Technical Memorandum

To: San Jacinto River Stage III Technical Advisory Committee

From: Joseph C. Caldwell, PE | CPSWQ | CPESC - Director- Stormwater Engineering

Date: June 9, 2016

Re: Mystic Lake Storage Modeling

The following technical memorandum is prepared to document the analysis of the storage volume available in Mystic Lake. This analysis was prepared in conjunction with the current San Jacinto River Stage III Planning effort. Of interest is the potential dead storage volume available in Mystic Lake, and what affect this volume has on downstream San Jacinto River flows. Single-day and multi-day storm events were considered as part this analysis. Based upon the results of this analysis, modeling recommendations are provided for the current master planning effort.

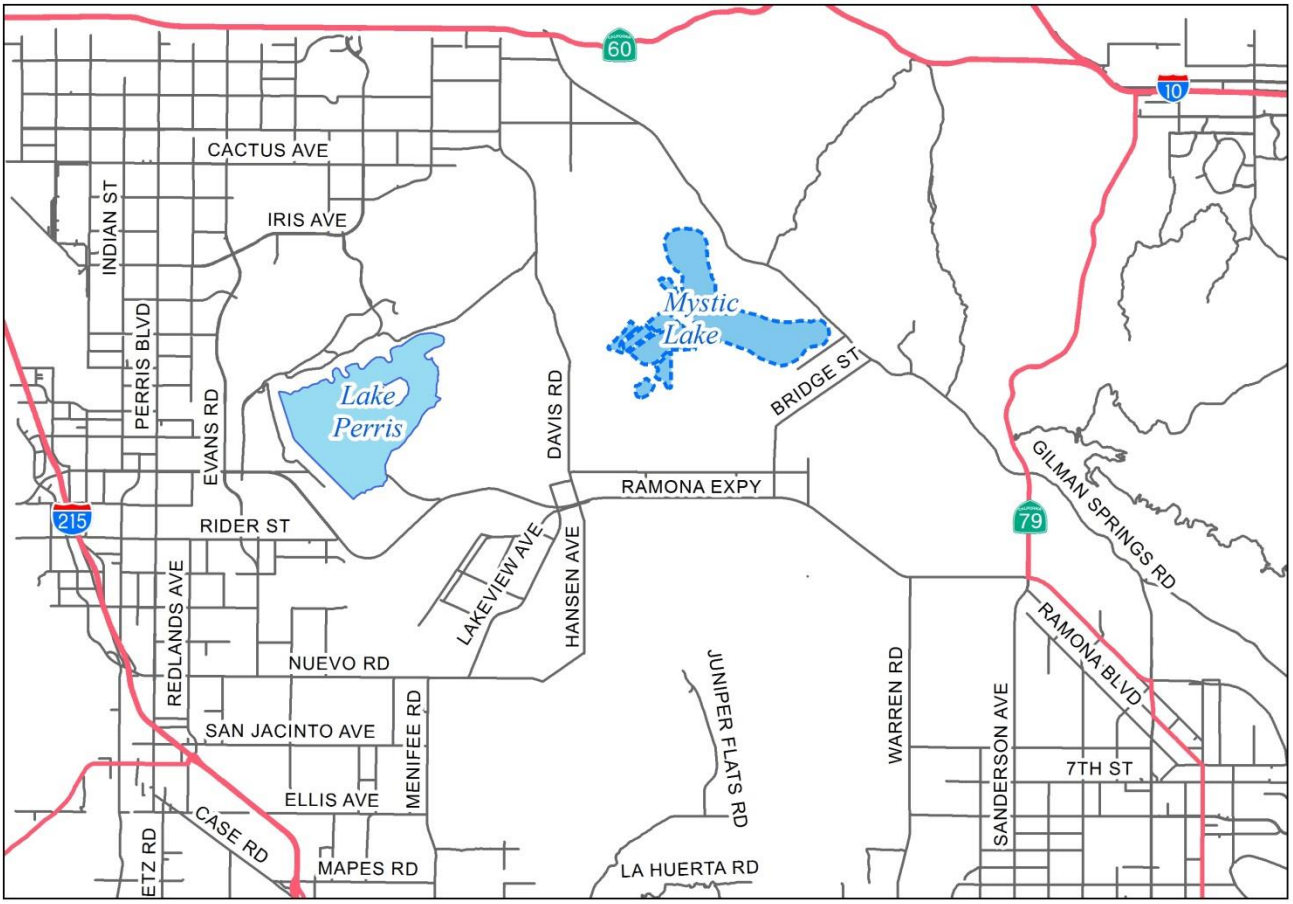

Figure 1 - Mystic Lake Vicinity Map

Mystic Lake is located between Stage III and Stage IV of the San Jacinto River in an area commonly referred to as the "Gap". **Figure 1** is a general vicinity map of Mystic Lake. It is located southwesterly of Gilman Springs Road, northwesterly of Bridge Street and easterly of Davis Road in unincorporated Riverside County. Mystic Lake is a natural sump with no positive drainage outlet. Over the years there has been documented subsidence of Mystic Lake which means the available "dead storage" is generally increasing.

In 2014 RCFC&WCD (District) obtained LIDAR Topography of the Mystic Lake area. Based upon a review of Google Earth, Mystic Lake was completely empty at this time. Runoff captured by Mystic Lake will spill out and flow downstream at an elevation of 1423 (NAVD 88). The District prepared a stage/storage curve based on the 2014 LIDAR Data. **Table 1** below summarizes this data and **Figure 2** graphically depicts this data.

Table 1 - 2014 Stage/Storage for Mystic Lake

2014 MYSTIC-LAKE STAGE/STORAGE			
ELEVATION (FT)	**SURFACE AREA (AC)**	**VOLUME (AC-FT)**	**CUMU VOL (AC-FT)**
1408	0	0	0
1409	86	43	43
1410	176	131	174
1411	275	226	400
1412	525	400	800
1413	715	620	1420
1414	849	782	2202
1415	964	907	3108
1416	1064	1014	4122
1417	1197	1131	5253
1418	1305	1251	6504
1419	1428	1367	7870
1420	1566	1497	9367
1421	1689	1628	10995
1422	1839	1764	12759
1423	1979	1909	14668
1424	2325	2152	16820
1425	2753	2539	19359

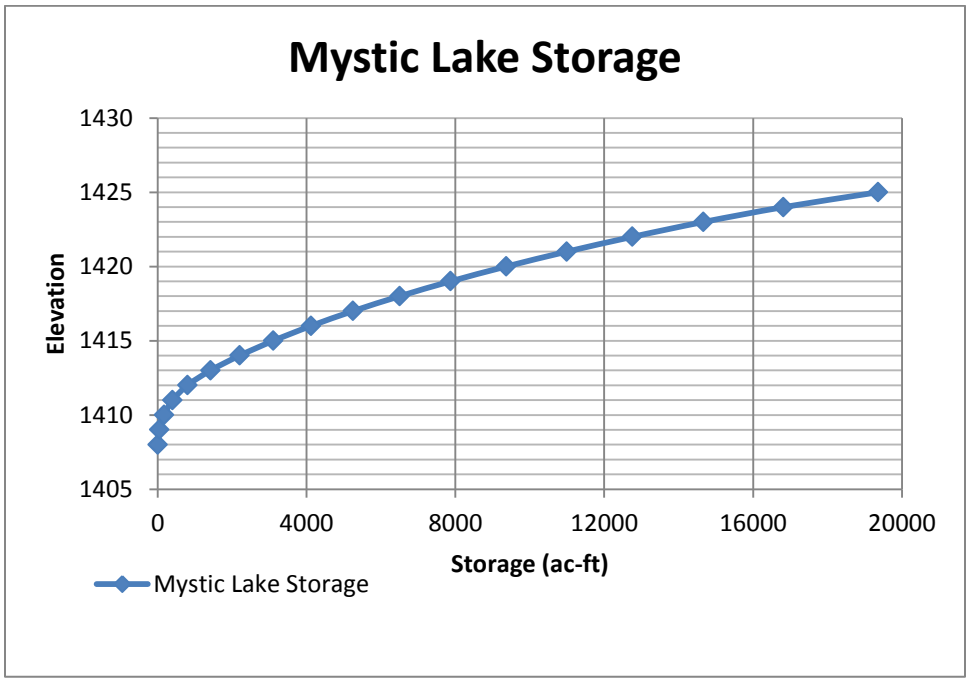

Figure 2 - 2014 Stage/Storage Curve for Mystic Lake

To determine the potential flow attenuation that the Mystic Lake Storage could provide, a two-dimensional HEC-RAS 5.0.1 model was developed for the Mystic Lake Area. HEC-RAS 5.0.1 has the ability to hydraulically model floodplains utilizing the finite volume method. Using this functionality, a mesh was made for Stage III and the "Gap". The general resolution of the mesh was 200 feet. The mesh was refined with a closer resolution a Ramona Expressway, Nuevo Road, I-215, Case Road and Goetz Road. The mesh was also refined along other prominent topographic features such as Ski Land. Inflow hydrographs from the previously prepared NOAA 14 single-day and multi-day analysis were input into corresponding locations on the mesh.

To model Mystic Lake empty, the grid was elevated utilizing the 2009 LIDAR topography that was obtained as part of the Physical Map Revision of the San Jacinto River. The single-day and multi-day storms were both modeled with the assumption that Ramona Expressway would remain in place. To model Mystic Lake full the same process described above was utilized with the exception that the gird was elevated with the "dead storage" of Mystic Lake removed. This approach brackets the maximum and minimum flow attenuation that the "dead storage" volume in Mystic Lake would provide. **Table 2** summarizes the results of the modeling.

Table 2 - Summary of Various Modeling Scenarios

	Single-Day				Multi-Day			
	Mystic Lake Full		Mystic Lake Empty		Mystic Lake Full		Mystic Lake Empty	
Location	Peak Flow (cfs)	Elevation	Peak Flow (cfs)	Elevation	Peak Flow (cfs)	Elevation	Peak Flow (cfs)	Elevation
Ramona Expressway	20,140	1430.33	12,605	1429.70	25,559	1430.66	17,079	1430.10
Nuevo Road	18,742	1423.18	11,594	1422.36	23,504	1423.60	15,699	1422.65
I-215	16,906	1419.02	10,455	1418.27	21,224	1419.69	14,503	1418.71
Case Road	14,724	1418.90	9,621	1417.69	18,048	1419.62	12,677	1418.52
Goetz Road	10,877	1418.68	7,789	1417.35	12,856	1419.42	8,969	1418.27

The preliminary results in **Table 2** were presented to District Staff. A review of the multi-day model with Mystic Lake Empty showed that the first two days of runoff fills up Mystic Lake approximately half way. This means that a Single-Day Mystic Lake Full event is approximately the same as a Multi-day event with Mystic Lake half full. It is recognized that a risk and uncertainty analysis could be performed that would compare the historic elevations of Mystic Lake against the probability of various storm events.

The preliminary results establish the minimum and maximum attenuation that “dead storage” in Mystic Lake would provide. This range shows that a risk and uncertainty analysis would at best yield only a few tenths of a foot difference in the 100-Year downstream water surface elevation. It was not felt that such an extensive analysis should take place for such a relativity minor reduction in downstream water surface elevations.

Based upon the discussions with District Staff it was determined the Single-day Mystic Lake Full scenario should be used for the alternatives analysis for the current San Jacinto River Stage III planning effort. This is consistent with the current FEMA Mapping of the San Jacinto River Floodplain. Based upon this it is WEBB’s recommendation that the Single-day Mystic Lake full scenario be used for all modeling all alternatives moving forward.