

# **APPENDIX E2**

## ***Sanitary Sewer Capacity Evaluation***

# Technical Memorandum

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**Subject:** Sanitary Sewer Capacity Evaluation for the Proposed El Camino Real Specific Plan

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The City is proposing a Specific Plan to guide future development along the El Camino Real (ECR) corridor. At the request of the City of Santa Clara (City), Woodard & Curran evaluated potential sanitary sewer capacity impacts of the proposed Specific Plan using the City’s sanitary sewer hydraulic model. This technical memorandum (TM) summarizes the approach, model input, and results of the analysis. As shown on **Figure 1**, the proposed Specific Plan redevelops multiple parcels along ECR. Parcels associated with specific ECR developments are shown cross-hatched. Parcels shown in red without cross-hatching are expected to be redeveloped as part of the overall ECR Specific Plan but are not associated with specific recently approved, pending, or pre-application stage developments. Remaining parcels along ECR were identified by the Specific Plan as “no change in land use expected”.

Flow from the Specific Plan would enter the City’s sanitary sewer system at various manholes along ECR as well as at unmodeled (8-inch) sewers discharging to trunks north of ECR. **Figure 2** shows the trunk sewer lines that may receive flow from ECR developments and parcels, depending on how flow is split at manholes where there are multiple outgoing pipes. As shown, flow from the ECR Specific Plan area may be conveyed through many of the trunk lines conveying flow north to the SJ/SC Regional Wastewater Facility and to the Trimble Road trunk. This evaluation addresses trunk sewers only. Unmodeled local small (6- and 8-inch) diameter sewers that may directly receive flow from the ECR developments and Specific Plan parcels were not analyzed as part of this evaluation.

It should be noted that flow from some of the ECR developments and Specific Plan parcels would discharge to sewers that would convey flow through the City’s 2016 Master Plan proposed capacity improvement project P3 (Cabrillo Avenue Sewer Improvement), the recently lined 24-inch sewer along Calabazas Creek (from manhole S62-51 to S62-40 and S62-38 to S62-34), the recently discovered 19-inch constriction along the Calabazas Creek sewer, and the recently constructed project P6-Alt (Calabazas Creek Sewer Improvement). These projects are also shown on **Figure 2**. Project P3 proposed to upsize 1,600 feet of 8-inch pipe in Cabrillo Avenue between Lawrence Expressway and Nobili Avenue to a 12-inch pipe.

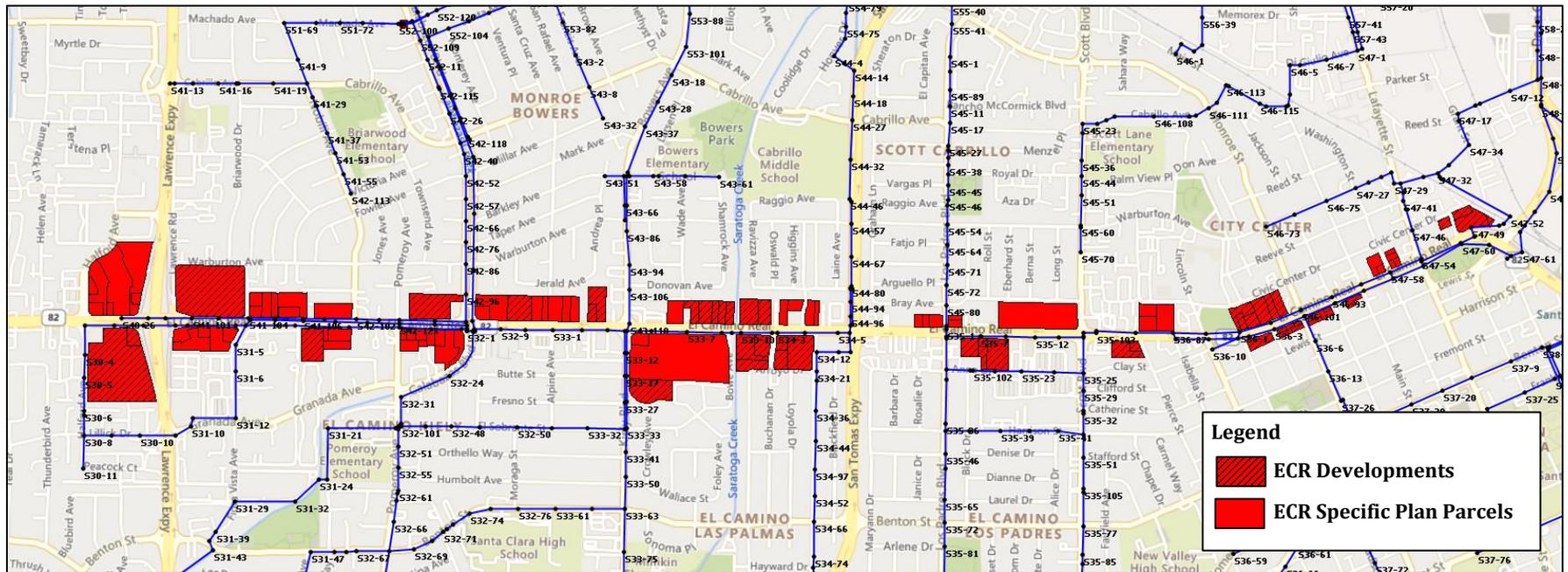


Figure 1: ECR Developments and Specific Plan Parcels

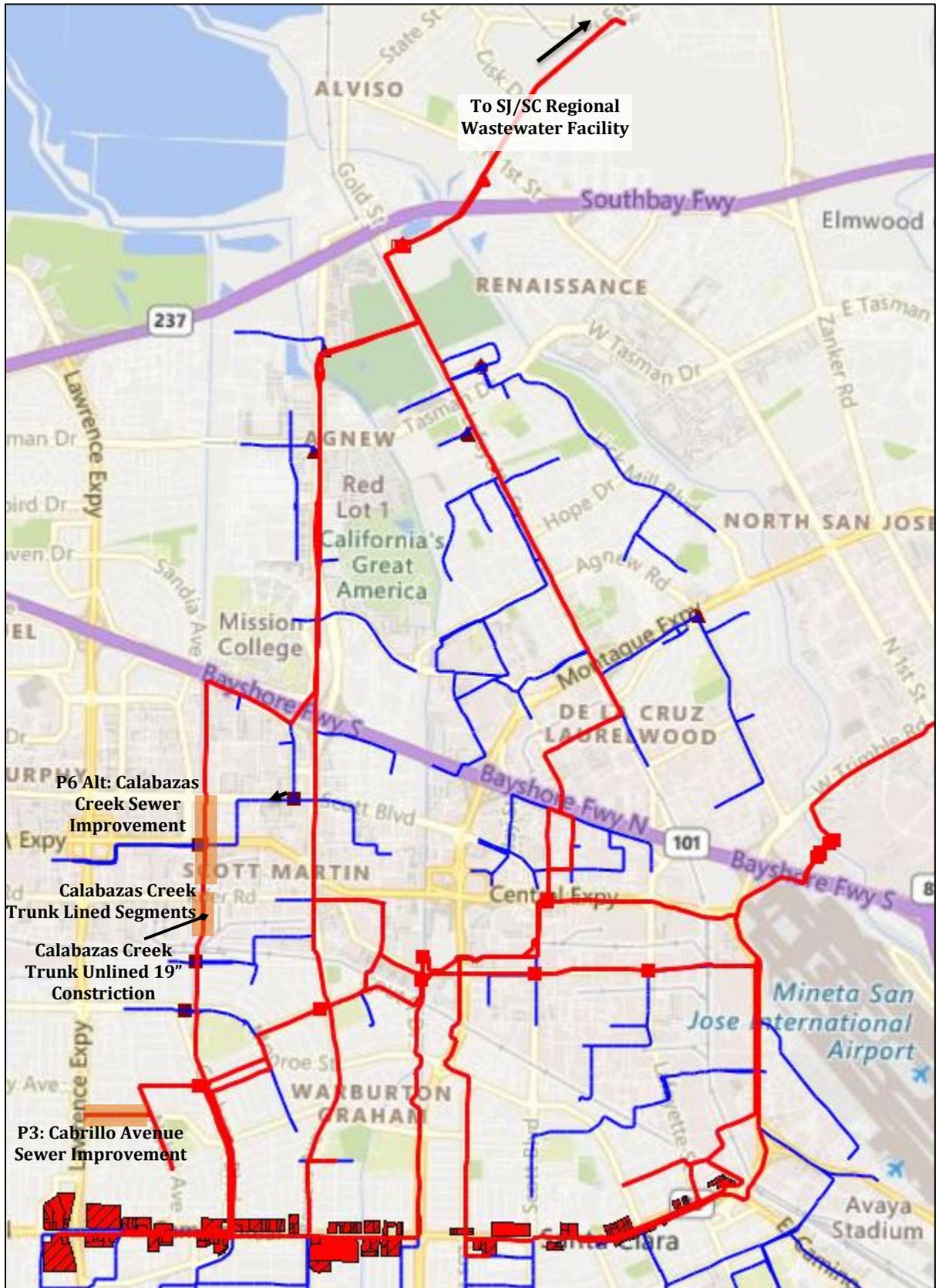


Figure 2: Trunk Sewers Downstream of the Proposed Project Site

## 1 Approach

To evaluate the potential sewer capacity impact of the proposed Specific Plan, the following model configurations were used:

- *Sewer network*: The City's current solution network was used. The network consists of the City's expanded trunk sewer system that was developed as part of the Sanitary Sewer Master Plan Update (2016 Master Plan). The network includes the improvements recommended by the 2016 Master Plan (P1, P2, P3, P4, P5, and E1 Modified) as well as the recent construction of project P6-Alternative (per the conformed drawings dated September 2019 with City of Santa Clara tracking number 12,175-D), the NVIDIA improvements (per the conformed drawings dated December 2014 with CSC tracking number 11,988-D), and the proposed improvements to the Old Ironside Drive, Tasman Drive, and the Tasman Drive Lift Station recommended as part of the Patrick Henry Drive Specific Plan capacity evaluation (refer to TM dated May 7, 2020). Projects P3 (Cabrillo Avenue Sewer Improvement) and P6-Alt (City of Santa Clara tracking number 12,175-D) are downstream of the ECR developments Specific Plan parcels.
- *Sanitary sewer load*: The Updated General Plan Phase 3 Loads (aka 2035 Loads) were used for this analysis. The 2035 loads were updated for the 2016 Master Plan, which includes updated base loads, updated development assumptions consistent with the City's 2035 General Plan, and projected loads for additional developments that were approved between 2009 (after the completion of the original 2035 Loads) and the completion of the 2016 Master Plan. The model also includes developments that have been evaluated since completion of the 2016 Master Plan including developments along ECR. Details on these developments are provided in **Section 2**. In addition to the wastewater flows generated within the City's service area, the City also receives flow from the Cupertino Sanitary District (CuSD). For planning purposes, the model capped the peak wet weather flow (PWWF) discharge from CuSD at 13.8 mgd, which is the contractual maximum flow rate that CuSD is allowed to discharge into the Santa Clara system.
- *Flow Scenario*: System capacity was evaluated based on the ability of the sanitary sewer system to convey future PDWF and PWWF under design storm conditions. This analysis used the same 10-year design storm that was used for the 2016 Master Plan.

## 2 Model Input

The ECR developments and Specific Plan parcels were added to the model as individual subcatchments with the following settings, based on the sewer model run request received on April 15, 2020 and subsequent information provided by the Planning Division:

- *Sanitary Sewer Loads*: For loading to the sewer model, parcels were identified as either specific developments (developments that have been approved, are pending, or have submitted pre-applications), or as general land use parcels (parcels with no specific development yet, but with future development guided by a Specific Plan land use).

The City provided a land use plan identifying the various land uses proposed for the ECR Specific Plan parcels (see **Figure 3**). The Planning Division specified the type of residential and commercial land uses for each category as follows:

- Corridor Residential – Townhomes and condominiums.
- Corridor Mixed Use – Apartments with ground floor small retail and restaurant use.
- Regional Commercial Mixed Use – Apartments with larger commercial uses such as offices, retail, and restaurants.

For estimating sanitary sewer loads, the same unit flow factors used in the 2016 Master Plan were used for the residential land uses. For the commercial land uses, the Land Use Plan did not identify

the specific square footage dedicated to general commercial (e.g. retail or office space) versus restaurant uses. The restaurant unit flow factor (1.04 gallons per day per square foot or gpd/SF) is significantly higher than the general commercial unit flow factor (0.1 gpd/SF). Therefore, for the purpose of this analysis, it was assumed that restaurant space makes up 25% of the total commercial space. This assumption results in a unit flow factor of 0.335 gpd/SF for the commercial land uses. Remaining parcels along ECR were identified by the Specific Plan as “no change in land use expected”. As a result, these parcels retained their original (2016 Master Plan) 2035 load estimates.

**Attachment A** includes tables detailing the two categories of loads. **Table A-1** provides a detailed summary of specific developments including the type and number of residential dwelling units, commercial square footage, their corresponding unit flow factors, the estimated average sewer flow, and the discharge manhole for each development. These specific developments are estimated to discharge a total average flow of 0.56 million gallons per day (mgd). **Table A-2** lists the parcels within the ECR Specific Plan that have no specific development yet but are defined by their general land use. The table includes each parcel’s corresponding land use, number of residential units, commercial square footage, unit flow factors, estimated sewer flow, and discharge manhole. These land use parcels are estimated to discharge a total average flow of 0.9 mgd.

**Figure A-1** in Attachment A following these tables shows the locations of the developments, parcels, and modeled discharge manholes. In total, the ECR developments and Specific Plan parcels are estimated to discharge an average flow of 1.46 mgd, which will replace the General Plan 2035 flow of 0.76 mgd estimated for these parcels. **Figure A-2** in Attachment A shows which parcels discharge to unmodeled local (6- and 8-inch) diameter sewers. **Table A-3** lists the parcels APNs and the corresponding development name (if applicable).

- *Diurnal Profile:* A residential diurnal curve was applied to the residential flows, and a commercial diurnal curve was applied to retail, office, and restaurant flows.
- *Rainfall Event:* The rainfall event used was the same 10-year design event used for the City’s 2016 Sanitary Sewer Master Plan Update.
- *Contributing Area and RDI/I Parameters:* The RDI/I parameters used were the calibrated parameters from the City’s 2016 Sanitary Sewer Master Plan Update. The contributing area remained the same. This means that the RDI/I response is assumed to neither increase nor decrease with the Specific Plan.

Figure 3: ECR Specific Plan Land Uses<sup>1</sup>



<sup>1</sup> Source: City's Planning Division.

### 3 Model Results

Model results under future (2035) PWWF conditions in the sewers receiving flow from the ECR Specific Plan (as shown on **Figure 2**) were reviewed. Profiles are provided for sewers shown to have deficiencies, sewers associated with proposed capacity improvement projects (e.g. P3 - Cabrillo Avenue Sewer Improvement), and sewers nearing full-pipe that had noticeable changes after the Specific Plan. Results were reviewed for all trunks affected by the ECR flows but profiles have not been included for every receiving pipe since there are numerous pipes receiving flow from the ECR area, and since for many trunks the change in flows and hydraulic grade line conditions was minor.

**Before the Specific Plan:** The scenario before the Specific Plan refers to the 2035 General Plan scenario that also includes specific developments along the El Camino Real Corridor that had been reviewed since completion of the 2016 Master Plan. Plan and profile views of model results under future (2035) PWWF for this scenario are included in the attached profiles. Sewers shown in red indicate surcharge conditions exceed the City's deficiency criteria (surcharge level above crown is one foot and greater), which occurs along the constricted section of the Calabazas Creek trunk. As shown on the profile, a segment of the 24-inch Calabazas Creek trunk is surcharged due to throttle conditions in the downstream lined segment (between manholes S62-38 and S62-34) and the 19-inch constriction (between manhole S62-37 and S62-38). These throttled segments cause backwater surcharge in the upstream sewers (from manhole S52-30 to S62-37). The maximum surcharge occurs at manhole S62-37 with 2.2 feet of surcharge above pipe crown. The minimum freeboard occurs at manhole S62-48 with 5.7 feet of freeboard remaining. As shown on the plan view, there is no other surcharge exceeding the City's criteria in the immediate downstream sewers along ECR, Calabazas Boulevard, Bowers Avenue, San Tomas Expressway, Los Padres Boulevard, or De La Cruz Boulevard.

A second plan view of model results under future (2035) PWWF for this scenario is shown indicating how full the sewers immediately downstream of the ECR Specific Plan area are. The plan view shows how full the sewers are based on their flow depth to pipe diameter ratio (d/D). Sewers that are up to 75% full are shown in blue. Sewers that are between 75 and 90% full are shown in green. Sewers that are more than 90% full but not yet surcharged are shown in orange. Surcharged sewers (due to backwater effects) are shown in pink. Surcharged sewers (due to throttle conditions, that is, the PWWF in the pipe exceeds the full pipe capacity) are shown in purple. As shown in the plan view, in general, most sewers immediately downstream of the ECR Specific Plan area are predicted by the model to be less than 75% full. There are a few sewer segments that are between 75% and 90% full and between 90% and full along El Camino Real, West of Calabazas Boulevard as well as along Calabazas Boulevard. The downstream segments of the Bowers Avenue trunk (North of Chromite Drive) are predicted to be 75% to 90% full. Sewer segments immediately upstream and downstream of the NVIDIA improvements (Walsh Avenue and San Tomas Expressway) and along Scott Boulevard are 75% to over 90% full (although not surcharged).

As shown on the profile of the proposed capacity improvement project P3 (Cabrillo Avenue Sewer Improvement), the model predicts the proposed upsized 12-inch to be 61% full.

**After the Specific Plan:** The scenario after the Specific Plan includes additional specific developments as well as more intense land use development on selected parcels compared to the scenario without the Specific Plan. Plan and profile views of model results under future (2035) PWWF for this scenario are included in the attached profiles. Sewers shown in red indicate surcharge conditions exceed the City's deficiency criteria, which (as with the before Specific Plan scenario) occurs along the constricted section of the Calabazas Creek trunk. The segment of the 24-inch Calabazas Creek trunk remains surcharged due to throttle and backwater conditions. However, conditions remain similar to the scenario before the Specific Plan, with the maximum surcharge being 2.2 feet above pipe crown (at manhole S62-37) and the minimum freeboard being 5.7 feet (at manhole S62-48). The small additional flow added by the ECR Specific Plan therefore has minimal impact on this deficiency. As shown on the plan view, the additional PWWFs from the Specific Plan do not cause any further deficiencies in the immediate downstream sewers along ECR,

Calabazas Boulevard, Bowers Avenue, San Tomas Expressway, Los Padres Boulevard, or De La Cruz Boulevard.

A second plan view of model results under future (2035) PWWF for this scenario is shown indicating how full the sewers immediately downstream of the ECR Specific Plan area are. The plan view shows how full the sewers are based on their flow depth to pipe diameter ratio (d/D). As shown on the profile of the proposed capacity improvement project P3 (Profile 1), the model predicts the 12-inch to be 54% to 72% full. As a result, the pipe still meets the City's sizing criteria for new sewer facilities (i.e. maximum allowable d/D of 0.75). Additional profiles have been provided for the same trunks detailed in the Before Specific Plan scenario. As shown on the plan and profile view, a few segments along El Camino Real (West of Calabazas Boulevard) are now surcharged (due to backwater conditions) and 91% full (refer to Profile 2). The Santa Maria Avenue 8-inch sewer (Profile 3) is now surcharged due to throttle conditions (in the downstream segments) and backwater conditions (in the upstream segments). The Calabazas Creek trunk (Profile 4) continues to be 77 to 98% full. The San Tomas Aquino Creek trunk (Profile 5) is now 66 to 89% full (was 59 to 74% full before the Specific Plan). The NVIDIA Improvements trunk (Profile 6) is now 88% to surcharged due to throttle conditions (was 80% to 95% full). The downstream reaches of this trunk (along Scott Boulevard) are now 87% to 95% full (was 76% to 85% full). However, none of the pipes exceed the City's hydraulic deficiency criteria.

The PWWF reaching the Rabello and Northside pump stations will be 45.7 mgd or 0.3 mgd more than the PWWF without the development (45.3 mgd). According to the City's Master Plan, the rated firm capacity of the Rabello and Northside pump stations is 20 mgd and 21 mgd, respectively. The updated total flow to the pump stations (45.7 mgd) will therefore exceed the current combined rated firm capacities (41 mgd). The City may therefore wish to consider planning for future pump station capacity improvements.

The deficiency along the Calabazas Creek trunk is caused by the newly discovered 19-inch constriction and will be addressed as part of the proposed Amendment no.1 to the agreement between the City and Woodard & Curran. As a result, the proposed ECR Specific Plan does not cause any deficiencies in the modeled trunks and no additional capacity improvement is needed to serve the proposed development.

## 4 Additional Considerations

As discussed in Section 1 and 3, flow from two ECR developments (3700 ECR and 3410 ECR) plus additional Specific Plan parcels discharge to sewers that convey flow to the Calabazas Creek trunk. As shown on **Figure A-3** in Attachment A, these developments and Specific Plan parcels discharge to a 10- and 9.5-inch (lined) sewer which then discharges into the 24-inch Calabazas Boulevard trunk. These parcels contribute a total average flow of 0.263 mgd to the Calabazas Creek trunk. As discussed earlier, downstream sections of the Calabazas Creek trunk are deficient. As a result, this deficiency should be addressed prior to further development of these parcels.

In addition, flow from some Specific Plan parcels (also shown on Figure A-3) would discharge to sewers that would convey flow through the City's 2016 Master Plan proposed capacity improvement project P3 (Cabrillo Avenue Sewer Improvement). These parcels would contribute a total average flow of 0.209 mgd to the Cabrillo Avenue sewer. This project should be in place prior to development of these parcels.