



November 11, 2020 **Inspection Date**

Fourteen Island and Mink Lakes Watershed Association
P.O. Box 105
Hartington, ON
K0H 1W0

Attention: Mary Rae, Director and President

Dear Ms. Rae:

**Re: FIMLWA Dam Inspection
D.M. Wills Associates Project No. 5394**

D.M. Wills Associates ("Wills") was retained to complete a structural inspection of the concrete gravity dam located at the outlet (tributary to Hardwood Creek and the Napanee River) of Fourteen Island Lake in the Township of South Frontenac. The inspection was completed by Mr. David Bonsall, P.Eng. on November 11, 2020.

A Photo Report is attached to this letter for reference.

A General Arrangement Drawing has also been prepared and is attached to this letter for reference.

The dam appears to be of rock core construction with a concrete "skin"; refer to Photo #1 and #2 for illustration of the downstream face of the dam (west and east "sides", respectively). The downstream face was sounded with a hammer and all concrete was in good condition with no delaminations or loose concrete.

The top surface of the dam, refer to Photo#3 and #4, is "L" shaped and is set into/against solid bedrock on each bank. No significant leakage was noted along the dam/rock interfaces. Significant deterioration was noted in the upstream half of the deck top in each "side" of the dam; refer to Photo #5 & #6. It appears that the dam may have been refaced in the past as there is a distinct formed line approx. 200mm (8") back from the upstream edge of the dam top. The line is now an open crack (line) that defines the upstream face from the deck top. The deck top against this line is in poor condition.





The upstream face of the dam is mostly submerged and could not be inspected. The upper portion of the face (above the water line) is in fair to good condition, with several large vertical cracks. These cracks would allow water to penetrate into the core of the dam; however there was no obvious sign of water flowing through the dam structure. The cracks can be seen in Photos #5 and #6.

There are steel angles set into the concrete to form the operable gains for the dam; refer to Photos #7 and #8. The steel angles are in generally good condition; however the anchorage into the east portion of the dam is questionable. The concrete along the east side of the sluice (adjacent to and downstream of the gain) is in very poor condition. While no water was observed flowing from the core at the time of inspection, it is clear that water may build up in this area as ice in the winter and could cause significant damage.

Water depth in the upstream lake is controlled by timber boards contained within the gains. The timbers can be seen in Photo #1. The upstream sediment levels are very high and a large pile of debris (stick, branches, etc.) has been cast to the downstream, east side of the dam. Dam operations and future inspections would significantly benefit from removal of sediment and debris.

Based upon the inspection, it is recommended that the dam be rehabilitated in the near future to include:

- Crack Injection (Repair) and Refacing of the Upstream Face;
- Removal and Replacement of the Top Slab;
- Removal and Replacement of the Gains and Sluice Walls;
- Installation of Drains in the Downstream Face.

Completion of the above noted work will significantly increase the service life of the dam. It is estimated that without rehabilitation, the dam may exhibit failure (loss of concrete and unwanted leakage/spill) within 5 years. Rehabilitation would increase the life of the dam by 15 to 20 years.

Please note that global stability and dam safety review should be completed prior to any rehabilitation design or construction. This Inspection Report may be used to document condition at the time of inspection, but should not be used to imply or conclude dam safety in terms of water control and/or overall dam failure.

Based upon the dam inspection, current access and provisions for cofferdams, we have estimated construction costs to be \$141,000 plus HST for the necessary rehabilitation needs of the dam. This work should be planned for completion within 5 years, as the current condition of the dam will present operational concerns if rehabilitation measures are not completed. A Cost estimate breakdown is attached.

The above noted information is provided based upon visual inspection and access available on November 11, 2020.

We trust this letter is adequate for your interim use and discussions. Should you require anything further, please contact the undersigned.



David Bonsall, P.Eng.
Manager, Structural Engineering



PHOTO#1 – Downstream Face (West Half)



PHOTO#2 – Downstream Face (East Half)



PHOTO#3 – Top of Dam (looking East)



PHOTO#4 – Top of Dam (looking West)



PHOTO#5 – Deck Top



PHOTO#6 – Deck Top



PHOTO#7 – East Gain



PHOTO#8 – West Gain





Attachment - Preliminary Cost Estimate

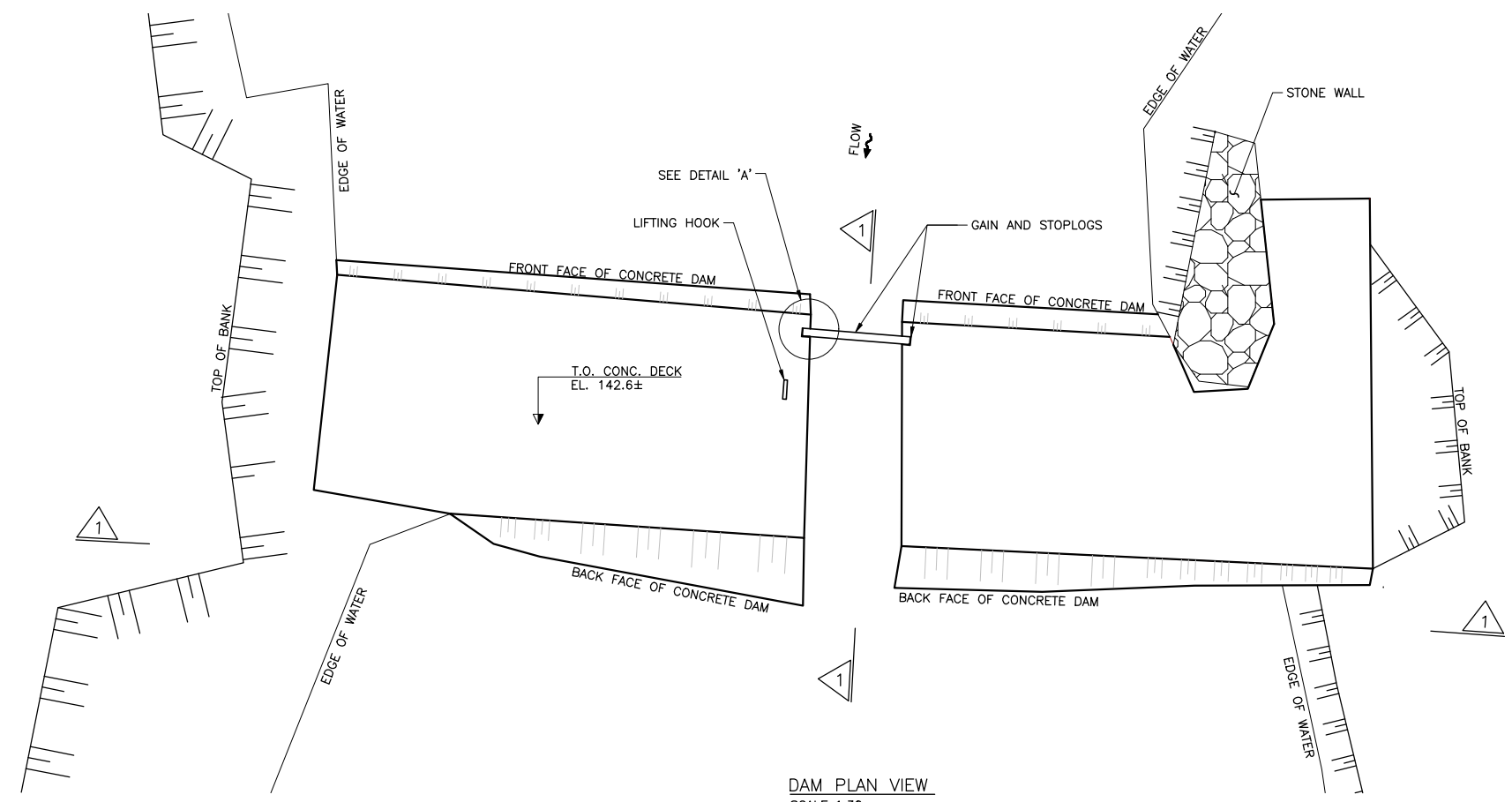
December 2020

Item No.	Description	Unit	Quantity	Est. Unit Price	Extension
1	Environmental / Watercourse Protection	Lump Sum	1	\$2,500	\$2,500
2	Access Improvements (Clearing, Grubbing, Road Const.)	Lump Sum	1	\$10,000	\$10,000
3	Cofferdam / Dewatering (AquaDam, Pumps, Flow Bypass)	Lump Sum	1	\$30,000	\$30,000
	Sediment / Debris Removals	Lump Sum	1	\$30,000	\$30,000
4	Concrete Removals	Lump Sum	1	\$10,000	\$10,000
5	New Concrete (Refacing - Upstream and Deck Top)	Lump Sum	1	\$20,000	\$20,000
6	New Gains (Concrete & Steel Forming)	Lump Sum	1	\$5,000	\$5,000
7	Dam Safety Features (Signs, Railing, etc.)	Lump Sum	1	\$5,000	\$5,000
8	Site Cleanup / Demobalization	Lump Sum	1	\$5,000	\$5,000
				Sub-Total	\$117,500
				Contingency (20%)	\$23,500
				TOTAL ESTIMATED COST	\$141,000

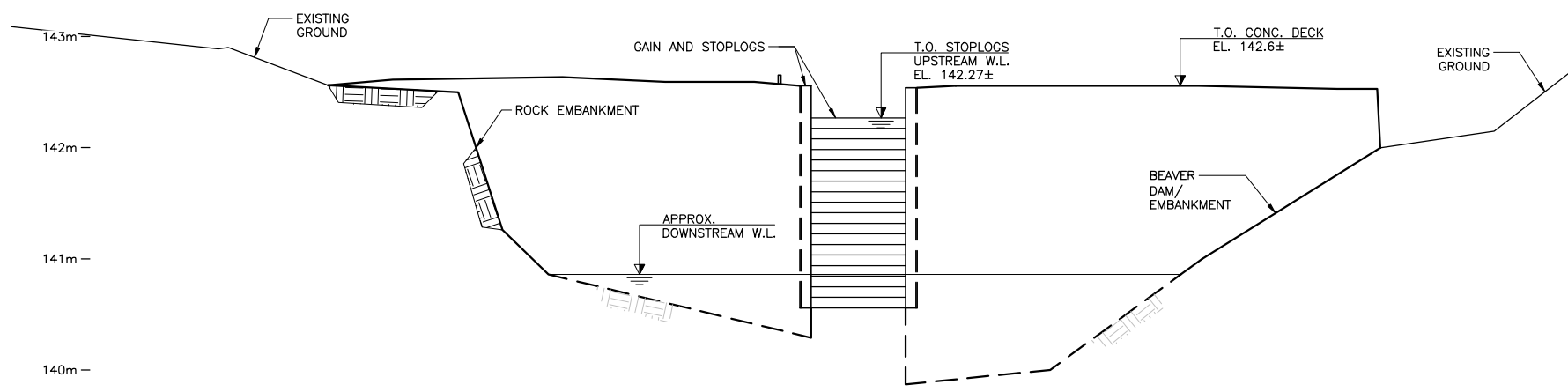
FILE NAME: U:\5300-5399\5394 - FIMLA 14 Island Lake Dam\02 Drawings\Current Drawings\5394 - 14 Island Lake Dam - GA Sketch.dwg
 CREATED: 2020-12-06
 MODIFIED: 2020-12-06 15:55
 D.M. WILLS ASSOCIATES LIMITED
 ANS-B
 2019-11

METRIC
 DIMENSIONS ARE IN METRES AND/OR
 MILLIMETRES UNLESS OTHERWISE SHOWN
 DRAWING NOT TO BE SCALED
 100mm ON ORIGINAL DRAWING

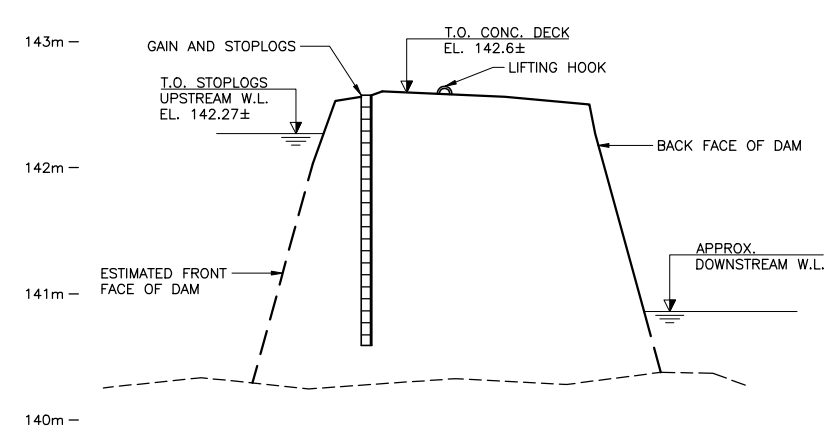
TOWNSHIP OF SOUTH FRONTENAC		
FOURTEEN ISLAND LAKE DAM		
EXISTING GENERAL ARRANGEMENT		SHEET SK-01
 D.M. Wills Associates Limited 150 Jameson Drive Peterborough, Ontario Canada, K9J 0B9 P. 705.742.2297 F. 705.748.9944 E. wills@dmwills.com		



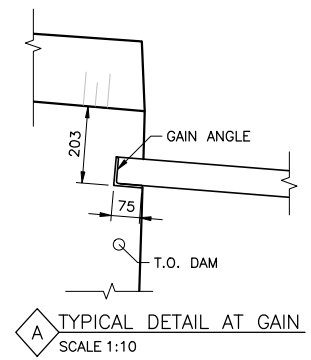
DAM PLAN VIEW
 SCALE 1:30



DAM ELEVATION VIEW
 SCALE 1:30



DAM SECTION VIEW
 SCALE 1:30



TYPICAL DETAIL AT GAIN
 SCALE 1:10

REVISIONS		DATE		BY		DESCRIPTION	
DESIGN	DSB	CHK		DATE	DEC 2020		
DRAWN	AO	CHK		DWG			SK-01