TECHNICAL MEMORANDUM

DATE 24 October 2019 **Project No.** 19127573-403-TM-Rev1

TO Manon Turmel
Agnico Eagle Mines Limited

CC Cameron Stevens

FROM Jenna Pearse, Julien Lacrampe **EMAIL cameron_stevens@golder.com**

WHALE TAIL PIT EXPANSION PROJECT: RESPONSE TO TECHNICAL COMMENT DFO 3.4

1.0 BACKGROUND

The Department of Fisheries and Oceans (DFO) requested additional information from Agnico Eagle Mines Limited (Agnico Eagle) related to Agnico Eagle's response to Technical Comment DFO 3.4 submitted to DFO in May 2019 as part of the Whale Tail Pit Expansion Project (the Project) regulatory review (Agnico Eagle 2019a,b). During the NIRB public hearing in Baker Lake (August 26-29, 2019), Agnico Eagles commitment to provide the requested information was recorded as Commitment #33.

DFO specifically requested an estimate of the Project's potential impacts on the surface water areas and volumes of downstream lakes during closure when the Whale Tail Lake North Basin is being refilled (2026 to 2042). These impacts are further discussed in Volume 6 of the Project's Final Environmental Impact Statement (FEIS) Addendum (Agnico Eagle 2018). This technical memorandum summarizes the methods and results to address DFO's request. The expectation is that the results will be integrated as part of the final offsetting plan for the Project.

2.0 METHODS

The hydrological assessment was completed on the lakes immediately downstream of the Project, including Lake A16 (Mammoth Lake), Lake A15, Lake A12, and Lake A76, downstream of which, the potential impacts of the Project on surface water quantity are expected to diminish rapidly in the downstream direction (Agnico Eagle 2018). The present assessment does not consider potential mitigation to reduce the magnitude of downstream changes on hydrology during closure, if identified as a requirement for closure planning purposes. The assessed lakes are shown in Figure 1.

The hydrological assessment was completed using the following methods:

- The assessment considered the closure period, during which the impacts of the Project on surface water quantity are expected to be the greatest, from the Project's closed-circuited activities resulting in reduced contributing areas at downstream lakes.
- The potential impacts on mean monthly lake depths provided in the FEIS Addendum (Agnico Eagle 2018) were applied to the bathymetry of the assessed lakes, available from the FEIS (Lake A16 [Mammoth Lake]), or collected in September 2019 by Portt and Associates (Lake A15 and Lake A12) and by Azimuth Consulting Group (Lake A76). Bathymetric data were supplemented by Light Detection and Ranging (LiDAR) data.

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REFERENCE(S)
1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.DWG
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
STUDY LAKES FOR THE ASSESSMENT OF DOWNSTREAM IMPACTS ON LAKE SURFACE AREA DURING CLOSURE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-10-17
DESIGNED	JL
PREPARED	CDB
REVIEWED	JL
APPROVED	CS

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3.0 RESULTS

The results are presented for the 2-year (median, representing both wet and dry conditions), 10-year dry, and 10-year wet return periods in the sub-sections below. The storage characteristics of each lake, derived from the bathymetric data to support this assessment, are provided in Attachment 1.

3.1 2-Year Return Period

The derived mean monthly water levels, surface areas, and volumes are shown for the months of June, July, August, and September for each lake under baseline and closure conditions, in Table 1 (Lake A16 [Mammoth Lake]), Table 2 (Lake A15), Table 3 (Lake A12), and Table 4 (Lake A76). The effects on water level, surface areas, and volumes are presented relative to the baseline value of the corresponding month.

Table 1: Lake A16 Baseline and Closure Water Level Conditions (2-Year Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	152.48	1,474,405	5,799,059	-0.20	152.28	1,410,699 (-4.3%)	5,511,467 (-5.0%)
July	152.30	1,416,241	5,538,939	-0.20	152.10	1,360,868 (-3.9%)	5,263,495 (-5.0%)
August	152.21	1,391,108	5,414,358	-0.14	152.07	1,352,012 (-2.8%)	5,219,269 (-3.6%)
September	152.24*	1,398,819	5,452,582	-0.14	152.10	1,360,061 (-2.8%)	5,259,462 (-3.5%)

Note: * = baseline elevation based on the Project's LiDAR data, collected on 28 August 2015

Table 2: Lake A15 Baseline and Closure Water Level Conditions (2-Year Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	151.61	332,428	725,470	-0.11	151.50	322,461 (-3.0%)	688,731 (-5.1%)
July	151.49	321,570	685,574	-0.12	151.37	311,221 (-3.2%)	648,924 (-5.3%)
August	151.44	317,377	670,727	-0.09	151.35	309,350 (-2.5%)	642,298 (-4.2%)
September	151.46*	319,072	676,729	-0.09	151.37	311,209 (-2.5%)	648,882 (-4.1%)

Note: * = baseline elevation based on the Project's LiDAR data

Table 3: Lake A12 Baseline and Closure Water Level Conditions (2-Year Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	148.75	283,750	644,834	-0.10	148.65	271,272 (-4.4%)	615,509 (-4.5%)
July	148.64	271,116	615,144	-0.11	148.53	261,803 (-3.4%)	585,797 (-4.8%)
August	148.59	265,345	599,306	-0.08	148.50	259,860 (-2.1%)	578,388 (-3.5%)
September	148.61*	266,900	605,235	-0.08	148.53	261,476 (-2.0%)	584,549 (-3.4%)

Note: * = baseline elevation based on the Project's LiDAR data

Table 4: Lake A76 Baseline and Closure Water Level Conditions (2-Year Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	147.70	700,261	3,967,752	-0.06	147.64	686,200 (-2.0%)	3,926,108 (-1.0%)
July	147.61	680,261	3,908,517	-0.08	147.53	666,022 (-2.1%)	3,855,794 (-1.3%)
August	147.56	668,000	3,872,204	-0.07	147.49	663,139 (-0.7%)	3,831,873 (-1.0%)
September	147.56*	668,000	3,872,204	-0.06	147.50	664,145 (-0.6%)	3,840,217 (-0.8%)

Note: baseline elevation based on the Project's LiDAR data

3.2 10-Year Wet Return Period

The derived mean monthly water levels, surface areas, and volumes are shown for the months of June, July, August, and September for each lake under baseline and closure conditions, in Table 5 (Lake A16 [Mammoth Lake]), Table 6 (Lake A15), Table 7 (Lake A12), and Table 8 (Lake A76). The effects on water level, surface areas, and volumes are presented relative to the baseline value of the corresponding month.

Table 5: Lake A16 Baseline and Closure Water Level Conditions (10-Year Wet Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	152.60	1,517,180	5,970,754	-0.24	152.36	1,433,424 (-5.5%)	5,624,109 (-5.8%)
July	152.41	1,449,289	5,698,248	-0.22	152.19	1,385,462 (-4.4%)	5,386,304 (-5.5%)
August	152.33	1,423,498	5,574,911	-0.17	152.15	1,374,878 (-3.4%)	5,333,450 (-4.3%)
September	152.37	1,436,525	5,639,480	-0.18	152.19	1,384,391 (-3.6%)	5,380,957 (-4.6%)

Table 6: Lake A15 Baseline and Closure Water Level Conditions (10-Year Wet Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	151.68	338,234	747,602	-0.13	151.55	327,096 (-3.3%)	705,145 (-5.7%)
July	151.57	328,839	711,788	-0.13	151.44	316,854 (-3.6%)	668,874 (-6.0%)
August	151.51	323,828	693,573	-0.10	151.41	314,782 (-2.8%)	661,537 (-4.6%)
September	151.54	326,225	702,062	-0.11	151.43	316,842 (-2.9%)	668,831 (-4.7%)

Table 7: Lake A12 Baseline and Closure Water Level Conditions (10-Year Wet Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	148.81	291,455	662,941	-0.11	148.70	277,692 (-4.7%)	630,598 (-4.9%)
July	148.73	280,949	638,252	-0.13	148.60	266,279 (-5.2%)	602,868 (-5.5%)
August	148.66	273,029	619,639	-0.09	148.57	264,076 (-3.3%)	594,466 (-4.1%)
September	148.69	276,596	628,022	-0.10	148.59	265,682 (-3.9%)	600,592 (-4.4%)

Table 8: Lake A76 Baseline and Closure Water Level Conditions (10-Year Wet Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	147.75	712,425	4,003,781	-0.07	147.68	696,625 (-2.2%)	3,956,984 (-1.2%)
July	147.66	692,843	3,945,782	-0.08	147.58	673,880 (-2.7%)	3,889,618 (-1.4%)
August	147.62	681,574	3,912,406	-0.06	147.56	668,123 (-2.0%)	3,872,567 (-1.0%)
September	147.62	682,944	3,916,464	-0.06	147.56	668,981 (-2.0%)	3,875,109 (-1.1%)

3.3 10-Year Dry Return Period

The derived mean monthly water levels, surface areas, and volumes are shown for the months of June, July, August, and September for each lake under baseline and closure conditions, in Table 9 (Lake A16 [Mammoth Lake]), Table 10 (Lake A15), Table 11 (Lake A12), and Table 12 (Lake A76). The effects on water level, surface areas, and volumes are presented relative to the baseline value of the corresponding month.

Table 9: Lake A16 Baseline and Closure Water Level Conditions (10-Year Dry Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	152.35	1,430,288	5,608,565	-0.16	152.19	1,384,276 (-3.2%)	5,380,379 (-4.1%)
July	152.22	1,392,688	5,422,190	-0.17	152.05	1,345,466 (-3.4%)	5,186,581 (-4.3%)
August	152.09	1,356,958	5,243,970	-0.11	151.98	1,327,245 (-2.2%)	5,094,107 (-2.9%)
September	152.11	1,362,657	5,272,427	-0.11	152.00	1,331,983 (-2.3%)	5,119,008 (-2.9%)

Table 10: Lake A15 Baseline and Closure Water Level Conditions (10-Year Dry Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	151.53	324,920	697,439	-0.090	151.44	316,915 (-2.5%)	669,090 (-4.1%)
July	151.45	318,262	673,861	-0.12	151.33	307,424 (-3.4%)	635,478 (-5.7%)
August	151.36	309,864	644,119	-0.08	151.28	303,202 (-2.1%)	620,826 (-3.6%)
September	151.37	310,856	647,633	-0.07	151.30	304,962 (-1.9%)	626,758 (-3.2%)

Table 11: Lake A12 Baseline and Closure Water Level Conditions (10-Year Dry Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	148.66	273,326	620,336	-0.09	148.58	264,806 (-3.1%)	597,251 (-0.9%)
July	148.59	265,639	600,427	-0.11	148.48	258,672 (-2.6%)	573,858 (-1.3%)
August	148.51	260,617	581,273	-0.09	148.43	254,989 (-2.2%)	559,812 (-0.8%)
September	148.52	260,858	582,192	-0.07	148.45	256,270 (-1.8%)	564,696 (-0.7%)

Table 12: Lake A76 Baseline and Closure Water Level Conditions (10-Year Dry Return Period)

Month	Baseline			Closure			
	Water Level (masl)	Area (m^2)	Volume (m^3)	Δ Water Level (m)	Water Level (masl)	Area (m^2) (Δ Area)	Volume (m^3) (Δ Volume)
June	147.63	684,189	3,920,152	-0.05	147.58	672,470 (-1.7%)	3,885,442 (-0.9%)
July	147.57	670,079	3,878,361	-0.09	147.48	662,542 (-1.1%)	3,826,918 (-1.3%)
August	147.49	662,864	3,829,594	-0.05	147.44	659,384 (-0.5%)	3,800,718 (-0.8%)
September	147.48	662,313	3,825,019	-0.04	147.44	659,290 (-0.5%)	3,799,943 (-0.7%)

Closure

This technical memorandum was prepared and reviewed by the undersigned.

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GOLDER ASSOCIATES LTD.
Signature
Date 24 OCTOBER 2019
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

References

Agnico Eagle (Agnico Eagle Mines Limited). 2018. Final Environmental Impact Statement Addendum, Whale Tail Pit – Expansion Project. December 2018.

Agnico Eagle. 2019a. Technical Comment Responses – Whale Tail Pit Expansion Project. Submitted to the Nunavut Impact Review Board. Submitted by Agnico Eagle Mines Limited – Meadowbank Division. May 29, 2019. 222 pages.

Agnico Eagle. 2019b. Final Written Statement Responses – Whale Tail Pit Expansion Project. Submitted to Nunavut Impact Review Board. Submitted by Agnico Eagle Mines Limited – Meadowbank Division. August 9, 2019. 105 pp.

Attachment 1: Lake Storage Characteristics

The derived lake storage characteristics are provided in the figures below. It is noted that the depth data of the bathymetric surveys were converted into elevation data by assuming that the Project's LiDAR data were representative of the water elevation on the day of bathymetric surveys.

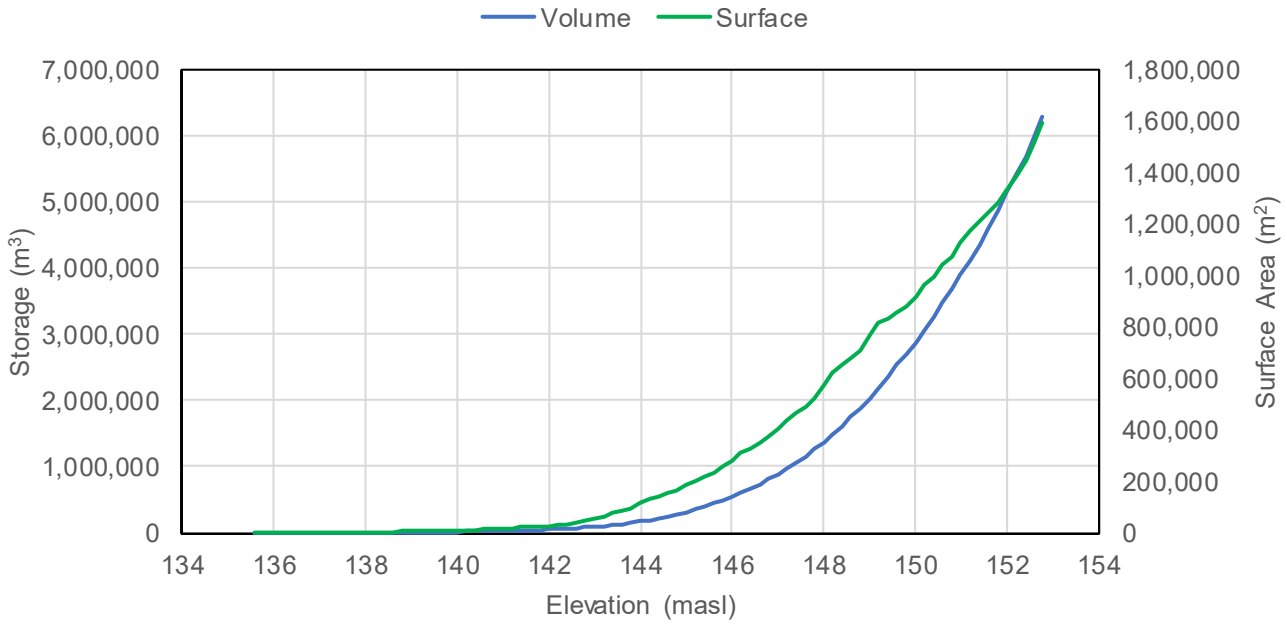

Figure 2: Lake Storage Characteristics (Lake A16 [Mammoth Lake])

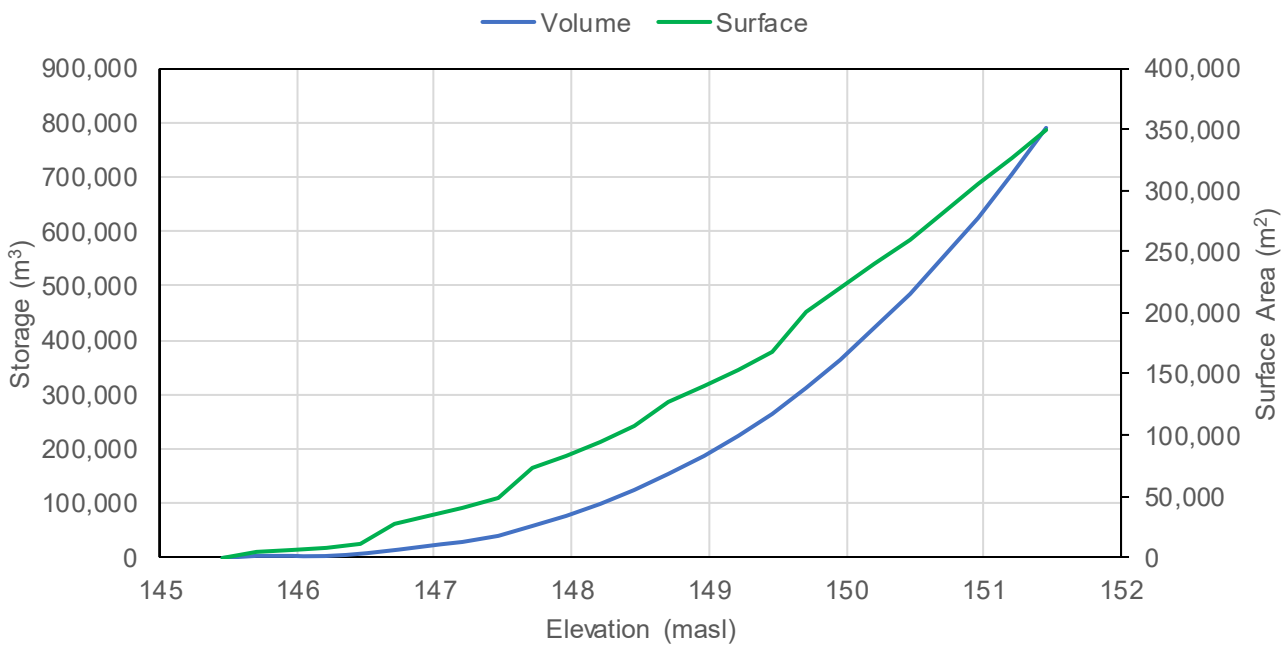

Figure 3: Lake Storage Characteristics (Lake A15)

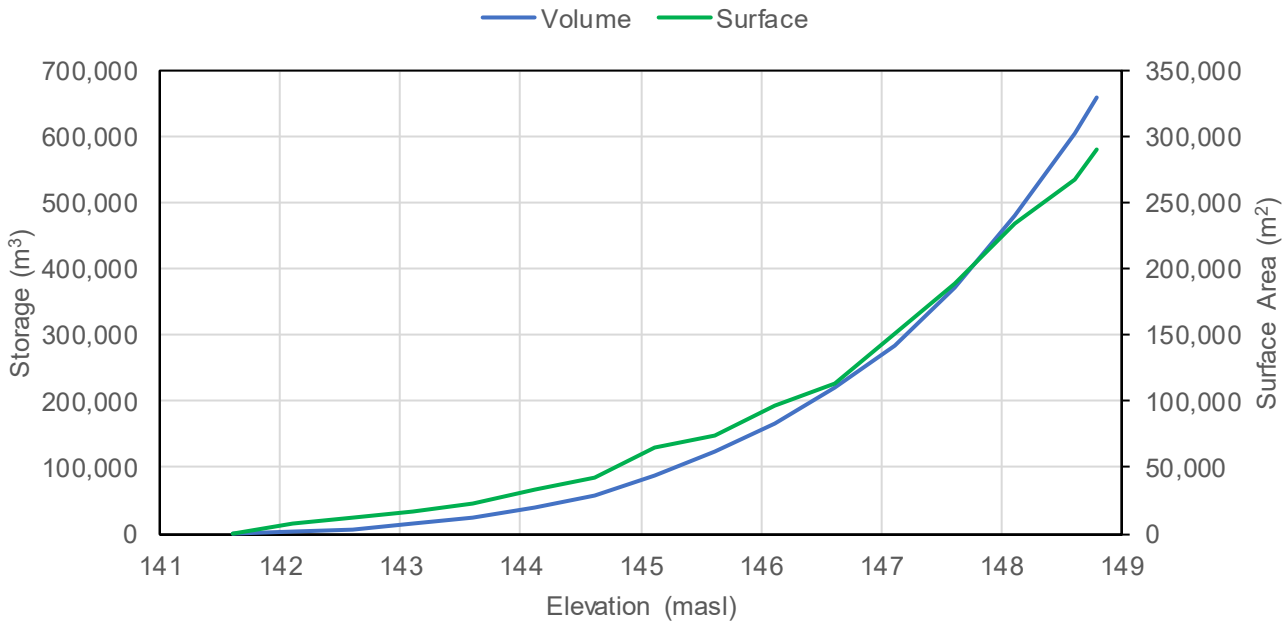

Figure 4: Lake Storage Characteristics (Lake A12)

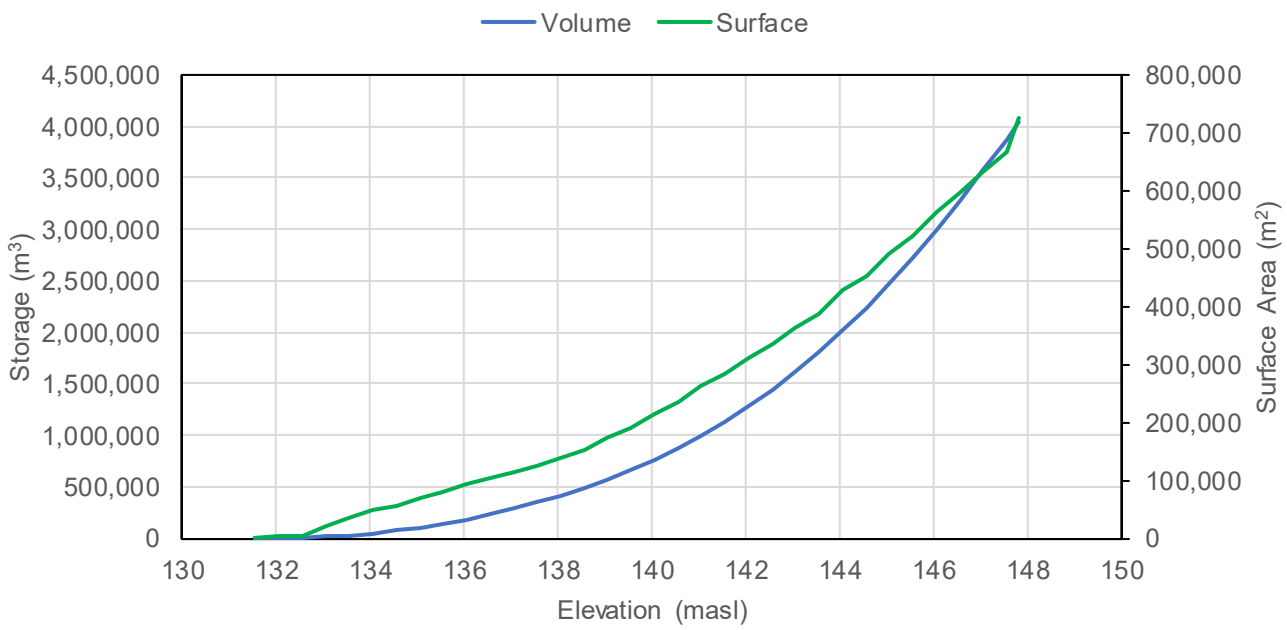

Figure 5: Lake Storage Characteristics (Lake A76)