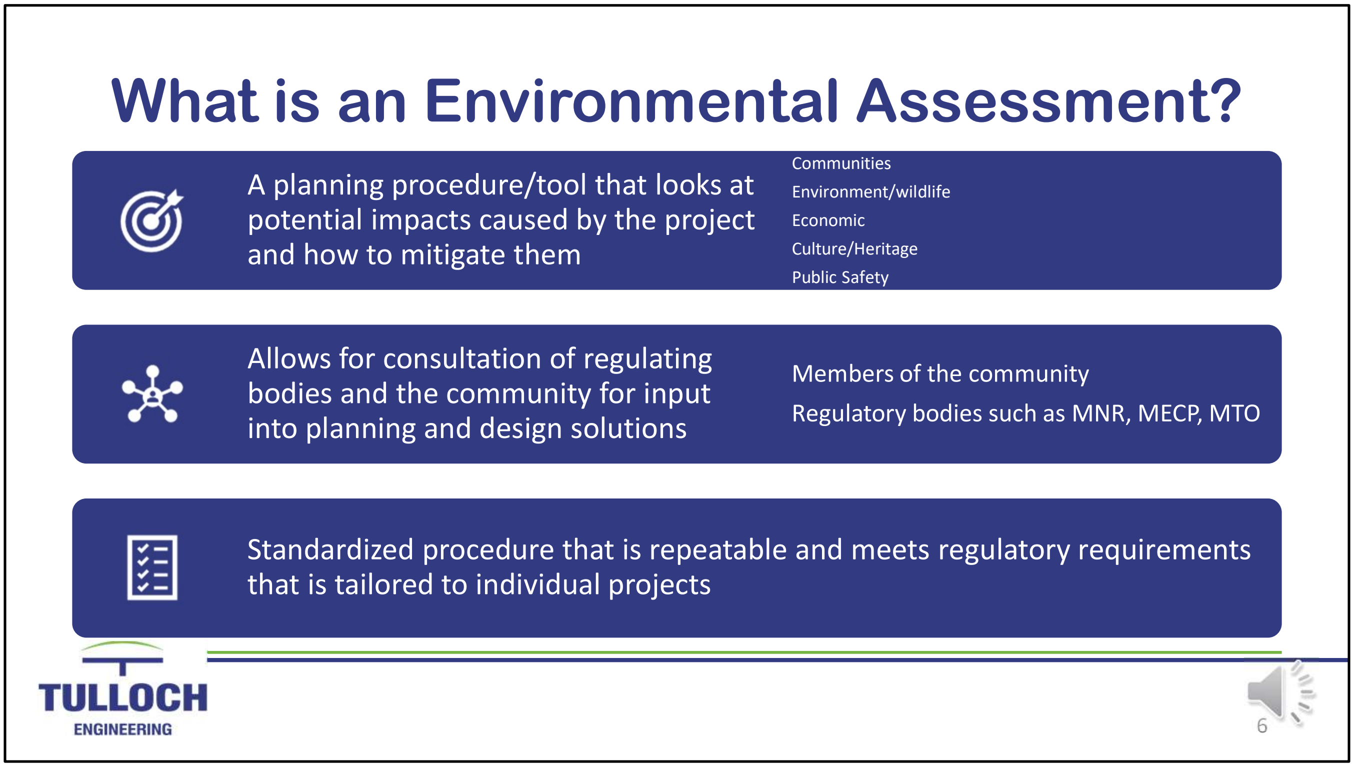
Provided on this slide are the goals I hope to achieve during this presentation. The first objective is to show and explain how a Municipal Class Environmental Assessment works and what the process of the study entails. This will include an introduction to the process as well I will walk you through the steps of the process and explain the purpose of the procedure. After we have discussed the EA process I will then give a brief overview of the history of the Burgess 1 Dam which will help give you context for the current state of the dam and the need for action. The next objective of the presentation is to explain the problem statement as it pertains to the EA and also provide a brief overview of the current state of Burgess 1 dam as well as the events of the spring of 2019 and the findings of the Dam Safety Review conducted in the summer of 2019. The presentation will then provide a walkthrough of the proposed alternative solutions to the problem statement. The alternative solutions will be discussed in turn and the advantages and disadvantages of each will be provided. Finally, a request for feedback and input will be made. I will explain how you can get involved in the study and where you can direct your questions, comments and provide us with valuable feedback to aide in the decision making process.



What Is a Class Environmental Assessment?

- **Municipal Engineers Association**
  - Municipal Class Environmental Assessments
  - Process for municipally owned projects such as roads, wastewater, bridges etc..
  - First implemented in 1987, A process designed to meet requirements of the Environmental Assessment Act for municipalities who wish to conduct projects

When we discuss a Municipal Class Environmental Assessment what that is referring to is a process that was created by the Municipal Engineers Association on behalf of Ontario municipalities, originally implemented in 1987 to aide municipalities in meeting their legal obligations under the Environmental Assessment Act for the implementation of new projects as they pertain to municipally owned infrastructure. As previously mentioned the process is aimed at municipally owned infrastructure. The Class Environmental Assessments are designed to envelope a number of different projects that can follow the same process to fulfill obligations and that can be tailored to fit each project. The EA process is an active process that has been updated over time and a corner stone of the process is public consultation to ensure that members of the public are informed of the project and can have a chance for feedback and input into the selection of a preferred solution prior to implementation of the project.



What is an Environmental Assessment?

A planning procedure/tool that looks at potential impacts caused by the project and how to mitigate them

- Communities
- Environment/wildlife
- Economic
- Culture/Heritage
- Public Safety

Allows for consultation of regulating bodies and the community for input into planning and design solutions

- Members of the community
- Regulatory bodies such as MNR, MECP, MTO

Standardized procedure that is repeatable and meets regulatory requirements that is tailored to individual projects

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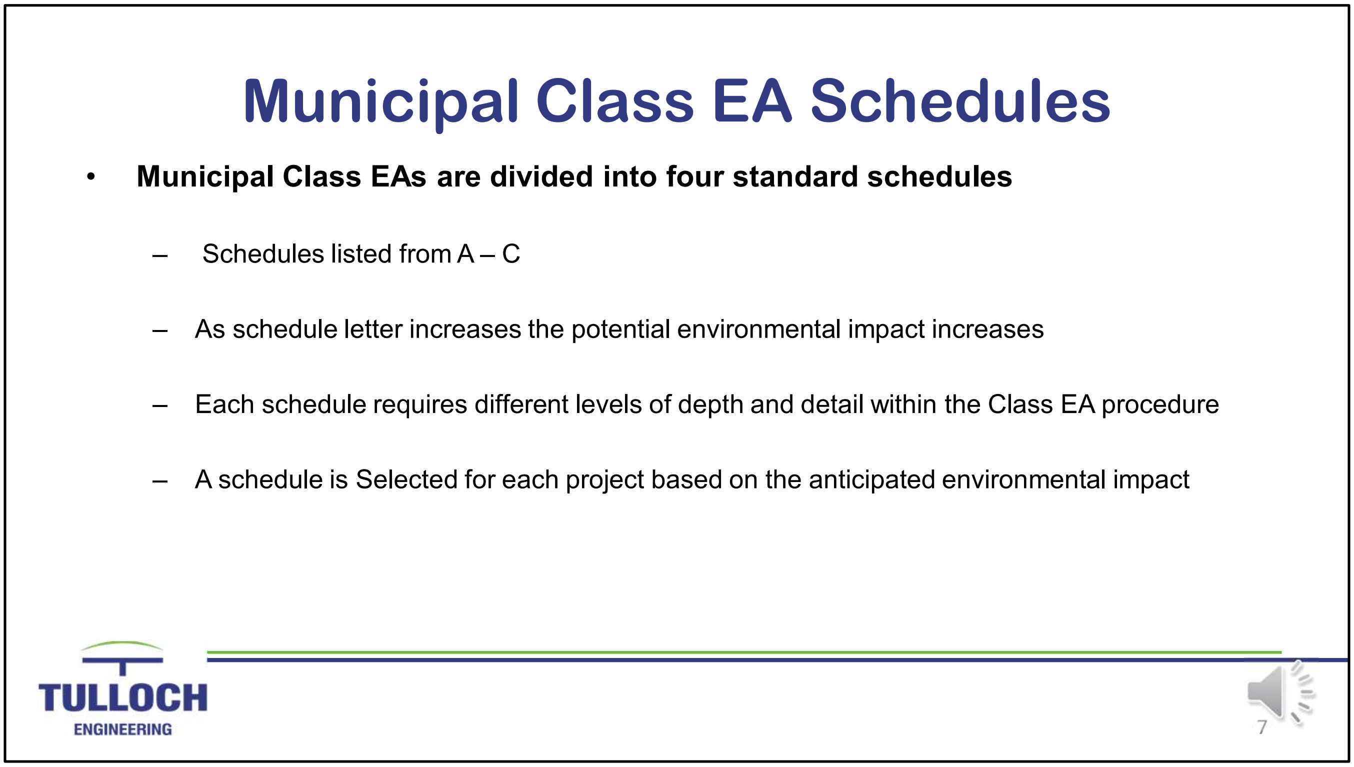
An Environmental Assessment is a planning tool and a standardized procedure that allows Municipalities to meet their legal obligations but also is a proven decision making tool that can guide and help municipalities reach the best possible solution for a project. An Environmental Assessment, or EA for short, looks at a given project very broadly and by environmental I mean this in a very general sense of the word as in how will this project impact the environment within which it exists. Some examples of impact include, impacts to local communities, wildlife, economic impacts including costs and potential negative or positive impacts to local economies, Cultural or heritage impacts to the study if the project is deemed to be significant to the heritage of the area, public safety and much more.

As I had previously mentioned a hallmark of the EA process is public consultation. This includes both members of the public and concerned citizens but also regulatory bodies who are consulted and notified in order to have input into the project as well. Government bodies such as the MECP, MNR and MTO as well as other important groups such as first nations communities and community groups like for example the Muskoka Watershed Council are all notified and their feedback is requested should they have any concerns. Typically open houses or Public Information Centres are also held for local members of the community to be consulted. The purpose of this presentation is to be in place of a community gathering.

Finally the EA process is a standardized procedure that has been commonly accepted by regulators to help guide municipalities through the implementation of their various projects. The EA process meets regulatory requirements and follows a standardized set of guidelines. However, as each project is different and has different needs and impacts so to is each EA therefore it is very important to identify needs and concerns of the community to make sure that these impacts and concerns are being captured as part of the study.



Municipal Class EA Schedules

- **Municipal Class EAs are divided into four standard schedules**
  - Schedules listed from A – C
  - As schedule letter increases the potential environmental impact increases
  - Each schedule requires different levels of depth and detail within the Class EA procedure
  - A schedule is Selected for each project based on the anticipated environmental impact

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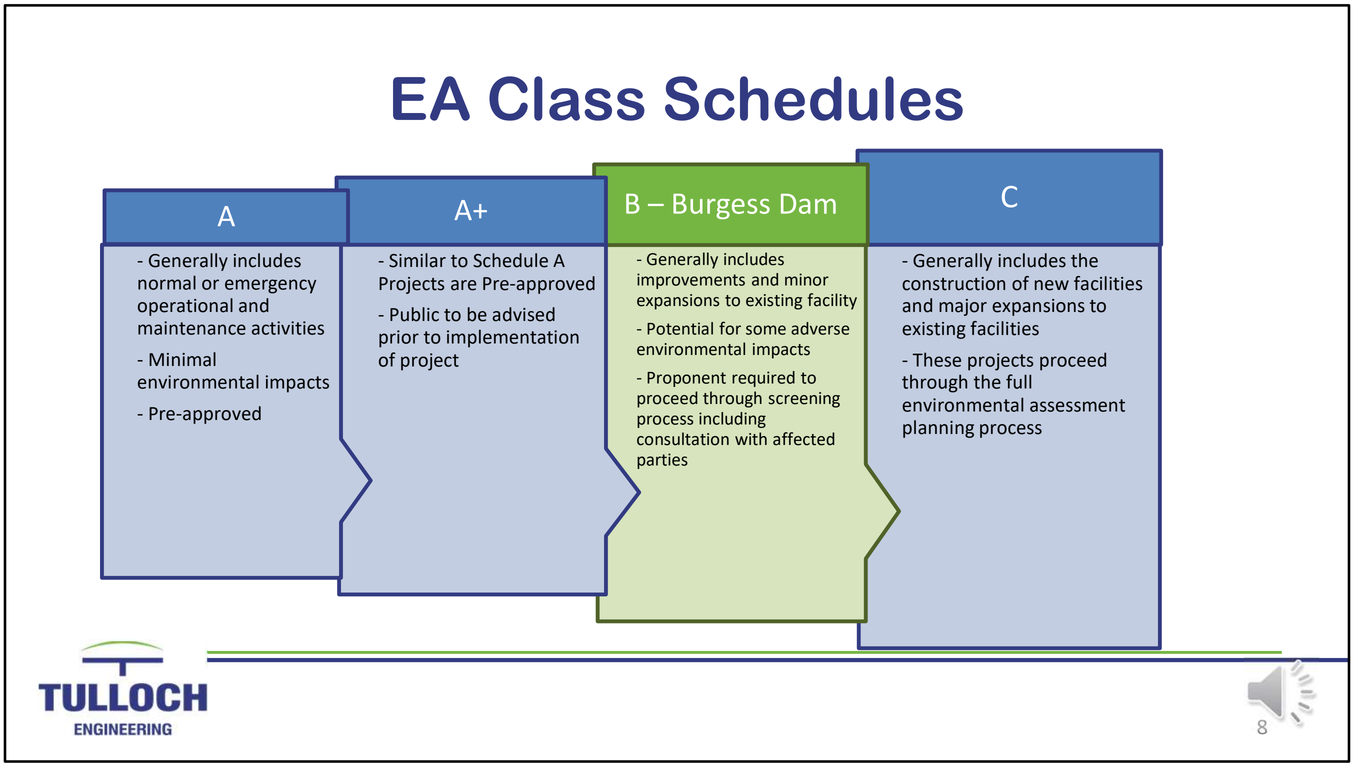
The first step to a Municipal Class EA is to identify the Schedule of the project. And, one of the last steps is to confirm that the appropriate schedule was selected at the outset. The Schedule of the process identifies the level of impact that is anticipated for a given project and also the level of detail and number of steps that are required to fulfill the EA process. The schedules range from A – C and as the letter increases the depth and detail required within the EA process also increases.



EA Class Schedules

A	A+	B – Burgess Dam	C
- Generally includes normal or emergency operational and maintenance activities - Minimal environmental impacts - Pre-approved	- Similar to Schedule A Projects are Pre-approved - Public to be advised prior to implementation of project	- Generally includes improvements and minor expansions to existing facility - Potential for some adverse environmental impacts - Proponent required to proceed through screening process including consultation with affected parties	- Generally includes the construction of new facilities and major expansions to existing facilities - These projects proceed through the full environmental assessment planning process

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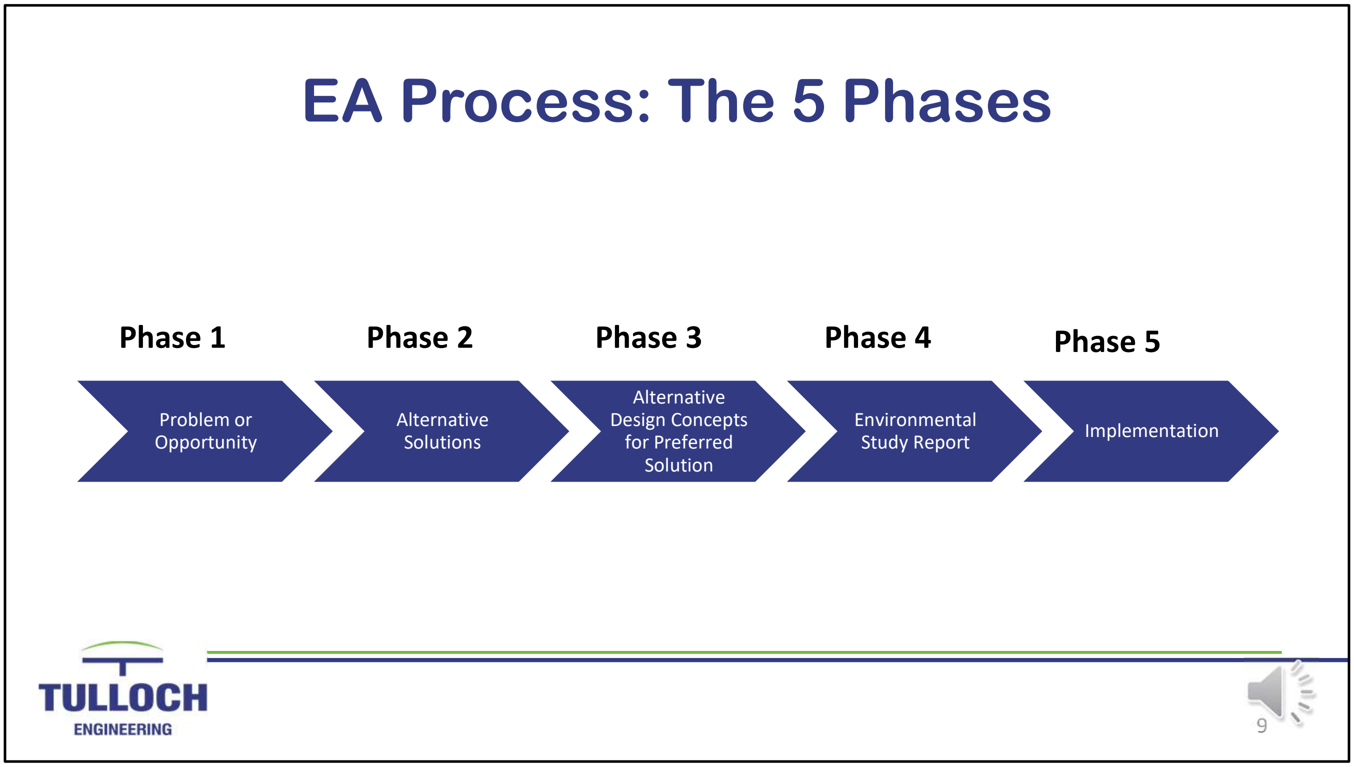
On this slide is a general list of the different schedules for a Municipal Class EA and helps show the justification for the selection of Burgess Dam. As you can see the general impacts of a project increase from Schedule A up to Schedule C.

Schedule A/A+ projects are typically pre-approved and do not require going through a formal public consultation process under the EA; these are typically for projects where the environmental impacts are minimal or for emergency situations. These projects typically involve maintenance or operation activities. For example resurfacing an existing road may qualify as a Schedule A/A+ Project. The main difference between Schedule A and A+ is that although it is pre-approved the public is to be advised prior to implementation of the project, this may come in the form of an advertisement or mail out, discussion at a council meeting or approval of a municipal budget.

A Schedule B project is meant for projects that have an increased amount of environmental impacts but do not typically entail new construction works. For, example they are typically for rehabilitations or retrofits or potentially minor expansions to existing facilities. There is a potential for some adverse impacts, more than a Schedule A but less than a Schedule C. A project deemed as a Schedule B is required to proceed through the EA process including consultation with affected parties. An example of a Scheduled B process might be rehabilitation or expansion of a small municipal bridge from 1 to 2 lanes.

Finally a Schedule C EA is thought to have the greatest and/or most environmental impacts for the implementation of the project. These are typically new build projects or major expansions to existing facilities. They require that the proponent proceed through the full EA planning process. An example would be the construction of a new road or bridge or wastewater sewage treatment plant where one has not previously existed.

The Burgess 1 Dam project has been determined to fit under the Schedule B umbrella. This project is largely viewed as a rehabilitation or replacement of existing infrastructure and therefore while some potential does exist for adverse environmental impacts the project does not warrant major expansion or creation of new facilities over a different or greater footprint that the existing facility currently occupies.



EA Process: The 5 Phases

Phase 1

Problem or Opportunity

Phase 2

Alternative Solutions

Phase 3

Alternative Design Concepts for Preferred Solution

Phase 4

Environmental Study Report

Phase 5

Implementation

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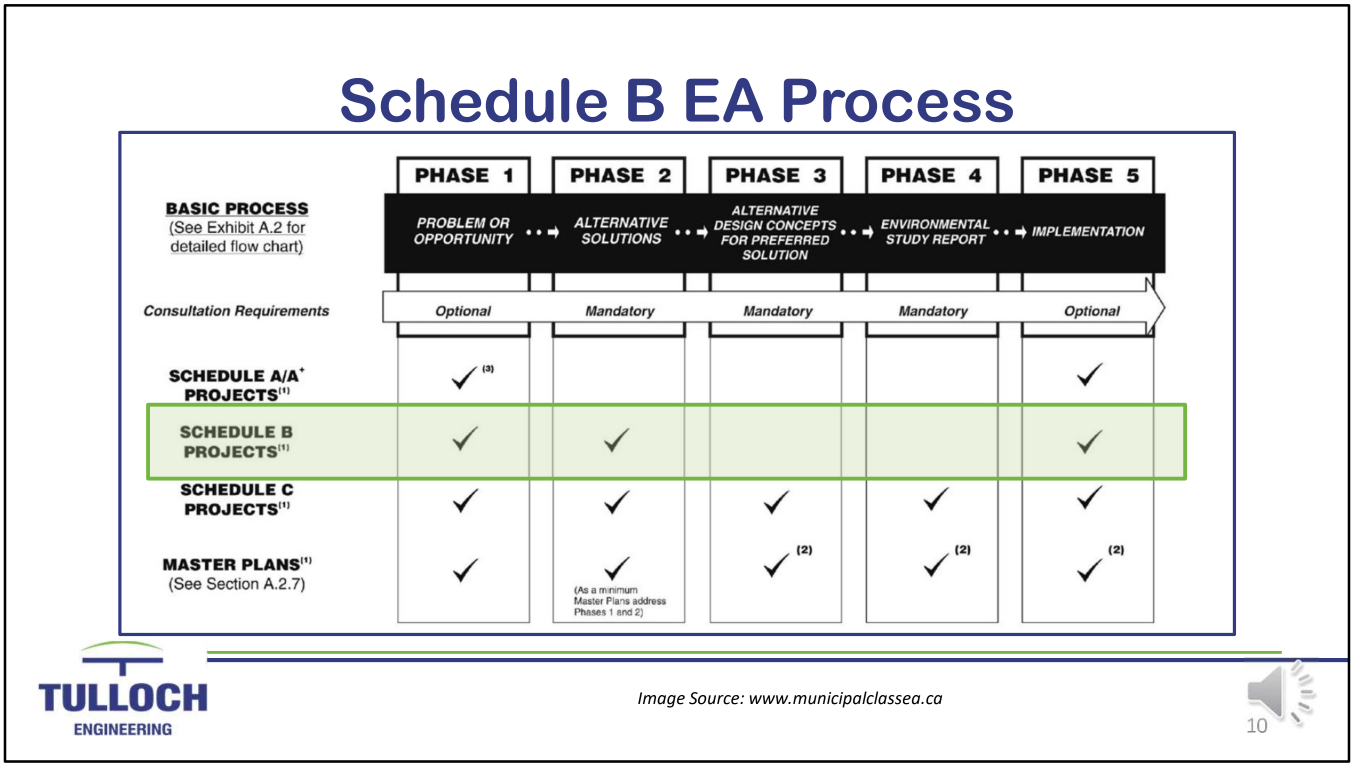
Broadly speaking the MEA Class EA is broken up into 5 main phases. Which are depicted in the order in which they should be conducted throughout the course of the study.

Phase 1 – Is the problem or opportunity statement which demonstrates a problem or need for which the project will fulfill
Phase 2 - Is the drafting of a range of alternative solutions which can address the problem statement, these typically form a spectrum of solutions from minimal to maximum effort and impact
Phase 3- Is the creation of alternative design concepts for a selected preferred solution from the alternative solution.
Phase 4 – Is the creation of an Environmental Study Report which details the impacts and mitigation efforts required for the implementation of the project
Phase 5 – The implementation of the project which includes tendering and actually conducting the work

Please note that Phase 3 and 4 are typically only applicable to Schedule C projects.



Schedule B EA Process

	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
BASIC PROCESS (See Exhibit A.2 for detailed flow chart)	*PROBLEM OR OPPORTUNITY*	*ALTERNATIVE SOLUTIONS*	*ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION*	*ENVIRONMENTAL STUDY REPORT*	*IMPLEMENTATION*
Consultation Requirements	*Optional*	*Mandatory*	*Mandatory*	*Mandatory*	*Optional*
SCHEDULE A/A^+ PROJECTS[1]	✓[3]				✓
SCHEDULE B PROJECTS[1]	✓	✓			✓
SCHEDULE C PROJECTS[1]	✓	✓	✓	✓	✓
MASTER PLANS[1] (See Section A.2.7)	✓	✓ (As a minimum Master Plans address Phases 1 and 2)	✓[2]	✓[2]	✓[2]

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Image Source: www.municipalclassea.ca

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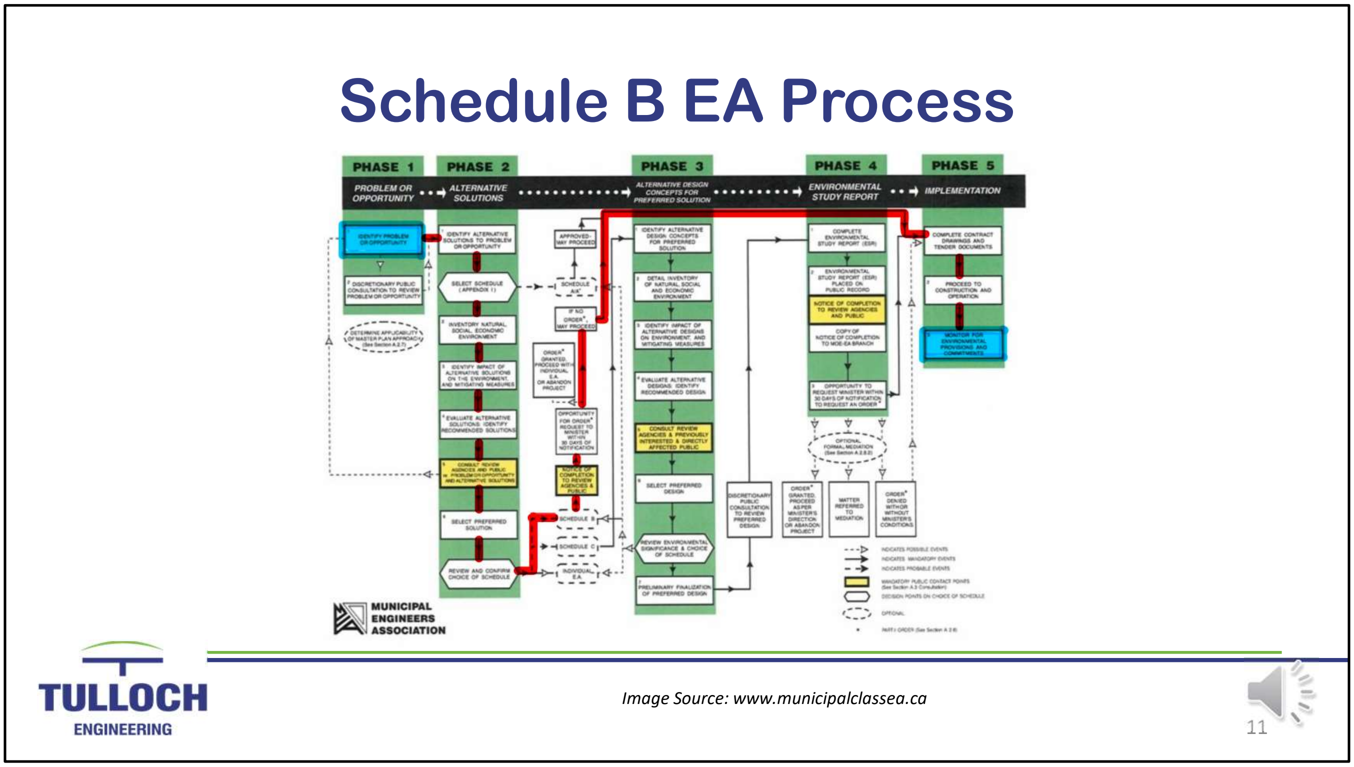
As you can see here the Schedule B EA process typically follows an abbreviated version of the full Class EA process. A schedule B project requires that the proponent follow the steps through Phase 1, 2 and 5 and it also requires public consultation at a minimum of 2 times during the study at the beginning and completion of the study but prior to implementation of the work. As you can see here the obligations of a Schedule B Municipal Class EA are highlighted. Again the purpose of this process is to create a transparent dialogue where a solution to the problem statement can be achieved that is best suited and tailored to the individual project and the community it impacts.



Schedule B EA Process

Image Source: www.municipalclassea.ca

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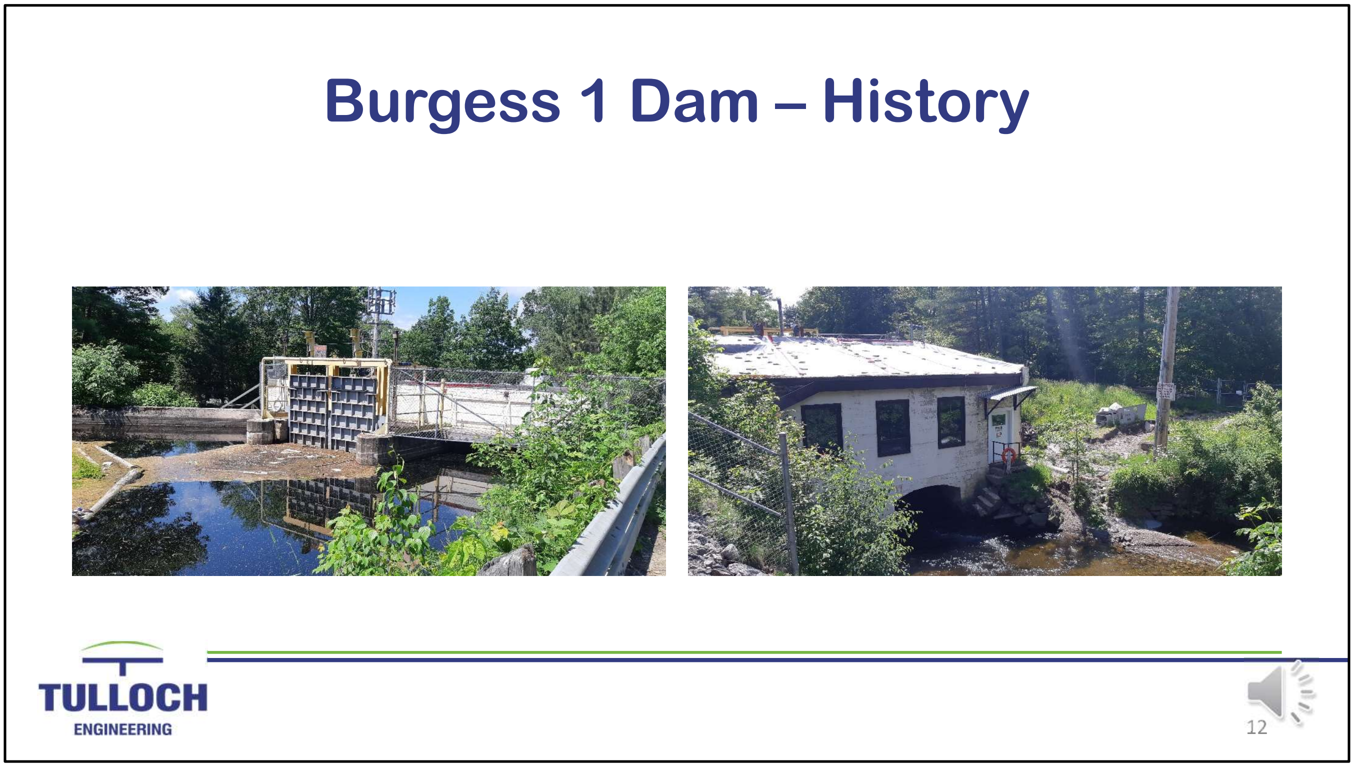
This schematic provides a more detailed break down of the Class EA, as you can see I have highlighted the beginning and end point in blue and if you follow the red line you will see the path that is to be followed for the Burgess 1 Dam project. The yellow boxes indicate when public consultation is required. For a Schedule B project, consultation is required at the beginning of a study or what is referred to as a Notice of Project which is what this presentation is for, and also a second consultation at the end of the study, or the Notice of Completion.

After the public, stakeholders and applicable regulating bodies has been consulted at the outset of the study and the alternative solutions have been presented, feedback will be taken and questions will be answered. With the input received in mind a preferred solution will be identified to move towards implementation. Once this solution has been selected a report and project file will be made publicly available and a notice of study completion will be issued. At this time members of the public, stakeholders as well as regulating bodies may have up to 30 days to review the document and make any further and/or additional comments with respect to the project. If all comments have been addressed the project can proceed to Phase 5 or implementation.

Implementation of the project will include completion of contract and tender drawings which will then lead to proceeding with construction. Finally during construction monitoring will continue to ensure that the commitments and/or provisions of the study are being followed during the implementation process.



Burgess 1 Dam – History

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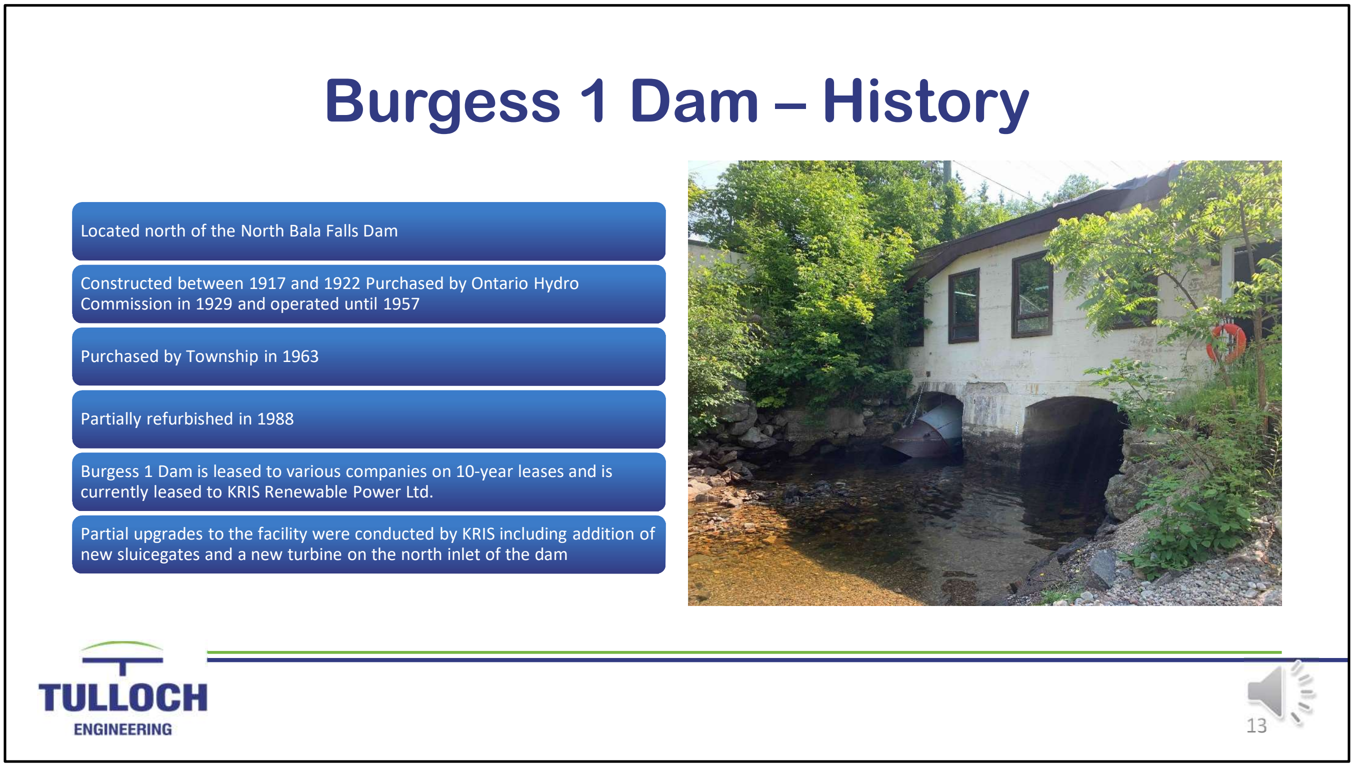
Now that I have explained the EA process I would like to give you some background information on the Burgess 1 Dam. My goal is to provide context of the site to help understand the problem statement and also the need to provide a solution for the facility. Pictured to the left is a view of the burgess dam taken upstream of the facility with the metal sluicegates in the centre of the frame. The picture on the right is a view downstream of the facility of the powerhouse where the turbines are located for the facility. The photos taken from this next section of the report were taken during the Dam Safety Review in the summer of 2019.



Burgess 1 Dam – History

- Located north of the North Bala Falls Dam
- Constructed between 1917 and 1922 Purchased by Ontario Hydro Commission in 1929 and operated until 1957
- Purchased by Township in 1963
- Partially refurbished in 1988
- Burgess 1 Dam is leased to various companies on 10-year leases and is currently leased to KRIS Renewable Power Ltd.
- Partial upgrades to the facility were conducted by KRIS including addition of new sluicegates and a new turbine on the north inlet of the dam

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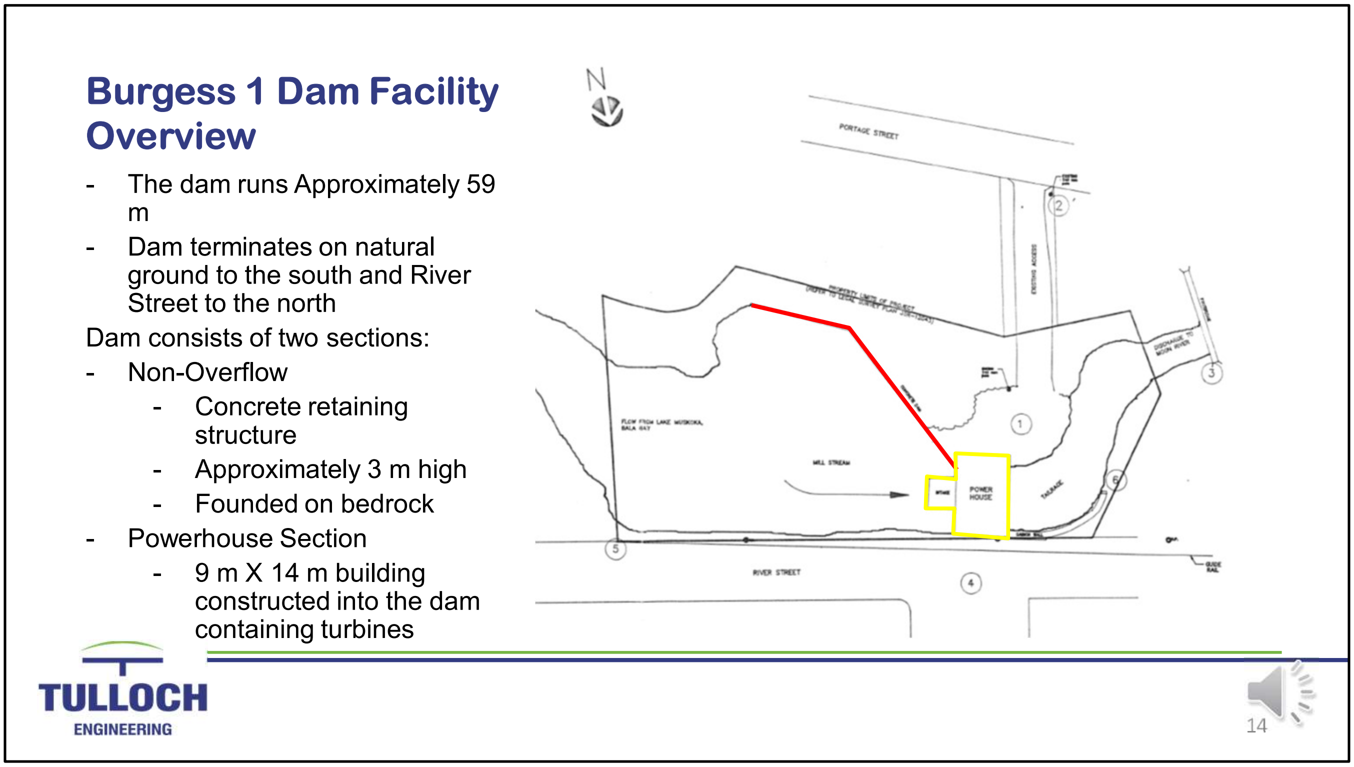
The Burgess 1 Dam is located north of the North Bala Falls Dam and is located between Portage an River Streets. Originally it was built by JW and AM Burgess between 1917 and 1922. After being in operation for approximately 7 years it was purchased by Ontario Hydro in 1929 who operated the dam until 1957 at which point it was sold to the Township of Muskoka lakes who are the current owners of the dam. The dam was initially used upon its sale, however, eventually it was largely kept in a care and maintenance state and was not actively generating power for many years.

New life was brought to Burgess when it was leased by the Township to Marsh Power on a 10 year lease in 1988, at which point the dam was partially refurbished including retrofitting to the powerhouse and also the turbine equipment. Marsh operated the dam and actively generated power until 1999. After the 10 year period the dam was then leased to Algonquin Power who operated the facility until 2011. Since this time the lease has been under the current managers KRIS Renewable Power Ltd. During Kris' tenure the facility received another partial upgrade including the addition of the new metal sluicegates pictured in the previous slide as well as the replacement of one of the turbines on the north inlet of the dam.



Burgess 1 Dam Facility Overview

- The dam runs Approximately 59 m
- Dam terminates on natural ground to the south and River Street to the north

Dam consists of two sections:

- Non-Overflow
    - Concrete retaining structure
    - Approximately 3 m high
    - Founded on bedrock
- Powerhouse Section
    - 9 m X 14 m building constructed into the dam containing turbines

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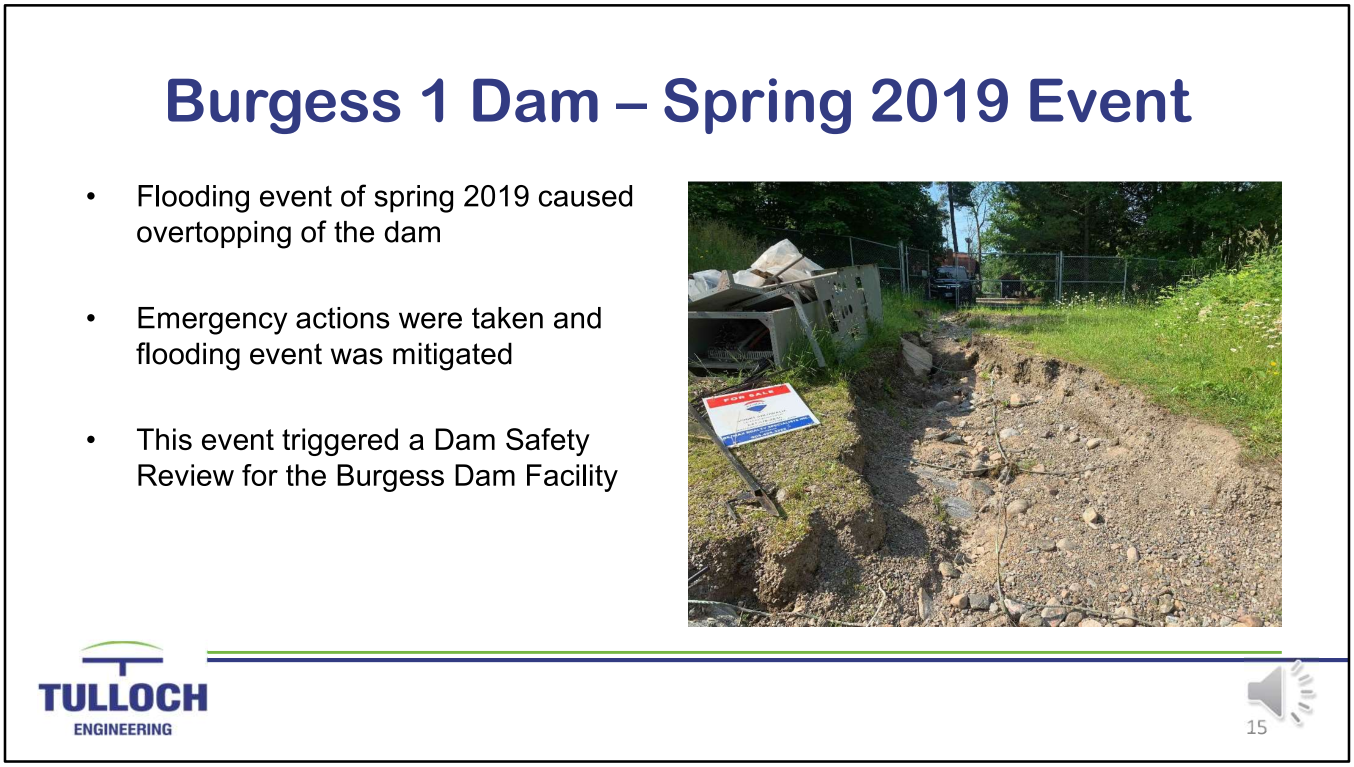
Pictured here is a general site plan of the Burgess dam. Please note to help orient yourself River Street is on the bottom and Portage is on the top. The dam runs approximately 59 meters from end to end. The south abutment of the dam terminates into natural ground whereas the north abutment of the dam terminates into the River Street embankment and also attaches to a concrete retaining wall that extends downstream of the facility along the south side of River Street.

Generally the dam consists of two major sections, a non-overflow section which constitutes the majority of the length of the dam, and the powerhouse section that is built into the northern section of the dam.

The non-overflow section of the dam consists of a rectangular concrete retaining structure founded directly on shallow bedrock. The structure is approximately 3.0m high along the length of the dam until it deepens at the powerhouse section. The Powerhouse section consists of an approximately 9 m X 14 m concrete building consisting of two turbines that is built directly into the dam. The east wall of the powerhouse is also the final section of the Burgess dam and also consists of a concrete retaining structure founded on shallow bedrock. The powerhouse has a timber structure roof and has also seen structural retrofitting over the years including the addition of steel bracing.

Water flowing through the dam exits out of two main sections on the north and south end of the powerhouse structure which form the tailrace of the dam. Water exits out towards the west into a small creek that opens below the North Bala Falls dam and eventually out to the Moon River.



Burgess 1 Dam – Spring 2019 Event

- Flooding event of spring 2019 caused overtopping of the dam
- Emergency actions were taken and flooding event was mitigated
- This event triggered a Dam Safety Review for the Burgess Dam Facility

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I'd like to now take some time to discuss the events of Spring 2019. As perhaps many of you may recall there was historic flooding along the Muskoka watershed last year. The flooding was largely attributed to a large snow accumulation accompanied with a rapid melt due to a sudden temperature increase and heavy rains during the spring melt. These conditions along with the cascading nature of the Muskoka Watershed led to very high water levels and flooding that was experienced throughout the region. As a consequence of this flooding Burgess 1 Dam experienced an overtopping event. Based on descriptions from eye witnesses water levels were approximately 0.3 – 0.4m above the current crest of the dam and caused considerable washout of the property as pictured to the right.

Emergency measures and trenches were excavated to help run water around the dam which ultimately helped temporarily mitigate the situation. However this event showed that the Burgess Dam does not have the capacity to handle high water flow situations. Given the seriousness of the event the Township retained TULLOCH to complete a Dam Safety Review on the facility to assess its current condition and evaluate the risks posed to the structure in the event of future flooding.

Burgess Dam – Dam Safety Review

Township retained TULLOCH Engineering to conduct a Dam Safety Review for Burgess 1 Dam

Deficiencies were noted and recommendations for improvement made for the facility

Major recommendations include:

- Improve facility to handle higher water levels
- Aging infrastructure requiring rehabilitation or replacement

The Township chose to complete a Municipal Class EA Study for the Burgess Dam to begin the process of public consultation and implementation of recommendations in a transparent manner

The Dam Safety Review was conducted by TULLOCH in the summer of 2019 and was a comprehensive evaluation of the dam's performance as well as a general review of its stability and safety for the general public. The Dam Safety review included an site inspection, document review and also a hydrotechnical and geotechnical analysis to assess the current state of the dam with respect to modern safety guidelines.

The conclusion reached by the Dam Safety Review brought forth a number of recommendations for improvements to be made for the facility. In general the facility was found to be in fair condition given its age, but also near or at the end of its design life in its present state. Given the overtopping event during the flooding of 2019, which roughly corresponded with the water level associated with the Design Flood of the Bala Falls Dams, the facility is currently unable to handle flood water levels and there is a risk of a loss of water control in an overtopping event in the future which could also threaten the stability of the dam.

Furthermore the aging infrastructure associated with both the non-overflow and powerhouse section of the dam have reached a point where rehabilitation or replacement is required to extend the useful life of the facility as well as to increase the stability and safety of the facility to modern design standards.

Given the recommendations of the Dam Safety Review the Township of Muskoka lakes began the EA process to address the issues raised in the review and to implement the project in a transparent and open manner.

Phase 1– Problem Statement

In the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review conducted in the summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents, furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes is considering replacement or rehabilitation of the Burgess 1 Dam.

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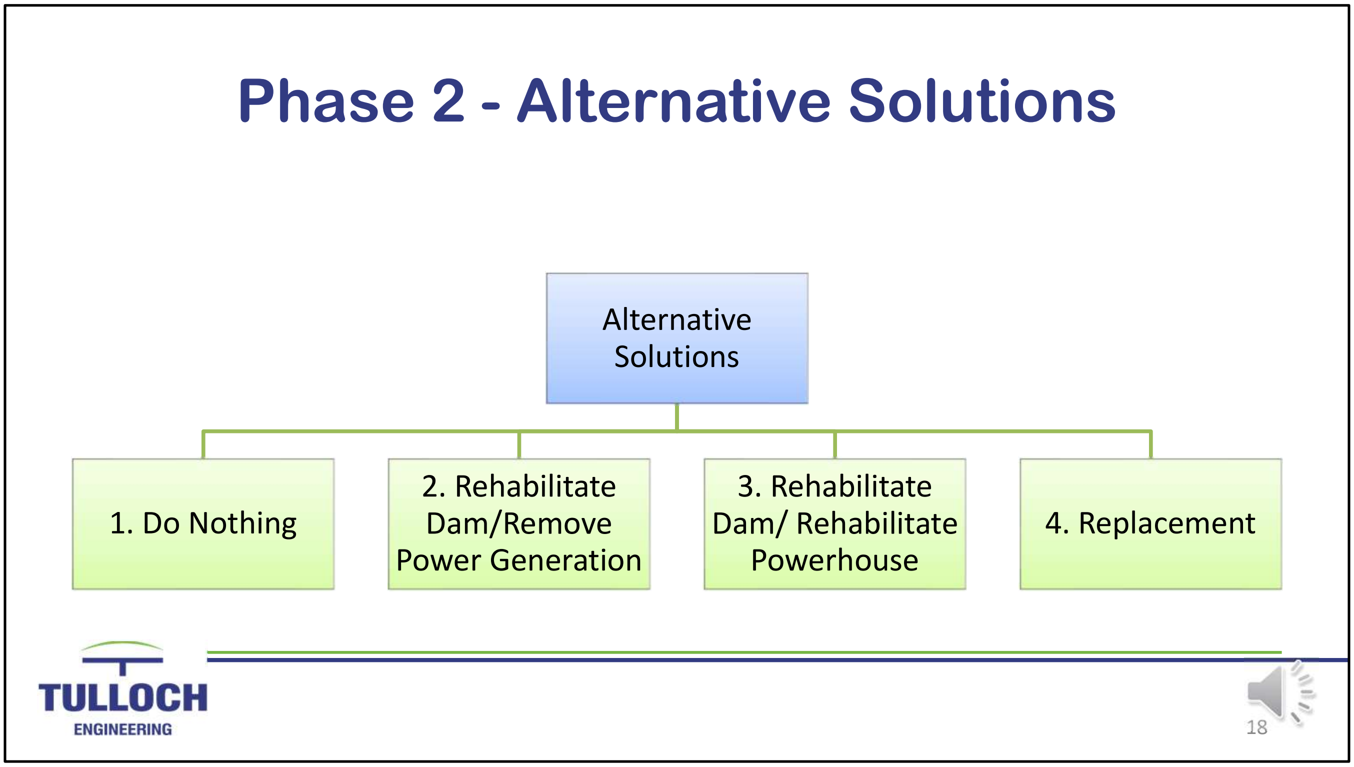
Following the EA process the first Phase of the project has identified the problem statement you see above which outlines the need for rehab or replacement of the Burgess one dam. The problem statement has been outlined as…

In the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review conducted in the summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents, furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes is considering replacement or rehabilitation of the Burgess 1 Dam.



Phase 2 - Alternative Solutions

Alternative Solutions

- 1. Do Nothing
- 2. Rehabilitate Dam/Remove Power Generation
- 3. Rehabilitate Dam/ Rehabilitate Powerhouse
- 4. Replacement

A number of alternative planning solutions have been identified and will be presented in turn. Currently there are four alternative planning solutions that are being considered for the Burgess 1 Dam project. The goal is, with your feedback, to select a preferred solution from this group of alternatives to move forward towards implementation. The alternative solutions were drafted based on a spectrum from least to greatest amount of environmental impact. As such, each alternative solution has advantages and disadvantages. Each alternative solution will be presented in the following slides giving an overview of the intent of each solution as well as potential advantages and disadvantages of implementation.

Alternative #1 – Do Nothing

- Leave the dam in as-is condition
- Critical safety issues with respect to the dam and powerhouse would NOT be addressed
- Maintain structure in similar fashion as previous

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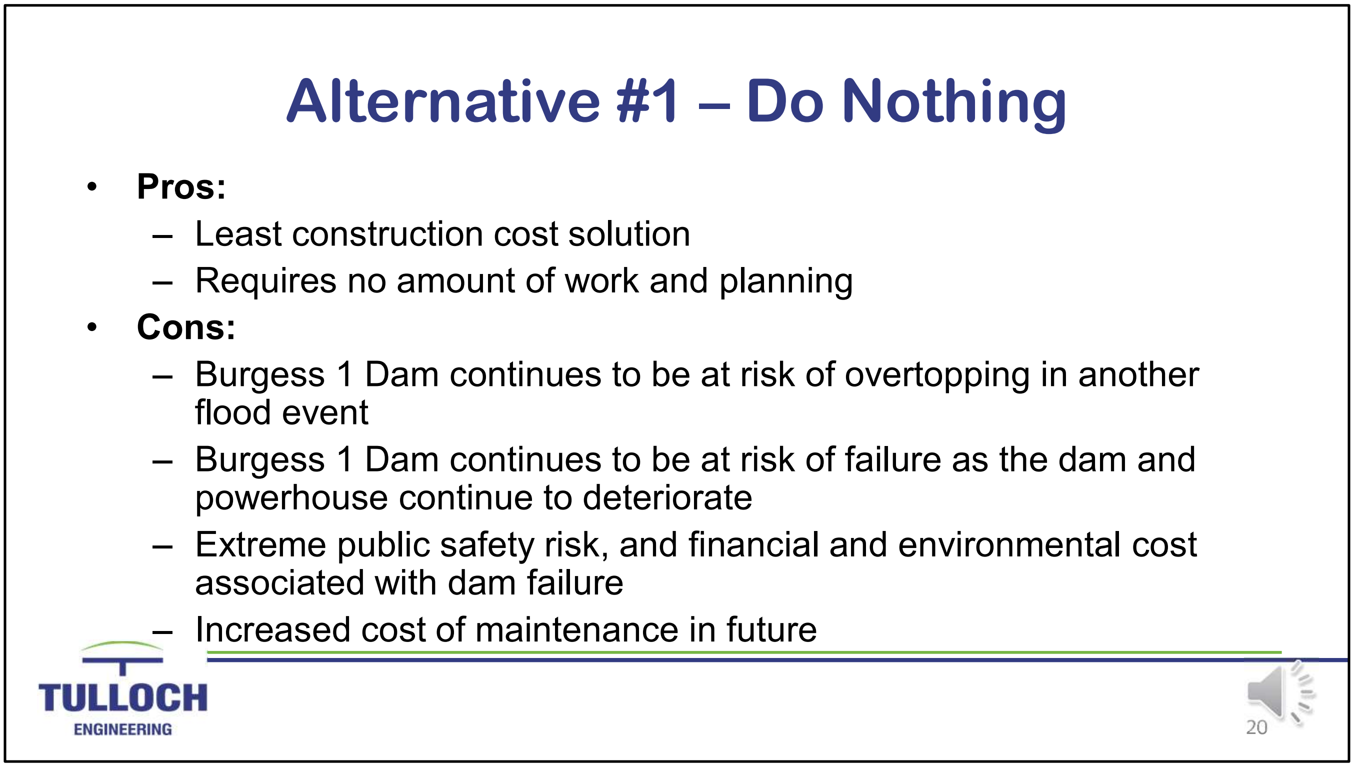
Alternative Solution #1 involves leaving the facility in its current condition. This would involve doing-nothing and NOT addressing any significant or critical safety issues at the facility that may pose a risk to public safety. Going further the dam facility would be maintained only on an as-needed basis similar to past actions.



Alternative #1 – Do Nothing

- **Pros:**
  - Least construction cost solution
  - Requires no amount of work and planning
- **Cons:**
  - Burgess 1 Dam continues to be at risk of overtopping in another flood event
  - Burgess 1 Dam continues to be at risk of failure as the dam and powerhouse continue to deteriorate
  - Extreme public safety risk, and financial and environmental cost associated with dam failure
  - Increased cost of maintenance in future

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Generally, the advantages and disadvantages for this alternative are fairly clear, with the least amount of impact environmentally this would also constitute the most economical solution requiring the least amount of initial investment by making minimal repairs to the facility. This solution would also require the least amount of work and planning and would likely be the fastest to implement.

However, there are significant disadvantages and risks associated with the do-nothing approach. First and foremost, this solution does not address any of the underlying problems with the facility with respect to stability and hydraulic capacity. The facility would continue to be at risk of overtopping in another flood event which could also potentially lead to failure of the facility. By not addressing the deficiencies of the dam now, the risk of failure would likely increase as the facility continues to deteriorate. If the dam were to fail, there would be an extreme risk to public safety as well as ahigh financial and environmental cost. Finally, as the structure continues to age by not making necessary upgrades now there would be higher maintenance costs moving forward

Alternative #1 – Do Nothing

- Given the extreme safety risk and costs associated with the "Do-Nothing" alternative, this option is eliminated and will not be considered any further.

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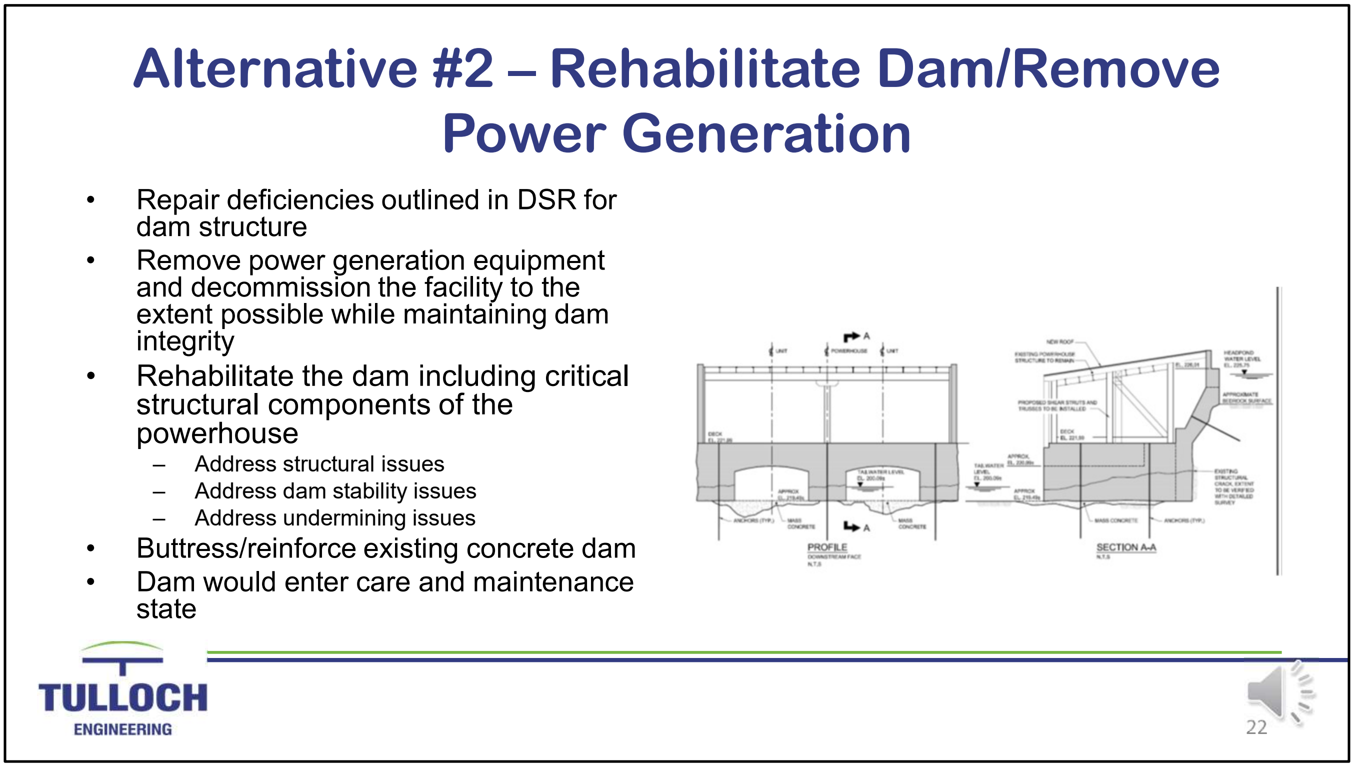
Having discussed the Do-Nothing approach, in the interest of public safety with respect to the stability and lack of flooding capacity for the Burgess 1 Dam, this option will be eliminated and not discussed further.



Alternative #2 – Rehabilitate Dam/Remove Power Generation

- Repair deficiencies outlined in DSR for dam structure
- Remove power generation equipment and decommission the facility to the extent possible while maintaining dam integrity
- Rehabilitate the dam including critical structural components of the powerhouse
  - Address structural issues
  - Address dam stability issues
  - Address undermining issues
- Buttress/reinforce existing concrete dam
- Dam would enter care and maintenance state

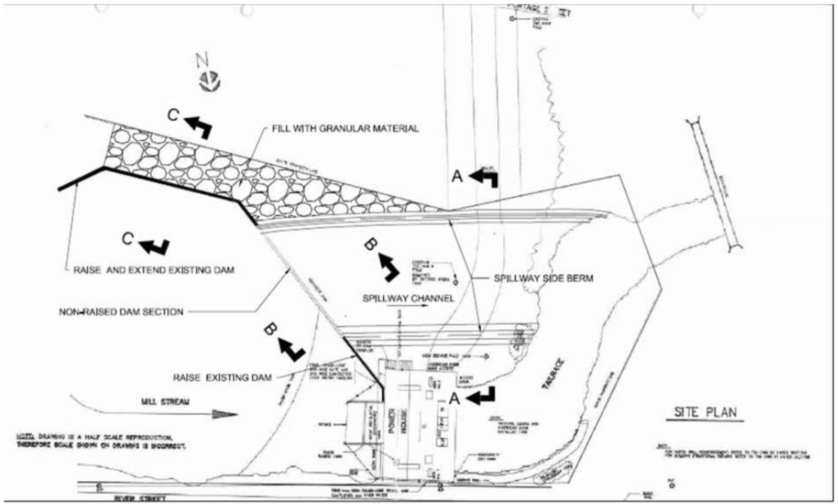
The second alternative planning solution that has been identified involves rehabilitating the dam and removing the power generation equipment and decommissioning the powerhouse facility to the maximum extent possible. Given that the powerhouse section of the dam was identified as requiring the most effort to retrofit and rehabilitate it may be considered preferable to decommission and remove the power generation system altogether. The powerhouse structure is an integral part of the dam and cannot be removed in it’s entirety. Detailed engineering evaluation is required to assess the extent of powerhouse that could be removed while maintaining overall dam integrity and safety.

Rehabilitation of the dam could take the form of repairing structural deficiencies that were identified in the DSR by increasing downstream ballast to prevent rotational sliding failure mechanisms, it could also involve raising the crest elevation of the dam to allow the facility to handle higher water flows without overtopping. In addition to stabilizing and raising the dam, the existing fills could be upgraded, as the sand and gravel fill was identified to be susceptible to erosion and or scour during the overtopping event of the spring of 2019. Upgrading to a more robust rockfill could allow for better protection against emergency overflow. Another potential option for the rehabilitation of the dam would be the construction of a spillway which would allow water during an overtopping event to be channeled in a controllable way.

Rehabilitation of the powerhouse could take many forms however key issues would need to be addressed including, structural, dam stability and any undermining issues that may have been caused by active generation over the operational life of the facility. This could potentially involve adding stabilizing anchor bolts to the section, grouting or filling any undermining that has been observed beneath the powerhouse, bracing or replacing the existing roof. Adding additional structural bracing to the facility as required to address any structural issues. Pictured to the right on this slide is a conceptual design of what may be considered for rehabilitation of the powerhouse section of the Burgess 1 Dam.

Removal of the power generation capability would involve decommissioning and removal of all equipment. The existing powerhouse structure would be made safe, rehabilitated or otherwise reinforced, since all or part of the structure is an integral part of the overall dam.

Once rehabilitation has been completed the dam would enter a care and maintenance state and would solely act as a passive water control structure.



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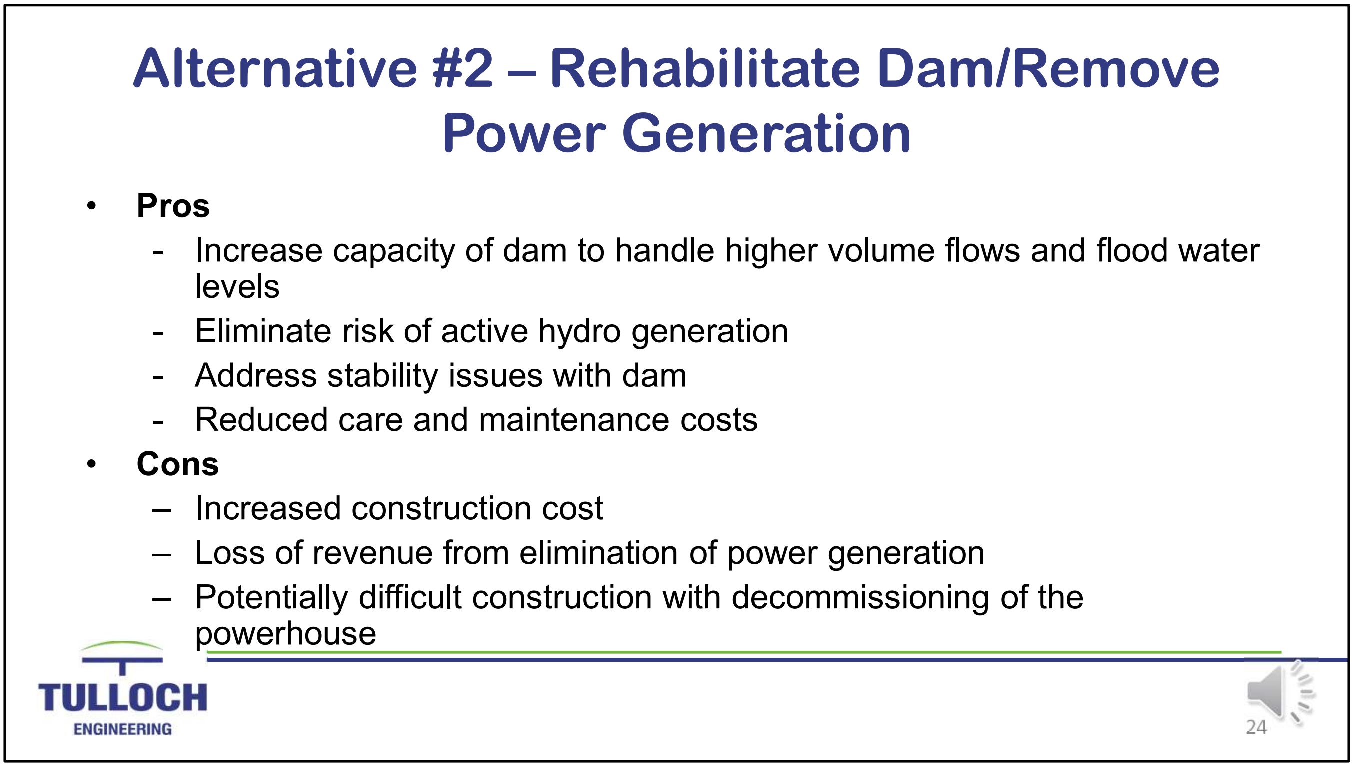
A conceptual mock up of this potential solution is presented in the slide above which was taken from the 2019 DSR. Here you can see what the addition of a partial dam raise in addition to the construction of a spillway and upgraded fill might look like over the existing site plan of the Burgess 1 Dam facility. Please note this is a conceptual mock up only and subject to change based on public consultation and further design analysis.

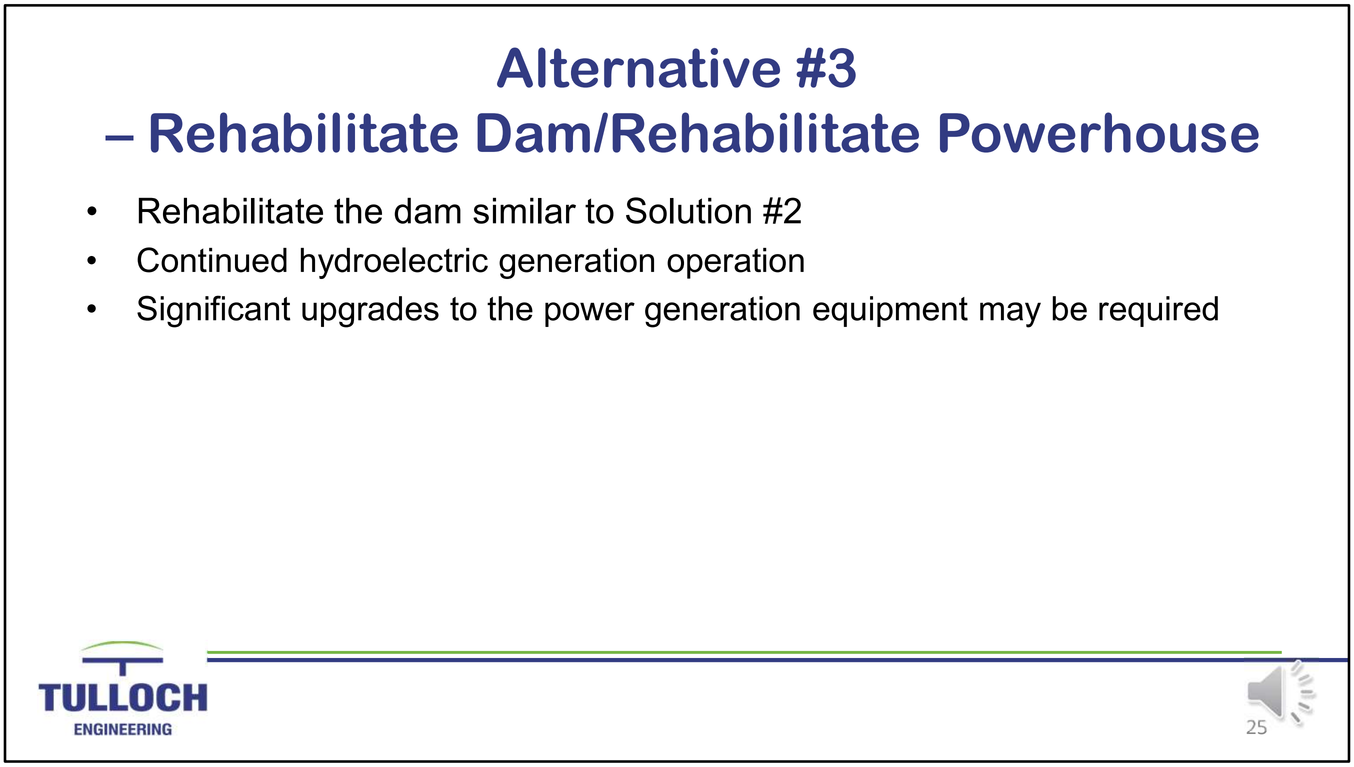


Alternative #2 – Rehabilitate Dam/Remove Power Generation

- **Pros**
  - Increase capacity of dam to handle higher volume flows and flood water levels
  - Eliminate risk of active hydro generation
  - Address stability issues with dam
  - Reduced care and maintenance costs
- **Cons**
  - Increased construction cost
  - Loss of revenue from elimination of power generation
  - Potentially difficult construction with decommissioning of the powerhouse

Advantages of the rehab/remove alternative are largely that the risks currently associated with the dam would be mitigated. The dam could be rehabilitated such that it can handle higher flows in the event of flooding and with the powerhouse being decommissioned would also reduce risks associated with active hydrogeneration such as fast moving water at the head waters and tailrace of the facility. Rehabilitation of the facility and decommissioning of the powerhouse would also address stability issues of the facilities current state. Addressing these issues would also help reduce maintenance costs into the future.

Disadvantages of this solution include an increased up front capital investment to rehabilitate the dam and decommission the powerhouse over the "Do-Nothing" option. Additionally, there is likely to be difficult construction and possibly temporary works to stabilize and then remove the powerhouse which may increase environmental impacts during the decommissioning of the facility. With the removal of the power generation equipment, the revenue to the Township would be eliminated.



Alternative #3
– Rehabilitate Dam/Rehabilitate Powerhouse

- Rehabilitate the dam similar to Solution #2
- Continued hydroelectric generation operation
- Significant upgrades to the power generation equipment may be required

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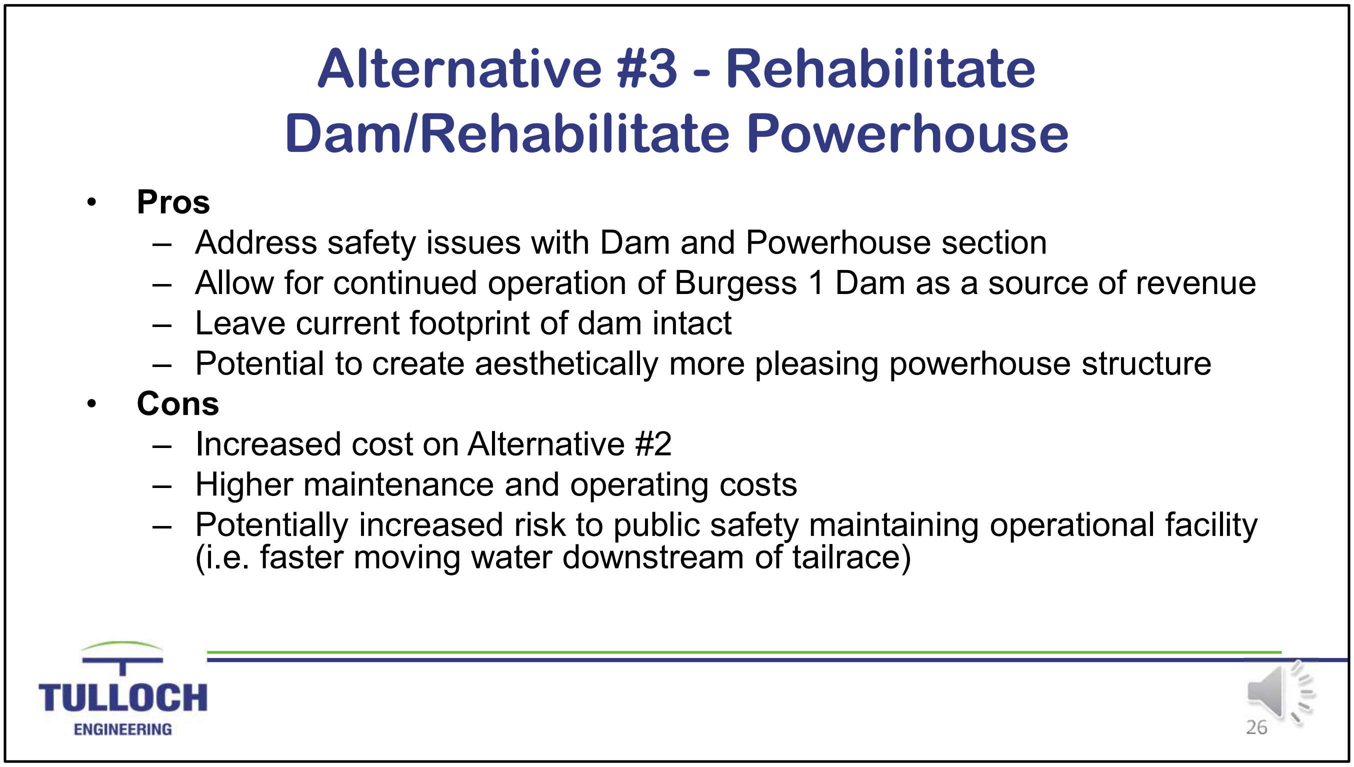
Alternative solution number three is similar to the previous alternative solution with one key difference, instead of decommissioning the powerhouse this solution would be to rehabilitate the powerhouse structure and power generation equipment and leave it intact. It is deemed a requirement that all or a portion of the powerhouse must remain to ensure integrity of the Burgess 1 Dam facility. Therefore there are a number of possibilities of rehabilitation for the powerhouse. This alternative solution would rehabilitate the non-overflow section of the dam as per the previous solution including the potential addition of a spillway or increasing the ability of the downstream fill to resist erosion.

Rehabilitation of the powerhouse would include similar actions to Alternative Solution #2, however there would be added consideration to ensure the stability and safety of the dam to continue to be operational as a power generating facility. This may include additional scour and/or erosion protection measures for the powerhouse as well as the tailrace of the facility. Added public safety measures would also likely be required to ensure members of the public are aware of the operation of the facility that meet modern standards such as updated and increased signage/warning equipment.

Based on the age of the infrastructure it is likely that significant retrofitting to the existing power generation equipment may also need to be conducted to allow for continued safe and efficient power generation. With the rehabilitation of the dam and powerhouse, the operational life of the dam would be extended well into the future and revenue would continue from the power generation.



Alternative #3 - Rehabilitate Dam/Rehabilitate Powerhouse

- **Pros**
  - Address safety issues with Dam and Powerhouse section
  - Allow for continued operation of Burgess 1 Dam as a source of revenue
  - Leave current footprint of dam intact
  - Potential to create aesthetically more pleasing powerhouse structure
- **Cons**
  - Increased cost on Alternative #2
  - Higher maintenance and operating costs
  - Potentially increased risk to public safety maintaining operational facility (i.e. faster moving water downstream of tailrace)

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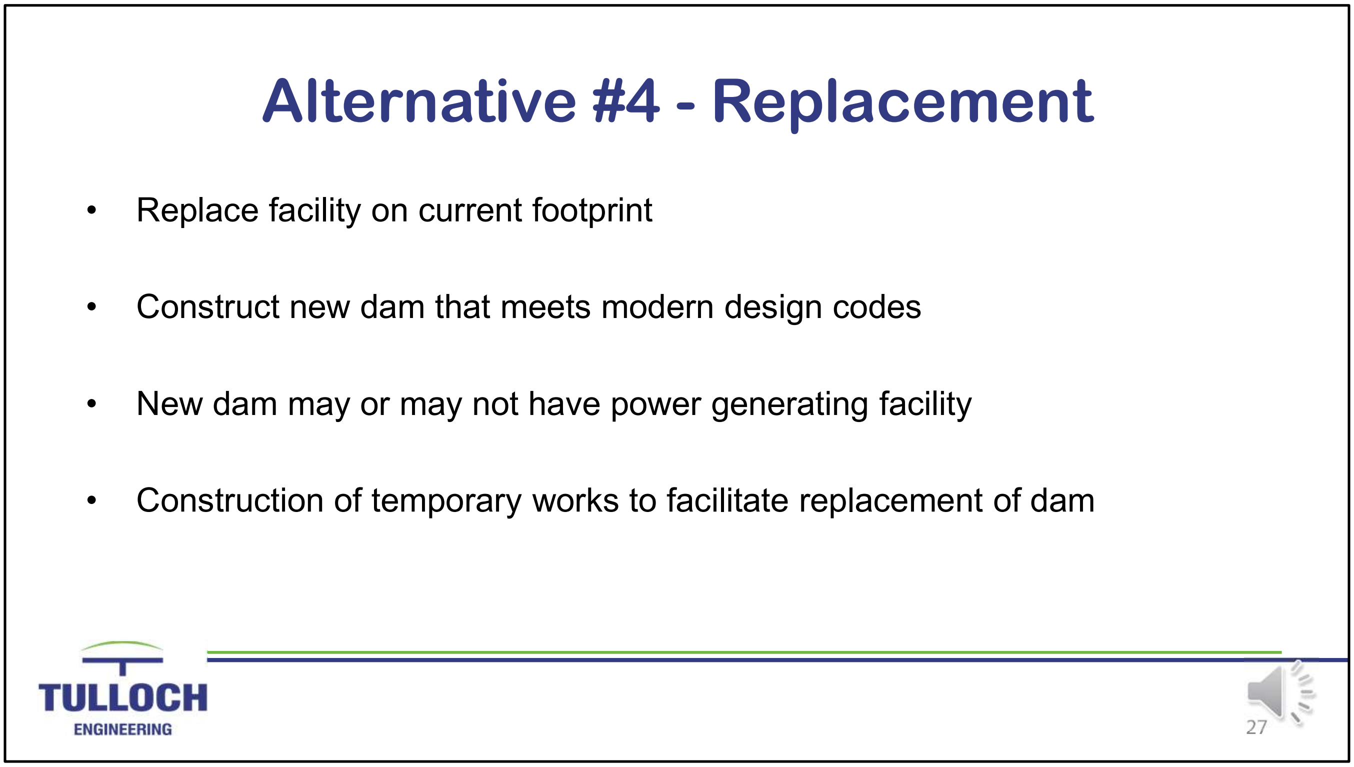
The advantages and disadvantages as they pertain to the non-overflow section for this alternative solution would be similar to the rehab/remove generation alternative solution. When it comes to the powerhouse, however, there are some additional benefits and draw backs that should be considered. With respect to advantages, again similar to the previous solution the rehabilitation of the powerhouse would address safety issues that have been raised with respect to stability of the facility as well as structural concerns. Furthermore, the rehabilitation of the structure could allow it to continue to operate and also may be a good time to upgrade some of the turbine facilities which are aging. This could maintain and possibly improve an income stream for the Township to help offset the rehabilitation costs of the structure. Rehabilitation of the powerhouse would allow the dam to exist generally within the same footprint and would therefore have overall lower environmental impacts. During the rehabilitation there is also the potential to create a more aesthetically pleasing structure which could better represent the historic context in which it was created.

Disadvantages to this alternative solution would be higher construction costs than alternative #2, the powerhouse would require extensive rehabilitation which will come with an associated capital investment. Higher maintenance costs would also be associated with rehabilitation to ensure that the rehabilitation efforts last and the structure continues to be safe. If the structure were to continue to be operational it would also require costs to continue to function such as labour associated with running the generating station. If the facility were to continue to operate there would also exist higher risk to public safety as the facility would need to be properly operated and there are hazards that are associated with an active generating station such as faster moving water and variable flow rates depending on the status of the facility. These risks would largely be similar to current conditions of the facility which is in operation.



Alternative #4 - Replacement

- Replace facility on current footprint
- Construct new dam that meets modern design codes
- New dam may or may not have power generating facility
- Construction of temporary works to facilitate replacement of dam

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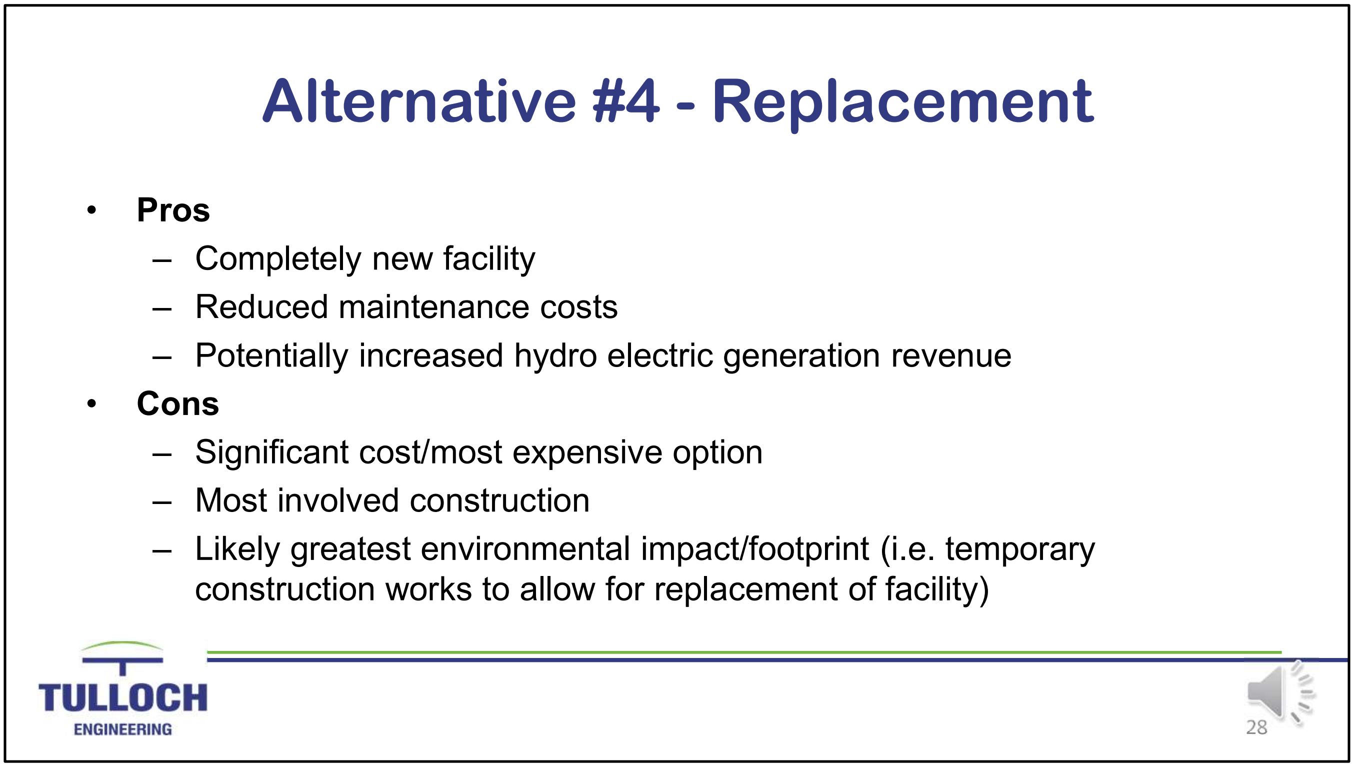
The final proposed alternative planning solution involves the complete replacement of the facility. This would likely involve the construction of an entirely new dam that may or may not take the form of a power generating facility. The dam replacement could take the form of multiple different designs including an earth fill or concrete water control structure. Alternatively replacement could also involve construction of a new power station or water control dam if it is desired. The new facility would be designed to modern standards with the goal of mitigating risks that exist with the current facility. Replacement of the dam would require temporary works such as sheet piling or cofferdams to allow for construction of a new facility. Generally for this solution the replacement dam would be constructed over the same footprint as the original requiring extensive temporary facilities.

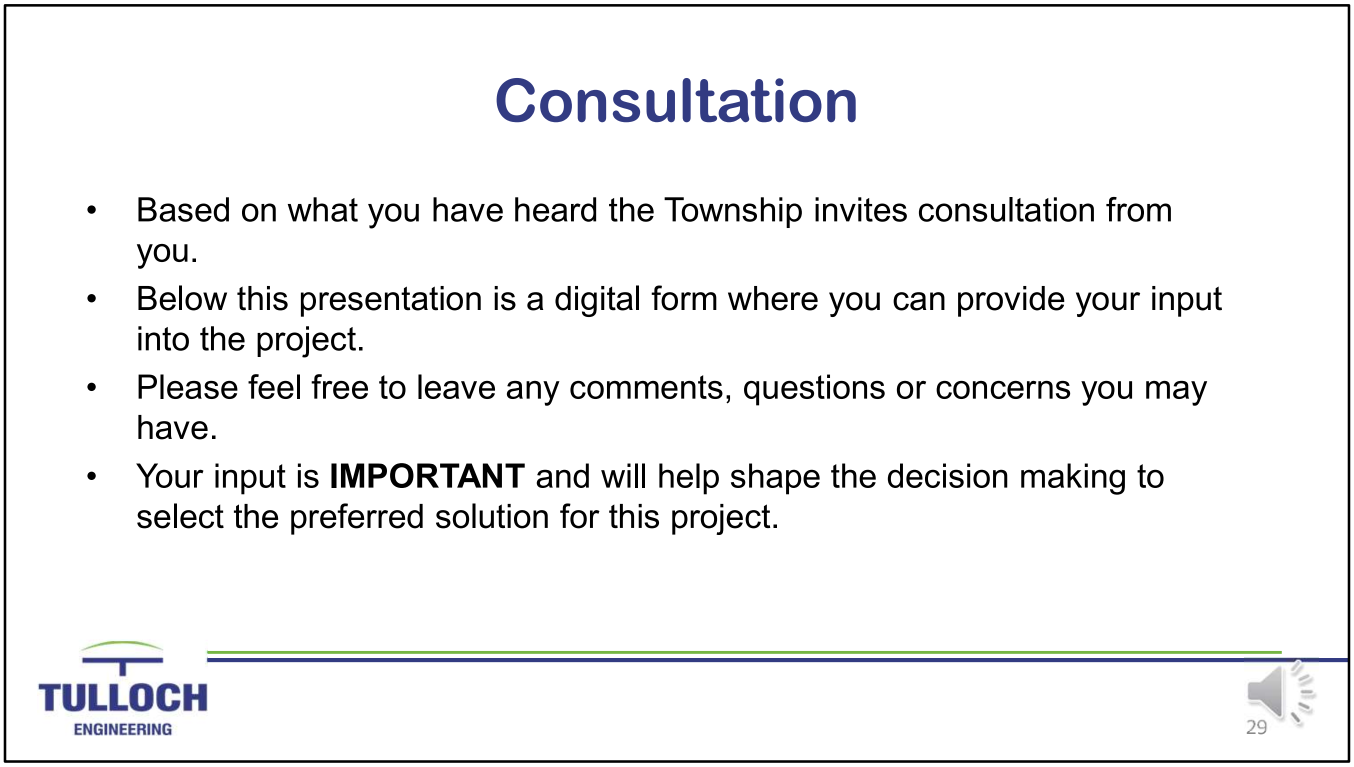


Alternative #4 - Replacement

- **Pros**
  - Completely new facility
  - Reduced maintenance costs
  - Potentially increased hydro electric generation revenue
- **Cons**
  - Significant cost/most expensive option
  - Most involved construction
  - Likely greatest environmental impact/footprint (i.e. temporary construction works to allow for replacement of facility)

As with the previous solutions here is an overview of the advantages and disadvantages of the replacement option. Generally the obvious advantage would the that a rebuilt new facility would address all of the issues with the current facility and from the previously mentioned problem statement. A new facility in whichever form it would take would meet modern design codes, and have reduced maintenance costs.

There are however disadvantages with this alternative solution and they include the following: Replacement of the dam would involve the largest upfront capital investment and would constitute the most expensive option in this presentation. Furthermore, the replacement of the Burgess 1 Dam likely has the greatest environmental impact with the most involved construction. Replacement of the dam facility would require temporary works that would extend the footprint of the works during construction.



Consultation

- Based on what you have heard the Township invites consultation from you.
- Below this presentation is a digital form where you can provide your input into the project.
- Please feel free to leave any comments, questions or concerns you may have.
- Your input is **IMPORTANT** and will help shape the decision making to select the preferred solution for this project.

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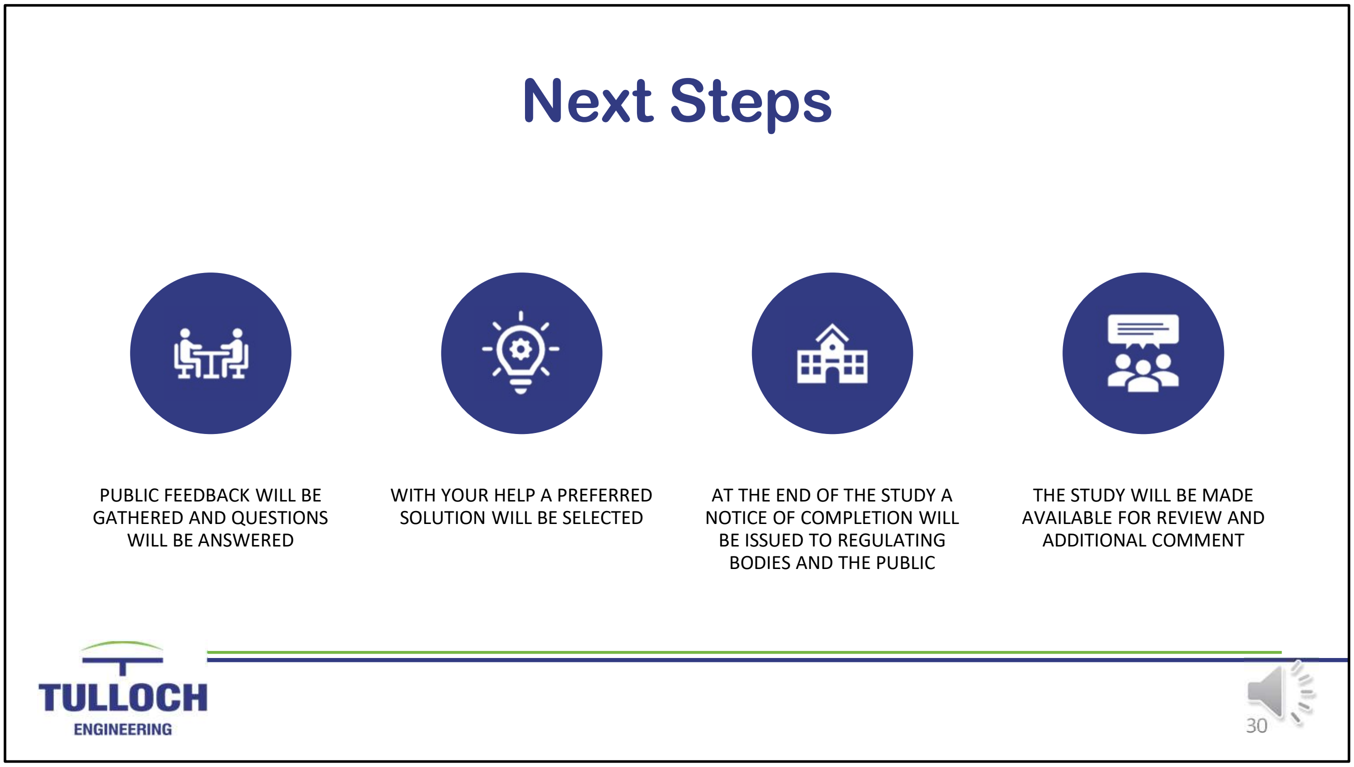
Having heard the Problem Statement and proposed Alternative Planning Solutions for the Burgess 1 Dam project we would now like to invite you to share your opinions and comments. Below this presentation you will find a digital form where you can type in any feedback you may have. Feel free to ask questions, leave comments and/or any concerns you may have with respect to the project. We would also like to invite you to select which one of the alternative planning solutions you would prefer. I would like to emphasize that the Township values your input and that it is important to help us shape the decision making process to select the preferred solution that will be implemented for the project. Please take some time to consider how you would like to see this project move forward.



Next Steps

PUBLIC FEEDBACK WILL BE GATHERED AND QUESTIONS WILL BE ANSWERED

WITH YOUR HELP A PREFERRED SOLUTION WILL BE SELECTED

AT THE END OF THE STUDY A NOTICE OF COMPLETION WILL BE ISSUED TO REGULATING BODIES AND THE PUBLIC

THE STUDY WILL BE MADE AVAILABLE FOR REVIEW AND ADDITIONAL COMMENT

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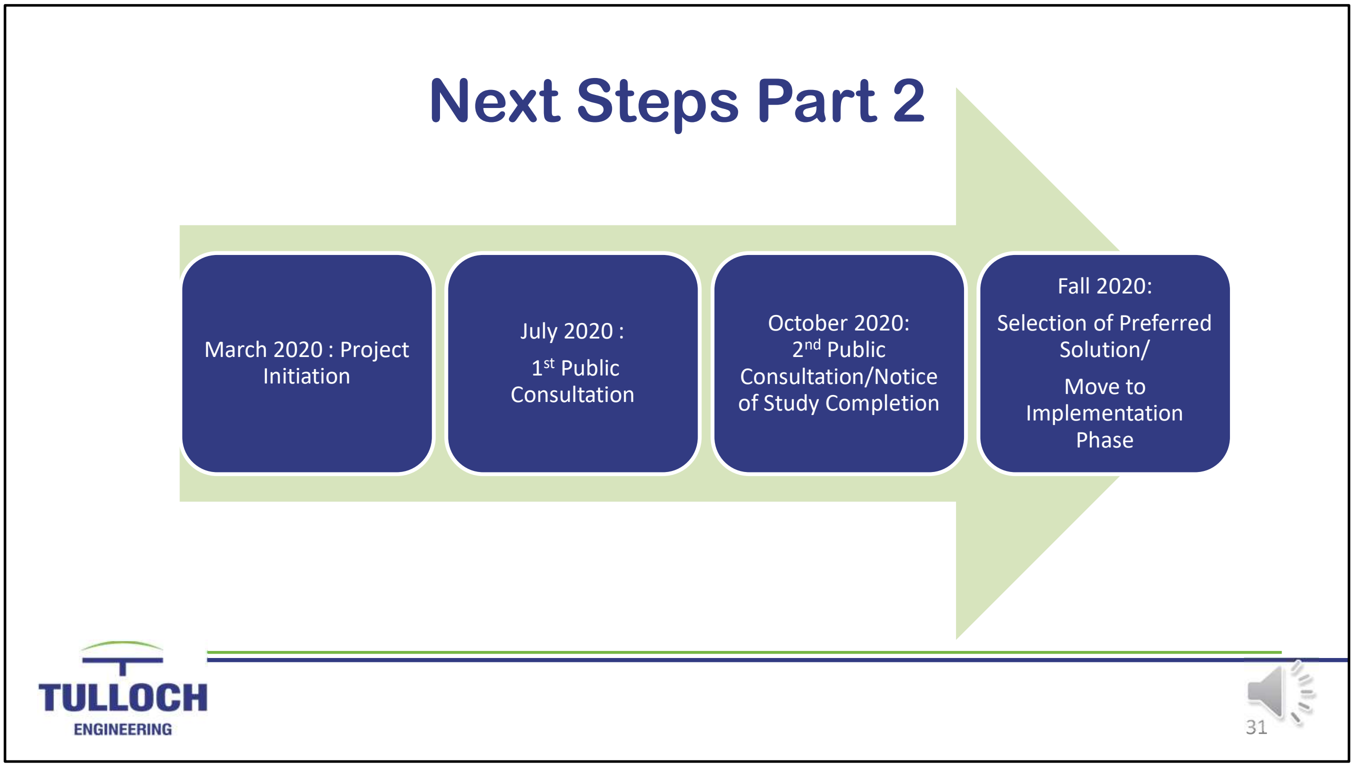
This slide is designed to give a look ahead to the coming weeks and the next steps of the study. The Township will be following the Municipal Class EA process that was outlined earlier in the presentation and as you will recall this presentation is the first of two public consultations as part of the study. After this presentation your feedback will be gathered and questions will be answered. With your feedback and with guidance from the Township as well any concerns or requirements from regulating bodies will be addressed and a preferred solution from the alternative solutions outlined above will be selected. Once the preferred solution is selected the EA study will be posted and made publicly available. At that time a notice of study completion will be issued and members of the public and stakeholders as well as regulating bodies will have 30 days to express further comments, concerns and ask any other questions they may have.



Next Steps Part 2

- March 2020 : Project Initiation
- July 2020 : 1st Public Consultation
- October 2020: 2nd Public Consultation/Notice of Study Completion
- Fall 2020: Selection of Preferred Solution/ Move to Implementation Phase

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On this slide please see a projected schedule for the progress of the Environmental Assessment for the Burgess Dam. The project was initiated in the spring of 2020 and we are currently at the phase of the 1st public consultation. We anticipate the majority of the study will be completed in October of 2020 and will be hosting a second public consultation either virtually or in person depending on public health guidelines at that time. Finally, later in the Fall of 2020 with your input a preferred solution will be selected and the Project will move towards Implementation.

Thank You!

- Stay tuned in September for a 2nd Public Information Centre or similar presentation will be made available to discuss the preferred alternative and the results of the EA Study.
- Stay tuned to your local news sources as well as the Township of Muskoka Lakes website for future updates.

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Once again, a second public information centre will be held to discuss the results of the EA and the preferred alternative, where again public feedback will be welcomed. Further information will be provided as the study progresses. Please stay tuned to your local news sources as well as the Township of Muskoka Lakes website for future updates with respect to the progress of the EA Study.

On behalf of TULLOCH Engineering and the Township of Muskoka Lakes I would like to thank you for taking the time to listen to this presentation. Finally, I would like to invite your input as your feedback is critical to the EA process and ensuring that a preferred alternative can be selected in an open and transparent manner.

What is the potential revenue for the municipality that could be generated by the Burgess Dam and how long is the return on investment?

The current rate for selling renewable hydro power back to the grid is approximately ¢8 / kW-hr. The Burgess Dam is estimated to be capable of generating an annual range of 680,000 kW-hrs (conservative) to 1,190,000 kW-hrs (optimistic), yielding a yearly revenue range of $54,300 to $95,300.

top of the page

If the power generation option is pursued, where would the revenue go?

This is a decision that would be made by Township Council as part of the budget process and is not within the scope of this MEA Class Environmental Assessment Study.

top of the page

Will the Burgess Dam continue to be under the Township's ownership with options for lease? Or can the dam be sold?

The options for ownership will be a future decision for Township Council and would be a decision to be made following the completion of this MEA Class Environmental Assessment. Options could include Township ownership with a lease for the dam's operation or sale of the dam.

top of the page

How does the existing powerhouse work in conjunction with the rehabilitated dam?

The existing powerhouse is currently an integral structural component of the Burgess Dam and will continue to be after rehabilitation. Currently the proposal for continued power generation would be rehabilitation of the powerhouse section which would be upgraded but left in place in its current location.

top of the page

What impact will the Burgess Dam have on the local launch ramps?

Currently, water levels upstream and downstream of the Burgess Dam are not anticipated to be impacted regardless of the form of rehabilitation.

top of the page

Is there enough flow to operate both the Bala Dams and the Burgess Dam?

The Bala North and South dams control the water levels of Lake Muskoka in accordance with the Muskoka River Water Management Plan (MRWMP) that has been in place since 2006. The MRWMP supersedes the Hackner-Holden agreement that was put into place in 1940. The Burgess Dam is able to operate while Lake Muskoka water levels are within the normal operating zone. Given the relatively small allotment of water given to Burgess in comparison to the amount of water available in the Muskoka River at the Bala reach, the water draw from Burgess is considered relatively small and the operation of the South and North dams should not affect its ability to operate.

top of the page

Did the current tenant undertake their proposed turbine replacement as was proposed?

The current tenant replaced one of the two existing Francis turbines with a new Kaplan turbine circa 2012. The new Kaplan turbine was manufactured by CSC Energie Inc.

top of the page

Does this dam impact the water level of the upstream or downstream water bodies?

The flows through the Burgess Dam are restricted to 4 m3/s and has little or no bearing on the water levels in Lake Muskoka or the Moon River. The Bala North and South dams control the water levels of Lake Muskoka in accordance with the Muskoka River Water Management Plan (MRWMP).

top of the page

Will locks be incorporated into the design to allow boat passage through the Burgess Dam?

The addition of locks is not being considered at this time but the feedback will be provided to Council upon completion of the EA study.

top of the page

What are potential costs associated with the alternative solution involving continued power generation vs. power generation removal and how might this affect the return on investment for the Burgess 1 Dam?

Although specific costs at this point in the planning phase are not known, it is estimated that there would be a considerable increase in price for rehabilitation and continued power generation at the Burgess 1 Dam facility, this would involve partial replacement or rehabilitation of the existing turbines and increased upgrades to the tail race of the facility to mitigate risks associated with erosion and undermining of the facility. Furthermore, increased maintenance would be required to continue to run the facility and it would also likely require part- or full-time supervision to ensure it is being run safely and efficiently. Specific costs are not currently available at this early phase of the project as the preferred solution has not yet been selected, however, it can be expected that a higher maintenance and supervision cost through the service life of the facility will be associated with continued power generation that will increase the time period for return on investment.

top of the page

I am having a difficult time selecting a preferred alternative solution. Can I get specific financial information regarding the alternative solutions?

The purpose of a Municipal Class Environmental Assessment Study is largely a planning tool to help guide municipalities and the public find helpful solutions to problems and/or projects, with a focus on public engagement. Therefore, the aim of this study is not to necessarily poll the public on specific solutions that should be chosen but to gather input and feedback to the municipality to help shape a beneficial solution for everyone. At this early planning phase specific details with regards to cost estimates of rehabilitation, specific return on investments and revenues are not known and will be developed as the project moves through the design process. At this point the Township is welcoming feedback and input from members of the public for general concerns and comment to help guide the overall direction of the project, at this point your selection does not need to dictate a specific permanent solution but instead your feedback and selection of a general preference of alternative solution is welcomed to help move the project forward together.

top of the page

Will upgrades to the facility help with over topping of the dam?

Rehabilitation or replacement of the Burgess 1 Dam will include mitigation measures to reduce the risk of another over topping event such as what happened in the spring of 2019.

top of the page

Is the Township considering a Public/Private Partnership for the rehabilitation of the Burgess 1 Dam facility?

The way in which the preferred solution is implemented will ultimately be a decision made by the Township Council during the implementation phase of the project and is not considered within the scope of this Municipal Class Environmental Assessment Study.

top of the page

Can the initial Dam Safety Review of the Burgess 1 Dam be provided to the public?

Yes, this document has been made publicly available and is posted on the Engage Muskoka Lakes website under the EA page for the Burgess 1 Dam, please follow the provided link to go directly to the Dam Safety Review report. (Link to report)

top of the page

Can changes be made to the upstream river conditions of the Muskoka River to Benefit Burgess 1 Dam?

Changes and modifications to the upstream environment of the river are considered outside the scope of the Study, furthermore changes made with respect to the bridges such as the one located on Highway 169 are outside the authority of the Township of Muskoka Lakes.

top of the page

Can water flow capacity be increased at Burgess?

Under the Muskoka River Water Management Plan which includes the Burgess 1 Generating station, Burgess is allotted a maximum water flow of 4 m3/s for power generation, changing this value is outside the scope of the Study. For further details on the Water Management Plan please visit Muskoka Water Web at www.muskokawaterweb.ca where the plan is publicly available for review.

Project Report

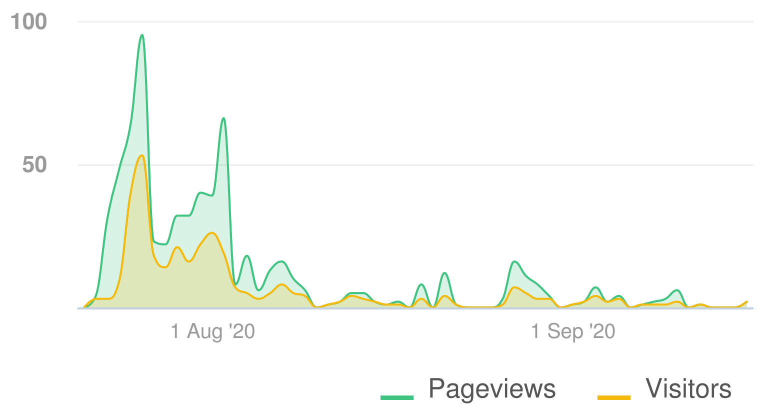
07 May 2020 - 14 September 2020

Engage Muskoka Lakes

Burgess 1 Dam Environmental Assessment Study

BANG THE TABLE engagementHQ

Visitors Summary



Highlights

TOTAL VISITS	MAX VISITORS PER DAY	NEW REGISTRATIONS
411	53	63

ENGAGED VISITORS	INFORMED VISITORS	AWARE VISITORS
29	64	260

Aware Participants	260
Aware Actions Performed	Participants
Visited a Project or Tool Page	260

Informed Participants	64
Informed Actions Performed	Participants
Viewed a video	0
Viewed a photo	0
Downloaded a document	0
Visited the Key Dates page	0
Visited an FAQ list Page	18
Visited Instagram Page	0
Visited Multiple Project Pages	38
Contributed to a tool (engaged)	29

Engaged Participants	29		
Engaged Actions Performed	Registered	Unverified	Anonymous
Contributed on Forums	0	0	0
Participated in Surveys	28	0	0
Contributed to Newsfeeds	0	0	0
Participated in Quick Polls	0	0	0
Posted on Guestbooks	0	0	0
Contributed to Stories	0	0	0
Asked Questions	5	0	0
Placed Pins on Places	0	0	0
Contributed to Ideas	0	0	0

ENGAGEMENT TOOLS SUMMARY

0	2	0	0	0	0	0	0
FORUM TOPICS	SURVEYS	NEWS FEEDS	QUICK POLLS	GUEST BOOKS	STORIES	Q&A S	PLACES

Tool Type	Engagement Tool Name	Tool Status	Visitors	Contributors		
				Registered	Unverified	Anonymous
Qanda	Questions?	Draft	27	5	0	0
Survey Tool	Survey	Archived	56	26	0	0
~~Survey Tool~~	~~Survey - Old~~	~~Draft~~	~~2~~	~~2~~	~~0~~	~~0~~

testing

INFORMATION WIDGET SUMMARY

0	0	1	1	0
DOCUMENTS	PHOTOS	VIDEOS	FAQS	KEY DATES

Widget Type	Engagement Tool Name	Visitors	Views/Downloads
Faqs	faqs	18	21
Video	Burgess 1 Dam Environmental Assessment Study Presentation	0	0

QANDA

Questions?

Visitors 27	Contributors 5	CONTRIBUTIONS 6

~~Q~~ [redacted]

31 July 20

~~Test question from~~ [redacted]

WEBSITE TESTING

~~A~~ ~~Privately Answered~~

~~Hello,Thank you for your question(s) regarding the Township of Muskoka Lakes Public Information Centre for the Municipal Class Environmental Assessment Study of the Burgess 1 Dam. The question(s) have been reviewed and a response has been posted in the Ask a Question section of the website found here: Ask a Question~~

Q [redacted]

24 July 20

What will be the impact of this on the launch ramp both during and after construction?

A Privately Answered

Hello,Thank you for your question(s) regarding the Township of Muskoka Lakes Public Information Centre for the Municipal Class Environmental Assessment Study of the Burgess 1 Dam. The question(s) have been reviewed and a response has been posted in the Ask a Question section of the website found here: Ask a QuestionThank you again for your interest.

QANDA

Questions?

Q [redacted]
26 July 20

What happened to the people who took over control of the Burgess Dam a few years back? Why did they not undertae a rehabilitation of the dam? Did they put in new turbines as was proposed?

A Privately Answered

Hello,Thank you for your question(s) regarding the Township of Muskoka Lakes Public Information Centre for the Municipal Class Environmental Assessment Study of the Burgess 1 Dam. The question(s) have been reviewed and a response has been posted in the Ask a Question section of the website found here: Ask a QuestionThank you again for your interest.

Q [redacted]
28 July 20

The presentation makes no mention of the new Swift River Energy hydro facility. Now that it is open, what has the impact been on water flows? Is there enough water for TWO hydro stations to operate in Bala? It may have a major influence on deciding whether to keep the power generation at Burgess or not.

A Privately Answered

Hello,Thank you for your question(s) regarding the Township of Muskoka Lakes Public Information Centre for the Municipal Class Environmental Assessment Study of the Burgess 1 Dam. The question(s) have been reviewed and a response has been posted in the Ask a Question section of the website found here: Ask a QuestionThank you again for your interest.

QANDA

Questions?

Q [redacted]
31 July 20

Can there be an option to rebuild the dam and powerhouse as a lock? Boating access to and from the Moon River would have tremendous benefits and improve real estate values, increasing township revenues.

A Privately Answered

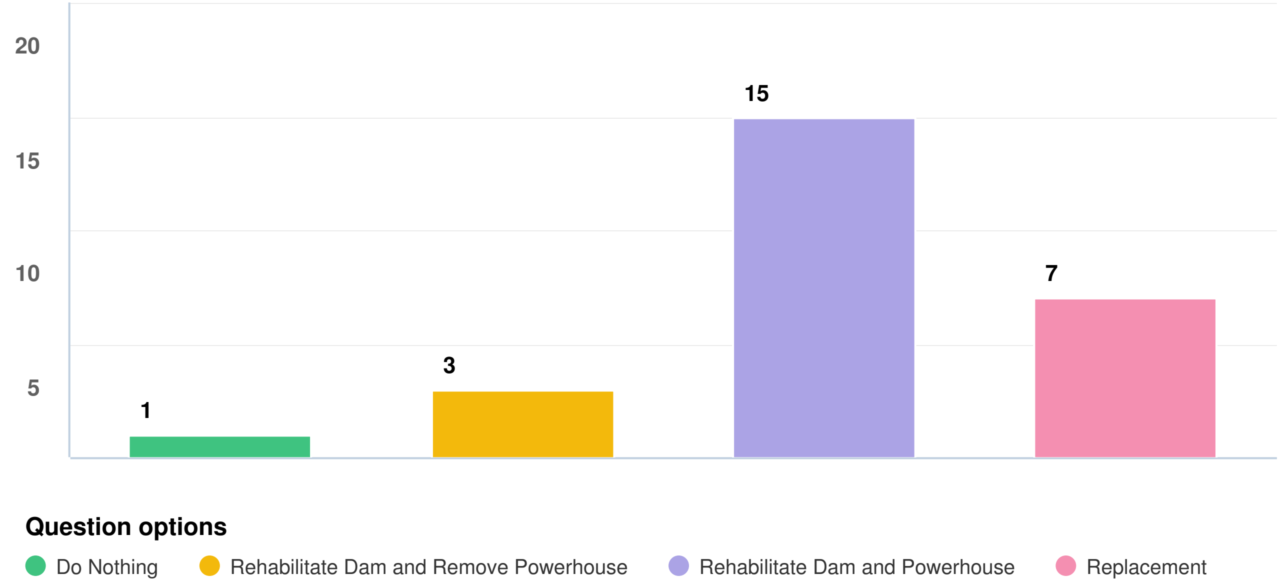
Hello,Thank you for your question(s) regarding the Township of Muskoka Lakes Public Information Centre for the Municipal Class Environmental Assessment Study of the Burgess 1 Dam. The question(s) have been reviewed and a response has been posted in the Ask a Question section of the website found here: Ask a QuestionThank you again for your interest.

ENGAGEMENT TOOL: SURVEY TOOL

Survey

Visitors **56**	Contributors **26**	CONTRIBUTIONS **26**

Which alternative solution do you prefer?



Mandatory Question (26 response(s))

Question type: Checkbox Question

Survey

SURVEY RESPONSE REPORT

07 May 2020 - 09 September 2020

PROJECT NAME:
Burgess 1 Dam Environmental Assessment Study

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 Full Name

[redacted] [redacted]

7/24/2020 06:57 AM

[redacted] [redacted]

7/24/2020 08:11 AM

[redacted] [redacted]

7/24/2020 01:29 PM

[redacted] [redacted]

7/24/2020 08:17 PM

[redacted] [redacted]

7/24/2020 09:41 PM

[redacted] [redacted]

7/25/2020 05:09 PM

[redacted] [redacted]

7/26/2020 11:21 AM

[redacted] [redacted]

7/28/2020 10:41 PM

[redacted] [redacted]

7/29/2020 08:35 PM

[redacted] [redacted]

7/31/2020 08:26 AM

[redacted] [redacted]

7/31/2020 08:44 AM

[redacted] [redacted]

7/31/2020 11:51 AM

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7/31/2020 07:31 PM

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8/02/2020 07:11 AM

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8/02/2020 10:14 AM

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8/05/2020 10:57 PM

[redacted] [redacted]

8/05/2020 11:15 PM

[redacted] [redacted]

8/07/2020 10:20 AM

[redacted] [redacted]

8/11/2020 11:42 AM

[redacted] [redacted]

8/15/2020 08:45 AM

[redacted] [redacted]

8/19/2020 03:22 PM

[redacted] [redacted]

8/24/2020 09:42 PM

[redacted] [redacted]

8/26/2020 04:10 PM

[redacted] I live immediately contiguous to the Burgess power plant and also happen to own the land under the Mill stream.

8/27/2020 05:20 PM

[redacted] [redacted]

9/08/2020 12:18 PM

[redacted] [redacted]

9/08/2020 09:24 PM

Mandatory Question (26 response(s))
Question type: Single Line Question

Q2 Mailing Address

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7/24/2020 06:57 AM

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7/24/2020 08:11 AM

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8/26/2020 04:10 PM

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8/27/2020 05:20 PM

[redacted]

9/08/2020 12:18 PM

[redacted]

9/08/2020 09:24 PM

Mandatory Question (26 response(s))

Question type: Single Line Question

Q3 Email

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9/08/2020 09:24 PM

Mandatory Question (26 response(s))

Question type: Email Question

Q4 Phone Number

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7/24/2020 08:11 AM

[redacted]

[redacted]

[redacted]

7/24/2020 09:41 PM

[redacted]

7/25/2020 05:09 PM

[redacted]

7/26/2020 11:21 AM

[redacted]

[redacted]

7/29/2020 08:35 PM

[redacted]

7/31/2020 08:26 AM

[redacted]

[redacted]

[redacted]

7/31/2020 07:31 PM

[redacted]

[redacted]

8/02/2020 10:14 AM

[redacted]

8/05/2020 10:57 PM

[redacted]

8/05/2020 11:15 PM

[redacted]

8/07/2020 10:20 AM

[redacted]

8/11/2020 11:42 AM

[redacted]

8/15/2020 08:45 AM

[redacted]

8/19/2020 03:22 PM

[redacted]

8/24/2020 09:42 PM

[redacted]

[redacted]

8/27/2020 05:20 PM

[redacted]

9/08/2020 12:18 PM

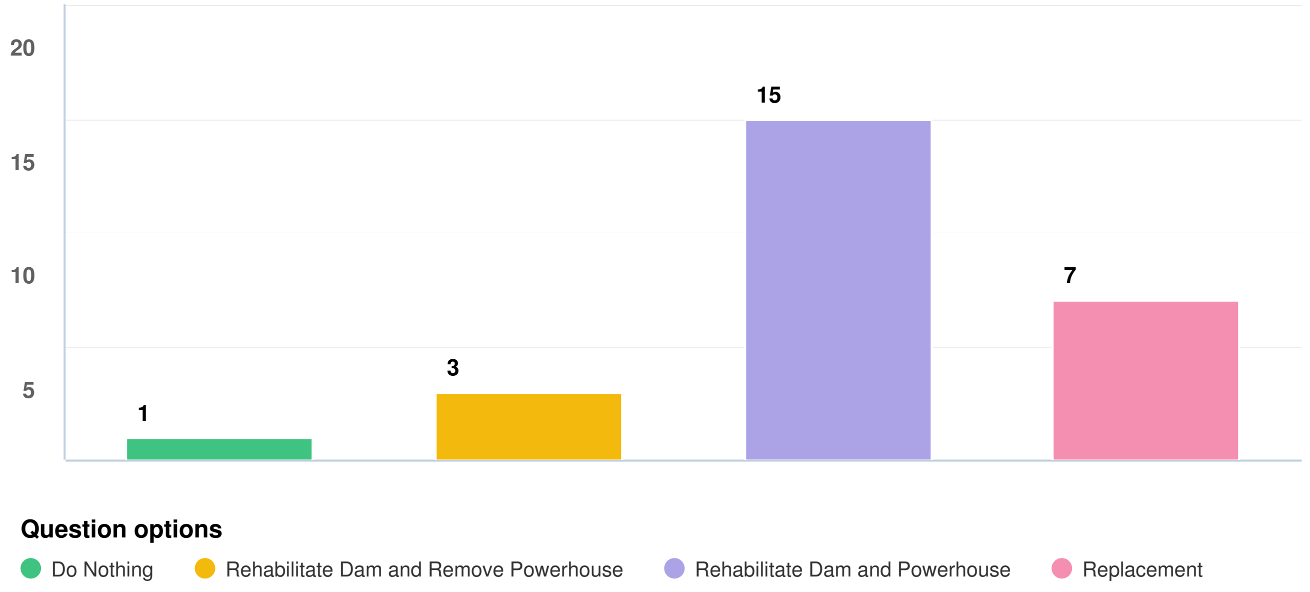
[redacted]

9/08/2020 09:24 PM

Optional question (25 response(s), 1 skipped)

Question type: Number Question

Q5 Which alternative solution do you prefer?



Mandatory Question (26 response(s))
Question type: Checkbox Question

Q6 Comments

[redacted]
7/24/2020 06:57 AM

What is missing in this is information on how much power and revenue the existing dam generates, how much power/revenue would be created in each option, estimated cost to undertake the alternatives, where the power generated goes (does Bala benefit directly), how does this power generating station work in conjunction with the new dam. Would the dam continue to be owned by the township and leased out or could it be sold? The greatest impact from this dam would be felt by those on the Moon River, especially if it fails and yet the emphasis (wording) seems more concerned with those on Lake Muskoka. It is a comprehensive presentation, clearly outlining initial options but does not provide sufficient information for residents to have good input. NOTE that in order to complete the survey i had to cast a vote BUT I am having to do so with incomplete data which is not correct. Therefore my vote should not be counted or considered accurate. I would appreciate answers to the questions raised above. Thank you.

[redacted]
7/24/2020 08:11 AM

Please replant and landscape for future generations. I have lived in Bala all my life and always swam at the falls. I am not able to access the water with new Hydro Dam it would have been nice if they had considered that as part of the design. Also the new building totally blocks the sunset when you come around bend from Purkes place. Please put a lot more consideration on landscape.. Hire a good landscape architect.. like a really good one. Deal with this new dam and problems with the most recent hydro installation

[redacted]
7/24/2020 01:29 PM

What impact will this have on the launch ramp?

[redacted]
7/24/2020 08:17 PM

Nothing was said about profit to the township. I'd like to know what an average annual profit is for the Township and where the hydro goes?

[redacted]
7/24/2020 09:41 PM

I would like to know what is the revenue now and what could it be with up to date equipment. What would be the payback time to refurbish the site and make it safe to operate.

[redacted]
7/25/2020 05:09 PM

A spillway is not needed as the constriction of Burgess Creek under Muskoka Road 169 is so great that it would be useless and the spill capacity of the Bala north and south falls is far greater. I suggest the replacement powerhouse have slightly higher capacity, such as 6 m^3/s, and be made as small and low as possible. The station should have publically-accessible emergency off buttons in case someone gets caught in the intake trash rack. The design should allow more of the site to be publically accessible rather then fenced-off.

[redacted]
7/26/2020 11:21 AM

It's time to replace with the most green solution that also generates income for the municipality.

[redacted]
7/28/2020 10:41 PM

Surprising that the presentation does not mention the impact of the new Swift River hydro station. Need to better understand impact of that new facility but I suspect it is drawing more water than people might like. Removing the Burgess Powerhouse and assigning its volume to Swift River instead might be helpful. Burgess Dam would then typically have almost no flow except in spring.

[redacted]
7/29/2020 08:35 PM

Clean power derived from this dam will always be welcome in the future. The rehabilitation of the dam will have a more moderate environmental impact than a tear down and new build. It will also be less expensive.

[redacted]
7/31/2020 08:26 AM

The replacement of the powerhouse would only make sense if the costs are able to be recovered within a reasonable amount of time through the leasing to energy companies. The rebuilding of the damn should also increase the height of the dam to prevent future overtopping of the dam.

[redacted]
7/31/2020 08:44 AM

Include locks for boats to travel to Lake Muskoka.

[redacted]
7/31/2020 11:51 AM

I would like to add another option: build a system of locks to provide small craft access between Lake Muskoka and the Moon River.

[redacted]
7/31/2020 07:31 PM

Hydro generation is a very efficient form of power generation. Provided that fish migration is not hugely impacted, I am supportive of the use of Dams for power generation. The falls in Bala are a perfect location for power generation. The falls project will produce fewer greenhouse gasses than many other power generating alternatives which is primarily why I support it.

[redacted]
8/02/2020 10:14 AM

Should we consider a P3 project for this? I assume the future power projection would be used to offset the cost of the construction.

[redacted]
8/05/2020 10:57 PM

Being a rate payer in Muskoka Lakes township I am in support of fiscal responsibility and doing what makes sense. As a seasonal resident on the Millstream itself I will not accept the cutting off of the flow through the Burgess facility. Over the years I have witnessed brief periods (several days) where flow was interrupted and the waters were allowed to stagnate into a putrid cesspool. There is much debris that makes its way into the Millstream and a lack of flow would have an extremely negative impact on the residents that dwell along its shores. As well it would be a blight on the town to have a stagnant pond in its heart. Please keep the water and the information flowing.

[redacted]
8/05/2020 11:15 PM

We are concerned the dam will function with flood control. In 2019 we realized the threat to our properties when the dam overflowed during the April flood. It washed out Portage Street where we reside.

[redacted]
8/07/2020 10:20 AM

It is almost impossible to pick a solution without consideration of the costs involved. Although I prefer the 3rd option, if a rate of return is based on the numbers you provided in the Q & A section ore correct it would be hard to invest in the generation aspect of the project.

[redacted]
8/11/2020 11:42 AM

Need more info to decide! No mention of approximate costs of alternatives. No forecast of revenue for the two proposed generation solutions. Not appropriate to be asking for opinions without disseminating important information...

[redacted]
8/15/2020 08:45 AM

I have selected this option due to the following concerns: -Cost to rehabilitate powerhouse while the township has so many other upcoming infrastructure costs we will incur. Unreliable return on investment. -Water velocity (not water levels) both above the dam where people swim and below where the only boat launch for the Moon River is located. A slow flow of water is necessary. Should the powerhouse be sold then the township will lose control over what a new operator would do to generate profitable power. -Both River St, and in particular Portage St, are very narrow road ways causing concerns if / how large construction trucks and equipment could access the site. And there is also the issue of roadways being blocked.

[redacted]
8/19/2020 03:22 PM

My main concern is that a flow is maintained through the mill stream.

[redacted]
8/24/2020 09:42 PM

Great part of Community history. Please Rehabilitate both.

[redacted]
8/26/2020 04:10 PM

We want the Mill Stream to be constantly moving. We don’t want a swamp filled with breeding mosquitoes. Thank you!

[redacted]

8/27/2020 05:20 PM

I live beside the existing dam and also own the property south of dam where the retaining wall abuts. I support the continued power generation and flow of water through the Mill stream.

[redacted]

9/08/2020 12:18 PM

[redacted] We are proposing the alternative solution: Number 3. Rehabilitation of the Dam and Power and rehabilitate Powerhouse. Few points that we need to be address and talk: a. The situation with the generating equipment - I really don't understand this point, but it sounds like your are suggesting the full replacement - this likely isn't required and somewhat misleading to the public; b. You are suggesting that having the generating station there creates a more dangerous situation than if was removed - I don't think anyone in that town believes that current operations of this station are dangerous, especially since we are talking about only 4 cms through the plant; c. We have a power contract, and they are no longer available. These are value assets. If you shut down for a portion of that contract for construction there is a significant loss of revenues. The dam can be rehabilitated while the plant continues to run and anchors can be installed through the powerhouse, but keeping the existing powerhouse until the contract expires should be a goal here; d. We believe there is a great possibility to realize a low budget rehabilitation of the dam and powerhouse and include a weir that will concentrate the excess of water along the dam to avoid overtopping water on a flood event. Generally it could be done one of two things to fix the above, reinforce the structure at the current height so that it can handle overtopping, or reinforce it and raise the height so it doesn't overtop anymore but can handle the extra head; e. By allowing it to overtop and creating a spillway channel, we will essentially lose our access road unless the spillway channel is done in concrete; f. The presentation doesn't seem to address the signed lease betwee[redacted]nd the Township; I would like to receive the stability study of the dam, structure and powerhouse of the Burgess 1 Dam for our own review. This could help to find a low cost realization of the work the Township wants to realize. If you have other study made for the purpose of the Burgess 1 Dam it will be appreciate to received it? [redacted]

[redacted]

9/08/2020 09:24 PM

Hi again Erik, and thank you for the call and opportunity to comment on the Burgess Dam. I have spent most of my life looking at the waterway and know it as well as anyone. My attachment to the millstream could even be described as “intimate”. I am not afraid to say that, we live next to the waterway, sit by and swim in it daily. Don’t get me wrong, we do stay far enough away from the plant itself. The video presentation of the Burgess Dam Environment Assessment process was informative and had a lot of good information, laying out the options. I believe that the options need to include several additional considerations. First and foremost, no matter what, the water needs to flow, and the structure needs to be cleaned daily. The amount of debris that accumulates is evident from the picture shown of the control gates in the video presentation. And as long as the current does not get too strong, we are ok with it. Additionally the lake bed under the highway bridge should be looked at to allow an additional volume of water to reach the Dam. The highway bridge does choke the flow of water. We know the history, and the flow that has been there for a long time. I have a picture from Frank Micklethwaite’s photography around 1900 shows it first as a sawmill, prior to the hydro dam being built by JW and Anne Burgess and around 1917. We did have input into the lease agreement with Marsh Hydro power in 1988 and a refurbishing that occurred at that time. Prior to this the facility was in need of repair, and the water did not flow well enough to keep the waterway clean. It is also worth noting that the Burgess Dam has priority over the North Bala Falls dam when it comes to the water. During the summer months or dry season, there may not be enough water to go around, so please keep the water flowing, and do not give any water rights away. We enjoy everything about the millstream, The waterway is shared by many that enjoy the flow and scenery. It is really one of the best kept swimming places there is. It also allows boating access to and from Bala Bay. We do notice whenever there is an electrical storm how quickly the mill stream plugs up. Any solution that eliminates or lessens the flow through the millstream is not acceptable. While the waterway is the lesser of the three routes for water to flow through Bala, the flow is needed, and when the water does not flow, it quickly becomes stagnant. The waterway also includes three important bridges that effect the character and operation of the waterway. The bridge over road 169 does restrict the amount of flow to the plant, the water is shallow, it is narrow and some rocks could be removed. The bridge above is also narrow, and the sidewalks do not allow two people to pass easily, when the bridge is due for replacement it should upgraded sidewalks widened like the bridge at the North Bala Falls. Option 1, is to do nothing, however, this option is still worth considering. The dam is operating, the water flowing. I am of the opinion, that the risk of another overflow event such as the one that happened in 2019, is minimal. There will likely be flood events that will happen again , however, I am of the opinion that another overflow could be prevented simply by diverting the water elseware. There will more flooding, but it is no longer as likely that Bala Bay will flood, nor will the millstream, please consider the following. During the 2019 flooding, the North Bala Falls Hydro Facility had not been completed. Given the new capacity of the North Bala Falls Hydro Plant, the amount of water that can now flow through Bala has been greatly increased, so the amount of water that needs to flow can now flow, and the risk of an overflow are now gone. Unless the choke points coming into Bala Bay are changed, the amount in and the amount out should be manageable. Any study to predict another flood overflow will need to include the volume of water that can flow through the new now operating North Bala Falls. The real issue on future flods is with the Moon River basin. The moon river chutes need to be studied with the possibility of a spillway there. There was talk of doing this, I am not sure if you are involved or are aware of anything happening. So I do not agree that there is an extreme risk to Public Safety, due to the risk of an another overflow. Also, it would be relatively easy to install a coffer dam if needed, to lower the flow to the millstream, and or the re routeing of the water down River Street as was done in 2019, so there is no real risk if the dam needed relief during another flooding event. Of course if the dam needed an upgrade to the retaining wall and or a spillway added, we would not be opposed to this. Further on the safety side, when the plant is running, in addition to the warning signs, I have often thought that there should be some way to turn off the plant if there were to be an emergency that required it. Having warning signs and or a phone number for some to call is great, but by the time anyone got there, it may be to late, so the continued operation of the plant should have an emergency shut off that can be operated by anyone, same for the North Bala Falls dam or any other plant. It amazes me that the operation of the plant does not require this as a safety feature. Option 2, Rehabilitate the Dam Only, and remove Power Generating Equipment, Decommission and remove part of the plant. We understand that Powerhouse cannot be removed completely. A care and maintenance state is not really possible as there is really no way to avoid the regular cleaning needed. So I do believe that option 2 and a decommission of the powerhouse slowing the flow would not be beneficial to the area unless there is a continued need to make it flow. Having someone come to clean the intake gates on a regular basis, and having a return on the investment, through hydro generation, is beneficial. Unless there will be some way to ensure the flow, and a regular cleaning, I am not sure about this option. If the power house is taken out, and there is still flow that can be adjusted with the water levels then this could work, it would be safer. Option 3, Rehabilitate the Dam and Powerhouse Continue to operate, update the signage, and warning systems to address the safety issues. I take it this may include new equipment in the power house that may be more efficient. As long as the flow does not get too strong, additional revenue could be obtained. The safety concern over an overflow event is important but also not as large of a safety concern given the choke points available upstream. The millstream flow can easily be stopped with a coffer dam at either the 169 Bridge or the footbridge to the Town Dock at the start of the water way. There is a far greater risk that a train will leave the tracks on one of the bridges that are above the water ways. And while this risk is outside the area of study it is a larger concern and would have a far greater impact should it ever happen. Option 4 is a complete rebuild with Higher safety risks, faster water, a higher construction cost. This option should only be used once the numbers are known. Given the location of the millstream, and the character of the area, there is an opportunity to make a large improvement with a larger investment, so this should not be ruled out, and I would like further opportunity for input should this route be taken. There is an opportunity here to make improvement. Lastly given the current pandemic and restrictions that in place, this new method of input is still questionable and subject to challenge, the recent Local Planning Appeal Tribunal regarding the Resort Commercial use at 3063 Muskoka Road 169 is an example. I do look forward to meeting with or talking with you again sometime soon.

Optional question (25 response(s), 1 skipped)
Question type: Essay Question

APPENDIX G

Public Correspondence

TULLOCH
ENGINEERING

80 Main St. W.
Huntsville, ON
P1H 1W9

T. 705 789.7851
F. 705 789.7891
TF. 877 535.0558
huntsville@tulloch.ca
www.TULLOCH.ca

20-1051
March 9, 2020

[Contact Organization]
[Contact Address]
[City, Province]
[Postal Code]

Dear Sir/ Madam:

Re: Notification of Study
The Township of Muskoka Lakes
Burgess 1 Dam
Class Environmental Assessment Study

In February of 2020, the Township of Muskoka Lakes initiated a Class Environmental Assessment (EA) Study for the improvement of the Burgess 1 Dam located in Bala, Ontario. The study will be carried out in accordance with the requirements for a Schedule 'B' project under the *Municipal Class Environmental Assessment* document.

The Burgess 1 Dam was originally constructed in 1917 and consists of an approximately 59 m long concrete dam founded on bedrock with a maximum height of 3 meters. A powerhouse has been built into the northern section of the dam which is currently in operation. In the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review (DSR) conducted in the summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents, furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes (The Township) is considering replacement or rehabilitation of the Burgess 1 Dam.

The EA process for this project will involve identifying the project need and developing and analyzing alternatives leading to the development of a preferred solution for the project. Following the selection of the preferred solution and subject to available funding, a preliminary design will be developed followed by detailed design, tendering and finally construction. As part of the project it is anticipated that there may be impacts to various stakeholders and aspects of the projects including local residents, existing utilities, waterbodies upstream and downstream of the facility and possible heritage impacts given the age of the structure.

A notice of project / public information centre was advertised locally to reflect the contents of this letter to notify the general public. Upon completion of this study a Project File will be available for public review and comment. A notice of study completion will be published at that time and sent to the parties on the project mailing list.

There is an opportunity at any time during the EA process for interested parties or agencies to provide comments. Any comments received pertaining to the study will be collected under the *Environmental Assessment Act* and, with the exception of personal information, will become part of the public record.

Please contact one of the following team members to receive further information, or to be removed from our project mailing list:

The Township of Muskoka Lakes
1 Bailey Street, P.O. Box 129
Port Carling, Ontario, P0B 1J0
Tel: 705-765-9156
Fax: 705-765-3156

Chris Stilwell, P.Eng.
Project Manager
TULLOCH Engineering Inc.
80 Main St. West
Huntsville, Ontario, P1H 1W9
Tel: 705 – 789 – 7851
Fax: 705 – 789 – 7891

Yours truly,

Chris Stilwell, P.Eng.
Project Manager
TULLOCH Engineering Inc.

Encl: Project Location plan
Cc: Project File
Twp. Muskoka Lakes, K. Becking

TULLOCH
ENGINEERING

80 Main St. W.
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TF. 877 535.0558
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www.TULLOCH.ca

20-1051
July 21, 2020

Dear Sir/ Madam:

Re: Notification of Study
The Township of Muskoka Lakes
Burgess 1 Dam
Class Environmental Assessment Study

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A notice of project / public information centre advertisement is enclosed. It will direct you to a website set up with a presentation to give further information on the project, EA study process and also solicit feedback.

There is an opportunity at any time during the EA process for interested parties or agencies to provide comments. Any comments received pertaining to the study will be collected under the *Environmental Assessment Act* and, with the exception of personal information, will become part of the public record.

Please contact one of the following team members to receive further information, or to be removed from our project mailing list:

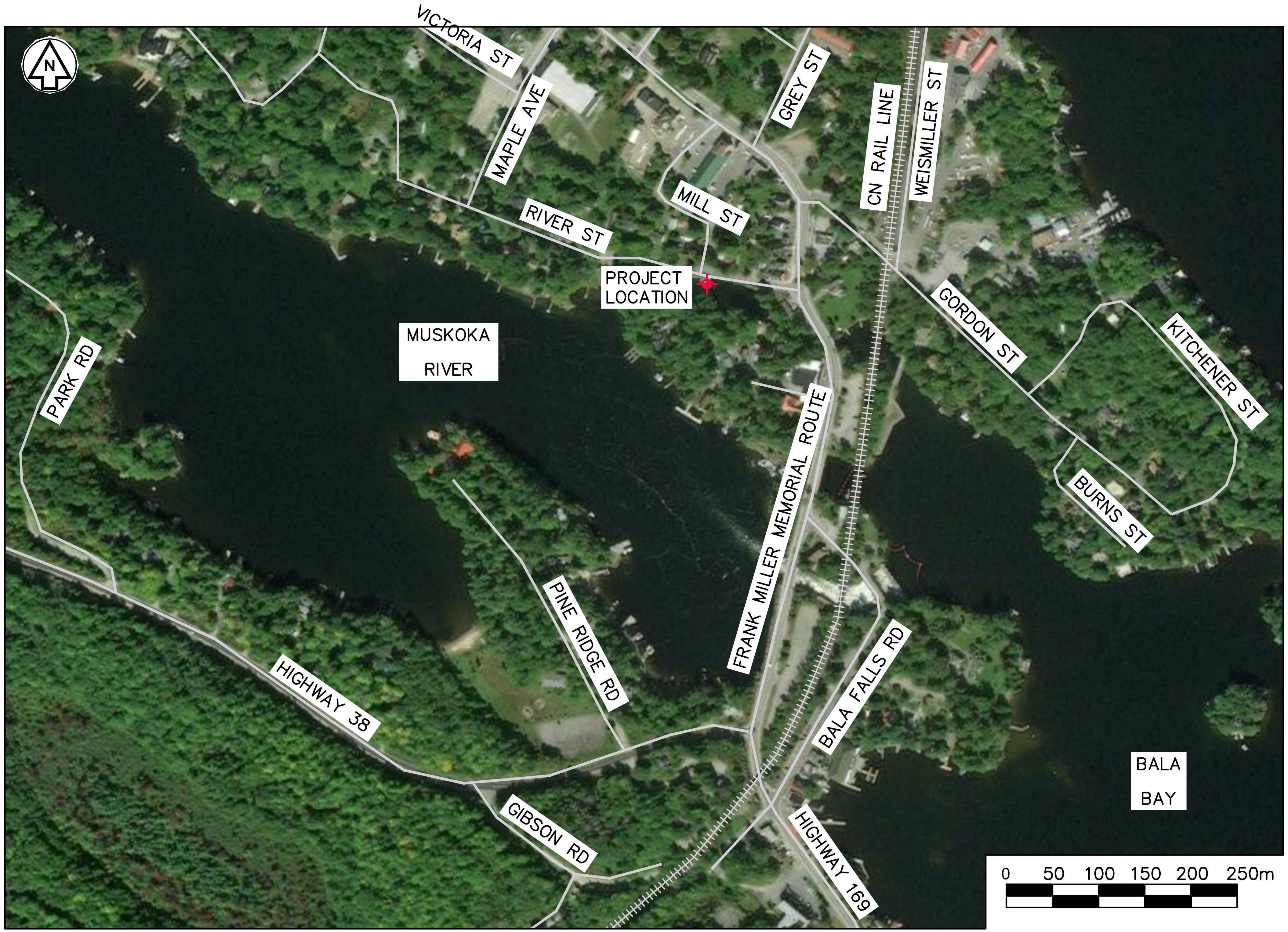
Erik Giles, P.Eng.
Project Manager
TULLOCH Engineering Inc.
80 Main St. West
Huntsville, Ontario, P1H 1W9
Tel: 705 – 789 – 7851
burgess.ea@tulloch.ca

Tim Sopkowe, C.E.T.
Public Works Technician
Township of Muskoka Lakes
P.O. Box 129, 1 Bailey Street
Port Carling, ON P0B 1J0
Tel: 705-765-3156 ext 251
tsopkowe@muskokalakes.ca

Yours truly,

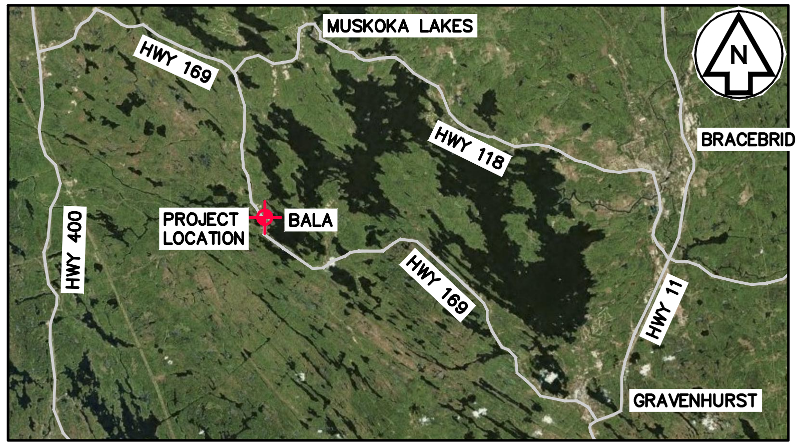
Erik Giles, P.Eng.
Project Manager
TULLOCH Engineering Inc.

Encl: Public Information Centre Ad
Cc: Project File
Twp. Muskoka Lakes, K. Becking, T. Sopkowe



PLAN - BALA, ONTARIO

N.T.S.



PROJECT LOCATION

N.T.S

No.	DATE	BY	ISSUES / REVISIONS
A	2019-08-13	KK	ISSUED DRAFT FOR CLIENT REVIEW

TULLOCH ENGINEERING

DRAWING:
PROJECT LOCATION
KEY PLAN

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM 1
DAM SAFETY ASSESSMENT

DRAWN BY: K. KORTEKAAS
CHECKED BY: E. GILES
DESIGNED BY: G. LIANG
APPROVED BY: G. LIANG
SCALE: AS NOTED
DATE: 2019-08-07
DRAWING No. 19-1493-C-00
REVISION No. A

H:\2019\ENGINEERING\191493 - Bala Dam Safety Review_DRAWINGS\191493-C-00.dwg

WASAUKSING FIRST NATION

WASAUKSING

P.O. Box 250
Parry Sound, Ontario
P2A 2X4

Phone:
(705) 746-2531
Fax:
(705) 746-5984

Chief
Warren Tabobondung

Chief Councillor
Brent Tabobandung

Councillors
Craig Brown
Joel King
Chance Pedoniqotte-King

Chris Stilwell, P. Eng.
Project Manager
TULLOCH Engineering Inc.
80 Main St. West
Huntsville, ON P1H 1W9

huntsville@tulloch.ca

April 9, 2021

Dear Mr. Stilwell,

RE: Notification of Study, The Township of Muskoka Lakes, Burgess 1 Dam Class Environmental Assessment Study

Please accept this letter as confirmation that Wasauksing First Nation has received correspondence dated February 2, 2021 in regards to the above Notification of Study for the Burgess 1 Dam. Wasauksing First Nation and our citizens rely upon, and shall continue to rely upon, the health of the natural environment within our Wasauksing-Anishinaabe Territory for the wellbeing and survival of all and are recognized stewards of the land and waters as stated in our *Wasauksing First Nation External Consultation and Accommodation Protocol, 2016.*

Thank you for continuing to inform us of the ongoing work and we wish to continue to be involved throughout future processes. This letter does not constitute Wasauksing First Nation's consent or agreement to the above Study. Should there be any negative residual effects or any impacts to our Aboriginal and/or Treaty Rights and lands or resources within our Wasauksing-Anishinaabe Territory, Wasauksing First Nation reserves the right to seek accommodation and mitigation measures from the Township of Muskoka Lakes and TULLOCH Engineering Inc.

Thank you for extending invitation for engagement to Wasauksing First Nation. Should you have any questions or concerns, please do not hesitate to contact me by email at ccc@wasauksing.ca or via telephone (705) 746-2531 ext. 2260.

Sincerely,

[redacted]

Ministry of Heritage, Sport,
Tourism, and Culture Industries

Programs and Services Branch
401 Bay Street, Suite 1700
Toronto, ON M7A 0A7
Tel:	416.314.7147

Ministère des Industries du Patrimoine,
du Sport, du Tourisme et de la Culture

Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto, ON M7A 0A7
Tél:	416.314.7147

April 6, 2020 EMAIL ONLY

Chris Stilwell, P. Eng.
Project Manager
Tulloch Engineering Inc.
80 Main Street West
Huntsville, ON P1H 1W9
chris.stilwell@tulloch.ca

MHSTCI File : 0012150
Proponent : The Township of Muskoka Lakes
Subject : Notice of Study Commencement – Municipal Class EA
Project : Burgess 1 Dam Rehabilitation
Location : Bala, The Township of Muskoka Lakes

Dear Chris Stilwell:

Thank you for providing the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) with the Notice of Study Commencement for the above-referenced project. MHSTCI's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources.

Project Summary
In February of 2020, the Township of Muskoka Lakes initiated a Class Environmental Assessment (EA) Study for the improvement of the Burgess 1 Dam located in Bala, Ontario. The study will be carried out in accordance with the requirements for schedule 'B' project under the Municipal Class Environmental Assessment document.

Identifying Cultural Heritage Resources
While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation. Indigenous communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Indigenous communities includes a discussion about known or potential cultural heritage resources that are of value to these communities. Municipal Heritage Committees, historical societies and other local heritage organizations may also have knowledge that contributes to the identification of cultural heritage resources.

Archaeological Resources

This EA project may impact archaeological resources and should be screened using the MHSTCI *Criteria for Evaluating Archaeological Potential* and *Criteria for Evaluating Marine Archaeological Potential* to determine if an archaeological assessment is needed. MHSTCI archaeological sites data are available at *archaeology@ontario.ca*. If the EA project area exhibits archaeological potential, then an archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *OHA*, who is responsible for submitting the report directly to MHSTCI for review.

Built Heritage and Cultural Heritage Landscapes

The MHSTCI *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether this EA project may impact cultural heritage resources. If potential or known heritage resources exist, MHSTCI recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, should be completed to assess potential project impacts. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send the HIA to MHSTCI for review, and make it available to local organizations or individuals who have expressed interest in review.

Environmental Assessment Reporting

All technical cultural heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MHSTCI whether any technical cultural heritage studies will be completed for this EA project, and provide them to MHSTCI before issuing a Notice of Completion or commencing any work on the site. If screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank you for consulting MHSTCI on this project and please continue to do so throughout the EA process. If you have any questions or require clarification, do not hesitate to contact me.

Sincerely,

[redacted]

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. MHSTCI makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MHSTCI be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Please notify MHSTCI if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the *Ontario Heritage Act* and the *Standards and Guidelines for Consultant Archaeologists*.

If human remains are encountered, all activities must cease immediately and the local police as well as the Registrar, Burials of the Ministry of Government and Consumer Services (416-326-8800) must be contacted. In situations where human remains are associated with archaeological resources, MHSTCI should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

Erik Giles

From:
Sent:
To:
Cc:
Subject:

[redacted]

Good Morning

Please be advised that the Canadian Navigable Waters Act will apply to this project. You may submit you application through our external submission site.

Regards

[redacted]

Inspection Officer
Navigation Protection Program, TransportCanada
Ontario Region
100 Front Street South
Sarnia, Ontario, N7T 2M4
nppont-ppnont@tc.gc.ca / Tel : 519-383-1863 / TTY : 1-888-675-6863

Agent Inspection
Programme de la pretoection de la navigation, Transports Canada
Region de l'Ontario
100 rue Front S
Sarnia, Ontario, N7T7R1
nppont-ppnont@tc.gc.ca / Tel : 519-383-1863 / ATS : 1-888-675-6863

[redacted]

Subject: 20-1051 - Burgess Dam EA - Mail Out

Good Morning,

A Schedule B Class Environmental Assessment Study for the rehabilitation or replacement of the Burgess 1 Dam located in Bala, Ontario has been initiated by the Township of Muskoka Lakes. Please find attached a letter regarding the notification of study as well as a site plan for the project. Please review at your convenience.

Regards,

[redacted]

Tell: 905 481 1678 x 906

TULLOCH Engineering Inc
1100 South Service Road, Suite 420 Stoney Creek, ON L8E 0C5
kelvin.cheung@TULLOCH.ca | TULLOCH.ca

Erik Giles

From: [redacted]
Sent: August 31, 2020 10:13 AM
To: [redacted]
Cc:
Subject: RE: Class EA in Bala
Attachments: Consultation Mail Out Letter - MOE Barrie District Office.pdf; Site Plan for Mail Out Letter.pdf

[redacted]

As Chris had mentioned, we have been retained by the Township of Muskoka Lakes and are currently about 50% of the way through an MEA Class Environmental Assessment Schedule B for the rehabilitation of the Burgess 1 Dam located in Bala, Ontario. I have re-attached our Notice of Project that we sent out earlier in the winter to the local MECP office for your reference.

We are aware that the burgess facility is currently a power generating station however its total capacity is ~ 160 kw with no intention of increasing capacity for the facility. Having spoken with the OWA this is below the threshold requirement of 500 kw and an increase of capacity below 25% that would trigger their class EA for the project.

Given the above, an MEA Class EA was selected as both the Township and TULLOCH are familiar with the process with the goal of engaging the public and meeting requirements for engagement and selection of a preferred solution under the Act. A Schedule B class EA was selected by the Township as this is largely seen as a rehabilitation project for the aging infrastructure associated with Burgess 1 Dam. The Dam is also owned by the Township.

Currently with the Township our alternative solutions are as follows:

1) Do nothing – Continued minimal maintenance, no upgrades to facility
2) Rehabilitation of Dam/removal of power generation – rehabilitate the dam and powerhouse structure to address safety deficiencies and decommission the powerhouse to the maximum extent possible with no future power generation planned
3) Rehabilitation of Dam/ Rehabilitation of Power – similar to alternative solution 2 but with continued power generation, no increase of power generation is planned, however some retrofits may be conducted to upgrade facilities to continue safely generating power at the same level into the future
4) Replace Dam in current footprint.

We have conducted an initial virtual public consultation and public feedback has been largely in support of either alternative solution 2 or 3.

Ultimately we would like to make sure that the MECP and yourself are onboard with what we are doing. We realize that the MEA Class does not specifically cover dam infrastructure, however , as a main instrument for public consultation and as a planning tool we believe we are fulfilling our duties under the Act by following the MEA Class procedure for this project. The ultimate goal is to allow the Township of Muskoka Lakes to be able to choose the best Alternative solution to improve the safety of the Burgess 1 Dam to help increase the safety of the structure.

If you could let us know your thoughts on what we have done and if you are OK with us continuing to move forward with the MEA Class Schedule B EA Study that would be greatly appreciated.

If you have any questions regarding the project I would be happy to answer them to the best of my ability.

Thank you,

[redacted]

Tel: 705 789 7851 x438
Fax: 705 789 7891
Cell: 647 968 9894

TULLOCH Engineering Inc
80 Main St. West, Huntsville, ON P1H 1W9
erik.giles@TULLOCH.ca | TULLOCH.ca

[redacted]
Sent: August 31, 2020 9:28 AM
[redacted]
Subject: RE: Class EA in Bala

Hi [redacted]

[redacted] from my firm will contact you.

[redacted]

80 Main Street West
Huntsville ON P1H 1W9

Tel: 705 789 7851 ext. 406
Fax: 705 789 7891
Cell: 705 787 8406

From: Dmytrenko, Matthew (MECP) <Matthew.Dmytrenko@ontario.ca>
Sent: August 31, 2020 9:13 AM
To: Chris Stilwell <chris.stilwell@tulloch.ca>
Cc: Liu, Chunmei (MECP) <Chunmei.Liu@ontario.ca>; Hyde, Chris (MECP) <Chris.Hyde@ontario.ca>; Hood, Cindy (MECP) <cindy.hood@ontario.ca>
Subject: RE: Class EA in Bala

[redacted] – I'm the Officer currently overseeing files in the Twp of Muskoka Lakes.

[redacted], cc'd, is our regional Planning and EA contact.

Please follow-up directly with me if you need any further information.

Sincerely,

[redacted]

Central Region, Barrie District Office
Ministry of the Environment, Conservation, and Parks

Fro[redacted]
Sent: Friday, August 28, 2020 08:24
To: [redacted]
Cc: [redacted]
Subject: FW: Class EA in Bala

Good morning [redacted]

Please see attached for Bala.

Thanks,
[redacted]

From: [redacted]
Sent: August 27, 2020 4:32 PM
T[redacted]
Subject: FW: Class EA in Bala

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hey [redacted]

Did you see this one?

Thanks,

[redacted]

TULLOCH
ENGINEERING

80 Main Street West
Huntsville ON P1H 1W9

Tel: 705 789 7851 ext. 406
Fax: 705 789 7891

Cell: 705 787 8406

From [redacted]
Sent: August 19, 2020 1:25 PM
To: [redacted]
Cc:
Subject: Class EA in Bala

[redacted]

We're doing a Class EA in Bala and would like to speak to a district or regional EA coordinator / reviewer. Can you give us a contact for Bala area?

Thanks,

[redacted]

TULLOCH
ENGINEERING

80 Main Street West
Huntsville ON P1H 1W9

Tel: 705 789 7851 ext. 406
Fax: 705 789 7891
Cell: 705 787 8406

Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

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

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. :   416 314-8001
Téléc. : 416 314-8452

February 1, 2021

Chris Stilwell, P.Eng.
Project Manager
Tulloch Engineering Inc.
chris.stilwell@tulloch.ca
BY EMAIL ONLY

Re: **Burgess 1 Dam**
Township of Muskoka Lakes
Schedule B Municipal Class Environmental Assessment
Notice of Study Commencement

Dear Mr. Stilwell,

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the Township of Muskoka Lakes has indicated that the study is following the approved environmental planning process for a Schedule B project under the Municipal Engineers Association's Municipal Class Environmental Assessment (Class EA).

The attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please identify the areas of interest which are applicable to the project and ensure they are addressed. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- Wahta Mohawks;
- Moose Deer Point First Nation;
- Wasauksing First Nation;
- Shawanaga First Nation;
- Métis Nation of Ontario Lands, Resources and Consultation Office;
- Métis Nation of Ontario Region 7 Councillor, David Dusome; and

The following Williams Treaties Communities with a copy to the Williams Treaties Coordinator Karry Sandy Mckenzie:

- Chippewas of Georgina Island;
- Chippewas of Rama First Nation; and
- Beausoleil First Nation.

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process".

Additional information related to Ontario's *Environmental Assessment Act* is available online at: www.ontario.ca/environmentalassessments

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information.

The proponent must contact the Director of Environmental Assessment Branch under the following circumstances subsequent to initial discussions with the communities identified by MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an impasse; or
- A Part II Order request is expected based on impacts to Aboriginal or treaty rights.

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

Once the report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the Proponent.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Part II Order requests on those matters should be addressed in writing to:

Minister Jeff Yurek
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor

Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Please note the project cannot proceed until at least 30 days after the end of the public review period provided for in the Notice of Completion.

Further, the project may not proceed after this time if:

- a Part II Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights; or
- the Director has issued a Notice of Proposed order regarding the project.

The public can request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent.

Once the requested information has been received, the Minister will have 30 days to make a decision or impose conditions on your project.

A draft copy of the report should be sent to me prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.

Please also ensure a copy of the final notice is sent to the ministry's Central Region EA notification email account (eanotification.cregion@ontario.ca) after the draft report is finalized.

Should you or your project team members have any questions regarding the material above, please contact me a [redacted]

Sincerely,

[redacted]

Regional Environmental Assessment Coordinator

[redacted]

Attachments: Areas of Interest
A Proponent’s Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities

AREAS OF INTEREST

It is suggested that you check off each applicable area after you have considered / addressed it.

☐ Species at Risk

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

☐ Planning and Policy

- Ontario has released "A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019)" which replaces the "Growth Plan for the Greater Golden Horseshoe (2017)". More information, including the Plan, is found here: https://www.placestogrow.ca.

- Parts of the study area may be subject to the A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019), Oak Ridges Moraine Conservation Plan (2017), Niagara Escarpment Plan (2017), Greenbelt Plan (2017) or Lake Simcoe Protection Plan (2014). Applicable policies should be referenced in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.

- The Provincial Policy Statement (2020) contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

☐ Source Water Protection (all projects)

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the

Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

  - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

  - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php.The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority.

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

☐ Climate Change

Ontario is leading the fight against climate change through the Climate Change Action Plan. Recently released, the plan lays out the specific actions Ontario will take in the next five years to meet its 2020 greenhouse gas reduction targets and establishes the framework necessary to meet its long-term targets. As a commitment of the action plan, **the province has now finalized a guide, "Considering Climate Change in the Environmental Assessment Process" (Guide).**

The Guide is now a part of the Environmental Assessment program's Guides and Codes of Practice.

The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. **Proponents should review this Guide in detail.**

- The MECP expects proponents to:

  1. Take into account during the assessment of alternative solutions and alternative designs, the following:
     a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
     b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
  2. Include a discrete section in the report detailing how climate change was considered in the EA.

  How climate change is considered can be qualitative or quantitative in nature, and should be scaled to the project’s level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

☐ **Air Quality, Dust and Noise**

- If there are sensitive receptors in the surrounding area of this project, an air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- **If a full Air Quality Impact Assessment is not required for the project, the report should still contain:**

  - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
  - A discussion of the nearby sensitive receptors and the project’s potential air quality impacts on present and future sensitive receptors;
  - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
  - A discussion of potential mitigation measures.

- As a common practice, “air quality” should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities*. report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

☐ Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- All natural heritage features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:

    - Areas of Natural and Scientific Interest (ANSIs)
    - Rare Species of flora or fauna
    - Watercourses
    - Wetlands
    - Woodlots

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, you may consider the provisions of the Rouge Park Management Plan if applicable.

☐ Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and

  sediment control during construction, and other details of the proposed works
  - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

☐ **Groundwater**

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

☐ **Contaminated Soils**

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites.

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- The report should identify any underground transmission lines in the study area. The owners should be consulted to avoid impacts to this infrastructure, including potential spills.

☐ Excess Materials Management

- Activities involving the management of excess soil should be completed in accordance with the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

☐ Servicing and Facilities

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with the Environmental Approvals Access and Service Integration Branch (EAASIB) to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

☐ Mitigation and Monitoring

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

☐ Consultation

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the SR that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The Class EA also directs proponents to include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments.

☐ **Class EA Process**

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. The Master Plan should clearly indicate the selected approach for conducting the plan, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Part II Order Requests under the *Environmental Assessment Act*, although the plan itself would not be.

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The Class EA also directs proponents to include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment. The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

A PROPONENT'S INTRODUCTION TO THE DELEGATION OF PROCEDURAL ASPECTS OF CONSULTATION WITH ABORIGINAL COMMUNITIES

Definitions

The following definitions are specific to this document and may not apply in other contexts:

Aboriginal communities – the First Nation or Métis communities identified by the Crown for the purpose of consultation.

Consultation – the Crown's legal obligation to consult when the Crown has knowledge of an established or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. This is the type of consultation required pursuant to s. 35 of the *Constitution Act, 1982*. Note that this definition does not include consultation with Aboriginal communities for other reasons, such as regulatory requirements.

Crown – the Ontario Crown, acting through a particular ministry or ministries.

Procedural aspects of consultation – those portions of consultation related to the process of consultation, such as notifying an Aboriginal community about a project, providing information about the potential impacts of a project, responding to concerns raised by an Aboriginal community and proposing changes to the project to avoid negative impacts.

Proponent – the person or entity that wants to undertake a project and requires an Ontario Crown decision or approval for the project.

I. Purpose

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that may adversely impact that right. In outlining a framework for the duty to consult, the Supreme Court of Canada has stated that the Crown may delegate procedural aspects of consultation to third parties. This document provides general information about the Ontario Crown's approach to delegation of the procedural aspects of consultation to proponents.

This document is not intended to instruct a proponent about an individual project, and it does not constitute legal advice.

II. Why is it Necessary to Consult with Aboriginal Communities?

The objective of the modern law of Aboriginal and treaty rights is the *reconciliation* of Aboriginal peoples and non-Aboriginal peoples and their respective rights, claims and interests. Consultation is an important component of the reconciliation process.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. For example, the Crown's duty to consult is triggered when it considers issuing a permit, authorization or approval for a project which has the potential to adversely impact an Aboriginal right, such as the right to hunt, fish, or trap in a particular area.

The scope of consultation required in particular circumstances ranges across a spectrum depending on both the nature of the asserted or established right and the seriousness of the potential adverse impacts on that right.

Depending on the particular circumstances, the Crown may also need to take steps to accommodate the potentially impacted Aboriginal or treaty right. For example, the Crown may be required to avoid or minimize the potential adverse impacts of the project.

III. The Crown's Role and Responsibilities in the Delegated Consultation Process

The Crown has the responsibility for ensuring that the duty to consult, and accommodate where appropriate, is met. However, the Crown may delegate the procedural aspects of consultation to a proponent.

There are different ways in which the Crown may delegate the procedural aspects of consultation to a proponent, including through a letter, a memorandum of understanding, legislation, regulation, policy and codes of practice.

If the Crown decides to delegate procedural aspects of consultation, the Crown will generally:

- Ensure that the delegation of procedural aspects of consultation and the responsibilities of the proponent are clearly communicated to the proponent;
- Identify which Aboriginal communities must be consulted;
- Provide contact information for the Aboriginal communities;
- Revise, as necessary, the list of Aboriginal communities to be consulted as new information becomes available and is assessed by the Crown;
- Assess the scope of consultation owed to the Aboriginal communities;
- Maintain appropriate oversight of the actions taken by the proponent in fulfilling the procedural aspects of consultation;
- Assess the adequacy of consultation that is undertaken and any accommodation that may be required;
- Provide a contact within any responsible ministry in case issues arise that require direction from the Crown; and
- Participate in the consultation process as necessary and as determined by the Crown.

IV. The Proponent's Role and Responsibilities in the Delegated Consultation Process

Where aspects of the consultation process have been delegated to a proponent, the Crown, in meeting its duty to consult, will rely on the proponent's consultation activities and documentation of those activities. The consultation process informs the Crown's decision of whether or not to approve a proposed project or activity.

A proponent's role and responsibilities will vary depending on a variety of factors including the extent of consultation required in the circumstance and the procedural aspects of consultation the Crown has delegated to it. Proponents are often in a better position than the Crown to discuss a project and its potential impacts with Aboriginal communities and to determine ways to avoid or minimize the adverse impacts of a project.

A proponent can raise issues or questions with the Crown at any time during the consultation process. If issues or concerns arise during the consultation that cannot be addressed by the proponent, the proponent should contact the Crown.

a) What might a proponent be required to do in carrying out the procedural aspects of consultation?

Where the Crown delegates procedural aspects of consultation, it is often the proponent's responsibility to provide notice of the proposed project to the identified Aboriginal communities. The notice should indicate that the Crown has delegated the procedural aspects of consultation to the proponent and should include the following information:

- a description of the proposed project or activity;
- mapping;
- proposed timelines;
- details regarding anticipated environmental and other impacts;
- details regarding opportunities to comment; and
- any changes to the proposed project that have been made for seasonal conditions or other factors, where relevant.

Proponents should provide enough information and time to allow Aboriginal communities to provide meaningful feedback regarding the potential impacts of the project. Depending on the nature of consultation required for a project, a proponent also may be required to:

- provide the Crown with copies of any consultation plans prepared and an opportunity to review and comment;
- ensure that any necessary follow-up discussions with Aboriginal communities take place in a timely manner, including to confirm receipt of information, share and update information and to address questions or concerns that may arise;
- as appropriate, discuss with Aboriginal communities potential mitigation measures and/or changes to the project in response to concerns raised by Aboriginal communities;
- use language that is accessible and not overly technical, and translate material into Aboriginal languages where requested or appropriate;
- bear the reasonable costs associated with the consultation process such as, but not limited to, meeting hall rental, meal costs, document translation(s), or to address technical & capacity issues;
- provide the Crown with all the details about potential impacts on established or asserted Aboriginal or treaty rights, how these concerns have been considered and addressed by the proponent and the Aboriginal communities and any steps taken to mitigate the potential impacts;
- provide the Crown with complete and accurate documentation from these meetings and communications; and
- notify the Crown immediately if an Aboriginal community not identified by the Crown approaches the proponent seeking consultation opportunities.

b) What documentation and reporting does the Crown need from the proponent?

Proponents should keep records of all communications with the Aboriginal communities involved in the consultation process and any information provided to these Aboriginal communities.

As the Crown is required to assess the adequacy of consultation, it needs documentation to satisfy itself that the proponent has fulfilled the procedural aspects of consultation delegated to it. The documentation required would typically include:

- the date of meetings, the agendas, any materials distributed, those in attendance and copies of any minutes prepared;
- the description of the proposed project that was shared at the meeting;
- any and all concerns or other feedback provided by the communities;

- any information that was shared by a community in relation to its asserted or established Aboriginal or treaty rights and any potential adverse impacts of the proposed activity, approval or disposition on such rights;
- any proposed project changes or mitigation measures that were discussed, and feedback from Aboriginal communities about the proposed changes and measures;
- any commitments made by the proponent in response to any concerns raised, and feedback from Aboriginal communities on those commitments;
- copies of correspondence to or from Aboriginal communities, and any materials distributed electronically or by mail;
- information regarding any financial assistance provided by the proponent to enable participation by Aboriginal communities in the consultation;
- periodic consultation progress reports or copies of meeting notes if requested by the Crown;
- a summary of how the delegated aspects of consultation were carried out and the results; and
- a summary of issues raised by the Aboriginal communities, how the issues were addressed and any outstanding issues.

In certain circumstances, the Crown may share and discuss the proponent's consultation record with an Aboriginal community to ensure that it is an accurate reflection of the consultation process.

c) Will the Crown require a proponent to provide information about its commercial arrangements with Aboriginal communities?

The Crown may require a proponent to share information about aspects of commercial arrangements between the proponent and Aboriginal communities where the arrangements:

- include elements that are directed at mitigating or otherwise addressing impacts of the project;
- include securing an Aboriginal community's support for the project; or
- may potentially affect the obligations of the Crown to the Aboriginal communities.

The proponent should make every reasonable effort to exempt the Crown from confidentiality provisions in commercial arrangements with Aboriginal communities to the extent necessary to allow this information to be shared with the Crown.

The Crown cannot guarantee that information shared with the Crown will remain confidential. Confidential commercial information should not be provided to the Crown as part of the consultation record if it is not relevant to the duty to consult or otherwise required to be submitted to the Crown as part of the regulatory process.

V. What are the Roles and Responsibilities of Aboriginal Communities' in the Consultation Process?

Like the Crown, Aboriginal communities are expected to engage in consultation in good faith. This includes:

- responding to the consultation notice;
- engaging in the proposed consultation process;
- providing relevant documentation;
- clearly articulating the potential impacts of the proposed project on Aboriginal or treaty rights; and
- discussing ways to mitigates any adverse impacts.

Some Aboriginal communities have developed tools, such as consultation protocols, policies or processes that provide guidance on how they would prefer to be consulted. Although not legally binding, proponents are encouraged to respect these community processes where it is reasonable to do so. Please note that there is no obligation for a proponent to pay a fee to an Aboriginal community in order to enter into a consultation process.

To ensure that the Crown is aware of existing community consultation protocols, proponents should contact the relevant Crown ministry when presented with a consultation protocol by an Aboriginal community or anyone purporting to be a representative of an Aboriginal community.

VI. What if More Than One Provincial Crown Ministry is Involved in Approving a Proponent's Project?

Depending on the project and the required permits or approvals, one or more ministries may delegate procedural aspects of the Crown's duty to consult to the proponent. The proponent may contact individual ministries for guidance related to the delegation of procedural aspects of consultation for ministry-specific permits/approvals required for the project in question. Proponents are encouraged to seek input from all involved Crown ministries sooner rather than later.

Jackson Mercer

From: [redacted]
Sent:
To: [redacted]
Cc: Burgess
Subject: Burgess Dam Municipal Class EA

Caution! This message was sent from outside your organization.

Good afternoon,

I understand that the Township of Muskoka Lakes initiated a Municipal Class EA to replace or rehabilitate the Burgess Dam facility in Bala.

This is a friendly reminder that the Notice of Commencement and the completed Project Information Form must be emailed to our Central Region EA Notifications email address (eanotification.cregion@ontario.ca). I have included instructions for our Class EA notifications procedures below for your reference.

Thanks,

[redacted]

I would like to inform you of a new process related to providing Class EA notifications to the Ministry of the Environment, Conservation and Parks that is in effect as of **May 1, 2018.** The information is below. Please read carefully.

Please follow the new process and submit an electronic version of the Notice and completed Project Information Form to the Central Region email (eanotification.cregion@ontario.ca). All Notices of commencement and completion are to follow the new process. If you have any questions, please feel free to contact me. Please feel free to pass along this information to your colleagues. Thank you.

New Notification Procedure:
The Ministry of the Environment, Conservation and Parks becomes aware of streamlined environmental assessments (e.g., class environmental assessment projects, electricity projects and waste management projects) through notifications by project owners. Notifying the ministry is an important step in the streamlined environmental assessment processes. As part of the ministry's ongoing efforts to improve processes and ensure the ministry has an opportunity to provide input on projects undergoing streamlined environmental assessments, the ministry has established dedicated email accounts in each regional office. These accounts will be used to receive notices as required in your class environmental assessment process along with a new "Project Information Form". As of May 1, 2018, proponents must use this new process.

4 Step Process for Submitting Notices for Streamlined EAs

To submit your notice you need to do the following:

1. **Download and complete the Project Information Form.** (The Form can be found here under "Streamlined EAs". It is an excel spreadsheet with columns that need to be filled out by the proponent. The form has been developed for ease of use (i.e. drop down pick list for most fields). Instructions on filling out the form are contained in 2 tabs within the form itself).

2. **Create an email. The subject line of your email must include in this order: project location, type of streamlined EA and project name**

   For example:

   - York Region, MEA Class EA, Elgin Mills Rd East (Bayview to Woodbine)
   - Durham Region, Electricity Screening Process, New Cogeneration Station
   - City of Ottawa, Waste Management Screening Process, Landfill Expansion

3. **Attach the completed Project Information Form (in excel format) and a copy of your project notice (in PDF format) to the email.**

4. **Send by email to the appropriate ministry regional office:**

   Central Region – eanotification.cregion@ontario.ca

   Eastern Region – eanotification.eregion@ontario.ca

   Northern Region – eanotification.nregion@ontario.ca

   South West Region – eanotification.swregion@ontario.ca

   West Central Region – eanotification.wcregion@ontario.ca

Notes:

- The hyperlink to the MECP District Officer Locator website, can be used to assist with determining what ministry region your project is located.
- The minimum requirement is to send project initiation and completion notices (and where applicable, Revised Notice of Completion, Notice of Filing of Addendum, Statement of Completion). All other notices (e.g. Notice of PIC/OH) can be sent to the Regional email address but not required.
- If your project is located in more than one ministry region, you need to submit your notices to all appropriate regions.

Erik Giles

From: [redacted]
Sent: August 18, 2020 4:59 PM
To: [redacted]
Cc:
Subject: RE: 20-1051 - Burgess Dam EA - Mail Out

[redacted]

Firstly, my apologies for not acknowledging your email/letter notification earlier.
I think my focus at the time was likely on spring freshet in the local watersheds and the global pandemic was also just unfolding.

We appreciate the notification of commencement of the study and look forward to working with Tulloch and the Township of Muskoka lakes as the options are considered and discussed.
Staff in our Ministry have met to discuss the notification and you are welcome to reach out to us with any questions you may have as the project unfolds.

While the preferred option and associated requirements for permitting and further consultation may not be known at this time, we encourage you to keep in mind the requirements of the Environmental Assessment Act for Waterpower projects, and the Lakes and Rivers Improvement Act with respect to permitting and Water Management Planning.

Regard,

Chris

[redacted]

Fro[redacted]
Sent: March-13-20 11:01 AM
To: [redacted]
[redacted]
Subject: 20-1051 - Burgess Dam EA - Mail Out

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good Morning,

A Schedule B Class Environmental Assessment Study for the rehabilitation or replacement of the Burgess 1 Dam located in Bala, Ontario has been initiated by the Township of Muskoka Lakes. Please find attached a letter regarding the notification of study as well as a site plan for the project. Please review at your convenience.

Regards,

[redacted]

Tell: 905 481 1678 x 906

TULLOCH Engineering Inc
1100 South Service Road, Suite 420 Stoney Creek, ON L8E 0C5
kelvin.cheung@TULLOCH.ca | TULLOCH.ca

Erik Giles

From: [redacted]
Sent: March 17, 2020 7:06 PM
To: [redacted]
Cc: [redacted]
Subject: RE: 20-1051 - Burgess Dam EA - Mail Out

[redacted]

Your email was forwarded to me. The Ministry of Transportation's (MTO) only interest in this project would be related to upstream or downstream water levels and the potential impact on water crossings under provincial highways. MTO only needs to be further consulted if there will be impacts to water crossings/levels under provincial highways.

Thanks

[redacted]

From: [redacted]
Sent: March-16-20 8:31 AM
To [redacted]
Subject: FW: 20-1051 - Burgess Dam EA - Mail Out

[redacted]

For appropriate action please.

[redacted]

From: [redacted]
Sent: Sunday, March 15, 2020 7:56 PM
To: [redacted]
Cc: [redacted]
Subject: FW: 20-1051 - Burgess Dam EA - Mail Out

[redacted]

Thank you for the e-mail and attachments. I am currently off on an assignment working on other Ministry priorities. Junaid Asghar is the acting Manager of Engineering while I am away. By copy of this e-mail I am forwarding the notice and site plan to Junaid for his action.

Thanks

[redacted]

From [redacted]
Sent: March 13, 2020 11:11 AM
To: [redacted]
Cc: [redacted]
Subject: 20-1051 - Burgess Dam EA - Mail Out

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good Morning,

A Schedule B Class Environmental Assessment Study for the rehabilitation or replacement of the Burgess 1 Dam located in Bala, Ontario has been initiated by the Township of Muskoka Lakes. Please find attached a letter regarding the notification of study as well as a site plan for the project. Please review at your convenience.

Regards,

[redacted]

TULLOCH
ENGINEERING
Tell: 905 481 1678 x 906

TULLOCH Engineering Inc
1100 South Service Road, Suite 420 Stoney Creek, ON L8E 0C5
kelvin.cheung@TULLOCH.ca | TULLOCH.ca

2016

WASAUKSING FIRST NATION

EXTERNAL CONSULTATION AND ACCOMMODATION PROTOCOL

OUR COMMUNITY MOVING FORWARD

WASAUKSING FIRST NATION | P.O. BOX 250 - PARRY SOUND, ONTARIO - P2A 2X4 | (705) 746-2531
WWW.WASAUKSING.CA

Dated for Reference: October 13, 2016 - COUNCIL APPROVED (BCR # 2016-0078)

Photo Credit: Jodi Baker

Table of Contents

Wasauksing First Nation External Consultation and Accommodation Protocol

1.0 Preamble

Whereas: WASAUKSING FIRST NATION is a part of the Ojibway, Potawatomi and Odawa people who together comprise a historical affiliation known as the Three Fires Confederacy; and

Whereas: WASAUKSING FIRST NATION and our CITIZENS possess ABORIGINAL AND TREATY RIGHTS and interests over lands and RESOURCES within our WASAUKSING-ANISHINAABE TERRITORY as more particularly shown in Appendix “A” hereto; and

Whereas: Section 35 of the *Constitution Act, 1982* recognizes and affirms the existing ABORIGINAL AND TREATY RIGHTS of the Aboriginal peoples of Canada; and

Whereas: the Supreme Court of Canada, in the *Haida, Taku River* and *Mikisew* cases, established that Aboriginal peoples asserting ABORIGINAL AND TREATY RIGHTS must be consulted and accommodated prior to the occurrence of any DECISIONS, conducts and/or ACTIVITIES which may have an IMPACT on those rights and interests of the Aboriginal peoples; and

Whereas: WASAUKSING FIRST NATION is ready, willing and able to engage in consultation(s), and where deemed appropriate by WASAUKSING FIRST NATION, to be ACCOMMODATED with respect to, any and all, DECISIONS, conducts and/or ACTIVITIES that may have the potential to IMPACT our collective ABORIGINAL AND TREATY RIGHTS and our lands and RESOURCES within our WASAUKSING-ANISHINAABE TERRITORY; and

Whereas: the CROWN and private industry sector PROPONENTS seeking to make DECISIONS and to carry out conducts and/or ACTIVITIES within the WASAUKSING-ANISHINAABE TERRITORY, should only do so in accordance with this PROTOCOL and with the ***free, prior and informed consent*** of WASAUKSING FIRST NATION; and

Whereas: WASAUKSING FIRST NATION has a profound relationship with the land that is rooted in respect for the spiritual value of the Earth and the gifts of the Creator. It is within our Clan systems and our Seven Grandfather Teachings that we recognize and acknowledge our CITIZENS, including our Elders and our children, as knowledge-keepers whose voices warrant the same level of merit and respect as any other accredited sources of expertise.

2.0 Name and Adoption of this Protocol

2.1 This PROTOCOL shall be known as the *Wasauksing First Nation External Consultation and Accommodation Protocol*.

2.2 This PROTOCOL was adopted by the WASAUKSING FIRST NATION Council by way of WASAUKSING FIRST NATION Band Council Resolution # 2016-0078, dated November 10, 2016, and is in full force and in effect immediately.

2.3 This PROTOCOL applies to all lands and RESOURCES and all projects, DECISIONS or matters that may IMPACT the rights and/or interests of WASAUKSING FIRST NATION and/or our CITIZENS within our WASAUKSING-ANISHINAABE TERRITORY but does not limit or IMPACT the rights of WASAUKSING FIRST NATION in or to our RESERVE lands, or other lands held for the use and benefit of WASAUKSING FIRST NATION, including, but not limited to, those lands set out in Appendix "B" hereto.

2.4 Any reference to the rights and/or interests of WASAUKSING FIRST NATION herein shall be read and construed as meaning the "rights and/or interests of WASAUKSING FIRST NATION and/or our CITIZENS".


Photo Credit: Jodi Baker

3.0 Aboriginal and Treaty Rights

3.1 For the purposes of the *Wasauksing First Nation External Consultation and Accommodation Protocol*, the term "ABORIGINAL AND TREATY RIGHTS" is used in a manner that is consistent with Section 35(1) of the *Constitution Act, 1982* which states:

> *"The existing ABORIGINAL AND TREATY RIGHTS of the aboriginal peoples of Canada are hereby recognized and affirmed".*

3.2 This *Wasauksing First Nation External Consultation and Accommodation Protocol*, and all actions, ACTIVITIES, DECISIONS or authorizations made pursuant hereto are and shall be interpreted as being without prejudice to any claims, specific claims and/or outstanding land claims asserted by WASAUKSING FIRST NATION with respect to our lands and RESOURCES within our WASAUKSING-ANISHINAABE TERRITORY, including WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS.

3.3 All consultations and ACCOMMODATIONS between WASAUKSING FIRST NATION and any municipality or private sector PROPONENT do not absolve the CROWN of its obligation and duty to consult with WASAUKSING FIRST NATION and/or ACCOMMODATE the rights and interests of WASAUKSING FIRST NATION in accordance with Section 35(1) of the *Constitution Act, 1982*.

3.4 Notwithstanding anything in this *Wasauksing First Nation External Consultation and Accommodation Protocol*, WASAUKSING FIRST NATION reserves the right to challenge by way of judicial review, application, action, or any other legal, administrative and/or other processes, any ACTIVITY which may potentially pose a threat to WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS.

4.0 Non-Derogation

4.1 Nothing in this *Wasauksing First Nation External Consultation and Accommodation Protocol* or any actions, ACTIVITIES, DECISIONS or authorizations shall be construed so as to abrogate and/or derogate from the ABORIGINAL AND TREATY RIGHTS of WASAUKSING FIRST NATION.

Photo Credit: Daniella Baker

5.0 Application

5.1 This *Wasauksing First Nation External Consultation and Accommodation Protocol* applies to the territory over which WASAUKSING FIRST NATION asserts our ABORIGINAL AND TREATY RIGHTS and interests, known as our WASAUKSING-ANISHINAABE TERRITORY, as more particularly defined in Appendix "A" hereto. WASAUKSING FIRST NATION reserves the right to define our WASAUKSING-ANISHINAABE TERRITORY from time to time based upon our traditional, spiritual, communal and historical uses of the land.

5.2 This *Wasauksing First Nation External Consultation and Accommodation Protocol* applies to:

(i) Any consultations engaged between WASAUKSING FIRST NATION and the CROWN DESIGNATE, which includes: the CROWN in right of Canada, the CROWN in right of Ontario and all of their Ministries, cabinets, committees, CROWN corporations, local governments (municipalities and regional districts), agencies, employees, representatives and contracted agents;

(ii) Any and all consultations proposed and/or being undertaken with any municipalities and townships within our WASAUKSING-ANISHINAABE TERRITORY; and

(iii) All CROWN and private sector PROPONENTS proposing to undertake any ACTIVITIES and/or DECISIONS that may potentially alter and affect the lands, RESOURCES, air and watersheds or any use, benefit or association of WASAUKSING FIRST NATION or our CITIZENS of our WASAUKSING-ANISHINAABE TERRITORY.

5.3 **Impacts for Outside Projects** - WASAUKSING FIRST NATION relies on the health of the natural environment in our WASAUKSING-ANISHINAABE TERRITORY for our wellbeing and survival and are recognized stewards of the land and waters, including the upper waterways that may be outside of our WASAUKSING-ANISHINAABE TERRITORY. Therefore, to the extent that any proposed project(s) outside of our WASAUKSING-ANISHINAABE TERRITORY will IMPACT or may IMPACT any lands, rivers, waterways, flora or fauna within our WASAUKSING-ANISHINAABE TERRITORY, such projects will be subject to this PROTOCOL.

6.0 Triggers for the Duty to Consult

6.1 The duty to consult arises when: (a) the CROWN has KNOWLEDGE of any ACTIVITY, work, or undertaking or proposal for any ACTIVITY, work or undertaking within our WASAUKSING-ANISHINAABE TERRITORY or that may IMPACT our WASAUKSING-ANISHINAABE TERRITORY; (b) any DECISION, approval, permit or other governmental authorization or DECISION is requested with respect to any ACTIVITY, work or undertaking within our WASAUKSING-ANISHINAABE TERRITORY; or (c) any person, firm or corporation (the "PROPONENT") engages in, plans to engage in or proposes to engage in an ACTIVITY, work or undertaking that may IMPACT WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS, regardless of CROWN KNOWLEDGE, real or CONSTRUCTIVE, of the existence of an ABORIGINAL OR TREATY

RIGHT. They include the undertaking of the following proposed ACTIVITIES, actions and/or DECISIONS, but are not limited to:

(i) Disposing of any right, title or interest in and to CROWN lands, whether in whole or in part, including any issuances of letters patent, grants of fee simple, land use permits, leases, licences and easements;

(ii) Disposing of or dealing with any ABORIGINAL AND TREATY RIGHTS to Treaty lands, including permits and public land stewardship securements for wildlife conservation purposes;

(iii) All land use planning, official five (5) year planning reviews and proposed amendments and/or DECISIONS pertaining to public land use policies by any governmental authority;

(iv) Any proposed expansions and/or adjustments to municipal/township boundaries or roadways including proposed public access restriction/closures to: a) accessible public roads; b) accessible public land areas; and c) accessible public watersheds and waterways;

(v) Any recorded mining stake claims, including CROWN sponsored, authorized or approved mapping and exploration activities;

(vi) All forestry management and logging activities, hydroelectricity, solar and wind development projects, mineral or aggregate operations, mineral exploration, extraction, mining, petroleum resource exploration extractions - oil and shale gas drilling, processing, transportation (transmission or pipeline corridors) or storage;

(vii) All new construction/reconstruction of roads, dams, water diversions, bridges or any other such infrastructure that may have the potential to IMPACT the environment, forests, flora, lakes, watersheds, waterways, fish, wildlife and air quality;

(viii) Any PROPONENT ACTIVITY that causes disruptive vibrations and harmful noise pollution to WASAUKSING FIRST NATION CITIZENS, our natural environment and/or our wildlife;

(ix) Any proposed ACTIVITY that may disturb and/or damage culturally significant sites such as: sacred ceremonial sites, burial grounds, any identified areas of traditional medicines/plants and food harvesting sites, such as sweetgrass, hemlock, berries, hunting and fishing, etc.;

(x) Any PROPONENT ACTIVITY that may potentially pose serious health risks, physical injury risks and/or result in death to any WASAUKSING FIRST NATION CITIZEN;

(xi) Any PROPONENT ACTIVITY that may potentially pose structural risks to any CITIZEN household, community infrastructures and business buildings within WASAUKSING FIRST NATION; and

(xii) Any and all nuclear power and nuclear fuel waste management, including nuclear fuel waste transportation projects.

6.2 Any potential risk of adverse IMPACTS to the environment and any other potential health, safety and life-threatening risks that are a consequence of projects and/or ACTIVITIES carried out by any governmental, municipality or private sector PROPONENT will trigger the duty to consult with WASAUKSING FIRST NATION. It is the responsibility of the CROWN, municipality and private sector PROPONENTS to notify WASAUKSING FIRST NATION when it is aware, or ought to be aware, of any such IMPACTS.

Photo Credit: Jennifer Predie

7.0 Guiding Principles for Meaningful Consultation

7.1 **Honour of the Crown** - The CROWN, in all its dealings with WASAUKSING FIRST NATION, must uphold the honour of the CROWN and undertake consultations in good faith. The Supreme Court of Canada, Council of the Haida Nation v. British Columbia in 2004 stated:

> *"The Government's duty to consult with Aboriginal Peoples and accommodate their interests is grounded in the honour of the CROWN".*

7.2 **Meaningful Engagement** - Meaningful engagement means that WASAUKSING FIRST NATION is placed in a position to make informed DECISIONS and understands the effects/IMPACTS of proposed projects, actions, ACTIVITIES and/or proposed POLICY amendments/DECISIONS that may have IMPACTS to WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS and to ensure that those proposed projects, actions, ACTIVITIES and/or proposed POLICY amendments/DECISIONS addresses the needs, concerns and aspirations of WASAUKSING FIRST NATION. Any projects, ACTIVITIES, conduct or DECISIONS, existing or proposed, that have not been fully explained, reviewed and commented upon by WASAUKSING FIRST NATION and our CITIZENS prior to their commencement, shall be deemed to not have been the subject of "meaningful engagement" with WASAUKSING FIRST NATION.

7.3 **Reconciliation** - Without derogating from WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS when ACCOMMODATION is deemed impossible or inadequate, the principle of reconciliation, a reciprocal process between WASAUKSING FIRST NATION and the CROWN and/or a PROPONENT, which strives to reasonably balance both parties' intents and interests, shall govern and guide, any and all consultation and ACCOMMODATION ACTIVITIES with WASAUKSING FIRST NATION.

7.4 **Environmental Protection and Sustainable Development** - WASAUKSING FIRST NATION and our CITIZENS rely upon, and shall continue to rely upon, the health of the natural environment for the wellbeing and survival of all. In fulfilling our environmental stewardship responsibilities, WASAUKSING FIRST NATION shall consider the sustainability of all projects, works, undertakings or developments and the sustainability of all NATURAL RESOURCES, lands, rivers, waterbeds, flora and fauna in light of any actual or proposed projects, works, undertakings or developments and shall require appropriate safeguards, MITIGATION or ACCOMMODATION to protect the future of our WASAUKSING-ANISHINAABE TERRITORY.

7.5 **Accommodation** - Fulfilling the CROWN'S duty to WASAUKSING FIRST NATION, the CROWN shall ensure that the necessary steps are taken to address and ACCOMMODATE, where required, WASAUKSING FIRST NATION'S interests, views and concerns with respect to proposed projects/ACTIVITIES and/or DECISIONS that may have potential IMPACTS within our WASAUKSING-ANISHINAABE TERRITORY. It is strongly emphasized that MITIGATION is not considered ACCOMMODATION.

7.6 **Sharing in Impact Benefits** - It is the overall presiding principle that WASAUKSING FIRST NATION is entitled to share in the economic wealth that may arise from proposed project developments, actions and/or ACTIVITIES by way of nation-to-nation negotiated IMPACT Benefit Agreements, Memorandums of Understanding and Resource Revenue Benefits Sharing Agreements with the CROWN and/or PROPONENT. WASAUKSING FIRST NATION is a recognized nation-to-nation government and has Aboriginal title through the signing of the *Robinson-Huron Treaty of 1850* and is further enshrined in Section 25 of the *Canadian Charter of Rights and Freedoms*.

7.7 **Capacity** - In all cases where the need for independent research and technical services are identified, WASAUKSING FIRST NATION will submit a request for capacity funding to the CROWN and/or PROPONENT in order to effectively participate in a meaningful consultative process. As soon as the duty to consult is triggered, it is the expectation of WASAUKSING FIRST NATION that funding for capacity must be readily available for independent research, technical services and professional advice. Meaningful consultation cannot occur without these resources being available when requested. Non-compliance will be deemed to be in direct violation of this PROTOCOL.

Photo Credit: Jodi Baker

8.0 Free, Prior and Informed Consent

8.1 All engagement/consultation matters and processes entered into with WASAUKSING FIRST NATION must adhere to the principle of ***free, prior and informed consent*** as recognized under the *United Nations Declaration on the Rights of Indigenous Peoples, March 2008*. Non-compliance to these principles will be deemed to be in direct violation of this PROTOCOL.

8.2 The principle of ***free, prior and informed consent*** is an ongoing consultative process throughout the life of any and all mutually-agreed upon development projects within our WASAUKSING-ANISHINAABE TERRITORY and applies to any and all contemplated POLICY amendments/DECISIONS. WASAUKSING FIRST NATION reserves the right to request regular updates on active projects taking place within our WASAUKSING-ANISHINAABE TERRITORY.

8.3 **Free** - All consultations are to be free from coercion, force, manipulation, intimidation and pressure by all levels of government and/or by all private sector PROPONENTS.

8.4 **Prior** - Before any work, action or DECISION is made that could affect WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS, WASAUKSING FIRST NATION must be effectively engaged, consulted and ACCOMMODATED. Consideration must be given for respectful time requirements within our internal departmental and governmental processes. In instances where multiples of affected First Nation communities are involved, consideration of the time needed to consult with our sister First Nations within the region must be considered.

8.5 **Informed** - WASAUKSING FIRST NATION must be properly advised of all the relevant facts, information and risks from any and all projects, ACTIVITIES and/or DECISIONS that will affect and/or have enduring IMPACTS in or on our WASAUKSING-ANISHINAABE TERRITORY.

In addition, WASAUKSING FIRST NATION maintains the right to have:

(i) Access to independent information and advice apart from the CROWN and/or private sector PROPONENTS; and

(ii) Access to experts, when required, for technical and legal advice.

8.6 **Consent** - WASAUKSING FIRST NATION maintains the collective right to say “Yes” or “No” to any proposed projects that may cause irreversible environmental damage within our WASAUKSING-ANISHINAABE TERRITORY or where ACCOMMODATION is insufficient to protect WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS. WASAUKSING FIRST NATION also maintains the right to say “Yes” or “No” at each and every stage of project development that affects our lands and RESOURCES and/or is within our WASAUKSING-ANISHINAABE TERRITORY. If harmful and/or not beneficial to WASAUKSING FIRST NATION'S CITIZENS, or our rights and interests and/or to the environment, WASAUKSING FIRST NATION maintains the right to deny and/or reject a proposed project and/or proposed ACTIVITY. If it is proven to be of benefit to WASAUKSING FIRST NATION'S CITIZENS and/or to the environment, the project and/or proposed ACTIVITY may be granted consent to move forward.

9.0 Notice of Consultation

9.1 The CROWN and/or PROPONENT shall submit a written Request for Consultation addressed to the Chief of WASAUKSING FIRST NATION at the preliminary stages of project planning or at least six (6) months prior to the undertaking of any ACTIVITIES that may affect WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS and/or our interests.

9.2 WASAUKSING FIRST NATION asserts that a written Notice of Consultation does not constitute meaningful consultation with WASAUKSING FIRST NATION. In order for meaningful consultation to take place by the CROWN and/or PROPONENT, it must occur at the community level.

9.3 The Request for Consultation shall provide all relevant information pertaining to the proposed project, ACTIVITY, undertaking and/or contemplated DECISION written in a language and form that is comprehensible to WASAUKSING FIRST NATION. It shall include, but is not limited to:

(i) The nature and scope of the project, geographical location in UTM, maps, etc.;
(ii) The duration and timelines of the proposed project and ACTIVITY;
(iii) All available resource materials - environmental assessments, permit applications, background papers for official plan reviews, proposed amended policies and any other relevant documents;
(iv) The distance to, location and name of nearest waterbodies;
(v) All potential environmental IMPACTS from the proposed project, ACTIVITY, undertaking or DECISION;
(vi) A list of any MITIGATION or compensation measures intended to minimize, eliminate or make up for potential environmental IMPACTS;
(vii) Contact information - names, addresses, phone numbers, email addresses and websites;
(viii) A commitment to continue to update and provide the foregoing information as and when available; and
(ix) An agreement to abide by this PROTOCOL.

9.4 In the event that a PROPONENT fails to provide a written Request for Consultation and WASAUKSING FIRST NATION becomes aware of a project, ACTIVITY, undertaking or proposed DECISION within our WASAUKSING-ANISHINAABE TERRITORY or that may affect our ABORIGINAL AND TREATY RIGHTS, WASAUKSING FIRST NATION will send the PROPONENT a written letter advising of their failure to do so and will set a reasonable timeframe for the PROPONENT to comply with Sections 9.0 - 9.3 of this PROTOCOL.

10.0 Time Constraints

10.1 There shall be no unreasonable time constraints imposed upon WASAUKSING FIRST NATION to fully respond to proposed moderate to extensive consultation projects, ACTIVITIES, undertakings or DECISIONS, as identified in the *Wasauksing First Nation Consultation Matrix*, attached as Appendix "C" hereto.

10.2 Time constraint demands of ninety (90) days or less are not considered an acceptable practice and will not be honoured by WASAUKSING FIRST NATION.

11.0 Responsibilities of Wasauksing First Nation

11.1 WASAUKSING FIRST NATION shall:

(i) Provide a confirmation of receipt letter to the CROWN and/or PROPONENT indicating when the consultation request was received;

(ii) Assess the nature and complexity for each proposed project, ACTIVITY, undertaking and/or DECISION, and its potential effect on WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS, in a fair and consistent manner, as per the *Wasauksing First Nation Consultation Matrix*, and if unable to do so, shall request further information from the CROWN/PROPONENT in order to perform such assessment; and

(iii) Operate and negotiate in good faith.

Photo Credit: Jennifer Predie

12.0 Consultation and Accommodation Process

12.1 All consultation processes shall require a Memorandum of Understanding (MOU) between WASAUKSING FIRST NATION and the PROPONENT, which details: (a) the PROPONENT'S acknowledgement and respect for WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS; (b) a commitment to communicate and share information with WASAUKSING FIRST NATION; (c) when requested by WASAUKSING FIRST NATION. a commitment to meet with WASAUKSING FIRST NATION'S CITIZENS to explain the project, proposal or plan and hear and read any concerns exposed; (d) a commitment to negotiate proper ACCOMMODATION for WASAUKSING FIRST NATION and our CITIZENS where appropriate; (e) a commitment to abide by and follow the dispute resolution process as set out in Section 17.0 hereto; and (f) a commitment to report all archeological or historical discoveries immediately to WASAUKSING FIRST NATION and not undertake any further work within 500m of any such discovery without WASAUKSING FIRST NATION'S consent; and acknowledgement that all archeological items discovered shall be the property of WASAUKSING FIRST NATION and immediately delivered to WASAUKSING FIRST NATION.

12.2 The consultation and ACCOMMODATION process for proposed projects, ACTIVITIES and/or DECISIONS deemed to require moderate to extensive levels of consultation, as per the *Wasauksing First Nation Consultation Matrix*, will require:

(i) The CROWN and/or PROPONENT to be open to making revisions to the original proposal, plan, ACTIVITY, undertaking and/or DECISION based on the concerns or views expressed during WASAUKSING FIRST NATION'S internal consultation process with our CITIZENS;

(ii) All parties to enter into a mutually agreed upon MOU, an IMPACT Benefit Agreement, a Mutual Benefits Agreement, a Resource Revenue Benefit Sharing Agreement and/or a co-management agreement if the proposed ACTIVITY and/or DECISION is collectively agreed to proceed by WASAUKSING FIRST NATION;

(iii) Any DECISION as to whether or not ACCOMMODATION is necessary shall be decided collaboratively by the PROPONENT and WASAUKSING FIRST NATION, in the spirit of reconciliation; and

(iv) PROPONENTS must comply with all negotiated ACCOMMODATION agreements with WASAUKSING FIRST NATION.

12.3 If at any point during the consultation process, WASAUKSING FIRST NATION decides to cease consultation or oppose a proposed project, ACTIVITY, undertaking and/or DECISION, a letter stating our objection and outlining our justification(s) will be forwarded to the CROWN and/or PROPONENT.

13.0 Application for Crown/Treaty Lands Disposition

13.1 Approval or consent for disposition of CROWN land and/or shoreline reserves shall not be provided where outstanding land claims for such lands or any immediately adjacent lands are in existence.

14.0 Consultation Status Readjustment

14.1 WASAUKSING FIRST NATION maintains the right at any time to readjust the consultation level for a proposed project, ACTIVITY, undertaking and/or DECISION from light consultation to moderate consultation or extensive consultation, or vice versa, and will notify the CROWN and/or PROPONENT through a written Notice of Consultation Status Change.

15.0 Consultation Cost

15.1 Depending on the nature of a proposed project, ACTIVITY, undertaking and/or DECISION and the level of consultation required, WASAUKSING FIRST NATION may require funding from the CROWN and/or PROPONENT for expenses and services related to:

(i) Access to independent professional legal, technical and economic expertise;
(ii) Research activities and project analysis;
(iii) Information management and dissemination; and
(iv) Costs associated with attending and hosting consultation meetings and community information and consultation sessions, such as: per diems, rental of meeting room, hotel accommodations, food and beverages, travel, overhead, etc.

16.0 Confidentiality

16.1 WASAUKSING FIRST NATION'S collected cultural and land-use data is the sole property of the First Nation and any information shared by WASAUKSING FIRST NATION shall not grant or convey any rights in or to such information to any person, firm or corporation.

16.2 PROPONENTS requiring review of WASAUKSING FIRST NATION'S cultural and land-use data will be required to enter into a confidentiality agreement prior to such review with WASAUKSING FIRST NATION.


Photo Credit: Jodi Baker

17.0 Dispute Resolution

17.1 The consultation process shall cease for the duration of a dispute resolution process.

17.2 In the event of a dispute held between the PROPONENT and WASAUKSING FIRST NATION, the following resolution steps shall be taken:

(i) One party and/or both parties shall provide a written notice of the existence of a dispute, including a brief and concise explanation of the circumstance(s) and/or reason(s) leading up to the dispute and address it to the Community Consultation Coordinator, who will forward copies of the dispute notice to senior representatives of the PROPONENT, WASAUKSING FIRST NATION Council, and the CROWN;

(ii) Both parties shall co-operate and negotiate in good faith to resolve the disputed matter to their mutual satisfaction;

(iii) In such cases where a dispute cannot be resolved to both parties' mutual satisfaction, the appointment of a mediator or a facilitator shall be called upon prior to any litigation.

(iv) If the mediation process fails or does not occur within ninety (90) days of the commencement of the dispute, either party may seek resolution through litigation.

17.3 The CROWN shall bear all the costs associated with the dispute resolution process.

17.4 Notwithstanding section 17.2, either party to the dispute may seek injunction relief in appropriate cases in the Ontario Superior Court of Justice or the Federal Court of Canada, as may be required.

18.0 Community Consultation Coordinator

18.1 The WASAUKSING FIRST NATION Community Consultation Coordinator shall be the point-of-contact person for all consultation and ACCOMMODATION matters.

19.0 Review and Amendment

19.1 WASAUKSING FIRST NATION'S Community Consultation Coordinator and our Lands and Resources Committee shall review this PROTOCOL on an annual basis, or as required. Any changes to the PROTOCOL will be recommended to Council for approval.

19.2 WASAUKSING FIRST NATION'S Community Consultation Coordinator and our Lands and Resources Committee may also create regulations regarding this PROTOCOL, which will be recommended to Council for approval.

20.0 Glossary

"**ABORIGINAL AND TREATY RIGHTS**" means practices, customs, and traditions that are integral to the distinctive culture of WASAUKSING FIRST NATION CITIZENS, as recognized and affirmed by Section 35(1) of the *Constitution Act, 1982*.

"ACCOMMODATION" means the process of adapting or adjusting to someone or something, a settlement or a compromise. The CROWN has an obligation to ACCOMMODATE, if required, the interests of those First Nation communities who may be potentially IMPACTED by a proposed DECISION and/or ACTIVITY.

"**ACTIVITY**" means any CROWN or PROPONENT action, including, but not limited to, any work, procedure, operation or other physical act, which may have an IMPACT on WASAUKSING FIRST NATION'S ABORIGINAL AND TREATY RIGHTS, our WASAUKSING-ANISHINAABE TERRITORY and/or our lands and RESOURCES.

"**CONSTRUCTIVE KNOWLEDGE**" means information that a person is assumed to have. For example, the CROWN is assumed to know all the Treaties it has entered into with First Nations and their contents.

"**CROWN DESIGNATE**" includes the CROWN in right of Canada or the CROWN in right of Ontario, their cabinets, committees, ministries, CROWN corporations, local governments (municipalities and regional districts), agencies, employees and contracted agents, representatives and delegates for the purpose of the duties of consultation and ACCOMMODATION.

“**DECISION**” means any CROWN DECISION or PROPONENT DECISION, including, but not limited to, any legislation, regulation, POLICY, procedure, plan, license, permit, amendment, approval, operation or other DECISION which may have an IMPACT on WASAUKSING FIRST NATION’S ABORIGINAL AND TREATY RIGHTS, our WASAUKSING-ANISHINAABE TERRITORY and/or our lands and RESOURCES.

“**IMPACT**” or “**IMPACTS**” means any effect(s) that any ACTIVITY and/or DECISION may cause within our WASAUKSING-ANISHINAABE TERRITORY or to WASAUKSING FIRST NATION’S ABORIGINAL AND TREATY RIGHTS and our lands and RESOURCES.

“**MITIGATION**” means the act of lessening the IMPACTS of environmental and ecosystem damage due to a project, action and/or ACTIVITY.

“NATURAL RESOURCES” or **“RESOURCES”** means any materials found in nature, on or under the land, including wildlife, timber, fresh water, or a mineral deposit, that is necessary or useful to humans and therefore has economic value.

“**POLICY**” means strategy, plan, rule, guiding principle, course of action, guidelines and procedure.

“**PROPONENT**” includes, but is not limited to, any individual, researcher, company, corporation, firm, municipality, regional district, industry, society, non-governmental organization or CROWN DESIGNATE that is proposing to undertake or is undertaking an ACTIVITY or DECISION as defined above.

“**PROTOCOL**” means this *Wasauksing First Nation External Consultation and Accommodation Protocol*.

“**RESERVE**” means the RESERVE of WASAUKSING FIRST NATION, being Parry Island Indian RESERVE #16, which is a RESERVE established and subsisting under the Indian Act R.S.C. 1985 c. 1-5 (See Appendix B: Wasauksing First Nation Location Map).

“**RESIDUAL EFFECT**” means the IMPACTS to the environment, lands, and RESOURCES during or after the completion of a proposed project, ACTIVITY and/or DECISION.

“**WASAUKSING-ANISHINAABE TERRITORY**” means the traditional territory of our WASAUKSING FIRST NATION CITIZENS, as described in Appendix “A” hereto, known as the Robinson-Huron Treaty Area.

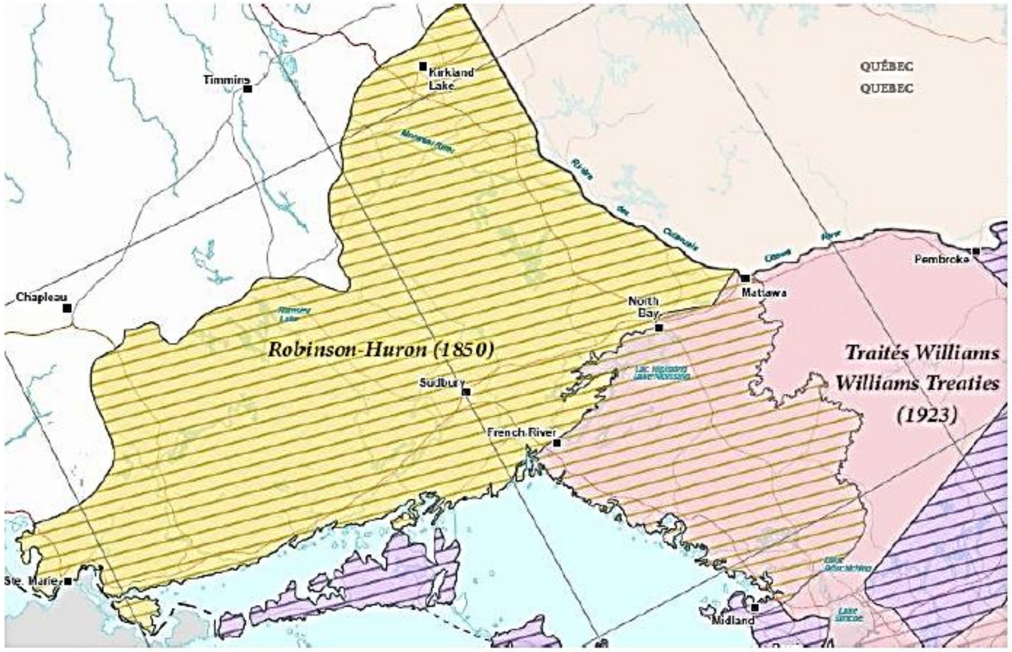
“WASAUKSING FIRST NATION” means WASAUKSING FIRST NATION and its CITIZENS.

“**WASAUKSING FIRST NATION CITIZEN**” means a person whose name appears on the WASAUKSING FIRST NATION Citizenship List, as managed by WASAUKSING FIRST NATION in accordance with Section 10 of the *Indian Act*.

21.0 Appendix A: Wasauksing-Anishinaabe Territory: The Robinson-Huron Treaty Area

OVERLAP OF ROBINSON HURON TREATY AND WILLIAMS TREATIES

Aboriginal Affairs and Northern Development Canada is currently reviewing the southern boundary of the Robinson Huron Treaty shape in an effort to upload it in the Aboriginal and Treaty Rights Information System (ATRIS).



▨ Shape of Robinson Huron Treaty 1850 based on Treaty text

🟨 Robinson Huron Treaty boundary in recent federal maps

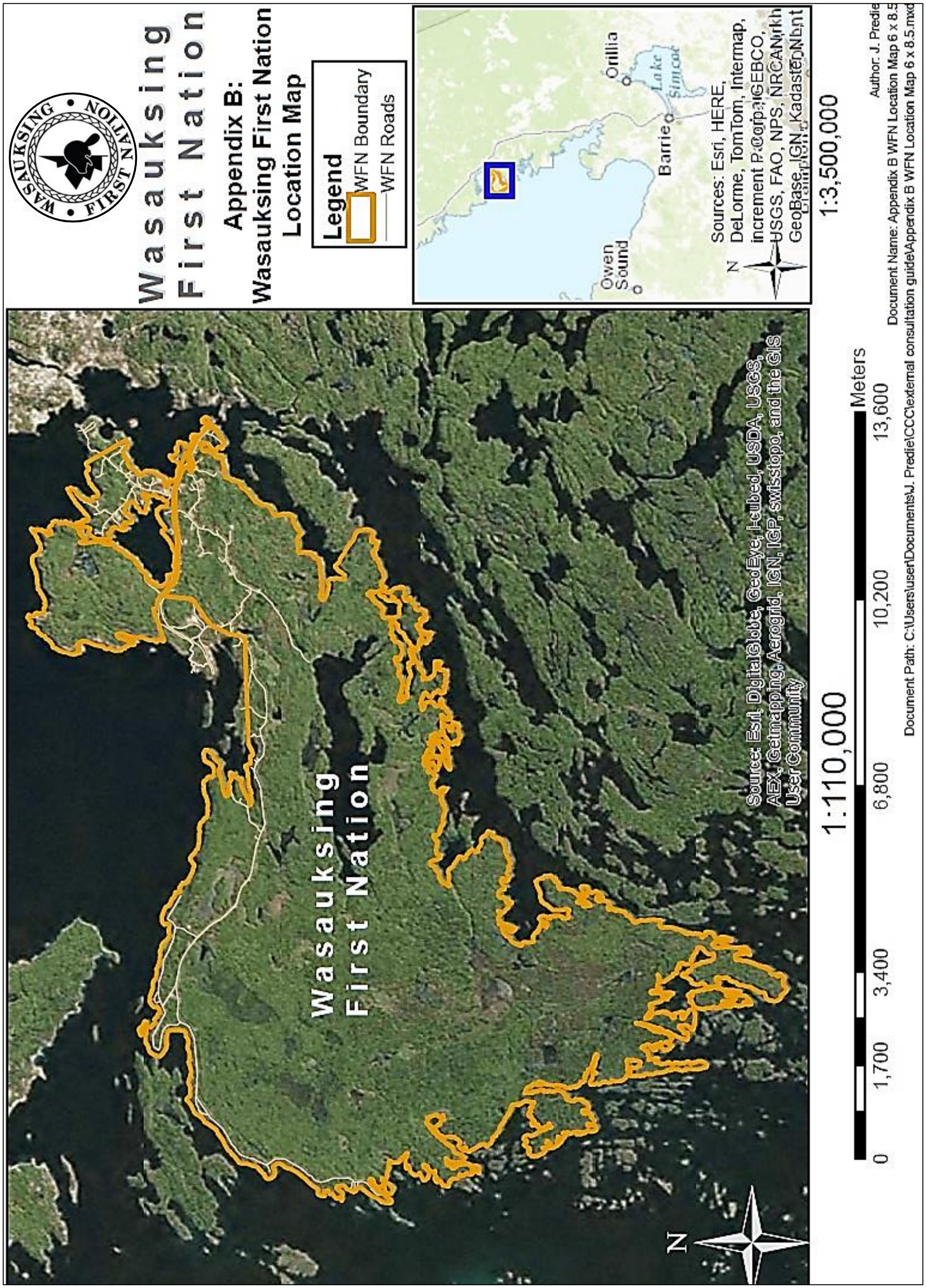
🟥 Shape of Northern Williams Treaties 1923

Sources:
Aboriginal Affairs and Northern Development Canada:
Treaties and Aboriginal Government Sector, February 2014.
Watershed : GeoBase, National Hydro Network (NHN), October 2013.

Disclaimer:
Boundaries shown are approximate. This map is for illustration purposes only.

NCR#7493600 - v1

22.0 Appendix B: Wasauksing First Nation Location Map



Although Depot Harbour and the CN Railway locations have not been included within the WFN Boundary, these lands are managed by WASAUKSING FIRST NATION as if they are RESERVE Lands.

23.0 Appendix C: Wasauksing First Nation Consultation Matrix

WFN Consultation Matrix

Residual Effects of Proposed Project/Decision

High	Level 1: No Consultation	*Level 4: Extensive Consultation*	*Level 4: Extensive Consultation*	*Level 4: Extensive Consultation*
Moderate	Level 1: No Consultation	*Level 3: Moderate Consultation*	*Level 3: Moderate Consultation*	*Level 4: Extensive Consultation*
Minor	Level 1: No Consultation	*Level 2: Light Consultation*	*Level 3: Moderate Consultation*	*Level 4: Extensive Consultation*
None	Level 1: No Consultation	Level 1: No Consultation	Level 1: No Consultation	Level 1: No Consultation
	None	**Minor**	**Moderate**	**High**

Aboriginal and Treaty Rights in the Project/Decision Area

Level 1: No Consultation:

- No RESIDUAL EFFECT of a proposed ACTIVITY/DECISION and/or no potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS will not require community consultation.

Records of all such notices will be maintained by the CCC, and a summary can be provided to the community/CITIZEN upon request.

Level 2: Light Consultation:

- Minor RESIDUAL EFFECT(s) of a proposed ACTIVITY/DECISION and/or minor potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS will require a light community consultation.

Consultation will consist of providing the community with a notice/update for the proposed ACTIVITY/DECISION via the Monthly Newsletter and WFN Website

Level 3: Moderate Consultation:

- Minor RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and moderate potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS;
- Moderate RESIDUAL EFFECT(s) of a proposed ACTIVITY/DECISION and/or moderate potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS; and
- Moderate RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and minor potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS.

Consultation will include: a notice/update to the community via Community Newsletter and a community information session/meeting to receive comments and/or concerns from CITIZENS.

Level 4: Extensive Consultation:

- Minor RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and high potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS;
- Moderate RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and high potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS;
- High RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and moderate potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS; and
- High RESIDUAL EFFECT(s) of a proposed ACTIVITY and/or DECISION and minor potential IMPACTS to our ABORIGINAL AND TREATY RIGHTS.

Consultation will include: a notice/update to the community via Community Newsletter and WFN Website, community information sessions to receive comments and/or concerns from CITIZENS, presentation(s) from CROWN DESIGNATE(S) and/or PROPONENT(S), including a community vote in the rare circumstances where a proposed project and/or DECISION may necessitate the need for a community vote, etc.

Photo Credit: Jennifer Predie

Photo Credit: Jennifer Predie

WASAUKSING FIRST NATION

1508 Lane G, Geewadin Road
P.O. Box 250
Parry Sound, ON P2A 2X4
P: (705) 746-2531
F: (705) 746-5984
W: www.wasauksing.ca

Dated for Reference: October 13, 2016 - COUNCIL APPROVED (BCR # 2016-0078)

Jackson Mercer

From: [redacted]
Sent: August 4, 2020 6:25 PM
To: Burgess
Subject: Burgess 1 Dam EA , Bala ON

Hello
Please mail me a hard copy of presentation and comment card to ;
[redacted]

Thanks
[redacted]

Jackson Mercer

From: [redacted]
Sent:
To: Burgess
Subject: Re: Burgess 1 Dam EA , Bala ON

Ok, thanks.

No troubles at all
Thanks
[redacted]

On Wed, Aug 5, 2020 at 11:07 AM Burgess <burgess.ea@tulloch.ca> wrote:

> Hello [redacted]
>
> We will put something together and mail it out to you. Out of curiosity did you have difficulty with the website? If there are any issues I would like to report them to the Township so hopefully we can make it as accessible as possible.
>
> Thanks,
>
> [redacted]
>
> TULLOCH ENGINEERING
>
> Tel: 705 789 7851 x438
>
> Fax: 705 789 7891
>
> [redacted]
>
> TULLOCH Engineering Inc

80 Main St. West, Huntsville, ON P1H 1W9

erik.giles@TULLOCH.ca | TULLOCH.ca

From: [redacted]
Sent: August 4, 2020 6:25 PM
To: Burgess <burgess.ea@tulloch.ca>
Subject: Burgess 1 Dam EA , Bala ON

Hello

Please mail me a hard copy of presentation and comment card to ;

[redacted]

Thanks

[redacted]

--

Thanks,

[redacted]

--
Thanks,

[redacted]

Jackson Mercer

[redacted]

From:
Sent: February 7, 2021 9:42 PM
To: Burgess
Subject: Re: Burgess 1 Dam EA , Bala ON

Caution! This message was sent from outside your organization.

Hi [redacted]
Hope all is well with you

Wondered if there were any updates you might share regarding the Burgess Dam project in Bala.

Thanks
[redacted]

On Wed, Aug 5, 2020 at 11:34 AM Fred Thompson <fthompson887@gmail.com> wrote:

> Ok, thanks.
>
> No troubles at all
> Thanks
> [redacted]
>
> On Wed, Aug 5, 2020 at 11:07 AM Burgess <burgess.ea@tulloch.ca> wrote:
>
> > Hello [redacted]
> >
> > We will put something together and mail it out to you. Out of curiosity did you have difficulty with the website? If there are any issues I would like to report them to the Township so hopefully we can make it as accessible as possible.
> >
> > Thanks,
> >
> > **Erik Giles**
> >
> > Geotechnical P.Eng
> >
> > Project Manager

TULLOCH
ENGINEERING

Tel: 705 789 7851 x438

Fax: 705 789 7891

[redacted]

TULLOCH Engineering Inc

80 Main St. West, Huntsville, ON P1H 1W9

erik.giles@TULLOCH.ca | TULLOCH.ca

Fro[redacted]
Sent: August 4, 2020 6:25 PM
To: Burgess <burgess.ea@tulloch.ca>
Subject: Burgess 1 Dam EA , Bala ON

Hello

Please mail me a hard copy of presentation and comment card to ;

[redacted]

Thanks

[redacted]

--

Thanks,

[redacted]

--
Thanks,

[redacted]

--
Thanks,

[redacted]

From: Burgess
Sent: July 4, 2021 8:49 PM
To: [redacted]
Subject: RE: Burgess Hydro Plant Rehab

[redacted]

Thank you for expressing interest in the project. Yes currently we are in the process of the Environmental Assessment for Burgess. We are currently in the process of collecting the survey data polled from those who answered the online surveys and in the process of presenting our findings to the Township of Muskoka Lakes Council. We will be posting a notice of completion which will show all of our findings as well as our report which will be available to the public as per the Schedule B process.

To answer a few of your questions, there are currently two turbines in the plant, one of which was installed circa 2012 by the current tenant and the other turbine, the age is not exactly known however it is an older style francis turbine likely nearing the end of its design life.

Flow available to burgess dam is based on the allotment for the facility from the current operating agreement for the Muskoka watershed which is 4 m^3/s the 0.14 MW is the current combined capacity of the plant at this time.

There is also an FAQ page you may find useful which you can find here

https://engagemuskokalakes.ca/burgess-1-dam-environmental-assessment-study/widgets/62333/faqs

Warm Regards,

[redacted]

-----Original Message-----
From [redacted]
Sent: July 3, 2021 9:29 AM
To: Burgess <burgess.ea@tulloch.ca>
Subject: Burgess Hydro Plant Rehab

Visiting Balla on June 25, we noticed the new Hydro Plant, not generating, yet the Burgess Dam was operating. Saw the Tulloch sign re the EA process. I had not been aware of this process till now. Visited the website which was interesting. Also read the inspection report by Erik Giles, which is excellent engineering. Please note that on sketches the Tailwater elevation is incorrectly stated as 200.09 m - should be 220.09!!
In the report it says that plant is rated at 0.14 MW? Is that one turbine. How old is that equipment? There seems to be no mention of what flow is available to this plant and whether that water right expires in the future.

I recall the opposition to the redevelopment of Bala Falls, and am pleased that common sense prevailed. I would hope that redevelopment of Burgess will also be successful

From the 4 alternatives, which one is now recommended and what is the status of the current process.

I have worked for Acres since 1962, on many hydro plants throughout Canada and overseas, mostly very large turbines and am still interested in what happens in Ontario. Just toured the Canadian Niagara (Rankin) plant which I had been involved with over the years and now just opened as a museum.

Hope to hear back.

[redacted]

Sent from my iPad

Jackson Mercer

From: [redacted]
Sent: October 25, 2021 11:54 AM
To: Burgess
Subject: RE: Burgess Dam Rehabilitation/Replacement

Thank you

[redacted]

constructconnect

From: Burgess <burgess.ea@tulloch.ca>
Sent: Monday, October 25, 2021 11:37 AM
[redacted]
Subject: RE: Burgess Dam Rehabilitation/Replacement

Hello [redacted]

Please forgive me for the delay on this reply, the preferred option is still under discussion with the Town of Muskoka Lakes at this time. TULLOCH presented the feedback from the survey and studies conducted for the EA for the council meeting conducted on October 13th, 2021.

Thank you,

From: [redacted]
Sent: October 5, 2021 1:07 PM
To: Burgess <burgess.ea@tulloch.ca>
Subject: Burgess Dam Rehabilitation/Replacement

Good afternoon,

Can you please tell me if a preferred option has been selected for the Burgess Dam project and when it may be presented to the General/Finance Committee?

Thank you, [redacted]

[redacted]

constructconnect.

From: Burgess
Sent: August 17, 2020 10:38 AM
To: [redacted]
Cc: Tim Sopkowe; Burgess
Subject: RE: Burgess EA
Attachments: burgess presentation notes.pdf

[redacted]

First off I would like to thank you for your interest in this project and I hope you fill find the following satisfactory. I understand that the video is pretty quick, I have attached a pdf of the slideshow so you can perhaps review the drawings more thoroughly. We do not at present have photo mock-ups of the proposed design as we are still in the preliminary/planning phase. However, having said that, it is likely if an emergency spillway were to be selected for implementation as part of one of the larger planning alternative solutions that it would have to go along the south side of the property south of the powerhouse section as the site is not very big and that is the only real spot where a spillway could be feasibly constructed. This concept is illustrated on slide 23 in the attached PDF.

Our intent at this point is to not change the water flow directly downstream of the Burgess Dam but to retrofit the dam to address overtopping issues.

Thank you very much for your interest in this project. I would also like to direct you to the Township of Muskoka Lakes FAQ page that may also help answer any other questions you may have.

https://engagemuskokalakes.ca/burgess-1-dam-environmental-assessment-study/widgets/62333/faqs#question1097

This page is also updated regularly to reflect new questions and aspect of feedback that we have received so far in this process.

Kind Regards,

[redacted]

TULLOCH ENGINEERING

Tel: 705 789 7851 x438
Fax: 705 789 7891

TULLOCH Engineering Inc
80 Main St. West, Huntsville, ON P1H 1W9
erik.giles@TULLOCH.ca | TULLOCH.ca

From: [redacted]
Sent: August 12, 2020 9:00 PM
To: Burgess <burgess.ea@tulloch.ca>
Subject: Burgess EA

Do you not have actual photos of the area to be designed as the spillway for a fixed damsite? I know the area and walked there recently but am having difficulty interpreting the drawings.
I am also interested in the guaranteed flow for the ‘creek/falls’ into the Moon under a fixed dam scenario.
Thank you

[redacted]

Sent from [Mail]() for Windows 10

Jackson Mercer

From: [redacted]
Sent: July 24, 2020 9:38 AM
To:
Subject: [redacted]

[redacted]

Here is another response for the EA. I am not sure this requires a response as much as this is to be included in public comment. We will have to sort it out as we go. Maybe next week once we have had a few responses come in and work out some of these kinks (which I expected since it is the first time we have used this tool) we can have a chat to streamline our process for the this phase of the study. I think a quick phone call between us we should be able to come up with a plan.

Give me a call anytime next week – [redacted]

[redacted]

[redacted]

Sincerely,

[redacted]

From: [redacted]
Sent: Friday, July 24, 2020 9:17 AM
To: [redacted]
Subject: [redacted]

From: Engage Muskoka Lakes <notifications@engagementhq.com>
Sent: Friday, July 24, 2020 8:11 AM
To: [redacted]
Subject [redacted]

[redacted] just submitted the survey Survey with the responses below.

Full Name

[redacted]

Mailing Address

[redacted]

Email

[redacted]

Phone Number

[redacted]

Which alternative solution do you prefer?

Rehabilitate Dam and Powerhouse

Comments

Please replant and landscape for future generations. I have lived in Bala all my life and always swam at the falls. I am not able to access the water with new Hydro Dam it would have been nice if they had considered that as part of the design. Also the new building totally blocks the sunset when you come around bend from Purkes place. Please put a lot more consideration on landscape.. Hire a good landscape architect.. like a really good one. Deal with this new dam and problems with the most recent hydro installation

From: [redacted]
Sent: July 24, 2020 9:33 AM
To: Burgess
Subject: FW: RIverwood completed Survey

[redacted]

Here are some questions from the website. I am going to address the concerns about the survey response and not being able to submit questions without submitting a survey today and see if we can change this feature around to allow questions and comments without completing the survey.

[redacted]

Sincerely,

[redacted]

From [redacted]
Sent: Friday, July 24, 2020 9:17 AM
To [redacted]
Subject: FW: [redacted] completed Survey

From: Engage Muskoka Lakes <notifications@engagementhq.com>
Sent: Friday, July 24, 2020 6:57 AM
To [redacted]
Subject: [redacted] completed Survey

[redacted] ust submitted the survey Survey with the responses below.

Full Name

[redacted]

Mailing Address

[redacted]

Email

[redacted]

Which alternative solution do you prefer?

Rehabilitate Dam and Powerhouse

Comments

What is missing in this is information on how much power and revenue the existing dam generates, how much power/revenue would be created in each option, estimated cost to undertake the alternatives, where the power generated goes (does Bala benefit directly), how does this power generating station work in conjunction with the new dam. Would the dam continue to be owned by the township and leased out or could it be sold? The greatest impact from this dam would be felt by those on the Moon River, especially if it fails and yet the emphasis (wording) seems more concerned with those on Lake Muskoka. It is a comprehensive presentation, clearly outlining initial options but does not provide sufficient information for residents to have good input. NOTE that in order to complete the survey i had to cast a vote BUT I am having to do so with incomplete data which is not correct. Therefore my vote should not be counted or considered accurate. I would appreciate answers to the questions raised above. Thank you.

[redacted]

From: [redacted]
Sent: October 22, 2020 7:52 PM
To: Burgess
Subject: Burgess 1 dam

[redacted]

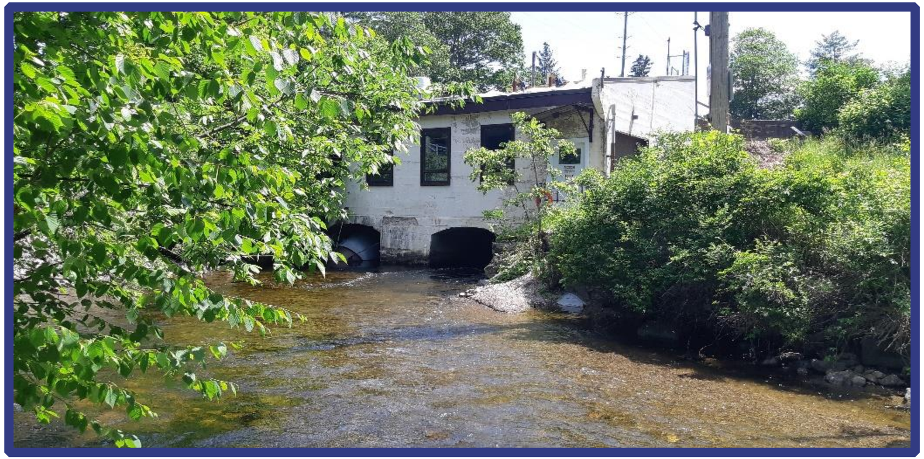
I might be mistaken but I thought you guys were going to share the results of the survey in September.

Any updates on the feasibility study for each option? Thanks.

Regards,
[redacted]

APPENDIX H

Council Presentation



MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
BURGESS 1 DAM

20-1051

TULLOCH ENGINEERING

Introduction – Project Location

- The Township of Muskoka Lakes (TML) has retained TULLOCH Engineering to conduct a Municipal Class Environmental Assessment (EA) for the Burgess 1 Dam located in Bala, Ontario.

Image Source: Google Maps

What is an Environmental Assessment?

A planning procedure/tool that looks at potential impacts caused by the project and how to mitigate them

- Communities
- Environment/wildlife
- Economic
- Culture/Heritage
- Public Safety

Allows for consultation of regulating bodies and the community for input into planning and design solutions

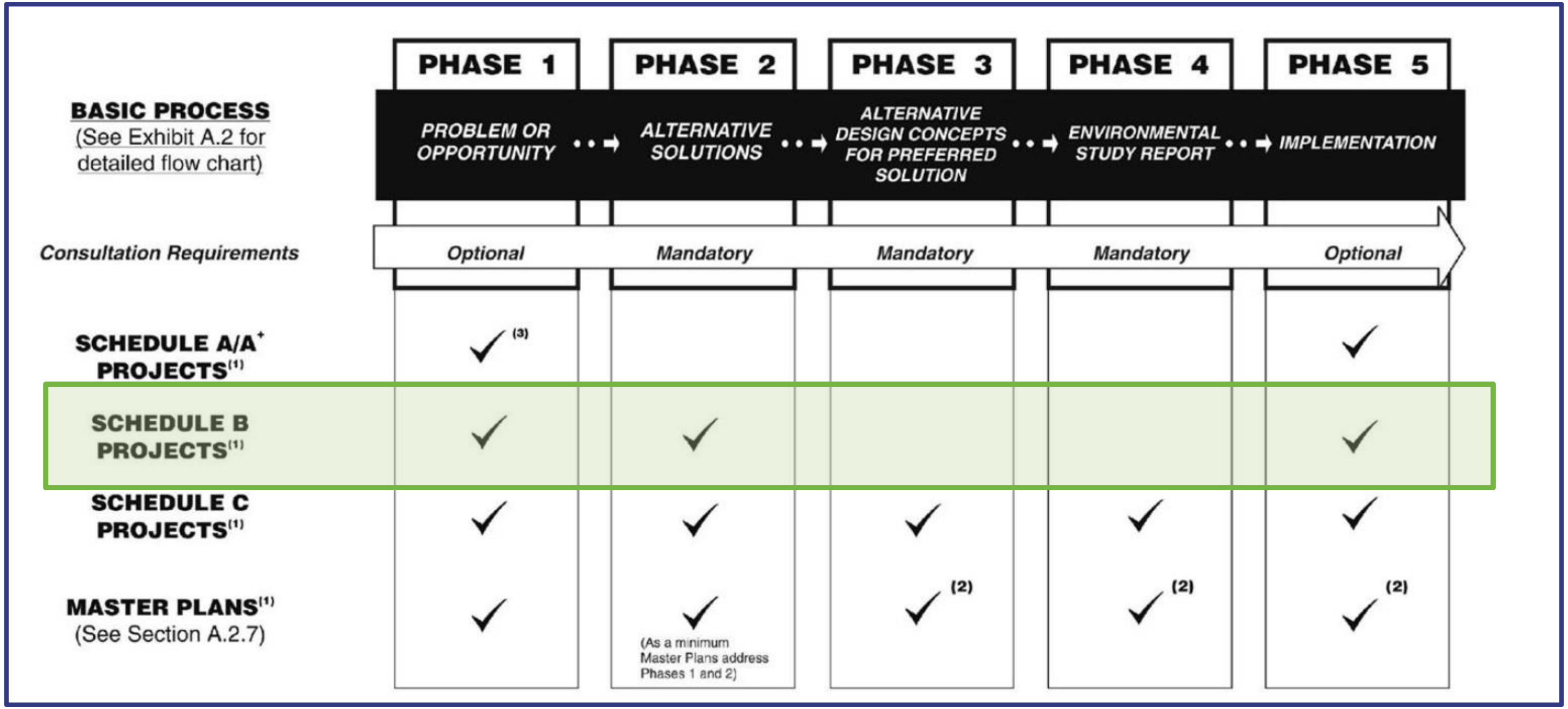
- Members of the community
- Regulatory bodies such as MNR, MECP, MTO

Standardized procedure that is repeatable and meets regulatory requirements that is tailored to individual projects

EA Class Schedules

A	A+	B – Burgess Dam	C
- Generally includes normal or emergency operational and maintenance activities - Minimal environmental impacts - Pre-approved	- Similar to Schedule A Projects are Pre-approved - Public to be advised prior to implementation of project	- Generally includes improvements and minor expansions to existing facility - Potential for some adverse environmental impacts - Proponent required to proceed through screening process including consultation with affected parties	- Generally includes the construction of new facilities and major expansions to existing facilities - These projects proceed through the full environmental assessment planning process

Schedule B EA Process



	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
BASIC PROCESS (See Exhibit A.2 for detailed flow chart)	*PROBLEM OR OPPORTUNITY* →	*ALTERNATIVE SOLUTIONS* →	*ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION* →	*ENVIRONMENTAL STUDY REPORT* →	*IMPLEMENTATION*
Consultation Requirements	*Optional*	*Mandatory*	*Mandatory*	*Mandatory*	*Optional*
SCHEDULE A/A$^+$ PROJECTS(1)	✓ (3)				✓
SCHEDULE B PROJECTS(1)	✓	✓			✓
SCHEDULE C PROJECTS(1)	✓	✓	✓	✓	✓
MASTER PLANS(1) (See Section A.2.7)	✓	✓ (As a minimum Master Plans address Phases 1 and 2)	✓ (2)	✓ (2)	✓ (2)

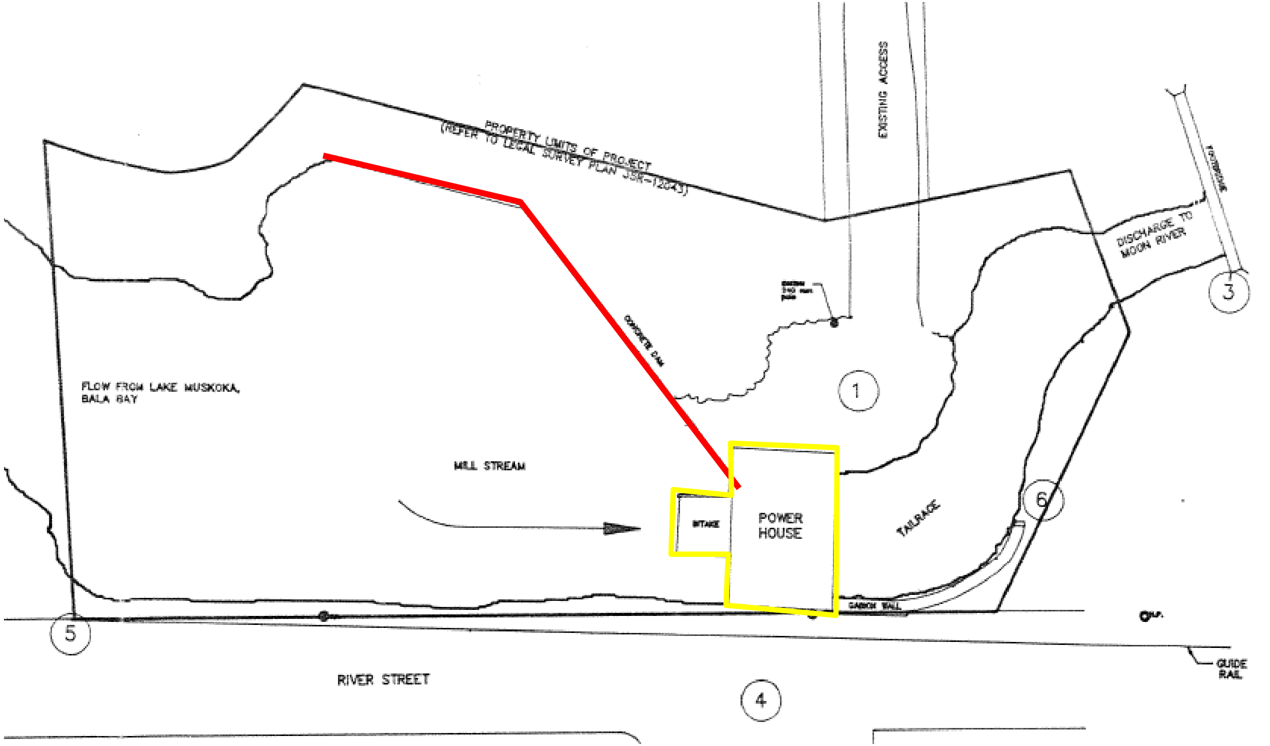
Image Source: www.municipalclassea.ca

Burgess 1 Dam Facility Overview

- The dam runs approximately 59 m
- Dam terminates on natural ground to the south and River Street to the north

Dam consists of two sections:

- Non-Overflow
  - Concrete retaining structure
  - Approximately 3 m high
  - Founded on bedrock
- Powerhouse Section
  - 9 m X 14 m building constructed into the dam containing turbines



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Burgess 1 Dam – Spring 2019 Event

- Flooding event of spring 2019 caused overtopping of the dam
- Emergency actions were taken and flooding event was mitigated
- This event triggered a Dam Safety Review for the Burgess Dam Facility

Burgess Dam – Dam Safety Review

Township retained TULLOCH Engineering to conduct a Dam Safety Review for Burgess 1 Dam

Deficiencies were noted and recommendations for improvement made for the facility

Major recommendations include:

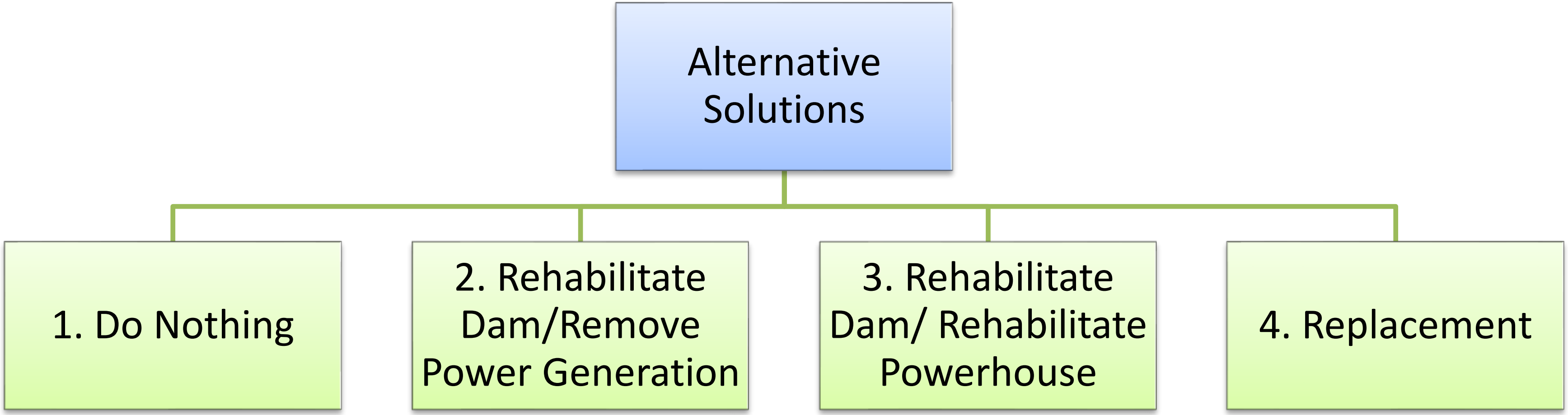
- Improve facility to handle higher water levels
- Aging infrastructure requiring rehabilitation or replacement

The Township chose to complete a Municipal Class EA Study for the Burgess Dam to begin the process of public consultation and implementation of recommendations in a transparent manner

Phase 1– Problem Statement

In the spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the dam at risk. A Dam Safety Review conducted in the summer of 2019 determined safety concerns with respect to dam stability and capacity to withstand a similar event. Failure of the Burgess 1 Dam would result in significant loss of water control upstream affecting Lake Muskoka and its residents, furthermore, failure of the dam could result in property damage and risk to public safety downstream of the facility along the Moon River. The Township of Muskoka Lakes is considering replacement or rehabilitation of the Burgess 1 Dam.

Phase 2 - Alternative Solutions



Alternative Solutions

1. Do Nothing

2. Rehabilitate Dam/Remove Power Generation

3. Rehabilitate Dam/ Rehabilitate Powerhouse

4. Replacement

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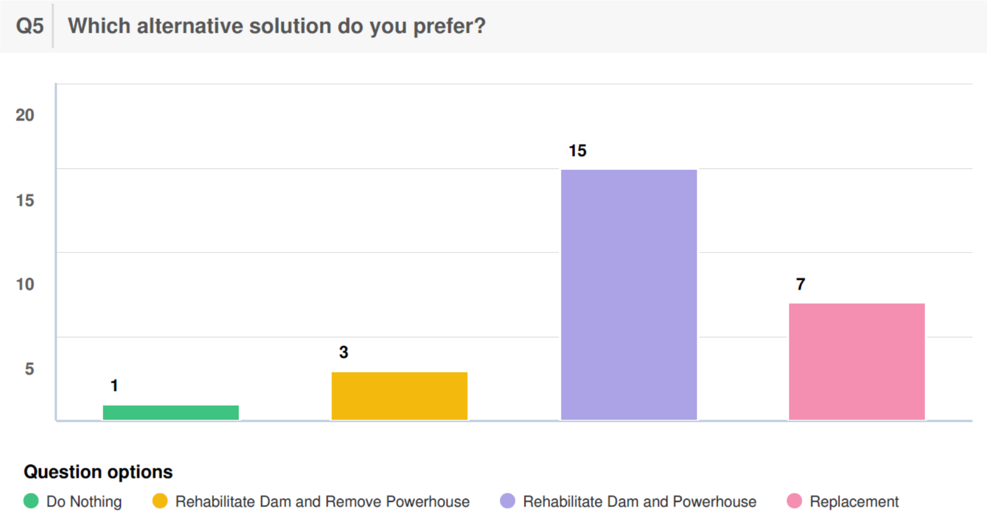
Public Feedback

- Virtual PIC held on Engage Muskoka lakes webpage
- Survey distributed most popular response was Option 3: Rehab Dam and Powerhouse
- General Comments included
    - Rehab and continue power generation if economically responsible
    - General support for green energy
    - Fix safety issues of the dam
    - Water should not be allowed to stagnate in tailrace



Cultural Heritage Evaluation Report

- Cultural Heritage Evaluation Report conducted by Horizon Archaeology Inc based in North Bay, Ontario
- Site visit conducted on May 6th, 2021
- CHER included historical document review of publicly available data as well as requested reports provided by TULLOCH
- Summary of findings:
  - Burgess Dam meets criteria for being included in Ontario Heritage Act Register
  - Façade and shell of building should be preserved if possible as there have only been minor modifications such as the head gate and new windows
  - The interior has been altered beyond any historic or cultural value
  - The original William Hamilton Turbine should be preserved if possible either in place or somewhere which may be able to use it for cultural or historical purposes such as a display or in a local museum.

Environmental Impact Assessment

EIA conducted to assess potential habitat and ecological impact of rehabilitation

Field visit conducted May 6, 2020

- Potential Habitat for Species at Risk exists – Barn Swallow
- Spawning habitat for Walleye and White Sucker observed downstream, White Sucker Spawning Observed 5-10 m downstream of dam

Final Summary

- Any vegetation removal/clearing should be outside of the General Nesting Periods
- In water work will required DFO approval, must be isolated with fish salvage and MRFO in-water timing guidelines should be followed.

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Turbine/Mechanical and Electrical Assessment

- NORCAN Hydraulic Turbine Inc. was retained to conduct a condition assessment of the turbine and power generating equipment at Burgess. Site visit conducted March 2021
- Key findings:
  - Generally site in fair to poor safe condition
  - Head gate and trash rack in good condition – upgraded by KRIS Power.
  - Original Francis turbine surpassed manufacturer's life expectancy, typically "run to fail"
  - Further detailed inspection recommended including review of internal parts/electronic control equipment
  - Replacement of new equipment ~ $800,000 investment
  - Replacement might be replacing dual turbines with single Kaplan style turbine, replacement of turbine would be most cost effective during civil/structural upgrades.
  - New equipment if properly maintained could have a design life of up to 50 years.

Economic Analysis Part 1

- ROI on continued power generation is highly dependent upon rate paid per kw-hr and the number of operable days per year

- Estimated Capital Costs
  - From DSR – Conceptual Civil Costs $775,000
  - From NORCAN Report – Turbine Replacement $800,000
  - Total Estimated Capital Cost = $1,575,000

- Estimated Maintenance Costs
  - 20% of annual Revenue
  - Estimated $15,000 annually in Dam Maintenance/property upkeep
  - $15,000 every 10 years for turbine maintenance

Generation Capacity vs. Energy Production

Scenario	Inoperable Days	Energy Production (kW – hrs)
Conservative	170	680,000
Average	69	1,040,000
Optimistic	25	1,190,000

Annual Generation Revenue

Scenario	Typical Hydro Rate (¢ 8/kW -hr)	Solar Rate (¢ 10/kW-hr)	FIT Rate (¢ 24.1/kW-hr)
Conservative	$ 54,300	$ 68,300	$ 163,880
Average	$ 82,800	$ 103,500	$ 250,640
Optimistic	$ 95,300	$ 68,300	$ 286,790

Return On Investment in Years

Scenario	Typical Hydro Rate (¢ 8/kW -hr)	Solar Rate (¢ 10/kW-hr)	FIT Rate (¢ 24.1/kW-hr)
Conservative	40	30	13
Average	25	20	8
Optimistic	22	16	7

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Assessment of Alternatives: Weighted Evaluation Matrix

Evaluation Criteria	Weighting	Option 1: Do Nothing	Option 2: Rehab Dam Remove Power	Option 3: Rehab Dam/Rehab Powerhouse	Option 4: Replace Replacement
Public Input/Social Environment	15	1	2	4	3
Cultural Heritage	10	2	3	4	1
Natural Environment	15	4	2	3	1
Public Safety	30	1	3	2	4
Economic Impact	20	4	3	2	1
Physical Environment	10	1	3	4	2
TOTAL	**100**	**215**	**270**	**285**	**230**

TULLOCH ENGINEERING

Scoring: 1 – Worst Option for Criterion to 4 Best Option for Criterion X Weighting Factor

Recommendations

- Public Input – Option 3
- CHER – Option 3 – Plus maintain building façade and cultural value of original turbine
- EIA – Maintain water flow, and rehabilitate, Option 2 or 3 feasible under conditions of EIA
- Condition Assessment – Option 3 financial case for continued power generation given appropriate investment and care/maintenance
- Economic Analysis – Option 3 – Given the typical current hydro rate of 8¢/kw-hr and the conservative case of operating days the ROI would be 40 years, if design is for a 50 year lifespan there is an economic case that recouping the initial investment is feasible.
- Key item is to address Dam Safety Issues to prevent overtopping or possible failure, rehabilitation of dam can be done with either Option 2 or 3 however there may be an economic case given the possible return period for continued power generation either through a well managed lease agreement or possible sale after completion of upgrades.
- **Overall, based on public and stakeholder feedback the general consensus would be to rehabilitate the dam and powerhouse while maintaining power generation – Option 3**

Burgess Class EA - Financial Overview

No.	Item	Option 1 Do Nothing	Option 2 Rehab Dam/ Remove Generation	Option 3 Rehab Dam/ Rehab Generation	Option 4 Replacement
1	**Engineering and Design**				
1.1	Detailed Design	$ -	$ 120,000.00	$ 160,000.00	$ 480,000.00
1.2	Schedule C EA	$ -	$ -	$ -	$ 100,000.00
1.3	**SUBTOTAL**	**$ -**	**$ 120,000.00**	**$ 160,000.00**	**$ 580,000.00**
2.0	**Capital Construction Costs**				
2.1	Estimated Civil Works	$ -	$ 775,000.00	$ 775,000.00	$ 4,000,000.00
2.2	Estimated Turbine Works	$ -	$ 400,000.00	$ 800,000.00	$ 800,000.00
2.3	**SUBTOTAL**	**$ -**	**$ 1,175,000.00**	**$ 1,575,000.00**	**$ 4,800,000.00**
3.0	**Construciton Admin and Inspection**				
3.1	Third Party CQA	$ -	$ 120,000.00	$ 160,000.00	$ 480,000.00
3.2	**SUBTOTAL**	**$ -**	**$ 120,000.00**	**$ 160,000.00**	**$ 480,000.00**
3.3	**Contingency (25%)**		**$ 353,750.00**	**$ 473,750.00**	**$ 1,465,000.00**
3.3	**TOTAL ESTIMATED CAPITAL COSTS (+/-25%)**	**$ -**	**$ 1,768,750.00**	**$ 2,368,750.00**	**$ 7,325,000.00**
4.0	**Annual Operating Maintenance and Revenue**				
4.1	Estimated Annual Civil Maintenance	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 10,000.00
4.2	Estimated power generation cost (~20% of average generating revenue)	$ -	$ -	$ 17,000.00	$ 17,000.00
4.3	Annual Turbine Maintenance	$ -	$ -	$ 3,000.00	$ 3,000.00
4.4	10 Year Turbine Maintenance	$ -	$ -	$ 15,000.00	$ 15,000.00
5.0	**Estimated Annual Revenue**				
5.1	Annual Revenue (Average Case)	$ 1,500.00	$ -	$ 83,000.00	$ 83,000.00

Exclusions:
-Environmental Permitting Costs
- Land Acquisition
- Financing/IDG
- Owner's Costs
- Bonding and Insurance

TULLOCH
ENGINEERING

PROJECT:	20-1051	DATE:	Oct-21
DESIGN:	EG	REV:	A

Financial Overview of Alternative Solutions

Burgess 1 Dam - Environmental Assessment

Figure 1

APPENDIX I

Preliminary Design Memo

TULLOCH

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Huntsville, ON
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www.TULLOCH.ca

20-1051
November 17, 2022

Township of Muskoka Lakes
1 Bailey Street
Port Carling, ON
P0B 1J0

Attention: Ken Becking, P.Eng. | Director of Public Works

CC: Tim Sopkowe C.E.T.

RE: Burgess 1 Dam Preliminary Design Brief Memo

Dear Mr. Becking,

This memorandum documents TULLOCH's design process for rehabilitation and improvement of the Burgess 1 Dam facility which comprises a small two (2) turbine generating station including a concrete powerhouse and concrete gravity dam which is located in Bala, Ontario adjacent to the North and South Bala Falls Dams. This memorandum will discuss the preliminary design intent, hydraulic and stability modelling for the dam and north slope wall, design upgrades, estimated quantities and costing.

1. BACKGROUND INFORMATION

In the Spring of 2019, the Burgess 1 Dam experienced an overtopping event caused by flooding of the Muskoka watershed upstream of the facility that put the safety of the dam at risk. A Dam Safety Review (DSR) in the Summer of 2019 was conducted by TULLOCH (TULLOCH Doc No. 19-1493-20-2050-0001) which determined safety concerns with respect to dam stability and capacity to withstand a similar or larger flood event in the future. Recommendations were made to replace or rehabilitate the existing facility to handle extreme flood events and improve the stability of the water retaining structure. A Municipal Class Environmental Assessment Schedule B Study (EA) was conducted starting in February of 2020 with the goal of evaluating and assessing the various proposed alternative solutions while encouraging public and agency feedback for the project. Four (4) alternative solutions were proposed to the Township and stakeholders for evaluation to address the recommendations made within the DSR. The project file report for the EA Project File Report was submitted in the Fall of 2022 (TULLOCH Doc No. 20-1051-2050-0003). The preferred solution chosen through the EA study was rehabilitation of the existing Dam and Powerhouse.

2. DESIGN INTENT

Major deficiencies identified for the Burgess 1 Dam during the 2019 DSR included an inadequate factor of safety against sliding and overturning for the gravity dam, absence of an emergency spillway/inadequate capacity to pass flood flows, and the poor condition of the powerhouse. A visual assessment of the powerhouse was also conducted by TULLOCH's structural engineers who observed that the powerhouse was noted to have a longitudinal crack through the foundation, severe corrosion to the existing steel reinforcing frame, over spanned interior timber bearing line, and inadequate roof framing which was observed to be over spanned. The 2019 DSR also noted stability issues with the north slope directly downstream of the dam including the poor condition of the existing gabion baskets forming the toe of the north slope, and potential instability of the retaining wall adjacent to the powerhouse. An additional geotechnical investigation was conducted, and the findings are outlined in the report attached to this memorandum (TULLOCH Doc. No 20-1051-2050-0002).

The proposed rehabilitation measures of the Burgess 1 Dam are designed to address the safety concerns regarding stability and flow discharge capacity of the dam under a design flood event to prevent uncontrolled overtopping of the dam. The partial dam raise of 0.6 m meets the Inflow Design Flood (IDF) level of the structure with approximately 100 mm of additional freeboard. Raising the dam will allow for the IDF level to be retained without overtopping to allow time for the peak flood flows to be passed by the larger North and South Bala Falls Dams per the Muskoka River Dam Operation Manual.

In the event of water level rising above the IDF level, the existing non-overflow section of the gravity dam adjacent to the powerhouse will be upgraded to an overflow structure. This upgrade will allow flood flows to pass over the dam crest and then be diverted to the downstream main river channel. A designated spillway was initially discussed during the conceptual design phase in the 2019 DSR, however, due to limited space an overflow design was adopted. The downstream overflow path will be confined by the proposed south control berm and the left concrete wall of the powerhouse. The overflow will be designed and diverted to the main tailrace channel. Reinstatement of downstream fill material with rockfill erosion protection against the dam will improve the factor of safety against sliding and overturning, as well as to prevent downstream erosion under overflow flooding conditions.

Mitigation measures to the powerhouse structure should include foundation slab anchoring and grouting to reconnect the two broken halves, concrete infill for the undermining observed below the powerhouse, steel reinforcing frame replacement, interior bearing line replacement, removal and replacement of existing roof framing, and upgrades to the tailrace apron and walls.

The north slope improvements include an anchored concrete wall extending beyond the tailrace apron to act as both a retaining wall against the north slope as well as a training wall for the powerhouse to prevent future erosion of the toe from operational flows. The wall will be backfilled with free draining fill materials and should have drainage outlets which will improve factor of safety to meet the design criteria.

Preliminary design drawings are provided for the civil and structural rehabilitation of the Burgess 1 Dam attached to this memorandum. At this time mechanical and electrical drawings and rehabilitation of the power generation equipment are considered out of TULLOCH's scope and should be considered in the Detailed Design Phase of the project, budgetary costing for replacement of the turbine has been included based on NORCAN's Turbine assessment which was included in the EA Project File Report.

3. HYDRAULIC AND STABILITY MODELLING

The Inflow Design Flood (IDF) for the Burgess 1 Dam is defined as 1/100-year return flood for Lake Muskoka of 226.49 m as defined in the Muskoka River Dam Operation Manual. This was used as a basis for hydraulic and stability modelling exercises. Riprap sizing calculations were completed for the downstream side of the overflow dam section which is designed to overtop and pass IDF flows. Based on the preliminary design, riprap gradation was determined, and is presented in Table 3-1 below.

Table 3-1: Downstream Riprap Sizing

Riprap Gradation	Riprap Diameter (m)
D100	1.43
D85	1.17
D50	0.84
D15	0.5

Stability modelling was completed for the preferred option, including the non-overflow dam section and north slope retaining wall. Table 3-2 and Table 3-3 show factors of safety associated with various case conditions for the dam non-overflow section and Table 3-4 shows factors of safety for the preliminary design of the north slope retaining wall. The factors of safety for the proposed dam and north slope upgrades all meet or surpass the design requirements.

Table 3-2: Slope Stability Summary for Non-Overflow Dam Section

Case	Water Level	Seismic Consideration	Failure Direction	Required FS	Calculated FS
1	Upper NOL[1]	No	US to DS	1.5	1.5
2	Lower NOL[1]	No	DS to US	1.5	12.2
3	Upper NOL[1]	Yes	US to DS	>1.0	1.4
4	Lower NOL[1]	Yes	DS to US	>1.0	11.8
5	IDF	No	US to DS	1.3	1.5

Note(s):[1] NOL = Normal Operating Level

Table 3-3: Block Stability for Non-Overflow Dam Section

Case	Phreatic Condition	Seismic Consideration	Failure Direction	Failure Condition	Required FS	Calculated FS
1	Upper NOL[1]	No	US to DS	Sliding	1.5	6.7
				Overturning	2.0	5.1
2	Lower NOL[1]	No	DS to US	Sliding	1.5	3.3
				Overturning	2.0	2.0
3	Upper NOL[1]	Yes	US to DS	Sliding	1.3	6.7
				Overturning	1.3	5.1
4	Lower NOL[1]	Yes	DS to US	Sliding	1.3	2.5
				Overturning	1.3	1.3
5	IDF	No	US to DS	Sliding	1.3	3.6
				Overturning	1.3	2.2

Note(s): [1]NOL = Normal Operating Level

Table 3-4: North Slope Retaining Wall Preliminary Design Block Stability

Failure Condition	Required FS	Calculated FS
Sliding	1.5	1.71
Overturning	2.0	2.04

4. QUANTITIES AND COSTING

Material quantities were estimated for the Burgess 1 Dam upgrade design with unit prices applied to each quantified item. The total construction cost for the Burgess 1 Dam Upgrades and Rehabilitation is estimated at $2,599,680.00. The above cost estimate excludes, land acquisition, financing, owner costs, bonding and insurance.

5. CLOSURE

The findings of the Design Memorandum for improvement of the Burgess 1 Dam located in Bala, Ontario have been prepared by TULLOCH Engineering in consultation with the Township of Muskoka Lakes. This memorandum has been prepared for the exclusive use of the Township of Muskoka Lakes and their authorized agents.

We trust that the information in this report will be sufficient to allow the Township to proceed with the project. Should further elaboration be required for any portion of this project, we would be pleased to assist.

Sincerely,

Kelvin Cheung, B.Sc., EIT.
Engineer in Training

Reviewed By:
George Liang, Ph.D., P. Eng.
Senior Geotechnical Engineer

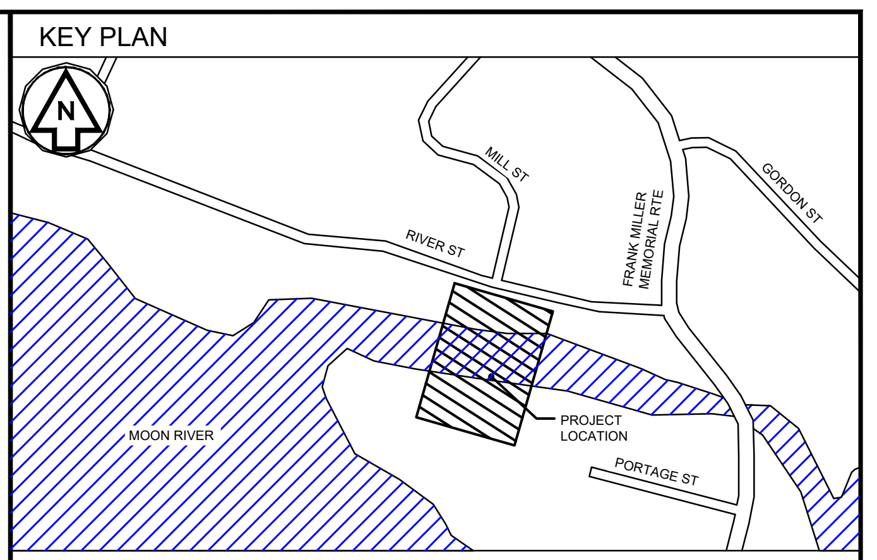
Erik Giles, P. Eng.
Geotechnical Engineer

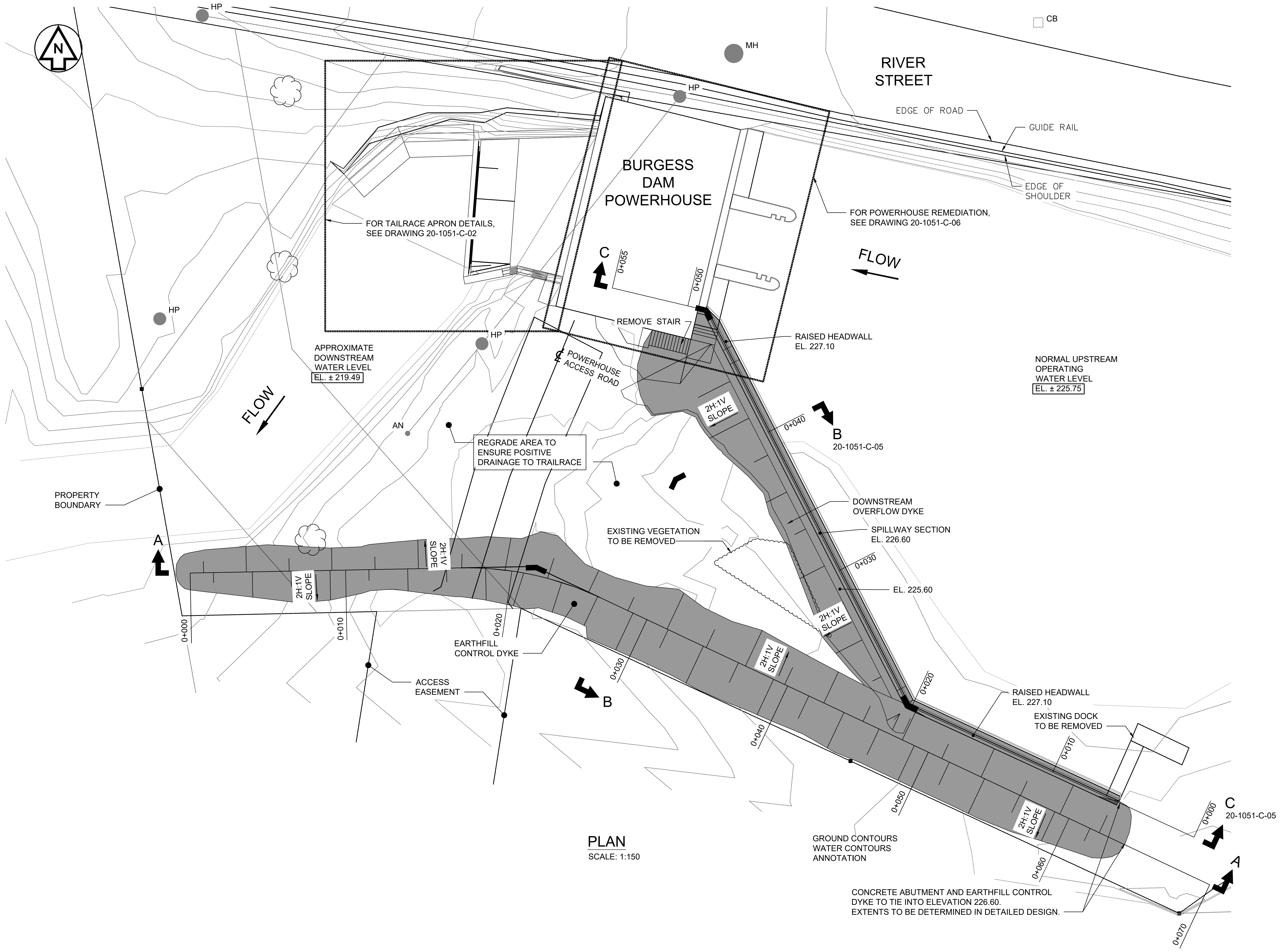
LICENSED PROFESSIONAL ENGINEER
E. K. GILES
100206670
NOV 17/2022
PROVINCE OF ONTARIO

Attachment(s): Civil & Structural Preliminary Design Drawings, North Slope Investigation, Notice to Reader

Civil & Structural Preliminary Design Drawings

KEY PLAN





PLAN
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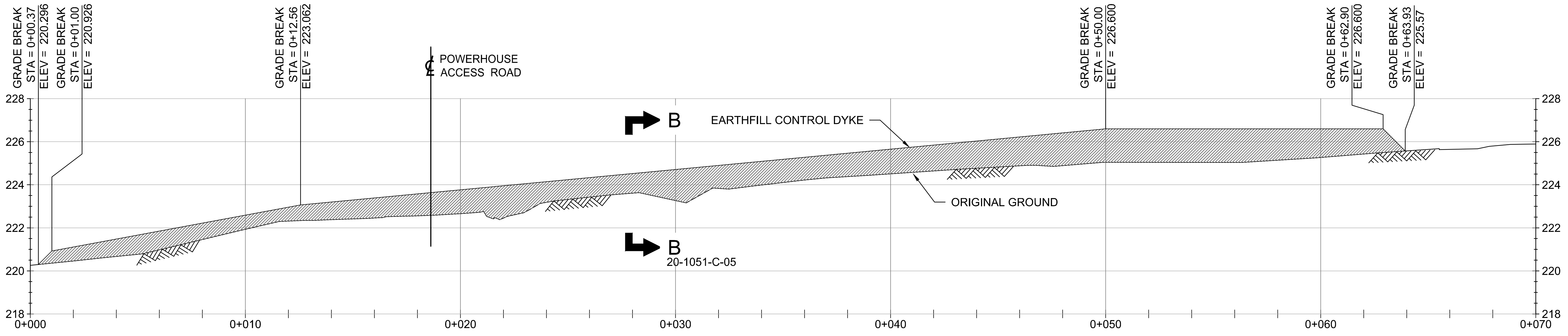

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Scale: 1:150

TULLOCH
ISSUED FOR INFORMATION

No.	DATE	BY	DESCRIPTION
B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW

REVISIONS

TULLOCH

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

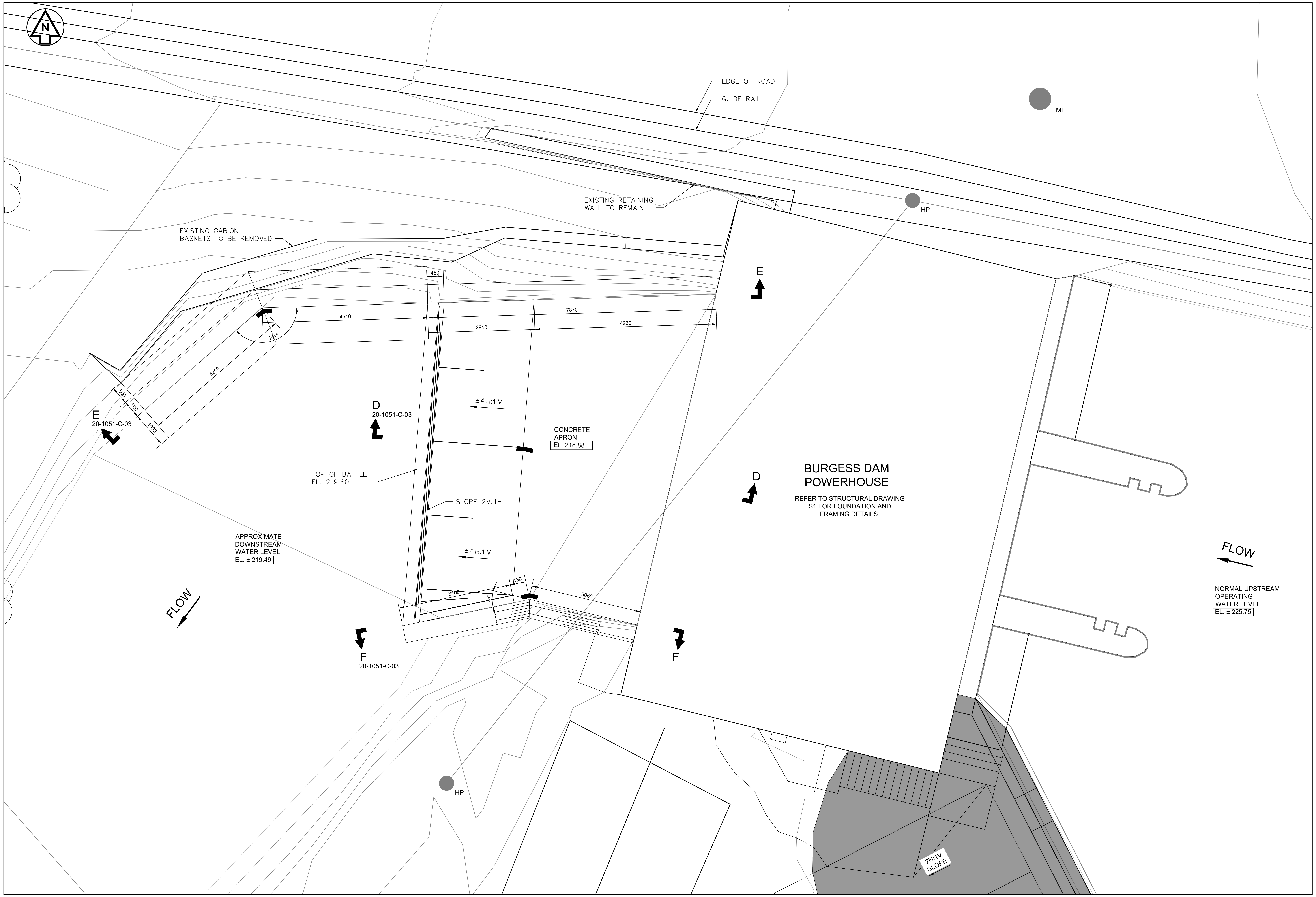
PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
GENERAL ARRANGEMENT
PLAN

DRAWN BY: K.KORTEKAAS
CHECKED BY: E GILES
DESIGNED BY: K KORTEKAAS
APPROVED BY: C STILLWELL
SCALE: AS NOTED
DATE: 2022-05-24
DRAWING No. 20-1051-C-01
REVISION No. B

\\tulloch.local\data\Projects\2020\Stoney Creek\20-1051 - Burgess Dam\02 Drawings\20-1051-C-01 to 06.dwg

DIMENSIONS SHOWN IN MILLIMETRES
ELEVATIONS SHOWN IN METRES



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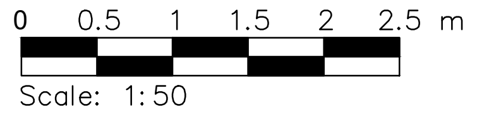

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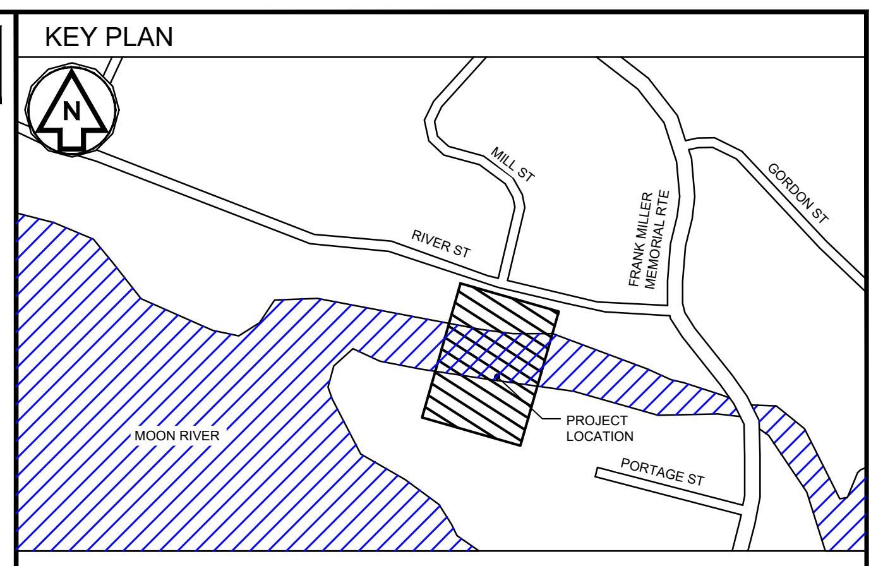

TULLOCH
ISSUED FOR INFORMATION

B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW
No.	DATE	BY	DESCRIPTION

REVISIONS

TULLOCH

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
TAILRACE APRON
PLAN

ENGINEER'S SEAL

DRAWN BY:	CHECKED BY:	DESIGNED BY:
K.KORTEKAAS	E GILES	K KORTEKAAS
APPROVED BY:	SCALE:	DATE:
C STILLWELL	AS NOTED	2022-05-24

DRAWING No.
20-1051-C-02

REVISION No.
B

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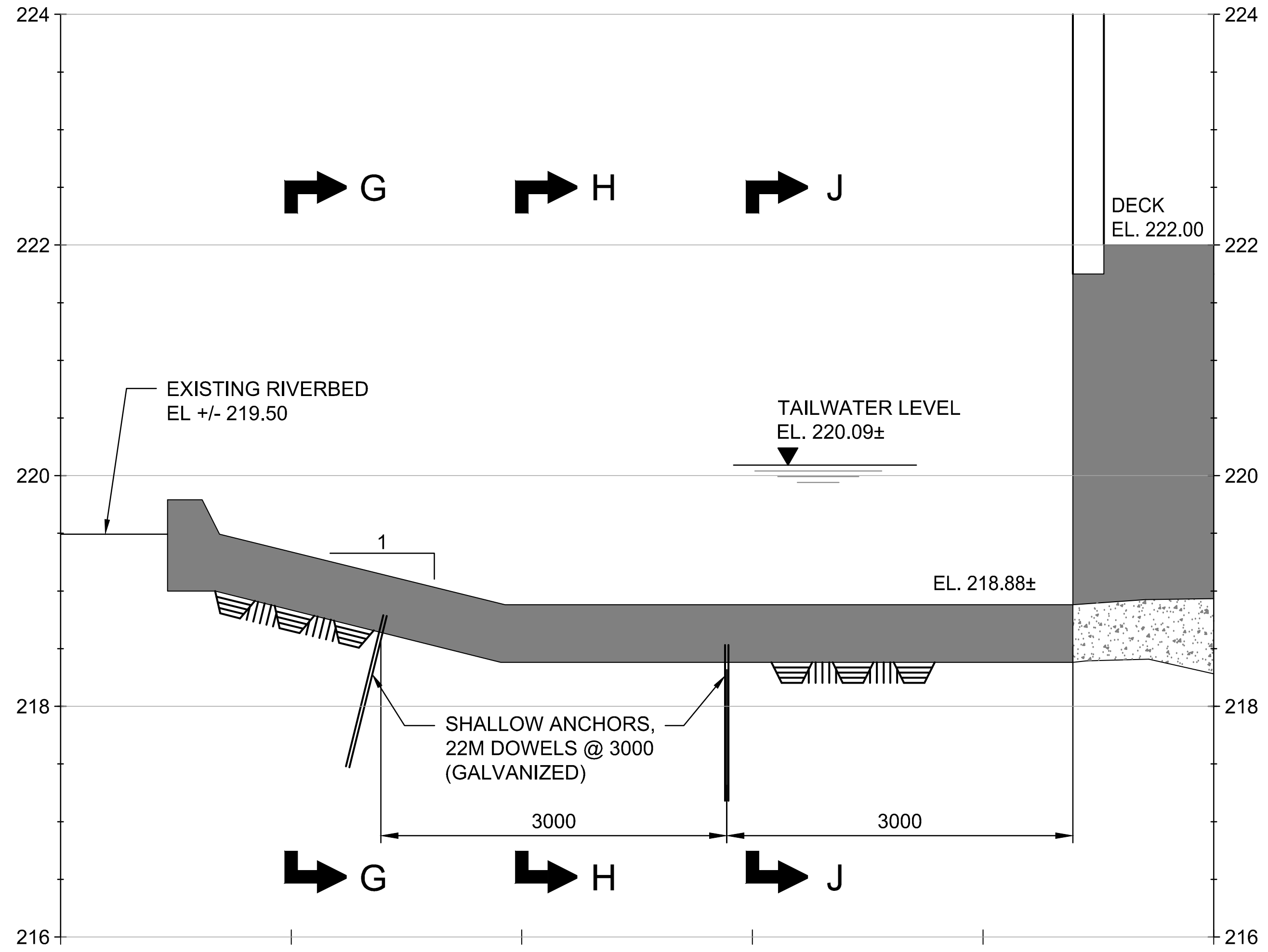

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20-1051-C-02
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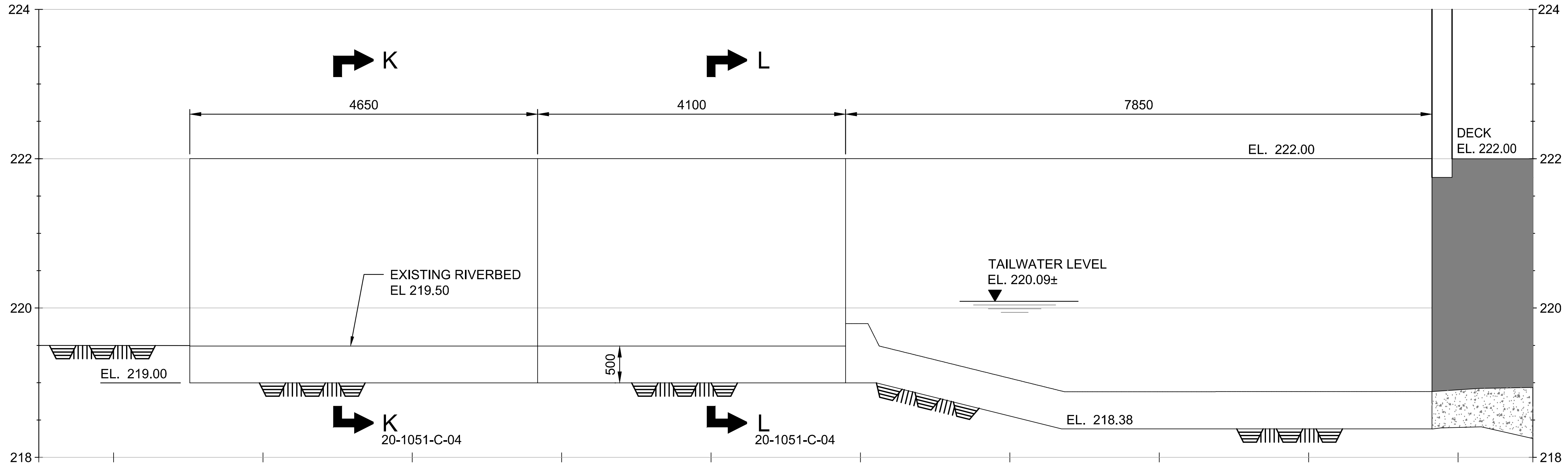

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20-1051-C-02
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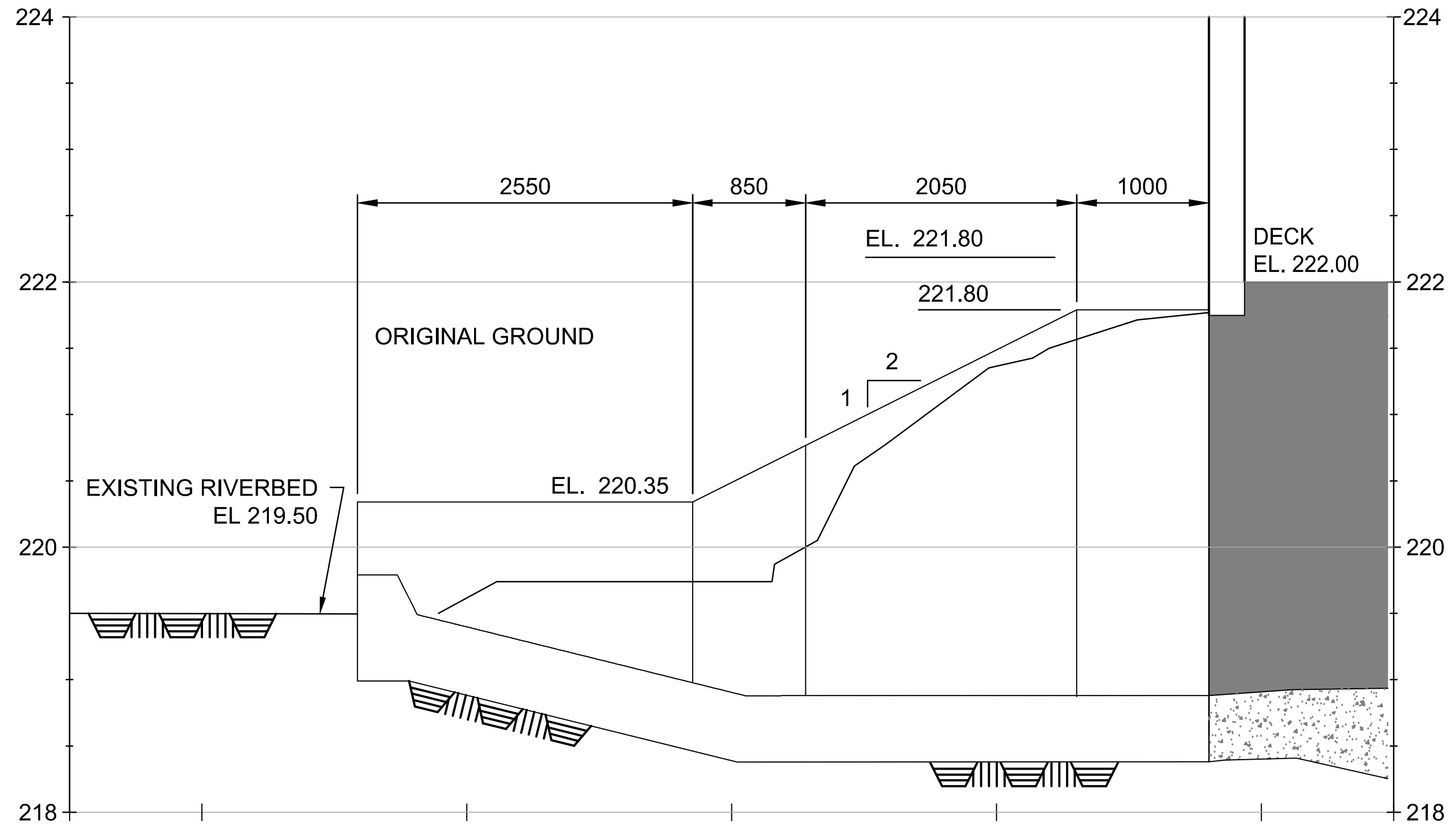

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20-1051-C-02
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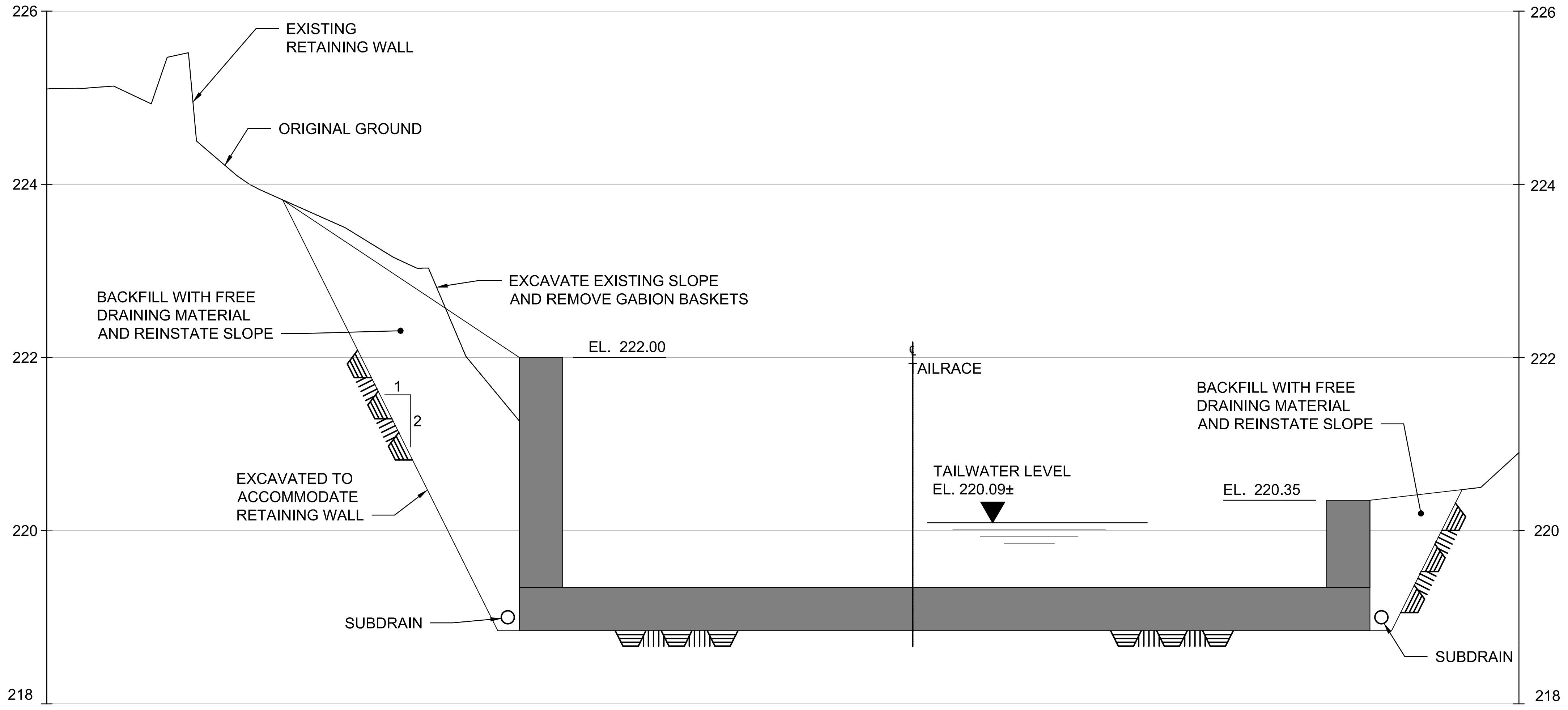

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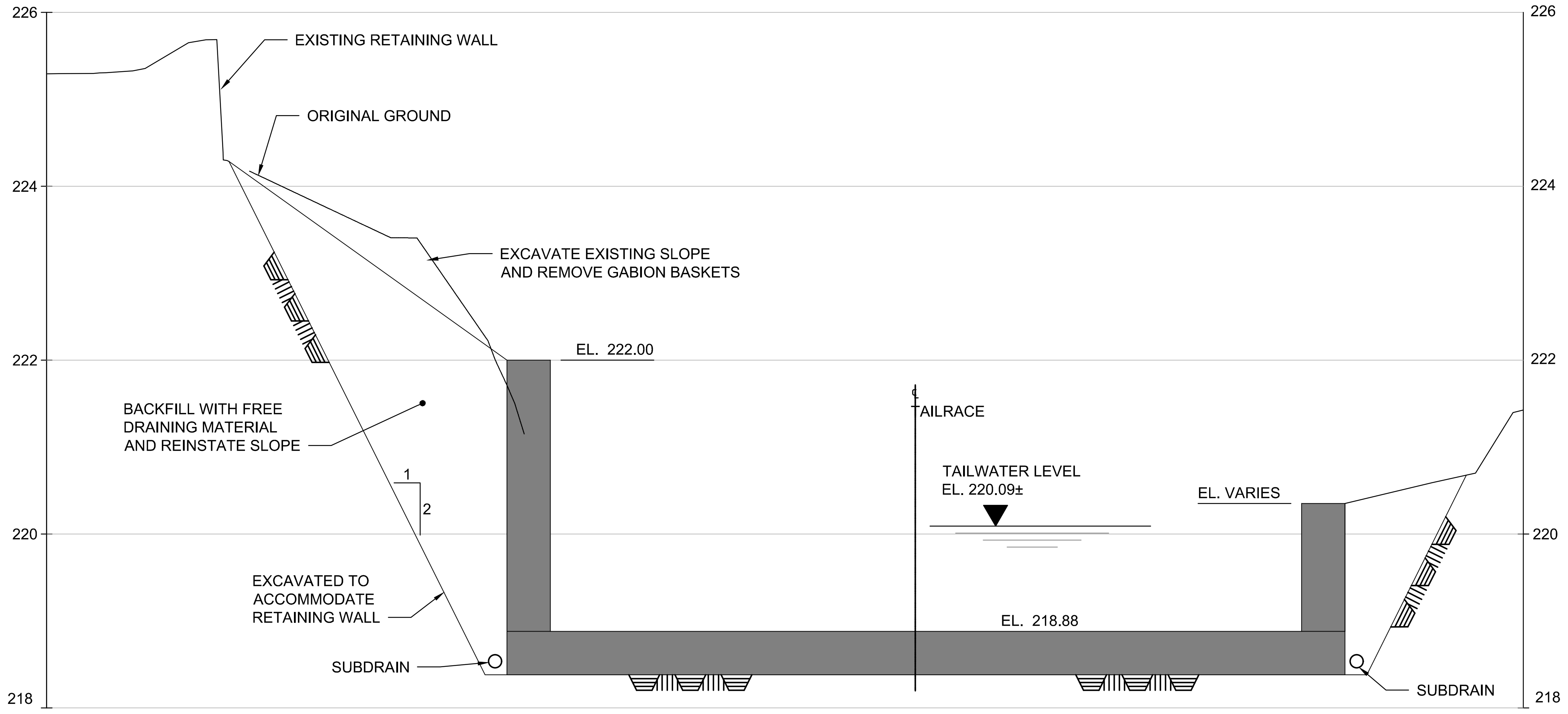

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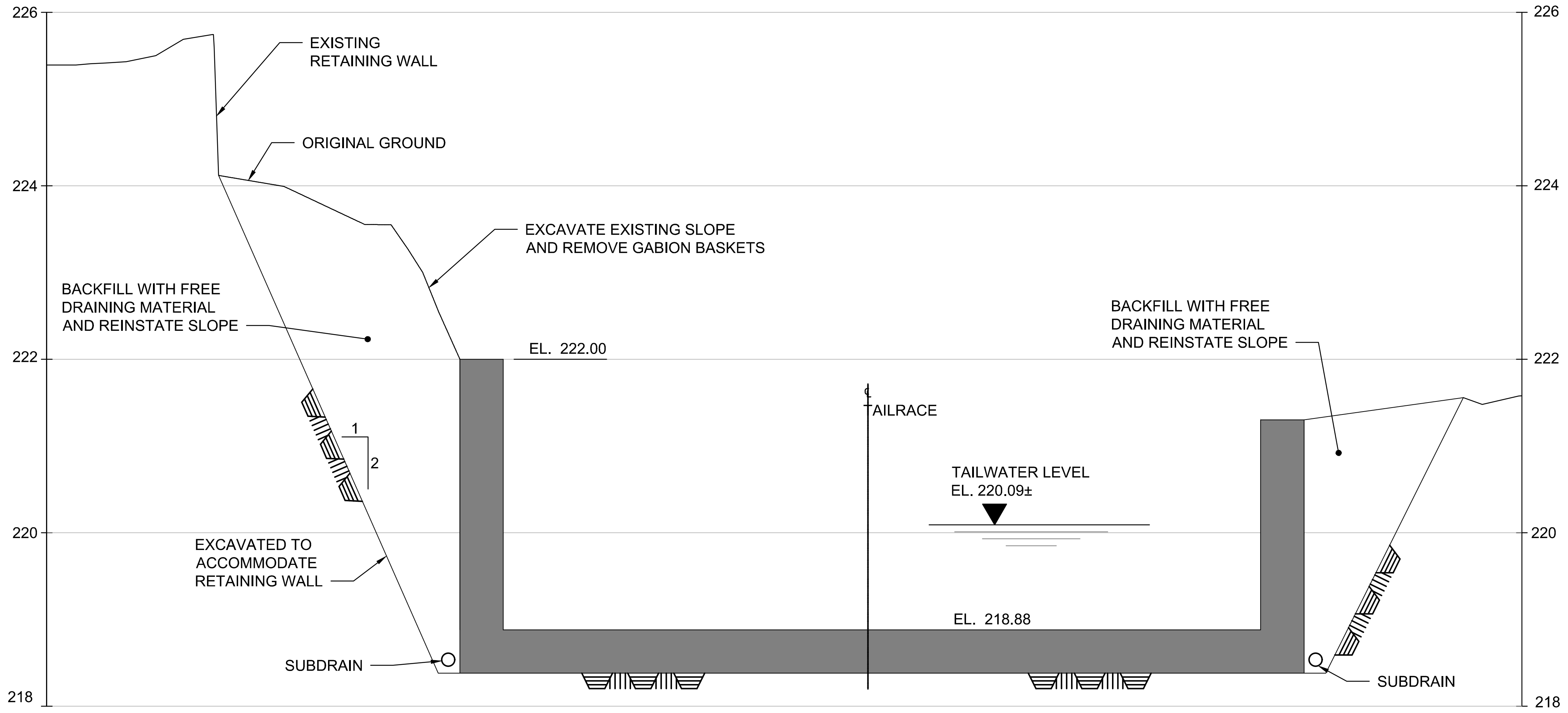

SECTION J-J

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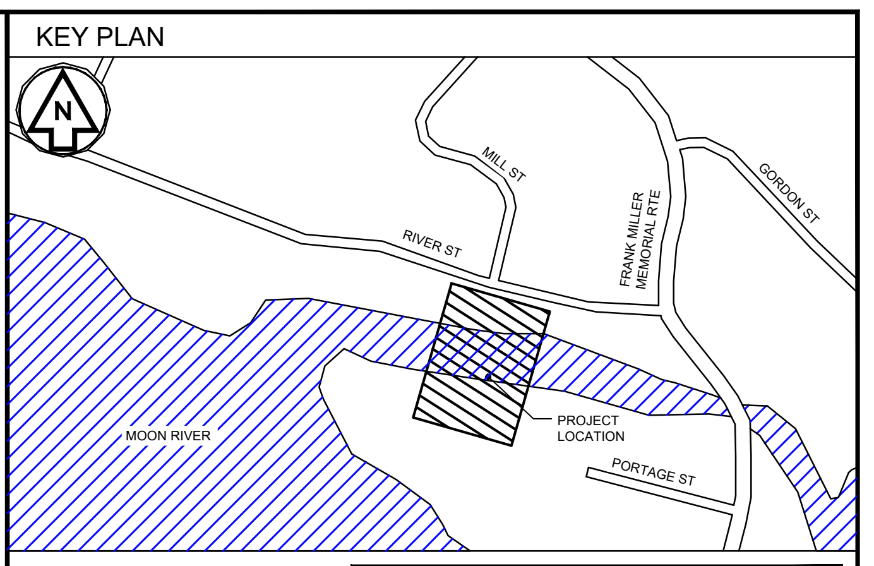
KEY PLAN



DIMENSIONS SHOWN IN MILLIMETRES
ELEVATIONS SHOWN IN METRES

TULLOCH
ISSUED FOR
INFORMATION

No.	DATE	BY	DESCRIPTION
B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW

REVISIONS

TULLOCH

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
TAILRACE APRON
SECTIONS PAGE 1 OF 2

DRAWN BY: K.KORTEKAAS	CHECKED BY: E GILES	DESIGNED BY: K KORTEKAAS
APPROVED BY: C STILLWELL	SCALE: AS NOTED	DATE: 2022-05-14

DRAWING No.: 20-1051-C-03
REVISION No.: B

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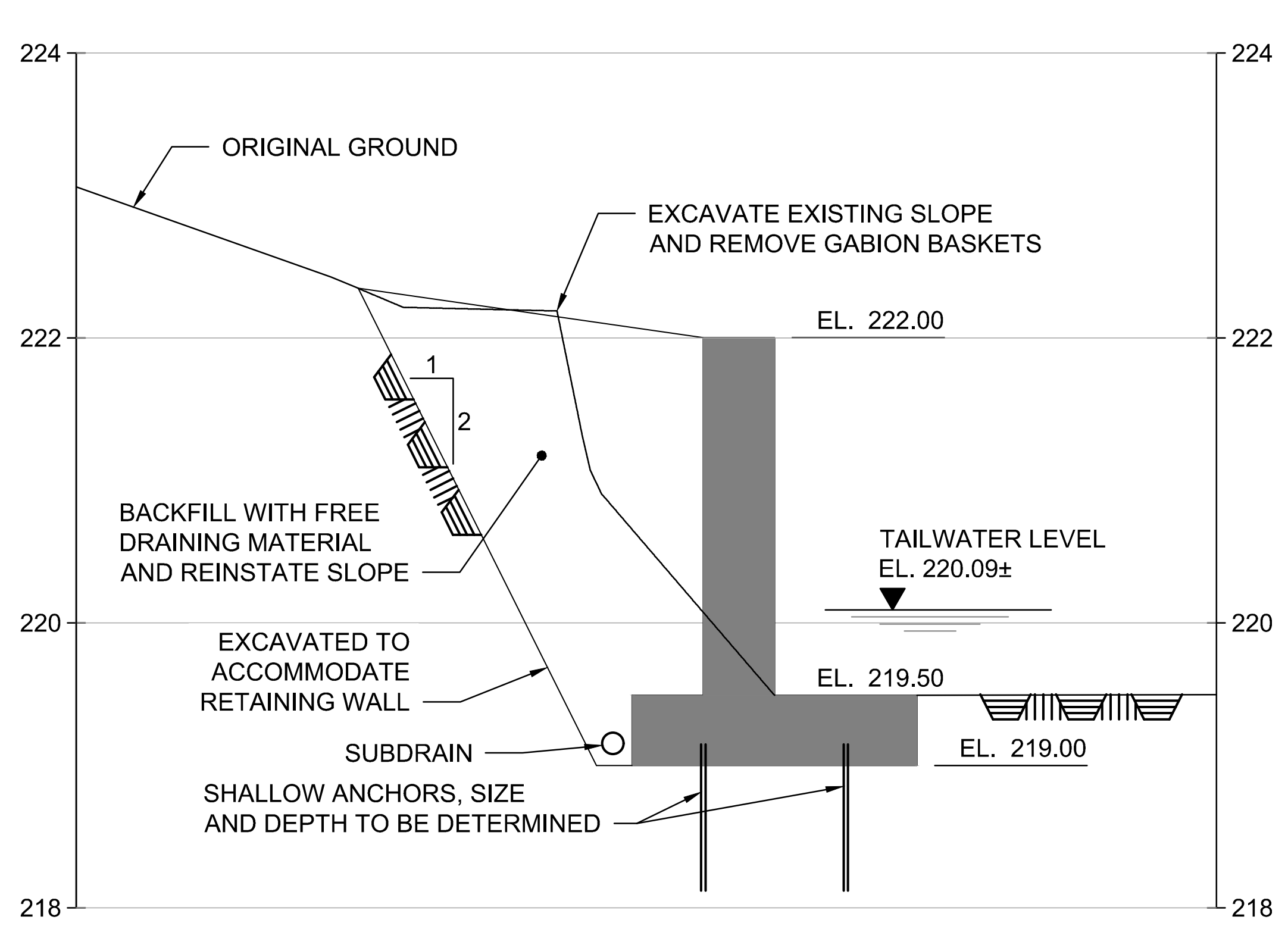
ELEVATIONS SHOWN IN METRES



SECTION K-K

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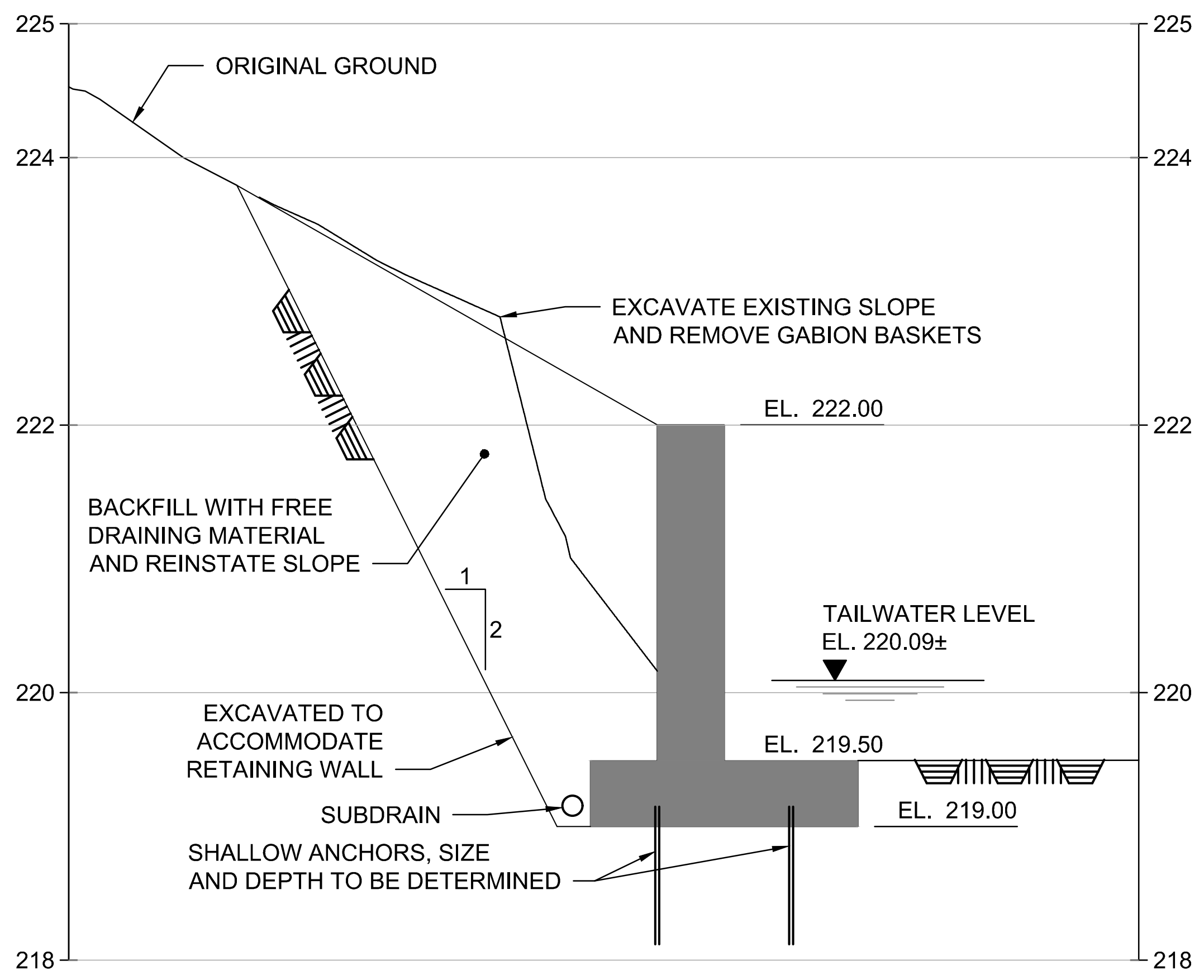

SECTION L-L

20-1051-C-03
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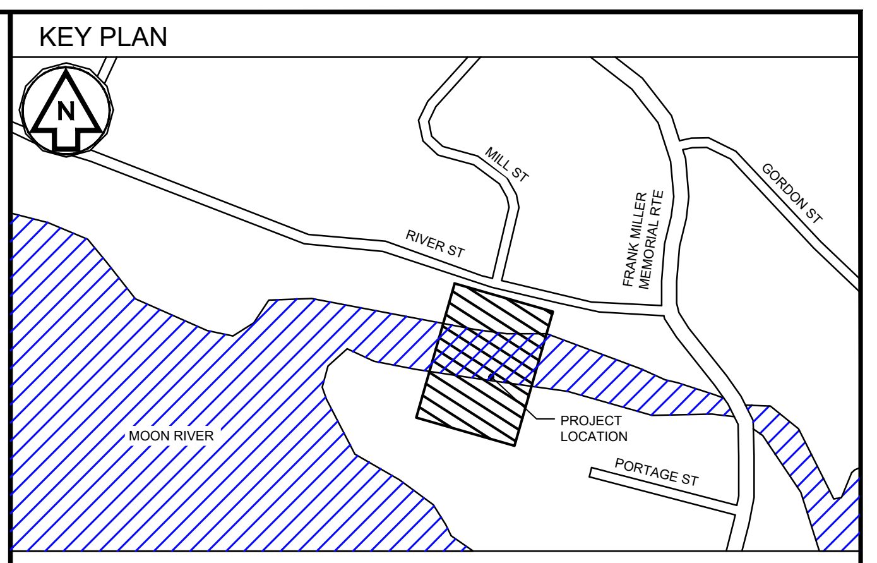
KEY PLAN



ISSUED FOR
INFORMATION

No.	DATE	BY	DESCRIPTION
B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW

REVISIONS

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
TAILRACE APRON
SECTIONS PAGE 2 OF 2

DRAWN BY:	CHECKED BY:	DESIGNED BY:
K.KORTEKAAS	E GILES	K KORTEKAAS
APPROVED BY:	SCALE:	DATE:
C STILLWELL	AS NOTED	2022-05-24

DRAWING No.: 20-1051-C-04
REVISION No.: B

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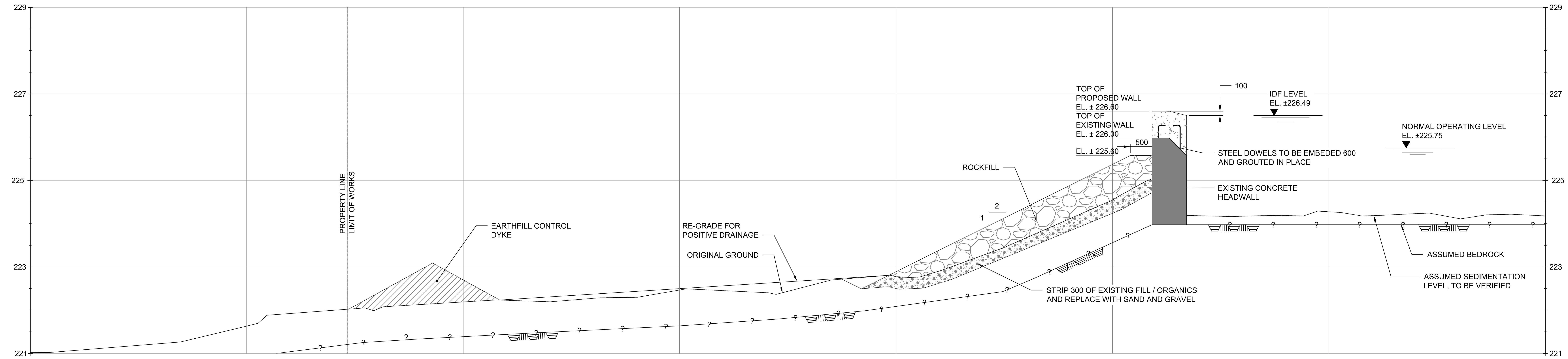
DIMENSIONS SHOWN IN MILLIMETRES
ELEVATIONS SHOWN IN METRES



SECTION B-B - EMERGENCY OVERFLOW

20-1051-C-01
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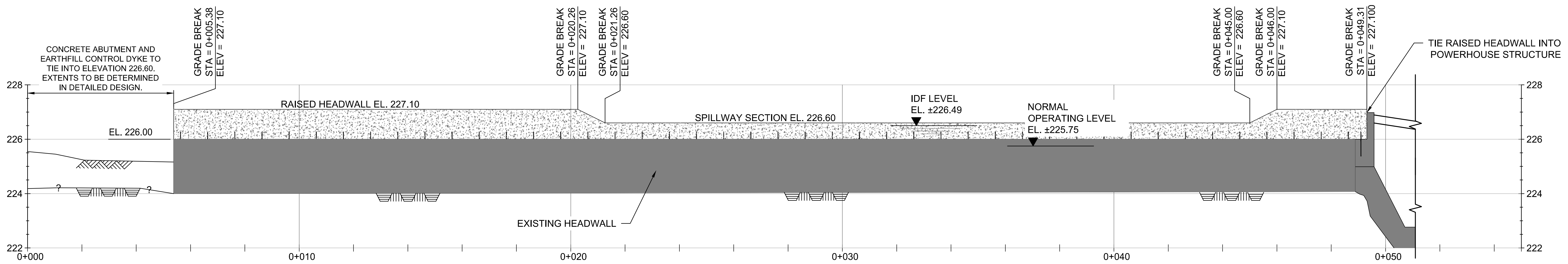

SECTION C-C HEADWALL GEOMETRY

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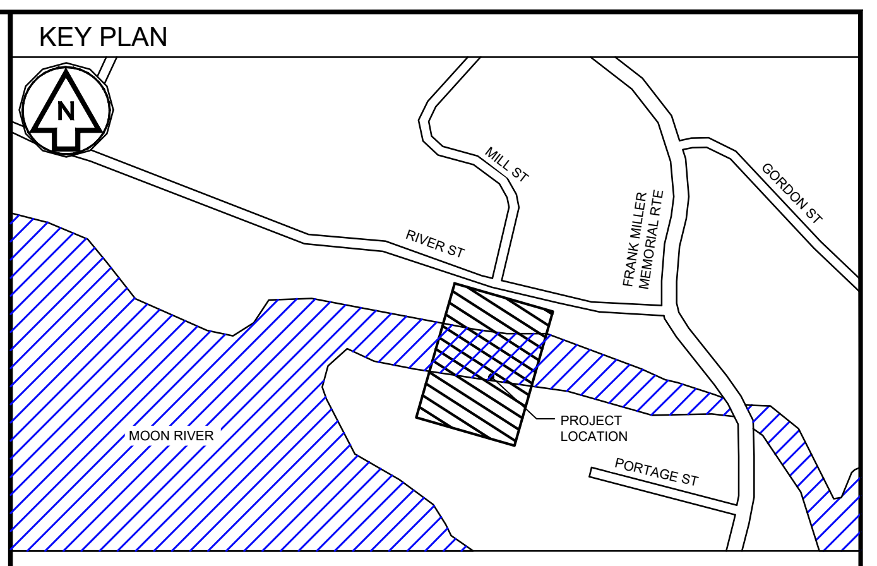
20-1051-C-05

KEY PLAN



TULLOCH
ISSUED FOR INFORMATION

No.	DATE	BY	DESCRIPTION
B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW

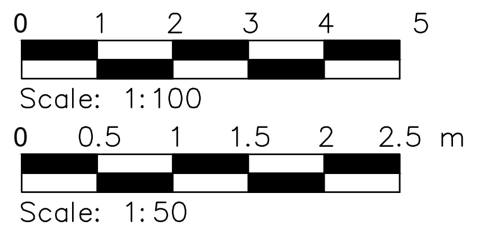
REVISIONS

TULLOCH

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
BURGESS NON-OVERFLOW
SECTION



DRAWN BY: K.KORTEKAAS
CHECKED BY: E GILES
DESIGNED BY: K KORTEKAAS
APPROVED BY: C STILLWELL
SCALE: AS NOTED
DATE: 2022-05-24
DRAWING No. 20-1051-C-05
REVISION No. B

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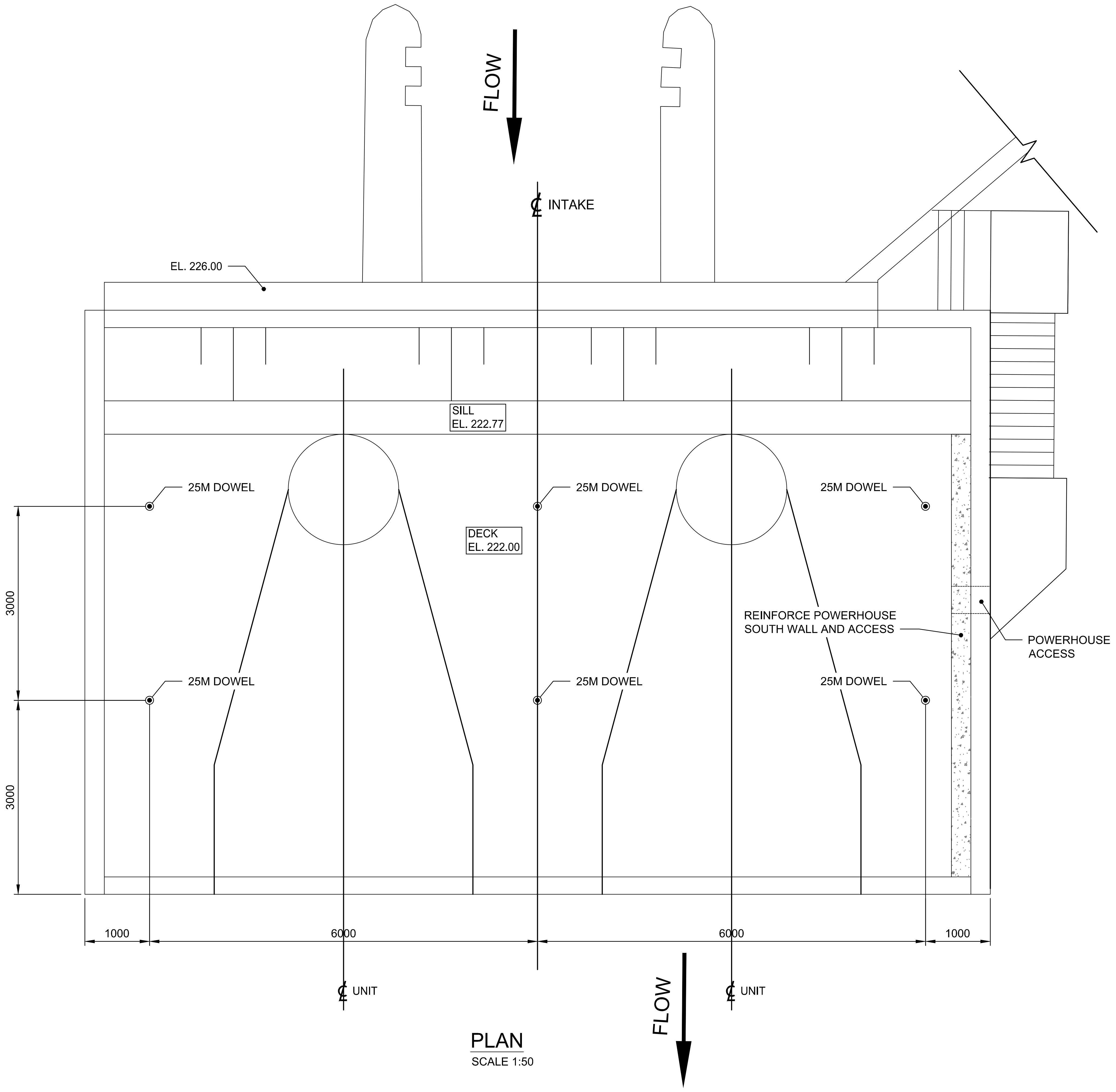
DIMENSIONS SHOWN IN MILLIMETRES
ELEVATIONS SHOWN IN METRES



PLAN
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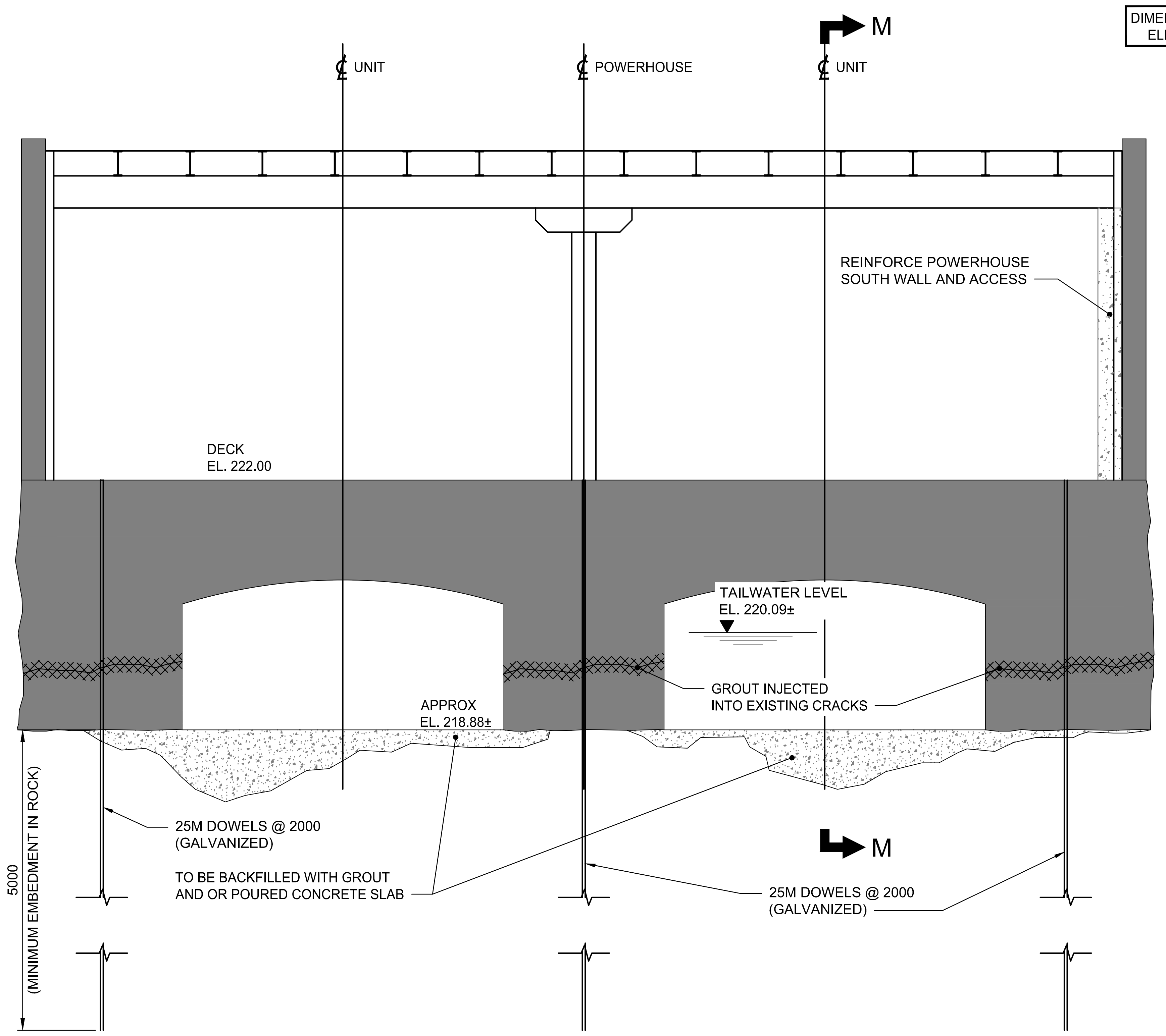
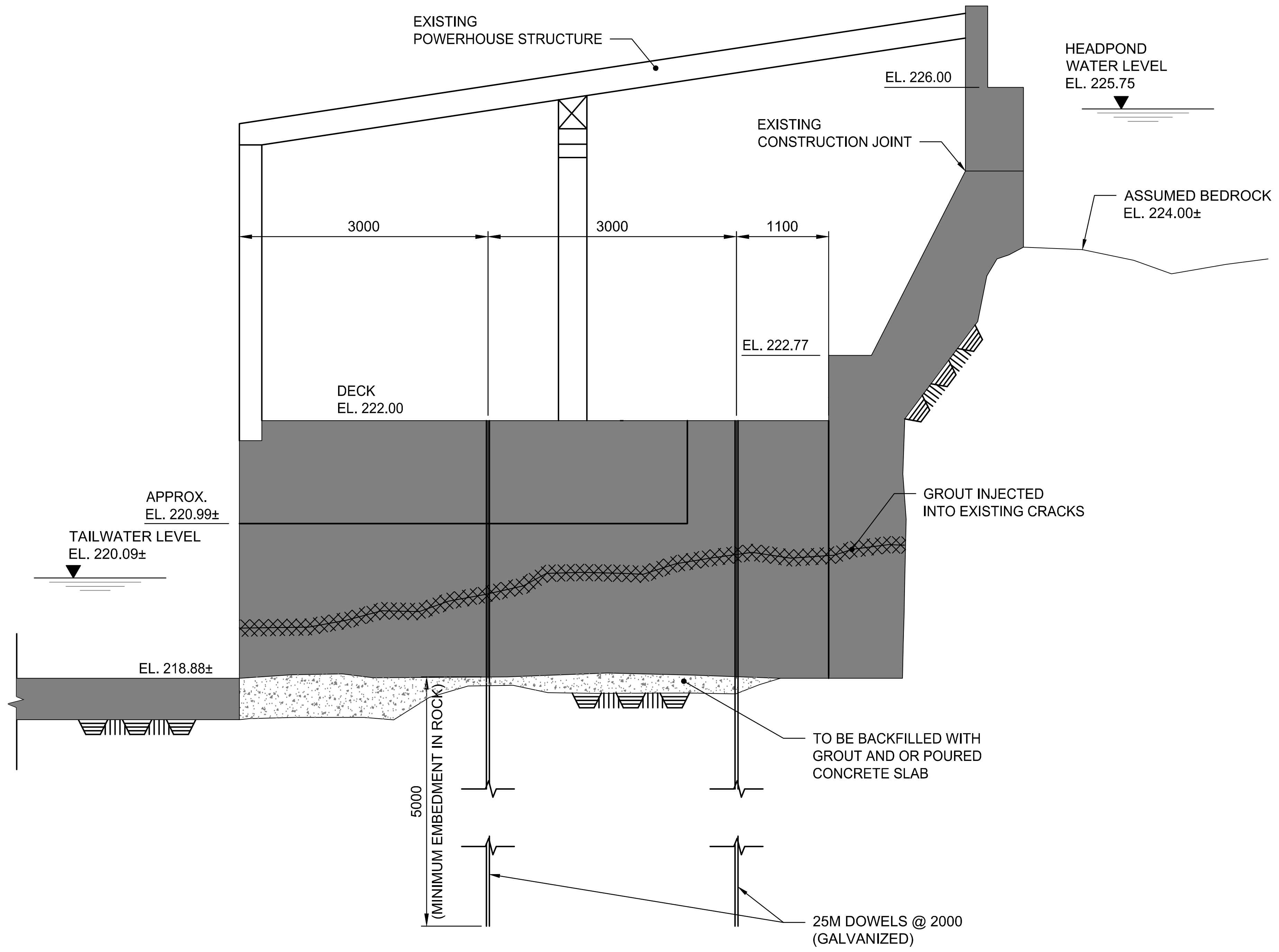


ELEVATION - DOWNSTREAM FACE
SCALE 1:50



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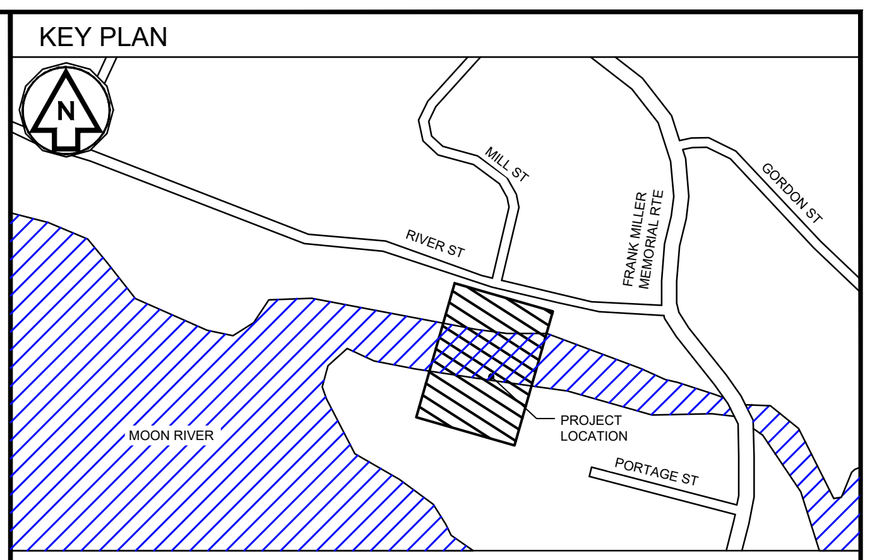
Scale: 1:50

KEY PLAN



TULLOCH
ISSUED FOR INFORMATION

No.	DATE	BY	DESCRIPTION
B	2022-05-24	KK	ISSUED FOR INTERNAL REVIEW
A	2022-05-16	KK	ISSUED FOR INTERNAL REVIEW

REVISIONS

TULLOCH

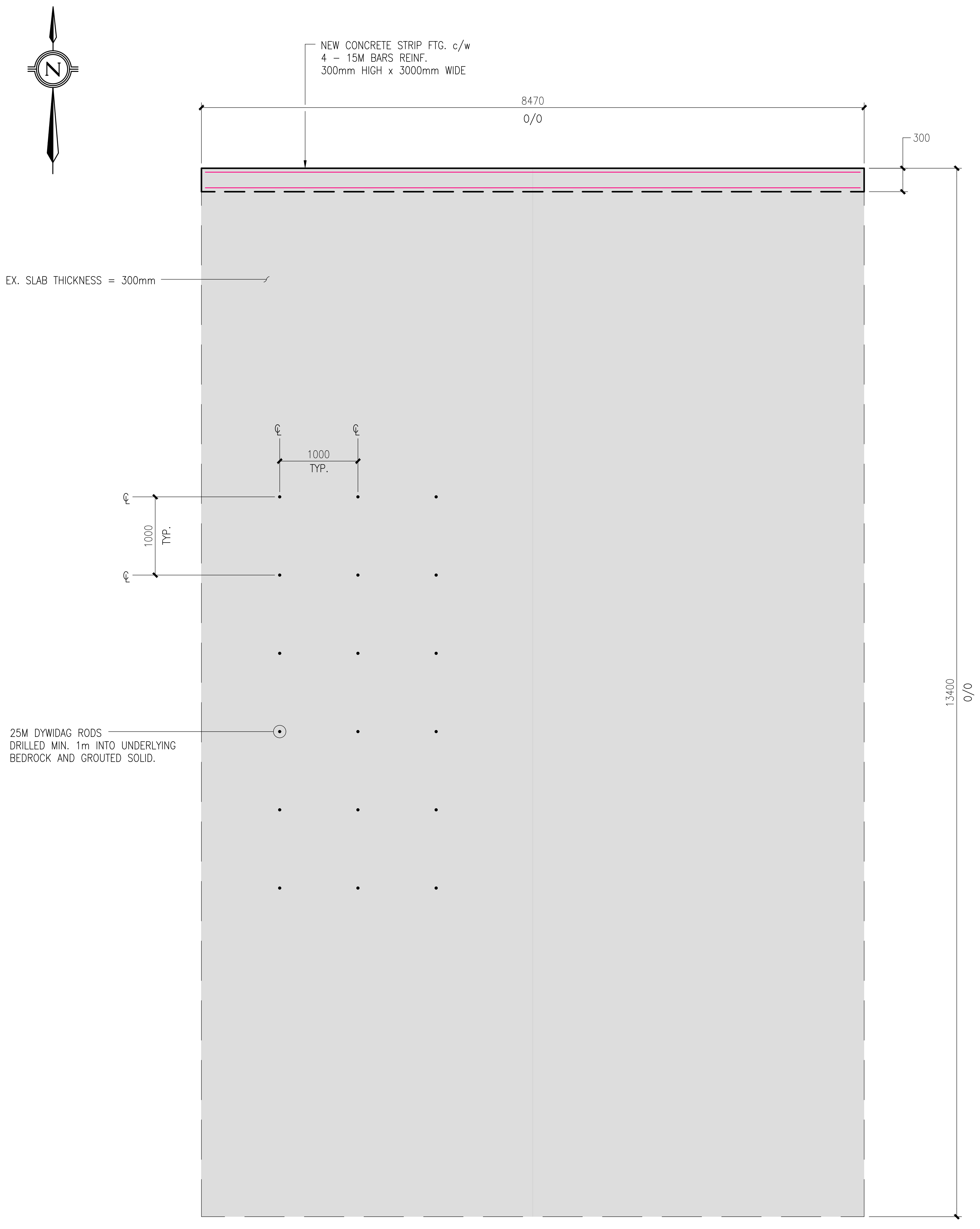
CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
BURGESS DAM
GENERATING STATION REHAB

DRAWING:
BURGESS POWERHOUSE
REMEDIATION
PLAN, ELEVATION AND SECTION

DRAWN BY: K.KORTEKAAS
CHECKED BY: E GILES
DESIGNED BY: K KORTEKAAS
APPROVED BY: C STILLWELL
SCALE: AS NOTED
DATE: 2022-05-24
DRAWING No. 20-1051-C-06
REVISION No. B

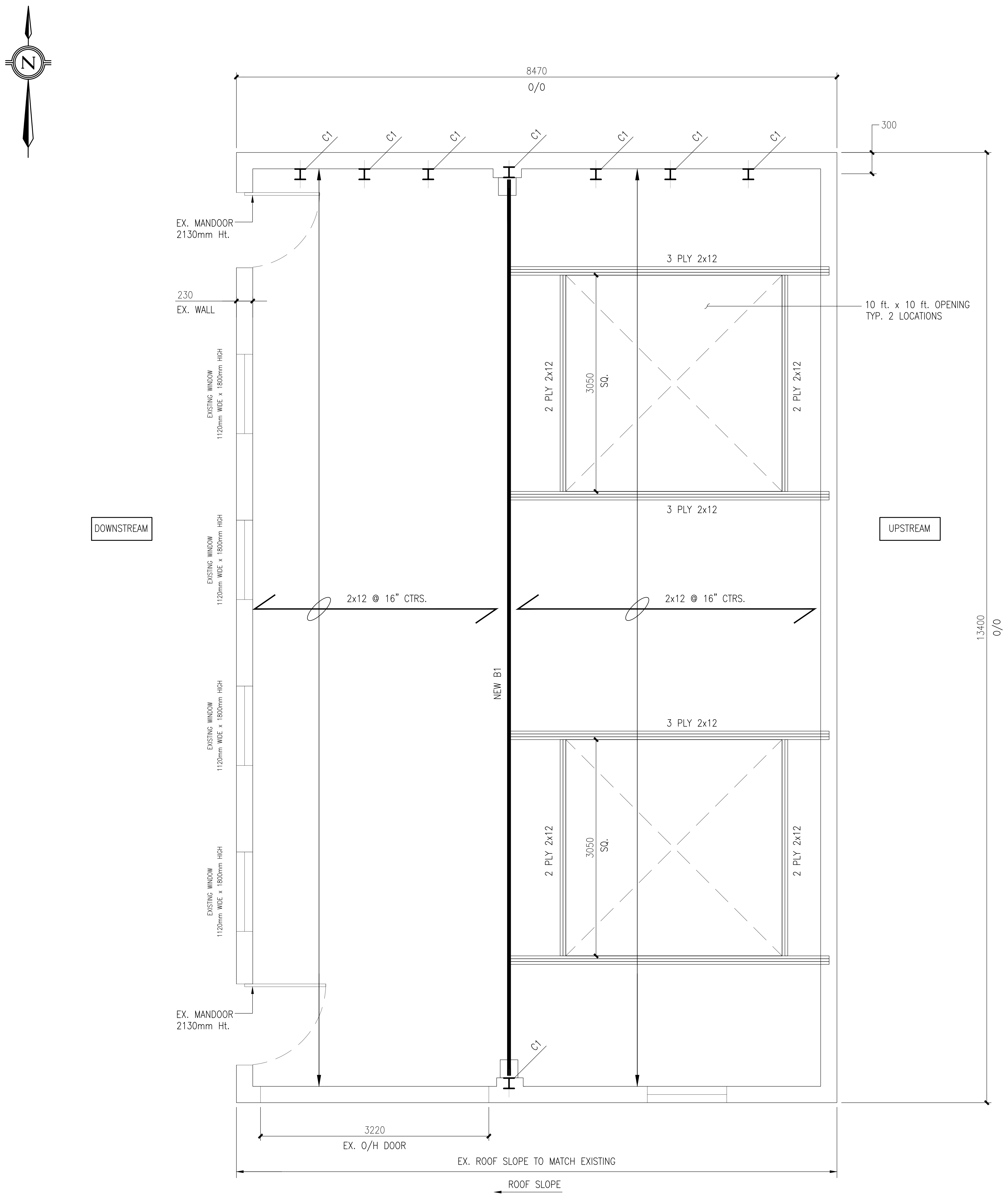
\\tulloch.local\data\Projects\2020\Stoney Creek\20-1051 - Burgess Dam\02 Drawings\20-1051-C-01 to 06.dwg



FOUNDATION PLAN

SCALE: 1:40

PROPOSED UPGRADES



PROPOSED ROOF FRAMING PLAN

SCALE: 1:40

BEAM SCHEDULE

B1 = NEW W200 x 59 w/
CONT. NAILER PL.

COLUMN SCHEDULE

C1 = NEW W150 x 22 w/ BASE PL.
TO BE ANCHORED TO EX. WALL.

TULLOCH
ISSUED FOR
REVIEW
Not Issued

KEY PLAN

22.09.30	A	ISSUED FOR CLIENT REVIEW	BWJ	FP
DATE (YR./MTH/DAY)	REV.	REVISION	BY	APP'D

ENGINEER'S SEAL:

CLIENT:

TOWNSHIP OF MUSKOKA Lakes
Township of Muskoka Lakes
1 Bailey Street, P.O. Box 129
Port Carling, ON.

CONSULTANT:

TULLOCH

DRAWING TITLE:

BURGESS DAM
EQUIPMENT ROOM REHAB
STRUCTURAL
FDN. & FRAMING PLAN

BWJ		**FP**	
DRAWN	DESIGNED	CHECKED	APPROVED
As Noted		**SEPT. 9, 2022**	
SCALE		DATE	

201051	**A**	**S1**
PROJECT No.	REVISION	DRAWING

North Slope Investigation

M E M O R A N D U M

Date: Thursday, November 17, 2022

To: **Ken Becking, P.Eng.**
Director of Public Works
Township of Muskoka Lakes
1 Bailey St., P.O. Box 129
Port Carling, ON P0B 1J0

From: Erik Giles P.Eng., Kelvin Cheung E.I.T.

CC: George Liang P.Eng.

RE: Burgess Dam – North Slope Geotechnical Investigation and Slope Stability Analysis

Dear Mr. Becking,

TULLOCH was retained by The Township of Muskoka Lakes (The Client) to perform a site investigation adjacent to the North Slope downstream of the Burgess 1 Generating Station Powerhouse in Bala, Ontario. The scope of work included the advancement of three (3) sampled boreholes on River Street adjacent to the Burgess 1 Generating Station. The purpose of the investigation was to further understand the subsurface soil and shallow bedrock conditions of the area to aid in development of mitigation or rehabilitation options for the slope. Drawing 20-1051-G-01 attached to this memorandum presents a site plan detailing borehole location for the geotechnical investigation completed for this project.

The memorandum will discuss a brief overview of the regional local geology, summary of the investigation methodology and factual findings, followed by a description of the analysis undertaken, and presentation of rehabilitation options. Terminology as it pertains to the borehole logs and memorandum is attached. Detailed borehole logs including individual soil layers and descriptions are also attached to this document, as well as analysis results.

1. INTRODUCTION AND SCOPE

The slope directly north of the Burgess 1 Generating Station is located downstream of the dam and directly downstream of the powerhouse. An existing concrete retaining wall, approximately 7.25 m long, keys into the north side of the powerhouse. Gabion baskets provide support below the retaining wall and extend approximately 11 m beyond the retaining wall limits in the downstream direction. At the toe of the gabions, there appears to be historically placed or dumped rock fill that varies in height and size. Generally, the restricted slope areas near the powerhouse are overgrown, while the sloped area downstream is grass covered.

The scope of work for this memorandum as part of the larger Burgess Rehabilitation Project is outlined below, it includes:

- Geotechnical Site Investigation (including Borehole Drilling, Soil Sampling and Description, etc.)
- Detailed Description of factual subsurface conditions including laboratory testing and standard geotechnical testing
- Slope Stability Analysis including development of preliminary mitigation and rehabilitation options for the North Slope identified above
- Delivery of one (1) Engineering Geotechnical Memorandum for detailing the findings of the analysis and the preliminary options for remediation/rehabilitation of the North Slope based on the soil properties and in-situ groundwater measurements. The recommendations in this memo will be input into the overall preliminary design of the rehab of the Burgess 1 Dam facility.

It is noted that two (2) boreholes were originally proposed on the South side of River St., with one (1) proposed on the north side. Due to hazards associated with overhead powerlines on the South side of River St., all three (3) boreholes were advanced on the north side of River St.

2. REGIONAL GEOLOGY

Based on review of Bedrock Geology and Surficial Geology of Southern Ontario mapping as published by the Ontario Geological Society (OGS), the site surficial geology is comprised of Canadian Shield with formations of Precambrian Bedrock typical within the Muskoka region. The typical geologic formations for the Bala area including hard and smooth pink to grey migmatitic rocks as well as quartzofeldspathic gneisses (OGS 2019). The Burgess 1 Dam is located at the lower section of the Muskoka River watershed near the bottom of Lake Muskoka where regional topography is typically mapped as low local relief varying from plains to undulating hummocky conditions. Overburden in the Bala area is typically sandy and shallow in depth with thick organic deposits found in low lying wetland areas.

3. SITE INVESTIGATION AND METHODOLOGY

The geotechnical investigation program included the following scope of work:

1. Borehole investigations on September 9th, 2020, including three (3) sampled boreholes in total, labelled BH-20-01 to BH-20-03.

2. Bedrock coring was completed in BH-20-01. Core logging of all rock core samples retrieved during the investigation was completed during the execution of the borehole. Cores were logged immediately upon retrieval, and measurements for Rock Quality Designation (RQD) were obtained to determine bedrock quality.

Drawing 20-1051-G-01 attached presents a site plan detailing borehole locations for the geotechnical investigation.

3.1 Geotechnical Borehole Summary

A summary of the boreholes drilled on the site are shown below in Table 3-1.

Table 3-1: Summary of Borehole Information

Borehole No.	Elevation[1] (m)	Northing[1] (m)	Easting[1] (m)	Bedrock Depth[2] (mbgs)	Borehole Depth[2] (mbgs)
BH-20-01	225.1	609067	4985600	1.47	4.5
BH-20-02	224.7	609059	4985601	1.24[3]	1.2
BH-20-03	224.4	509053	4985601	1.78[3]	1.8

Note(s):[1] Elevation and Borehole Coordinates are shown in UTM 17T Datum. [2] Meters below ground surface (mbgs), rounded to nearest 0.1 m. [3] Inferred bedrock depth.

Boreholes were advanced using a CME55 truck-mounted drill rig owned and operated by Landcore Drilling from Chelmsford, Ontario. The boreholes were advanced using hollow stem augers. Bedrock cores were retrieved within the NW casing via diamond rotary with an NQ2 (76 mm OD) rock core barrel. The rig was equipped with standard soil sampling equipment including an automatic hammer.

During the geotechnical drilling, soil samples were obtained using standard split spoon equipment in conjunction with Standard Penetration Tests (SPT) conducted in accordance with ASTM D1586 procedures. SPT sampling generally occurred at semi continuous 0.76 m intervals. In the bedrock, core samples were generally retrieved in 1.5 m continuous runs with an NQ2 core barrel. The bedrock was logged in the field and Rock Quality Designation (RQD) was calculated on site as the core runs were retrieved.

The drilling and soil sampling programs were directed by a TULLOCH representative, who logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil and rock cores were transported to TULLOCH's CCIL Certified Laboratory in Sault Ste. Marie, ON. Detailed borehole logs are attached to this memorandum.

4. LABORATORY TESTING PROGRAM

A geotechnical laboratory testing program was performed on representative soil and rock core samples in accordance with ASTM standards. Table 4-1 provides a list of the testing program. Detailed laboratory reports for the particle size analysis and unconfined compressive strength of rock tests, can be found attached to this memorandum.

Table 4-1: Summary of Rock Laboratory Testing Program

Test	Number of Tests	ASTM Standards
Particle Size Analysis	2	ASTM D422
Unconfined Compressive Strength (Rock)	2	ASTM D7012

5. SUMMARY OF SUBSURFACE CONDITIONS

5.1 General

The following section outlines the soil deposits/stratigraphy and corresponding depths encountered during the investigation. Further details can be found in the attached borehole logs.

It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. Further, in boreholes where bedrock coring was not undertaken, depths to bedrock are inferred based on auger refusal.

5.2 Stratigraphy Overview

A total of three (3) boreholes were advanced to assess the subsurface conditions on River St. and the adjacent North Slope. All boreholes were advanced to refusal, BH-20-01 was cored to confirm and assess the shallow bedrock conditions. Throughout the boreholes, 125 mm of asphalt was found to overly road base fills consisting of gravelly sand to sand some gravel. In BH-20-01 auger grinding occurred from below the asphalt to bedrock surface at 1.47 m, inferred to be caused by the presence of cobbles and boulders. Bedrock was confirmed at 1.47 m in BH-20-01 and was inferred at 1.2 and 1.8 mbgs in BH-20-02 and -03 respectively. In BH-20-01, bedrock was found to be granitic gneiss, fine to medium grained with angled foliation. The rock was slightly weathered to fresh, and strong with unconfined compression strengths ranging from 100.3 MPa in Run 1 to 130.3 MPa in Run 2.

A simplified stratigraphic profile, and bedrock depths for each borehole is summarized below in Table 5-1. Further details with individual soil layers and characteristics can be viewed in the detailed borehole logs attached to this memorandum.

Table 5-1: Summary of Soil and Bedrock Conditions

Borehole No.	Ground Surface Elevation[1] (m)	Investigation Profile (mbgs)	Bedrock Depth (mbgs)[2]	Bedrock RQD Range (%)
BH-20-01	225.1	0.00-0.13, Asphalt 0.13-1.47, (SW) Sand, some gravel	1.47	56-94
BH-20-02	224.7	0.00-0.13 Asphalt 0.13-1.24, (SW) Sand, some gravel	1.24[3]	-
BH-20-03	224.4	0.00-0.13 Asphalt 0.13-1.78, (SW) Sand, some gravel	1.78[3]	-

Note(s):[1] Elevation and Borehole Coordinates are shown in UTM 17T Datum. [2] Meters below ground surface (mbgs). [3] Inferred bedrock depth.

5.3 Groundwater Conditions

Groundwater was measured upon completion of each borehole location. A summary of groundwater measurements taken in the boreholes is presented in Table 5-2 below. Groundwater readings were taken down hole upon drilling completion, as such the ground water levels measured on site may not represent static conditions.

Table 5-2: Water Level Readings Summary

Borehole No.	Surface Elevation (m)	Groundwater Depth[1] (mbgs)
BH-20-01	225.1	4.12
BH-20-02	224.7	Not encountered
BH-20-03	224.4	Not encountered

Note(s):[1] Meters below ground surface (mbgs)

Groundwater level is subject to seasonal fluctuations with high levels occurring during wet weather conditions in the spring and fall and lower levels during dry weather conditions.

6. NORTH SLOPE STABILITY ANALYSIS

The following sections will discuss the results of the stability modelling of the existing North Slope retaining wall, gabion basket wall and the overall global slope stability. The modelling was based on review of available drawings, topographic survey, and the encountered stratigraphy from the geotechnical investigation.

6.1 Retaining Wall and Gabion Stability Analysis

Concrete retaining wall global stability and gabion wall global and internal stability calculations were conducted for the North Slope area. Using the data collected from the geotechnical investigation, and topographic survey the initial Factor of Safety (FOS) calculations were completed to help frame the recommendations in the following sections. The FOS calculation for stability analysis of the gabion and retaining wall sections are based on the following Equations:

FOS against sliding failure:

$$FOS = \frac{\sum Resisting\ Froce}{\sum Driving\ Force} \qquad [1\text{-}1]$$

FOS against overturning failure:

$$FOS = \frac{\sum Resisting\ Moment}{\sum Driving\ Moment} \qquad [1\text{-}2]$$

Table 6-1 summarizes the geotechnical parameters used in the stability calculations. Geotechnical parameters were based on the results of the geotechnical investigation and TULLOCH's engineering experience for conservative design purposes.

Table 6-1: Summary of Geotechnical Parameters Stability Calculation[1]

No.	Type of Material	Cohesion, c' (kPa)	Internal Friction Angle,φ' (Degree)	Unit Weight, γ' (kN/m^3)
1	Silty Sand Fill	0	35	19
2	Rockfill	0	38	20
3	Gabion Basket	30	38	20
4	Retaining Wall Concrete	-	-	24
5	Concrete to Rock Interface	-	38	-

Note(s): [1]-Geotechnical parameters are assumed based on TULLOCH's engineering experience.

6.1.1 Gabion Stability Results

Geometry used in stability analysis of the gabion retaining wall was based on the available historical information and observations during site inspection. For global stability, the external boundary of the gabion retaining wall structure was taken to be from the toe of the gabion basket (Gabion 1) retaining wall to the upstream edge of the upper most gabion basket (Gabion 4). The gabion wall is assumed to be founded on bedrock as no construction records or design drawings were available for the structure. Gabion basket widths are all taken to be 1m for the purposes of the stability calculation based on review of available historical drawings. Active and passive earth pressure coefficients have been modified to consider the sloping backfill geometry of the North

Slope above the gabion wall. Table 6-2 summarizes the required and calculated factors of safety for the stability of the gabion basket retaining wall.

Table 6-2: Calculated FOS for Stability of Gabion Basket Retaining Wall

Stability Case	Stability Case	FOS	Minimum Required FOS
Global	Sliding	1.69	1.5
	Overturning	7.64	2.0
Gabion 1	Sliding	**1.05**	1.5
Gabion 2	Sliding	**1.40**	1.5
Gabion 3	Sliding	2.15	1.5
Gabion 4	Sliding	5.08	1.5

It should be noted that based on the available survey data, traffic loading on top of the slope is within the active wedge zone and therefore is applied to the gabion wall calculations. This is a preliminary assessment with limited investigation data and the geometry of gabion wall inferred from the inspection.

Based on the above results, the stability of the gabion basket retaining wall is in a marginally unsafe condition. The internal stability of the wall does not meet the required safety factor with respect to sliding. The rockfill at the toe of the wall has been ignored in this analysis due to its discontinuous nature, however, in reality it may provide minor support to the lower two gabions. Continued deterioration and movement of the wall will likely cause further instability if left unchecked. Therefore, action is recommended to remediate or replace the Gabion Wall which will be discussed in Section 7.

6.1.2 Existing Concrete Retaining Wall Stability Results

Geometry used in stability analysis of the concrete retaining wall was based on the available historical information and provided drawings as well as observation during site inspection. Based on the historical drawings, the concrete retaining wall is assumed to be founded on bedrock. Table 6-3 summarizes the required and calculated factors of safety for the stability of the retaining wall. A sensitivity analysis was conducted based on the U/S water level of the retaining wall as a subdrain for the wall was not presented in the drawing nor established during the site inspection of the wall. As such in a flooding event similar to 2019 water could build up behind the wall causing additional force on the wall.

Table 6-3: Calculated FOS for Stability of Concrete Retaining Wall

Stability Case	Stability Case	FOS	Minimum Required FOS
U/S water level at surface of U/S fill	Sliding	2.5	1.5
	Overturning	**1.7**	2
U/S water level 0.5 m below surface of U/S fill	Sliding	3.0	1.5
	Overturning	2.2	2

It should be noted that based on the available survey data, the traffic loading is within the active wedge zone of the backfill and therefore is applied to the concrete retaining wall calculations. This is a preliminary assessment with limited investigation data and the geometry of concrete wall is inferred from the inspection and available historical information.

Based on the results, the existing concrete retaining wall is typically in a safe condition. However, when the U/S water level is high, i.e., at the surface of the fill, the factor of safety decreases to a marginally safe condition with the required Safety Factor for overturning not being met. This condition likely occurs during period of high precipitation, during the spring freshet and is also likely during an overtopping event. Buildup of water pressure on the upstream side of the wall is expected due to the lack of drains through the retaining wall. It is also noted that a large, open vertical crack exists in the retaining wall which indicates historic movement. Continued deterioration and movement of the wall may cause further reduction in overall stability if left unchecked.

6.2 North Slope Global Stability Analysis

Limit equilibrium global stability analysis was conducted for the North Slope area using Geostudio 2021 R2, version 11.1.3.22700 by GEOSLOPE International Ltd. Survey data collected as part of the 2019 DSR for the Burgess Dam, information from the geotechnical investigation, and limited available historical information, was used to generate analysis geometry and determine a critical section which is shown in Figure 6-1 Below. It should be noted that the bedrock profile in the model is assumed based on local site and regional geology characteristics. The phreatic surface was assumed based on typical powerhouse tailwater elevation and the groundwater conditions encountered during the geotechnical investigation. See Figure 6-1 below.

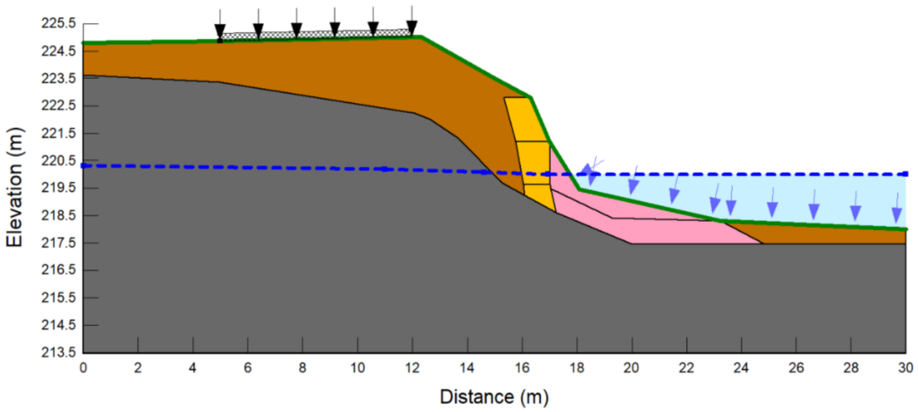


Figure 6-1: Slope Stability Geometry and Phreatic Surface

The slope stability model resulted in a global factor of safety of 1.24, the required factor of safety for the current site conditions is typically 1.5. A sensitivity study where the gabion basket netting has deteriorated was also run, this yielded a factor of safety of 0.61 showing that without a gabion wall in good condition, the slope is unsafe and would likely fail. The condition of the gabion wall below the rockfill at the downstream toe is unknown as it is covered in rock fill, however given its age and the fair condition of the existing gabion wall it is reasonable to assume that the gabions are nearing the end of their service life and it is recommended that they be rehabilitated or replaced.

7. ENGINEERING DISCUSSION

The following section will discuss engineering recommendations for the North Slope and associated structures to be incorporated into the preliminary design of the Burgess 1 Generating Station facility. The Gabion Basket Existing Retaining Wall and overall North Slope will be discussed.

The existing concrete retaining wall is noted to have extended vertical cracks from the crest to the soil contact on the downstream side. Further, typical features of modern retaining walls including subdrain system, and reinforcement in the form of anchor points or dowelling were not apparent on historical drawings or observed during the last DSR conducted in 2019. This indicates that the wall is in fair condition and should be rehabilitated or replaced. Given the planned rehabilitation of the overall facility replacement or remediation of this wall is recommended at this time.

The gabion wall is noted to be in marginally unsafe condition, with some unknowns as to the geometry and foundation. The North Slope is noted to be steep at approximately a 1.75 to 1 (H:V).

The various North Slope stability analyses indicate that the concrete retaining wall, gabion wall and north slope areas are all in a marginally safe condition. Given the above information, the following remediation options are presented for consideration.

7.1 Option 1 – Remediation of Existing Concrete Retaining and Gabion Basket Walls

With the various components of the North Slope area in fair to poor condition, remediation of the existing structure should be considered. This would include remediation of the existing concrete retaining wall and reinforcement and possible replacement of the existing Gabion Wall.

The following recommendations should be implemented for rehabilitation of the North Slope area:

- Subdrains should be installed in the concrete retaining wall to prevent pore pressure buildup on the upstream side, drains should be run into the tailrace area to prevent additional erosion. Surface run-off should be collected and diverted away from the retaining wall section.
- Cracks in the concrete retaining wall should be repaired and if required additional structural reinforcement should be added.
- Anchoring of the concrete retaining wall into the shallow bedrock should be considered to improve stability in overturning and sliding.
- The concrete retaining wall and repair locations should be regularly inspected for further movement over time. A monitoring system could be implemented on the wall to track movement in the future.
- Removal of rockfill at the toe of the gabion wall to inspect the lower Gabions and determine their condition, the Gabions could then be remediated or replaced as required. Adequately sized rip rap and/or larger gabion stone could be used to prevent erosion and help stabilize the North Slope.
- The North Slope should be monitored regularly for signs of instability or movement.

Rehabilitation may extend the service life of the walls and the North Slope; however, it would require regular monitoring and maintenance with potential for eventual replacement as the structures in question are aging and near the end of their service life.

7.2 Option 2 – Replacement of Concrete and Gabion Basket Retaining Walls

With future plans for upgrades to the current Burgess Dam structures including dam raising, powerhouse rehabilitation and improvements to the tailrace, this presents a good opportunity to replace the existing North Slope retaining structures and incorporate a more robust retention system for River Street. Though construction of properly engineered retaining structures requires larger initial investment, it will have reduced maintenance costs, increased safety of the walls and surrounding infrastructure, and minimized risk to power generation in the long term. Given the required rehabilitation of the Generating Station and Dam it may be difficult to replace these North Slope infrastructure at a later point which could increase cost when eventual replacement is required. The following recommendations should be implemented in North Slope area.

- Removal of existing concrete and gabion basket retaining walls.
- Removal of existing fill and native materials to competent bedrock.
- Construction of a concrete training wall dowelled into bedrock and tied into the Powerhouse, extending to the current downstream limit of the gabion wall. The concrete training wall should include subdrains.
- Construction of a replacement concrete retaining wall tied into the powerhouse and founded on bedrock, which should include subdrains.
- Backfilling behind and between all structures should be an approved free draining granular fill such as OPSS Granular B Type II or equivalent backfill compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD). Placed in compacted lifts of maximum loose lift thickness of 300 mm.
- Regrading of all slopes above the gabion wall to 2:1 (H:V) or less.

Extending a training wall from the powerhouse will prevent erosion of the North Slope and allow for significantly better control of water through the powerhouse particularly during high flow events. Furthermore, the heightened and improved training wall will act as a retaining wall for the North Slope and provide better structural resistance to the North Slope allowing the infrastructure to perform better and mitigate the risks associated with slope failure on the site.

A preliminary drawing will be issued for the training wall as part of the preliminary design memo for the Burgess 1 Generating Station. It should be noted that the recommendations in the memorandum are preliminary in nature. It is recommended that the calculations and remediation options be re-evaluated in the detailed design phase to ensure that they meet the needs of the Township.

8. CLOSURE

This geotechnical memorandum has been prepared by TULLOCH for the exclusive use of the Client and their authorized agents. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering, for the above noted location. Classification and identification of soils, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Please refer to the Notice to Reader attached, which is an integral part of this report.

We trust that the information in this report will be sufficient to allow the Client to proceed with the project. Should further elaboration be required for any portion of this project, we would be pleased to assist.

Sincerely,

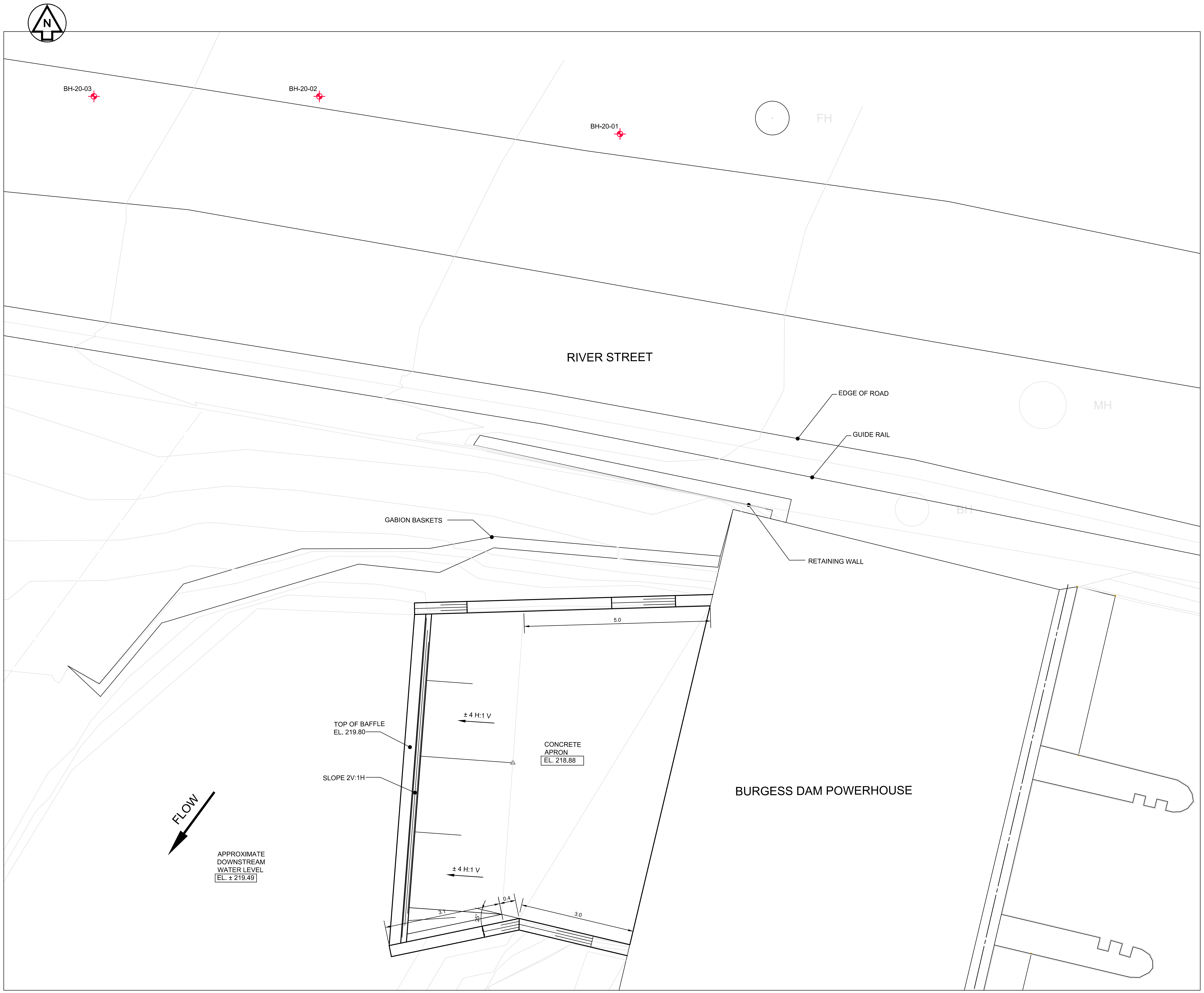
Kelvin Cheung B.Sc. E.I.T
Engineer in Training

Reviewed By:
Erik Giles P.Eng.
Geotechnical Engineer

LICENSED PROFESSIONAL ENGINEER
E. K. GILES
100206670
NOV 17/2022
PROVINCE OF ONTARIO

Attachment(s): Site Plan, Terminology, Site Photo Log, Borehole Logs, Rock Core Photos, Laboratory Data, Slope Stability Results, Notice to Reader

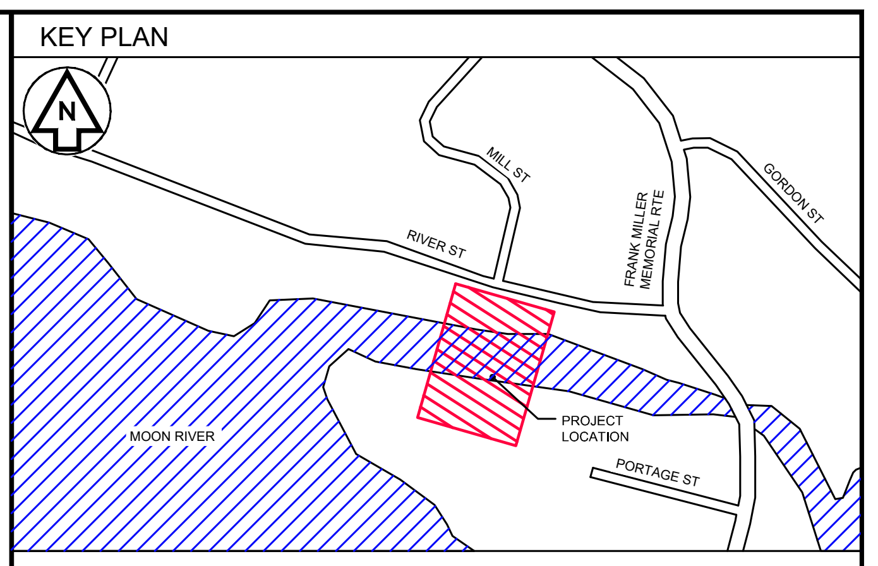
Site Plan



PLAN
SCALE: 1:50

0 0.5 1 1.5 2 2.5 m
Scale: 1:50

KEY PLAN



LEGEND:

BH-20-01 ⌖ BOREHOLE LOCATION

NOTES:

1. CO-ORDINATES ARE IN UTM ZONE 17 (NAD83 CSRS).

BOREHOLE LOCATIONS

BOREHOLES	EASTING	NORTHING	ELEVATION
BH-20-01	609 067	4 985 600	225.1
BH-20-02	609 059	4 985 601	224.7
BH-20-03	609 053	4 985 601	224.4

No.	DATE	BY	DESCRIPTION
A	2022-02-23	KK	ISSUED FOR INTERNAL REVIEW

REVISIONS

TULLOCH

CLIENT:
TOWNSHIP OF
MUSKOKA LAKES

PROJECT:
LITTLE BURGESS
GENERATING STATION REHAB

DRAWING:
NORTH EMBANKMENT
GEOTECHNICAL INVESTIGATION
PLAN

DRAWN BY: M. ANYS
CHECKED BY: E GILES
DESIGNED BY: K KORTEKAAS
APPROVED BY: C STILLWELL
SCALE: AS NOTED
DATE: 2022-02-23
DRAWING No. 20-1051-G-01
REVISION No. A

P:\Projects\2020\20-1051 - Burgess Dam\02 Drawings\20-1051-G-01.dwg

Terminology

ABBREVIATIONS, TERMINOLOGY AND PRINCIPAL SYMBOLS USED IN REPORT AND BOREHOLE LOGS

BOREHOLES AND TEST PIT LOGS

Soils

AA	Auger Sample	w	Water Content
SS	Split Spoon	wP	Plastic Limit
TO	Tin-walled Tube	wL	Liquid Limit
TP	Thin-walled Piston	V(FV)	Field Vane
WS	Washed Sample	OR	Organic Content
SC	Soil Core	GR	Gravel
BS	Block Sample	SA	Sand
WH	Weight of rods & hammer	SI	Silt
WR	Weight of rods	CL	Clay

Bedrock

TCR	Total Core Recover	VN	Vein
SCR	Solid Core Recovery	CO	Contact
FI	Fracture frequency index	KV	Karstic void
HQ	Rock Core (63.5 mm dia.)	MB	Mechanical Break
NQ	Rock Core (47.6 mm dia.)	PL	Planar
BQ	Rock Core (36.5 mm dia.)	CU	Curved
JN	Joint	UN	Undulating
FLT	Fault	IR	Irregular
SH	Shear	SM	Smooth
K	Slikensided	SR	Slightly Rough
BD	Bedding	R	Rough
FO	Foliation	VR	Very rough

IN SITU SOIL TESTING

Standard Penetration Test (SPT) "N" value. The number of blows required to drive a 51 mm OD split barrel sampler into the soil a distance of 300 mm with a 63.5kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm base area with a 60 degree apex pushed through the soil at a penetration rate of 2cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

SOIL DESCRIPTIONS

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification	
Clay	<0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.075 to 4.75 mm
Gravel	4.751o 75 mm
Cobbles	75 to 200 mm
Boulders	>200 mm

Terminology	Proportion
"trace", sand, etc.	1%to 10%
"some"	10% to 20%
Sandy, Gravelly, etc.	20% to 35%
"and"	>35%
Ex., SAND, SILT, etc.	>35%

Notes:

1. Soil properties, such as strength, gradation, plasticity, structure, etc., dictate the soils engineering behaviour over the grain size fractions;
2. With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the relative density condition of cohesionless soil:

Cohesionless Soils

Compactness	SPT "N" Value (blows/30cm)
Very Loose	0 to 4
Loose	5 to 10
Compact	11 to 30
Dense	31 to 50
Very Dense	>50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value (blows/30 cm)
Very Soft	<12.5	< 2
Soft	12.5 to 25	2 to 4
Firm	25 to 50	5 to 8
Stiff	50 to 100	9 to 15
Very Stiff	100 to 200	16 to 30
Hard	> 200	>30

Note: Utilizing the SPT, "N" value to correlate the consistency and undrained shear strength of cohesive soils is very approximate and needs to be used with caution.

Particle Sizes

Constituent	Description	Size (mm)	Size (in)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	< 0.075	< (200)

ROCK CORING

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum.

Intact Rock Strength

Intact Strength (Mpa)	Description
< 1	Extremely low strength
1-5	Very low strength
5-25	Low strength
25-50	Medium strength
50-100	High strength
100-250	Very high strength
>250	Extremely high strength

Rock Mass Quality

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

Rock Mass Weathering

Term	Description
Unweathered (Fresh)	No visible sign of material weathering to discoloration on major discontinuity surfaces.
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity of surfaces. All the rock material may be discolored by weathering and may be somewhat weaker than its fresh condition.
Moderatly Weathered	Less than half the rock material is decomposed and/or disintegrates to soil. Fresh or discolored rock is present either as a continuous frame work of as core stones.
Highly Weathered	More than half the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a discontinuous frame work or as core stones.
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

Joint and Foliation Spacing

Description	Spacing
Very Wide	Greater than 3 m
Wide	1 m to 3 m
Moderately Close	0.3 m to 1 m
Close	50 mm to 300 mm
Very Close	Less than 50 mm

Bedding Thickness

Description	Spacing
Very thick	Greater than 2 m
Thick	0.6 m to 2 m
Medium	0.2 m to 0.6 m
Thin	60 mm to 0.2 m
Very thin	20 mm to 60 mm
Laminated	6 to 20 mm
Thinly Laminated	Less than 6 mm

SYMBOLS

General

w_N	Natural water content within the soil sample
γ	Unit weight
γ'	Effective unit weight
γ_D	Dry unit weight
γ_{SAT}	Saturated unit weight
ρ	Density
ρ_s	Density of solid particles
ρ_w	Density of water
ρ_D	Dry density
ρ_{SAT}	Saturated density
e	Void ratio
n	Porosity
S	Degree of saturation
E_{50}	Fifty percent secant modulus

Consistency

w_L	Liquid Limit
w_P	Plastric Limit
I_P	Plasticity Index
w_S	Shrinkage limit
I_L	Liquidity index
I_C	Consistency index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density index (formerly relative density)

Shear Strength

S_u	Undrained shear strength parameter (total stress)
c'	Effective cohesion intercept
ϕ'	Effective friction angle
τ_R	Peak shear strength
τ_R	Residual shear strength
δ	Angle of interface friction
μ	Coefficient of friction = tan ϕ'

Consolidation

C_c	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
m_v	Coefficient of volume change
c_v	Coefficient of consolidation
T_v	Time factor (vertical direction)
U	Degree of consolidation
σ_v'	Effictive overburden pressure
OCR	Overconsolidation ratio

Site Photo Log

Photo 1: General investigation area, note low powerlines on left side of photo which prevented drilling closer to the North Slope. Powerhouse on left.

Photo 2: Retaining wall near road surface, gabion basket wall at slope toe. Powerhouse on right. Image looking from downstream of powerhouse to upstream.

CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	K. Cheung
DESIGNED	K. Cheung
REVIEWED	E.Giles
APPROVED	

TITLE
Geotechnical Investigation – Site Photos

PROJECT NO.	Phase/Task	Rev.	FIGURE
20-1051		**Rev 0**	**C1**

Photo 3: View of retaining wall behind the fence from road surface.

Photo 4: North Slope with powerhouse and tailrace in background on right. Note abrupt slope change where gabion basket wall exists at break in slope.

CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	K. Cheung
DESIGNED	K. Cheung
REVIEWED	E.Giles
APPROVED	

TITLE
Geotechnical Investigation – Site Photos

PROJECT NO.	Phase/Task	Rev.	FIGURE
20-1051		Rev 0	C2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
25 mm
0

Photo 5: Gabion wall at toe of North Slope. Note rockfill located at toe of gabion wall above tailrace water level.

CLIENT Township of Muskoka Lakes	PROJECT Burgess Dam – North Slope Investigation

CONSULTANT

TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	K. Cheung
DESIGNED	K. Cheung
REVIEWED	E.Giles
APPROVED	

TITLE
Geotechnical Investigation – Site Photos

PROJECT NO.	Phase/Task	Rev.	FIGURE
20-1051		Rev 0	C3

Borehole Logs

TULLOCH ENGINEERING

RECORD OF BOREHOLE No 20-01

1 OF 1

METRIC

JOB NUMBER 20-1051
LOCATION River Street, Bala, Ontario
ORIGINATED BY JM
CLIENT Township of Muskoka Lakes
DATUM Ground Suface
BOREHOLE TYPE HSA/NQ Diamond Rotary
COMPILED BY JM
DRILLER Landcore Drilling
DATE 2020.09.09
NORTHING 4985600
EASTING 609067
CHECKED BY EG

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa
○ POCKET PEN + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

UNIT WEIGHT γ kN/m³

SOIL PROFILE			SAMPLES				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.00	Ground Surface						
0.00 -0.13	125 mm ASPHALT	■					Grinding augers from 0.125 m to 1.47 m. Inferred cobbles to boulders.
0.13	FILL - (SW) SAND, fine to coarse grained, gravelly to some fine to coarse gravel, sub-angular, trace non-plastic fines, brown (PAVEMENT STRUCTURE, Base, Subbase); non-cohesive, moist, dense to compact	⊠	1	SS	31		12 82 (6)
	Note: - Auger refusal encountered at 1.47 m. - Landcore Drilling switched to NW casing and core barrel.	⊠	2	SS	20		30 58 (12)
-1.47 1.47	BEDROCK - Granitic Gneiss, fine to medium grained, angled foliation, medium to coarse grained feldspar intrusion, natural vertical and angular jointing with muscovite and calcite deposits within discontinuities, angular and horizontal fractures throughout, slightly weathered, strong rock Note: - SILT infiltration in discontinuity near 2.59 m Run 1: RQD: 83/147 = 56% TCR: 138/147 = 94% SCR: 105/147 = 71%	▨	Run 1	NQ			Rock Core Compressive Strength at 2.3 mbgs = 100.3 MPa
-2.95 2.95	BEDROCK - Granitic gneiss, fine to medium grained, angled foliation, medium to coarse grained feldspar intrusion, angular and horizontal fractures throughout, unweathered, strong rock Run 2: RQD: 145/155 = 94% TCR: 155/155 = 100% SCR: 155/155 = 100%	▨	Run 2	NQ		∇	Rock Core Compressive Strength at 3.9 mbgs = 130.3 MPa
-4.50 4.50	END OF BOREHOLE Note: - Groundwater was measured at 4.12 m upon completion of investigation. It should be noted that groundwater may not be stabilized upon completion of borehole. - A reduced section sub broke during the attempted removal of a 1.54 m long section of streel casing which became ceased within the borehole. Landcore Drilling was unable to remove this ceased section of casing, therefore it was hammered to 0.2 m below top of asphalt surface, backfilled and abandoned in the borehole.						

DEPTH (M): 1, 2, 3, 4

$^{200}+$: Numbers refer to Field Vane Over Limit
$+^{3}, \times^{3}$: Numbers refer to Sensitivity
$\circ^{3\%}$ STRAIN AT FAILURE

TULLOCH ENGINEERING

RECORD OF BOREHOLE No 20-02

1 OF 1 **METRIC**

JOB NUMBER 20-1051
LOCATION River Street, Bala, Ontario
ORIGINATED BY JM
CLIENT Township of Muskoka Lakes
DATUM Ground Suface
BOREHOLE TYPE HSA
COMPILED BY JM
DRILLER Landcore Drilling
DATE 2020.09.09
NORTHING 4985600
EASTING 609067
CHECKED BY EG

SOIL PROFILE			SAMPLES					DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH (M)				
0.00	Ground Surface										
0.00 -0.13	125 mm ASPHALT	■									
0.13	FILL - (SW) SAND, fine to coarse grained, gravelly to some fine to coarse gravel, sub-angular, trace non-plastic fines, brown (PAVEMENT STRUCTURE, Base, Subbase); non-cohesive, moist, dense to compact	▨	1	SS	29						
-1.24		▨	2	SS	>50/ 2"		1				
1.24	END OF BOREHOLE Note: - Spoon and auger refusal encountered at 1.24 m. Inferred bedrock surface - Groundwater was not encountered upon completion of investigation. It should be noted that groundwater may not be stabilized upon completion of borehole.										

200 + : Numbers refer to Field Vane Over Limit
+ 3, × 3: Numbers refer to Sensitivity
○ 3% STRAIN AT FAILURE

TULLOCH
ENGINEERING

RECORD OF BOREHOLE No 20-03

1 OF 1 **METRIC**

JOB NUMBER 20-1051
LOCATION River Street, Bala, Ontario
ORIGINATED BY JM
CLIENT Township of Muskoka Lakes
DATUM Ground Suface
BOREHOLE TYPE HSA
COMPILED BY JM
DRILLER Landcore Drilling
DATE 2020.09.09
NORTHING 4985600
EASTING 609067
CHECKED BY EG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DEPTH (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
0.00	Ground Surface										
0.00 -0.13	125 mm ASPHALT	■									
0.13	FILL - (SW) SAND, fine to coarse grained, gravelly to some fine to coarse gravel, sub-angular, trace non-plastic fines, brown (PAVEMENT STRUCTURE, Base, Subbase); non-cohesive, moist, dense to compact	⊠	1	SS	33						Grinding experienced throughout auger advancement from 0.125 m to 1.78 m. Inferred cobbles to boulders.
			2	SS	30		1				
-1.78			3	SS	>50/ 2"						
1.78	END OF BOREHOLE Note: - Spoon and auger refusal encountered at 1.78 m. Inferred bedrock surface - Groundwater was not encountered upon completion of investigation. It should be noted that groundwater may not be stabilized upon completion of borehole.										

200 + : Numbers refer to Field Vane Over Limit
$+^3, \times^3$: Numbers refer to Sensitivity
$○^{3\%}$ STRAIN AT FAILURE

1. SOIL REPORT (DEPTH) (DEFAULT) PROJECT FILE (20-1051 - BURGESS DAM NORTH SLOPE).GPJ ONTARIO MTO.GDT 22-3-1

Rock Core Photos

Retrieved Rock Core at Borehole Location

BH-20-01: Run 1 and Run 2 – 1.47 m to 4.50 m

Top of Bedrock

Bottom of Core

CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

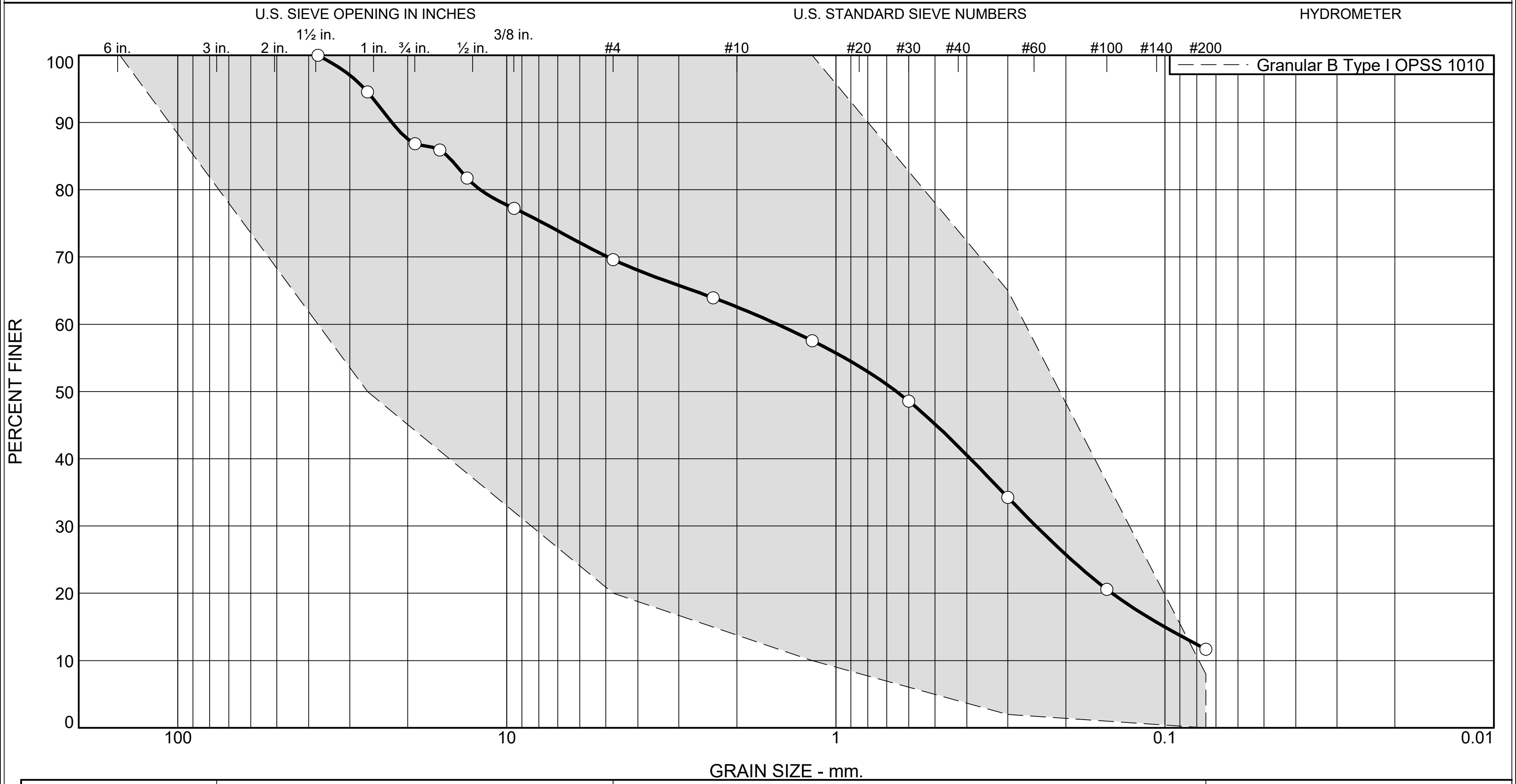
YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	EG

TITLE
Rock Core Photos – BH-20-01

PROJECT No.	Phase / Task	Rev.	Figure
20-1051		0	E-1

Laboratory Data

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0.0	13.1	17.3	7.0	20.8	30.1	11.7

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-21-01 Depth: 0.9m - 1.5m Sample Number: SS2	Sept 9, 2020		Feb 25, 2022

Client Township of Muskoka Lakes

Project Burgess Dam

Project No. 20-1051

Figure

TULLOCH ENGINEERING

71 Black Road
Unit 8
Sault Ste. Marie, ON
P6B 0A3

T. 705 949.1457
F. 705 949.9606
TF. 866 806.6602
Daren.Stadnisky@TULLOCH.ca

Tested By: T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2022-03-01

Client: Township of Muskoka Lakes
Project: Burgess Dam
Project Number: 20-1051
Location: BH-21-01
Depth: 0.9m - 1.5m **Sample Number:** SS2
Date Sampled: Sept 9, 2020 **Date Tested:** Feb 25, 2022
Tested by: T. Linley
Material specification: Granular B Type I OPSS 1010

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 778.00
Tare Wt. = 163.30
Minus #200 from wash = 8.2%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Lower Spec. Limit, %	Upper Spec. Limit, %	Deviation From Spec., %
832.80	163.30	37.5mm	0.00	0.00	100.0			
		26.5mm	36.60	0.00	94.5	50.0	100.0	
		19mm	51.40	0.00	86.9			
		16mm	6.30	0.00	85.9			
		13.2mm	28.00	0.00	81.7			
		9.5mm	30.10	0.00	77.2			
		#4	51.10	0.00	69.6	20.0	100.0	
		#8	38.00	0.00	63.9			
		#16	42.80	0.00	57.5	10.0	100.0	
		#30	60.10	0.00	48.6			
		#50	95.80	0.00	34.2	2.0	65.0	
		#100	91.50	0.00	20.6			
		#200	59.60	0.00	11.7	0.0	8.0	*+3.7*

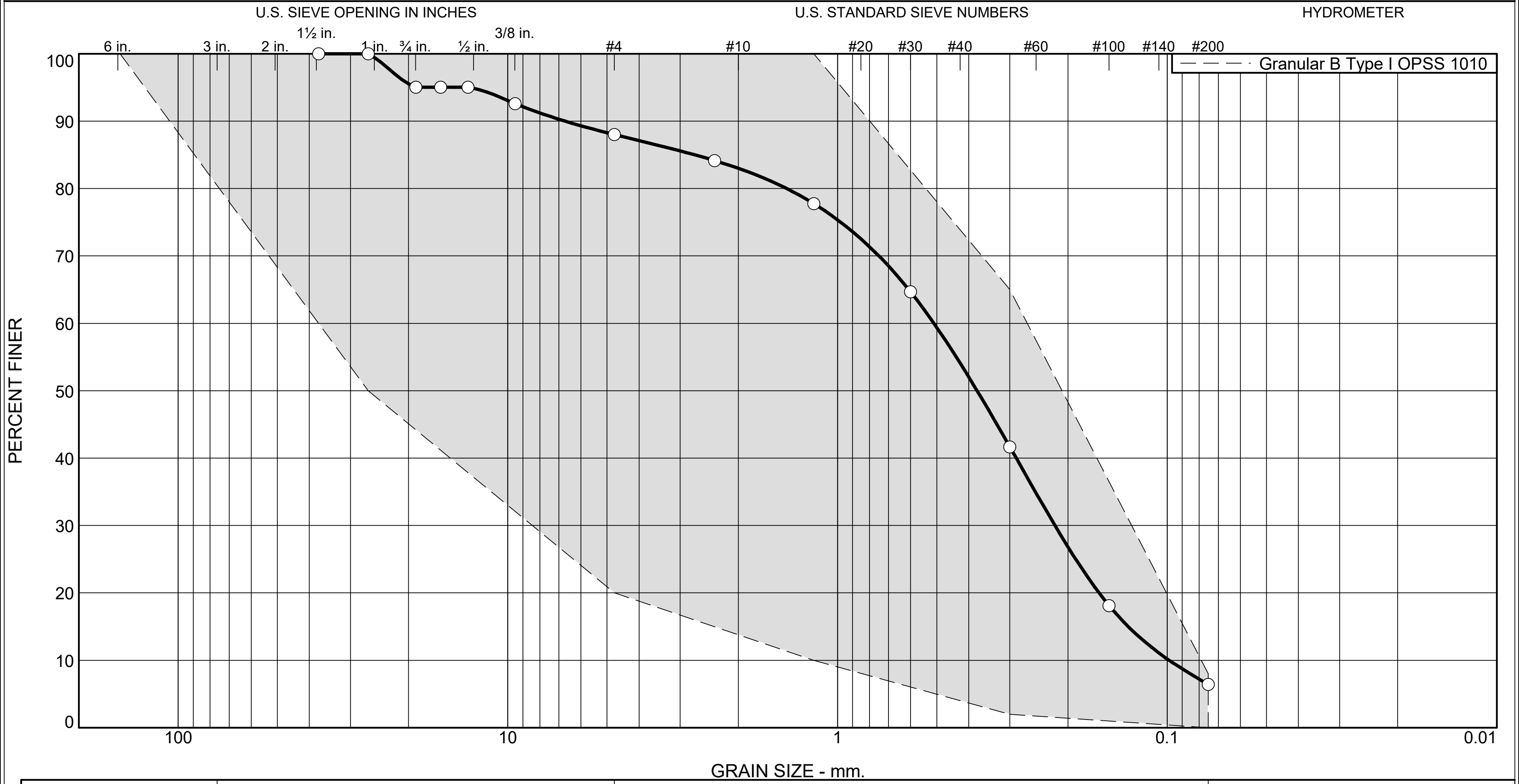
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	13.1	17.3	30.4	7.0	20.8	30.1	57.9			11.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.1001	0.1446	0.2464	0.3900	0.6544	1.5061	12.0512	15.1429	22.3752	27.0349

Fineness Modulus
3.41

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0.0	4.9	7.1	5.0	28.9	47.7	6.4

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-21-02 Depth: 0.2m - 0.8m Sample Number: SS1	Sept 9, 2020		Feb 25, 2022

Client Township of Muskoka Lakes

Project Burgess Dam

Project No. 20-1051 Figure

TULLOCH ENGINEERING

71 Black Road
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T. 705 949.1457
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TF. 866 806.6602
Daren.Stadnisky@TULLOCH.ca

Tested By: T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2022-03-01

Client: Township of Muskoka Lakes
Project: Burgess Dam
Project Number: 20-1051
Location: BH-21-02
Depth: 0.2m - 0.8m **Sample Number:** SS1
Date Sampled: Sept 9, 2020 **Date Tested:** Feb 25, 2022
Tested by: T. Linley
Material specification: Granular B Type I OPSS 1010

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 879.00
Tare Wt. = 151.50
Minus #200 from wash = 4.1%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Lower Spec. Limit, %	Upper Spec. Limit, %	Deviation From Spec., %
910.20	151.50	37.5mm	0.00	0.00	100.0			
		26.5mm	0.00	0.00	100.0	50.0	100.0	
		19mm	37.60	0.00	95.0			
		16mm	0.00	0.00	95.0			
		13.2mm	0.00	0.00	95.0			
		9.5mm	18.50	0.00	92.6			
		#4	34.90	0.00	88.0	20.0	100.0	
		#8	29.30	0.00	84.1			
		#16	48.50	0.00	77.8	10.0	100.0	
		#30	99.30	0.00	64.7			
		#50	174.50	0.00	41.7	2.0	65.0	
		#100	178.70	0.00	18.1			
		#200	88.80	0.00	6.4	0.0	8.0	

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	4.9	7.1	12.0	5.0	28.9	47.7	81.6			6.4

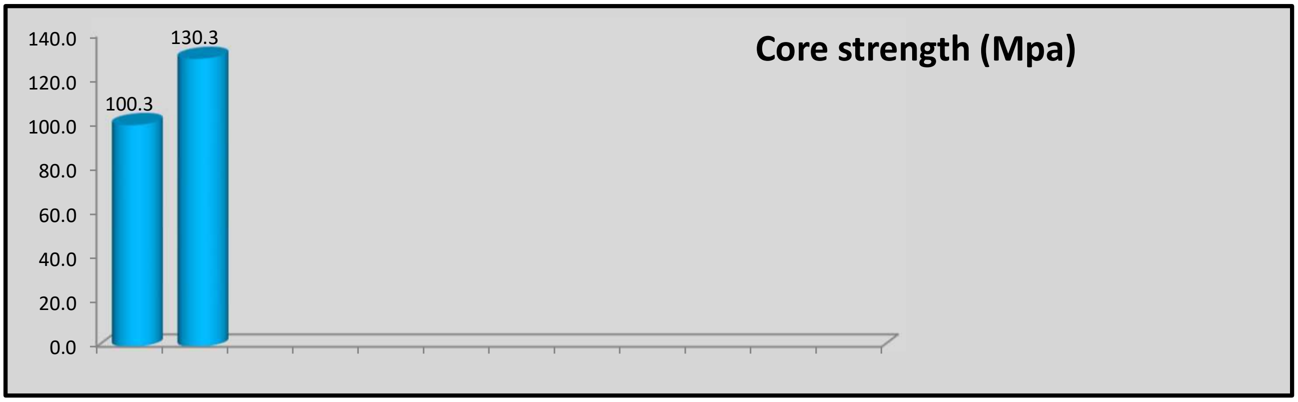
D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0986	0.1313	0.1609	0.2189	0.2869	0.3771	0.5100	1.4264	2.7128	6.7118	13.0360

Fineness Modulus	C_u	C_c
2.38	5.17	0.95

Rock Core Compressive Strength Report

PROJECT: Burgess Dam
DATE SAMPLED: September 9, 2020
DATE TESTED: February 25, 2022
CONTRACT: 20-1051
RUN BY: J. Draper
SOURCE: Boreholes

Sample Location	Run #	Distance from top of run (cm)	Height (mm)	Diameter (mm)	L/D Ratio	Correction Factor	Peak Load (lbs)	Compressive Stength (Mpa)
BH-01	1	81	94.62	47.35	2.0	1.0	39700	100.3
BH-01	2	97	94.68	47.41	2.0	1.0	51700	130.3

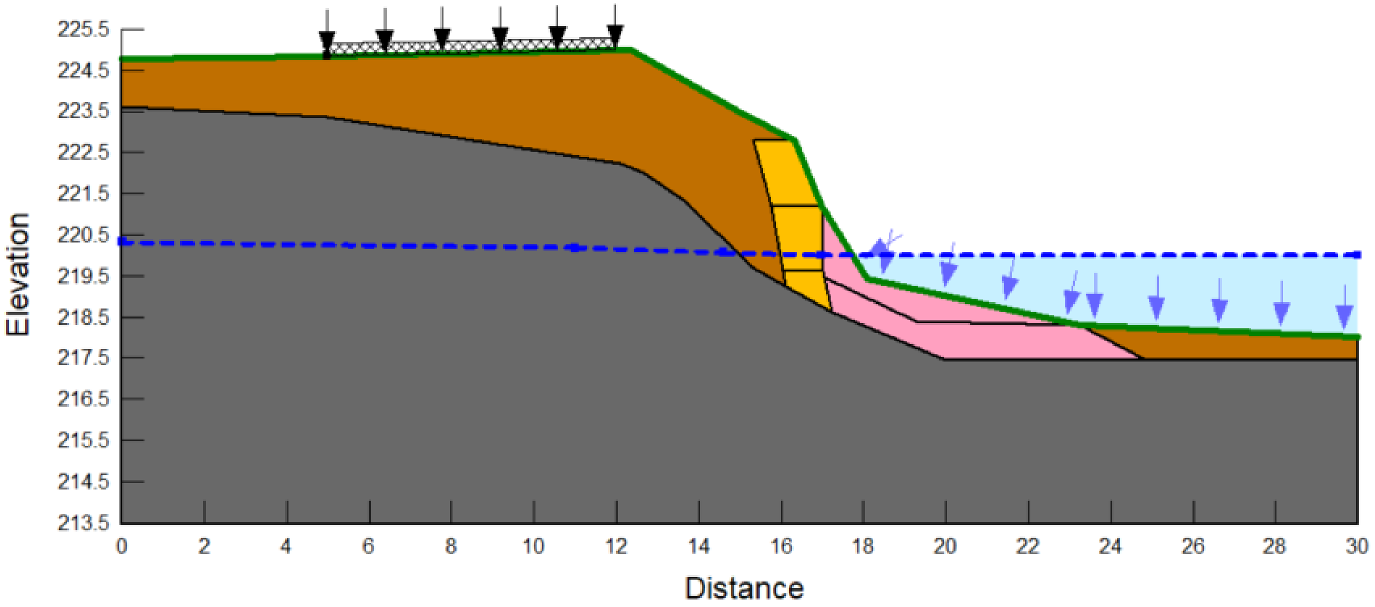


REMARKS:

CLIENT: Township of Muskoka Lakes

Slope Stability Results

Color	Name	Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
⬛	Bedrock	Bedrock (Impenetrable)					1
🟨	Gabion Baskets	Mohr-Coulomb	20	30	38	0	1
🟥	Rockfill	Mohr-Coulomb	20	0	38	0	1
🟫	Sandy Soil	Mohr-Coulomb	19	0	35	0	1



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CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

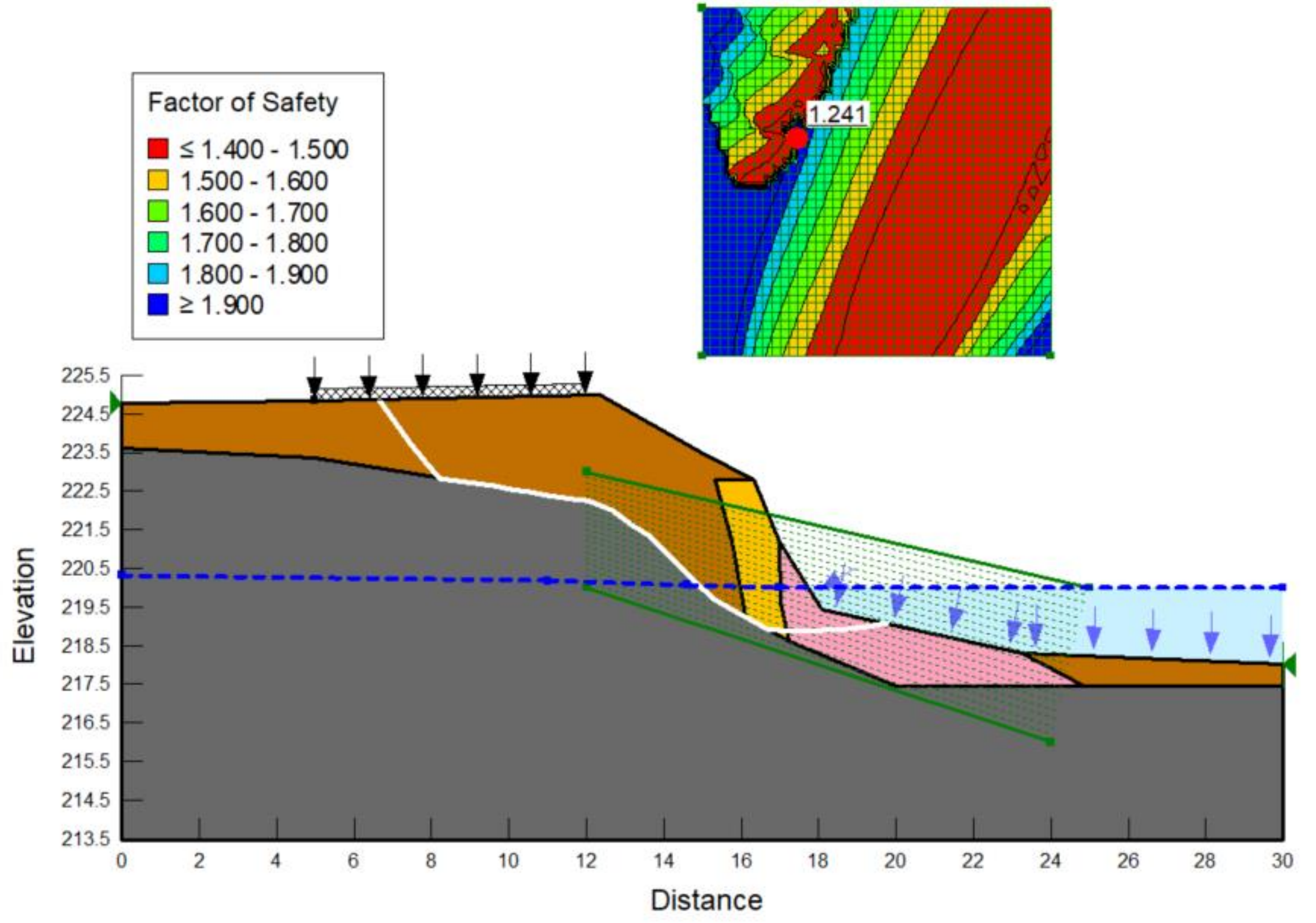
CONSULTANT

TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope
Geostudio LE Model Geometry and Parameters

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	A	G-1



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CLIENT
Township of Muskoka Lakes

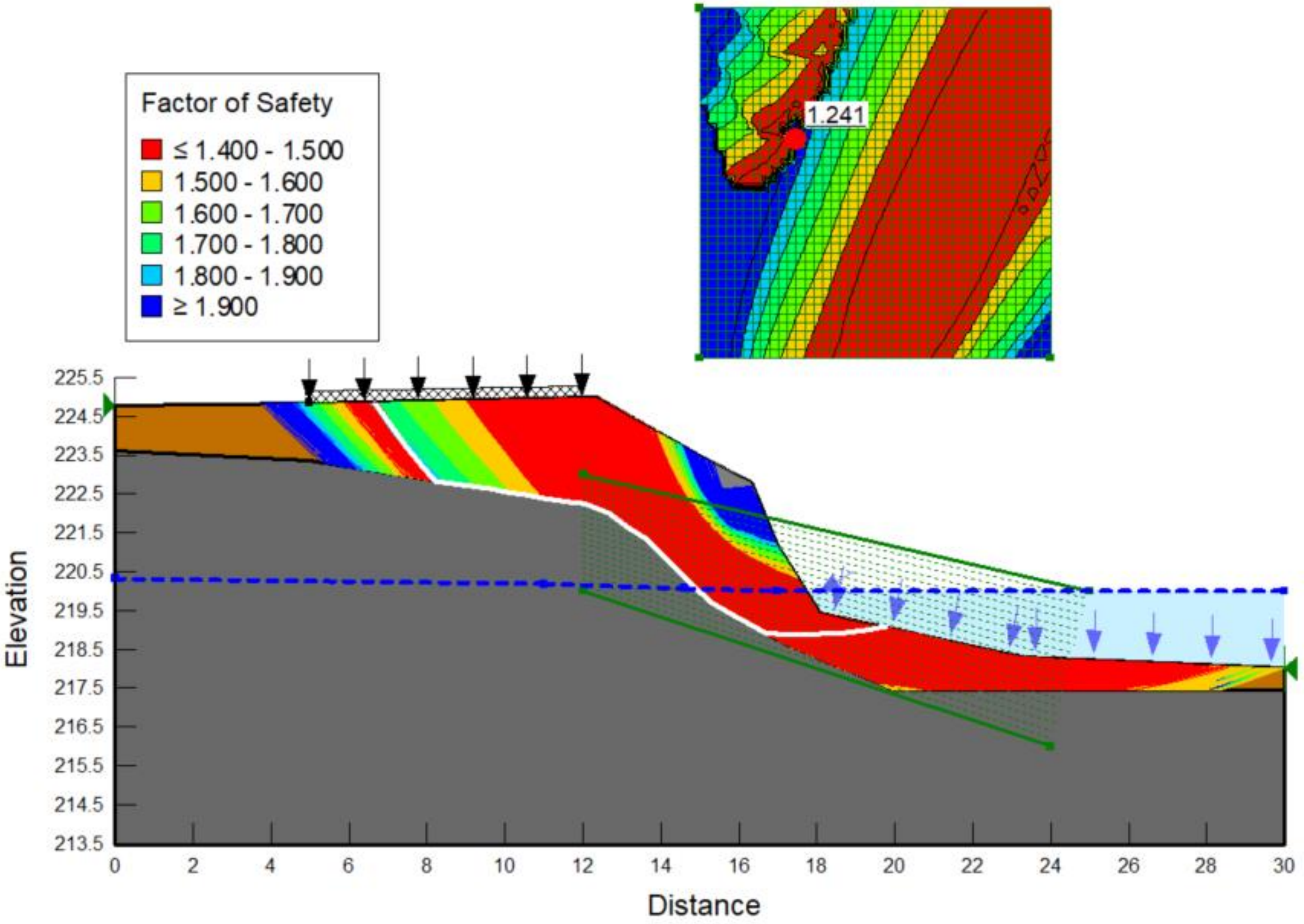
PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope
Geostudio LE Model Results

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	A	G-2



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CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

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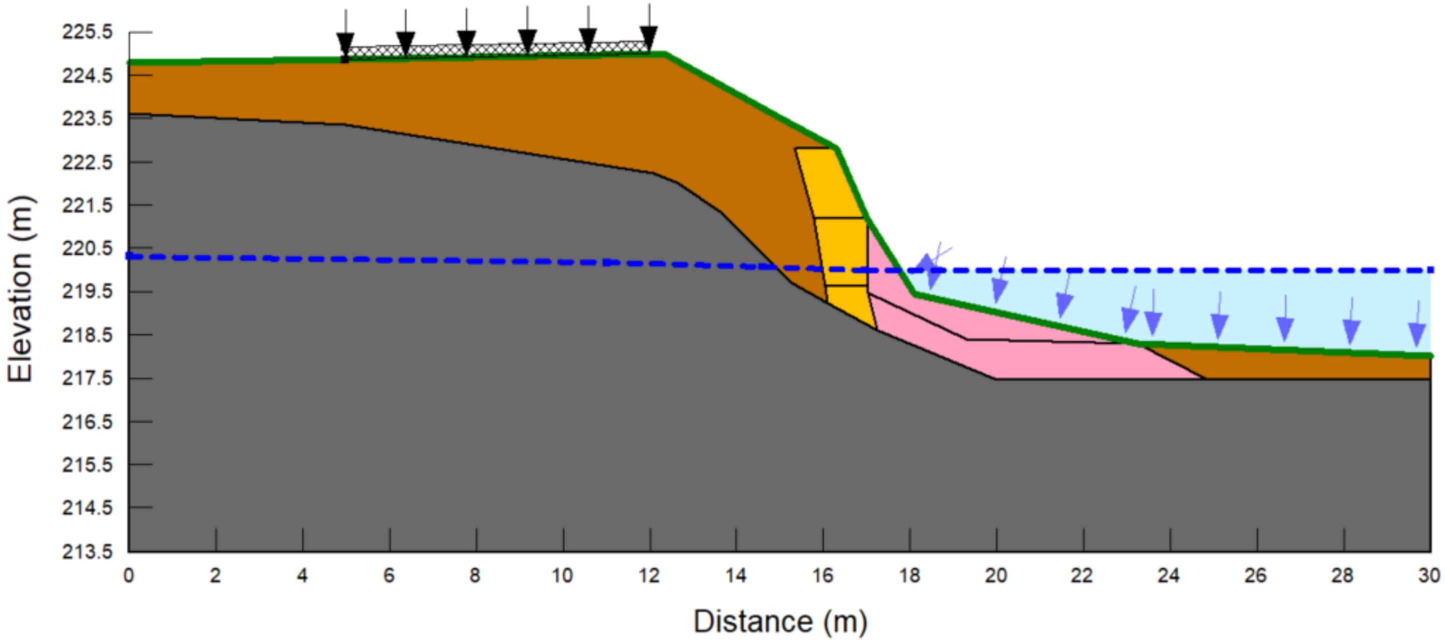
YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope
Geostudio LE Model Results

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	A	G-3

Color	Name	Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
■	Bedrock	Bedrock (Impenetrable)					1
🟨	Gabion Baskets	Mohr-Coulomb	20	0	38	0	1
■	Rockfill	Mohr-Coulomb	20	0	38	0	1
🟫	Sandy Soil	Mohr-Coulomb	19	0	35	0	1



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CLIENT
Township of Muskoka Lakes

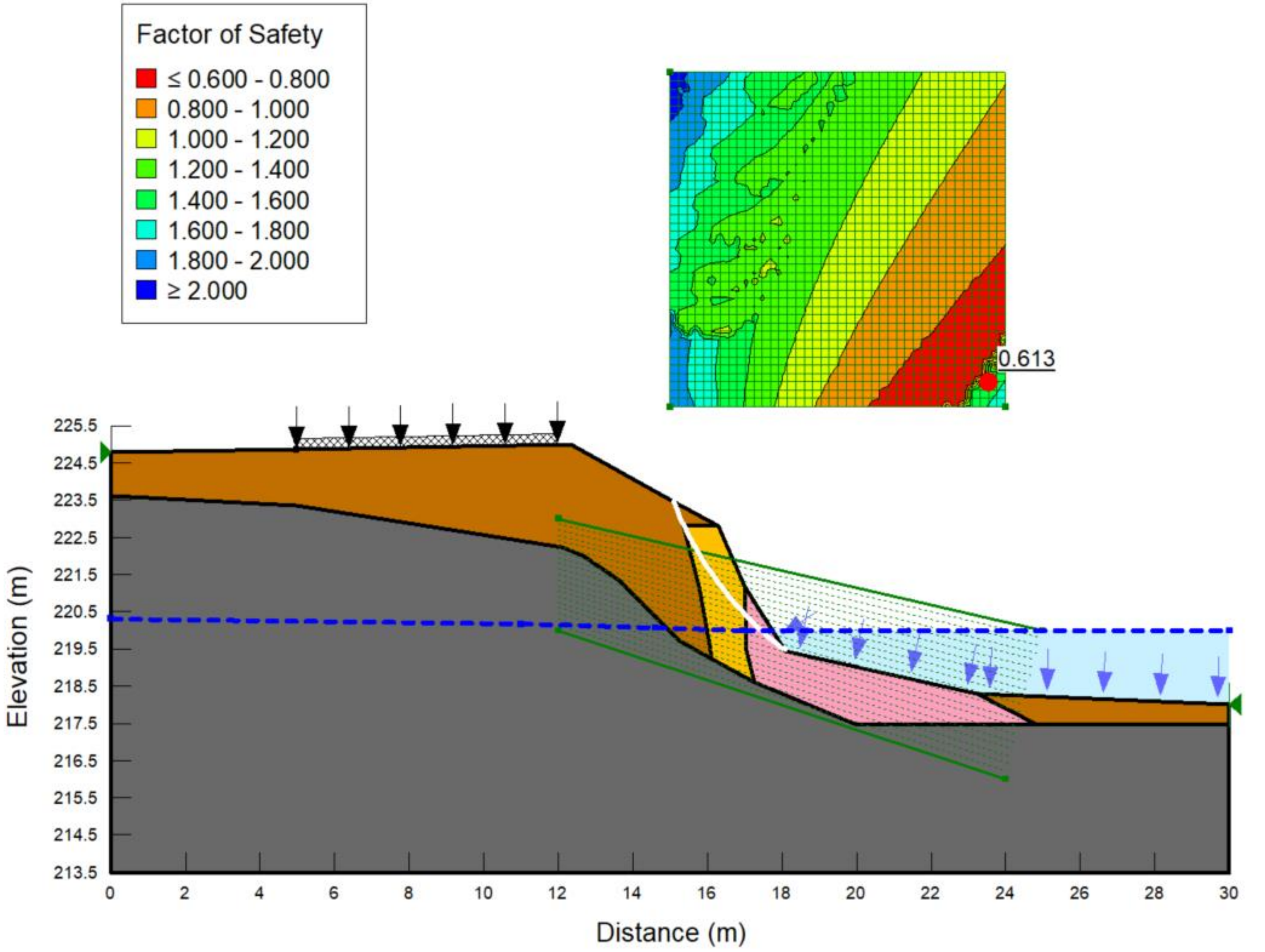
PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope – Failed Gabion Meshing
Geostudio LE Model Geometry and Parameters

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	A	G-4



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CLIENT
Township of Muskoka Lakes

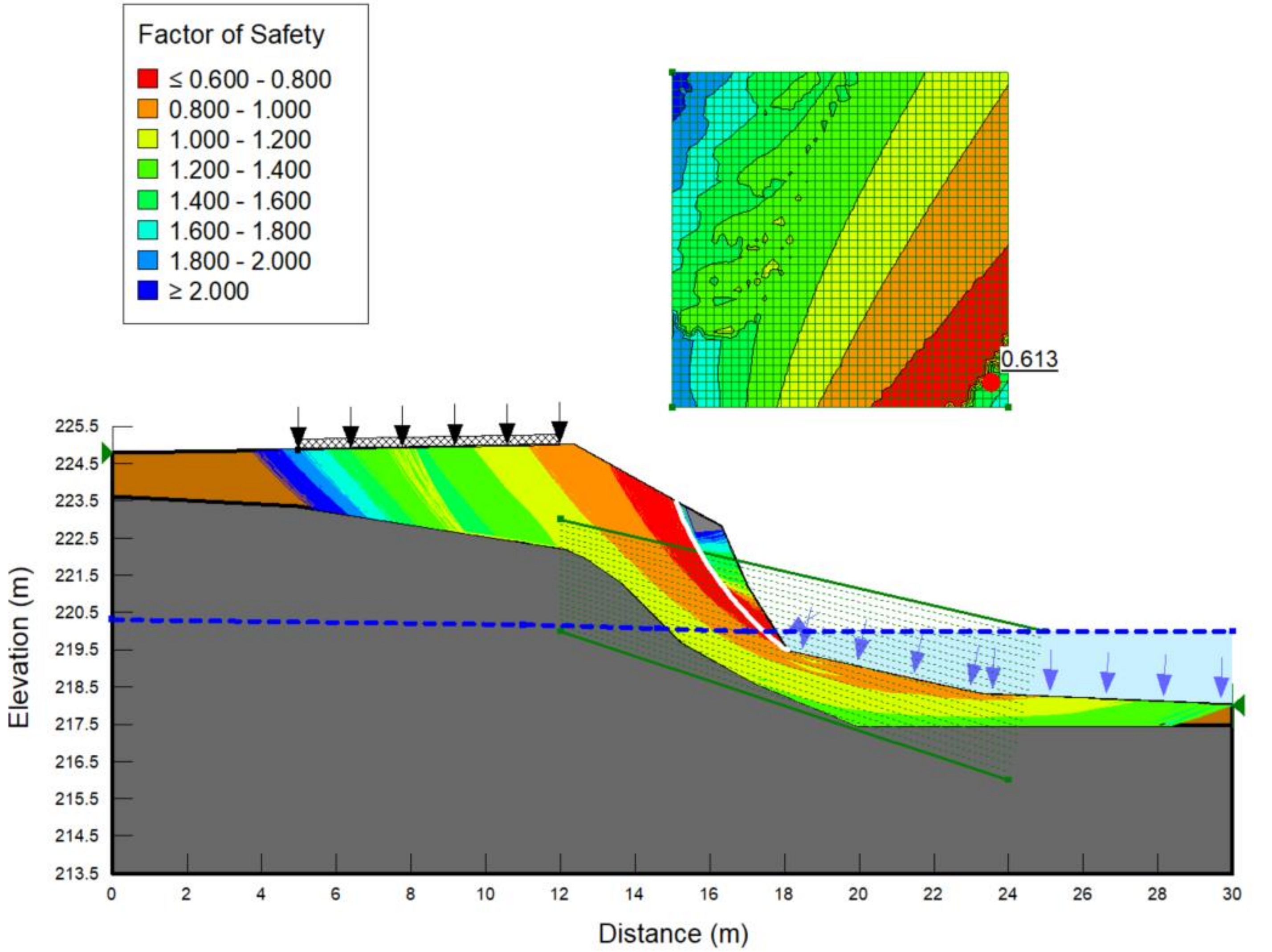
PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope – Failed Gabion Meshing
Geostudio LE Model Results

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	A	G-5



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CLIENT
Township of Muskoka Lakes

PROJECT
Burgess Dam – North Slope Investigation

CONSULTANT
TULLOCH

YYYY-MM-DD	2022-03-08
PREPARED	KC
DESIGN	KC
REVIEW	EG
APPROVED	GL

TITLE
North Slope – Failed Gabion Meshing
Geostudio LE Model Results

PROJECT No.	Phase / Task	Rev.	Figure
20-1051	-	**A**	**G-6**

Givens and Assumptions

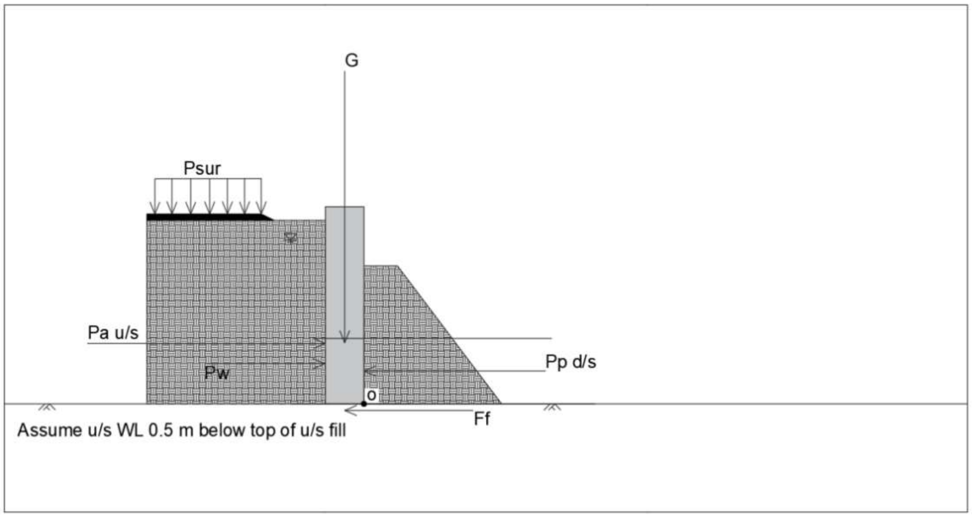
Geometry Input Parameters

Max. Wall Height	H	3.66	m
Dam Base width	t	0.30	m
Height of the u/s fill	hfus	3.35	m
Height of the d/s fill	hfds	2.44	m
Height of u/s water	hw	3.35	m
Traffic Surcharge Loading	Psur	20	kPa

Soil/Rock Input Parameters

Unit weight-Unreinforced Concrete	γc	23.58	kN/m^3
Unit weight-u/s and d/s Fill	γf	19	kN/m^3
Unit weight of water	γw	9.8	kN/m^3
Friction angle- u/s and d/s fill	ϕ'f	35	degree
Friction angle- Concrete-to-rock interface	ϕ'c-R	38	degree
Active Earth Pressure Coeff.	ka	0.27	-
Passive Earth Pressure Coeff.	kp	3.69	-

WL 0.5m below Top of U/S Fill - U/S to D/S Slide Direction



*N.T.S

Calculation

Force (kN)	FBD ID	Force (kN)	Moment Arm to "O" (m)	Moment (kN.m)
Traffic Surcharge Load	Pt	5.42	1.68	9.09
u/s Water Pressure	Pw	39.88	0.95	37.92
u/s Active Earth Pressure	Pa u/s	28.94	1.12	32.34
d/s Passive Earth Pressure	Pp d/s	208.44	0.81	-169.42
Gravity Force of Concrete dam	G	26.29	0.15	-4.01
Uplift Force	n/a	0.00	0.00	0.00
Friction Force-Concrete-to-Rock	Ff	14.27	0.00	0.00

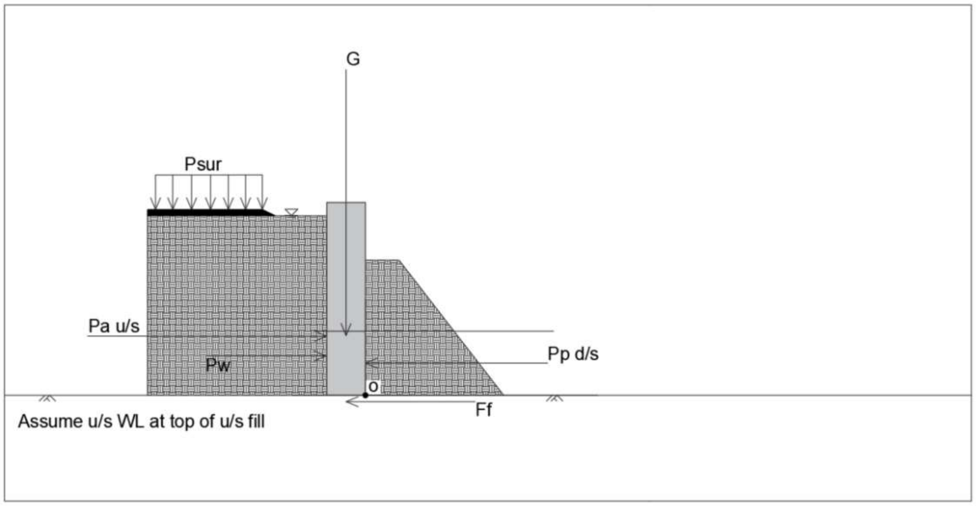
Result

	∑Applied Force (kN)	∑Resistive Force (kN)	FOS		Required FOS
Sliding	74.2	222.7	3.0	OK	1.5

	∑OT Moment (kN*m)	∑ Anti–OT Moment (kN*m)	FOS		Required FOS
Overturning	79.4	-173.4	2.2	OK	2.0

Calculated By: KC
Checked By: EG

WL at Top of U/S Fill - U/S to D/S Slide Direction



*N.T.S

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Gravity Force of Concrete dam	G	26.29	0.15	-4.01
Uplift Force	n/a	0.00	0.00	0.00
Friction Force-Concrete-to-Rock	Ff	14.27	0.00	0.00

Result

Sliding	∑Applied Force (kN)	∑Resistive Force (kN)	FOS	OK	Required FOS
	89.4	222.7	2.5		1.5

Overturning	∑OT Moment (kN*m)	∑ Anti–OT Moment (kN*m)	FOS	Not OK	Required FOS
	103.0	-173.4	1.7		2.0

Calculated By: KC
Checked By: EG

Notice to Reader

NOTICE TO READER

This factual Report has been prepared by TULLOCH Engineering Inc. ('TULLOCH') for the sole and exclusive use of the Township of Muskoka Lakes. (the 'Client') to support the rehabilitation of the north slope located downstream of the Burgess 1 Dam facility along River Street (the 'Development') in Bala, Ontario (the 'Site'). The Report shall not be used for any other purpose, or provided to, relied upon or used by any third party without the express written consent of TULLOCH.

A limited number of boreholes were advanced at the Site; and as such, the information collected and presented herein applies to the borehole locations only. The subsurface conditions between boreholes can change and accordingly any use of the data contained in this Report should take into consideration the nature of the materials and potential variation between boreholes.

This Report contains opinions, conclusions and recommendations made by TULLOCH using professional judgment and reasonable care for the purpose preliminary assessment for the Development. Use of or reliance on this report by the Client is subject to the following conditions:

a) the report being read in the context of and subject to the terms of the Engineering Services Agreement for the Work, including any methodologies, procedures, techniques, assumptions and other relevant terms or conditions specified or agreed therein;
b) the report being read in its entirety. TULLOCH is not responsible for the use of portions of the report without reference to the entire report;
c) the conditions of the site may change over time or may have already changed due to natural forces or human intervention, and TULLOCH takes no responsibility for the impact that such changes may have on the accuracy or validity of the observations, conclusions and recommendations set out in this report;
d) the classification of soils and rocks in this report is based on commonly accepted methods. However, the classification of geologic materials and the boundaries between subsurface layers involves judgement. Boundaries between different soils layers may also be transitional rather than abrupt. TULLOCH does not warrant or guarantee the exactness of these descriptions and boundaries.
e) the subsurface conditions must be verified by a qualified geotechnical engineer during construction to ensure that the borehole data presented herein is representative of the actual site conditions so that the design recommendations contained herein remain valid; and
f) the report is based on information made available to TULLOCH by the Client or by certain third parties; and unless stated otherwise in the Agreement, TULLOCH has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith.

This report has been prepared with the degree of care, skill and diligence normally provided by engineers in the performance of comparable services for projects of similar nature.

Notice to Reader

NOTICE TO READER

This Memorandum has been prepared by TULLOCH Engineering Ltd. (‘TULLOCH’) for the sole and exclusive use of The Township of Muskoka Lakes (the ‘Client’) to support the preliminary design for the rehabilitation of the Burgess 1 Dam (the ‘Development’) in Bala, Ontario (the ‘Site’). The Report shall not be used for any other purpose, or provided to, relied upon or used by any third party without the express written consent of TULLOCH.

The Memorandum is based up on interviews with stakeholders and publicly available information, limited borehole data, and commonly accepted engineering practices; and as such, the information collected and presented herein applies for preliminary design purposes.

This Report contains opinions, conclusions and recommendations made by TULLOCH using professional judgment and reasonable care for the purpose of aiding the preliminary design for the rehabilitation for the Development. Use of or reliance on this report by the Client is subject to the following conditions:

a) the report being read in the context of and subject to the terms of the Engineering Services Agreement for the Work, including any methodologies, procedures, techniques, assumptions and other relevant terms or conditions specified or agreed therein;
b) the report being read in its entirety. TULLOCH is not responsible for the use of portions of the report without reference to the entire report;
c) the conditions of the site may change over time or may have already changed due to natural forces or human intervention, and TULLOCH takes no responsibility for the impact that such changes may have on the accuracy or validity of the observations, conclusions and recommendations set out in this report;
d) the assumed flow conditions should be verified by a qualified hydrotechnical engineer or study to confirm assumptions made in the memorandum and advance design past the preliminary phase; and
e) the report is based on information made available to TULLOCH by the Client or by certain third parties; and unless stated otherwise in the Agreement, TULLOCH has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith.

This report has been prepared with the degree of care, skill and diligence normally provided by engineers in the performance of comparable services for projects of similar nature. The scope of this report includes foundation engineering design only and it specifically excludes investigation, detection, prevention and assessment of the presence of subsurface contaminants. No conclusions or inferences should be drawn regarding contamination at the site including but not limited to molds, fungi, spores, bacteria, viruses, soil gases such as Radon, PCBs, petroleum hydrocarbons, inorganic and volatile organic compounds, polycyclic aromatic hydrocarbons and or any by products thereof.

APPENDIX J

Quantities & Preliminary Cost Estimate

Burgess 1 Dam Rehabilitation

Cost Estimate - Dam Upgrades and Rehabilitation

Item		Description	Estimated	Unit	Unit Price	Total
			Quantity		($/Unit)	($)
A	**Civil Rehabilitation Items**					
	1	**Dam Rehabilitation**				
	1.1	Stripping	135	m2	$50.00	$6,750
	1.2	Sand and Gravel	40	m3	$150.00	$6,000
	1.3	Riprap/rockfill	40	m3	$250.00	$10,000
	1.4	Geotextile	135	m2	$10.00	$1,350
	1.5	Concrete (partial raise 0.5m)	35	m3	$3,000.00	$105,000
	1.6	Grouting existing dam cracks	1	LS	$95,000.00	$95,000
	1.7	Anchor Φ25, 1m @ spacing 2m for dam raise	1	LS	$35,000.00	$35,000
		Subtotal				**$259,100**
	2	**Downstream Regrading**				
	2.1	Regrading (Fill produced)	15	m3	$50.00	$750
		Fill used on site	25	m3	$50.00	$1,250
		Balance - Imported Fill	10	m3	$100.00	$1,000
		Subtotal				**$3,000**
	3	**South Control Berm**				
	3.1	Stripping	260	m2	$50.00	$13,000
	3.2	Berm Fill (sand and gravel)	150	m3	$100.00	$15,000
	3.3	Sod or Seed with Topsoil (slope stabilization)	300	m2	$30.00	$9,000
		Subtotal				**$37,000**
	4	**Powerhouse Retrofit**				
	4.1	Concrete Fill for undermined area of the powerhouse foundation	30	m3	$3,000.00	$90,000
	4.2	Foundation Grouting	1	LS	$125,000.00	$125,000
	4.3	Anchorage the existing concrete slab to bedrock,Φ36mm, 8m long with 6m in rock	1	LS	$100,000.00	$100,000
	4.4	New powerhouse roof	1	LS	$100,000.00	$100,000
	4.5	Additional frame and column for powerhouse structure	1	LS	$50,000.00	$50,000
	4.6	Downstream cofferdam	15	m3	$150.00	$2,250
		Subtotal				**$467,250**
	5	**Tailrace, excluding North Slope Rehabilitation**				
	5.1	Concrete for apron and South wall	30	m3	$3,000.00	$90,000
	5.2	Anchors - shallow	1	LS	$15,000.00	$15,000
	5.3	Stripping	70	m3	$50.00	$3,500
	5.4	Sand and Gravel	15	m3	$100.00	$1,500
		Subtotal				**$110,000**
	6	**North Slope Rehabilitation**				
	6.1	Stripping	65	m2	$50.00	$3,250
	6.2	Slope Excavation and Gabion basket removal	105	m3	$100.00	$10,500
	6.3	Sand and Gravel	95	m3	$150.00	$14,250
	6.4	Geotextile	45	m2	$10.00	$450
	6.5	Concrete Wall on North Slope	30	m3	$4,000.00	$120,000
		Subtotal				**$148,450**
		Subtotal Civil Rehabilitation Items				**$1,024,800**
B	**Power Generation Equipment Upgrades**					
	1	Turbine Replacement and Upgrades	1	LS	$800,000.00	$800,000
		Subtotal Power Generation Upgrades				**$800,000**
C	**Contingencies**					
	Construction Contingency		10%			$102,480
	Detailed Design Allowance		10%			$182,480
	Engineering Allowance (CQA)		10%			$182,480
	Preliminary Design Estimating Contingency		30%			$307,440
		Subtotal Civil Contingencies				**$774,880**
		Total Estimated Construction Cost				**$2,599,680**

Exclusions:

- Land acquisition
- Financing / IDC
- Owner's costs
- Bonding and Insurance