APPENDIX 6-E

Supporting Evidence of the Hydrology Effects Assessment

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Report No. 1541520

AGNICO EAGLE

Golder Associates

6.E-1 BACKGROUND

The purpose of this appendix is to summarize water management activities of the Project relevant to surface water quantity during the construction, dewatering, operational, closure, and post-closure phases. Potential effects on hydrological indicators, including discharges and water levels, are also summarized herein.

6.E-2 AVAILABLE INFORMATION

Relevant information related to construction, dewatering, operational, closure, and post-closure phases was available from the water management plan (Volume 8, Appendix 8-B.2), and in flooding analyses (Volume 6, Appendix 6-F).

6.E-3 WATER MANAGEMENT ACTIVITIES DURING PROJECT PHASES

6.E-3.1 Construction Phase

Water management activities relevant to surface water quantity during the construction phase include the following, from June 2018 to January 2019:

- Construction of the Whale Tail Dike, from June 2018 to January 2019 (and continuing into the dewatering phase in February 2019);
- construction of the Mammoth Dike, from September to October 2018 (and continuing into the dewatering phase in February 2019), unless delayed until winter 2018;
- Construction of the Whale Tail Waste Rock Storage Facility (WRSF) Dike, from June to September 2018; and
- Freshwater intake from Lake C38 (Nemo Lake), to be constructed in the summer of 2018.

Water management activities during the construction phase are presented in Table 6-E-1 and illustrated in Figure 6-E-1. These activities encroach the dewatering phase.

Table 6-E-1: Water Management Activities during the Construction Phase

Activity	Construction Phase							Dewatering Phase					
	2018							2019					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Whale Tail Dike													
Mammoth Dike													
WRSF Dike													
Freshwater Intake from Lake C38 (Nemo Lake)	Construction during summer 2018												

Note: Construction of the Mammoth Dike may be delayed until winter 2018-2019 and may not be relevant to the open water season of the construction phase.
WRSF = waste rock storage facility.

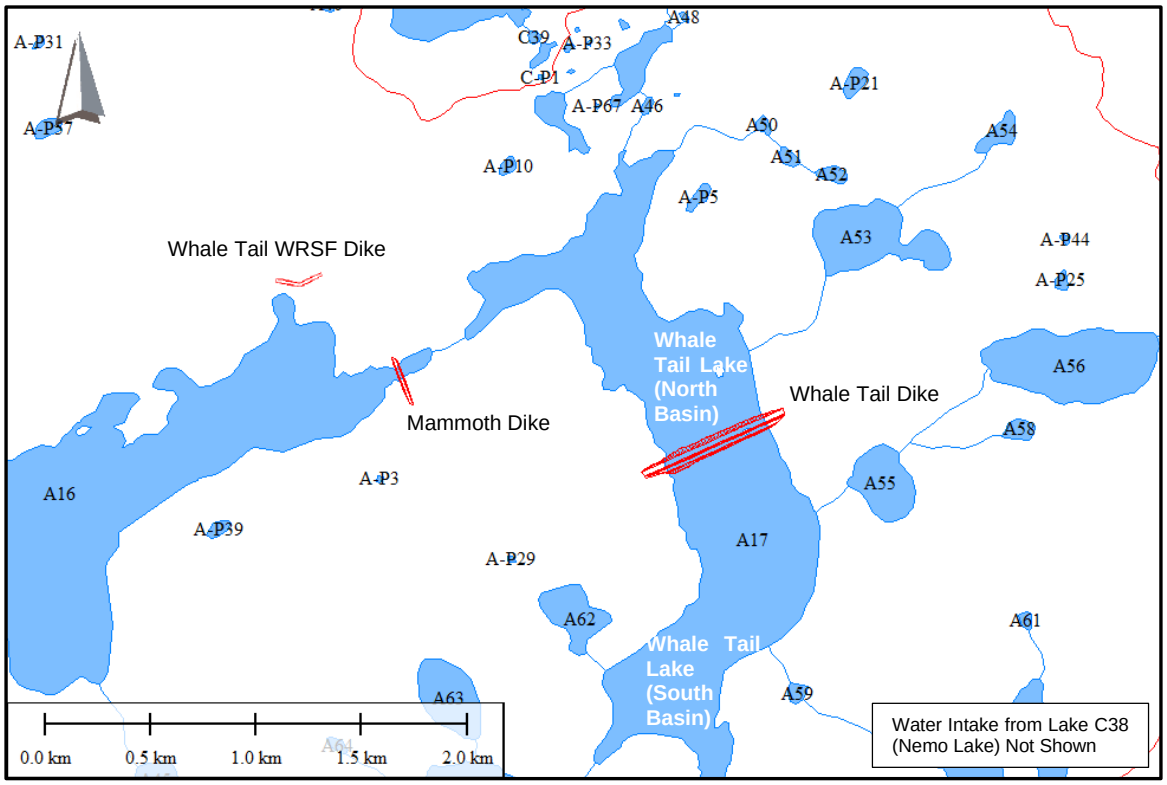

Figure 6-E-1: Construction Phase Activities

6.E-3.2 Dewatering Phase

Water management activities presented herein supplement dikes built during the construction phase (Section 6.E-3).

Dewatering activities include those listed below, from February to October 2019:

- Dewatering through Whale Tail Lake (South Basin) from February (may only start in March) to May 2019;
- Dewatering through Lake A16 (Mammoth Lake) from June to September 2019;
- Construction of the Northeast Dike from February to March 2019;
- Construction of the East Channel from December to April 2019;
- If deemed necessary, construction of the North Channel from in 2019; and
- Freshwater intake from Lake C38 (Nemo Lake).

Thus, for the purpose of the surface water quantity effect assessment, the dewatering phase was assumed to include dewatering activities listed above from February to October 2019.

Water management activities during the dewatering phase are presented in Table 6-E- and illustrated in Figure 6-E-2.

Table 6-E-2: Water Management Activities during the Dewatering Phase

Activity	Dewatering Phase[a]				Operational Phase[a]						
	2019										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dewatering through Whale Tail Lake (South Basin)	■	■	■	■							
Dewatering through Lake A16 (Mammoth Lake)					■	■	■	■			
Construction of the Northeast Dike	■	■									
Construction of the East Channel (December 2018 Start)	■	■	■								
If deemed necessary, the construction of the North Channel							■	■	■		
Freshwater Intake from Lake C38 (Nemo Lake)	■	■	■	■	■	■	■	■	■	■	■

[a] The dewatering phase was assumed to include water management activities listed above for the purpose of the surface water quantity effect assessment.

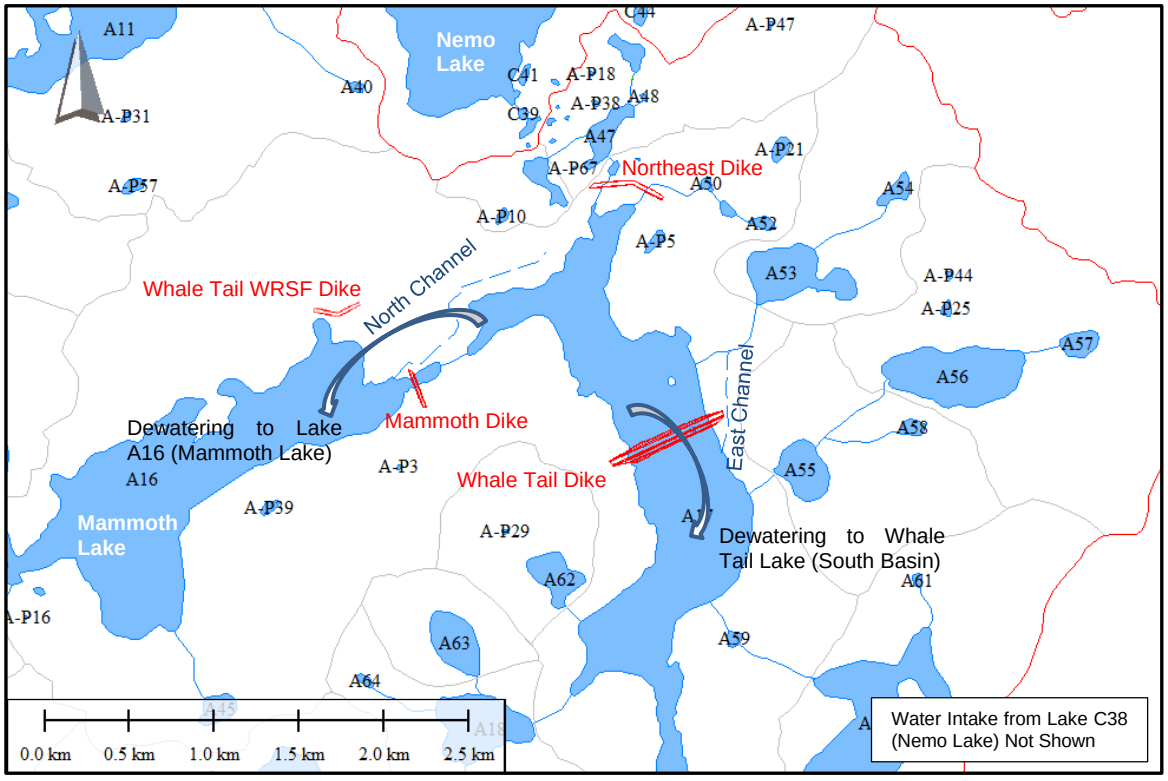

Figure 6-E-2: Dewatering Phase Activities

6.E-3.3 Operational Phase

Water management activities relevant to the surface water quantity of the receiving environment during the operational phase are listed below:

- treated water from the Water Treatment Plant discharged to Lake A16 (Mammoth Lake) during the months of June, July, August, and September 2020 and 2021;
- the diversion of Whale Tail Lake (South Basin) to Lake A16 (Mammoth Lake), through Lake A45;
- the diversion of the Northeast sector to Lake C38 (Nemo Lake), through Lake C44; and
- freshwater intake from Lake C38 (Nemo Lake).

Water management activities during the operational phase are presented in Table 6-E-3 and illustrated in Figure 6-E-3.

Table 6-E-3: Water Management Activities during the Operational Phase

Activity	Operational Phase																												
	2019						2020												2021										
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Discharge from the Water Treatment Plant to Lake A16 (Mammoth Lake)																														
Diversion from Whale Tail Lake (South Basin) to Lake A16 (Mammoth Lake)																														
Diversion from the Northeast Sector Lake to Lake C38 (Nemo Lake)																														
Freshwater Intake from Lake C38 (Nemo Lake)																														

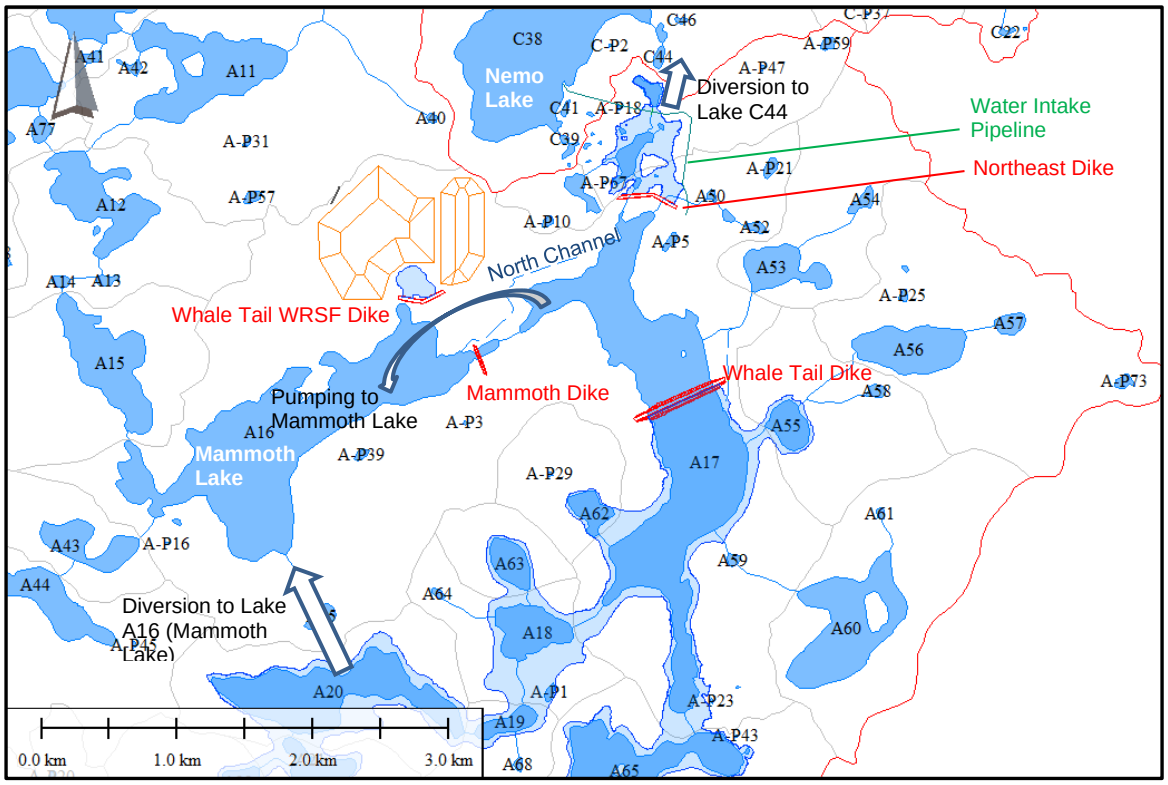

Figure 6-E-3: Operational Phase Activities

6.E-3.4 Closure Phase

The closure phase was defined as the period of refilling of Lake A17 (Whale Tail Lake) to baseline level, prior to breaching of the Whale Tail Dike and Mammoth Dike in 2029, for the purpose of this surface water quantity assessment. Relevant activities considered in this surface water quantity assessment during the closure phase include the following:

- ongoing closed-circuiting of Whale Tail Lake (North Basin) from the operational phase;
- draw-down of Whale Tail Lake (South Basin) to refill the open pit by pumping;
- draw-down of the Northeast sector to refill the open pit by pumping;
- re-establishment of natural drainage patterns of the North sector; and
- ongoing diversion of the Whale Tail WRSF runoff to the Water Treatment Plant.

Water management activities during the closure phase are presented in Table 6-E-4 and illustrated in Figure 6-E-4.

Table 6-E-4: Water Management Activities during the Closure Phase

Activity	Closure Phase (years)							
	2022	2023	2024	2025	2026	2027	2028	2029
Refilling of Open Pit	■	■	■	■				
Refilling of Whale Tail Lake (North Basin)					■	■	■	
Diversion of Waste Rock Storage Facility Runoff	■	■	■	■	■	■	■	■

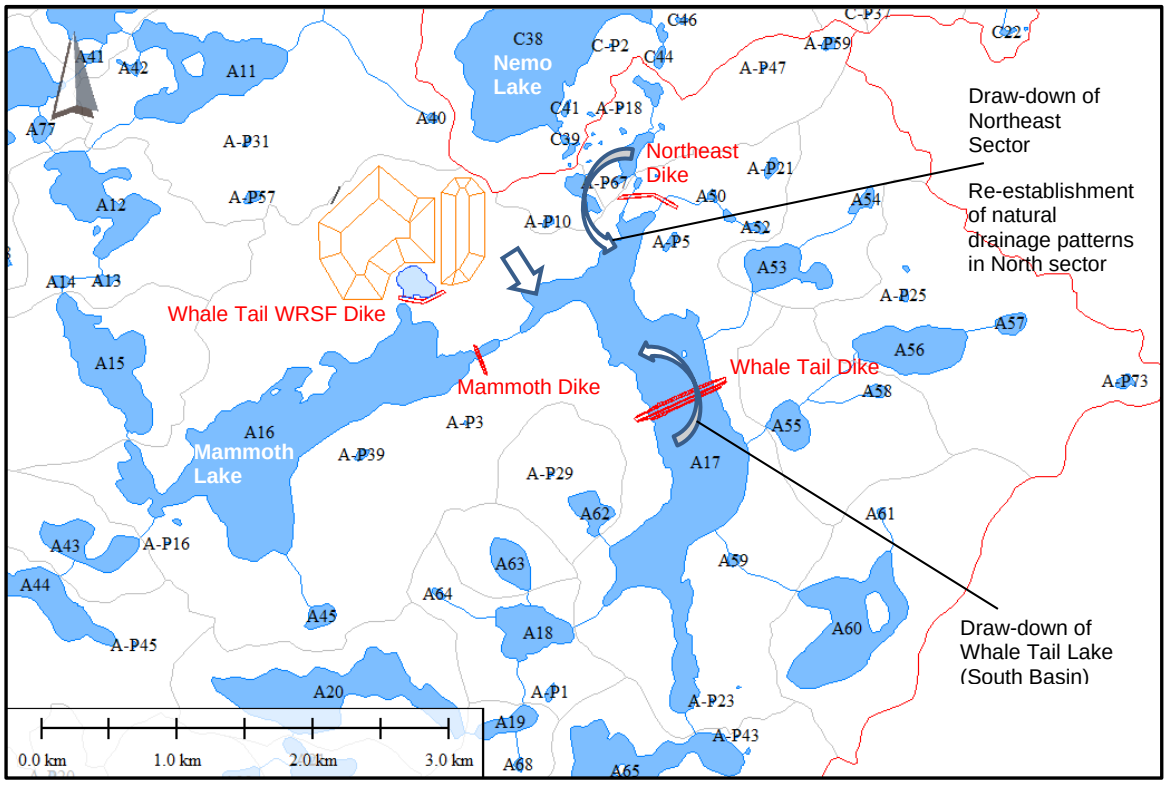

Figure 6-E-4: Closure Phase Activities

6.E-3.5 Post-closure Phase

All infrastructure will be decommissioned by the end the closure phase, and drainage patterns will be returned to baseline conditions.

6.E-4 POTENTIAL EFFECTS TO SURFACE WATER QUANTITY

6.E-4.1 Construction Phase

Potential effects to surface water quantity during the construction phase are summarized as follows:

- Construction of the Whale Tail Dike will prevent runoff from Whale Tail Lake (South Basin) to Whale Tail Lake (North Basin), and downstream lakes, from June 2018 until the end of the closure phase. The Whale Tail Dike will reduce the drainage area of Whale Tail Lake (North Basin) by 79%, from 28.1 km^2 (baseline conditions) to 5.8 km^2 (following construction of the Whale Tail Dike), resulting in reduced discharges at the outlet of Lake A17 (Whale Tail Lake), and downstream lakes.
- Rock placement to construct the Whale Tail Dike will displace water which may result in an increase in water level and discharge in North Whale Tail until the Mammoth Dike is constructed. A similar increase in water level is possible from the construction of the Mammoth Dike in Lake A16 (Mammoth Lake); however, the Mammoth Dike will be constructed near the eastern shoreline of the lake resulting in a less significant increase in water level.
- Construction of the Whale Tail WRSF Dike will prevent runoff upstream of the dike to Lake A16 (Mammoth Lake), and downstream lakes, from June 2018 until the end of the post-closure phase. The Whale Tail WRSF Dike will reduce the drainage area of Lake A16 (Mammoth Lake) by 1.16 km^2, resulting in reduced discharges at the outlet of Lake A16 (Mammoth Lake), and downstream lakes.
- Construction of the Mammoth Dike will prevent runoff from Whale Tail Lake (North Basin) to Lake A16 (Mammoth Lake), and downstream lakes, from September 2018 until the end of the closure phase. The Mammoth Dike will reduce the Lake A17 (Whale Tail Lake) watershed by 100%. The Mammoth Dike will also encroach on the local watershed of Lake A16 (Mammoth Lake) by approximately 5%, including 0.012 km^2 in lake area, and 0.357 km^2 in land area. The total Lake A16 (Mammoth Lake) watershed will be reduced by 77% from 38.7 km^2 to 9.0 km^2 from the Whale Tail WRSF Dike and the Mammoth Dike, resulting in reduced discharges at the outlet of Lake A16 (Mammoth Lake), and downstream lakes.
- The freshwater intake at Lake C38 (Nemo Lake) will be installed during summer 2018 to withdraw up to 8,760 m^3/year (based on a complete year of withdrawal) and may result a reduction in discharges at Lake C38 (Nemo Lake) and downstream lakes.

Watershed area modifications of Lake A17 (Whale Tail Lake) and Lake A16 (Mammoth Lake) are presented in Table 6-E-5.

Table 6-E-5: Watershed Area Modifications during the Construction Phase

Condition	Whale Tail Lake (km^2)			Mammoth Lake (km^2)		
	Lake	Land	Total	Lake	Land	Total
Baseline	4.70	23.4	28.1	6.59	32.1	38.7
Whale Tail Dike[a]	0.870	4.94	5.81	2.77	13.6	16.4
WRSF Dike[a]	--	--	--	2.77	12.4	15.2
Mammoth Dike[a, b]	--	--	--	1.88	7.1	9.0

[a] Modified area from construction of the dike.

[b] The Mammoth Dike may not be constructed until winter 2018-2019, or outside of the open water season of the construction phase.

WRSF = waste rock storage facility; km^2 = square kilometre.

6.E-4.2 Dewatering Phase

Potential effects to surface water quantity during the dewatering phase are summarized as follows:

- Cumulative effects are expected at Lake A16 (Mammoth Lake) and downstream lakes from the following activities:
  - The Mammoth Dike, built during the construction phase (Section 6.E-3), will reduce the watershed area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges;
  - The Whale Tail WRSF Dike will reduce the land area of the Lake A16 (Mammoth Lake) and downstream lake watersheds, resulting in reduced discharges;
  - The road to the north of Whale Tail Pit, or if deemed necessary, the construction of the North Channel will divert runoff from the Whale Tail Lake watershed (i.e., approximately 0.277 km^2) to Lake A16 (Mammoth Lake) and will augment discharges at Lake A16 (Mammoth Lake) and downstream Lake starting in August 2019; and
  - Dewatering through Lake A16 (Mammoth Lake) will augment discharges at Lake A16 (Mammoth Lake) and downstream lakes.
- The Whale Tail Dike will divert discharges from the Whale Tail Lake (South Basin) watershed to the Lake A16 (Mammoth Lake) watershed, through Lake A45, and will augment discharges at Lake A45 and downstream lakes. The diversion is not expected to affect the Lake A45 watershed until the operational phase in 2020 (Volume 6, Appendix 6-F), because it will take some time for the Whale Tail Lake (South Basin) water level to increase to the spill elevation. Therefore, potential impacts to Lake A45 and downstream lakes from the diversion are not expected during the dewatering phase.
- The Northeast Dike will divert discharges from the Lake A46 watershed to the Lake C38 (Nemo Lake) watershed, and will augment discharges at Lake C38 (Nemo Lake) and downstream lakes. The diversion is not expected to affect the Lake C38 (Nemo Lake) watershed until the operational phase in 2020 (Volume 6, Appendix 6-F), because it will take some time for the Lake A46 and upstream lake water levels to increase to the spill elevation. Therefore, impacts to Lake C38 (Nemo Lake) and downstream lakes from the diversion are not expected during the dewatering phase.
- No direct impacts are expected to the receiving environment (i.e., Lake A16 [Mammoth Lake] and downstream lakes) from construction of the East channel.
- The freshwater intake at Lake C38 (Nemo Lake), installed during the construction phase in summer 2018 to withdraw up to 8,760 m^3/year and may result a reduction in discharges at Lake C38 (Nemo Lake) and downstream lakes.

6.E-4.3 Operational Phase

Potential effects to surface water quantity during the operational phase are summarized as follows:

- Lake A45 will become part of the South Whale Tail diversion channel until the South Whale Tail diversion is decommissioned at closure.

- Cumulative effects are expected at Lake A16 (Mammoth Lake) and downstream lakes from the following activities:
  - The Mammoth Dike, built during the construction phase, will reduce the watershed area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges;
  - The Whale Tail Dike will result in the diversion of the Whale Tail Lake (South Basin) watershed to the Lake A16 (Mammoth Lake) watershed, thereby augmenting discharges at Lake A16 (Mammoth Lake) and downstream lakes;
  - The Whale Tail WRSF Dike will reduce the land area of the Lake A16 (Mammoth Lake) and downstream lake watersheds, resulting in reduced discharges;
  - The road to the north of Whale Tail Pit, or if deemed necessary, the operation of the North Channel will divert runoff from the Whale Tail Lake watershed (i.e., approximately 0.277 km^2) to Lake A16 (Mammoth Lake) and will augment discharges at Lake A16 (Mammoth Lake) and downstream lakes starting in August 2019; and
  - Treated water from the Water Treatment Plant discharged to Lake A16 (Mammoth Lake) will augment the discharges at Lake A16 (Mammoth Lake) and downstream lakes.
- Cumulative effects are expected at Lake C38 (Nemo Lake) and downstream lakes from the following activities:
  - The Northeast Dike will divert discharges from the Lake A46 watershed to the Lake C38 (Nemo Lake) watershed (through Lake C44), and will augment discharges at Lake C44 and downstream lakes; and
  - The freshwater intake at Lake C38 (Nemo Lake) will result a reduction in discharges at Lake C38 (Nemo Lake) and downstream lakes.

6.E-4.4 Closure Phase

Potential effects to surface water quantity during the closure phase are summarized as follows:

- Cumulative effects are expected at Lake A16 (Mammoth Lake) and downstream lakes from the following activities:
  - The Mammoth Dike, built during the construction phase (Section 6.E-3.1), will reduce the watershed area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges; and
  - The Whale Tail WRSF Dike, built during the construction phase (Section 6.E-3.2), will reduce the land area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges.
- The Whale Tail Lake (South Basin) diversion will be drawn-down by November 2022 (Volume 6, Appendix 6-F). As such, lakes previously affected by the South Whale Tail diversion, located upstream of Whale Tail Lake (South Basin), will return to baseline conditions by November 2022. This will also remove the diversion to Lake A16 (Mammoth Lake).
- The Northeast Sector will be drawn-down by May 2022 (Volume 6, Appendix 6-F). As such, lakes previously affected by the Northeast Sector diversion (i.e., Lake A47, Lake A48, Lake A113, Pond A-P38,

and Pond A-P68), located upstream of Whale Tail Lake (North Basin), will return to baseline conditions by May 2022. This will also remove the diversion to Lake C38 (Nemo Lake).

6.E-4.5 Post-Closure Phase

The end pit lake will increase the surface area of Lake A17 (Whale Tail Lake) by 13% from 1.66 km^2 (baseline conditions) to 1.87 km^2 (post-closure conditions) (Figure 6-E-5), resulting in proportionate increases in direct precipitation and evaporative losses. All other lakes will be returned to baseline conditions.

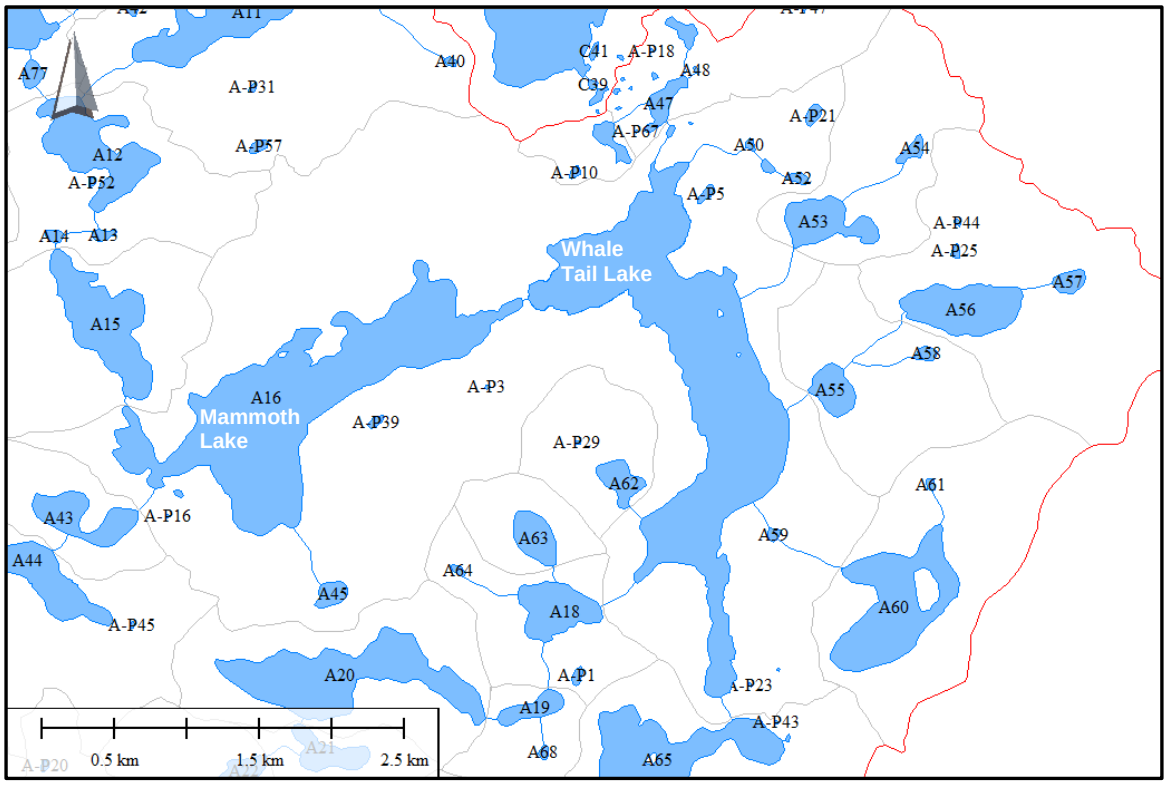

Figure 6-E-5: Post-Closure Phase Activities

6.E-5 EFFECTS ASSESSMENT

6.E-5.1 Construction Phase

Potential effects on hydrological indicators are presented below for Lake A16 (Mammoth Lake), Lake A15, Lake A5, and Lake A69. Methods are presented in Attachment A. For this assessment, construction of the Whale Tail Dike was assumed to be instantaneously completed in June, and the potential increase in water level from rock placement of the dike was not considered, resulting in conservative results.

Freshwater intake from Lake C38 (Nemo Lake) was assessed for the dewatering phase. A lower volume is required during the construction phase than during the dewatering phase, and effects from water withdrawal on discharge and water levels are expected to be negligible during the construction phase and not further discussed.

Water levels mentioned herein refer to water surface elevations. Stages presented in figures below represent water surface elevations referenced to an arbitrary datum.

6.E-5.1.1 Lake A16 (Mammoth Lake)

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the entire open water season.

  The 2-year flood discharge is expected to decrease by 50% and the 100-year flood discharge is expected to decrease by 47% from the baseline values. Low discharges are expected to decrease from 62% to 64% from the baseline values. Derived discharge regimes are presented in Figure 6-E-6 for the baseline and construction phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the entire open water season.

  The 2-year flood level is expected to decrease by 0.19 m, and the 100-year flood level is expected to decrease by 0.24 m from the baseline values. Mean monthly water levels are expected remain similar to baseline conditions in May, and decrease by 0.16 m in June, 0.16 m in July, 0.11 m in August, 0.14 m in September, and 0.13 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-7 for the baseline and construction phases.

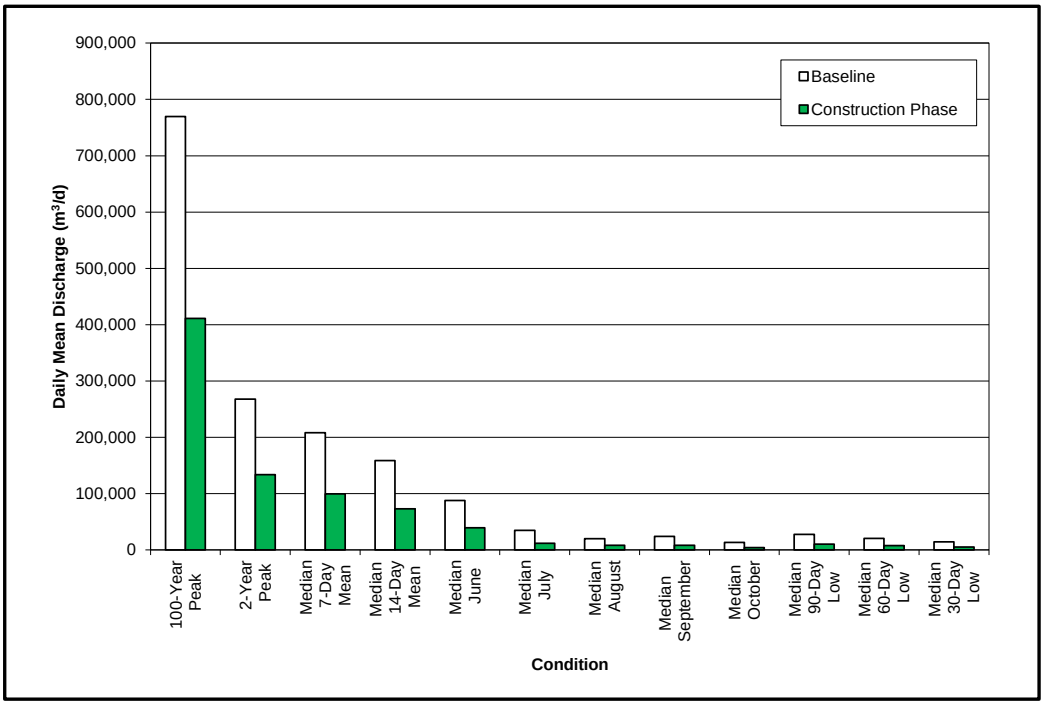

Figure 6-E-6: Derived Discharge Regimes at Lake A16 (Mammoth Lake) during the Construction Phase

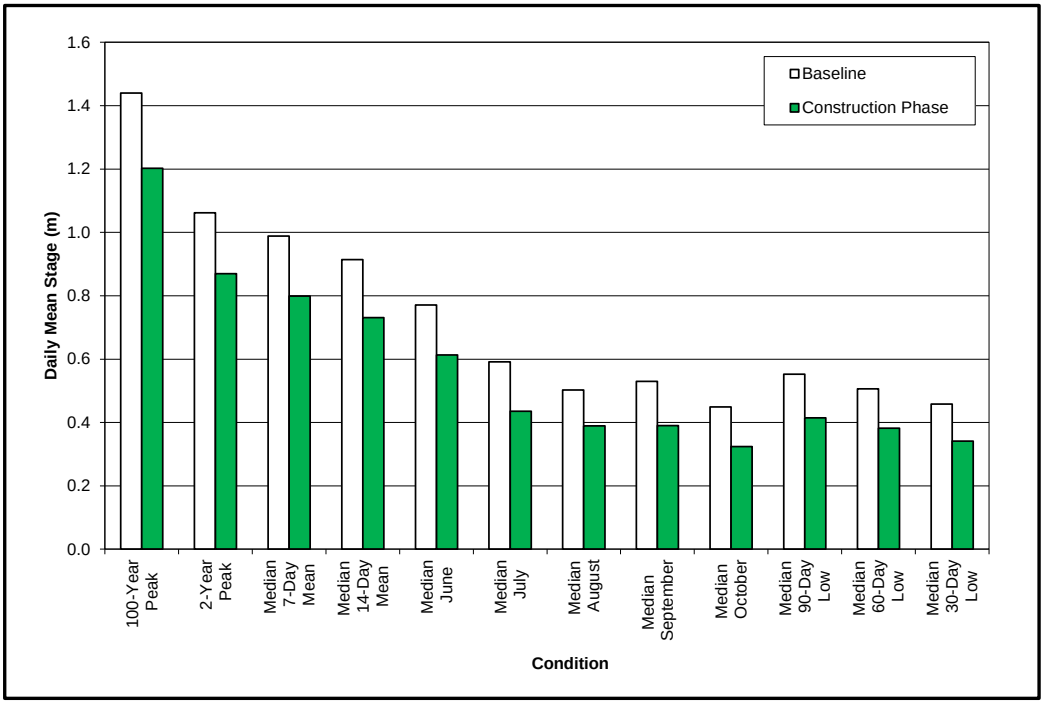

Figure 6-E-7: Derived Stage Regimes at Lake A16 (Mammoth Lake) during the Construction Phase

6.E-5.1.2 Lake A15

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the entire open water season.

  The 2-year flood discharge is expected to decrease by 46% and the 100-year flood discharge is expected to decrease by 40% from the baseline values. Low discharges are expected to decrease from 58% to 61% from the baseline values. Derived discharge regimes are presented in Figure 6-E-8 for the baseline and construction phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the entire open water season.

  The 2-year flood level is expected to decrease by 0.10 m, and the 100-year flood level is expected to decrease by 0.10 m from the baseline values. Mean monthly water levels are expected to remain similar in May, and decrease by 0.09 m in June, 0.09 m in July, 0.07 m in August, 0.09 m in September, and 0.08 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-9 for the baseline and construction phases.

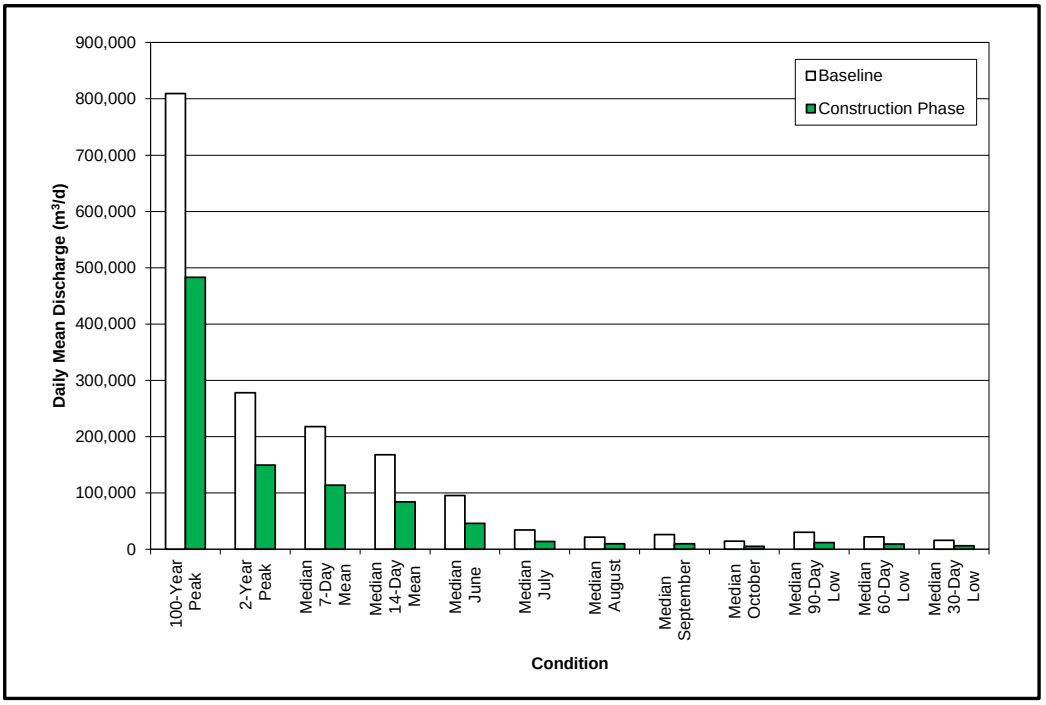

Figure 6-E-8: Derived Discharge Regimes at Lake A15 during the Construction Phase

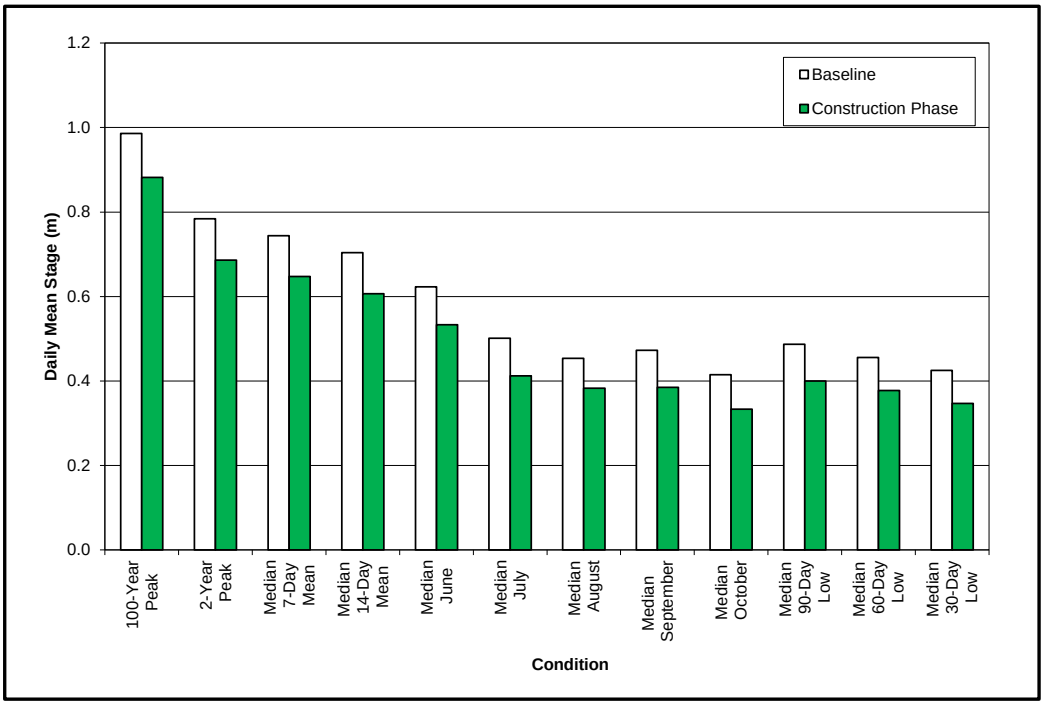

Figure 6-E-9: Derived Stage Regimes at Lake A15 during the Construction Phase

6.E-5.1.3 Lake A5

- Discharges: peak discharges are expected to decrease slightly and mean monthly discharges are expected to decrease from the baseline values during the entire open water season.

  The 2-year flood discharge is expected to decrease by 17% and the 100-year flood discharge is expected to decrease by 16% from the baseline values. Low discharges are expected to decrease from 42 to 47% from the baseline values. Derived discharge regimes are presented in Figure 6-E-10 for the baseline and construction phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the open water season.

  The 2-year flood level is expected to decrease by 0.03 m, and the 100-year flood level is expected to decrease by 0.04 m from the baseline values. Mean monthly water levels are expected to remain similar in May, decrease slightly by 0.05 m in June, 0.05 m in July, 0.04 m in August, 0.04 m in September, and 0.04 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-11 for the baseline and construction phases.

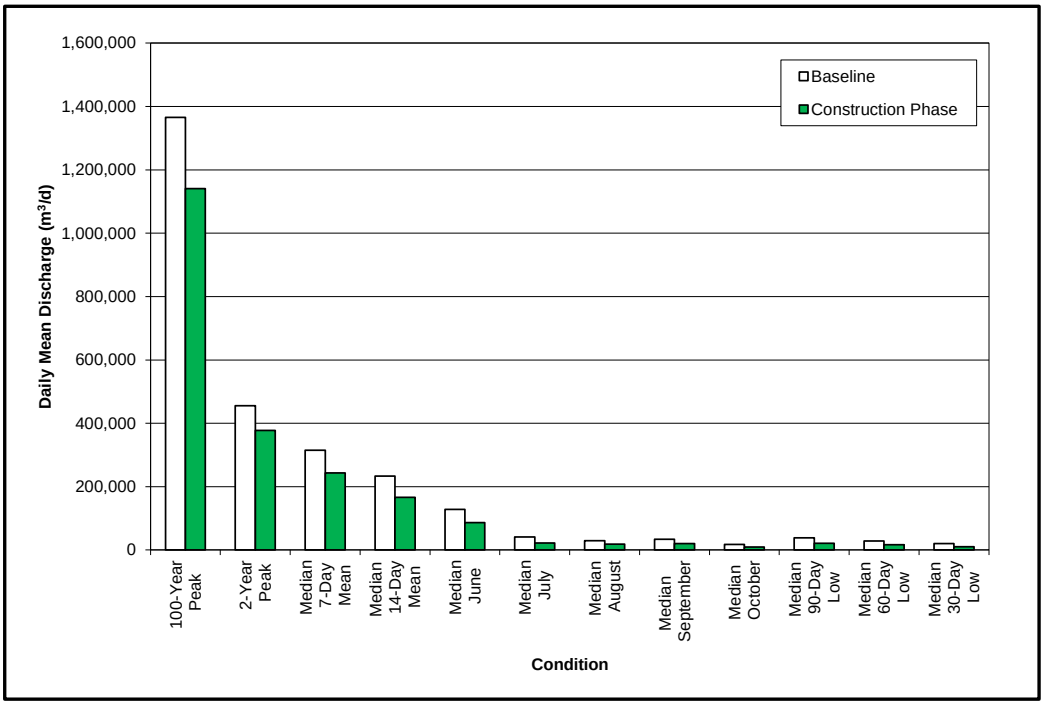

Figure 6-E-10: Derived Discharge Regimes at Lake A5 during the Construction Phase

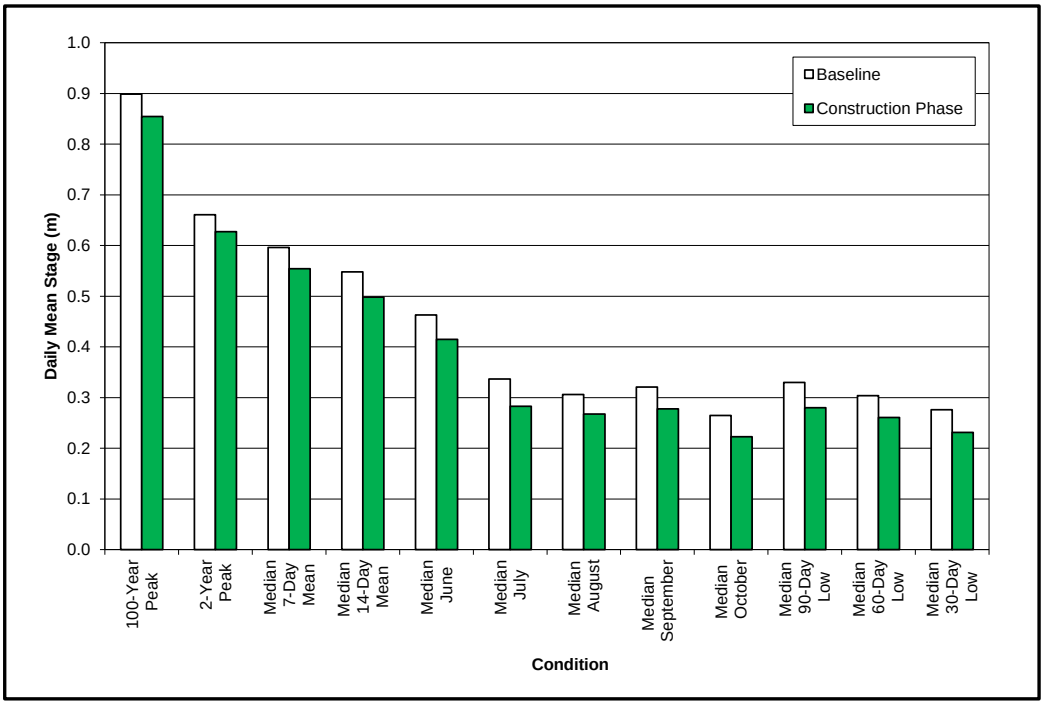

Figure 6-E-11: Derived Stage Regimes at Lake A5 during the Construction Phase

6.E-5.1.4 Lake A69

- Discharges: mean monthly discharges are expected to decrease slightly from the baseline values during the entire open water season.

  The 2-year flood discharge is expected to decrease by 1% from the baseline value and the 100-year flood discharge is expected to decrease by 1% from the baseline values. Low discharges are expected to decrease from 8% to 9% from the baseline values. Derived discharge regimes are presented in Figure 6-E-12 for the baseline and construction phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year and 100-year flood levels are expected to be similar to the baseline values. Mean monthly water levels are expected to remain similar to baseline values throughout the entire open water season with less than 0.01 m decrease. Derived water level regimes are presented in Figure 6-E-13 for the baseline and construction phases.

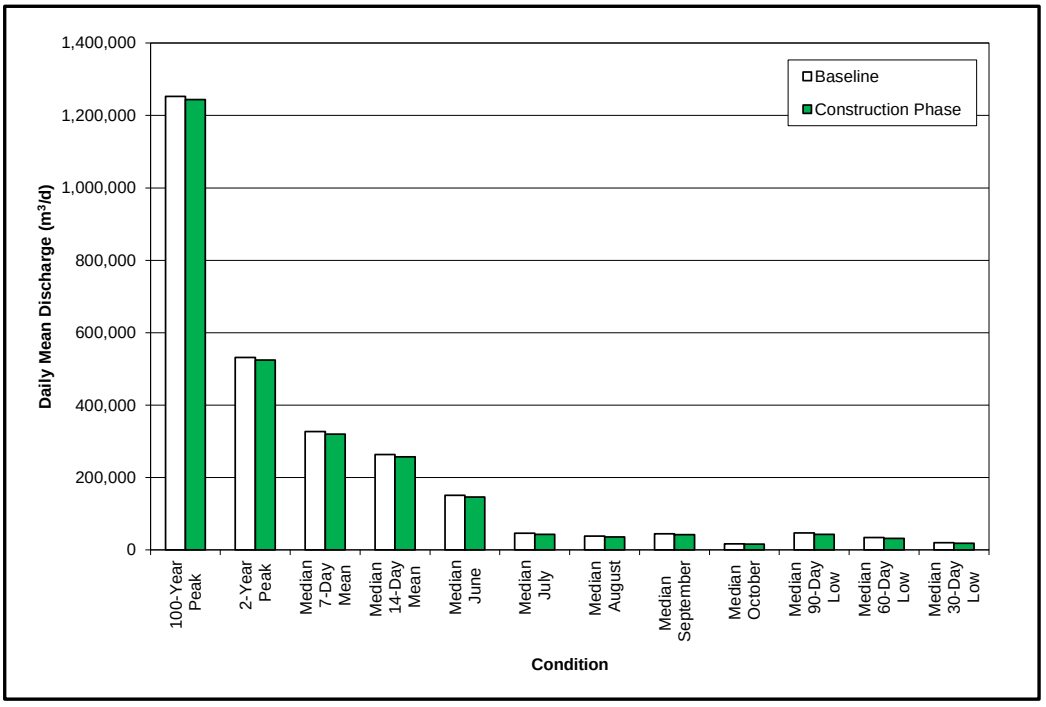

Figure 6-E-12: Derived Discharge Regimes at Lake A69 during the Construction Phase

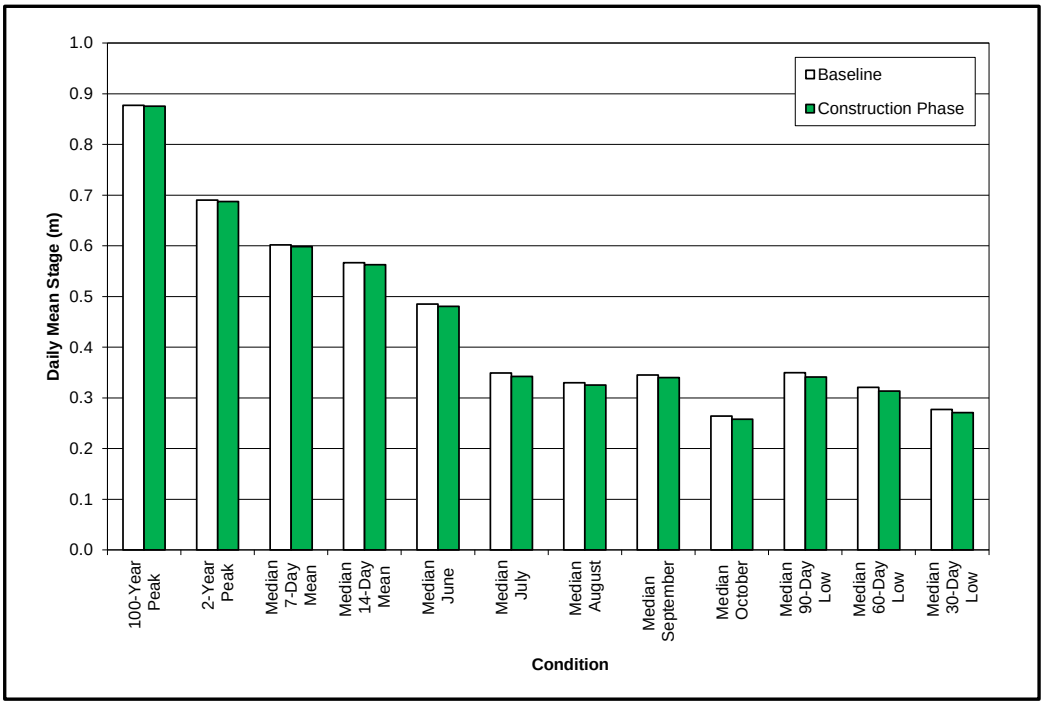

Figure 6-E-13: Derived Stage Regimes at Lake A69 during the Construction Phase

6.E-5.2 Dewatering Phase

Potential effects on hydrological indicators are presented below for Lake A16 (Mammoth Lake), Lake A15, Lake A5, Lake A69, and Lake C38 (Nemo Lake). Methods are presented in Attachment A.

Dewatering through Lake A16 (Mammoth Lake) during open water months minimizes the potential for effects on discharges and water levels which would be increased with a winter schedule.

Water levels mentioned herein refer to water surface elevations. Stages presented in figures below represent water surface elevations referenced to an arbitrary datum.

6.E-5.2.1 Lake A16 (Mammoth Lake)

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 38% and the 100-year flood discharge is expected to decrease by 36% from the baseline values. Low discharges are expected to decrease from 31 to 34% from the baseline values. Derived discharge regimes are presented in Figure 6-E-14 for the baseline and dewatering phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of May, June, July, August, September, and October. ,

  The 2-year flood level is expected to decrease by 0.14 m, and the 100-year flood level is expected to decrease by 0.18 m from the baseline values. Mean monthly water levels are expected to decrease slightly in May, by 0.12 m in June, 0.04 m in July, 0.05 m in August, 0.09 m in September, and 0.10 m in October,

from the baseline values. Derived water level regimes are presented in Figure 6-E-15 for the baseline and dewatering phases.

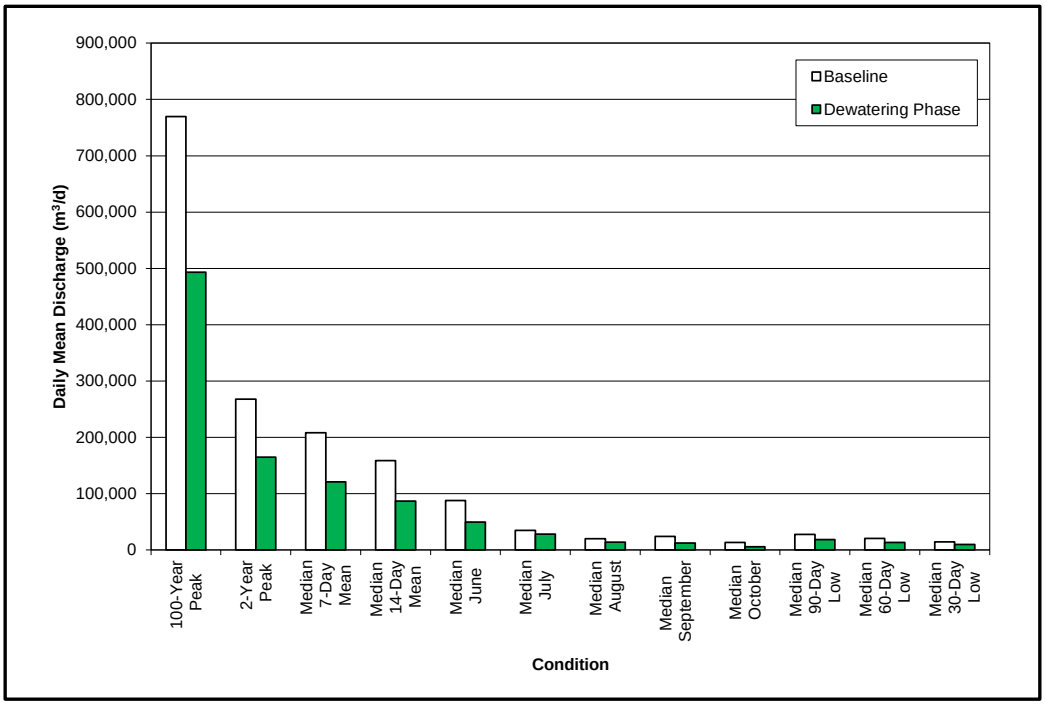

Figure 6-E-14: Derived Discharge Regimes at Lake A16 (Mammoth Lake) during the Dewatering Phase

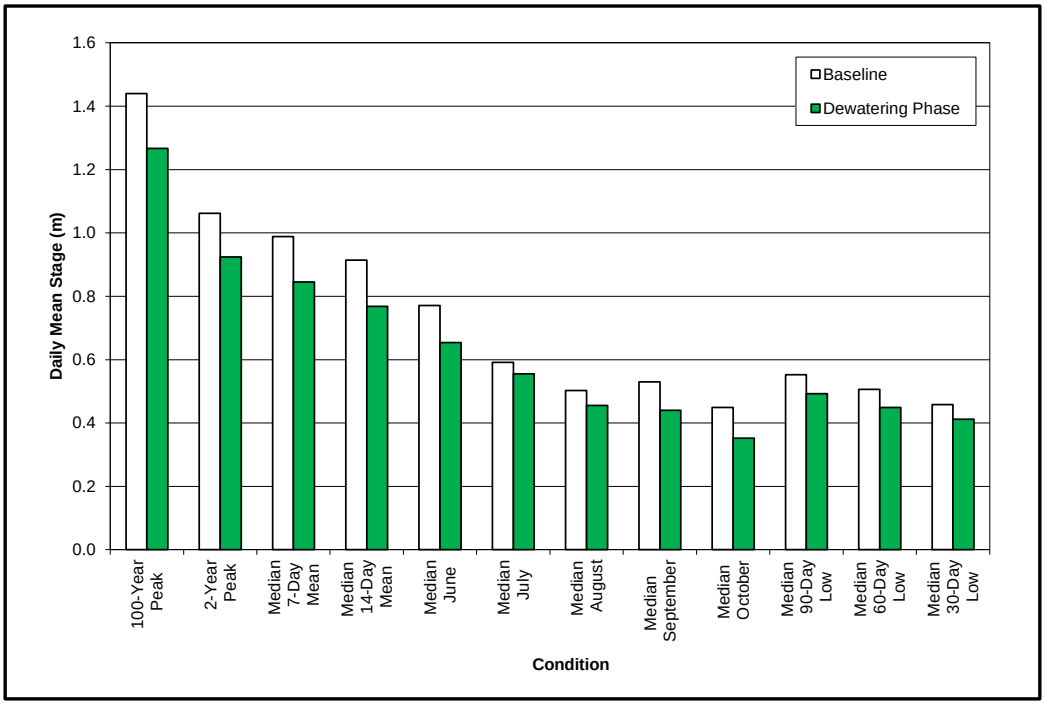

Figure 6-E-15: Derived Stage Regimes at Lake A16 (Mammoth Lake) during the Dewatering Phase

6.E-5.2.2 Lake A15

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 33% and the 100-year flood discharge is expected to decrease by 27% from the baseline values. Low discharges are expected to decrease from 28 to 32% from the baseline values. Derived discharge regimes are presented in Figure 6-E-16 for the baseline and dewatering phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood level is expected to decrease by 0.07 m, and the 100-year flood level is expected to decrease by 0.06 m from the baseline values. Mean monthly water levels are expected to decrease slightly in May, by 0.07 m in June, 0.02 m in July, 0.02 m in August, 0.06 m in September, and 0.06 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-17 for the baseline and dewatering phases.

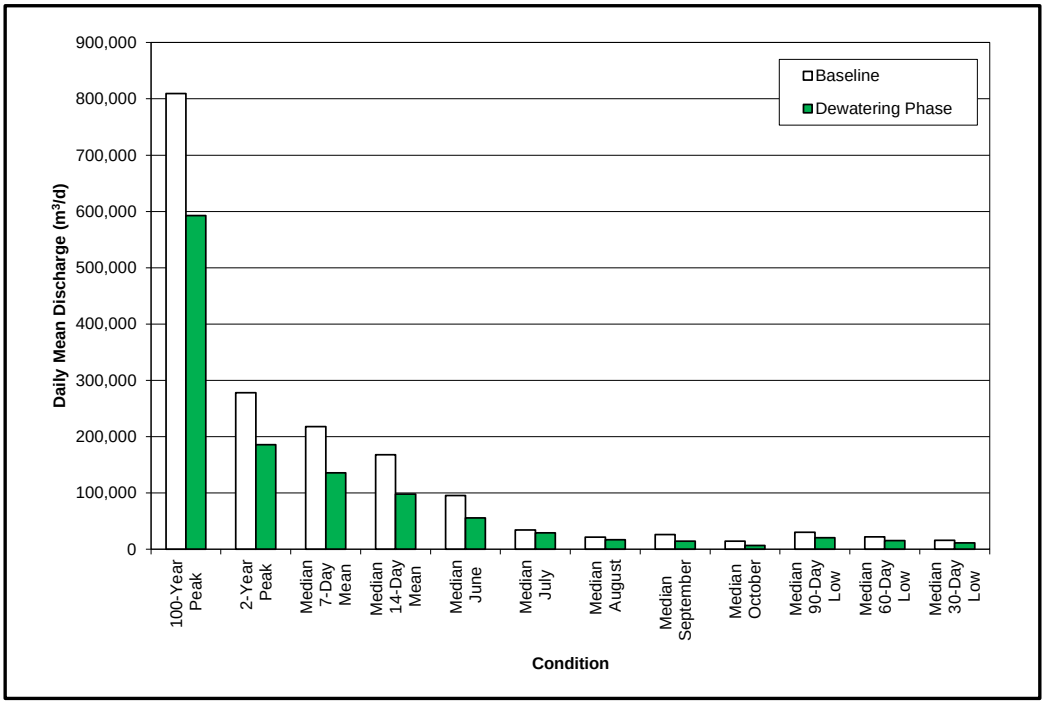

Figure 6-E-16: Derived Discharge Regimes at Lake A15 during the Dewatering Phase

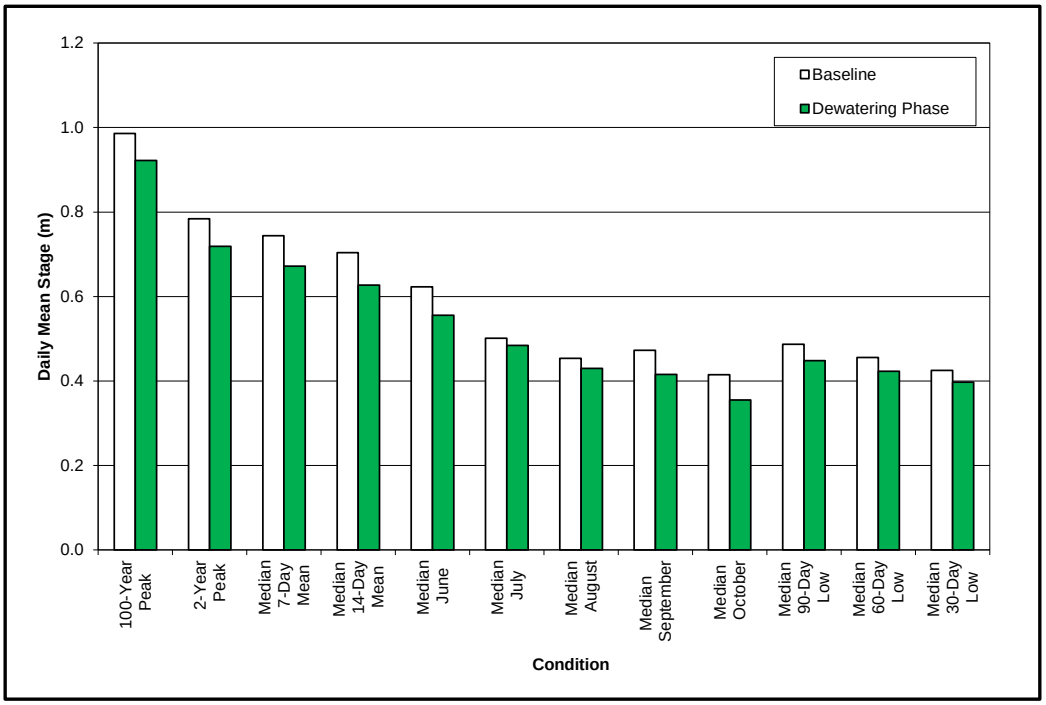

Figure 6-E-17: Derived Stage Regimes at Lake A15 during the Dewatering Phase

6.E-5.2.3 Lake A5

- Discharges: mean monthly discharges are expected to decrease slightly from the baseline values during the months of June, July, August, September, and October, and remain similar to the baseline value during the month of May.

  The 2-year flood discharge is expected to decrease by 12% and the 100-year flood discharge is expected to decrease by 9% from the baseline values. Low discharges are expected to decrease from 15 to 24% from the baseline values. Derived discharge regimes are presented in Figure 6-E-18 for the baseline and dewatering phases.

- Water levels: mean monthly water levels are also expected to decrease slightly from the baseline values during the months of June, July, August, September, and October, and remain similar to the baseline value during the month of May.

  The 2-year flood level is expected to decrease by 0.02 m, and the 100-year flood level is expected to decrease by 0.02 m from the baseline values. Mean monthly water levels are expected to remain similar to baseline values in May, decrease by 0.04 m in June, 0.02 m in July, 0.01 m in August, 0.03 m in September, and 0.03 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-19 for the baseline and dewatering phases.

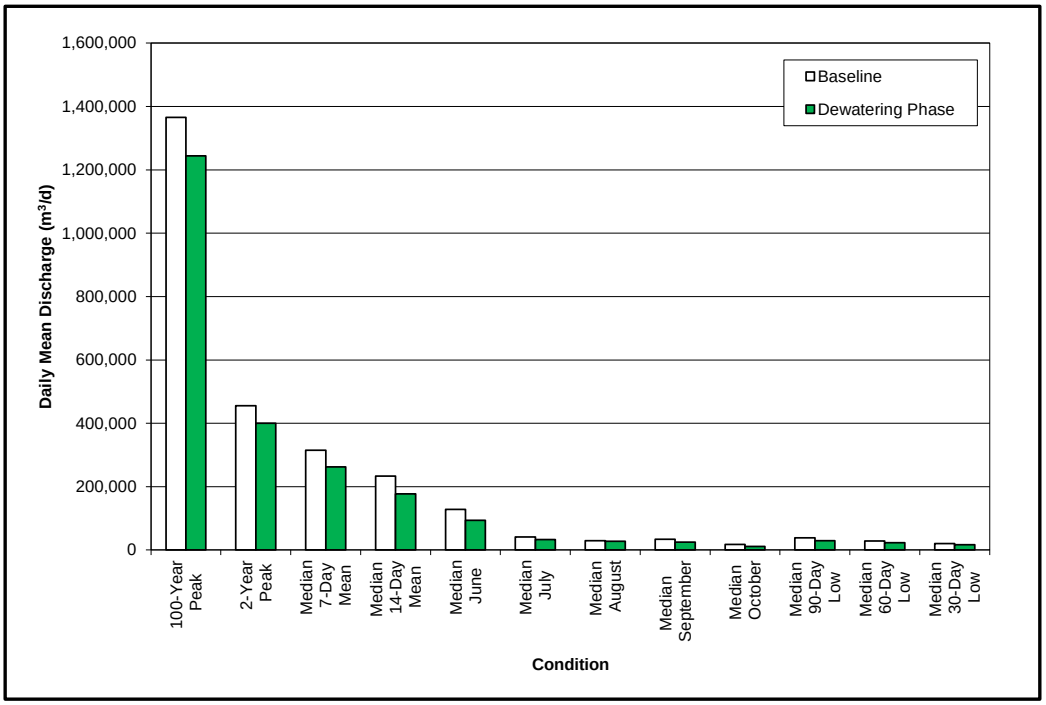

Figure 6-E-18: Derived Discharge Regimes at Lake A5 during the Dewatering Phase

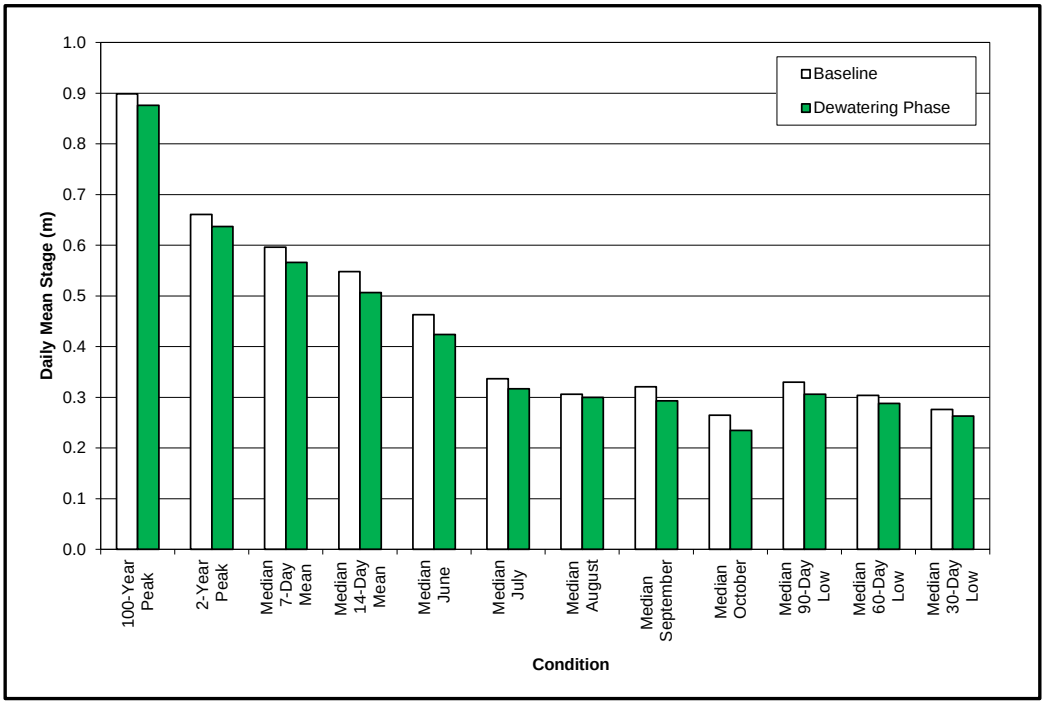

Figure 6-E-19: Derived Stage Regimes at Lake A5 during the Dewatering Phase

6.E-5.2.4 Lake A69

- Discharges: mean monthly discharges are expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 1% from the baseline value and the 100-year flood discharge is expected to remain similar to the baseline value. Low discharges are expected to decrease from 1 to 6% from the baseline values. Derived discharge regimes are presented in Figure 6-E-20 for the baseline and dewatering phases.

- Water levels: mean monthly water levels are also expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

- The 2-year and 100-year flood levels are expected to remain similar to the baseline values. Mean monthly water levels are expected to remain similar to baseline values in May, decrease by 0.004 m in June, decrease by 0.003 m in July, remain similar to baseline values in August, decrease by 0.003 m in September, and decrease by 0.004 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-21 for the baseline and dewatering phases.

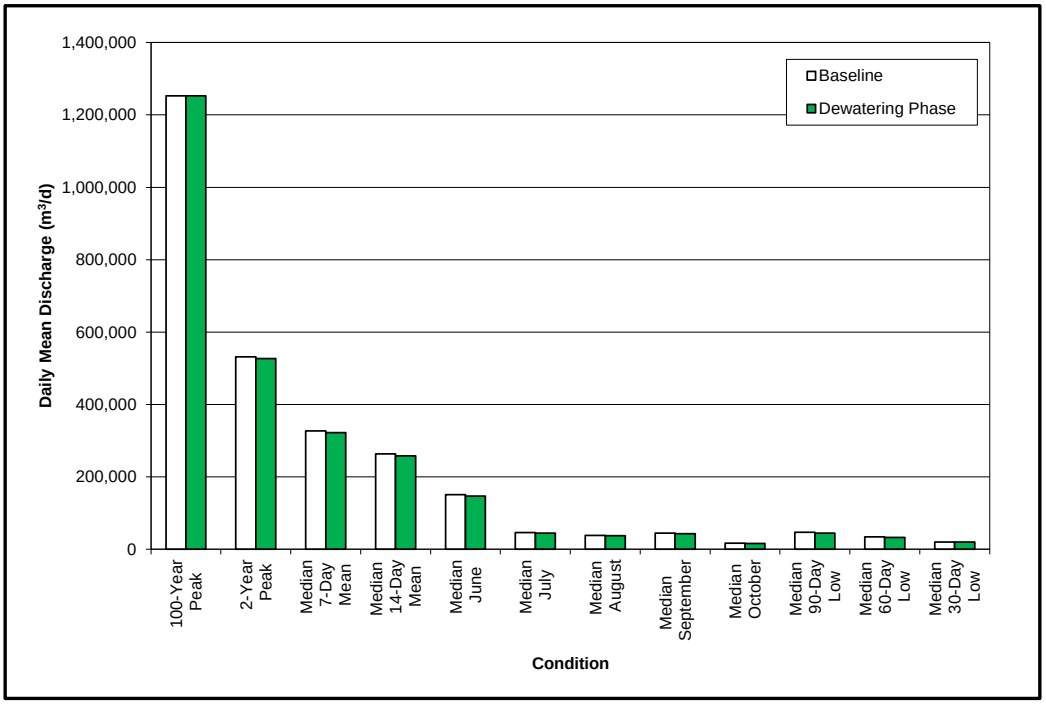

Figure 6-E-20: Derived Discharge Regimes at Lake A69 during the Dewatering Phase

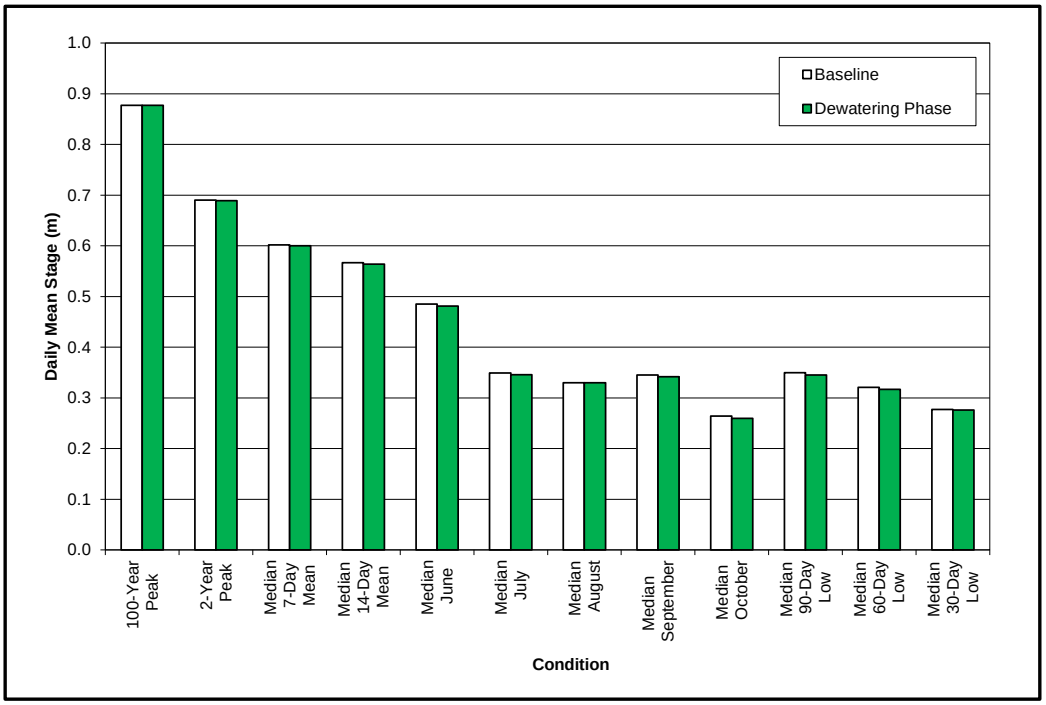

Figure 6-E-21: Derived Stage Regimes at Lake A69 during the Dewatering Phase

6.E-5.2.5 Lake C38 (Nemo Lake)

- Discharges: mean monthly discharges are expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year and 100-year flood discharges are expected to decrease by 1% from the baseline value. Low discharges are expected to decrease from 3 to 4% from the baseline values. Derived discharge regimes are presented in Figure 6-E-22 for the baseline and dewatering phases.

- Water levels: mean monthly water levels are also expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

- The 2-year and 100-year flood levels are expected to remain similar to the baseline values. Mean monthly water levels are expected to remain similar to baseline values in May, decrease by 0.006 m in June, decrease by 0.008 m in July, decrease by 0.007 m in August, decrease by 0.006 m in September, and decrease by 0.003 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-23 for the baseline and dewatering phases.

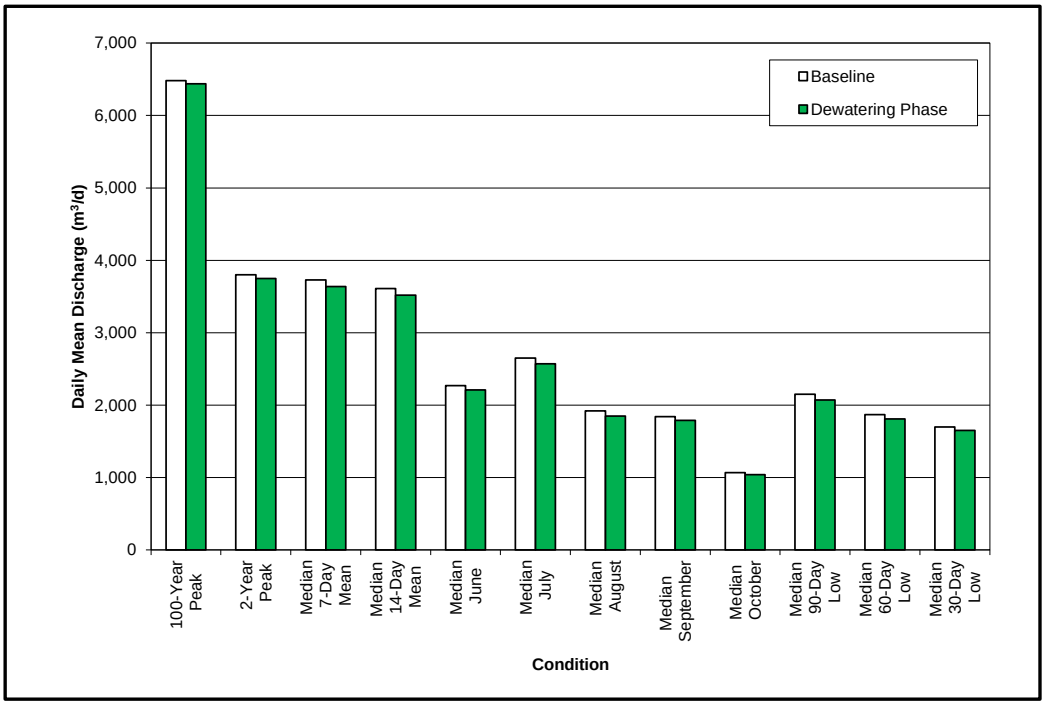

Figure 6-E-22: Derived Discharge Regimes at Lake C38 (Nemo Lake) during the Dewatering Phase

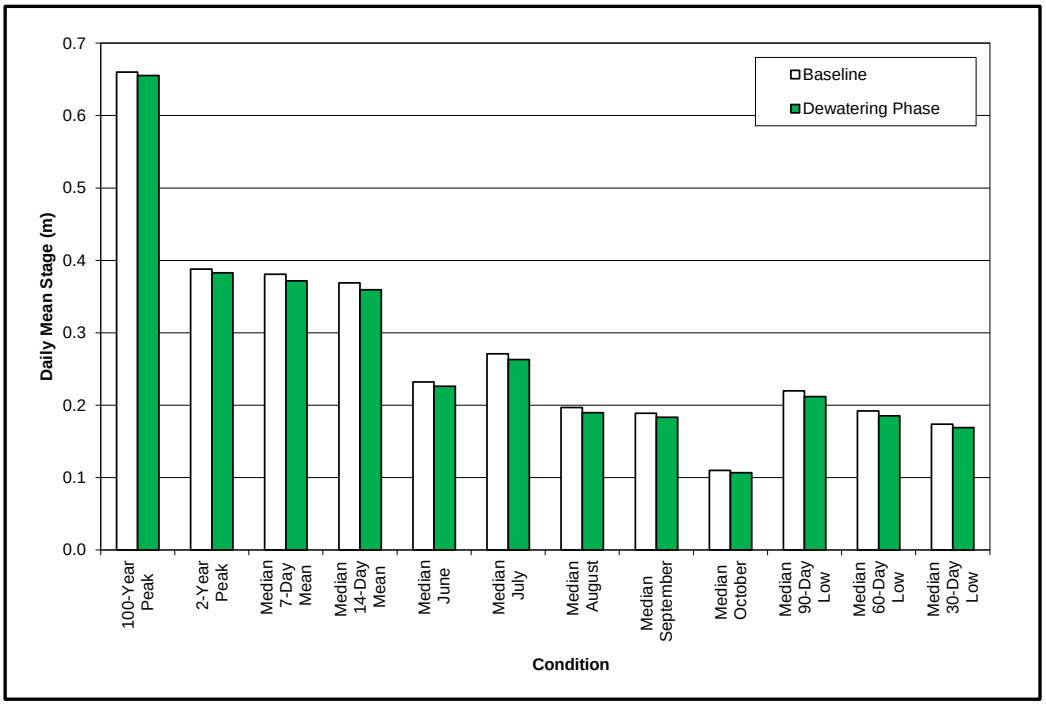

Figure 6-E-23: Derived Stage Regimes at Lake C38 (Nemo Lake) during the Dewatering Phase

6.E-5.3 Operational Phase

Potential effects on hydrological indicators are presented below for Lake A16 (Mammoth Lake), Lake A15, Lake A5, Lake A69, Lake C38 (Nemo Lake), and Lake C8. Methods are presented in Attachment A.

Lake A45 was not explicitly modeled. During the operational phase, the diversion of Whale Tail Lake (South Basin) will increase the drainage area of Lake A45 by approximately 44 times, from 0.535 km^2 under baseline conditions, to 23.7 km^2 under operational conditions. Lake A45 will become part of the Whale Tail Lake (South Basin) diversion channel and be permanently altered.

Water levels mentioned herein refer to water surface elevations. Stages presented in figures below represent water surface elevations referenced to an arbitrary datum.

6.E-5.3.1 Lake A16 (Mammoth Lake)

- Discharges: mean monthly discharges are expected to increase slightly from the baseline values during the months of June and September, and decrease slightly during the month of July, and remain similar to baseline values during the months of May, August, and October.

  The 2-year flood discharge is expected to increase by 13% and the 100-year flood discharge is expected to increase by 8% from the baseline values. Low discharges are expected to increase from 2 to 3% from the baseline values. Derived discharge regimes are presented in Figure 6-E-24 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to increase slightly from the baseline values during the months of June and September, and decrease slightly during the month of July, and remain similar to baseline values during the months of May, August, and October.

  The 2-year flood level is expected to increase by 0.04 m, and the 100-year flood level is expected to increase by 0.03 m from the baseline values. Mean monthly water levels are expected to increase by 0.01 m in June, by 0.01 m in September, decrease by 0.02 m in July, and remain similar to the baseline values in May, August, and October. Derived water level regimes are presented in Figure 6-E-25 for the baseline and operational phases.

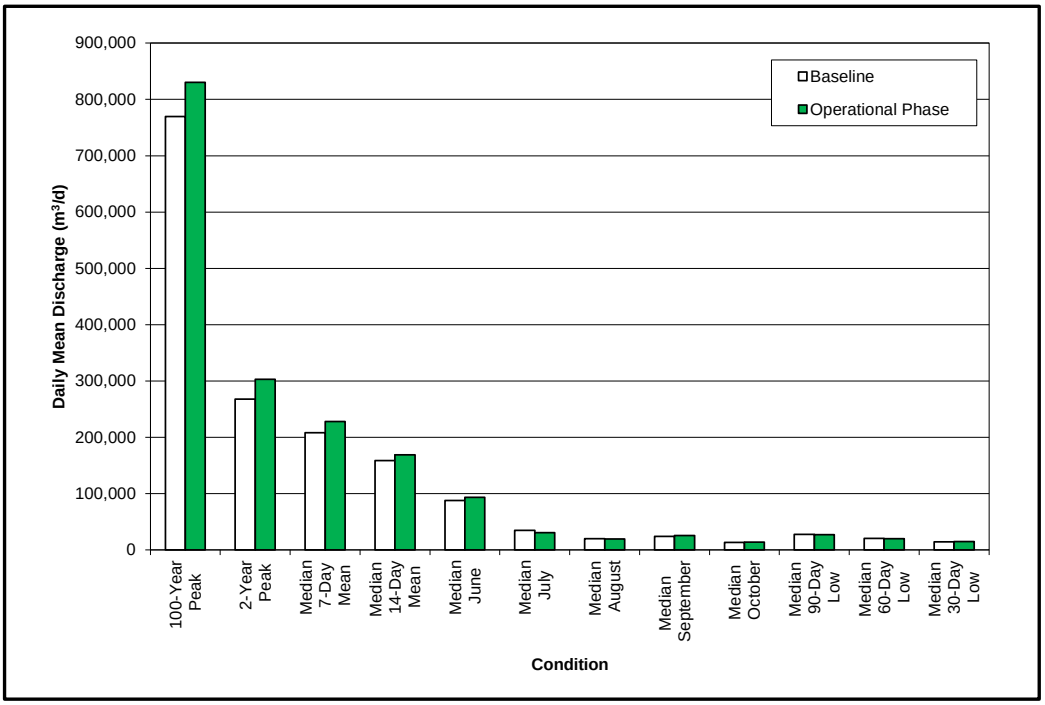

Figure 6-E-24: Derived Discharge Regimes at Lake A16 (Mammoth Lake) during the Operational Phase

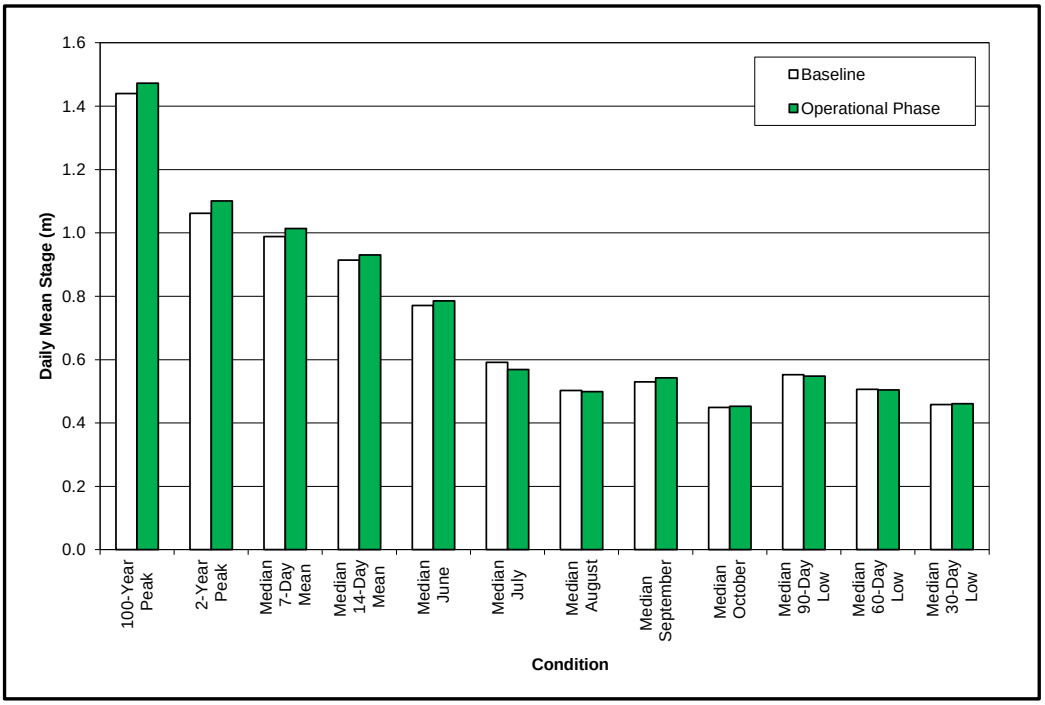

Figure 6-E-25: Derived Stage Regimes at Lake A16 (Mammoth Lake) during the Operational Phase

6.E-5.3.2 Lake A15

- Discharges: mean monthly discharges are expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to increase by 12% and the 100-year flood discharge is expected to increase by 7% from the baseline values. Low discharges are expected to decrease by up to 5% from the baseline values. Derived discharge regimes are presented in Figure 6-E-26 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood level is expected to increase by 0.02 m, and the 100-year flood level is expected to increase by 0.01 m from the baseline values. Derived water level regimes are presented in Figure 6-E-27 for the baseline and operational phases.

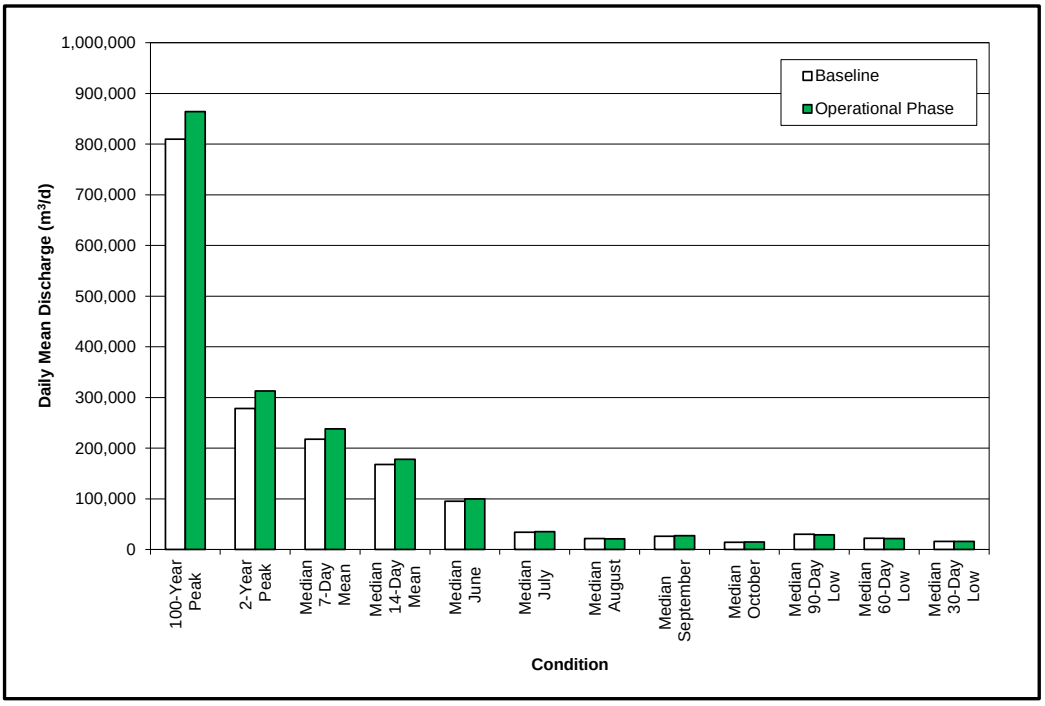

Figure 6-E-26: Derived Discharge Regimes at Lake A15 during the Operational Phase

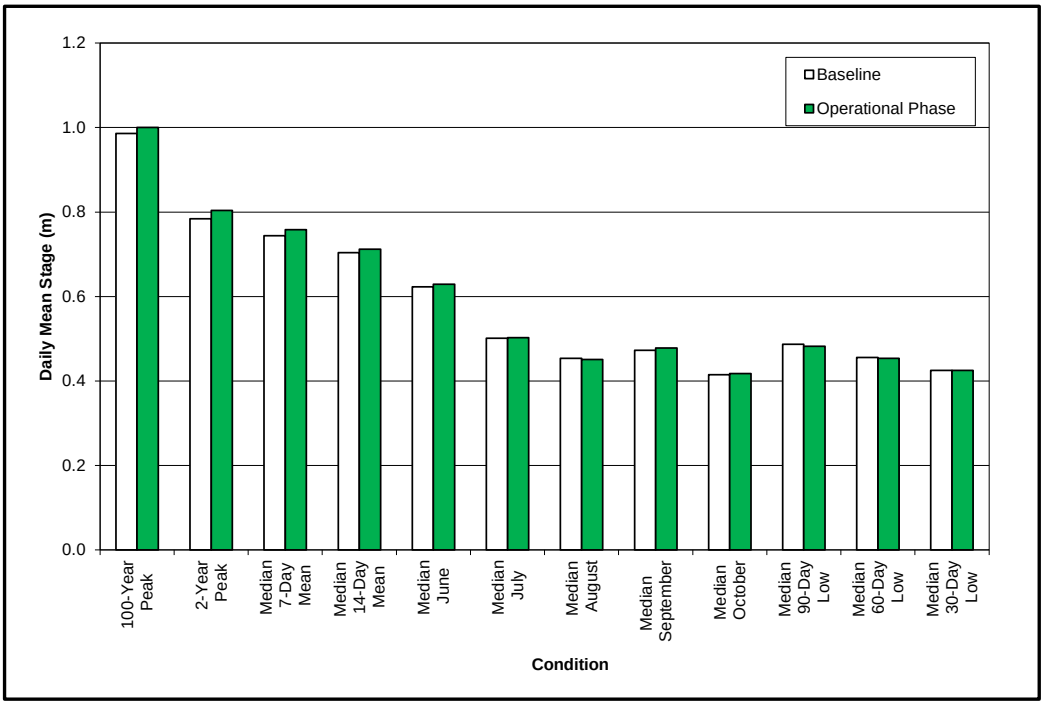

Figure 6-E-27: Derived Stage Regimes at Lake A15 during the Operational Phase

6.E-5.3.3 Lake A5

- Discharges: mean monthly discharges are expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to increase by 2% and the 100-year flood discharge is expected to increase by 3% from the baseline values. Low discharges are expected to decrease from 3 to 5% from the baseline values. Derived discharge regimes are presented in Figure 6-E-28 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year and 100-year flood level are expected to remain similar to the baseline values. Derived water level regimes are presented in Figure 6-E-29 for the baseline and operational phases.

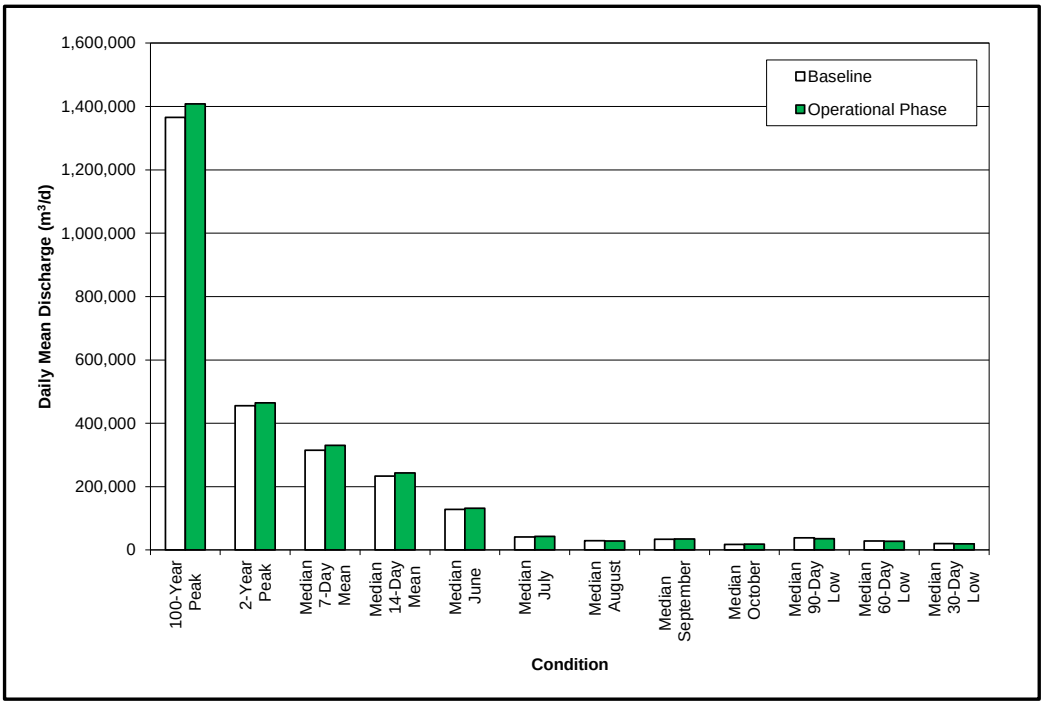

Figure 6-E-28: Derived Discharge Regimes at Lake A5 during the Operational Phase

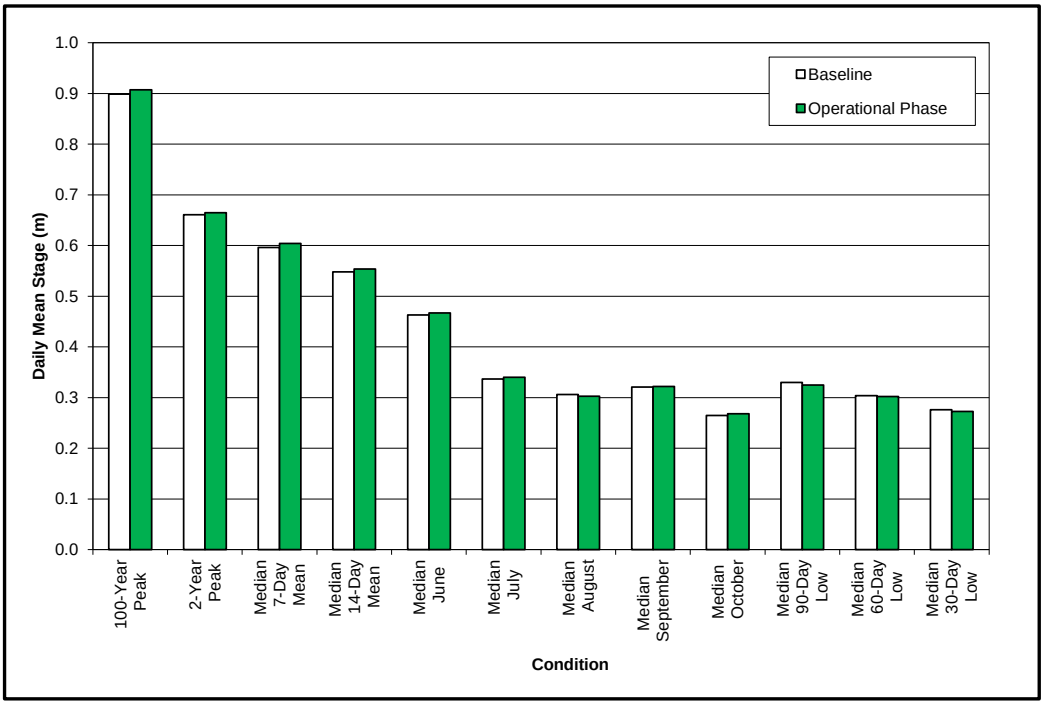

Figure 6-E-29: Derived Stage Regimes at Lake A5 during the Operational Phase

6.E-5.3.4 Lake A69

- Discharges: mean monthly discharges are expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood and 100-year flood discharges are expected to remain similar to the baseline value. Low discharges are expected to decrease from 1 to 4% from the baseline values. Derived discharge regimes are presented in Figure 6-E-30 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to remain similar to the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood and 100-year level are expected to remain similar to baseline values. Derived water level regimes are presented in Figure 6-E-31 for the baseline and operational phases.

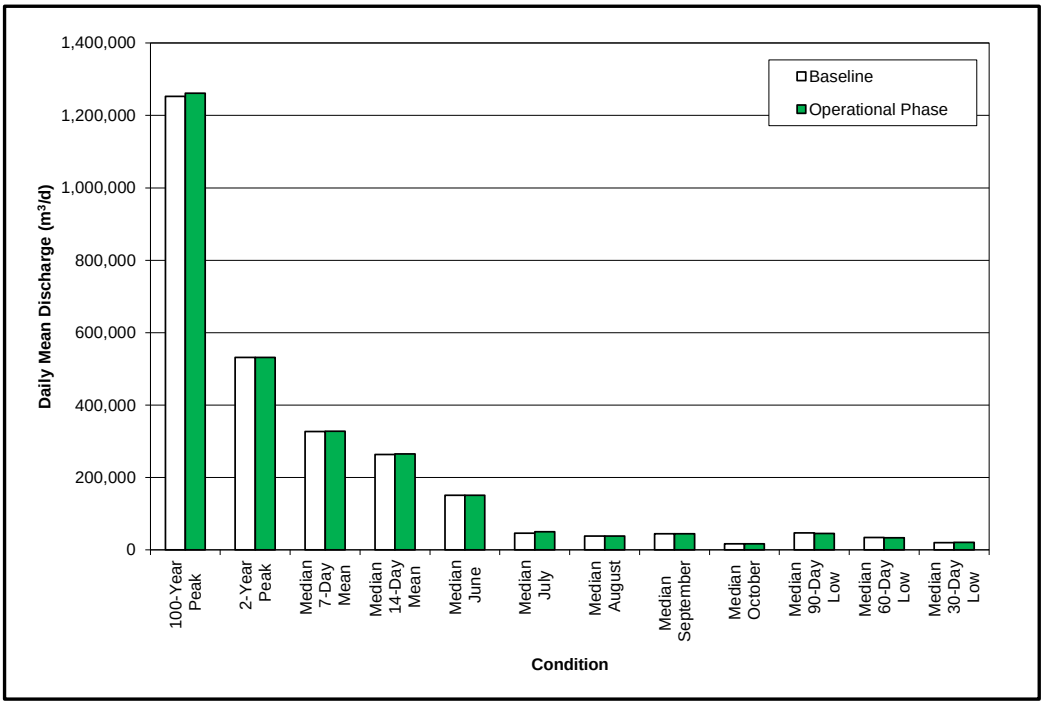

Figure 6-E-30: Derived Discharge Regimes at Lake A69 during the Operational Phase

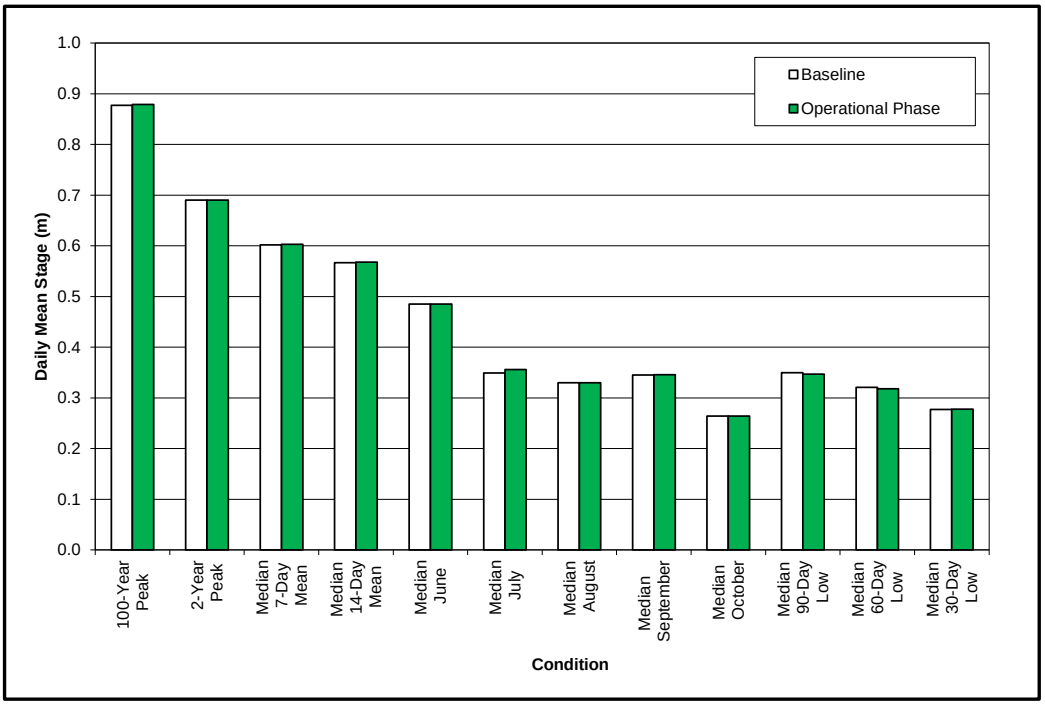

Figure 6-E-31: Derived Stage Regimes at Lake A69 during the Operational Phase

6.E-5.3.5 Lake C38 (Nemo Lake)

- Discharges: mean monthly discharges are expected to increase from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to increase by 22% and the 100-year flood discharge is expected to increase by 36% from the baseline values. Low discharges are expected to increase by 33 to 36% from the baseline values. Derived discharge regimes are presented in Figure 6-E-32 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to increase from the baseline values during the months of May, June, July, August, September, and October.

The 2-year flood level is expected to increase by 0.09 m, and the 100-year flood level is expected to increase by 0.24 m from the baseline values. Mean monthly water levels are expected to remain similar to baseline values in May, increase by 0.05 m in June, 0.08 m in July, 0.07 m in August, 0.07 m in September, and 0.04 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-33 for the baseline and operational phases.

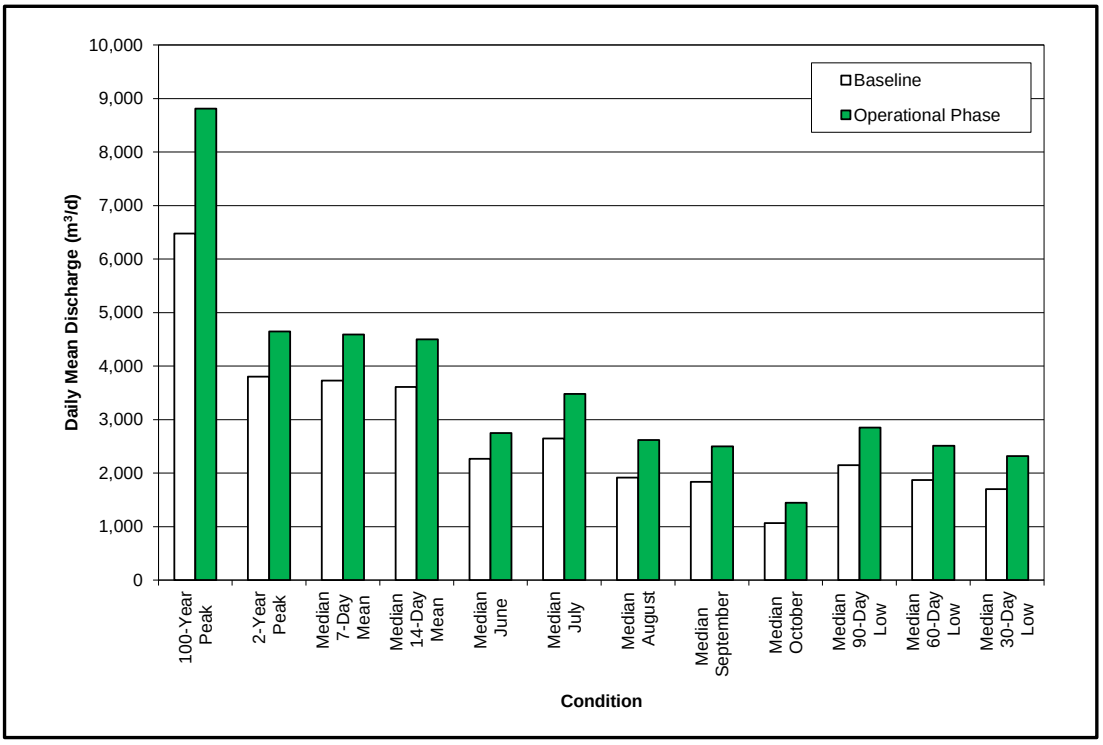

Figure 6-E-32: Derived Discharge Regimes at Lake C38 (Nemo Lake) during the Operational Phase

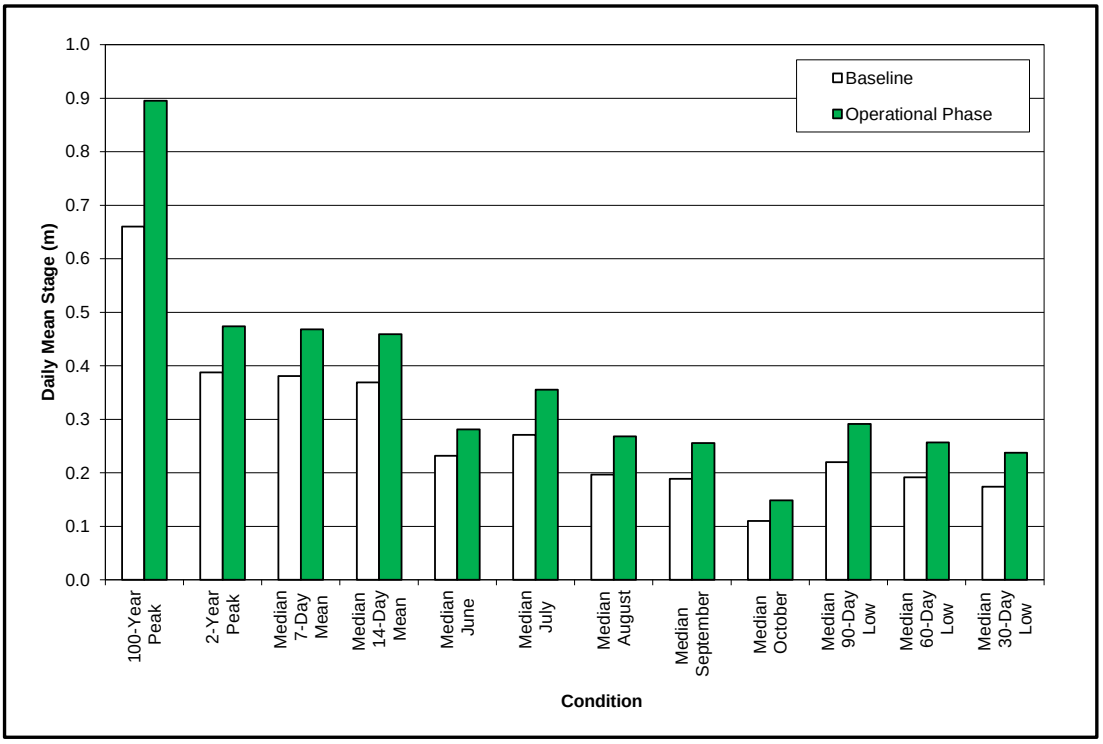

Figure 6-E-33: Derived Stage Regimes at Lake C38 (Nemo Lake) during the Operational Phase

6.E-5.3.6 Lake C8

- Discharges: mean monthly discharges are expected to increase slightly from the baseline values during the months of July, August, September, and October, and remain similar to the baseline values during the months of May and June.

  The 2-year flood discharge is expected to increase by 2% and the 100-year flood discharge is expected to increase by 1% from the baseline values. Low discharges are expected to increase by 12 to 24% from the baseline values. Derived discharge regimes are presented in Figure 6-E-34 for the baseline and operational phases.

- Water levels: mean monthly water levels are also expected to increase slightly from the baseline values during the months of July, August, September, and October, and remain similar to the baseline values during the months of May and June.

  The 2-year flood level is expected to increase by 0.002 m, and the 100-year flood level is expected to increase by 0.002 m from the baseline values. Mean monthly water levels are expected to increase by 0.01 m in July, 0.01 m in August, 0.01 m in September, and 0.01 m in October. Derived water level regimes are presented in Figure 6-E-35 for the baseline and operational phases.

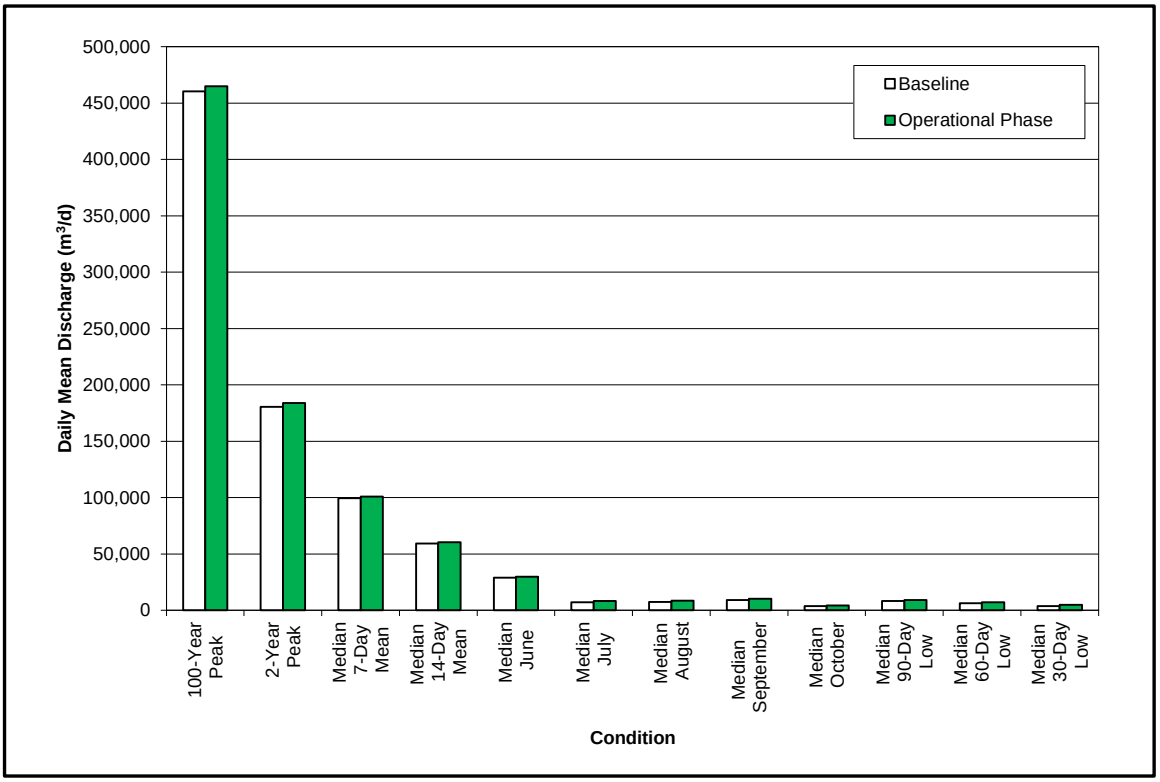

Figure 6-E-34: Derived Discharge Regimes at Lake C8 during the Operational Phase

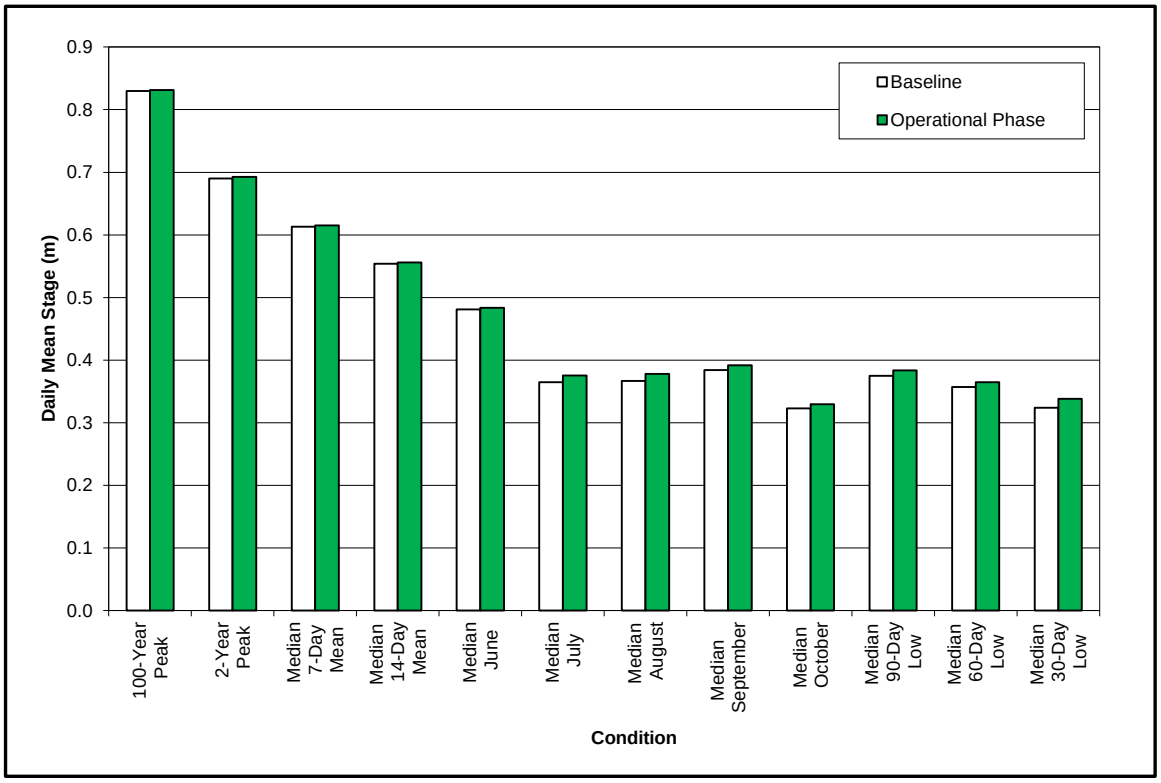

Figure 6-E-35: Derived Stage Regimes at Lake C8 during the Operational Phase

6.E-5.4 Closure Phase

Potential effects on hydrological indicators are presented below for Lake A16 (Mammoth Lake), Lake A15, Lake A5, and Lake A69. Methods are presented in Attachment A.

Water levels mentioned herein refer to water surface elevations. Stages presented in figures below represent water surface elevations referenced to an arbitrary datum.

6.E-5.4.1 Lake A16 (Mammoth Lake)

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of May, June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 56% and the 100-year flood discharge is expected to decrease by 53% from the baseline values. Low discharges are expected to decrease by approximately 69% from the baseline values for the entire season. Derived discharge regimes are presented in Figure 6-E-36 for the baseline and closure phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the entire open water season.

  The 2-year flood level is expected to decrease by 0.23 m, and the 100-year flood level is expected to decrease by 0.28 m from the baseline values. Mean monthly water levels are expected to decrease slightly in May, by 0.20 m in June, 0.20 m in July, 0.14 m in August, 0.14 m in September, and 0.12 m in October,

from the baseline values. Derived water level regimes are presented in Figure 6-E-37 for the baseline and closure phases.

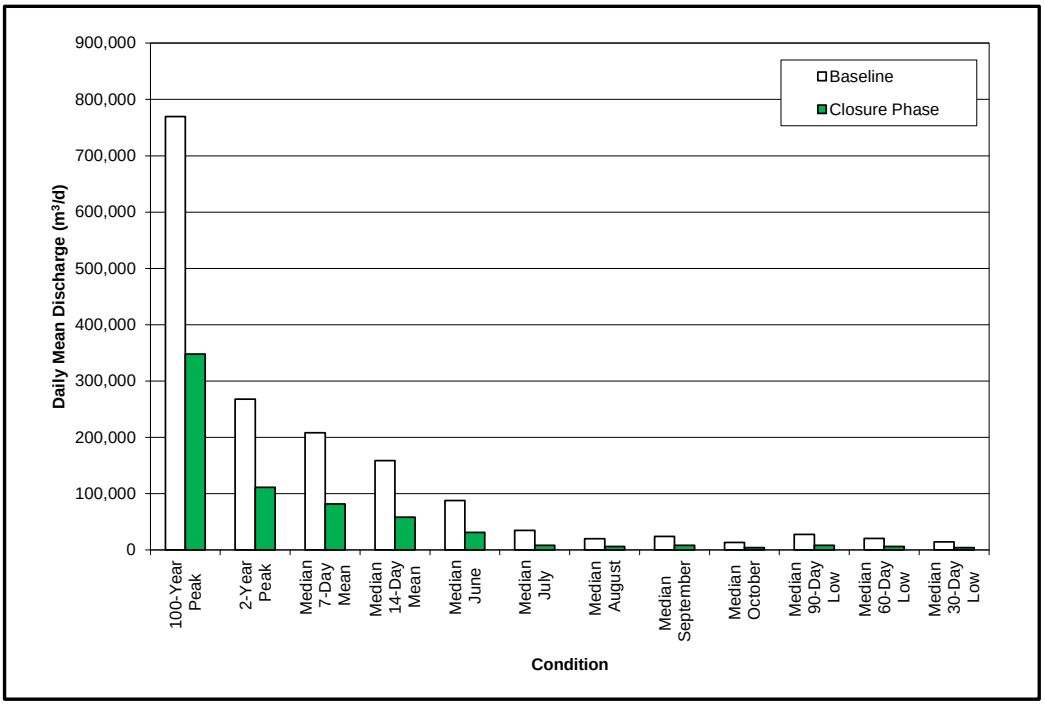

Figure 6-E-36: Derived Discharge Regimes at Lake A16 (Mammoth Lake) during the Closure Phase

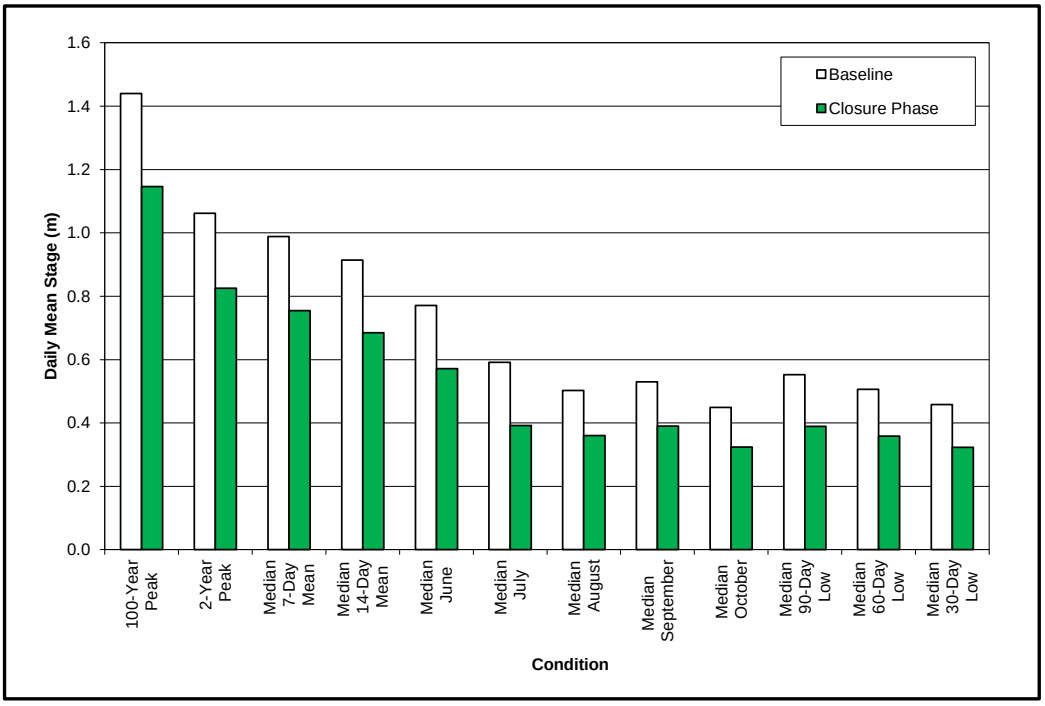

Figure 6-E-37: Derived Stage Regimes at Lake A16 (Mammoth Lake) during the Closure Phase

6.E-5.4.2 Lake A15

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 49% and the 100-year flood discharge is expected to decrease by 43% from the baseline values. Low discharges are expected to decrease by approximately 63% from the baseline values for the entire season. Derived discharge regimes are presented in Figure 6-E-38 for the baseline and closure phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year flood level is expected to decrease by 0.40 m, and the 100-year flood level is expected to decrease by 0.58 m from the baseline values. Mean monthly water levels are expected to decrease slightly in May, by 0.26 m in June, 0.20 m in July, 0.14 m in August, 0.14 m in September, and 0.11 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-39 for the baseline and closure phases.

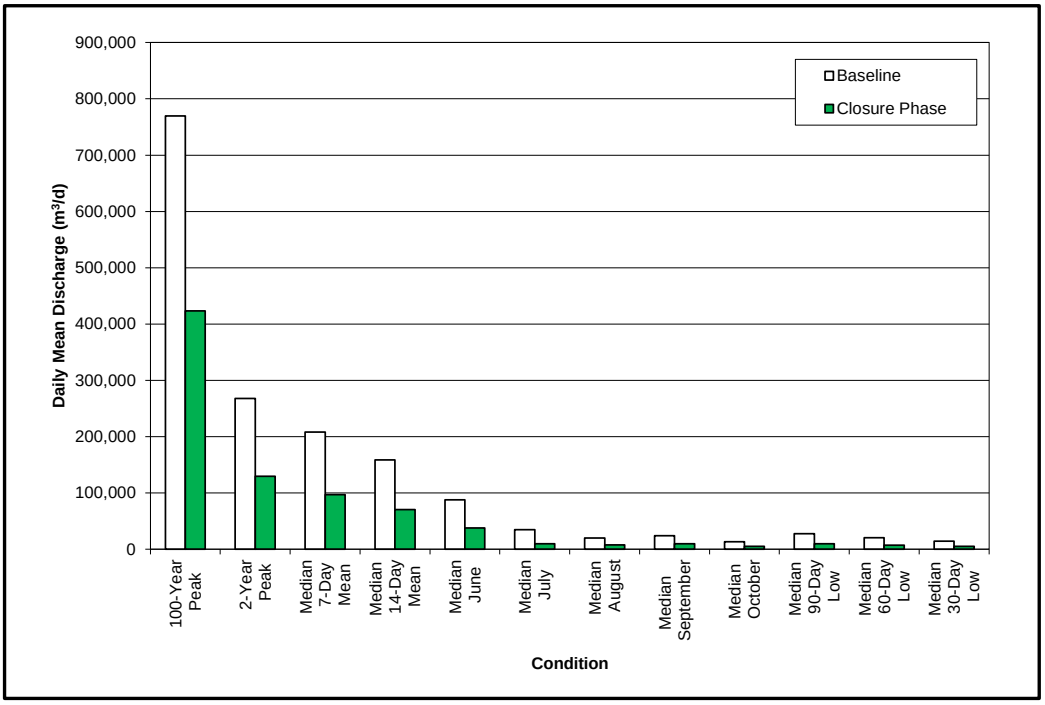

Figure 6-E-38: Derived Discharge Regimes at Lake A15 during the Closure Phase

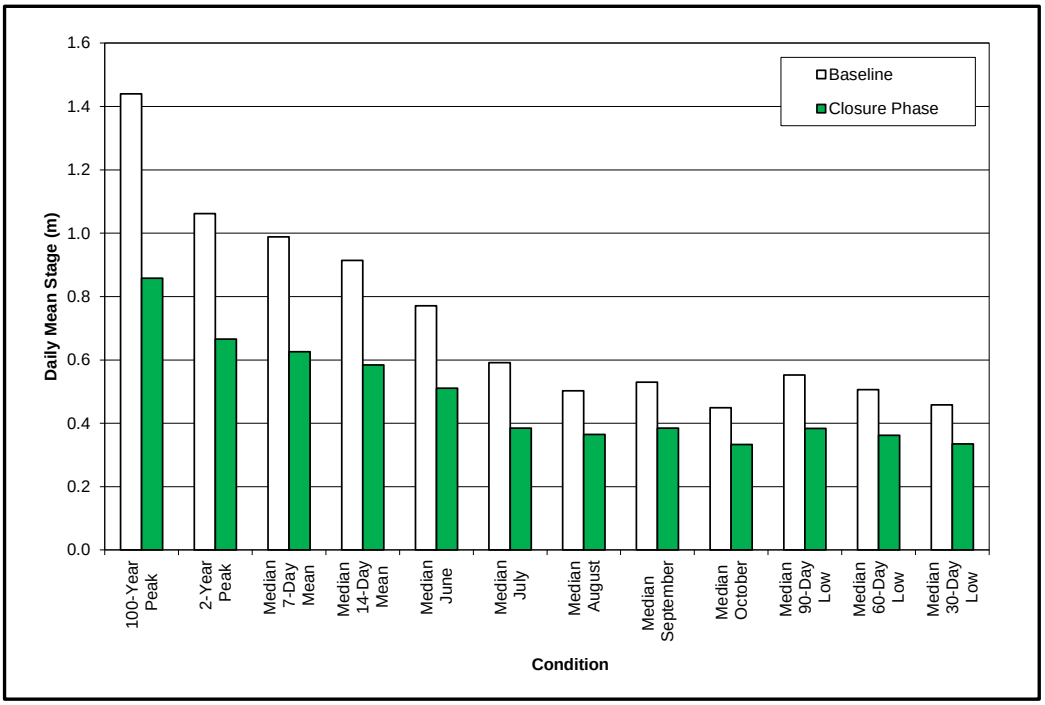

Figure 6-E-39: Derived Stage Regimes at Lake A15 during the Closure Phase

6.E-5.4.3 Lake A5

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year flood discharge is expected to decrease by 22% and the 100-year flood discharge is expected to decrease by 20% from the baseline values. Low discharges are expected to decrease by 48 to 53% from the baseline values. Derived discharge regimes are presented in Figure 6-E-40 for the baseline and closure phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year flood level is expected to decrease by 0.04 m, and the 100-year flood level is expected to decrease by 0.05 m from the baseline values. Mean monthly water levels are expected to remain similar in May, and decrease by 0.06 m in June, 0.07 m in July, 0.05 m in August, 0.04 m in September, and 0.04 m in October, from the baseline values. Derived water level regimes are presented in Figure 6-E-41 for the baseline and closure phases.

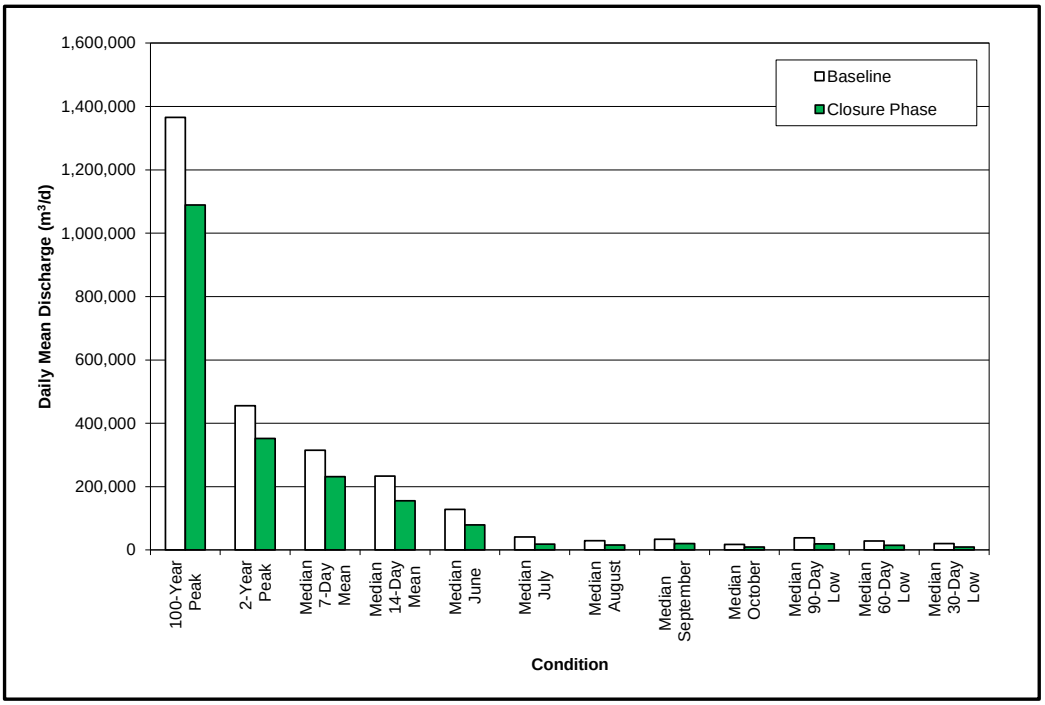

Figure 6-E-40: Derived Discharge Regimes at Lake A5 during the Closure Phase

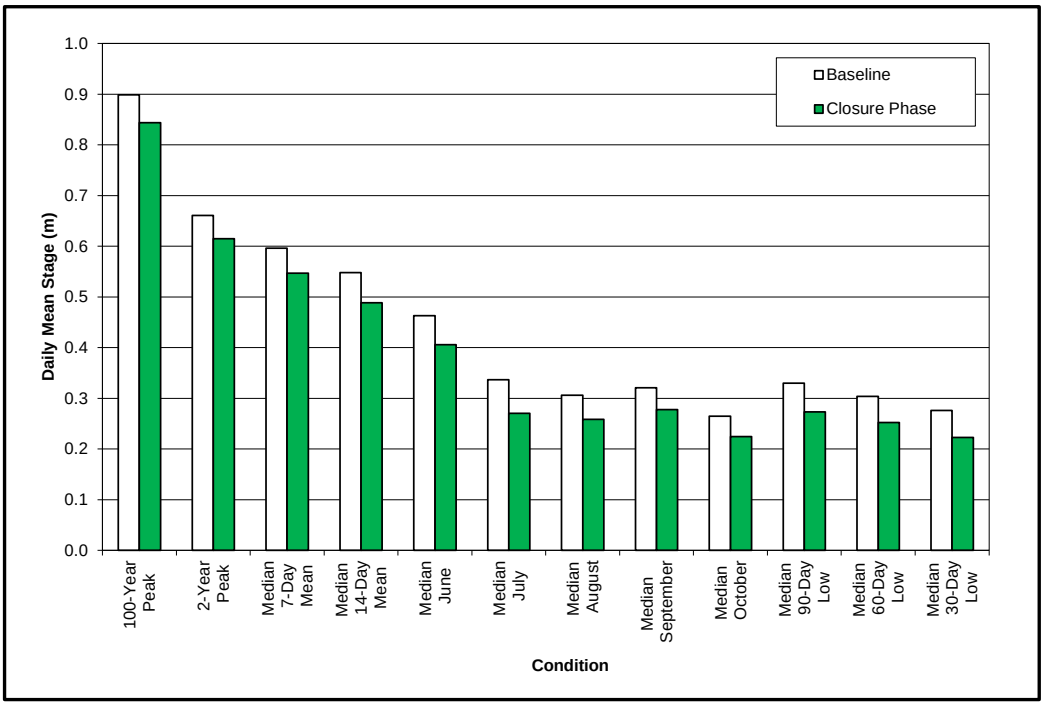

Figure 6-E-41: Derived Stage Regimes at Lake A5 during the Closure Phase

6.E-5.4.4 Lake A69

- Discharges: mean monthly discharges are expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year and the 100-year flood discharges are expected to decrease by 1% from the baseline value. Low discharges are expected to decrease by 8% to 9% from the baseline values. Derived discharge regimes are presented in Figure 6-E-42 for the baseline and closure phases.

- Water levels: mean monthly water levels are also expected to decrease from the baseline values during the months of June, July, August, September, and October.

  The 2-year and 100-year flood levels are expected to be slightly below the baseline values. Mean monthly water levels are expected to remain similar to baseline values throughout the entire open water season, with less than 0.01 m decrease. Derived water level regimes are presented in Figure 6-E-43 for the baseline and closure phases.

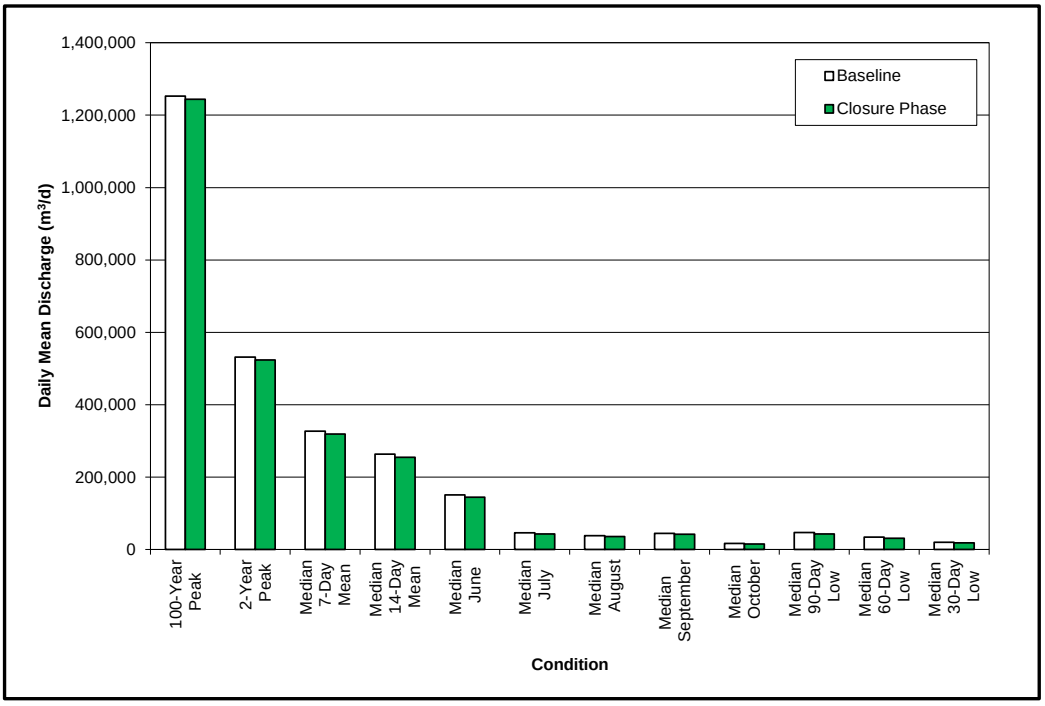

Figure 6-E-42: Derived Discharge Regimes at Lake A69 during the Closure Phase

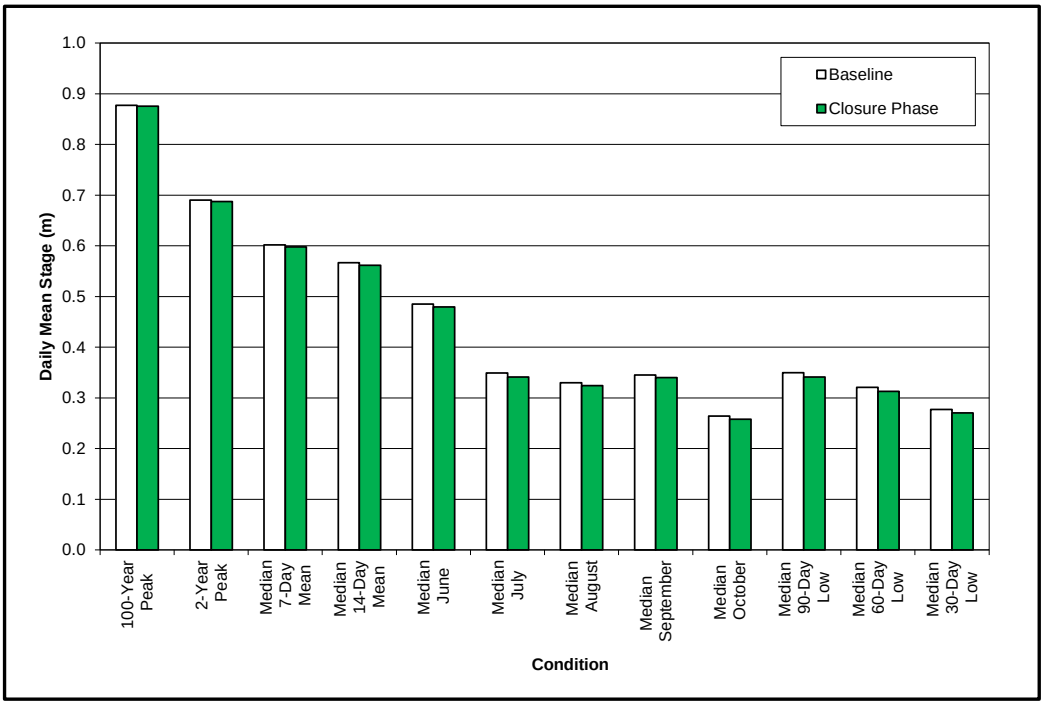

Figure 6-E-43: Derived Stage Regimes at Lake A69 during the Closure Phase

6.E-5.5 Post-Closure Phase

Potential effects on hydrological indicators are presented below for Lake A17 (Whale Tail Lake). Methods are presented in Attachment A.

Water levels mentioned herein refer to water surface elevations. Stages presented in figures below represent water surface elevations referenced to an arbitrary datum.

Discharge and water level regimes at post-closure are expected be similar to baseline conditions (Figure 6-E-44, Figure 6-E-45).

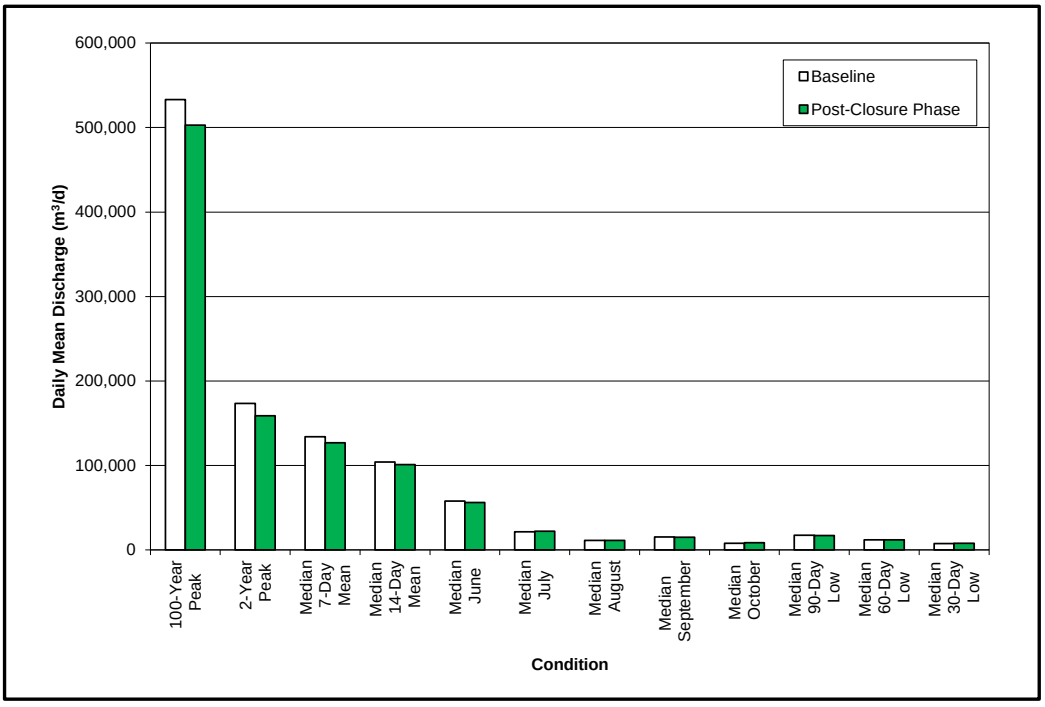

Figure 6-E-44: Derived Discharge Regimes at Lake A17 (Whale Tail Lake) during the Post-Closure Phase

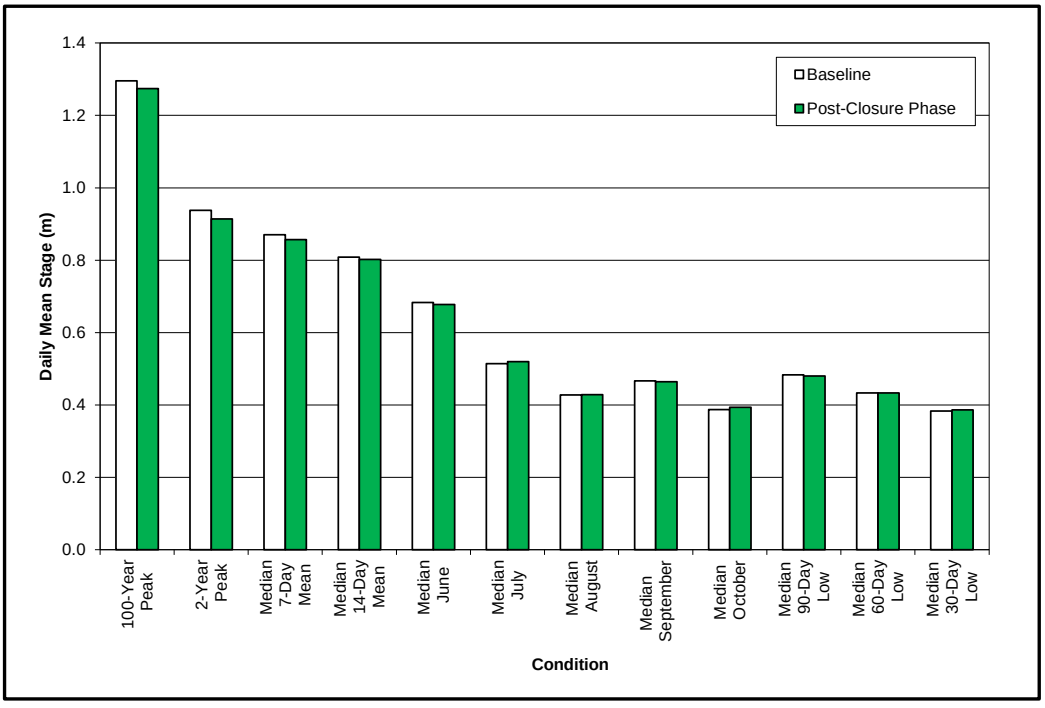

Figure 6-E-45: Derived Stage Regimes at Lake A17 (Whale Tail Lake) during the Post-Closure Phase

ATTACHMENT A

Construction Phase

The construction phase was assessed by modeling two reductions in drainage area, and modifying the baseline model, as follows:

- The local drainage area of Lake A17 (Whale Tail Lake) was reduced by the local drainage area of Whale Tail Lake (South Basin) (i.e., upstream of the Whale Tail Dike), shown in green in Figure A-1, and local tributaries of Whale Tail Lake (South Basin) over the modeling period. A first iteration of results was provided under this condition.
- The drainage area upstream of the Mammoth Dike was removed from the total drainage area of Lake A16 (Mammoth Lake), in September and October, over the modeling period. Water levels of Whale Tail Lake (North Basin) and downstream lakes prior to spring melt were re-set to the water level from the first iteration (described above) at the beginning of each year to prevent underestimation of water levels prior to the construction of the Mammoth Dike in September.

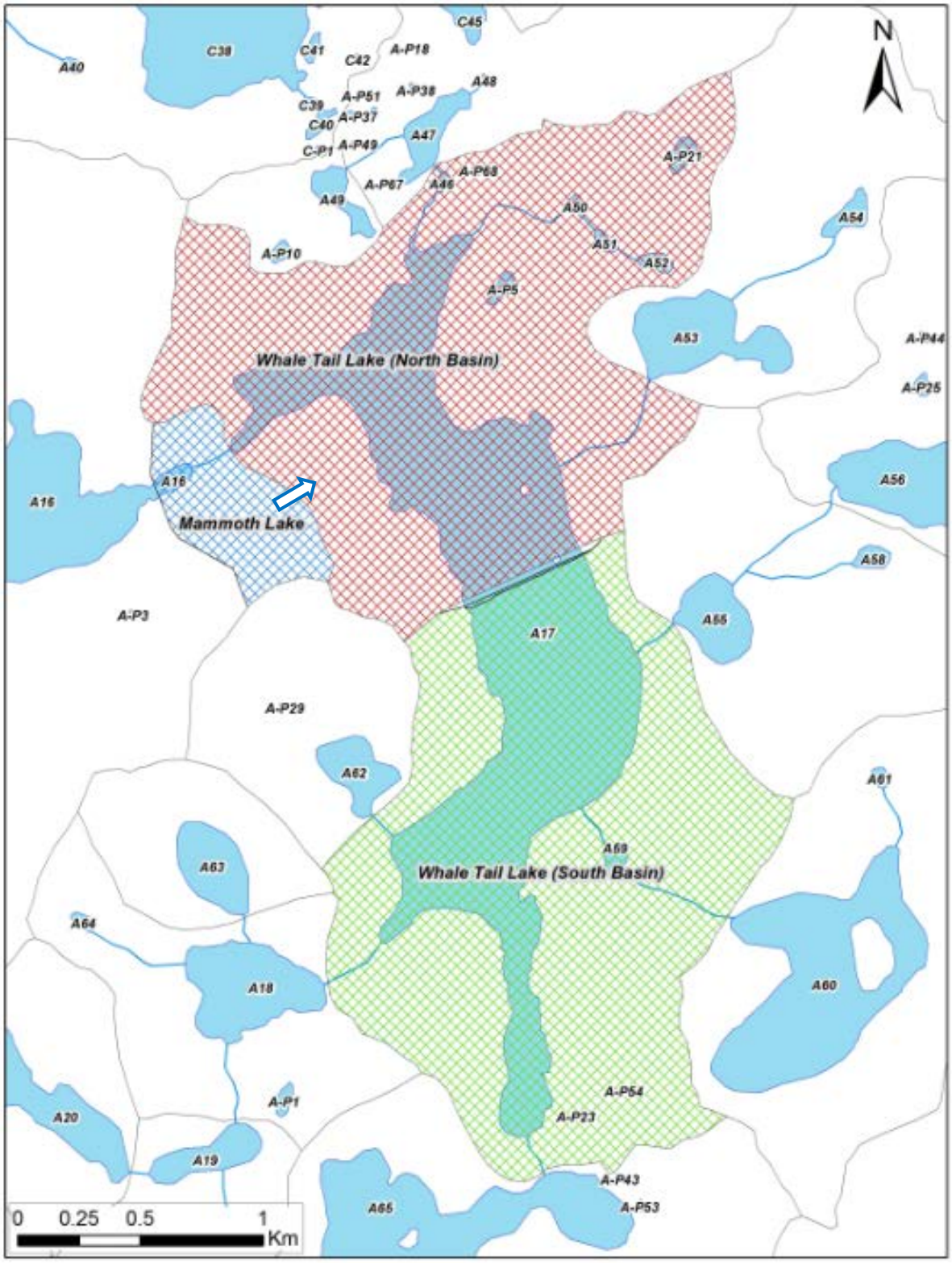

Figure A-1: Whale Tail Lake (South Basin) Local Watershed

Dewatering Phase

The dewatering phase was assessed by modifying the baseline model as follows:

- The Whale Tail Lake outlet was disconnected from Lake A16 (Mammoth Lake), to simulate the Mammoth Dike.
- The local lake area of the Lake A16 (Mammoth Lake) watershed was decreased by 0.012 km^2, to simulate the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed.
- The local land area of the Lake A16 (Mammoth Lake) watershed was decreased by 1.229 km^2, to simulate the cumulative effects of the Whale Tail WRSF Dike (i.e., a loss of 1.162 km^2 in land area), the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed (i.e., a loss of 0.344 km^2 in land area), and of the runoff diversion from the North Channel to Lake A16 (Mammoth Lake) (i.e., an increase of 0.277 km^2). While construction of the North Channel is scheduled in August 2019, this modification in land area was applied over the whole year. This may theoretically result in slightly overestimated discharges in June and July; however, this increase is not expected to significantly alter results or conclusions of the assessment.
- Inflows were added to Lake A16 (Mammoth Lake), following the pumping schedule presented in Table A-1, to simulate dewatering through Lake A16 (Mammoth Lake). Inflow volumes were obtained from the water management team on a monthly basis, and were distributed using a daily average rate for each month.
- 8,760 m^3 of water per year was pumped from Lake C38 (Nemo Lake), distributed using a daily average rate, to simulate freshwater intake from Lake C38 (Nemo Lake).

Table A-1: Dewatering Volumes to Lake A16 (Mammoth Lake) during the Dewatering Phase

Date	Volume (m^3)
June 2019	720,000
July 2019	689,829
August 2019	32,002
September 2019	137,031

m^3 = cubic metre

Operational Phase

The operational phase was assessed by modifying the baseline model as follows:

- The Whale Tail Lake outlet was disconnected from Lake A16 (Mammoth Lake), to simulate the Mammoth Dike.
- The local lake area of the Lake A16 (Mammoth Lake) watershed was decreased by 0.012 km^2, to simulate the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed.
- The local land area of the Lake A16 (Mammoth Lake) watershed was decreased by 0.067 km^2, to simulate the cumulative effects of the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed (i.e., a loss of 0.344 km^2 in land area), and of the runoff diversion from the North Channel to Lake A16 (Mammoth Lake) (i.e., an increase of 0.277 km^2).
- Inflows were added to Lake A16 (Mammoth Lake), following the pumping schedule presented in Table A-2, to simulate discharge of the Water Treatment Plant to Lake A16 (Mammoth Lake). Inflow volumes were derived from the water management plan (Volume 8, Appendix 8-B.2) and diversion studies (Volume 6, Appendix 6-F) on a monthly basis, and were distributed using a daily average rate for each month.
- The local watershed area of Lake A20 was modified to include the local watershed area of Whale Tail Lake (South Basin) (i.e., 14.1 km^2 of local watershed area, inclusive of 4.10 km^2 of local lake area, 0.053 km^2 of local tributary area, and 9.95 km^2 of local land area), with inflows from the Lake A23, Lake A60, Lake A56, and Lake A53 (i.e., from the East Channel diversion) watersheds, and outflow to the Lake A16 (Mammoth Lake) watershed (Figure A-1). The rating curve of Lake A20 was not modified, assuming that the diversion channel connecting Lake A20 to Lake A45 will result in similar discharge regimes, in the absence of detailed design plans. The latter is not anticipated to affect conclusions herein.
- 118,625 m^3 of water per year was pumped from Lake C38 (Nemo Lake), distributed using a daily average rate, to simulate freshwater intake from Lake C38 (Nemo Lake).
- The local watershed area of Lake A47 was modified to include the local watershed area of the Northeast Sector (i.e., 1.85 km^2 of local watershed area, inclusive of 0.263 km^2 of local lake area, 0.041 km^2 of local tributary area, and 1.55 km^2 of local land area), with inflows from the Lake A49 watershed, and outflow to the Lake C38 (Nemo Lake) watershed (Figure A-2). The rating curve of Lake A47 was used to represent the resulting stage-discharge relationship for the Northeast Sector.

Table A-2: Dewatering Volumes to Lake A16 (Mammoth Lake) during the Operational Phase

Date	Volume (m^3)
June 2020 / 2021	194,806
July 2020 / 2021	15,602
August 2020 / 2021	28,465
September 2020 / 2021	101,263

m^3 = cubic metres

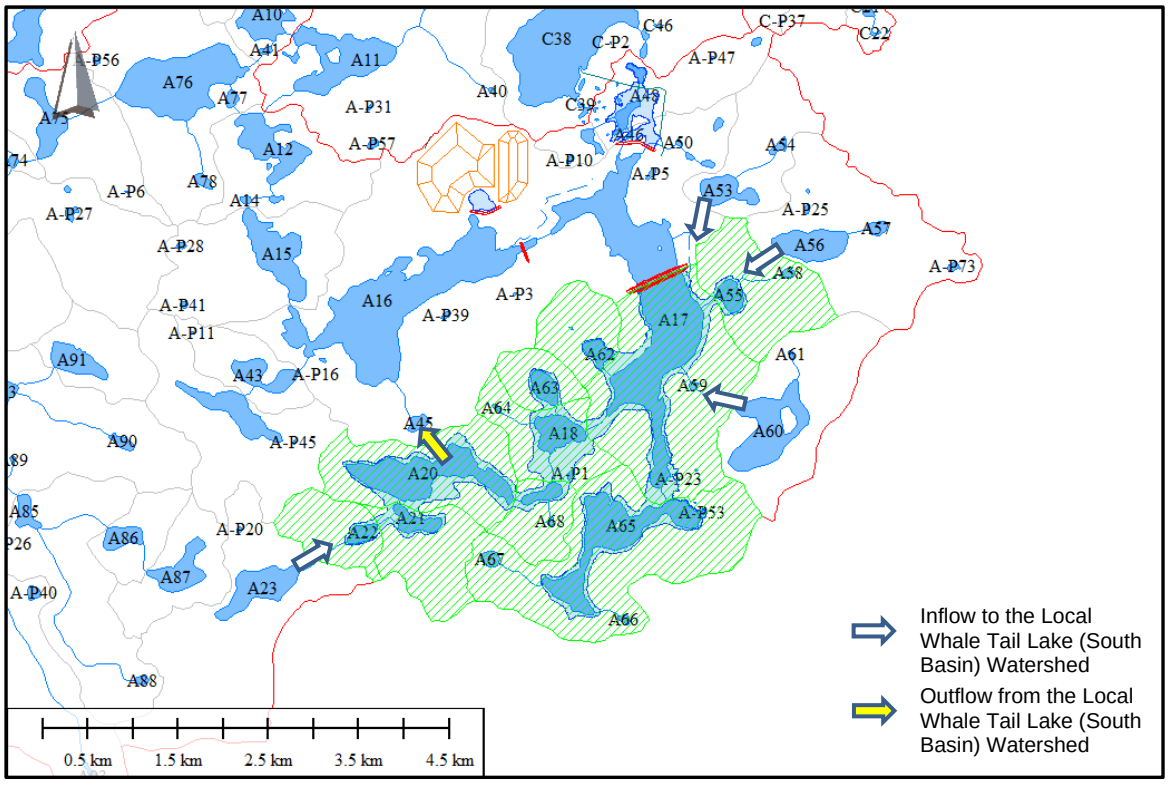

Figure A-2: Whale Tail Lake (South Basin) Local Watershed

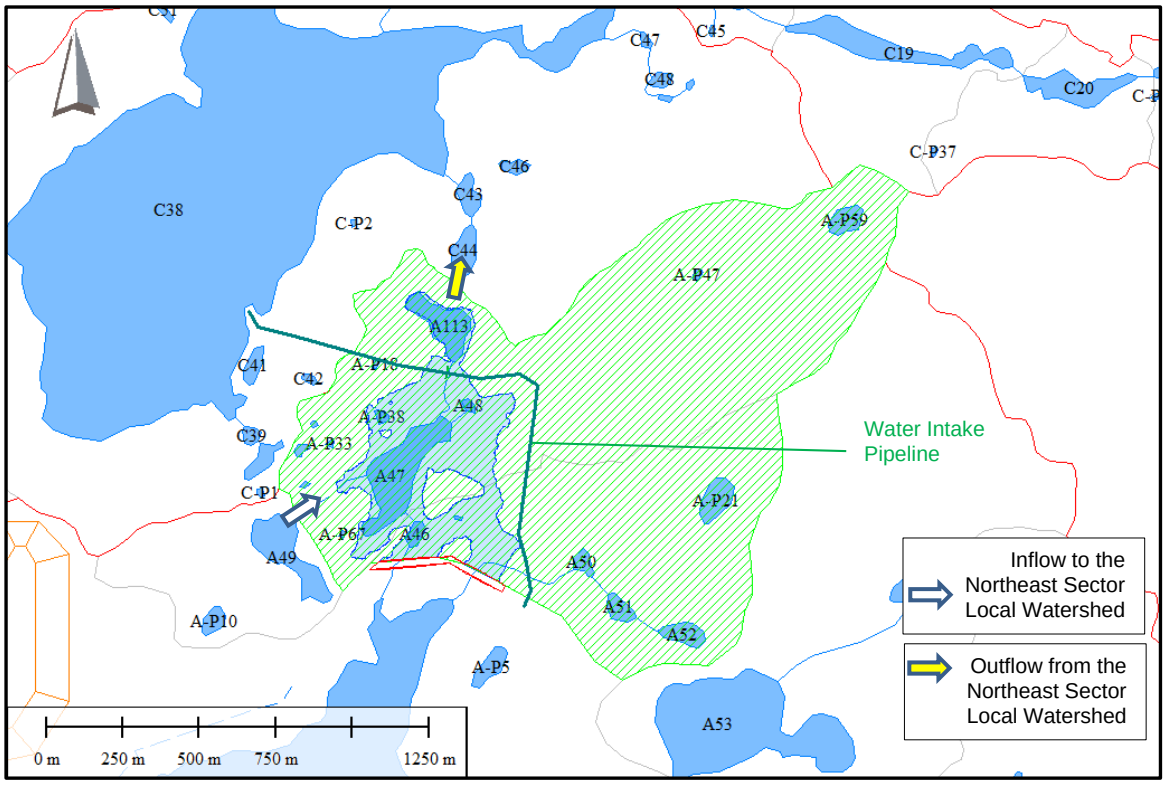

Figure A-3: Northeast Sector Local Watershed

Closure Phase

The closure phase was assessed by modifying the dewatering model (Section 6.E-3.2) as follows:

- The dewatering volumes from Whale Tail Lake were removed from input to Lake A16 (Mammoth Lake), to simulate refilling of the Whale Tail Lake (North Basin).
- The local lake area of the Lake A16 (Mammoth Lake) watershed was not changed from the dewatering model (i.e. decreased by 0.012 km^2 from the baseline model), to simulate the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed.
- The local land area of the Lake A16 (Mammoth Lake) watershed remained the same as in the dewatering model, that is decreased by 0.952 km^2, to simulate the cumulative effects of the Whale Tail WRSF Dike (i.e., a loss of 1.162 km^2 in land area), and the encroachment of the Mammoth Dike on the Lake A16 (Mammoth Lake) watershed (i.e., a loss of 0.344 km^2 in land area).

Post-Closure Phase

The post-closure phase was assessed by modifying the baseline model (Volume 6, Appendix 6-C) as follows:

- The surface area of Lake A17 (Whale Tail Lake) was increased from 1.66 km^2 to 1.87 km^2.