

# **Appendix A**

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## **Watercraft Use and Build Out Assumptions**

# Memo



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**Date:** April 6, 2018  
**To:** File  
**From:** Ascent Environmental  
**Subject:** Joint Fact-Finding Committee Watercraft Use Estimates

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## Introduction

The Joint Fact Finding (JFF) committee reviewed an January 18, 2017 memo that presented an approach to estimate watercraft use associated with moorings (buoys, boat houses, boat lifts, and slips), and an approach to estimate air pollution emissions from that boat use. The JFF committee also received a May 3, 2017 memo that described an estimate of boat use associated with boat ramps. Both of those memos incorporated JFF committee input during multiple meetings in 2016 and 2017. The final memo to the JFF committee, published on November 3, 2017, compiled the information from previous memos and additional information from a 2017 survey of engine use conducted by TRPA at public boat ramps. The additional survey data corroborated assumptions already developed with the JFF committee. While the original assumptions agreed to by the JFF committee included the approach to estimate air pollution emissions estimates, those assumptions were revised for the Shoreline Plan Environmental Impact Statement (EIS) analysis, as described in Chapter 4, "Air Quality," of the EIS.

Consequently, this memo has been revised to include only those assumptions agreed to by the JFF committee that were carried forward to the EIS. That information is organized here into two parts:

Part 1: Watercraft Use Associated with Moorings: This section presents an estimate of watercraft use associated with moorings.

Part 2: Watercraft Use Associated with New Boat Ramps: This section presents estimates of watercraft use associated with boat ramps.

The information in this memo will be used to evaluate the environmental effects of the Shoreline Plan alternatives in the environmental impact statement (EIS). This memo also allows the Shoreline Policy Committee to understand the incremental emissions associated with each additional mooring and launch facility, which can inform the development of the Shoreline Plan.

## Part 1: Watercraft Use Associated with Moorings

### Watercraft Use Levels

Under the Shoreline Plan, increases in the number of moorings (i.e., buoys, lifts, slips, and boathouses) would result in changes in watercraft use levels. Therefore, an estimate of the boat-hours per mooring (i.e.,

the hours that watercraft supported by each mooring are in operation) is necessary to estimate the emissions that would result from watercraft use associated with additional moorings. To estimate the boat-hours per mooring, the daily number of hours of boat use per mooring, by mooring type, was established for holidays, peak weekend days, peak weekdays, off-peak weekend days and off-peak weekday days. This was calculated for each mooring type using the following equation:

$$M \times U \times H = \text{Boat-hours}$$

M = the average number of watercraft per mooring

U = the percent of watercraft moored on the lake that are in use

H = hours of use per day

### Average Number of Watercraft per Mooring

The average number of watercraft per mooring was generated from boat use monitoring data collected by TRPA in the summers of 2014 and 2016 (TRPA 2016b). To measure the number of watercraft per mooring, TRPA divided the shoreline into grid cells and selected a series of cells as a representative sample of the shoreline (see attachment A). The TRPA boat crew then visited each of these cells during the morning hours. The data for the two years include peak holidays (including the Labor Day weekend and Fourth of July weekend), weekends (during the peak season of July 1 through Labor Day), weekdays (during the same peak season), off-peak weekends (during May, June, or after Labor Day – September 30), and off-peak weekdays (during the same off-peak period).

Within each grid cell, the total number of each type of mooring was counted, as well as the number of boats present on those moorings. This data was then summed for each type of day (e.g., weekend, weekday) to derive a percent occupied for each mooring type. The number of boat lifts, boathouses, and slips observed was relatively small, and the occupancy of these moorings are affected by lake levels, which were low during the survey periods. Therefore, a conservative estimate of 100 percent occupancy is proposed for these mooring types for all days. The resulting occupancy rates and average number of boats per mooring per type of day are presented in Table 1.

Day Type*	Buoys		Slips, Boatlifts, and Boathouses	
	Percent occupied	Boats per mooring	Percent occupied	Boats per mooring
Peak Holiday	63%	0.63	100%	1
Weekend	61%	0.61	100%	1
Weekday	59%	0.59	100%	1
Off-peak Weekend	48%	0.48	100%	1
Off-peak Weekday	22%	0.22	100%	1

\*Boat use monitoring data was filtered to include only morning surveys that occurred prior to 11:00am, and afternoon surveys that occurred between 12:00pm and 3:00pm to reflect peak times of watercraft use. Holidays in the TRPA dataset were defined as statutory holidays and adjoining weekend days. July 4 fell on a Friday or Monday in both survey years.

### Percent of Watercraft in Use

The percent of watercraft moored on the lake that are in use was derived from the same TRPA boat use monitoring data (TRPA 2016b). To measure the percent of the moored watercraft that were in use during each type of day, the TRPA boat crew revisited each grid cell during the peak time of day for boat use (noon – 3 pm). The difference between the number of boats observed in the morning and the number of boats

observed during the afternoon period reflected the percent of boats in use for any given day. The observed percentage of boats in use for each mooring type and each type of day are presented below. The monitoring data did not include observations of the percentage of boats in slips that were in use each day. This value was assumed to be equal to the level of use observed for boat lifts, because the convenience of accessing each of these mooring types is relatively similar.

Day Type	Buoys	Boat Lifts*	Boat Houses*	Slips
Peak Holiday	40%	36%	17%	36%
Weekend	40%	36%	17%	36%
Weekday	29%	16%	24%	16%
Off-peak Weekend	23%	3%	17%	3%
Off-peak Weekday	1%**	1%	1%	1%

\*Where zero boat use was observed, the estimate was increased to 1 percent to reflect a conservative estimate of use.  
 \*\* Insufficient data was available on watercraft use associated with buoys on off-peak weekdays therefore use was assumed to be consistent with other mooring types.

### Hours of Use per Day

The average hours of boat operation per day were derived from private watercraft records maintained by four Lake Tahoe marinas and compiled by the North Tahoe Marina. These records include data on engine hours at the beginning of the season (as watercraft are prepared for the boating season) and at the end of the season (as watercraft are winterized). For watercraft stored at marinas, data are also available on the number of trips taken by each watercraft during the season. For the watercraft for which this information is available (n = 115), the total hours of engine operation during 2016 are 2,927 and the total number of trips is 1,467, resulting in an average of 2 hours of use per trip (North Tahoe Marina 2017).

### Boat-hours per Mooring

The boat-hours per mooring were then calculated for each type of day based on the data and equation described above (see Table 3). The boat-hours per mooring for each type of day were then multiplied by the number of days within a typical boating season to generate the boating hours per mooring for the entire season, as shown in Table 4.

Day Type	Buoys	Boat Lifts	Boat Houses	Slips
Peak Holiday	0.50	0.71	0.33	0.72
Weekend	0.49	0.71	0.33	0.72
Weekday	0.35	0.33	0.47	0.32
Off-peak Weekend	0.22	0.06	0.33	0.06
Off-peak Weekday	0.01	0.02	0.02	0.02

Day Type	Buoys	Boat Lifts	Boat Houses	Slips
Peak Holiday	3.02	4.29	2.00	4.32
Weekend	7.65	11.22	5.24	11.31

Weekday	14.94	14.17	20.44	13.85
Off-peak Weekend	5.29	1.48	8.00	1.44
Off-peak Weekday	0.28	1.28	1.28	1.28
Entire Season*	31.18	32.44	36.96	32.21
*Boating Season is considered May 1 through September 30. It is assumed that each boating season includes 6 peak holidays, 16 weekends, 43 weekdays, 24 off-peak weekends, and 64 off-peak weekdays.				

## Part 2: Watercraft Use Associated with New Boat Ramps

The Shoreline Plan could authorize construction of new public boat ramps, which could result in increases in watercraft use and associated environmental effects. Thus, it will be necessary to estimate the changes in watercraft use that would result from new boat ramps. Such use would need to be estimated for both the peak day and the entire season to support the analysis of criteria air pollutant emissions and greenhouse gas emissions, respectively.

Because new public boat ramps would increase the launch capacity at Lake Tahoe, new boat ramps would likely increase watercraft use to some extent. It would be reasonable to assume that the level of boat launch activity associated with new boat ramps would be typical of the average boat launch activity at existing public boat ramps.

Estimating watercraft use that would result from new boat ramps is challenging because it is affected by a number of factors that are unknown at this time, including: the launch capacity of new boat ramps (which would in turn be affected by the location, design, parking capacity, and accessibility of future boat ramps); the extent to which launching activities at new boat ramps would constitute *new* watercraft use versus watercraft activity that would otherwise occur at other launch sites; and the overall future demand for watercraft use on Lake Tahoe. If we assume that new boat ramps would result in new watercraft use at levels comparable to existing public boat ramps, this would be a reasonable and conservative approach because it would assume that all launching activities at new ramps would not otherwise occur at other launch sites. The following equation could be used to calculate boat-hours of use associated with a new ramp for a peak day and for the entire season.

$$L \times H = \text{Boat-hours}$$

L = watercraft launches per ramp

H = hours of engine use per day

### Annual Watercraft Launches per Ramp

TRPA assembled data on the annual number of launches at public boat ramps from 2010 through 2015. These data are derived from launch counts associated with the boat inspection program, and reflect the best available counts of boat launches at public facilities (TRPA 2017a). The highest, lowest, and average annual number of launches from each facility is presented in Table 1, below.

Location	High	Low	Average
Cave Rock	6,677	3,601	4,752
Coon Street	579	472	526

El Dorado Boat Ramp	608	110	359
Lake Forest Boat Ramp	6,731	4,320	5,469
Lakeside Marina	1,185	334	772
Meeks Bay	2,628	1,383	1,746
Obexer's	2,882	1,903	2,352
Sand Harbor	4,548	3,696	4,189
Ski Beach (IVGID)	5,336	2,077	3,266
<b>Average</b>	3,464	1,988	<b>2,603</b>
<b>Median</b>	2,882	1,903	<b>2,352</b>

The median number of launches during the lowest recorded year for each ramp (1,903), and the average number of launches during the highest year for each ramp (3,464), provide a reasonable range of expected annual launches at a new public boat ramp. Either the average of the average number of launches at each ramp (2,603), or the median of the average launches (2,352) would provide a reasonable estimate. To estimate the annual increased boat use from new ramps in the Shoreline Plan EIS, the more conservative estimate of 2,603 is recommended.

### Peak Day Watercraft Launches per Ramp

The Lake Tahoe Watercraft Inspection Program tracks the number of daily boat launches at boat ramps, marinas, and other boat launching facilities throughout the year. TRPA identified the number of peak daily launches for public boat ramps for each year from 2010 through 2016. These data reflect the best available information for peak daily boat launches at public facilities (TRPA 2017a). The highest and lowest recorded peak days for 2010 through 2016 are presented in Table 2, along with the average of the peak days for all years.

Location	Highest Peak Day	Lowest Peak Day	Average Peak Day
Cave Rock	170	115	151
Coon Street	30	20	25
El Dorado Boat Ramp	45	30	38
Lake Forest Boat Ramp	198	117	153
Lakeside Marina	72	53	62
Meeks Bay	83	32	52
Obexer's	161	79	124
Sand Harbor	186	99	131
Ski Beach (IVGID)	172	84	113
<b>Average</b>	124	70	<b>94</b>
<b>Median</b>	161	79	<b>113</b>

The average number of launches during the lowest recorded peak day for each ramp (70), and the median number of launches during the highest year for each ramp (161), provide a reasonable range of expected launches during a peak day at a new public boat ramp. Either the average of the average number of launches at each ramp (94), or the median of the average launches (113) would provide a reasonable estimate. To estimate the increased peak day boat use from new ramps in the Shoreline Plan EIS, the more conservative estimate of 113 is recommended.

## Hours of Use per Day

As described in a previous memo to the Joint Fact Finding Committee, the average hours of watercraft engine operation per day for vessels moored on Lake Tahoe was derived from private watercraft records maintained by four Lake Tahoe marinas (North Tahoe Marina 2017). The data show that watercraft stored on Lake Tahoe averaged 2 hours of engine use per trip. In general, launching a vessel at a boat ramp requires more time and effort than accessing a watercraft that is already moored on the lake. In some cases, vessels launched at boat ramps are towed from areas outside of the Lake Tahoe Basin to be used during a vacation in the region. Because of the additional time and effort involved in launching a vessel from a boat ramp, it is reasonable to assume that users would operate their vessels for a longer period of time per trip so as to increase the recreational value of each launch. The 2015 boat registration data (TRPA 2016a) provides survey responses on the number of hours per trip as reported by watercraft operators for both watercraft moored at Lake Tahoe, and launched at boat ramps but not stored on the lake. When the average reported trip duration for vessels moored on Lake Tahoe (n=2,515) is compared to the average reported trip duration for day-use vessels launched at boat ramps (n=2,959), the average trip duration for day-use vessels launched from boat ramps is 11 percent higher than for vessels moored on Lake Tahoe. Thus, it is reasonable to assume that the average hours of engine operation would be 11 percent higher for vessels launched from boat ramps, or 2.22 hours per trip. In the summer of 2017, TRPA conducted engine hour measurements of watercraft launched at public boat ramps (TRPA 2017b). The actual engine hours were recorded for a watercraft when the watercraft was launched. The actual engine hours were then recorded again when the same watercraft was removed from the lake later the same day. These measurements provided data on the actual engine use of watercraft launched at boat ramps on Lake Tahoe. A total of 200 watercraft were surveyed at five separate public boat ramps over the course of 11 days in this study. This study found that 2.22 hours of engine operation was the average and median measurement of actual engine hours per launch. This study corroborated the estimate developed based on survey responses, and provides a high degree of confidence in the estimate of hours of use per day.

## Boat-Hours per New Boat Ramp

As described above, the annual number of boat-hours that would be expected to result from the authorization of each new public boat ramp can be calculated by multiplying the annual number of launches per ramp by the average hours of use per day for watercraft launched from boat ramps (2.22). Thus, if we assumed use of new ramps would result in 2,603 annual launches at each new public boat ramp authorized by the Shoreline Plan, each new ramp would result in **5,779 annual boat-hours**.

The number of boat-hours that would be expected from each new public boat ramp on a peak day could be calculated by multiplying the estimated number of launches at a public boat ramp on a peak day (113) by the average hours of use per day for watercraft launched from boat ramps (2.22). Thus, each new public boat ramp authorized by the Shoreline Plan would be expected to result in **251 peak day boat-hours**.

## References

California State Parks and California Tahoe Conservancy. 2016. Boating Fact Sheet. Available at: <http://www.parks.ca.gov/pages/21299/files/KBSRA%20BOATING%20FACT%20SHEET5.pdf>

North Tahoe Marina. 2017. Watercraft use records from North Tahoe Marina, Homewood High & Dry, Tahoe City Marina/A&M Marine, and Sunnyside Marina. Compiled by North Tahoe Marina.

Tahoe Regional Planning Agency. 2016a. 2015 Boat Records Collected During Aquatic Invasive Species Inspections. Provided by Kenneth Kasman, Research & Analysis Division Manager of the Tahoe Regional Planning Agency.

\_\_\_\_\_. 2016b. Boat Use Monitoring and Boat Survey Data. Collected by TRPA in 2014 and 2016.

\_\_\_\_\_. 2017a. Boat Ramp Launch Data. Collected by Lake Tahoe Watercraft Inspection Program in 2010 through 2016.

\_\_\_\_\_. 2017b. Boat Ramp Survey Report. Prepared by TRPA in summer 2017.

TRPA. See Tahoe Regional Planning Agency.



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# Memo



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Date: April 6, 1028

To: File

From: Ascent Environmental

Subject: **Boat Use Calculation Assumptions for the Shoreline Plan Environmental Impact Statement**

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Many of the assumptions regarding boat use at Lake Tahoe were established by the Joint Fact Finding (JFF) Committee and have been recorded in the memo titled, "Preliminary Approach for Estimating Watercraft Use and Emissions." This memorandum documents the additional assumptions develop during the EIS boat use modeling. Together with the JFF committee memo the following background assumptions informed the estimates of boat use presented in the EIS.

- ▲ No data was available on the frequency of use of private boat ramps. Therefore, individual private boat ramps usage was assumed to be equal to that observed for private lifts.
- ▲ Alternatives 1, 2, and 3 would allow a set number of new moorings of all types (buoys, slips, and lifts). Details vary by Alternative and are described in Chapter 2, "Project Description," of the Shoreline Plan EIS. Assumptions have been made regarding the allocation of these moorings among the various mooring types, as follows:
  - For Alternatives 1, 2, and 3, the proportion of existing piers with lifts was used to estimate the proportion of new piers would have lifts under each alternative. There are lifts on 261 of the 738 existing piers on Lake Tahoe, which equates to a rate of 34 percent. It was therefore assumed that 34 percent of new piers would also have lifts.
  - Alternatives 1 and 3 would allow buoy to slip conversions. Buoy to slip conversion rates were based on a survey of existing marina owners. Tahoe City and Sunnyside Marinas provided information suggesting that they would convert 65 buoys to slips with implementation of a Shoreline Plan. Therefore, it was assumed that only 65 of new moorings under Alternatives 1 and 3 would be slips.
- ▲ The baseline estimate of non-ramp marina launches was provided by Jim Phelan (pers. comm. 2017). Non-ramp marina launches include boats launched from gantry lift, fork lift, or other means.

- ▲ The baseline rental boat use estimates used the following assumptions:
  - There are an estimated 387 motorized boat rentals available at concessions (TRPA 2014 and 2017).
  - Concession boats run for an estimated 185 annual engine hours per year (North Tahoe Marina 2017).
  - Engine hours were only available on an annual basis, but an estimate of peak day use was also needed for the analysis. To obtain an estimate of use on peak days, it was assumed that the balance of use on a peak day would be the same that observed at private lifts (2.2% of annual use occurring on a peak day).
  - It was assumed that the trip length for a concession boat would be the same as a day trip for private boats (2.22 engine hours per trip).
- ▲ The cumulative condition assumed 1.2% growth per year, which was based on California population growth estimates (CARB 2014:8). This increase was applied only to launch points capable of accommodating growth (boat ramp annual launches, non-ramp marina launches, and concession launches). The compound result is a 26.9% increase in boat use at these facilities by buildout year 2040.

## 1 REFERENCES

California Air Resources Board. 2014 (November). Recreational Watercraft Emissions Inventor Methodology.

CARB. See California Air Resources Board.

North Tahoe Marina. 2017. Watercraft use records from North Tahoe Marina, Homewood High & Dry, Tahoe City Marina/A&M Marine, and Sunnyside Marina. Compiled by North Tahoe Marina.

Phelan, Jim. 2017. Gantry Lift Notes from Jim Phelan.

Tahoe Regional Planning Agency. 2014 and 2017. Inventory of boat rental concessions.

**Alternative 1**

**Number of Moorings and Estimated Boat Use**

	Moorings				Launch Points				Totals
	Buoy	Slip	Lift	Boat House	Public Boat Ramp	Private Boat Ramp	Non-ramp Marina Launch Points	Rental Concessions	
<b>Boat Trips Per Structure/Unit</b>									
Peak Day	0.25	0.36	0.36	0.17	113	0.32	0.15	1.83	n/a
Average Annual	15.6	16.1	16.2	18.5	2,603	14.6	16.6	83.3	n/a
<b>Engine Hours Per Structure/Unit</b>									
Peak Day	0.50	0.72	0.71	0.33	251	0.71	0.33	4.07	n/a
Average Annual	31.2	32.2	32.4	37.0	5,779	32.4	37.0	185.0	n/a
<b>Baseline Conditions</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	329	387	n/a
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	49	710	5,899
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	109	1,575	12,512
Annual Boat Trips	65,478	66,111	4,233	3,049	57,269	234	5,477	32,250	234,102
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	127,138	519	12,160	71,595	489,155
<b>Effects of Alternative 1</b>									
Number of Structures/Units	2,006	65	45	-	2	-	-	-	n/a
Peak Day Boat Trips	501	23	16	-	226	-	-	-	767
Peak Day Boat Engine-hours	1,003	47	32	-	502	-	-	-	1,584
Annual Boat Trips	31,269	1,047	734	-	5,206	-	-	-	38,257
Annual Boat Engine-hours	62,539	2,094	1,469	-	11,558	-	-	-	77,659
<b>Alternative 1 Existing plus Project</b>									
Number of Structures/Units	6,206	4,170	306	165	24	16	329	387	n/a
Peak Day Boat Trips	1,551	1,501	109	27	2,714	5	49	710	6,666
Peak Day Boat Engine-hours	3,103	3,002	217	54	6,024	11	109	1,575	14,096
Annual Boat Trips	96,747	67,158	4,968	3,049	62,476	234	5,477	32,250	272,359
Annual Boat Engine-hours	193,495	134,316	9,935	6,098	138,696	519	12,160	71,595	566,814
<b>Alternative 1 Cumulative</b>									
Number of Structures/Units	6,206	4,170	306	165	24	16	418	491	n/a
Peak Day Boat Trips	1,551	1,501	109	27	2,714	5	62	900	6,870
Peak Day Boat Engine-hours	3,103	3,002	217	54	6,024	11	138	1,999	14,549
Annual Boat Trips	96,747	67,158	4,968	3,049	79,282	234	6,951	40,925	299,314
Annual Boat Engine-hours	193,495	134,316	9,935	6,098	176,005	519	15,431	90,854	626,653

**Alternative 2**

**Number of Moorings and Estimated Boat Use**

	Moorings				Launch Points				Total
	Buoy	Slip	Lift	Boat House	Public Boat Ramp	Private Boat Ramp	Non-ramp Marina Launch Points	Rental Concessions	
<b>Boat Trips Per Structure/Unit</b>									
Peak Day	0.25	0.36	0.36	0.17	113	0.32	0.15	1.83	
Average Annual	15.6	16.1	16.2	18.5	2,603	14.6	16.6	83.3	
<b>Engine Hours Per Structure/Unit</b>									
Peak Day	0.50	0.72	0.71	0.33	251	0.71	0.33	4.07	
Average Annual	31.2	32.2	32.4	37.0	5,779	32.4	37.0	185.0	
<b>Baseline Conditions</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	329	387	
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	49	710	<b>5,899</b>
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	109	1,575	<b>12,512</b>
Annual Boat Trips	65,478	66,111	4,233	3,049	57,269	234	5,477	32,250	<b>234,102</b>
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	127,138	519	12,160	71,595	<b>489,155</b>
<b>Effects of Alternative 2</b>									
Number of Structures/Units	4,871	1,897	168	-	6	-	-	-	
Peak Day Boat Trips	1,218	683	60	-	678	-	-	-	<b>2,639</b>
Peak Day Boat Engine-hours	2,435	1,366	120	-	1,506	-	-	-	<b>5,427</b>
Annual Boat Trips	75,934	30,551	2,730	-	15,619	-	-	-	<b>124,834</b>
Annual Boat Engine-hours	151,867	61,102	5,461	-	34,674	-	-	-	<b>253,105</b>
<b>Alternative 2 Existing plus Project</b>									
Number of Structures/Units	9,071	6,002	429	165	28	16	329	387	
Peak Day Boat Trips	2,268	2,161	152	27	3,166	5	49	710	<b>8,537</b>
Peak Day Boat Engine-hours	4,535	4,321	305	54	7,028	11	109	1,575	<b>17,939</b>
Annual Boat Trips	141,412	96,662	6,964	3,049	72,888	234	5,477	32,250	<b>358,936</b>
Annual Boat Engine-hours	282,823	193,324	13,928	6,098	161,812	519	12,160	71,595	<b>742,260</b>
<b>Alternative 2 Cumulative</b>									
Number of Structures/Units	9,071	6,002	429	165	28	16	418	491	
Peak Day Boat Trips	2,268	2,161	152	27	3,166	5	62	900	<b>8,741</b>
Peak Day Boat Engine-hours	4,535	4,321	305	54	7,028	11	138	1,999	<b>18,392</b>
Annual Boat Trips	141,412	96,662	6,964	3,049	92,495	234	6,951	40,925	<b>388,692</b>
Annual Boat Engine-hours	282,823	193,324	13,928	6,098	205,339	519	15,431	90,854	<b>808,317</b>

**Alternative 3**

**Number of Moorings and Estimated Boat Use**

	Moorings				Launch Points				Total
	Buoy	Slip	Lift	Boat House	Public Boat Ramp	Private Boat Ramp	Non-ramp Marina Launch Points	Rental Concessions	
<b>Boat Trips Per Structure/Unit</b>									
Peak Day	0.25	0.36	0.36	0.17	113	0.32	0.15	1.83	
Average Annual	15.6	16.1	16.2	18.5	2,603	14.6	16.6	83.3	
<b>Engine Hours Per Structure/Unit</b>									
Peak Day	0.50	0.72	0.71	0.33	251	0.71	0.33	4.07	
Average Annual	31.2	32.2	32.4	37.0	5,779	32.4	37.0	185.0	
<b>Baseline Conditions</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	329	387	
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	49	710	<b>5,899</b>
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	109	1,575	<b>12,512</b>
Annual Boat Trips	65,478	66,111	4,233	3,049	57,269	234	5,477	32,250	<b>234,102</b>
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	127,138	519	12,160	71,595	<b>489,155</b>
<b>Effects of Alternative 3</b>									
Number of Structures/Units	300	65	30	-	1	-	-	-	
Peak Day Boat Trips	75	23	11	-	113	-	-	-	<b>222</b>
Peak Day Boat Engine-hours	150	47	22	-	251	-	-	-	<b>469</b>
Annual Boat Trips	4,677	1,047	493	-	2,603	-	-	-	<b>8,820</b>
Annual Boat Engine-hours	9,354	2,094	987	-	5,779	-	-	-	<b>18,213</b>
<b>Alternative 3 Existing plus Project</b>									
Number of Structures/Units	4,500	4,170	291	165	23	16	329	387	
Peak Day Boat Trips	1,125	1,501	103	27	2,600	5	49	710	<b>6,121</b>
Peak Day Boat Engine-hours	2,250	3,002	207	54	5,773	11	109	1,575	<b>12,982</b>
Annual Boat Trips	70,155	67,158	4,727	3,049	59,873	234	5,477	32,250	<b>242,923</b>
Annual Boat Engine-hours	140,310	134,316	9,453	6,098	132,917	519	12,160	71,595	<b>507,368</b>
<b>Alternative 3 Cumulative</b>									
Number of Structures/Units	4,500	4,170	291	165	23	16	418	491	
Peak Day Boat Trips	1,125	1,501	103	27	2,600	5	62	900	<b>6,325</b>
Peak Day Boat Engine-hours	2,250	3,002	207	54	5,773	11	138	1,999	<b>13,435</b>
Annual Boat Trips	70,155	67,158	4,727	3,049	75,978	234	6,951	40,925	<b>269,177</b>
Annual Boat Engine-hours	140,310	134,316	9,453	6,098	168,672	519	15,431	90,854	<b>565,653</b>

**Alternative 4**

**Number of Moorings and Estimated Boat Use**

	Moorings				Launch Points				Total
	Buoy	Slip	Lift	Boat House	Public Boat Ramp	Private Boat Ramp	Non-ramp Marina Launch Points	Rental Concessions	
<b>Boat Trips Per Structure/Unit</b>									
Peak Day	0.25	0.36	0.36	0.17	113	0.32	0.15	1.83	
Average Annual	15.6	16.1	16.2	18.5	2,603	14.6	16.6	83.3	
<b>Engine Hours Per Structure/Unit</b>									
Peak Day	0.50	0.72	0.71	0.33	251	0.71	0.33	4.07	
Average Annual	31.2	32.2	32.4	37.0	5,779	32.4	37.0	185.0	
<b>Baseline Conditions</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	329	387	
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	49	710	<b>5,899</b>
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	109	1,575	<b>12,512</b>
Annual Boat Trips	65,478	66,111	4,233	3,049	57,269	234	5,477	32,250	<b>234,102</b>
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	127,138	519	12,160	71,595	<b>489,155</b>
<b>Effects of Alternative 4</b>									
Number of Structures/Units	-	-	-	-	-	-	-	-	-
Peak Day Boat Trips	-	-	-	-	-	-	-	-	-
Peak Day Boat Engine-hours	-	-	-	-	-	-	-	-	-
Annual Boat Trips	-	-	-	-	-	-	-	-	-
Annual Boat Engine-hours	-	-	-	-	-	-	-	-	-
<b>Alternative 4 Existing plus Project</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	329	387	
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	49	710	<b>5,899</b>
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	109	1,575	<b>12,512</b>
Annual Boat Trips	65,478	66,111	4,233	3,049	57,269	234	5,477	32,250	<b>234,102</b>
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	127,138	519	12,160	71,595	<b>489,155</b>
<b>Alternative 4 Cumulative</b>									
Number of Structures/Units	4,200	4,105	261	165	22	16	418	491	
Peak Day Boat Trips	1,050	1,478	93	27	2,487	5	62	900	<b>6,103</b>
Peak Day Boat Engine-hours	2,100	2,956	185	54	5,522	11	138	1,999	<b>12,965</b>
Annual Boat Trips	65,478	66,111	4,233	3,049	72,675	234	6,951	40,925	<b>259,656</b>
Annual Boat Engine-hours	130,956	132,222	8,467	6,098	161,338	519	15,431	90,854	<b>545,885</b>

Date: January 12, 2018

To: Ascent

From: Alyssa Bettinger

Subject: Alternative 2 Updated Structure Numbers

Summary: This memo provides an overview of the process for updating the overall structure cap numbers for Alternative 2 (No Project). These numbers were previously based on the 2004 DEIS, which were (likely) estimated using the TRPA adopted 1987 Fish Habitat Layer. An updated 2016 Fish Habitat layer has been published, but has not been adopted by TRPA's Governing Board. Below is an estimate of structure numbers using the 2016 Fish Survey.

Note to be added when using this data in the EIS:

Structure estimates modified from the currently adopted 1987 Fish Habitat layer. Structure eligibility will be based on site verifications using the 2016 Fish Habitat Survey, and actual total buildout numbers may vary.

### Alternative 2 Structure Numbers

Structure	Expected Overall Structures (No numeric cap; structures limited by fish habitat prohibition)
Buoys and/or Lifts	9,239 (existing & new)
Slips	1,897 (no change, taken from 2008 plan)
Piers	476 (private & public)
Ramps	6 public <sup>1,2</sup>

### Ramps

Under TRPA Code Section 84.6.1, a maximum of one boat ramp may be permitted per littoral parcel that meets all the following requirements:

- Does not already have a ramp
- Is not deed restricted
- Is not located within 200 feet of the stream inlets
- Is located within a distance that would allow a buildable ramp in "marginal" fish habitat

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<sup>1</sup> Sourced from *Suggested New Launch Sites*, Shoreline Steering Committee Meeting 10 Notes, [http://shorelineplan.org/wp-content/uploads/2017/06/SC10\\_meeting\\_packet.pdf](http://shorelineplan.org/wp-content/uploads/2017/06/SC10_meeting_packet.pdf)

<sup>2</sup> Lands in the backshore are treated as Land Capability District (LCD) 1b. Lands classified or treated as LCD 1b are limited to 1 percent coverage, which effectively prohibits the placement of a boat ramp on private parcels.



## Piers

Under TRPA Code Section 84.5.1, an estimated 476 parcels would be eligible for a pier<sup>3</sup>.

### Eligibility Criteria

(excludes parcels that):

- Already have a pier
- Are deed restricted
- Are not located within 200 feet of the stream inlets
- Are located within a distance that would allow a buildable pier in “marginal” fish habitat landward of 6,219 feet elevation, or the pierhead line, whichever is more limiting. The placement of piers is prohibited in areas identified as “Feeding And/Or Escape Cover Habitat,” “Spawning Habitat,” or “Areas Targeted for Habitat Restoration”.

### Methodology:

Parcels initially selected from TRPA Littoral Parcel layer that excludes attributes listed above, and intersected with “Marginal” Fish Habitat selection layer. Parcels were then manually excluded based on proximity to Marginal Fish Habitat. Parcels were not excluded if they did not directly intersect “Marginal” fish habitat as our parcel data does not always extend far enough out to where piers could potentially be built. TRPA’s 6,219-foot LTD water line layer and Pierhead layer were used to analyze how far a pier could extend based on TRPA’s current code limiting piers from extending beyond 6,219 feet elevation or the pierhead line, whichever is more limiting.

## Buoys

# Existing Buoys from 2016 Survey	4,690 <sup>4</sup>
# Potential New Buoys in Non-Marina Buoy Fields (50 ft spacing <sup>5</sup> )	2,393 <sup>6</sup>
# Potential New buoys in Marina Buoy Fields (60 ft spacing <sup>5</sup> )	1,420 <sup>7</sup>

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<sup>3</sup> Not every parcel included in this number will be eligible for a pier. Field verification would be required.

<sup>4</sup> Sourced from data in the Buoys & Buoy Field memo, minus the 196 buoys counted during field surveys that are recognized as personal watercraft moorings. <http://shorelineplan.org/wp-content/uploads/2017/05/Meeting-Materials-Buoys-v3-2-16-17.pdf>

<sup>5</sup> In general, marinas will have larger boats than non-marina buoy fields. Thus, we are assuming more space between each buoy in marina buoy fields.

<sup>6</sup> This includes the assumptions listed in the Buoys & Buoy Field memo here: <http://shorelineplan.org/wp-content/uploads/2017/05/Meeting-Materials-Buoys-v3-2-16-17.pdf>

<sup>7</sup> Sum of additional capacity of marina buoy field assessment in *Summary of Water Access for Marinas and Public Boat Ramps* memo at [Shorelineplan.org/materials](http://Shorelineplan.org/materials)

# Estimate of Littoral Parcels Eligible for 1 or 2 Mooring Buoys (assumed that 168 of these buoys would be traded for lifts)	736 <sup>8</sup>
TOTAL BUOYS (existing & new)	9,239 <sup>9,10</sup>

Under TRPA Code Section 84.7.1, an estimated 736 littoral parcels are eligible for up to 2 mooring buoys.

Eligibility Criteria

(excludes parcels that):

- Do not already have existing buoy(s) directly lakeward of parcel (this is a visual estimate based on TRPA littoral parcel and buoy layer. Actual parcels will require field verification).
- Are outside stream mouth protection areas
- Are located within a distance that would allow a buoy in “marginal” fish habitat landward of 350ft from 6,229ft high water line

Methodology

Parcels initially selected from Littoral Parcel layer that do not have an existing buoy directly lakeward of parcel. Per TRPA Code Section 84.7.1, buoys shall not extend lakeward beyond 350 feet of the 6,229-foot LTD high-water line, therefore a 350-foot buffer from high water line layer was applied to further exclude parcels that did not have “marginal” fish habitat within that buffer zone. Parcels were not necessarily excluded if they didn’t directly intersect “marginal” fish habitat, only if there was not any “marginal” fish habitat within the buffer zone. This number only excludes parcels with the criteria listed above, and includes parcels that are deed restricted and within an HOA.

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<sup>8</sup> Estimate using TRPA GIS layers. Eligibility criteria and methodology provided.

<sup>9</sup> Not every parcel included in this number will be eligible for a buoy. Field verification would be required.

<sup>10</sup> Includes 168 lifts that private littoral parcel owners could trade buoys for.

	Boat Trips Per Structure/Unit		Vehicle Trips Per Structure/Unit		Effects of Alternative 1			Effects of Alternative 2			Effects of Alternative 3			Effects of Alternative 4		
	Peak Day	Average Annual	Peak Day	Average Annual	Number of Structures	Peak Day Vehicle Trips	Average Annual Vehicle Trips	Number of Structures	Peak Day Vehicle Trips	Average Annual Vehicle Trips	Number of Structures	Peak Day Vehicle Trips	Average Annual Vehicle Trips	Number of Structures	Peak Day Vehicle Trips	Average Annual Vehicle Trips
<b>Moorings</b>																
Buoy	0.25	15.59	0.50	31.18	265	132.50	8,262.70	-	-	-	300	150.00	9,354.00	-	-	-
Slip	0.36	16.11	0.72	32.21	65	46.80	2,093.65	1,897	1,365.84	61,102.37	65	46.80	2,093.65	-	-	-
Boat House (slip/lift)	0.17	18.48	0.33	36.96	-	-	-	-	-	-	-	-	-	-	-	-
Private Boat Lift	0.36	16.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Launch Points</b>																
Public Boat Ramp	113.06	2609.15	226.13	5206.31	2	452.25	10,412.61	6	1,356.76	31,237.84	1	226.13	5,206.31	-	-	-
Private Boat Ramp	0.32	14.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Additional Marina (racks and gantry lift)	0.15	16.65	0.30	33.30	-	-	-	-	-	-	-	-	-	-	-	-
Rental Concessions	1.83	83.33	3.67	166.67	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total Peak Summer Day Vehicle Trips</b>					<b>N/A</b>	<b>631.552252252252</b>	<b>20,769</b>	<b>N/A</b>	<b>2,722.59675675676</b>	<b>92,340</b>	<b>N/A</b>	<b>422.926126126126</b>	<b>16,654</b>	<b>N/A</b>	<b>-</b>	<b>-</b>
<b>Total VMT<sup>1</sup></b>					<b>N/A</b>	<b>11,368</b>	<b>373,841</b>	<b>N/A</b>	<b>49,007</b>	<b>1,662,124</b>	<b>N/A</b>	<b>7,613</b>	<b>299,771</b>	<b>N/A</b>	<b>-</b>	<b>-</b>

<sup>1</sup>18 miles per trip assumed for all recreational trips

VMT per vehicle trip (mi)	18
TRPA Air Quality Threshold	2,030,938

2017 RTP/SCS Projected 2040 VMT	Alternative 1 Peak Day VMT		Alternative 2 Peak Day VMT		Alternative 3 Peak Day VMT		Alternative 4 Peak Day VMT	
	Project	Existing + Project	Project	Existing + Project	Project	Existing + Project	Project	Existing + Project
2,168,384	11,368	2,179,752	49,007	2,217,391	7,613	2,175,997	-	2,168,384
	0.5%	(148,814)	2.3%	(186,453)	0.4%	(145,059)	0.0%	(137,446)

1. Buoys = number assumed to marinas
2. Slips = all slips would be public
3. Ramps = all ramps would be public