Appendix M

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TECHNICAL MEMORANDUM

DATE: July 14, 2023

Project No.: 1037-60-22-01
SENT VIA: EMAIL

TO: Jennifer Freedman, Overton Moore Properties

CC: Rick Teczon and Yanming Zhang, City of Livermore

FROM: Patrick Johnston, PE, RCE #59028

REVIEWED BY: Chris Malone, PE, RCE #51009

SUBJECT: Airport Lift Station Analysis

Overton Moore Properties (OMP) is pursuing the development of two (2) properties within the City of Livermore (City) that are referred to as SMP 39 and SMP 40. The two (2) properties are in an area of the City where the wastewater collection system flows to the Airport Lift Station. The purpose of this technical memorandum (TM) is to present analysis of the effects of the development of SMP 39 and SMP 40 on the capacity of the Airport Lift Station (Station), the associated force main, and the influent pump station at the Water Reclamation Plant (WRP).

EVALUATION CRITERIA

The criteria used to evaluate the capacity of the Station were taken from the 2017 Sewer Master Plan that was prepared by West Yost. The criteria state that a lift station shall have sufficient capacity to pump the peak design flow with the largest pump out of service (firm capacity), and that force mains shall have a maximum velocity of 7 feet per second (fps) under peak operating conditions and 2 fps under minimum flow conditions.

FLOW CALCULATION

When flow projections were performed for the 2017 Sewer Master Plan, the SMP 39 and SMP 40 areas were shown with a land use code of parks, trailways, recreation areas, which is a zero flow-producing land use category. Therefore, any flow calculated for SMP 39 and SMP 40 would be in addition to the buildout flow projections in the 2017 Sewer Master Plan.

According to a memorandum from Kier + Wright, dated June 1, 2022, SMP 39 and SMP 40 were assumed to have a land use code of Low Intensity Industrial. For the Low Intensity Industrial land use code, the 2017 Sewer Master Plan projects a dry weather flow factor of 420 gallons per day (gpd) per acre and a flow factor of 800 gpd/acre for rainfall dependent inflow and infiltration. Table 1 shows the dry and wet weather flows in units of gallons per minute (gpm) calculated for SMP 39 and SMP based on the flow factors from the 2017 Sewer Master Plan.

Table 1. Flow Calculations				
Site	Area, acres	Dry Weather Flow gpm	Wet Weather Flow gpm	Manhole Assignment
SMP 39	54.9	16.0	30.5	ACS5C4010
SMP 40	40.5	11.8	22.5	ACS5C4025

Figure 1 shows the manholes to which the flows for SMP 30 and SMP 40 were assigned in the hydraulic model.

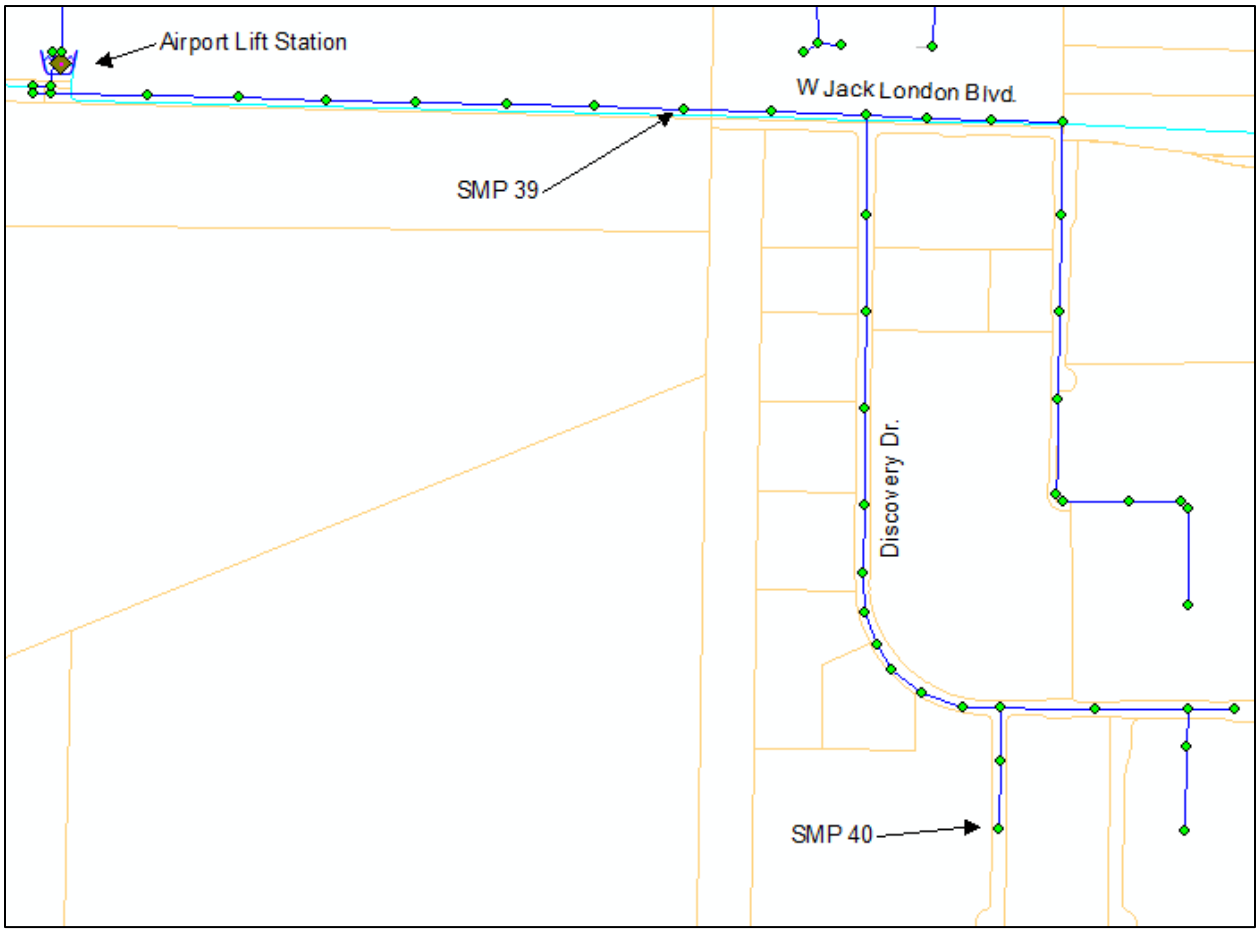

Figure 1. Manhole Assignments for Calculated Flows

Since flows were calculated for the existing scenario of the 2017 Sewer Master Plan, several parcels have been developed within the area tributary to the Station. The parcels that have been developed are summarized in Table 2. These are included in Table 3-5 of the 2017 Sewer Master Plan as Reasonably Foreseeable Development Projects (RFDP) with parcel areas and estimated sewer flows. The RFDPs were included in the buildout scenarios of the 2017 Sewer Master Plan but were not included in the existing scenarios. For this analysis, the RFDPs in Table 2 were added to the existing conditions scenario.

Table 2. Flows for Recently Developed Projects

Planning Area	Name	Area, acres	Dry Weather Flow gpm	Wet Weather Flow gpm
1a	Outlets – Phase 1	17	7.0	9.4
1b	Outlets – Phase 2	46	19.9	25.6
2	The Shoppes	12	8.8	6.7
3	CrossWinds	25	18.7	13.9
4	Sywest Driving Range	21	7.5	11.7

HYDRAULIC ANALYSIS

The hydraulic analysis presented in this TM describes the impacts of the flows from SMP 39 and SMP 40 on the Station, its associated force main and the influent pump station at the WRP.

Airport Lift Station and Force Main

According to the 2017 Sewer Master Plan, the Station has two pumps, each with a capacity of 1,145 gpm, which equates to a firm capacity of 1,145 gpm. The City has indicated that a field test performed in 2020 showed that the two pumps have capacities of 1,096 and 1,092 gpm, which equates to a lift station firm capacity of 1,092 gpm.

Table 3 summarizes the evaluation of the available firm capacity at the Station and force main velocities under various peak flow scenarios. Based on the hydraulic analysis, under existing flow conditions, the Station has adequate firm capacity to accommodate the addition of flows from SMP 39 and SMP 40. Under buildout conditions, however, the Station does not have adequate firm capacity, even without the addition of flows from SMP 39 and SMP 40. Therefore, the additional flows from SMP 39 and SMP 40 would worsen the expected capacity deficiency of the Station.

Table 3. Analysis of Airport Lift Station Capacity

Flow Scenario	Design Flow, gpm	Remaining Capacity, gpm[(a)]	Force Main Velocity in 8-inch, fps	Force Main Velocity in 10-inch, fps
Existing(a)	874	218	5.6	3.6
Existing + SMP 40	921	171	5.9	3.8
Existing + SMP 39 + SMP 40	984	108	6.3	4.0
Buildout	1,480	(388)	9.4	6.0
Buildout + SMP 39 + SMP 40	1,590	(498)	10.1	6.5

(a) Existing conditions include RFDPs 1a, 1b, 2, 3 and 4 shown in Table 2

As described in the 2017 Sewer Master Plan, 1,023 feet of the Station force main is 8-inch diameter, and 4,300 feet of the force main is 10-inch diameter. Under existing conditions, velocities in the 8-inch diameter portion of the force main meet the maximum peak velocity criterion of 7 fps, but under buildout conditions, that criterion is exceeded. The addition of flows from SMP 39 and SMP 40 exacerbates that exceedance. Accordingly, the 2017 Sewer Master Plan recommended that the 8-inch diameter force main

be upsized to 10-inch. When the additional flows from SMP 39 and SMP 40 are added to buildout flows at the Station, velocities in a 10-inch diameter force main would be approximately 6.5 fps, which meets the 7 fps criterion.

It was also requested by OMP that an analysis be performed showing the impacts of adding flows only from SMP 40 for existing conditions. As indicated in Table 2, that scenario does not trigger any exceedances for either lift station firm capacity or force main velocity.

WRP Influent Pump Station

According to the 2017 Sewer Master Plan, the influent pumps at the WRP have a pumping limit of approximately 12 million gallons per day (mgd). The WRP is equipped with an influent holding basin that is utilized any time influent flows exceed the 12 mgd pumping limit of the WRP influent pumps, such that any flows above 12 mgd go straight to the holding basin. According to information provided by the City's Water Resources Division, the influent pumps and holding basin can handle the buildout design conditions with the addition of flows from SMP 39 and SMP 40. The WRP is designed to treat 8.5 MGD average daily flow (Phase 5 Expansion Project Design Criteria, 1991). Due to slow population growth and water conservation efforts, the current daily flow is only 5.5 MGD with a projected buildout increase of 21% per the 2017 Sewer Master Plan for a total buildout design flow of less than 7 MGD. Therefore, there is sufficient capacity to accept the additional flows from the SMP 39 and SMP 40 project. .

RECOMMENDATIONS AND COSTS

Based on the analysis presented in this TM, the following actions are recommended:

1. It is recommended that capital improvement project BO-CIP-P07 from the 2017 Sewer Master Plan be adjusted to accommodate the additional flows from SMP 39 and SMP 40. The force main portion of the project does not need to be changed. However, additional flows from SMP 39 and SMP 40 will require additional pumping capacity at the Station.
2. It is recommended that the capacity of the emergency holding basin be analyzed to determine the effect of the projected increase in buildout flows resulting from the addition of SMP 39 and SMP 40.

The costs for capital improvement project BO-CIP-P07 from the 2017 Sewer Master Plan have been escalated to July 2022 (using the 20-Cities ENR CCI) and are shown in Table 4. For comparison purposes, the costs for the original Station project are shown, along with the costs for the project when the additional flows from SMP 39 and SMP 40 are included. The escalated costs of the force main improvement from the 2017 Sewer Master Plan are also shown.

Table 4. Cost Estimate

Improvement	Estimated Construction Cost[(a)], dollars	Estimated Capital Cost[(b)], dollars
Station at 1,480 gpm	842,000	1,642,000
Station at 1,594 gpm	870,000	1,697,000
Force Main Upsize 1,023 feet to 10-inch	255,000	497,000

(a) Cost shown are based on the July 2022 20-Cities ENR CCI of 13168.
(b) Costs include base construction costs plus 30 percent estimating contingency, plus an additional markup equal to 50 percent for professional services.

Costs for the lift stations were developed based on cost curves, quantity takeoffs, cost information from previous projects or planning studies, engineer judgement and construction cost estimates from other similar projects. The cost curve used for this project assumed that the lift station would be upgraded, rather than replaced and uses the following flow-based cost curve applicable to the size range of the Station, where Q denotes the flow capacity of the lift station in units of million gallons per day:

Cost = ENR adjustment x $[(-1{,}200 \times Q^2 + 120{,}000 \times Q) + 300{,}000]$

The cost curve above was developed for costs from November 2008 20-Cities ENR CCI of 8602.

It is recommended that the City monitor and evaluate further development within the area tributary to the Station so that the capacity of the lift station is not exceeded. Table 3 indicates that there will be 108 gpm of firm capacity remaining after SMP 39 and SMP 40 are completed. Using the dry weather flow factor of 420 gallons per day (gpd) per acre for Low Intensity Industrial land use, a dry weather peaking factor of 2.05 from the 2017 Sewer Master Plan and a flow factor of 800 gpd/acre for rainfall dependent inflow and infiltration, the 108 gpm of remaining firm capacity could support approximately 93 acres of additional Low Intensity Industrial development.