ALBERT A. WEBB ASSOCIATES

Corporate Headquarters
3788 McCray Street
Riverside, CA 92506
951.686.1070

Palm Desert Office
74967 Sheryl Avenue
Palm Desert, CA 92260
951.686.1070

Murrieta Office
41870 Kalmia Street #160
Murrieta, CA 92562
T: 951.686.1070

WEBB W.O.: 2021-0127

February 9, 2022

Mr. Moe Yousif
Senior Project Manager
SAN BERNARDINO COUNTY
DEPARTMENT OF PUBLIC WORKS, SPECIAL DISTRICTS
PO Box 11969
San Bernardino, CA 92423

RE: Sewer Study Letter for APN 0482-031-01,-02,-07, and -08, located on the southwest corner of the intersection of Pahute Avenue and Tamarisk Road.

Dear Mr. Yousif:

Pursuant to the District's request, we have performed a sewer study for the above referenced project that includes a review of how the proposed project affects the District's existing facilities and identifies any required system improvements. The proposed project consists of 39 residential lots and is located west of Tamarisk Road and south of Pahute Avenue in the City of Victorville, as shown in **Figure 1**. The proposed facility is requesting sewer service from County Service Area 64.

Project Wastewater Generation

The project's wastewater flow generation is calculated using comparable wastewater generation factors. A sewer generation value of 100 gpd/capita was used in the calculation of the proposed project's sewer generation, as specified in the County of San Bernardino Special Districts Department Standards for Sanitary Sewer (November 13, 2012). According to the U.S. Census Bureau data from 2015-2019, there is a density of 3.60 people per household in the city of Victorville. Therefore, the proposed development's calculated sewer generation is calculated below.

Total Residential Households = 39 homes
Population Density = 3.60 people/home
Sewer Generation Rate = 100 gpd/person

$$\textbf{Sewer Generation}_{\textbf{Average}} = (\textbf{39 homes}) \times \left(\textbf{3.60}\frac{\textbf{people}}{\textbf{home}}\right) \times \left(\textbf{100}\frac{\textbf{gpd}}{\textbf{person}}\right) = \textbf{14,040 gpd}$$

The estimated peak flow for this project is 28,080 gpd or 19.5 gpm based on the peaking factor consistent with the sewer monitoring study.

Project Connection Point

In preparation of this sewer study, we have reviewed available data related to the proposed sewer connection point. Available data includes District atlas maps and a hydraulic model of the existing CSA 64 sewer system created by WEBB to perform previous studies. There are existing 8-in sewers in Tamarisk Road and Pahute Avenue fronting the project boundaries. No interior sewer plan has been developed yet. A likely sewer connection point to the existing CSA 64 sewer system would be located either on Tamarisk Road or Pahute Avenue in the public right-of-way.

Hydraulic Model Information

A hydraulic model of the CSA 64 Easterly Sewer System was created by WEBB to perform a previous sewer study dated October 20, 2017. In 2021, WEBB was asked to perform two additional sewer studies, and in each study, WEBB recommended field flow monitoring in the CSA 64 easterly system to verify if current field sewer flows match WEBB's 2017 hydraulic model flows. Field flow monitoring was conducted from June to July 2021, and the hydraulic model was re-calibrated in August 2021 after the field flow monitoring. The re-calibrated CSA 64 sewer model is used for this analysis. Please see the attached analysis for the re-calibrating the sewer model using the field flow monitoring.

Analysis Load Input

To include the proposed project flows in the system's existing model, an average daily sewer load of 0.01404 MGD, as calculated above, was applied to the 8-inch diameter sewer line in Tamarisk Road. The following model point wastewater loads summarized in **Table 1** were included in the system's model to account for other developments in the CSA 64 system that are currently approved. **Figure 1** shows a map of the proposed project location, point load locations, and the system's model sewer facilities.

Table 1

Point Load Source	Sewer Flow (gpd) – Average Flow	Sewer Flow (gpm) – Peak Flow
Victor Valley College (w/o Stadium) [1]	56,000	
Lakeview Middle School[1]	8,820	
Endeavour School of Exploration[1]	8,330	
Excelsior Charter School[1]	14,700	
Victor Valley College Stadium[2]		47.22

[1] From the CSA 64 Easterly Sewer System Modeling/Hesperia Sewer Study (10/20/2017)
[2] From the CSA 64 Victor Valley College – New Stadium and Education Event Center Sewer Study (04/09/2021)

Analysis Results

The model's sewer pipelines from the proposed development location to the downstream Lakeview Lift Station were analyzed for high depth-over-Diameter (d/D) ratios. The downstream pipelines with the highest d/D ratios are listed in **Table 2** below.

Table 2

Pipe ID	Diameter (in)	Total Flow (mgd)	d/D
12-8030-11	21	2.328	0.507
14-8030-13	21	2.197	0.490
13-8030-12	21	2.201	0.488
15-8030-14	21	2.160	0.454
1-8099-6	15	0.925	0.452
6-8099-5	15	0.925	0.452

All Planned Projects

One other project is also in the planning stage and not yet approved. When this planned project is considered, the updated wastewater loads is be summarized in **Table 3**

Table 3 – With all planned projects

Point Load Source	Sewer Flow (gpd) – Average Flow	Sewer Flow (gpm) – Peak Flow
Victor Valley College (w/o Stadium) (1)	56,000	
Lakeview Middle School(1)	8,820	
Endeavour School of Exploration(1)	8,330	
Excelsior Charter School(1)	14,700	
APN 0482-043-08(3)	4,950	
Victor Valley College Stadium(2)		47.22

[1] From the CSA 64 Easterly Sewer System Modeling/Hesperia Sewer Study (10/20/2017)
[2] From the CSA 64 Victor Valley College – New Stadium and Education Event Center Sewer Study (04/09/2021)
[3] From the CSA 64 APN 0482-043-08 Sewer Study (11/29/2021)

Analysis Results

The model's sewer pipelines from the proposed development location to the downstream Lakeview Lift Station were analyzed for high depth-over-Diameter (d/D) ratios. The downstream pipelines with the highest d/D ratios are listed in **Table 4** below.

Table 4 – With all planned projects

Pipe ID	Diameter (in)	Total Flow (mgd)	d/D
12-8030-11	21	2.338	0.509
14-8030-13	21	2.207	0.492
13-8030-12	21	2.211	0.490
15-8030-14	21	2.170	0.455
1-8099-6	15	0.935	0.455
6-8099-5	15	0.935	0.455

The peak flow at the Lakeview Lift Station is estimated at 2.34 MGD or 3.62 cfs. The model analysis concludes that downstream sewer pipe segments from the proposed development experience flow d/D ratios that are below the maximum d/D standards, with the model inputs including planned but not approved projects. The District can consider accepting sewage flows from these proposed projects without upgrading the existing collection system pipelines, however the Lakeview Lift Station should be reviewed in detail for its capability for this increased flowrate.

Should you have any questions, please call me.

ALBERT A. WEBB ASSOCIATES

Bradley Sackett, Webb Associates
Senior Engineer

cc: Gustavo Gomez, Webb Associates
Bruce Davis, Webb Associates

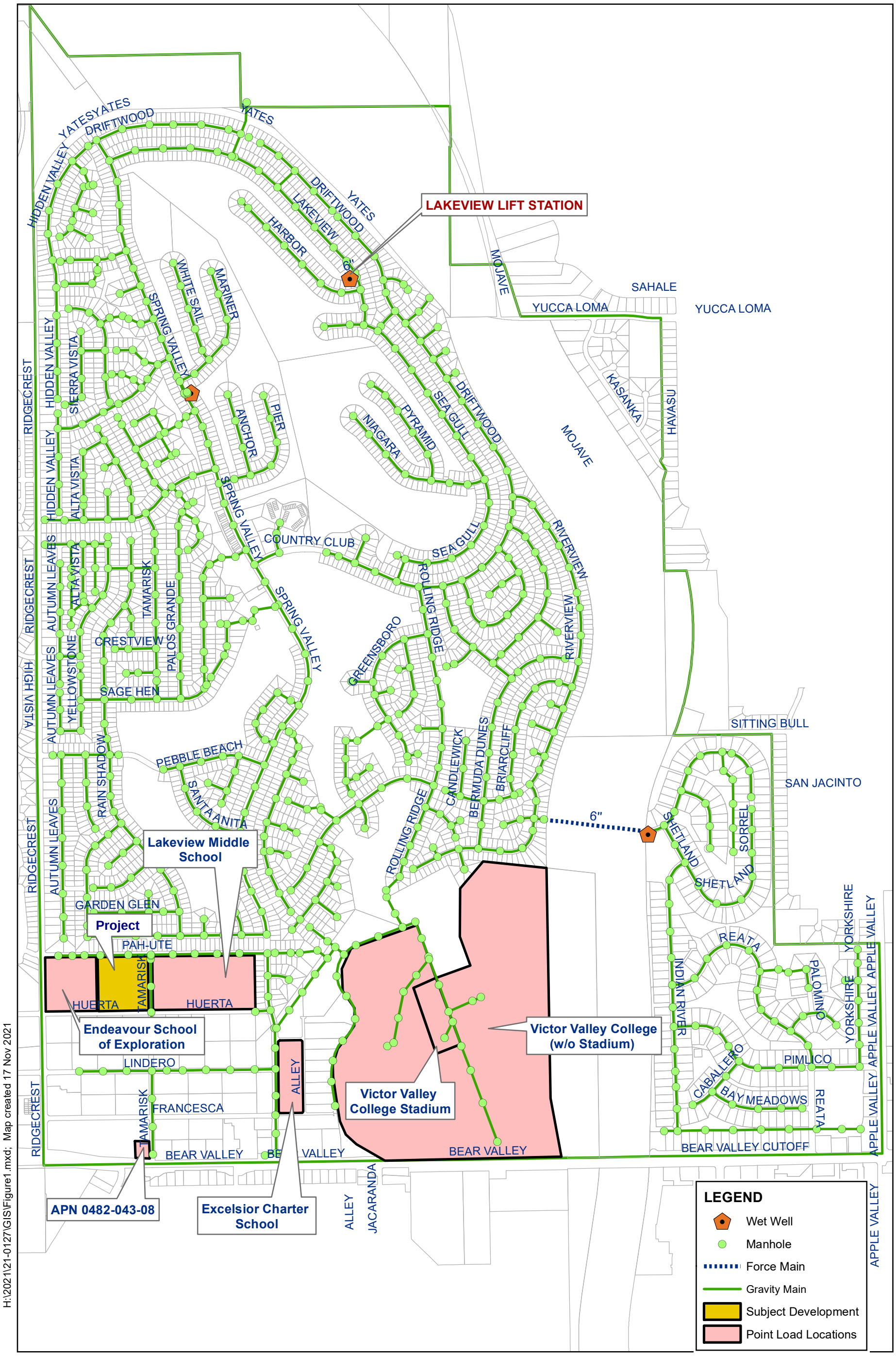

FIGURE 1 - EXISTING SEWER SYSTEM
CSA 64

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Murrieta Office
41870 Kalmia Street #160
Murrieta, CA 92562
T: 951.686.1070

WEBB W.O.: 2021-0127

November 16, 2021

Mr. Nelson Sarti, P.E.
Project Manager
SAN BERNARDINO COUNTY
Department of Public Works, Special Districts
PO Box 11969
San Bernardino, CA 92423

RE: CSA 64 Sewer System Calibration based on June – July 2021 Sewer Flow Monitoring.

Dear Mr. Sarti:

Two previous sewer modeling studies were performed for upcoming developments within County Service Area 64. The two studies are listed below:

- Previous Study 1 - CSA 64 Victor Valley College – New Stadium and Educational Event Center Sewer Study (April 09, 2021)
- Previous Study 2 - Sewer Study Letter for TR 17049 – APN 0482-031-01,-02,-07, and -08 (July 20, 2021)

The two previous studies utilized a hydraulic model created by WEBB to perform the CSA 64 Easterly Sewer System Modeling/ Hesperia Sewer Study in 2017. This model used generally accepted sewer generation factors for the existing land uses. The sewer generation factors are intended to size sewer systems to ensure there are no sanitary sewer overflows in the system and account for variability in the anticipated sewer generated by yet to be constructed development. Now that CSA 64 is close to build-out, the sewer generation for the actual constructed development can be determine by flow monitoring. The previous modeling studies recommended that sewer flow monitoring be conducted to confirm the model's flow and d/D projections. From June 25, 2021 to July 8, 2021, field sewer monitoring was conducted at Manholes 8031-3, 8099-5, and 8030-12. **Table 1** summarizes the flows previously calculated in the model at the three monitoring locations, the actual field monitoring flows and the differential between the model and actual flows at the monitoring locations.

Table 1: Previous Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Previous Model [1]		Field Monitoring [2]		Differential [3]	
		Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)
8031-3	12	0.278	0.780	0.063	0.175	0.215	0.605
8099-5	15	0.562	1.572	0.150	0.380	0.412	1.192
8030-12	21	1.263	3.537	1.092	2.137	0.171	1.400

(1) From the model utilized in Previous Study 1 and Previous Study 2 described in this report.
(2) From the field sewer monitoring conducted from June 25, 2021 to July 8, 2021.
(3) From the difference between value of (1) and value of (2)

It is evident that the previously calculated model flows are significantly higher than the actual field flows experienced by the CSA 64 wastewater collection system. Therefore, after reviewing the field monitoring flow data, the model flows were recalibrated and adjusted to more closely resemble the actual sewer flows experienced in the system by evenly lowering the model's sewer loading. *The method used is a conservative approach that can be applied District-wide and avoids the creation or need for parcel-specific factors.* During the recalibration process, it was important to consider that the updated flows needed to remain slightly conservative to provide a factor of safety to prevent the system from becoming hydraulically deficient if higher than anticipated peak flows are experienced in the future. **Table 2** below summarizes the updated model flows at the monitoring locations, with an updated flow differential.

Table 2: Updated Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Updated Model [1]		Field Monitoring [2]		Differential [3]	
		Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)
8031-3	12	0.131	0.263	0.063	0.175	0.068	0.088
8099-5	15	0.415	0.829	0.150	0.380	0.265	0.449
8030-12	21	1.116	2.232	1.092	2.137	0.024	0.095

(1) From the model utilized in Previous Study 1 and Previous Study 2 described in this report.
(2) From the field sewer monitoring conducted from June 25, 2021 to July 8, 2021.
(3) From the difference between value of (1) and value of (2)

The flow differentials show that after recalibration, the model flow rates remain higher than the recorded field flow rates, especially in Manhole 8099-5. Model flow rates remain higher for Manhole 8099-5 because reducing flows at Manhole 8099-5 would result in proportionally lowering the model flows at Manholes 8031-3 and 8030-2 to the point where they are considerably lower than the field

flow rates at those locations. Therefore, although inconsistencies remain between field measurements and model results, the flow reduction was conducted such that the modeled flows always generated more flow than the field measurements. Notably, model results and field measurements were very consistent at the most downstream point of the system (MH 8030-12).

San Bernardino Special Districts Department standards specify that pipelines that are 8-inches in diameter and smaller shall be sized to carry the peak flow when fifty percent full (d/D=0.50), while pipelines larger than 8-inches in diameter shall be sized to carry the peak flow when seventy-five percent full (d/D=0.75). The updated model flows do not approach the maximum d/D capacity, as summarized in **Table 3**.

Table 3: Updated Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Field Monitoring Peak d/D [1]	Updated Model Peak d/D [2]	Maximum d/D Standard [3]	Available Peak Flow Capacity per Model (mgd) [4]
8031-3	12	0.23	0.31	0.75	1.121
8099-5	15	0.29	0.44	0.75	1.125
8030-12	21	0.49	0.50	0.75	1.858

(1) Calculated from field sewer monitoring conducted from June 25, 2021 to July 8, 2021
(2) From the updated CSA 64 InfoSewer model
(3) From the Department's Design Standards
(4) From the difference of the full capacity calculated using Manning's equation and the updated model peak flow.

The peak flows measured in the field monitoring are lower than the previously calculated model flows. Therefore, in the system's existing situation, there is additional available capacity to receive flows from new development projects.

It appears that the Lakeview Lift Station and force main system may be undersized for any additional peak flow as the model indicates there may be a 6-in diameter force main at this location. This lift station is equipped with a screw pump and may not actually have a 6-diameter force main.

The District can consider accepting sewage flows from these proposed projects without upgrading the existing collection system pipelines, however the Lakeview Lift Station should be reviewed in detail for its capability for this increased flowrate.

Should you have any questions, please call me.

ALBERT A. WEBB ASSOCIATES

Gustavo Gomez, PE
Associate Engineer

cc: Bradley Sackett, Webb Associates
Bruce Davis, Webb Associates