

Element 8 - System Evaluation and Capacity Assurance Plan

The District evaluates the collection system's capacity and maintains a Capital Improvement Plan (CIP) and implementation schedule in order to respond to problem areas identified in these evaluations.

8.1 Regulatory Requirements

WDR Order No. 2006-0003-DWQ Section D.13(viii) states:

The Enrollee shall prepare and implement a capital improvement plan (CIP) that will provide hydraulic capacity of key sanitary sewer elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather even. At a minimum, the plan must include:

- (a). **Evaluation:** Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or contributing to an SSO discharge caused by hydraulic deficiency. The evaluation must provide estimates of peak flows (including flows from SSOs that escape the system) associated with conditions similar to those causing overflow events, estimates of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events;
- (b). **Design Criteria:** Where design criteria do not exist or are deficient, undertake the evaluation identified in (a) above to establish appropriate design criteria; and
- (c). **Capacity Enhancement Measures:** The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules. The CIP may include increases in pipe size, I/I reduction programs, increases and redundancy in pumping capacity, and storage facilities. The CIP may include an implementation schedule and may identify sources of funding.
- (d). **Schedule:** The Enrollee shall develop a schedule of completion dates for all portions of the capital improvement program developed in (a)-(c) above. This schedule may be reviewed and updated consistent with the SSMP requirements as described in [WDR Order 2006-0003-DWQ] Section D.14.

8.2 Capital Improvement Plan

The District maintains a CIP and budget, in order to ensure the WWTP and trunk system are in good working order and have sufficient capacity. The current CIP and budget is included in SSMP Element 4: Operations and Maintenance, Appendix 4A.

8.3 System Hydraulic Evaluation and Capacity Assurance Plan

The District completed a Trunk Sewer System Capacity Study in 2006, which is provided in Appendix 8A. The study concluded that tributary flows were within the design flow capacities of the system and that there were only three problem areas, which were addressed by the CCTV and cleaning done in 2008. The three problem areas and the 2008 CCTV and cleaning are discussed in Trunk Sewer System Capacity Study and SSMP Element 4 – Operations and Maintenance.

THE SEPTEMBER 19, 2007 BAKEMAN LANE TRUNK LINE ANALYSIS UPDATE IS INCLUDED IN APPENDIX 8B AND ADDRESSES ONE OF THE PROBLEM AREAS NOTED IN 2006.

Appendix 8A

SSLOCSD Trunk Sewer System Capacity Study

South San Luis Obispo County Sanitation District

Trunk Sewer System Capacity Study

Final Draft Report

May 12, 2006

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SSLOCSD Trunk Sewer System Capacity Study

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1. INTRODUCTION

1.1 PURPOSE

The South San Luis Obispo County Sanitation District's (District or SSLOCSD) existing wastewater collection system was designed and built in 1966. Raw wastewater is collected through 6.5 miles of District trunk lines that extend through Oceano and Arroyo Grande with pipes varying in size from 18 to 30-inches. Trunk lines (pipes varying from 15 to 24-inches) in Grover Beach which convey sewage to the treatment plant were also included in this study although, presently, these trunk lines are not owned by the District. Capacity in District trunk lines is not specifically divided among the parent agencies. As outlined in Ordinance No. 2000-3, impact fees are collected for new developments from each agency which are used for expansion related improvements. As a result, those agencies which sustain the most new development contribute a greater share to facility expansion. This Trunk Sewer Capacity Study presents the analysis of existing and future flows within the District trunk sewer lines and identifies existing and future capacity concerns that will enable staff to make project recommendations throughout the District's service area.

1.2 Scope of Study

The Trunk Sewer Capacity Study was conducted to evaluate the existing wastewater trunk sewers under current and build out conditions, and to re-evaluate how to correct those deficiencies in the SSLOCSD service area. The scope of this study included the following:

Research and Review of Documents - Data for this study included planning information from each agency as well as available records for sewer utility locations throughout the service area.

Existing Wastewater Flows - Wastewater flow data at the District treatment plant was analyzed, and flow information was based on population information data within the District service area. The plant influent data was analyzed to estimate the peak diurnal flow to the plant, and this in turn was used to estimate a peaking factor for each service area. Historical average daily flows incorporating rainfall data and general trends of inflow/infiltration to the plant was reviewed and analyzed, to assess the capacity of trunk lines. This did not include inflow and infiltration (I/I) monitoring in the trunk sewer but is recommended in future studies.

Future Wastewater Flows - Future wastewater flows and flow characteristics were based on growth projections provided by each participating agency served by the District.

Trunk Sewer Modeling - A hydraulic model of the entire gravity trunk sewer was based on information collected from as-built or record drawings. This gravity flow model was created on an Excel spreadsheet developed by Wallace Group. All sewer inverts were provided on District as-built drawings. Design criteria was generated for each trunk sewer relative to design capacities and flow parameters. The flow analysis utilized Manning's open channel flow equation for flow in circular channels. All sewers 12" diameter and larger which directly impacted the District's trunk sewer system were included in the model. The City of Arroyo Grande's 12" trunk sewer, which is part of the District's overall trunk sewer system, was recently modeled in their wastewater master plan. This data was also included into this spreadsheet. Wastewater demands were distributed throughout the trunk sewer system based on available zoning/land use maps. Analysis of these zoning/land use maps included discussions with corresponding agency staff relative to developed and undeveloped areas through their respective service areas. Model runs were conducted for existing flows (at diurnal peak flow conditions during the maximum month), and at future projected wastewater flows (also at diurnal peak flow conditions during the maximum month).

1.3 Acknowledgments

The District appreciates the assistance provided by the following individuals and thanks them for their contributions to this report:

Jeff Appleton – Plant Superintendent, SSLOCSD

Phil Davis – Utility Manager, Oceano Community Services District

Chuck Ellison – General Manager, Fluid Resource Management; former Superintendent
SSLOCSD

Mike Ford – Utility Manager, City of Grover Beach

Scott Mascolo – Shift Supervisor, SSLOCSD

Shane Taylor – City of Arroyo Grande, Public Works Superintendent

Murray Wilson – Staff Assistant, City of Grover Beach Planning Department

2. SSLOCSD SERVICE AREA

2.1 Service Area Boundaries

The District encompasses a geographic area of 165 square miles. It is located within an area known as the Five Cities area in the southwestern portion of San Luis Obispo County, 15 miles south of the City of San Luis Obispo. Refer to Figure 2-1 for the project vicinity map, and Figure 2-2 for the SSLOCSD Service Area Boundaries. Refer to Appendices A and B for maps of the District's trunk sewers. The following is a brief description of each of the communities served by the District trunk sewer system.

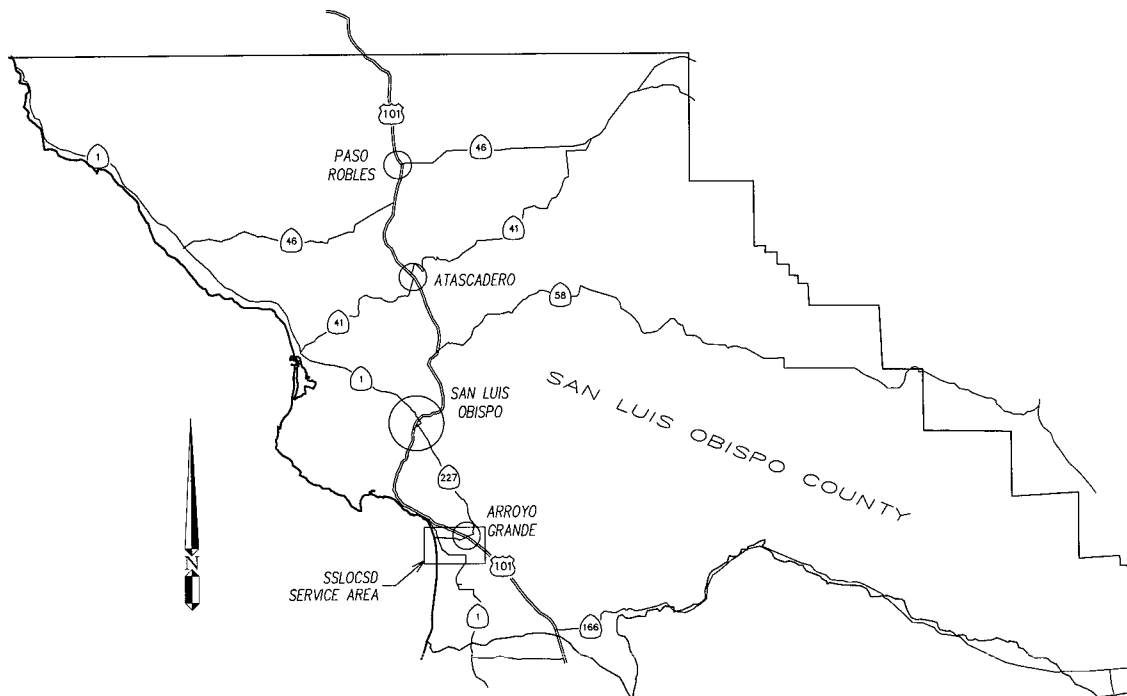


Figure 2-1 Vicinity Map

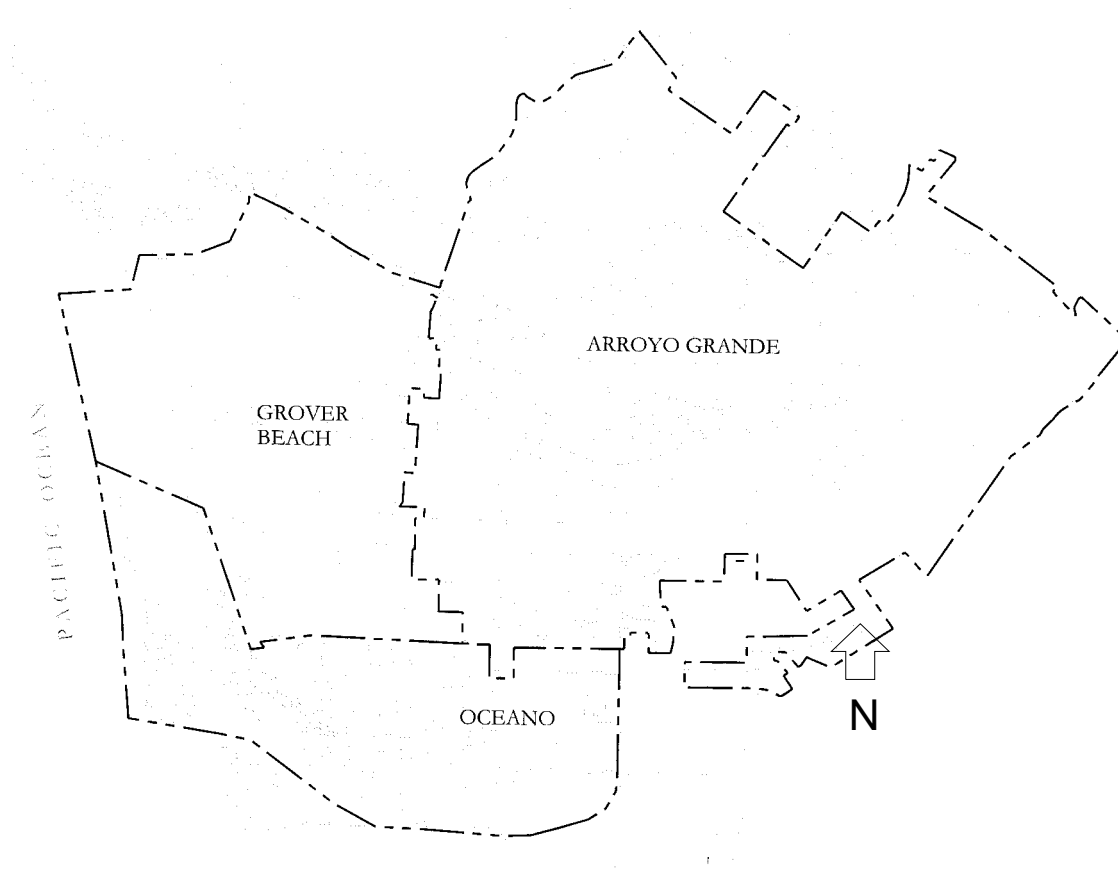


Figure 2-2 SSLOCSD Service Area Boundaries

2.1.a. City of Arroyo Grande

The City of Arroyo Grande is a community encompassing 5.45 square miles of diverse landscape ranging from gentle rolling suburbs to scenic canyon lands.

The City extends on both sides of Highway 101, which bisects Arroyo Grande into an eastern and western section. Both “sections” of the City contain commercial and residential areas. The eastern section contains what many consider the “Old Village” with accompanying residences rising up into canyon land extending to the north and east. A limited amount of agriculture occurs in this City, and Lopez Lake lies due east of Arroyo Grande.

The western section of town includes predominantly suburban homes and service businesses and is served by Grand Avenue, a major commercial corridor which passes through Arroyo Grande and extends into Grover Beach.

2.1.b. City of Grover Beach

Grover Beach is an incorporated ocean -front City encompassing approximately 2.25 square miles.

The topography includes gently rolling hills, urban and suburban neighborhoods. The weather is moderate during the winter and slightly cool during the summer months. The City receives an average of 20 inches of annual rainfall. Grand Avenue is a major commercial corridor connecting to California Hwy 101 in the City of Arroyo Grande.

The economic base is primarily commercial service and tourism, and there are no heavy industries located in the service area. The City has been served by the District since its inception, first as a contract agency, then as a member agency since 1997.

2.1.c. Oceano Community Services District

Oceano is an unincorporated area of San Luis Obispo County governed by the Oceano Community Services District. It reportedly began in the late 1800's as a fishing village and evolved into an agricultural community. At one point, in 1972, the community considered incorporation but the tax base was not adequate to sustain city status.

In 1981, the Oceano Community Services District (OCSD) was formed, and provides water, sewer, street lighting, recreation and fire protection services. The OCSD boundaries encompass an area of approximately 1.7 square miles and includes both the town of Oceano and community of Halcyon.

2.2 Descriptions

The SSLOCSD is governed by a three-member board of directors consisting of a representative from each of its member agencies. Member agencies include the City of Arroyo Grande, the City of Grover Beach, and the Oceano Community Services District. Wastewater collection (trunk sewers only), treatment, and disposal services are provided by the District to each member agency as described in the following sections:

2.2.a. Trunk Sewer System

The District owns and maintains a system of gravity trunk sewers to serve its member agencies. The District trunk sewers vary between 18" and 30" in diameter. The majority of the system was constructed in 1966. The trunk capacity available for each member agency is not established by contract and no capacity allocation exists for each agency. However, the District collects impact fees from new development projects within each member agency, and the funds are used for major replacements and expansion-related improvements. As a result, those agencies which incur the most new development contribute a greater share of the cost to expand the District system expansion.

2.2.b. Wastewater Treatment Plant (WWTP)

The District owns and operates a wastewater treatment and ocean disposal facility with a design average annual flow capacity of 5.0 million gallons per day. The system consists of a secondary treatment facility including the following process elements:

- Headworks - flow meter and raw wastewater pump station
- Primary clarification
- Secondary treatment utilizing a biological fixed film reactor
- Secondary clarification
- Disinfection and dechlorination
- Gravity ocean outfall (shared with the City of Pismo Beach)

The treatment system is operating at approximately 58% of capacity¹ (2.88 mgd). As with trunk capacity, wastewater treatment and disposal capacity was not established by contract and was therefore not apportioned amongst the member agencies.

¹

District flow records, 2000 Annual Report

3. EXISTING AND FUTURE LAND USE AND POPULATION

The land area served by the District includes residences, tourism, and commercial districts composed primarily of service businesses and light industry. Scattered agricultural uses within the District's service area are limited and not currently expanding in scale.

Arroyo Grande, Grover Beach, and Oceano Community Services District each have land use plans as part of applicable general plans guiding development within their respective areas. In the case of OCSD, the County's land use plan governs.

3.1 City of Arroyo Grande

Arroyo Grande's General Plan emphasizes the community's desire to maintain a rural, small town character. It recommends that large scale commercial development remain focused along the Hwy 101 corridor and small scale commercial development continue to occupy the "village area" and the Grand Avenue corridor.

Agricultural uses lie primarily on the southeast side of Arroyo Grande and are split by Hwy 101. Expansion of agricultural uses is unlikely, but Arroyo Grande's general plan considers preservation of existing agricultural land use as a priority goal.

The majority of Arroyo Grande is residential in use and character. Approximately 82% of the land area is occupied by housing. Southwest of Hwy 101 the land is relatively flat and suburban in character. It has a mix of both single family and multiple family residences with single family predominating. The residential area on the Northeast side of Hwy 101 is a mixture of flatter development and hillside residences.

Arroyo Grande has recently experienced a considerable increase in commercial/retail development along the Hwy 101 corridor. There are approximately 18 acres of city land devoted to light industrial and a business park to be developed.

The current population of Arroyo Grande is reported to be 16,115² with a build out population projected to be 20,000 (see Table 3-1) in the year 2012.

² City of Arroyo Grande General Plan

Table 3-1 Existing and Future Populations		
City or District	Existing Population	Future Population (Build Out)
Arroyo Grande	16,115	20,000
Grover Beach	13,067	16,268
Oceano Community Services District	7,260	9,601
Total	36,442	45,869
Populations based on 2000 Census data and assessment of additional dwellings in 2001.		

3.2 City of Grover Beach

Grover Beach's general plan seeks to "... preserve and promote an economically diverse town influenced by the natural benefits of its location on the hills and valleys, reaching out to the coastal dunes, the beach, and the Pacific Ocean."

Most of the City appears commercial, suburban and recreational in character. There is little light industry and no heavy industry. Commercial/Retail uses are located primarily on the Grand Avenue corridor.

The Land Use Element of the General Plan divides Grover Beach into 13 separate neighborhoods for which housing and population statistics have been compiled. The current population of the City of Grover Beach is 13,067 with a projected future build out population of 16,268 (Table 3-1) anticipated to be reached around 2011. Any one of these neighborhoods may have a mix of uses but as in the case of Arroyo Grande, they are primarily residential in character. Two exceptions to this, however, include the Central Business District Neighborhood and the Beach Neighborhood. In these neighborhoods residential uses give way to commercial and retail uses.

Two major transportation corridors serve Grover Beach. Grand Avenue serves the Central Business District, connecting to Hwy 101 on the East and the beach on the West. Highway One and the railroad line separates the majority of Grover Beach from the beach area. The rail runs north and south and carries both passenger and freight traffic on the main line that connects Los Angeles and San Francisco.

Grover Beach considers itself an "affordable" community while continuing to attract and serve tourists to its natural resources. There is a small area of agricultural land remaining in Grover Beach (approximately 150 acres).

3.3 Oceano Community Services District

The County's San Luis Bay Area Plan governs land use and development in Oceano. There are both coastal and inland versions of this plan. Particular reference is made in this plan to the area within the Oceano Urban Reserve Line.

The current population of the Oceano community is 7,260. Population projected by the San Luis Obispo County Oceano Specific Plan and Environmental Impact Report (August 2001) indicates a population of 9,601 at buildout. Although a specific year is not stated for the build out population to be reached, the life of this Specific Plan was stated as 20 years.

The community of Oceano is primarily residential with 42% of its 896 acres encumbered by this use. There are large open space areas within the District in the form of beach land, the Oceano Airport, and several agricultural fields totaling about 126 acres. Of the residential areas, approximately 34% are single family homes, 6% of the areas are mobile home parks, and about 2% are multi-family dwellings.

Commercial areas are located along the railroad/Highway One corridor which divides the community in a north and south direction. There are also commercial uses along Pier Avenue, which is the access point to the beach. These areas account for about 20% of the total land area.

A limited amount of light industrial uses are also located along the railroad corridor. These uses occupy about 20 acres of land. The Oceano airport consisting of approximately 65 acres is located very near the beach area and the District's wastewater treatment plant.

Most of the housing units in Oceano are modest single family homes with vacation homes located along the beach. About 75 percent of the housing was built before 1984, with about a third of that constructed before 1960.

4. WASTEWATER FLOWS

4.1 Existing Wastewater Flows

Existing wastewater flows were assessed utilizing the following sources of data:

- The Arroyo Grande Wastewater Master Plan.
- The District wastewater treatment plant influent flow records and annual reports.
- Population data from each agency.

Since no additional flow data was available from Grover Beach or Oceano, the existing wastewater flows were derived from the sources of data listed above. The approximate percentage of the total flow that the City of Arroyo Grande contributes to the District treatment facility was determined. The District flow data, which includes continuous flow records and daily totals, was then used to confirm seasonal peaking factor characteristics. As of mid-2001, the District served a total population of 36,802 persons including the following entities:

- City of Arroyo Grande (16,115 persons)
- City of Grover Beach (13,067 persons)
- Oceano Community Services District (7,260 persons)

There is a small population that is serviced by the District that is not incorporated within the above mentioned entities. This population consist of less than 50 residences, and the associated demands were included in this study.

Flow meters were installed (2001) at the two District trunk mains that convey wastewater from Arroyo Grande. An analysis of data from the Arroyo Grande Wastewater Master Plan shows that during dry weather periods, Arroyo Grande contributes approximately 44% of the total raw wastewater flow to the District. This result was consistent with the current Arroyo Grande population, which also represents approximately 44% of the total District population. It was a reasonable assumption then, that Grover Beach and the Oceano Community Services District would also contribute proportionate flows based on their population ratios. Table 4-1 shows the determination of existing flows.

Table 4-1 Existing Average Annual (Daily) Flows by Land Use¹			
City or District	Existing Population	Percentage to District Population	Total Average Annual Flow (Million gallons/day)
Arroyo Grande	16,115	44%	1.26
Grover Beach	13,067	36%	1.03
Oceano Community Services District	7,260	20%	0.59
SSLOCSD TOTAL	36,802³	N/A	2.88²

- Notes:
1. These values were based on the values used in the Arroyo Grande Wastewater Master Plan adopted on November 2001.
 2. The Annual Average Flow (year 2000) for The District during the same period was 2.88 MGD
 3. Population not incorporated within Arroyo Grande, Grover Beach, and the OCSD, but were still serviced by the District will not alter the percentages significantly.

Although existing flow data used for this study was based on the year 2000, the District Treatment Plant average daily flows for 2001, 2002 were 2.72 mgd, 2.73 mgd respectively. It was a reasonable assumption that the present day flow analysis will vary minimally from the data used in the year 2000. The population as of 2003 has increased by about 3%¹ from 2001.

4.2 Peaking Factor Analysis

In order to appropriately design wastewater collection facilities, peak flow conditions are quantified, and summarized below:

Average Annual Flow (AAF) was obtained by dividing the total flow conveyed in one year by 365 days. Peak conditions were derived by multiplying the AAF by a peaking factor (PF). Table 4-1 summarizes the average annual flows to the SSLOCSD WWTP.

Peak Day Dry Weather Flow (PDF) is the maximum flow during one day of the dry season. This flow condition is often used for the biological design of treatment processes. PDF was based on data provided by the District.

Peak Hour Wet Weather Flow (PHWWF) is the single hour maximum flow rate during wet weather. This condition will govern the design of sewers and represents the maximum flow rate that the system must convey. This flow condition was used in determining the peaking factor used for this study.

Average Day Maximum Month Dry Weather Flow reflects the maximum flow rate during the peak month of summer. This condition reflects the seasonal variation in dry weather flow. This flow condition was only used as a reference (Table 4-2).

Table 4-2 Summary of Peaking Factor Analysis		
Peak Flow Condition	Historical Peaking Factor (SSLOCSD)	Arroyo Grande Peaking Factor
Average Annual (Daily) Flow (AAF)	--	--
Peak Day Dry Weather Flow (PDF) ¹	1.17	1.3
Peak Hour Wet Weather Flow (PHWWF) ²	2.79	3.0
Average Day Maximum Month Dry Weather Flow	1.02	1.1
Notes: 1.PDF was based on the District Peak Day in September, 2000 2.From the Arroyo Grande Wastewater Master Plan, PHWWF was confirmed by checking two conditions. Firstly, peak hour wet weather flow at The District was examined. Secondly, the known daily flow fluctuation in AG was applied to the AG portion of the maximum day wet weather flow at The District (March 5, 2001). The latter condition was assumed representative of the trunk lines within Arroyo Grande and Oceano.		

¹According to the 2003 Economic Report for the City of San Luis Obispo by the Research Department of the SLO Chamber of Commerce - Grover Beach 13,433; Arroyo Grande 16,523; OCSD 7,574

Table 4-2 summarizes the peaking factors used for this study. These peaking factors reflect peak flows due to gravity (lift stations were assumed inflow equals outflow) in reference to AAF. Since the Oceano trunk system also conveys Arroyo Grande flows, the Arroyo Grande peaking factor (3.0) was used for the trunk system within Arroyo Grande and Oceano. The various Arroyo Grande lift stations cause plug flows which adversely affect the peak gravity flow analysis (Table 4-2). Flow data from Arroyo Grande factors in the impact of its upstream lift stations. These plug flows will reflect higher peak flows to some extent downstream in the District trunk sewers (Appendix E - locations of these lift stations).

The trends of inflow/infiltration flows were factored into the peaking factors chosen for this study.

4.3 Future Wastewater Flows

Table 4-3 summarizes the future wastewater flows for each City/District at build-out using each member agency's planning and population information. The existing peaking factors from Table 4-2 were applied to these future wastewater flows for the build-out trunk sewer capacity analysis.

Table 4-3 Future Wastewater Flows (Average Daily Flows)		
City or District	Build-out Population	Build-out Flows (mgd)
Arroyo Grande	20,000	1.65
Grover Beach	16,268	1.34
Oceano Community Services District	9,601	0.79
Total	45,869	3.83

4.4 Arroyo Grande Tract Map Development Update

An updated tract map of Arroyo Grande enabled more conclusive flow projections (see Table 4-5, and Figure 4-4). The relevant issues are as follows:

- Although all but one(see #24 on Fig 4-4) of these developments are consistent with the Land Use Map of the Arroyo Grande General Plan, some of these developments are not projected by the Arroyo Grande Wastewater Master Plan.
- Flow additions by developments upstream of LS1, West AG, and East AG showed minor variances in the flow allocations projected by the AGWWMP.
- Present design upgrade plans to LS1 pumps will not exceed the existing pump outflow.
- LS1 and West Arroyo Grande wastewater flows are conveyed by the SSLOCSD Sewer Farm Trunk System, which has identified concerns (see section 5).
- East Arroyo Grande wastewater flows are conveyed by the SSLOCSD Cherry Avenue and Southside Trunk System.

Table 4-4 summarizes wastewater flow additions that will be contributed by developments shown by the updated tract map (see Table 4-5 for the full description). The Projected Average Flows account for current developments constructed or soon to be constructed. Although this data would indicate an excess of flows, it must be considered that the projections made by the AGWWMP are going to vary from the actual planned developments. Flow contributions from the updated tract map also shows that the Future Total Average Daily Flow projected by the AGWWMP has not been exceeded. For the purpose of this study, it will be assumed that these flows will add to the Future Total Average Daily Flow projected by the AGWWMP. With this assumption, flows from East Arroyo Grande will not impact the Southside Trunk System, but flows from West Arroyo Grande will impact the 18" Bakeman Lane Trunk Sewer (see Section 5) within the Sewer Farm Trunk System.

Table 4-4 – Arroyo Grande Updated Flow Additions	
Upstream Area	Projected Average Flows (gpd) (unaccounted by AGWWMP projections)
Lift Station 1	35,729
West Arroyo Grande	7,338
East Arroyo Grande	6,900
Unaccounted Total Average Flows (gpd)	49,967
Existing Total Average Daily Flow (gpd) (stated in AGWWMP)	1,260,000
Future Total Average Daily Flow (gpd) (projected by AGWWMP)	1,650,000
Future Total Average Daily Flow (gpd) (adjusted per the updated flow additions)	1,700,000

5. WASTEWATER TRUNK SEWER SYSTEM ANALYSIS

5.1 Trunk Sewer System Model

An Excel based spreadsheet program developed by Wallace Group was used to evaluate existing and future flows to the trunk sewer system. This spreadsheet program utilized Manning's Equation for Circular channel flow in conjunction with information from the Circular Channel Ratios¹ graph for d/D vs. Q/Q_{full} . This graph relates the ratio of depth of flow to the diameter of pipe (d/D) and the ratio of the actual flow rate to the full capacity flow rate (Q/Q_{full}).

Appendix C displays the existing and future flows to the system.

Appendix F, Table 1 - displays the existing flow data spreadsheet for the represented agencies.

Appendix F, Table 3 - displays the future flow data spreadsheet for the represented agencies.

5.2 Analysis and Deficiencies

Design criteria for the gravity sewer analysis recommends a maximum allowable flow depth ratio (d/D - ratio of depth of flow over diameter of pipe) of 0.90 for peak hour wet weather flow. This design criteria is acceptable for large diameter trunk lines (over 12"); however design judgement is required for each particular case. This design criteria is also consistent with that derived in the Arroyo Grande Wastewater Master Plan.

5.2.a Flow Impacts and Analysis

Analysis of the trunk sewer system was viewed under existing and future flow conditions.

- Existing Conditions:
 - Oceano - analysis shows no flow/capacity issues.
 - Arroyo Grande -
 - analysis shows flow conditions exceeding 0.90 d/D at Fair Oaks Ave near Hwy101 (Appendix F, Table 1, line 48 -52) at PHWWF.
 - 18" Bakeman Lane trunk sewer (Appendix F, Table 1 line 78 - 83) analysis does not show the d/D over 0.90. However, there are potential capacity issues with the trunk line in this reach. District staff² has reported a sag on this line. This sag has been substantiated by recent video of this reach of sewer. Recommendations for this Bakeman Lane trunk line are discussed in section 6.
 - Grover Beach - analysis shows the 18" trunk line (beginning at the intersection of Manhattan Street and Pacific Blvd to the corner of Coolidge Drive and Norswing Street) with a d/D over 0.80 (See Appendix F, Table 1, line 110 - 115) at PHWWF. All the flows from Grover Beach converge at manhole #340 (See Appendix F, Table 1, line 115).

¹From Civil Engineering Reference Manual 7th Edition Appendix 19.C

²Jeff Appleton, the Superintendent of the District WWTP

- Future Conditions:
 - Analysis of future conditions was conducted by determining the location of future growth and development from land use and zoning information. Locations of future flow additions were then introduced into the trunk sewer system accordingly. Such flows are shown on Figure 5-1 and are discussed as follows:
 - Oceano
 - future flow additions are observed to enter the Southside Trunk Sewer near Halcyon Road and Highway One. These flows would be conveyed by the 27" and 30" trunk lines along Nipomo Street and Highway One to the Treatment plant.
 - The District Trunk Sewer lines within Oceano have adequate capacity for buildout flows.
 - Arroyo Grande
 - 18" Bakeman Lane trunk line(Appendix F, Table 3 line 79- 83) d/D is over 0.90 at this stretch.
 - Other future flows are observed to enter the 27" trunk line (Southside Trunk Lines) at Halcyon Road at East Oceano.
 - The Southside Trunk lines show adequate design flow capacity.
 - Grover Beach
 - Future flows enter the 18" trunk line at Manhattan Street and Pacific Blvd (Appendix F, Table 3, line 110 - 115).
 - Further analysis of this stretch of trunk line shows surcharging in MH# 340 where all the flows converge.
 - Computer modeling shows surcharging at a height of about 2.5' from the invert of the manhole; this will raise the water level about 12" above the pipe crown during peak hour wet weather flow conditions.

5.2.b Gravity Flow Conditions

Since the impact of the lift station pumps are intermittent in nature, the system was appropriately analyzed with the lift station pumps cycling on and off. The analysis of the trunk sewer system was based on Peak Hour Wet Weather Conditions along with plug flows by various lift stations within the system (refer to Appendix E for lift station locations). A special analysis was considered with flow conditions that do not include the plug flows of these various lift station pumps. This analysis is displayed in Appendix F, Table 2 for Existing Conditions and Appendix F, Table 4 for Future Conditions. Although these conditions do not occur often, this analysis must be considered since it shows a picture of what conditions look like without the short cycles of increased flows that the lift stations discharge. Gravity flow conditions may be simulated if variable frequency drives (VFD) were installed in the upstream Arroyo Grande Lift stations. VFDs control the lift station motor so that the pumps continuously run to match flow output to flow input.

5.3 Conclusions / Recommendations

Overall results show that the capacities of District trunk lines for existing and future flows are adequate, except for three potential problem areas (see Appendix D for the map that identifies these areas) as follows:

- 18" trunk line beginning at the corner of Manhattan Street and Pacific Blvd in Grover Beach
 - This trunk line shows existing flows which approach the limits of design flow capacity during peak hour wet weather flow. Future analysis shows the potential for surcharging at manhole #340. Solutions such as decreasing the I/I in the trunk sewer system, should be investigated to abate this future problem. Also, flow monitoring is recommended to confirm the hydraulic peaking factors used in this study. Once the flow monitoring confirms the accuracy of the hydraulic model, further recommendations will need to be made at that time.
- 18" trunk line (Sewer Farm Trunk Line) at Bakeman Lane near the Oceano/West Arroyo Grande border
 - This trunk line is deep, around 25' at one point, and is located in an easement surrounded by a dense residential development and improvements in the easement. Along with these challenges, the trunk line is also reported to be sagging, and there is debris in the line restricting flow. This study recommends immediate solutions to mitigate this problem. *See the full discussion of this recommendation in chapter 6.*
- 12" trunk line at Fair Oaks lane near Hwy 101 in Arroyo Grande.
 - This trunk line is owned by the City of Arroyo Grande. A capital improvement plan for this stretch of trunk line is outlined in the Arroyo Grande Wastewater Master Plan, adopted November 13, 2001.

Recommendations:

- 2300-ft of 12" VCP Trunk Line along Fair Oaks Ave near Hwy 101 at Arroyo Grande needs to be upgraded by the City of Arroyo Grande, as recommended in the Arroyo Grande Wastewater Master Plan.
- 18" trunk sewer line near Bakeman Lane
 - Debris removal and pipe cleaning.
 - Flow monitoring upstream and downstream of the vicinity of the sag should be performed to observe the hydraulic conditions during peak flows.
 - Possible construction of a by-pass relief sewer should be considered if these maintenance measures do not mitigate the problems. *See the full discussion of this recommendation in chapter 6.*
 - The City of Arroyo Grande has a disposal station that is located upstream of the 18" trunk sewer line near Bakeman Lane. A new location to receive these flows through the Southside trunk system should be considered; a possible location is at Valley Road near Fair Oaks Ave.
- Video of District trunk system – Video of the trunk system was filmed during February 2004, but was only partially completed because of manhole inaccessibility within certain areas of the system – approximately 30 manholes are inaccessible. Appendix H shows a map of current sewer video information.
- Flow monitoring – conduct flow monitoring at various locations to verify modeled flows and assumptions. For example, Grover Beach MH#340 should be monitored where all the flows from Grover Beach converge in the 18" trunk line. Grover Beach has grown considerably in the last 3 years and updated wastewater flow data is needed.
- Work with each respective entity (Oceano Community Services District, City of Arroyo Grande, City of Grover Beach) to implement a comprehensive infiltration/inflow (I/I) program to reduce wet weather flows by 25% or more. The City of Arroyo Grande's Wastewater System Master Plan calls for inflow studies upstream of Lift Station #3 in its Capital Improvement Plan. Such programs are required by the Regional Water Quality Control Board in the Districts existing waste discharge requirements.
- Variable Frequency Drives (VFD) be installed in lift stations that are upstream of the 18" trunk sewer line near Bakeman Lane. *See more detailed discussion of this recommendation in section 6.6.*

It is intended that the findings in this report will enable staff to proceed with recommendations that will ensure continued capacity within the District Trunk Sewer System.

Chapter 6 presents a more in depth discussion of the recommendations to the 18" trunk sewer located near and parallel to Bakeman Lane in the form of a feasibility study.

6. BAKEMAN LANE BY- PASS RELIEF TRUNK SEWER FEASIBILITY STUDY

Within the SSLOCSD trunk sewer system, there are observed flow capacity problems within the stretch of trunk lines within the Sewer Farm Trunk system near Bakeman lane that extends on through The Pike. Results from the Arroyo Grande Wastewater Master plan (AGWWMP) , this Trunk Sewer Capacity analysis , and observations and analysis from SSLOCSD staff, indicate the need to restore trunk sewer capacity in this area. The 18" Bakeman trunk line conveys all of the sewage flows from West Arroyo Grande. A solution for continued flow capacity is needed to preserve existing capacity, and accommodate future developments that will be serviced by this stretch of trunk sewer. Staff was authorized by the Board to conduct a feasibility study for improving the 18" Bakeman Lane trunk sewer line.

6.1 Alternatives

The following alternatives assume that the 18" Bakeman Lane Trunk sewer will either need to be replaced or that a by-pass relief sewer be constructed.

A common approach to solving sewage capacity flow problems within trunk mains is to construct a relief sewer main parallel to the problem trunk main. This conventional alternative is not feasible in this case because the vicinity of the Bakeman Lane trunk sewer is virtually inaccessible due to location and depth. A large portion of the trunk sewer is located within a mobile home park and the depths of this stretch of sewer approaches 30-feet. The first construction alternative considered is known as pipe bursting. The second alternative is construction of a relief trunk sewer that would by-pass the problem Bakeman Lane trunk sewer line with another trunk sewer along South Elm Street and the Pike. These alternatives are discussed below.

- **Alternative 1 - Pipe Bursting**

Pipe bursting would make it possible to upgrade the existing sewer from 18" to a 21" diameter HDPE gravity sewer pipe and still meet the slope requirements. This method breaks the existing pipe and pulls the replacement pipe in place of the old. This alternative, although possible, does not appear to be feasible in this case. The drawbacks are summarized in the following:

- The geotechnical report shows highly compacted sand that would make pipe bursting unfavorable.
- The pipe bursting method, when employed in densely pack material, may adversely affect the residences nearby due to possible cracking of siding and drywall from vibrations.
- Inaccessibility of the manholes are a major drawback since construction will require that these manholes be accessed.
- This construction method will not repair the sag problem.

- **Alternative 2 - By-pass relief sewer**

The most feasible alternative is to construct a by-pass relief sewer in an alternative alignment. Since this is a proposed by-pass relief sewer trunk line, it is intended that the existing 18" trunk line remain in service.

The remainder of this chapter summarizes the feasibility analysis of Alternative 2. The proposed alignment of the Bakeman Lane by-pass relief gravity sewer begins at the corner of Fair Oaks and South Elm Street, proceeding south along South Elm Street, then at the intersection of South Elm and The Pike, proceed west along The Pike until it ties in to the sewer manhole near Tamara Street (the proposed end of connection). Please refer to the attached Figure 6-1. There does not appear to be any other feasible alignments. Other alignments would traverse residential areas, and/or would extend length and thus reduce flow capacity and velocities in the trunk sewer.

6.2 General Site Observations

These observations were made on April 2, 2004, Friday between 9:30am and 10:30am:

- At Fair Oaks Ave and South Elm Street, there is a park to the west. The existing trunk line proceeds west from this intersection. South Elm Street is a 4 lane commercial street; ac pavement is in good condition; in fact, the City of Arroyo Grande overlaid this road within the last two years. Mainly condominiums and apartments are on both sides of the street. The street slopes gently in the southerly direction.
- Southbound South Elm Street slopes upward as it crosses Farroll Ave then downward as it crosses Pacific Pointe Way until the intersection at The Pike.
- At The Pike and South Elm Street, the proposed alignment continues westbound along The Pike. The Pike is a 2 lane street with bike lanes on both sides; ac pavement is in good condition (this road has also been overlaid within the last two years) lined on both sides with residential housing.
- The existing trunk sewer MH where the proposed by-pass relief alignment would connect is located at The Pike near Tamara St, in front of North Oceano Elementary School.
- Tamara Street and 23rd Street are both narrow 2 lane residential streets; ac pavement is in good condition. Alignments down these streets were considered undesirable.
- South Elm Street and The Pike are the recommended alignments for the proposed by-pass relief sewer; other streets were investigated but access was limited.
- Utility maps show the width of the South Elm Street right-of-way as 80' and the width of the Pike right-of-way varies from 50' to 70'.

6.3 Utility Issues

The following summarizes utility information within the proposed sewer alignment.

Water utilities:

- The 8" ACP Lopez Water Line runs southbound along the western side of South Elm Street and at the intersection of The Pike proceeds westbound along the northern side of The Pike.
- On South Elm Street, a 10" Arroyo Grande Water Main runs parallel to the 8" Lopez line and proceeds east at the South Elm/The Pike intersection.
- The 6" Oceano water main connects to the 8" Lopez line at South Elm and Lancaster Dr. and both the Oceano 6" main and the 8" Lopez line continues southbound then proceeds westbound at the South Elm/ The Pike intersection. The 6" main runs along the northern side and the 8" Lopez line along the southern side of The Pike.

Sewer Utilities:

- A 10" VCP and 8" VCP gravity sewer run along most of South Elm Street.
- A 8" VCP gravity sewer runs along The Pike.

Gas Utilities:

- Gas lines run along the entire lengths of interest for both South Elm Street and The Pike.

PG&E Utilities:

- There are underground power lines along South Elm Street. The number and location of these lines must be verified before construction.
- There are no underground power utilities along The Pike.

These utility locations are schematically depicted on the utility drawings collected from each utility agency. The exact locations would need to be verified during detailed design.

Although there are a moderate amount of utilities within this proposed alignment, there is adequate space for design and placement of a new trunk sewer alignment within the road rights-of-way.

6.4 General Analysis

Table 6-1 presents the Tract Map update for Arroyo Grande which shows the developments that are either under construction or are making progress towards construction. Except where noted, these developments follow the Land Use and Zoning map of the Arroyo Grande General Plan 2001, which was the data referenced by the Arroyo Grande Wastewater Master Plan to estimate future sewer flows. In the area of interest, the updated AG tract map varies little with the 2001 AG General Plan; therefore, the hydraulic sewer analysis from the AG Wastewater Master Plan and the SSLOCSD Trunk Sewer Study can be applied to this study.

Table 6-1 – Developments at West Arroyo Grande¹

Development	Location	Status
Long's Drugs, Starbucks, Panda Express	Courtland St and Grand Ave, SE corner	Under Construction
Santa Lucia Bank	Courtland St and Grand Ave, NW corner	Under Construction
Tract 2338 – 26 SFR homes	Stonecrest Dr and El Camino Real	Under Construction
Commercial Building	El Camino Real, north of Brisco Rd	Under Construction
Tract 2236 – 20 SFR homes	Rodeo Dr. north of West Branch St.	Plan Check
Tract 1998 – 40 SFR homes ²	La Canada and James Way	EIR Review ²
20 Condos	James Way, east of Oak Park Blvd	Plan Check
40 Senior Apartments	Camino Mercado north of West Branch	Approved
5 Professional office bldgs	Camino Mercado near West Branch St.	Plan Check
Tract 2240 – 9 units	South Elm St. near Fair Oaks Ave.	Completed
Tract 2471 – 9 SFR homes	Grand Ave between Oak Park Rd and Courtland St.	Plan Check
108 Senior Apartments	Courtland St between Brighton and Grand Ave	Plan Check
Tract 2532 – 8 units	Ash St, east of South Elm St	Plan Check
Tract 2505 – 47 units	Ash St near Courtland St	Plan Check
Notes: 1. These flows will have influence on the Bakeman Lane Trunk Sewer. 2. The Arroyo Grande Wastewater Master Plan, adopted in November 2001, designates this as open space. Assuming that this subdivision will be approved, Appendix G shows an additional 7000 gallons per day added to the Future flow analysis. These flows enter the SSLOCSD trunk system at Fair Oaks and South Elm Street; which means that these flows would flow into the proposed by-pass relief trunk line or existing Bakeman Lane trunk.		

Table 6-2 summarizes the existing and proposed flows through the trunk system.

Flows enter the 18" Bakeman trunk line from two main areas (see Figure 6-1):

1. At the Fair Oaks/South Elm Street connection
2. At the connection where the 18" trunk line changes direction from west to south which is at the northeast corner of Tract 2310.

Table 6-2 – Trunk Sewer Conditions with Future Peak Flows¹

Trunk Sewer and Conditions	Peak Flow (gpm)
Future flows to Bakeman Ln 18" Trunk Sewer	2000 ^{1,5}
18" Bakeman Ln Trunk sewer with S. Elm St/The Pike By-pass Relief Trunk in operation ¹	900 ²
Proposed South Elm St/The Pike By-pass Relief Trunk Sewer ³	1100 ⁴
Notes: 1. These peak flows are future flows projected by the Arroyo Grande Wastewater Master Plan, adopted November 2001. 2. These are projected future flows that would continue to flow through this existing trunk line; since these flows connect downstream from where the proposed by-pass relief sewer alignment would connect. 3. See Appendix G for hydraulic analysis for each proposed trunk sewer diameter options. 4. These are the future flows projected by the Arroyo Grande Wastewater Master Plan that flows to the connection point of the proposed by-pass relief trunk line. 5. These are what the future flows would be to this existing 18" trunk line if no by-pass relief sewer were constructed.	

Table 6-3 - General Information for Proposed By-Pass Relief Sewer Alignment			
	Location	Approximate Top of Grade Elevation (ft)	Approximate Invert Elevation (ft)
Beginning of by-pass	South Elm / Fair Oaks Ave	78.0	73.5
End of by-pass	The Pike (near Tamara St)	83.5	60.2

The information in Table 6-3 was obtained from SSLOCSD Trunk Sewer Plan and Profile record drawings.

1. The total estimated length of the proposed by-pass trunk line is 3700 linear feet.
2. The elevation drop of the manhole inverts at the beginning and end of the proposed alignment is estimated at 13 ft. This would give an average slope of about 0.35%.

Appendix G at the end of this report presents a hydraulic analysis for trunk sewer options of various diameters for both existing and future conditions. It is recommended that a trunk sewer diameter of 21" be used; this allows more capacity, but also provides full build-out capacity should the Bakeman trunk sewer fail in the future. The SSLOCSD trunk system diameter reverts to 18" at the connection point at The Pike/Tamara Street. Even though the proposed by-pass relief sewer is a larger diameter, the hydraulic analysis as shown in the SSLOCSD Trunk Sewer Capacity Study shows that there is adequate flow capacity within the existing trunk sewers from this point of connection to the Wastewater Treatment Plant. The larger diameter proposed by-pass relief sewer will allow for future flows as shown on Table 6-1.

The criteria for capacity is the ratio of depth of flow (d) to diameter of pipe (D) for peak flow. A d/D ratio of 0.90 is a recommended design criteria for peak flows within large diameter (18" and over) trunk sewers. Once the proposed by-pass relief trunk sewer is in place, the existing trunk sewer will convey peak flows at less than 50% of its current capacity. The reduced flow within the existing 18-inch trunk sewer will be well within its calculated design capacity; but, this condition will need to be monitored because the sagging problem will cause this stretch of sewer to behave differently from calculated hydraulic analysis. This sagging trunk line can be a maintenance issue because of solids deposition. Additional future developments that are out of scope of the current land use and zoning analysis from the Arroyo Grande Wastewater Master Plan are recommended to tie in

to the proposed by-pass sewer.

6.5 Cost Estimates

This sub-section presents the cost estimate for the by-pass relief sewer alignment.

Budget cost estimates were prepared for this project with the following assumptions:

- The Arroyo Grande Wastewater Master Plan, adopted November 2001, is referenced for estimating the gravity sewer construction costs.
- The costs are estimated in Year 2004 dollars with an Engineering News Record (ENR) construction cost index of 7311 (November 2004).

A. By-pass relief sewer alignment cost estimate

It is assumed that half of the South Elm Street right-of-way will need to be resurfaced at 1.5" thick overlay.

Table 6-5– Construction Cost Summary – By-Pass Relief Sewer Alignment		
Pipe Diameter	Estimated Depth	Estimated Cost
21'	less than 10 feet	\$160 /LF
21'	10 to 15 feet	\$170 /LF
21'	over 15 feet	\$200 /LF
Cost for 3,700-LF of Sewer Pipe		\$740,000
Asphalt Re-Surfacing ¹ @ \$2.50 / SF		\$370,000
Pavement Striping ² @ \$1.10 / LF		\$4,070
Subtotal		\$1,114,070
Contingency at construction 25%		\$275,520
Design, Construction Management, Administration @ 40%		\$445,630
TOTAL ESTIMATED CONSTRUCTION COST		\$1,835,220
Note: 1. Based on County of SLO approved unit costs, adjusted for June 2004. Assumes AC grinding and 1.5" asphalt overlay of 40' wide (which is approximately half of the road) over the 3,700 length of road. 2. Based on County of SLO approved unit costs, adjusted for June 2004.		

6.6 Conclusion

Future flow (Appendix F, Table 4) conditions for the existing 18" Bakeman Lane Trunk Line shows an acceptable 85% d/D at PHWWF when gravity flow conditions apply (i.e. upstream lift stations are off or the upstream lift station pump flow output equals flow input). As upstream lift station pumps cycle on and off at the flow rate of each particular lift station, a plug flow is generated which increases the anticipated PHWWF. Gravity flow conditions can be maintained if the lift station motors are controlled by variable frequency drives (VFD). In the case of the Bakeman Lane Trunk Sewer, upstream Lift Station 1 in Arroyo Grande contributes the most flows. At the time of this report, it is confirmed¹ that upstream Lift Station #7 will be abandoned and its flows converted to gravity flow. Design plans to upgrade Lift Station 1 are in progress and a VFD will be included in the design.

The City of Arroyo Grande has a disposal station that is located upstream of the 18" Bakeman trunk sewer. Relocation of this disposal site should be considered. A location that would convey these flows through the east trunk system is preferable. Such a location is at Valley Road near Fair Oaks Ave.

The Bakeman Lane trunk sewer slope is very flat (0.0184%) and it also contains a sag. Sewer video information show that debris is causing up to 50% blockage at some sections. Inaccessibility issues make it difficult to service these areas. Such conditions also make it difficult to predict the hydraulic conditions within this trunk sewer. If these conditions can be mitigated, new construction may be avoided. It is highly recommended that efforts to remove this debris be pursued as soon as possible.

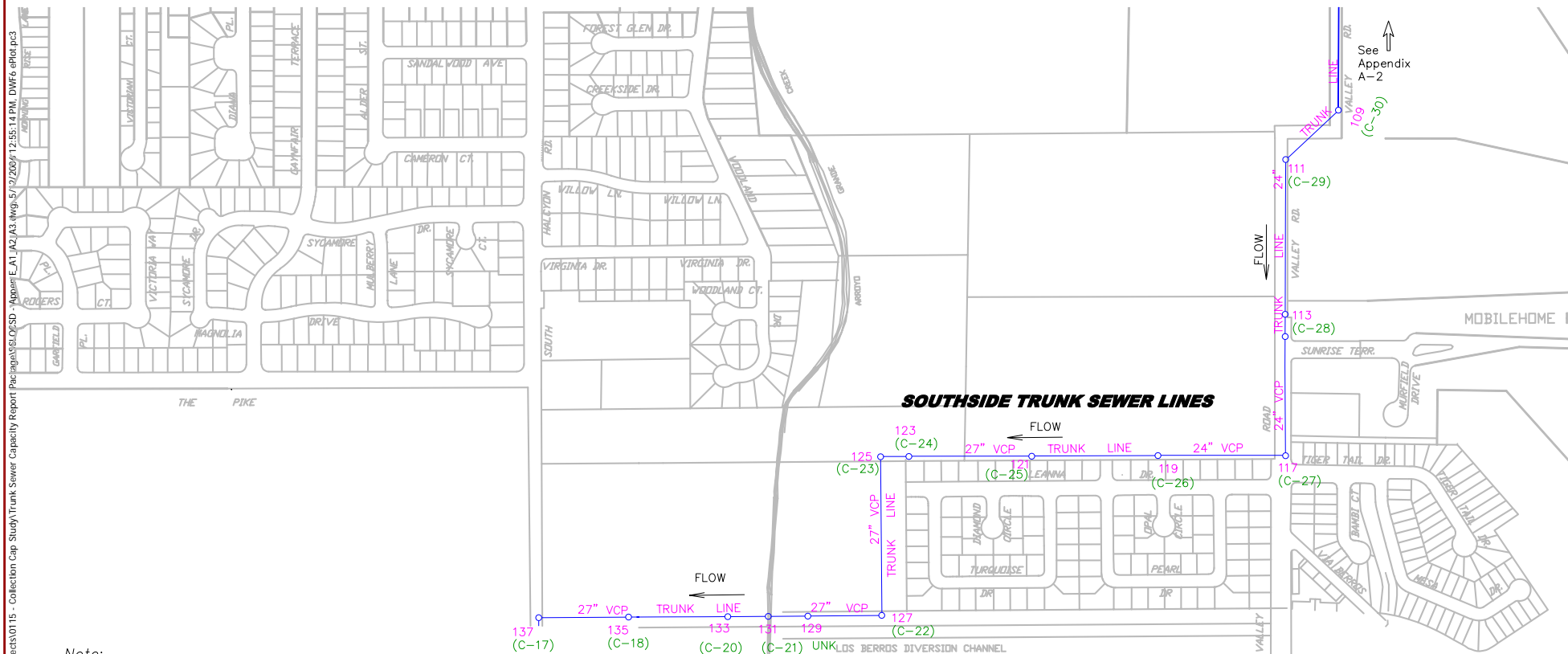
This chapter concludes that construction of a by-pass sewer alignment (along South Elm Street and The Pike) is feasible – although costly. Utility coordination and traffic control are issues that can be addressed in more detail during design phase. The estimated total costs (see Table 6-5) for this gravity by-pass sewer line by conventional trench construction is about \$1,835,220.

Flow capacity to the 18" Bakeman Lane trunk line needs to be improved, but the urgency of this improvement is driven by additional wastewater flows from new developments within the West Arroyo Grande area. The 18" trunk line can function marginally if no new additional flows impact this line.

¹ Confirmed by Shane Taylor, City of Arroyo Grande Public Works Superintendent, June 29, 2004

Appendices

\\026-SSLOCS026-002 District Engineering\026-002 Major Projects\0115 - Collection Cap Study\Trunk Sewer Capacity Report\Figures\SSLOCSD - Appendix A-1_A2\A3.dwg, 5/12/2009, 12:55:14 PM, DWG6 ePlot.pc3



Note:
Number in parentheses is the GIS reference
and Trunk Sewer Video reference

See
Appendix
A-6



SSLOCSD- Appendix A-1

District Trunk Sewer Pipe and Manhole Map
Arroyo Grande East - Southside Trunk Sewer Line

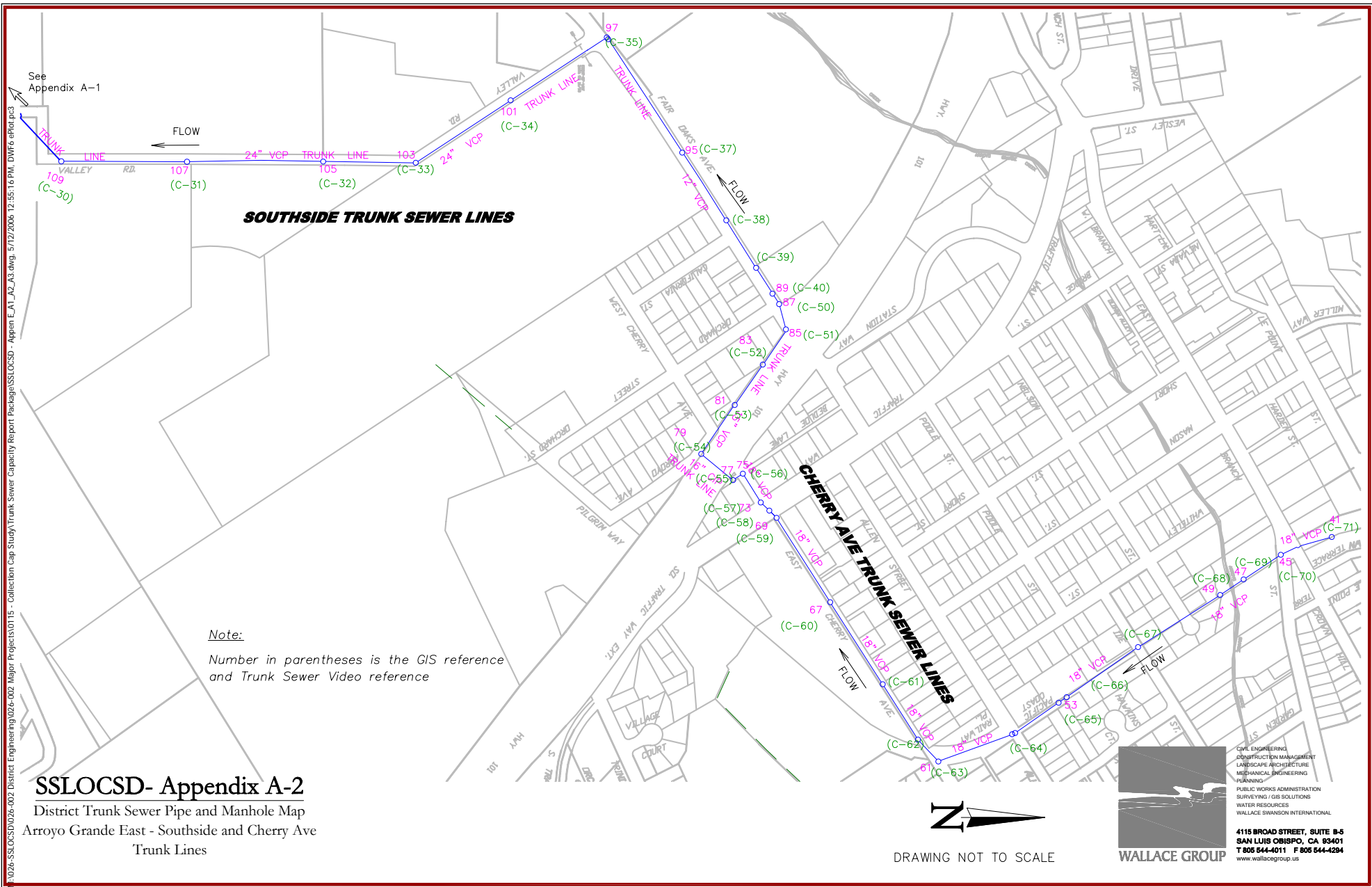


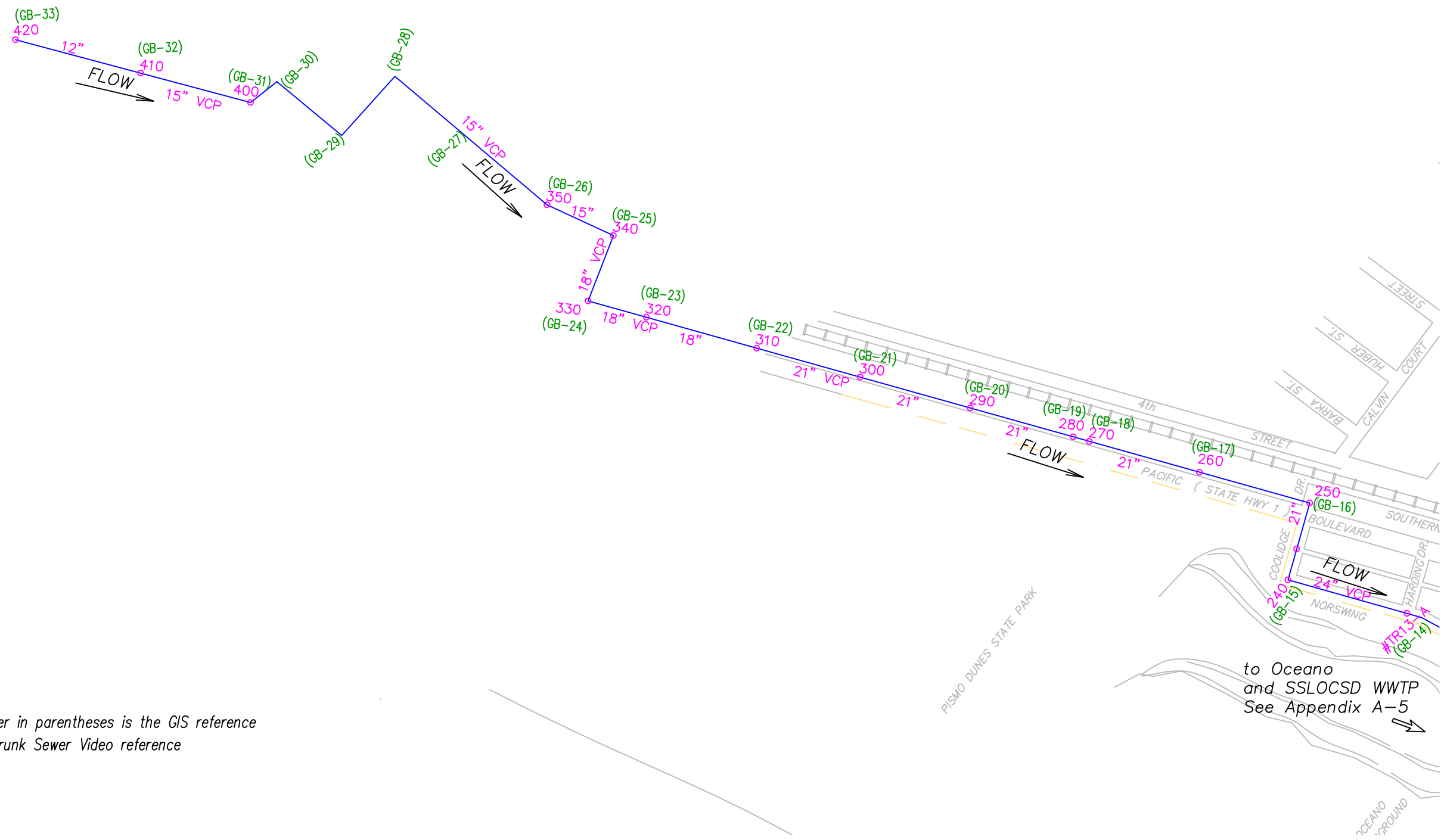
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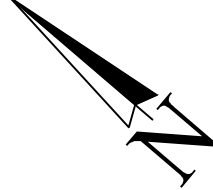
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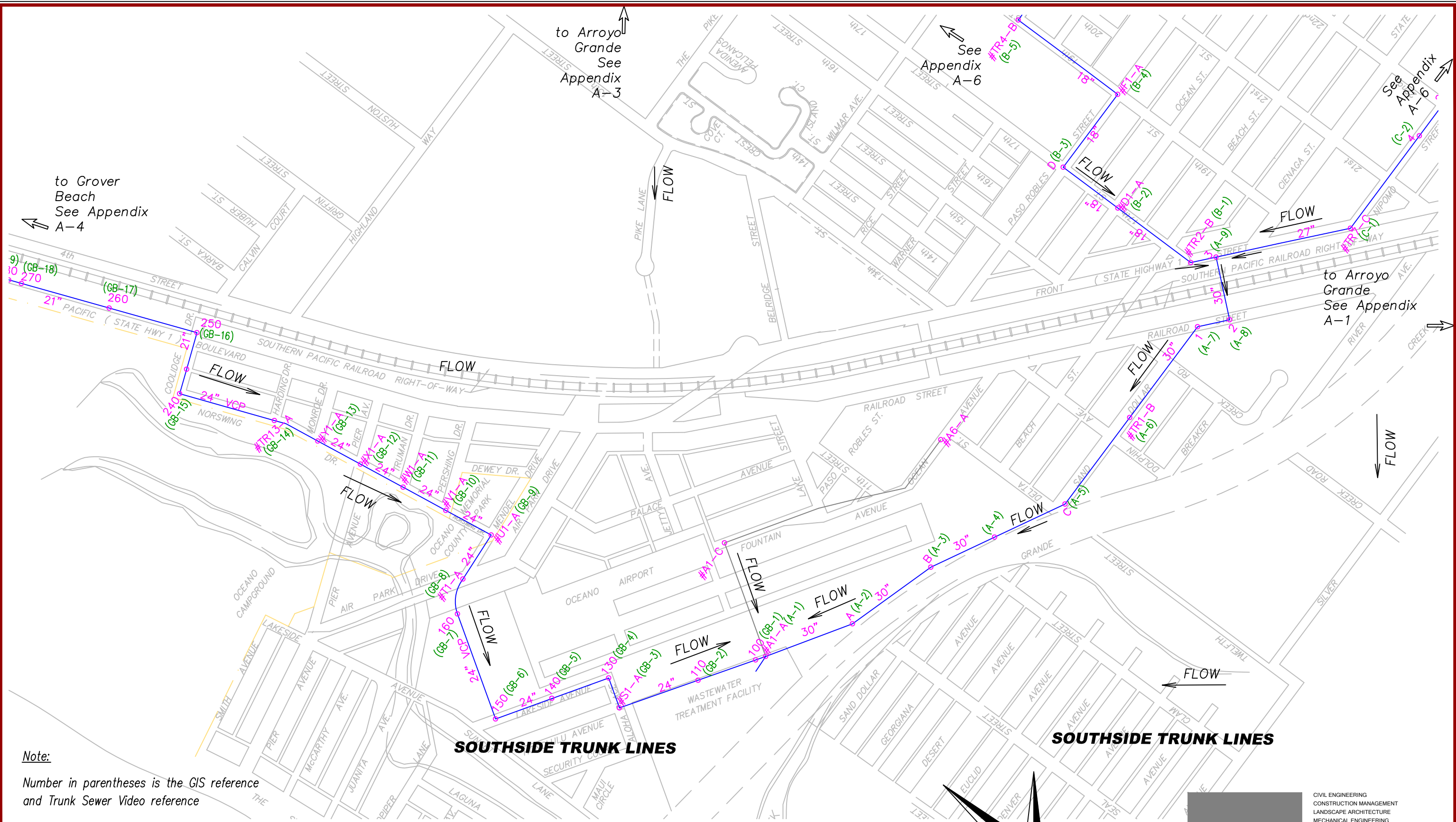
SSLOCSD- Appendix A-4 District Trunk Sewer Pipe and Manhole Map Grover Beach


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Note:

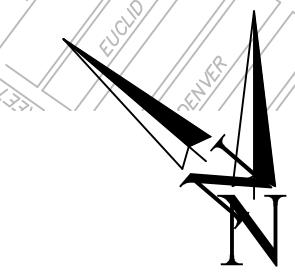
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SSLOCSD - Appendix A-5

District Trunk Sewer Pipe and Manhole Map
Grover Beach/Oceano

Note:

Number in parentheses is the GIS reference
and Trunk Sewer Video reference

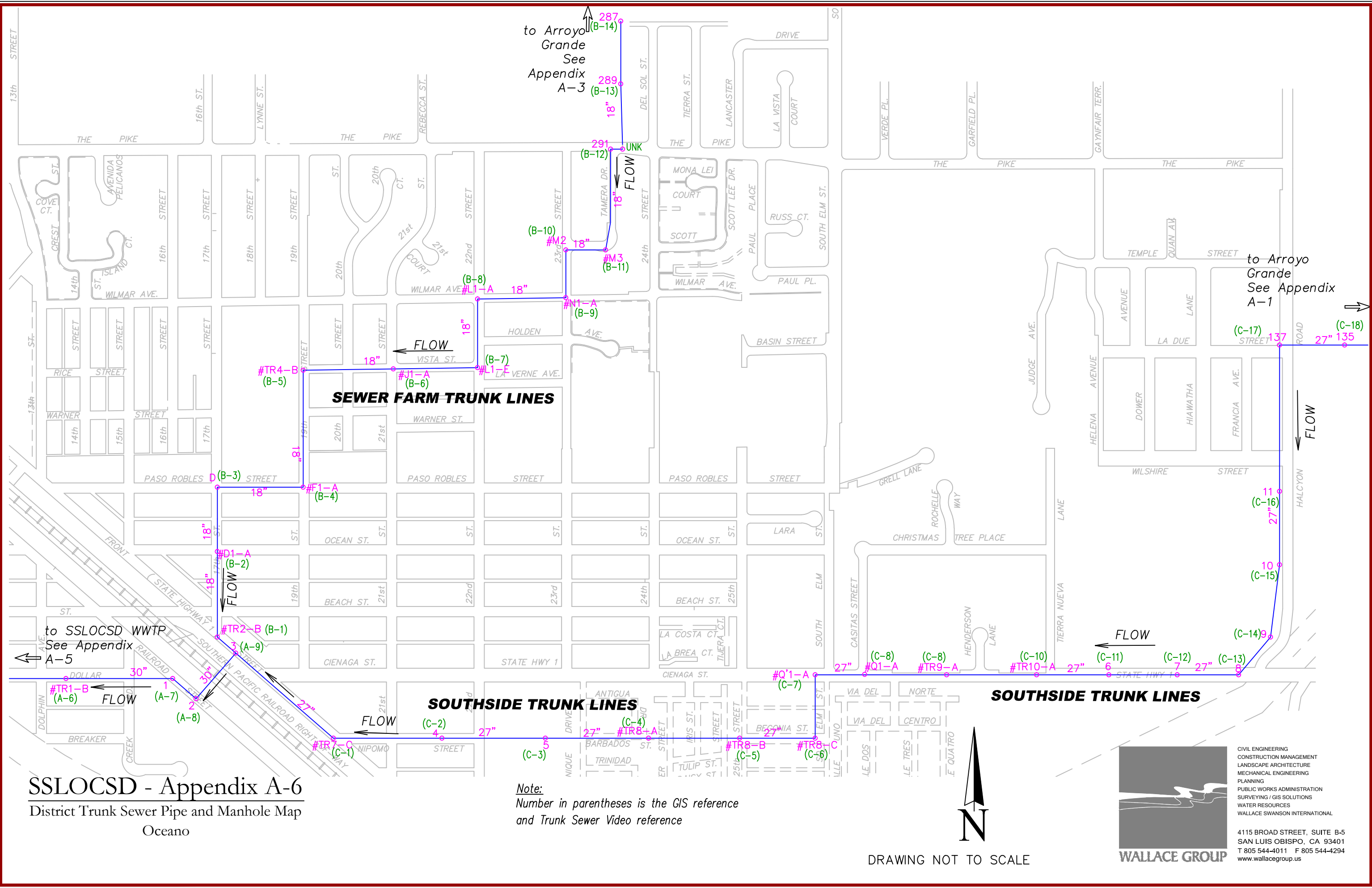


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SSLOCSD - Appendix A-6
District Trunk Sewer Pipe and Manhole Map
Oceano

Note:
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SSLOCSD - Appendix B

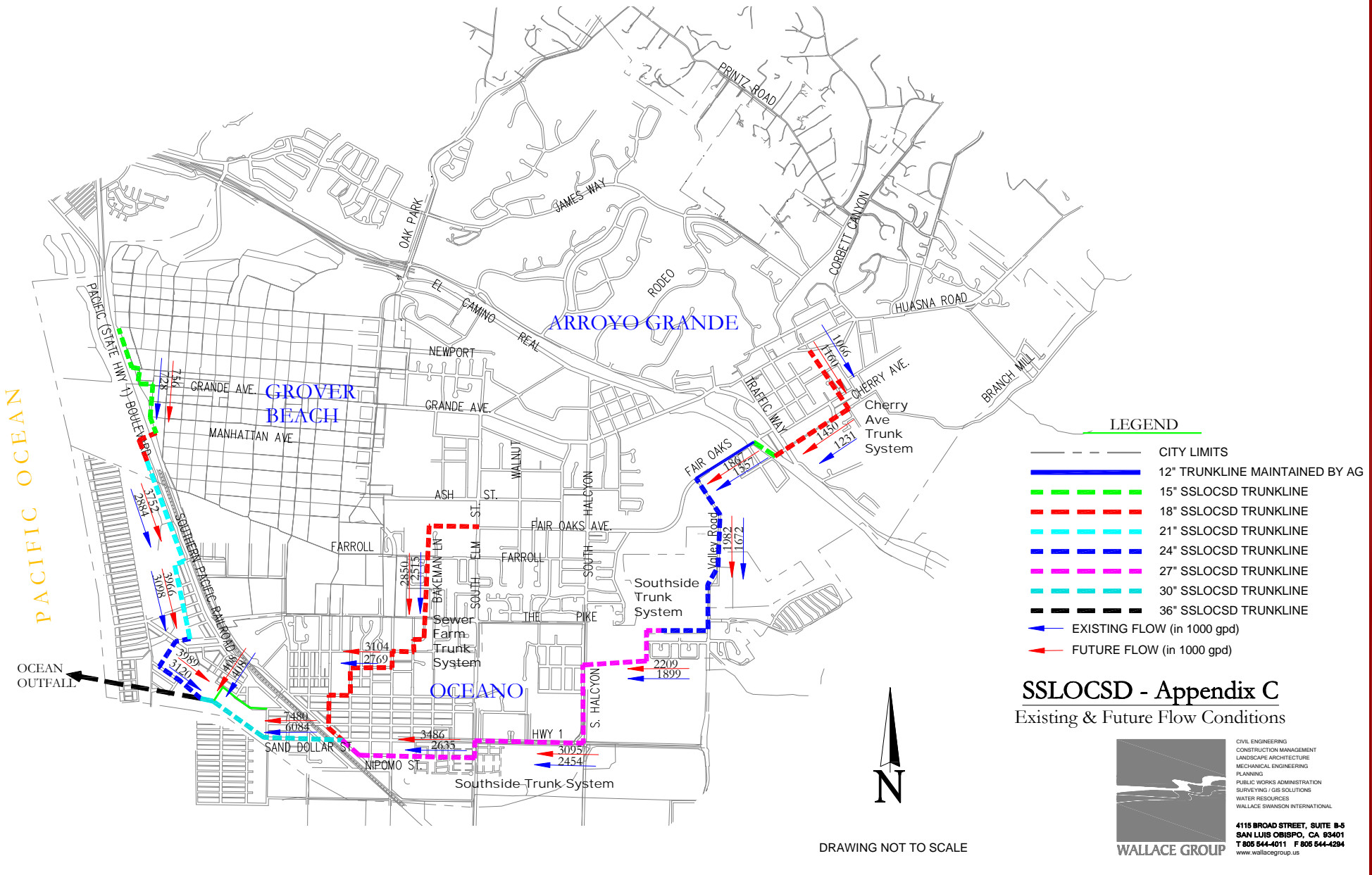
Trunk Sewer System

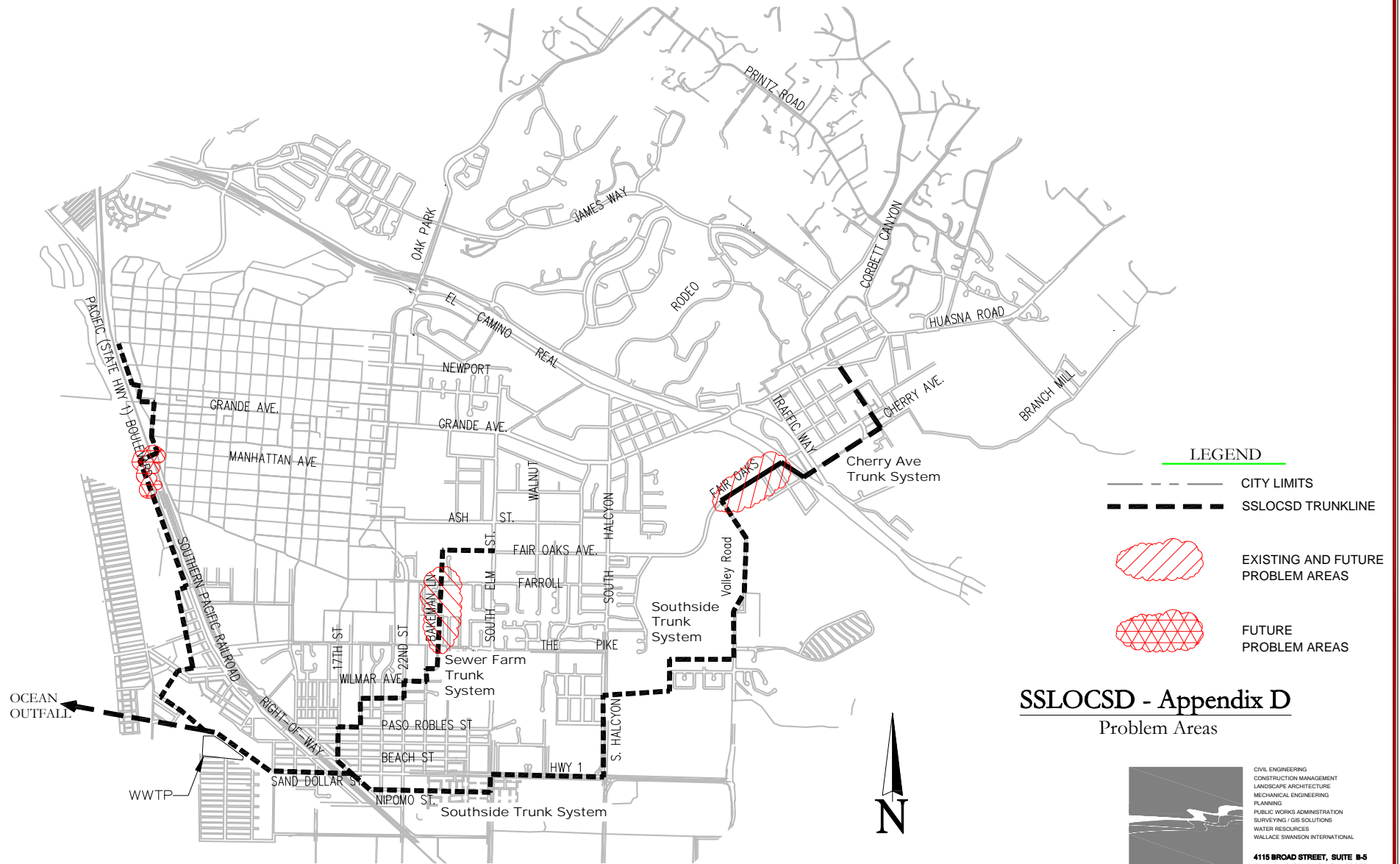


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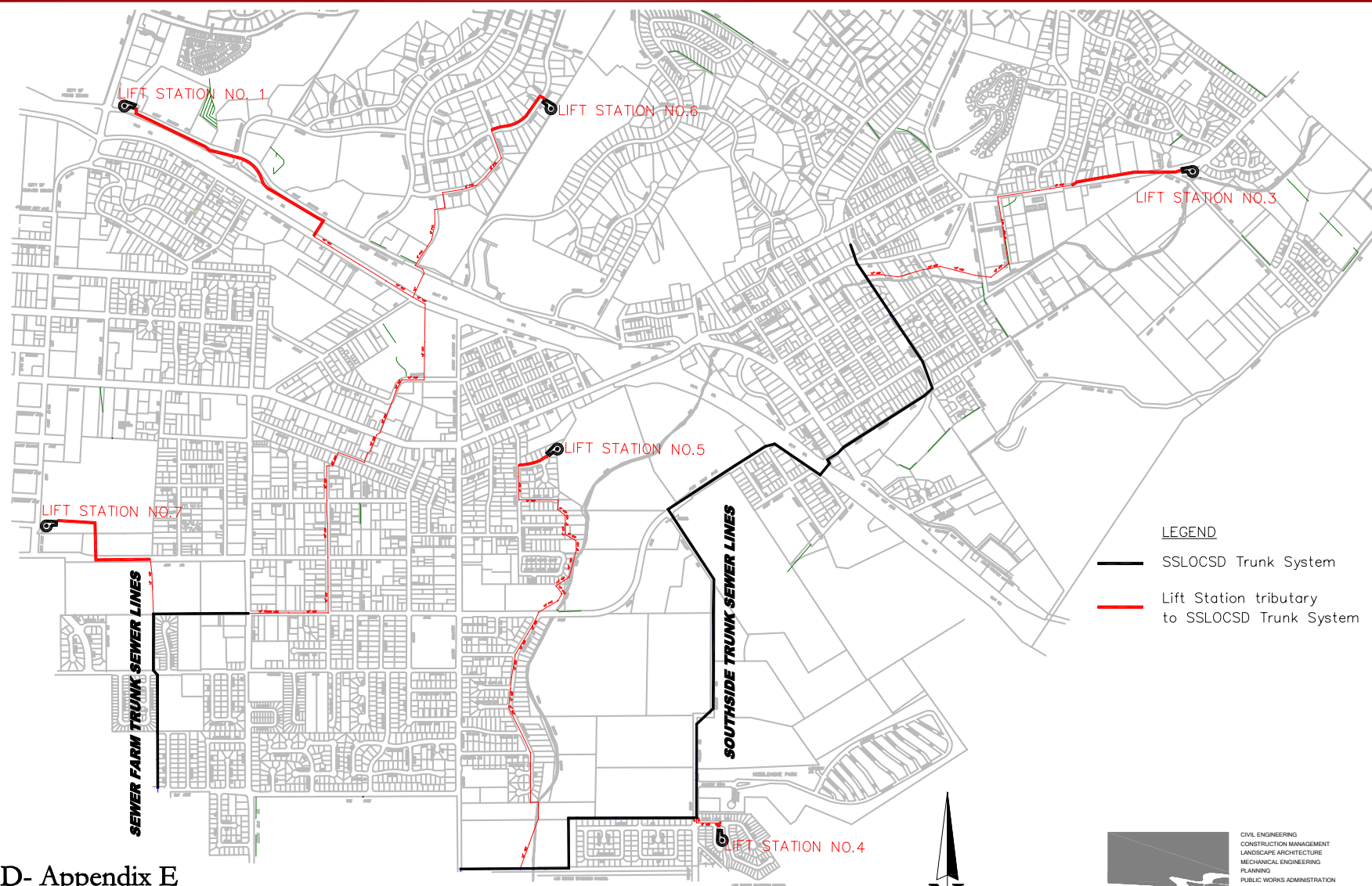




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SSLOCSD- Appendix E

Location of Lift Stations
Arroyo Grande



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SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	C	D	E		F	G		H		I	J	K	L	M	N	O	P	Q	R	
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D avg flow	d/D peak flow	d peak flow (in)	Velocity (ft/s)	Velocity Peak Flow (ft/s)		
1	WWTP		Honolulu	A1-A			509.16	2.50	4.9086	0.0025	3278336		4.918	9,835,008	6,830	14.753	8.911	17.821	3.631	0.276	0.828	0.356	10.680	0.689	20.670	3.050	4.037	
2	Oceano			A		B	530.10	2.50	4.9086	0.0025	2027836		3.042	6,083,508	4,225	9.125	8.911	17.821	3.631	0.171	0.512	0.270	8.100	0.504	15.120	2.658	3.631	
3	Oceano			B		C	809.32	2.50	4.9086	0.0025	2027836		3.042	6,083,508	4,225	9.125	8.911	17.821	3.631	0.171	0.512	0.270	8.100	0.504	15.120	2.658	3.631	
4	Oceano			C		TR1-B	593.03	2.50	4.9086	0.0025	2027836		3.042	6,083,508	4,225	9.125	8.911	17.821	3.631	0.171	0.512	0.270	8.100	0.504	15.120	2.658	3.631	
5	Oceano		Sand Dollar	TR1-B	Railroad		1	622.00	2.50	4.9086	0.0025	2027836	9000	3.042	6,083,508	4,225	9.125	8.911	17.821	3.631	0.171	0.512	0.270	8.100	0.504	15.120	2.658	3.631
6	Oceano		Railroad	1		2	173.53	2.50	4.9086	0.0025	2018836		3.028	6,056,508	4,206	9.085	8.911	17.821	3.631	0.170	0.510	0.260	7.800	0.500	15.000	2.600	3.631	
7	Oceano			2	Hwy 1	3	350.29	2.50	4.9086	0.0025	2018836		3.028	6,056,508	4,206	9.085	8.911	17.821	3.631	0.170	0.510	0.260	7.800	0.500	15.000	2.600	3.631	
8	Oceano	Southside Trunk Lines	Hwy 1	3		TR7-C	752.60	2.25	3.9760	0.0049	902370	24200	1.354	2,707,110	1,880	4.061	9.410	18.819	4.733	0.072	0.216	0.176	4.752	0.308	8.316	2.622	3.692	
9	Oceano	Southside Trunk Lines	Nipomo St	TR7-C		4	632.90	2.25	3.9760	0.0058	878170		1.317	2,634,510	1,830	3.952	10.248	20.496	5.155	0.064	0.193	0.163	4.401	0.290	7.830	2.742	3.938	
10	Oceano	Southside Trunk Lines		4		5	602.42	2.25	3.9760	0.0058	878170		1.317	2,634,510	1,830	3.952	10.248	20.496	5.155	0.064	0.193	0.163	4.401	0.290	7.830	2.742	3.938	
11	Oceano	Southside Trunk Lines		5		TR8-A	636.61	2.25	3.9760	0.0042	878170		1.317	2,634,510	1,830	3.952	8.741	17.483	4.397	0.075	0.226	0.176	4.752	0.316	8.532	2.436	3.483	
12	Oceano	Southside Trunk Lines		TR8-A		TR8-B	495.00	2.25	3.9760	0.0076	878170		1.317	2,634,510	1,830	3.952	11.762	23.523	5.916	0.056	0.168	0.150	4.050	0.260	7.020	3.017	4.236	
13	Oceano	Southside Trunk Lines		TR8-B		TR8-C	424.55	2.25	3.9760	0.0076	878170	8000	1.317	2,634,510	1,830	3.952	11.731	23.462	5.901	0.056	0.168	0.150	4.050	0.260	7.020	3.009	4.225	
14	Oceano	Southside Trunk Lines		TR8-C	Elm St	Q1-A	391.00	2.25	3.9760	0.0076	870170		1.305	2,610,510	1,813	3.916	11.731	23.462	5.901	0.056	0.167	0.150	4.050	0.260	7.020	3.009	4.225	
15	Oceano	Southside Trunk Lines	Hwy 1	Q1-A		Q1-Aa	89.45	2.25	3.9760	0.0069	870170		1.305	2,610,510	1,813	3.916	11.178	22.355	5.623	0.058	0.175	0.150	4.050	0.270	7.290	2.868	4.116	
16	Oceano	Southside Trunk Lines		Q1-Aa		Q1-A	200.15	2.25	3.9760	0.0020	870170	8000	1.305	2,610,510	1,813	3.916	6.018	12.036	3.027	0.108	0.325	0.215	5.805	0.392	10.584	1.925	2.688	
17	Oceano	Southside Trunk Lines		Q1-A		TR9-A	476.62	2.25	3.9760	0.0020	862170	8000	1.293	2,586,510	1,796	3.880	6.018	12.036	3.027	0.107	0.322	0.215	5.805	0.392	10.584	1.925	2.688	
18	Oceano	Southside Trunk Lines		TR9-A		TR10-A	532.31	2.25	3.9760	0.0020	854170	36250	1.281	2,562,510	1,780	3.844	6.018	12.036	3.027	0.106	0.319	0.215	5.805	0.386	10.422	1.925	2.652	
19	Oceano	Southside Trunk Lines		TR10-A		6	412.57	2.25	3.9760	0.0020	817920		1.227	2,453,760	1,704	3.681	6.018	12.036	3.027	0.102	0.306	0.215	5.805	0.380	10.260	1.925	2.652	
20	Oceano	Southside Trunk Lines		6		7	380.55	2.25	3.9760	0.0020	817920		1.227	2,453,760	1,704	3.681	6.018	12.036	3.027	0.102	0.306	0.215	5.805	0.380	10.260	1.925	2.652	
21	Oceano	Southside Trunk Lines		7		8	375.65	2.25	3.9760	0.0020	817920		1.227	2,453,760	1,704	3.681	6.018	12.036	3.027	0.102	0.306	0.215	5.805	0.380	10.260	1.925	2.652	
22	Oceano	Southside Trunk Lines		8		9	287.95	2.25	3.9760	0.0020	817920		1.227	2,453,760	1,704	3.681	6.018	12.036	3.027	0.102	0.306	0.215	5.805	0.380	10.260	1.925	2.652	
23	Oceano	Southside Trunk Lines		9		9a	134.20	2.25	3.9760	0.0020	817920		1.227	2,453,760	1,704	3.681	6.018	12.036	3.027	0.102	0.306	0.215	5.805	0.380	10.260	1.925	2.652	
24	Oceano	Southside Trunk Lines		9a		10	318.30	2.25	3.9760	0.0042	817920		1.227	2,453,760	1,704	3.681	8.762	17.524	4.408	0.070	0.210	0.176	4.752	0.308	8.316	2.442	3.438	
25	Oceano	Southside Trunk Lines		10		11	426.80	2.25	3.9760	0.0042	817920		1.227	2,453,760	1,704	3.681	8.721	17.441	4.387	0.070	0.211	0.176	4.752	0.308	8.316	2.430	3.422	
26	Oceano(AG flows in)	Southside Trunk Lines	Halcyon	11		137	853.10	2.25	3.9760	0.0042	817920		1.227	2,453,760	1,704	3.681	8.721	17.441	4.387	0.070	0.211	0.176	4.752	0.308	8.316	2.430	3.422	
27	AG	Southside Trunk Lines		137		135	397.03	2.25	3.9760	0.0022	817920		1.227	2,453,760	1,704	3.681	6.354	12.709	3.196	0.097	0.290	0.202	5.454	0.364	9.828	1.982	2.723	
28	AG	Southside Trunk Lines		135		133	399.23	2.25	3.9760	0.0022	817920		1.227	2,453,760	1,704	3.681	6.354	12.709	3.196	0.097	0.290	0.202	5.454	0.364	9.828	1.982	2.723	
29	AG	Southside Trunk Lines	AG Creek	133	(inverse siphon)	131	163.15	1.50	1.7671	0.0025	632880		0.949	1,898,640	1,319	2.848	2.282	4.564	2.583	0.208	0.624	0.300	5.400	0.570	10.260	2.015	2.717	
30	AG	Southside Trunk Lines		131		129	158.77	2.25	3.9760	0.0021	632880		0.949	1,898,640	1,319	2.848	6.181	12.362	3.109	0.077	0.230	0.176	4.752	0.324	8.748	1.723	2.500	
31	AG	Southside Trunk Lines		129		127	301.76	2.25	3.9760	0.0021	632880		0.949	1,898,640	1,319	2.848	6.166	12.333	3.102	0.077	0.231	0.176	4.752	0.324	8.748	1.718	2.494	
32	AG	Southside Trunk Lines		127		125	626.37	2.25	3.9760	0.0021	632880		0.949	1,898,640	1,319	2.848	6.166	12.333	3.102	0.077	0.231	0.176	4.752	0.324	8.748	1.718	2.494	
33	AG	Southside Trunk Lines		125		123	123.68	2.00	3.1415	0.0025	632880		0.949	1,898,640	1,319	2.848	4.915	9.829	3.129	0.097	0.290	0.202	4.848	0.364	8.736	1.940	2.666	
34	AG	Southside Trunk Lines		123		123a	131.82	2.00	3.1415	0.0025	632880		0.949	1,898,640	1,319	2.848	4.885	9.770	3.110	0.097	0.292	0.202	4.848	0.372	8.928	1.928	2.687	
35	AG	Southside Trunk Lines		123a		121	344.85	2.00	3.1415	0.0059	632880		0.949	1,898,640	1,319	2.848	7.518	15.036	4.786	0.063	0.189	0.163	3.912	0.280	6.720	2.546	3.503	
36	AG	Southside Trunk Lines		121		119	501.62	2.00	3.1415	0.0060	557280		0.836	1,671,840	1,161	2.508	7.601	15.202	4.839	0.055	0.165	0.150	3.600	0.260	6.240	2.488	3.465	
37	AG	Southside Trunk Lines	Valley Road	119		117	527.49	2.00	3.1415	0.0048	557280		0.836	1,671,840	1,161	2.508	6.781	13.563	4.317	0.062	0.185	0.163	3.912	0.280	6.720	2.297	3.160	
38	AG	Southside Trunk Lines		117		117a	326.84	2.00	3.1415	0.0047	557280		0.836	1,671,840	1,161	2.508	6.760	13.520	4.304	0.062	0.185	0.163	3.912	0.280	6.720	2.290	3.150	
39	AG	Southside Trunk Lines		117a		113	278.00	2.00	3.1415	0.0064	557280		0.836	1,671,840	1,161	2.508	7.888	15.776	5.022	0.053	0.159	0.150	3.600	0.250	6.000	2.561	3.515	
40	AG	Southside Trunk Lines		113		111	622.17	2.00	3.1415	0.0065	557280		0.836	1,671,840	1,161	2.508	7.925	15.849	5.045	0.053	0.158	0.150	3.600	0.250	6.000	2.573	3.532	
41	AG	Southside Trunk Lines		111		111a	99.83	2.00	3.1415	0.0065	557280		0.836	1,671,840	1,161	2.508	7.931	15.861	5.049	0.053	0.158	0.150	3.600	0.250	6.000	2.575	3.534	
42	AG	Southside Trunk Lines		111a		109	190.45	2.00	3.1415	0.0079	557280		0.836	1,671,840	1,161	2.508	8.736	17.473	5.562	0.048	0.144	0.130	3.120	0.243	5.832	2.592	3.804	
43	AG	Southside Trunk Lines		109		107	622.84	2.00	3.1415	0.0079	557280		0.836	1,671,840	1,161	2.508	8.720	17.439	5.551	0.048	0.144	0.130	3.120	0.243	5.832	2.587	3.797	
44	AG	Southside Trunk Lines		107		105	575.74	2.00	3.1415	0.0040	557280		0.836	1,671,840	1,161	2.508	6.178	12.355	3.933	0.068	0.203	0.163	3.912	0.300	7.200	2.092	3.068	
45	AG	Southside Trunk Lines		105		103	442.64	2.00	3.1415	0.0040	557280		0.836	1,671,840	1,161	2.508	6.178	12.355	3.93									

SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R			
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Q _{full}	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D avg flow	d avg flow (in)	d/D peak flow	d peak flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
53	AG	Southside Trunk Lines		83		81	230.44	1.20	1.1309	0.0024	506976		0.760	1,520,928	1,056	2.281	1.233	2.466	2.181	0.308	0.925	0.380	5.472	0.762	10.973	1.910	2.469
54	AG	Southside Trunk Lines		81		79	277.4	1.25	1.2271	0.0021	506976		0.760	1,520,928	1,056	2.281	1.286	2.572	2.096	0.296	0.887	0.372	5.580	0.734	11.010	1.811	2.360
55	AG	Cherry Ave Trunk Lines		79		77	192.46	1.33	1.3892	0.0026	506976		0.760	1,520,928	1,056	2.281	1.689	3.377	2.431	0.225	0.676	0.316	5.043	0.599	9.560	1.925	2.587
56	AG	Cherry Ave Trunk Lines		77		75	54.75	1.33	1.3892	0.0032	506976		0.760	1,520,928	1,056	2.281	1.873	3.747	2.697	0.203	0.609	0.300	4.788	0.560	8.938	2.104	2.821
57	AG	Cherry Ave Trunk Lines		75		73	158.69	1.50	1.7671	0.0044	410208		0.615	1,230,624	855	1.846	3.027	6.055	3.426	0.102	0.305	0.215	3.870	0.380	6.840	2.179	3.002
58	AG	Cherry Ave Trunk Lines		73		69	103.01	1.50	1.7671	0.0050	410208		0.615	1,230,624	855	1.846	3.227	6.454	3.653	0.095	0.286	0.202	3.636	0.364	6.552	2.285	3.112
59	AG	Cherry Ave Trunk Lines		69		67	467.81	1.50	1.7671	0.0071	410208		0.615	1,230,624	855	1.846	3.846	7.691	4.353	0.080	0.240	0.189	3.402	0.332	5.976	2.507	3.552
60	AG	Cherry Ave Trunk Lines		67		61	902.65	1.50	1.7671	0.0039	410208		0.615	1,230,624	855	1.846	2.850	5.700	3.226	0.108	0.324	0.215	3.870	0.392	7.056	2.052	2.865
61	AG	Cherry Ave Trunk Lines		61		2189	199.48	1.50	1.7671	0.0025	355392		0.533	1,066,176	740	1.599	2.282	4.564	2.583	0.117	0.350	0.222	3.996	0.410	7.380	1.684	2.350
62	AG	Cherry Ave Trunk Lines		2189		53	439.03	1.50	1.7671	0.0020	355392		0.533	1,066,176	740	1.599	2.041	4.082	2.310	0.131	0.392	0.236	4.248	0.434	7.812	1.543	2.148
63	AG	Cherry Ave Trunk Lines		53		49	908.34	1.50	1.7671	0.0020	355392		0.533	1,066,176	740	1.599	2.041	4.082	2.310	0.131	0.392	0.236	4.248	0.434	7.812	1.543	2.148
64	AG	Cherry Ave Trunk Lines		49		47	132.01	1.50	1.7671	0.0030	355392		0.533	1,066,176	740	1.599	2.500	5.000	2.829	0.107	0.320	0.215	3.870	0.386	6.948	1.799	2.478
65	AG	Cherry Ave Trunk Lines		47		45	208.69	1.50	1.7671	0.0069	355392		0.533	1,066,176	740	1.599	3.791	7.582	4.291	0.070	0.211	0.176	3.168	0.308	5.544	2.377	3.347
66	AG	Cherry Ave Trunk Lines		45		41	252.36	1.50	1.7671	0.0024	355392		0.533	1,066,176	740	1.599	2.236	4.472	2.531	0.119	0.358	0.222	3.996	0.410	7.380	1.650	2.303
67	Oceano	Sewer Farm Trunk Lines	Front St.	3		TR2-B	157.70	1.50	1.7671	0.0040	1116466		1.675	3,349,398	2,326	5.024	2.897	5.795	3.279	0.289	0.867	0.364	6.552	0.718	12.924	2.794	3.679
68	Oceano	Sewer Farm Trunk Lines	17th	TR2-B		D1-A	497.30	1.50	1.7671	0.0168	1116466	132900	1.675	3,349,398	2,326	5.024	5.916	11.831	6.695	0.142	0.425	0.243	4.374	0.452	8.136	4.580	6.361
69	Oceano	Sewer Farm Trunk Lines				D	374.66	1.50	1.7671	0.0174	983566		1.475	2,950,698	2,049	4.426	6.020	12.041	6.814	0.123	0.368	0.229	4.122	0.416	7.488	4.443	6.201
70	Oceano	Sewer Farm Trunk Lines	Paso Robles	D		F1-A	498.27	1.50	1.7671	0.0160	983566	36250	1.475	2,950,698	2,049	4.426	5.773	11.546	6.534	0.128	0.383	0.229	4.122	0.428	7.704	4.260	6.011
71	Oceano	Sewer Farm Trunk Lines	19th Street	F1-A		TR4-A	438.64	1.50	1.7671	0.0178	947316	12100	1.421	2,841,948	1,974	4.263	6.089	12.178	6.892	0.117	0.350	0.222	3.996	0.410	7.380	4.493	6.271
72	Oceano	Sewer Farm Trunk Lines				TR4-B	244.25	1.50	1.7671	0.0178	935216	12100	1.403	2,805,648	1,948	4.208	6.089	12.178	6.892	0.115	0.346	0.222	3.996	0.404	7.272	4.493	6.203
73	Oceano	Sewer Farm Trunk Lines	Vista	TR4-B		J1-A	518.05	1.50	1.7671	0.0060	923116	12100	1.385	2,769,348	1,923	4.154	3.535	7.071	4.001	0.196	0.588	0.290	5.220	0.544	9.792	3.057	4.129
74	Oceano	Sewer Farm Trunk Lines				J1-A	513.33	1.50	1.7671	0.0060	911016	9700	1.367	2,733,048	1,898	4.100	3.535	7.071	4.001	0.193	0.580	0.290	5.220	0.536	9.648	3.057	4.097
75	Oceano	Sewer Farm Trunk Lines	22nd St.	L1-E		L1-A	398.63	1.50	1.7671	0.0057	901316	9700	1.352	2,703,948	1,878	4.056	3.446	6.891	3.900	0.196	0.589	0.290	5.220	0.544	9.792	2.980	4.025
76	Oceano	Sewer Farm Trunk Lines	Wilmar	L1-A		N1-A	508.23	1.50	1.7671	0.0027	891616	43500	1.337	2,674,848	1,858	4.012	2.372	4.743	2.684	0.282	0.846	0.364	6.552	0.703	12.654	2.287	3.006
77	Oceano	Sewer Farm Trunk Lines	23rd St.	N1-A		M2	273.12	1.50	1.7671	0.0027	848116	9700	1.272	2,544,348	1,767	3.817	2.376	4.752	2.689	0.268	0.803	0.348	6.264	0.675	12.150	2.227	2.979
78	Oceano	Sewer Farm Trunk Lines	Tamara Dr.	M2		M3	331.11	1.50	1.7671	0.0027	838416		1.258	2,515,248	1,747	3.773	2.372	4.743	2.684	0.265	0.795	0.348	6.264	0.669	12.042	2.222	2.963
79	Oceano (AG flows in)	Sewer Farm Trunk Lines		M3			291	593.91	1.50	1.7671	0.0018	838416	1.258	2,515,248	1,747	3.773	1.958	3.915	2.216	0.321	0.964	0.392	7.056	0.788	14.184	1.968	2.517
80	AG	Sewer Farm Trunk Lines		291		289	375.06	1.50	1.7671	0.0018	838416		1.258	2,515,248	1,747	3.773	1.936	3.873	2.192	0.325	0.974	0.392	7.056	0.796	14.328	1.946	2.494
81	AG	Sewer Farm Trunk Lines		289		287	366.22	1.50	1.7671	0.0018	838416		1.258	2,515,248	1,747	3.773	1.936	3.873	2.192	0.325	0.974	0.392	7.056	0.796	14.328	1.946	2.494
82	AG	Sewer Farm Trunk Lines		287		285	358.45	1.50	1.7671	0.0018	834624		1.252	2,503,872	1,739	3.756	1.936	3.873	2.192	0.323	0.970	0.392	7.056	0.788	14.184	1.946	2.490
83	AG	Sewer Farm Trunk Lines		285		283	366.97	1.50	1.7671	0.0018	834624		1.252	2,503,872	1,739	3.756	1.936	3.873	2.192	0.323	0.970	0.392	7.056	0.788	14.184	1.946	2.490
84	AG	Sewer Farm Trunk Lines		283		281	59.17	1.50	1.7671	0.0018	834624		1.252	2,503,872	1,739	3.756	1.936	3.873	2.192	0.323	0.970	0.392	7.056	0.788	14.184	1.946	2.490
85	AG	Sewer Farm Trunk Lines		281		279	363.04	1.50	1.7671	0.0026	706752		1.060	2,120,256	1,472	3.180	2.327	4.654	2.634	0.228	0.683	0.316	5.688	0.606	10.908	2.086	2.818
86	AG	Sewer Farm Trunk Lines		279		277	365.80	1.50	1.7671	0.0026	706752		1.060	2,120,256	1,472	3.180	2.327	4.654	2.634	0.228	0.683	0.316	5.688	0.606	10.908	2.086	2.818
87	AG	Sewer Farm Trunk Lines		277		275	500.37	1.50	1.7671	0.0080	463872		0.696	1,391,616	966	2.087	4.082	8.164	4.620	0.085	0.256	0.189	3.402	0.340	6.120	2.661	3.826
88	AG	Sewer Farm Trunk Lines		275		273	494.83	1.50	1.7671	0.0060	463872		0.696	1,391,616	966	2.087	3.535	7.071	4.001	0.098	0.295	0.202	3.636	0.372	6.696	2.481	3.457
89	AG	Sewer Farm Trunk Lines		273		271	207.20	1.50	1.7671	0.0060	463872		0.696	1,391,616	966	2.087	3.535	7.071	4.001	0.098	0.295	0.202	3.636	0.372	6.696	2.481	3.457
90	Oceano		Ocean Ave	A6-A		A1-C	N/A	1.00	0.7854	0.0025	109000	109000	0.164	327,000	227	0.491	0.774	1.548	1.971	0.106	0.317	0.215	2.580	0.386	4.632	1.254	1.727
91	Oceano		Fountain	A1-C		A1-A	N/A	1.00	0.7854	0.0025	136000	27000	0.204	408,000	283	0.612	0.774	1.548	1.971	0.132	0.395	0.236	2.832	0.434	5.208	1.317	1.833
92	Oceano		At WWTP	A1-A		110	432.76	2.00	3.1415	0.0010	1114500		1.672	3,343,500	2,322	5.015	3.108	6.216	1.979	0.269	0.807	0.348	8.352	0.675	16.200	1.638	2.193
93	Oceano			110		S1-A	397.31	2.00	3.1415	0.0010	1114500	8000	1.672	3,343,500	2,322	5.015	3.108	6.216	1.979	0.269	0.807	0.348	8.352	0.675	16.200	1.638	2.193
94	Oceano			S1-A		130	175.87	2.00	3.1415	0.0010	1106500		1.660	3,319,500	2,305	4.979	3.108	6.216	1.979	0.267	0.801	0.348	8.352	0.675	16.200	1.638	2.193
95	Oceano		San Luis Pl.	130		140	326.82	2.00	3.1415	0.0010	1106500		1.660	3,319,500	2,305	4.979	3.108	6.216	1.979	0.267	0.801	0.348	8.352	0.675	16.200	1.638	2.193
96	Oceano			140		150	317.68	2.00	3.1415	0.0010	1106500		1.660	3,319,500	2,305	4.979	3.108	6.216	1.979	0.267	0.801	0.348	8.352	0.675	16.200	1.638	2.193
97	Oceano			150		160	482.32	2.00	3.1415	0.0010	1106500		1.660	3,319,500	2,305	4.979	3.108	6.216	1.979	0.267	0.801	0.348					

SSLOCSD
Trunk System Data

			From		To		A	B	C	D	E		F	G		H	I	J	K	L	M	N	O	P	Q	R		
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft²)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D avg flow	d _{avg} flow (in)	d/D peak flow	d _{peak} flow (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)	
102	Oceano			W1-A		X1-A	266.50	2.00	3.1415	0.0010	1058750	6250	1.588	3,176,250	2,206	4.764	3.108	6.216	1.979	0.255	0.766	0.340	8.160	0.651	15.624	1.638	2.177	
103	Oceano			X1-A		Y1-A	266.50	2.00	3.1415	0.0010	1052500	6250	1.579	3,157,500	2,193	4.736	3.108	6.216	1.979	0.254	0.762	0.340	8.160	0.651	15.624	1.638	2.177	
104	Oceano			Y1-A		TR13-A	265.14	2.00	3.1415	0.0010	1046250	6250	1.569	3,138,750	2,180	4.708	3.108	6.216	1.979	0.252	0.757	0.340	8.160	0.645	15.480	1.638	2.165	
105	Oceano		Coolidge Dr.	TR13-A			240	540.05	2.00	3.1415	0.0010	1040000	10000	1.560	3,120,000	2,167	4.680	3.108	6.216	1.979	0.251	0.753	0.340	8.160	0.645	15.480	1.638	2.165
106	Grover Beach			240			250	326.18	1.75	2.4052	0.0010	1030000		1.545	3,090,000	2,146	4.635	2.177	4.354	1.810	0.355	1.065	0.410	8.610	0.860	18.060	1.647	2.056
107	Grover Beach			250			260	500.00	1.75	2.4052	0.0018	1030000		1.545	3,090,000	2,146	4.635	2.921	5.842	2.429	0.264	0.793	0.348	7.308	0.669	14.049	2.011	2.681
108	Grover Beach			260			270	500.00	1.75	2.4052	0.0018	1030000		1.545	3,090,000	2,146	4.635	2.921	5.842	2.429	0.264	0.793	0.348	7.308	0.669	14.049	2.011	2.681
109	Grover Beach			270			280	72.77	1.75	2.4052	0.0018	1030000		1.545	3,090,000	2,146	4.635	2.921	5.842	2.429	0.264	0.793	0.348	7.308	0.669	14.049	2.011	2.681
110	Grover Beach			280			290	467.23	1.75	2.4052	0.0010	1030000		1.545	3,090,000	2,146	4.635	2.177	4.354	1.810	0.355	1.065	0.410	8.610	0.860	18.060	1.647	2.056
111	Grover Beach			290			300	500.00	1.75	2.4052	0.0010	1030000		1.545	3,090,000	2,146	4.635	2.177	4.354	1.810	0.355	1.065	0.410	8.610	0.860	18.060	1.647	2.056
112	Grover Beach			300			310	470.00	1.75	2.4052	0.0010	1030000		1.545	3,090,000	2,146	4.635	2.177	4.354	1.810	0.355	1.065	0.410	8.610	0.860	18.060	1.647	2.056
113	Grover Beach			310			320	500.00	1.50	1.7671	0.0022	1030000		1.545	3,090,000	2,146	4.635	2.141	4.281	2.423	0.361	1.083	0.416	7.488	0.890	16.020	2.205	2.723
114	Grover Beach			320			330	264.95	1.50	1.7671	0.0022	1030000		1.545	3,090,000	2,146	4.635	2.141	4.281	2.423	0.361	1.083	0.416	7.488	0.890	16.020	2.205	2.723
115	Grover Beach		Cross Railroad	330			340	307.00	1.50	1.7671	0.0022	1030000	770000	1.545	3,090,000	2,146	4.635	2.141	4.281	2.423	0.361	1.083	0.416	7.488	0.890	16.020	2.205	2.723
116	Grover Beach		Railroad	340			350	319.78	1.25	1.2271	0.0014	260000		0.390	780,000	542	1.170	1.050	2.100	1.712	0.186	0.557	0.280	4.200	0.520	7.800	1.253	1.739
117	Grover Beach			400			410	531.31	1.25	1.2271	0.0018	260000		0.390	780,000	542	1.170	1.191	2.382	1.941	0.164	0.491	0.260	3.900	0.494	7.410	1.390	1.921
118	Grover Beach			410			420	566.19	1.00	0.7854	0.0020	260000	260000	0.390	780,000	542	1.170	0.692	1.385	1.763	0.282	0.845	0.364	4.368	0.703	8.436	1.502	1.974

Appendix F - Table 1
Existing Conditions

SSLOCS
Trunk System Data

Location	Description	From		To		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
		Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg flow}	d _{avg flow} (in)	d/D _{peak flow}	d _{peak flow} (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
WWTP		Honolulu	A1-A		A	509.16	2.50	4.9086	0.00250	2882000	2001.4	4.323	8,646,000	12.969	17.821	3.631	0.243	0.728	0.332	9.960	0.630	18.900	2.963	3.950
Oceano			A		B	530.10	2.50	4.9086	0.00250	1631500	1133.0	2.447	4,894,500	7.342	17.821	3.631	0.137	0.412	0.236	7.080	0.446	13.380	2.425	3.413
Oceano			B		C	809.32	2.50	4.9086	0.00250	1631500	1133.0	2.447	4,894,500	7.342	17.821	3.631	0.137	0.412	0.236	7.080	0.446	13.380	2.425	3.413
Oceano			C		TR1-B	593.03	2.50	4.9086	0.00250	1631500	1133.0	2.447	4,894,500	7.342	17.821	3.631	0.137	0.412	0.236	7.080	0.446	13.380	2.425	3.413
Oceano		Sand Dollar	TR1-B	Railroad	1	622.00	2.50	4.9086	0.00250	1631500	1133.0	2.447	4,894,500	7.342	17.821	3.631	0.137	0.412	0.236	7.080	0.446	13.380	2.425	3.413
Oceano		Railroad	1		2	173.53	2.50	4.9086	0.00250	1622500	1126.7	2.434	4,867,500	7.301	17.821	3.631	0.137	0.410	0.236	7.080	0.440	13.200	2.425	3.413
Oceano			2	Hwy 1	3	350.29	2.50	4.9086	0.00250	1622500	1126.7	2.434	4,867,500	7.301	17.821	3.631	0.137	0.410	0.236	7.080	0.440	13.200	2.425	3.413
Oceano	Southside Trunk Lines	Hwy 1	3		TR7-C	752.60	2.25	3.9760	0.00489	660504	458.7	0.991	1,981,512	2.972	18.819	4.733	0.053	0.158	0.150	4.050	0.250	6.750	2.414	3.313
Oceano	Southside Trunk Lines	Nipomo St	TR7-C		4	632.90	2.25	3.9760	0.00580	636304	441.9	0.954	1,908,912	2.863	20.496	5.155	0.047	0.140	0.130	3.510	0.236	6.372	2.402	3.444
Oceano	Southside Trunk Lines		4		5	602.42	2.25	3.9760	0.00580	636304	441.9	0.954	1,908,912	2.863	20.496	5.155	0.047	0.140	0.130	3.510	0.236	6.372	2.402	3.444
Oceano	Southside Trunk Lines		5		TR8-A	636.61	2.25	3.9760	0.00422	636304	441.9	0.954	1,908,912	2.863	17.483	4.397	0.055	0.164	0.150	4.050	0.260	7.020	2.243	3.148
Oceano	Southside Trunk Lines		TR8-A		TR8-B	495.00	2.25	3.9760	0.00764	636304	441.9	0.954	1,908,912	2.863	23.523	5.916	0.041	0.122	0.130	3.510	0.229	6.183	2.757	3.857
Oceano	Southside Trunk Lines		TR8-B		TR8-C	424.55	2.25	3.9760	0.00760	636304	441.9	0.954	1,908,912	2.863	23.462	5.901	0.041	0.122	0.130	3.510	0.229	6.183	2.750	3.847
Oceano	Southside Trunk Lines		TR8-C	Elm St	Q'1-A	391.00	2.25	3.9760	0.00760	628304	436.3	0.942	1,884,912	2.827	23.462	5.901	0.040	0.121	0.130	3.510	0.229	6.183	2.750	3.847
Oceano	Southside Trunk Lines	Hwy 1	Q'1-A		Q'1-Aa	89.45	2.25	3.9760	0.00690	628304	436.3	0.942	1,884,912	2.827	22.355	5.623	0.042	0.126	0.130	3.510	0.229	6.183	2.620	3.666
Oceano	Southside Trunk Lines		Q'1-Aa		Q1-A	200.15	2.25	3.9760	0.00200	628304	436.3	0.942	1,884,912	2.827	12.036	3.027	0.078	0.235	0.176	4.752	0.324	8.748	1.677	2.434
Oceano	Southside Trunk Lines		Q1-A		TR9-A	476.62	2.25	3.9760	0.00200	620304	430.8	0.930	1,860,912	2.791	12.036	3.027	0.077	0.232	0.176	4.752	0.324	8.748	1.677	2.434
Oceano	Southside Trunk Lines		TR9-A		TR10-A	532.31	2.25	3.9760	0.00200	612304	425.2	0.918	1,836,912	2.755	12.036	3.027	0.076	0.229	0.176	4.752	0.316	8.532	1.677	2.397
Oceano	Southside Trunk Lines		TR10-A		6	412.57	2.25	3.9760	0.00200	576054	400.0	0.864	1,728,162	2.592	12.036	3.027	0.072	0.215	0.176	4.752	0.308	8.316	1.677	2.361
Oceano	Southside Trunk Lines		6		7	380.55	2.25	3.9760	0.00200	576054	400.0	0.864	1,728,162	2.592	12.036	3.027	0.072	0.215	0.176	4.752	0.308	8.316	1.677	2.361
Oceano	Southside Trunk Lines		7		8	375.65	2.25	3.9760	0.00200	576054	400.0	0.864	1,728,162	2.592	12.036	3.027	0.072	0.215	0.176	4.752	0.308	8.316	1.677	2.361
Oceano	Southside Trunk Lines		8		9	287.95	2.25	3.9760	0.00200	576054	400.0	0.864	1,728,162	2.592	12.036	3.027	0.072	0.215	0.176	4.752	0.308	8.316	1.677	2.361
Oceano	Southside Trunk Lines		9		9a	134.20	2.25	3.9760	0.00200	576054	400.0	0.864	1,728,162	2.592	12.036	3.027	0.072	0.215	0.176	4.752	0.308	8.316	1.677	2.361
Oceano	Southside Trunk Lines		9a		10	318.30	2.25	3.9760	0.00424	576054	400.0	0.864	1,728,162	2.592	17.524	4.408	0.049	0.148	0.130	3.510	0.243	6.561	2.054	3.015
Oceano	Southside Trunk Lines		10		11	426.80	2.25	3.9760	0.00420	576054	400.0	0.864	1,728,162	2.592	17.441	4.387	0.050	0.149	0.130	3.510	0.243	6.561	2.044	3.000
Oceano	Southside Trunk Lines	Halcyon	11		137	853.10	2.25	3.9760	0.00420	576054	400.0	0.864	1,728,162	2.592	17.441	4.387	0.050	0.149	0.130	3.510	0.243	6.561	2.044	3.000
Oceano	Southside Trunk Lines		137		135	397.03	2.25	3.9760	0.00223	576054	400.0	0.864	1,728,162	2.592	12.709	3.196	0.068	0.204	0.163	4.401	0.300	8.100	1.700	2.493
Oceano(AG flows in)	Southside Trunk Lines		135		133	399.23	2.25	3.9760	0.00223	576054	400.0	0.864	1,728,162	2.592	12.709	3.196	0.068	0.204	0.163	4.401	0.300	8.100	1.700	2.493
Oceano	Southside Trunk Lines	AG Creek	133	(inverse siphon)	131	163.15	1.50	1.7671	0.00250	557280	387.0	0.836	1,671,840	2.508	4.564	2.583	0.183	0.549	0.280	5.040	0.516	9.288	1.891	2.603
Oceano	Southside Trunk Lines		131		129	158.77	2.25	3.9760	0.00211	557280	387.0	0.836	1,671,840	2.508	12.362	3.109	0.068	0.203	0.163	4.401	0.300	8.100	1.654	2.425
Oceano	Southside Trunk Lines		129		127	301.76	2.25	3.9760	0.00210	557280	387.0	0.836	1,671,840	2.508	12.333	3.102	0.068	0.203	0.163	4.401	0.300	8.100	1.650	2.419
Oceano	Southside Trunk Lines		127		125	626.37	2.25	3.9760	0.00210	557280	387.0	0.836	1,671,840	2.508	12.333	3.102	0.068	0.203	0.163	4.401	0.300	8.100	1.650	2.419
Oceano	Southside Trunk Lines		125		123	123.68	2.00	3.1415	0.00250	557280	387.0	0.836	1,671,840	2.508	9.829	3.129	0.085	0.255	0.189	4.536	0.340	8.160	1.802	2.591
Oceano	Southside Trunk Lines		123		123a	131.82	2.00	3.1415	0.00247	557280	387.0	0.836	1,671,840	2.508	9.770	3.110	0.086	0.257	0.189	4.536	0.340	8.160	1.791	2.575
Oceano	Southside Trunk Lines		123a		121	344.85	2.00	3.1415	0.00585	557280	387.0	0.836	1,671,840	2.508	15.036	4.786	0.056	0.167	0.150	3.600	0.260	6.240	2.441	3.427
Oceano	Southside Trunk Lines		121		119	501.62	2.00	3.1415	0.00598	557280	387.0	0.836	1,671,840	2.508	15.202	4.839	0.055	0.165	0.150	3.600	0.260	6.240	2.468	3.465
Oceano	Southside Trunk Lines	Valley Road	119		117	527.49	2.00	3.1415	0.00476	557280	387.0	0.836	1,671,840	2.508	13.563	4.317	0.062	0.185	0.163	3.912	0.280	6.720	2.297	3.160
Oceano	Southside Trunk Lines		117		117a	326.84	2.00	3.1415	0.00473	557280	387.0	0.836	1,671,840	2.508	13.520	4.304	0.062	0.185	0.163	3.912	0.280	6.720	2.290	3.150
Oceano	Southside Trunk Lines		117a		113	278.00	2.00	3.1415	0.00644	557280	387.0	0.836	1,671,840	2.508	15.776	5.022	0.053	0.159	0.150	3.600	0.250	6.000	2.561	3.515
Oceano	Southside Trunk Lines		113		111	622.17	2.00	3.1415	0.00650	557280	387.0	0.836	1,671,840	2.508	15.849	5.045	0.053	0.158	0.150	3.600	0.250	6.000	2.573	3.532
Oceano	Southside Trunk Lines		111		111a	99.83	2.00	3.1415	0.00651	557280	387.0	0.836	1,671,840	2.508	15.861	5.049	0.053	0.158	0.150	3.600	0.250	6.000	2.575	3.534
Oceano	Southside Trunk Lines		111a		109	190.45	2.00	3.1415	0.00790	557280	387.0	0.836	1,671,840	2.508	17.473	5.562	0.048	0.144	0.130	3.120	0.243	5.832	2.592	3.804
Oceano	Southside Trunk Lines		109		107	622.84	2.00	3.1415	0.00787	557280	387.0	0.836	1,671,840	2.508	17.439	5.551	0.048	0.144	0.130	3.120	0.243	5.832	2.587	3.797
Oceano	Southside Trunk Lines		107		105	575.74	2.00	3.1415	0.00395	557280	387.0	0.836	1,671,840	2.508	12.355	3.933	0.068	0.203	0.163	3.912	0.300	7.200	2.092	3.068

Appendix F - Table 2
Existing Conditions
(Gravity only)

SSLOCS
Trunk System Data

		From		To		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
		Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D avg flow	d/D peak flow	d peak flow (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)	
Oceano	Southside Trunk Lines		105		103	442.64	2.00	3.1415	0.00395	557280	387.0	0.836	1,671,840	2,508	12.355	3.933	0.068	0.203	0.163	3.912	0.300	7.200	2.092	3.068
Oceano	Southside Trunk Lines		103		101	543.72	2.00	3.1415	0.00250	557280	387.0	0.836	1,671,840	2,508	9.829	3.129	0.085	0.255	0.189	4.536	0.340	8.160	1.802	2.591
Oceano	Southside Trunk Lines		101		97	555.54	2.00	3.1415	0.00250	557280	387.0	0.836	1,671,840	2,508	9.829	3.129	0.085	0.255	0.189	4.536	0.340	8.160	1.802	2.591
AG	Southside Trunk Lines	Fair Oaks	97		95	624.62	1.00	0.7854	0.00200	518880	360.3	0.778	1,556,640	2,335	1.385	1.763	0.562	1.686	0.528	6.336	1.000	12.000	1.791	1.763
AG	Southside Trunk Lines		95		89	783.35	1.00	0.7854	0.00740	518880	360.3	0.778	1,556,640	2,335	2.663	3.391	0.292	0.877	0.372	4.464	0.726	8.712	2.930	3.812
AG	Southside Trunk Lines		89		87	58.09	1.00	0.7854	0.05850	518880	360.3	0.778	1,556,640	2,335	7.488	9.535	0.104	0.312	0.215	2.580	0.386	4.632	6.064	8.352
AG	Southside Trunk Lines		87		85	122.12	1.00	0.7854	0.00250	518880	360.3	0.778	1,556,640	2,335	1.548	1.971	0.503	1.508	0.500	6.000	1.000	12.000	1.971	1.971
AG	Southside Trunk Lines		85		83	197.1	1.00	0.7854	0.00240	506976	352.1	0.760	1,520,928	2,281	1.517	1.931	0.501	1.504	0.500	6.000	1.000	12.000	1.931	1.931
AG	Southside Trunk Lines		83		81	230.44	1.20	1.1309	0.00240	506976	352.1	0.760	1,520,928	2,281	2.466	2.181	0.308	0.925	0.380	5.472	0.762	10.973	1.910	2.469
AG	Southside Trunk Lines		81		79	277.4	1.25	1.2271	0.00210	506976	352.1	0.760	1,520,928	2,281	2.572	2.096	0.296	0.887	0.372	5.580	0.734	11.010	1.811	2.360
AG	Cherry Ave Trunk Lines		79		77	192.46	1.33	1.3892	0.00260	506976	352.1	0.760	1,520,928	2,281	3.377	2.431	0.225	0.676	0.316	5.043	0.599	9.560	1.925	2.587
AG	Cherry Ave Trunk Lines		77		75	54.75	1.33	1.3892	0.00320	506976	352.1	0.760	1,520,928	2,281	3.747	2.697	0.203	0.609	0.300	4.788	0.560	8.938	2.104	2.821
AG	Cherry Ave Trunk Lines		75		73	158.69	1.50	1.7671	0.00440	410208	284.9	0.615	1,230,624	1,846	6.055	3.426	0.102	0.305	0.215	3.870	0.380	6.840	2.179	3.002
AG	Cherry Ave Trunk Lines		73		69	103.01	1.50	1.7671	0.00500	410208	284.9	0.615	1,230,624	1,846	6.454	3.653	0.095	0.286	0.202	3.636	0.364	6.552	2.265	3.112
AG	Cherry Ave Trunk Lines		69		67	467.81	1.50	1.7671	0.00710	410208	284.9	0.615	1,230,624	1,846	7.691	4.353	0.080	0.240	0.189	3.402	0.332	5.976	2.507	3.552
AG	Cherry Ave Trunk Lines		67		61	902.65	1.50	1.7671	0.00390	410208	284.9	0.615	1,230,624	1,846	5.700	3.226	0.108	0.324	0.215	3.870	0.392	7.056	2.052	2.865
AG	Cherry Ave Trunk Lines		61	2189	199.48	1.50	1.7671	0.00250	355392	246.8	0.533	1,066,176	1,599	4.564	2.583	0.117	0.350	0.222	3.996	0.410	7.380	1.684	2.350	
AG	Cherry Ave Trunk Lines		2189		53	439.03	1.50	1.7671	0.00200	355392	246.8	0.533	1,066,176	1,599	4.082	2.310	0.131	0.392	0.236	4.248	0.434	7.812	1.543	2.148
AG	Cherry Ave Trunk Lines		53		49	908.34	1.50	1.7671	0.00200	355392	246.8	0.533	1,066,176	1,599	4.082	2.310	0.131	0.392	0.236	4.248	0.434	7.812	1.543	2.148
AG	Cherry Ave Trunk Lines		49		47	132.01	1.50	1.7671	0.00300	355392	246.8	0.533	1,066,176	1,599	5.000	2.829	0.107	0.320	0.215	3.870	0.386	6.948	1.799	2.478
AG	Cherry Ave Trunk Lines		47		45	208.69	1.50	1.7671	0.00690	355392	246.8	0.533	1,066,176	1,599	7.582	4.291	0.070	0.211	0.176	3.168	0.308	5.544	2.377	3.347
AG	Cherry Ave Trunk Lines		45		41	252.36	1.50	1.7671	0.00240	355392	246.8	0.533	1,066,176	1,599	4.472	2.531	0.119	0.358	0.222	3.996	0.410	7.380	1.650	2.303
Oceano	Sewer Farm Trunk Lines	Front St.	3		TR2-B	157.70	1.50	1.7671	0.00403	961996	668.1	1.443	2,885,988	4,329	5.795	3.279	0.249	0.747	0.332	5.976	0.640	11.520	2.676	3.587
Oceano	Sewer Farm Trunk Lines	17th	TR2-B		D1-A	497.30	1.50	1.7671	0.01680	961996	668.1	1.443	2,885,988	4,329	11.831	6.695	0.122	0.366	0.229	4.122	0.416	7.488	4.365	6.093
Oceano	Sewer Farm Trunk Lines		D1-A		D	374.66	1.50	1.7671	0.01740	829096	575.8	1.244	2,487,288	3,731	12.041	6.814	0.103	0.310	0.215	3.870	0.380	6.840	4.334	5.969
Oceano	Sewer Farm Trunk Lines	Paso Robles	D		F1-A	498.27	1.50	1.7671	0.01600	829096	575.8	1.244	2,487,288	3,731	11.546	6.534	0.108	0.323	0.215	3.870	0.392	7.056	4.156	5.802
Oceano	Sewer Farm Trunk Lines	19th Street	F1-A		TR4-A	438.64	1.50	1.7671	0.01780	792846	550.6	1.189	2,378,538	3,568	12.178	6.892	0.098	0.293	0.202	3.636	0.372	6.696	4.273	5.954
Oceano	Sewer Farm Trunk Lines		TR4-A		TR4-B	244.25	1.50	1.7671	0.01780	780746	542.2	1.171	2,342,238	3,513	12.178	6.892	0.096	0.288	0.202	3.636	0.364	6.552	4.273	5.872
Oceano	Sewer Farm Trunk Lines	Vista	TR4-B		J1-A	518.05	1.50	1.7671	0.00600	768646	533.8	1.153	2,305,938	3,459	7.071	4.001	0.163	0.489	0.260	4.680	0.488	8.784	2.865	3.921
Oceano	Sewer Farm Trunk Lines		J1-A		L1-E	513.33	1.50	1.7671	0.00600	756546	525.4	1.135	2,269,638	3,404	7.071	4.001	0.161	0.482	0.260	4.680	0.488	8.784	2.865	3.921
Oceano	Sewer Farm Trunk Lines	22nd St.	L1-E		L1-A	398.63	1.50	1.7671	0.00570	746846	518.6	1.120	2,240,538	3,361	6.891	3.900	0.163	0.488	0.260	4.680	0.488	8.784	2.792	3.822
Oceano	Sewer Farm Trunk Lines	Wilmar	L1-A		N1-A	508.23	1.50	1.7671	0.00270	737146	511.9	1.106	2,211,438	3,317	4.743	2.684	0.233	0.699	0.324	5.832	0.613	11.034	2.158	2.888
Oceano	Sewer Farm Trunk Lines	23rd St.	N1-A		M2	273.12	1.50	1.7671	0.00271	693646	481.7	1.040	2,080,938	3,121	4.752	2.689	0.219	0.657	0.308	5.544	0.585	10.530	2.097	2.845
Oceano	Sewer Farm Trunk Lines	Tamara Dr.	M2		M3	331.11	1.50	1.7671	0.00270	683946	475.0	1.026	2,051,838	3,078	4.743	2.684	0.216	0.649	0.308	5.544	0.580	10.440	2.094	2.840
Oceano (AG flows in)	Sewer Farm Trunk Lines		M3		291	593.91	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		291		289	375.06	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		289		287	366.22	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		287		285	358.45	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		285		283	366.97	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		283		281	59.17	1.50	1.7671	0.00184	683946	475.0	1.026	2,051,838	3,078	3.915	2.216	0.262	0.786	0.348	6.264	0.663	11.934	1.835	2.446
AG	Sewer Farm Trunk Lines		281		279	363.04	1.50	1.7671	0.00260	683946	475.0	1.026	2,051,838	3,078	4.654	2.634	0.220	0.661	0.316	5.688	0.592	10.656	2.086	2.802
AG	Sewer Farm Trunk Lines		279		277	365.80	1.50	1.7671	0.00260	683846	474.9	1.026	2,051,538	3,077	4.654	2.634	0.220	0.661	0.316	5.688	0.592	10.656	2.086	2.802
AG	Sewer Farm Trunk Lines		277		275	500.37	1.50	1.7671	0.00800	463872	322.1	0.696	1,391,616	2,087	8.164	4.620	0.085	0.256	0.189	3.402	0.340	6.120	2.661	3.826

Appendix F - Table 2
Existing Conditions
(Gravity only)

Mannings coefficient: n=.015 is value for VCP see Appendix 19-A from CERM 7th Edition

SSLOCSD
Trunk System Data

Location	Description	From		To		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
		Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg. Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D avg flow	d/D peak flow	d _{peak} flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)	
AG	Sewer Farm Trunk Lines		275		273	494.83	1.50	1.7671	0.00600	463872	322.1	0.696	1,391,616	2.087	7.071	4.001	0.098	0.295	0.202	3.636	0.372	6.696	2.481	3.457
AG	Sewer Farm Trunk Lines		273		271	207.20	1.50	1.7671	0.00600	463872	322.1	0.696	1,391,616	2.087	7.071	4.001	0.098	0.295	0.202	3.636	0.372	6.696	2.481	3.457
Oceano		Ocean Ave	A6-A		A1-C	N/A	1.00	0.7854	0.00250	109000	75.7	0.164	327,000	0.491	1.548	1.971	0.106	0.317	0.215	2.580	0.386	4.632	1.254	1.727
Oceano		Fountain	A1-C		A1-A	N/A	1.00	0.7854	0.00250	136000	94.4	0.204	408,000	0.612	1.548	1.971	0.132	0.395	0.236	2.832	0.434	5.208	1.317	1.833
Oceano		At WWTP	A1-A		110	432.76	2.00	3.1415	0.00100	1114500	774.0	1.672	3,120,600	4.681	6.216	1.979	0.269	0.753	0.348	8.352	0.645	15.480	1.638	2.165
Oceano			110		S1-A	397.31	2.00	3.1415	0.00100	1114500	774.0	1.672	3,120,600	4.681	6.216	1.979	0.269	0.753	0.348	8.352	0.645	15.480	1.638	2.165
Oceano			S1-A		130	175.87	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano		San Luis Pl.	130		140	326.82	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano			140		150	317.68	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano			150		160	482.32	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano			160	Pier & Mendel	T1-A	313.69	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano		Mendel Dr.	T1-A		U1-A	280.18	2.00	3.1415	0.00100	1106500	768.4	1.660	3,098,200	4.647	6.216	1.979	0.267	0.748	0.348	8.352	0.640	15.360	1.638	2.165
Oceano		Norswing	U1-A		V1-A	282.84	2.00	3.1415	0.00100	1065000	739.6	1.598	2,982,000	4.473	6.216	1.979	0.257	0.720	0.340	8.160	0.625	15.000	1.638	2.141
Oceano			V1-A		W1-A	266.50	2.00	3.1415	0.00100	1065000	739.6	1.598	2,982,000	4.473	6.216	1.979	0.257	0.720	0.340	8.160	0.625	15.000	1.638	2.141
Oceano			W1-A		X1-A	266.50	2.00	3.1415	0.00100	1058750	735.2	1.588	2,964,500	4.447	6.216	1.979	0.255	0.715	0.340	8.160	0.625	15.000	1.638	2.141
Oceano			X1-A		Y1-A	266.50	2.00	3.1415	0.00100	1052500	730.9	1.579	2,947,000	4.421	6.216	1.979	0.254	0.711	0.340	8.160	0.625	15.000	1.638	2.141
Oceano			Y1-A		TR13-A	265.14	2.00	3.1415	0.00100	1046250	726.6	1.569	2,929,500	4.394	6.216	1.979	0.252	0.707	0.340	8.160	0.620	14.880	1.638	2.141
Oceano		Coolidge Dr.	TR13-A		240	540.05	2.00	3.1415	0.00100	1040000	722.2	1.560	2,912,000	4.368	6.216	1.979	0.251	0.703	0.340	8.160	0.620	14.880	1.638	2.141
Grover Beach			240		250	326.18	1.75	2.4052	0.00100	1030000	715.3	1.545	2,884,000	4.326	4.354	1.810	0.355	0.994	0.410	8.610	0.812	17.052	1.647	2.064
Grover Beach		Hwy 1	250		260	500.00	1.75	2.4052	0.00180	1030000	715.3	1.545	2,884,000	4.326	5.842	2.429	0.264	0.741	0.348	7.308	0.640	13.440	2.011	2.657
Grover Beach			260		270	500.00	1.75	2.4052	0.00180	1030000	715.3	1.545	2,884,000	4.326	5.842	2.429	0.264	0.741	0.348	7.308	0.640	13.440	2.011	2.657
Grover Beach			270		280	72.77	1.75	2.4052	0.00180	1030000	715.3	1.545	2,884,000	4.326	5.842	2.429	0.264	0.741	0.348	7.308	0.640	13.440	2.011	2.657
Grover Beach			280		290	467.23	1.75	2.4052	0.00100	1030000	715.3	1.545	2,884,000	4.326	4.354	1.810	0.355	0.994	0.410	8.610	0.812	17.052	1.647	2.064
Grover Beach			290		300	500.00	1.75	2.4052	0.00100	1030000	715.3	1.545	2,884,000	4.326	4.354	1.810	0.355	0.994	0.410	8.610	0.812	17.052	1.647	2.064
Grover Beach			300		310	470.00	1.75	2.4052	0.00100	1030000	715.3	1.545	2,884,000	4.326	4.354	1.810	0.355	0.994	0.410	8.610	0.812	17.052	1.647	2.064
Grover Beach			310		320	500.00	1.50	1.7671	0.00220	1030000	715.3	1.545	2,884,000	4.326	4.281	2.423	0.361	1.010	0.416	7.488	0.820	14.760	2.205	2.762
Grover Beach			320		330	264.95	1.50	1.7671	0.00220	1030000	715.3	1.545	2,884,000	4.326	4.281	2.423	0.361	1.010	0.416	7.488	0.820	14.760	2.205	2.762
Grover Beach		Cross Railroad	330		340	307.00	1.50	1.7671	0.00220	1030000	715.3	1.545	2,884,000	4.326	4.281	2.423	0.361	1.010	0.416	7.488	0.820	14.760	2.205	2.762
Grover Beach		Railroad	340		350	319.78	1.25	1.2271	0.00140	260000	180.6	0.390	728,000	1.092	2.100	1.712	0.186	0.520	0.280	4.200	0.504	7.560	1.253	1.712
Grover Beach			400		410	531.31	1.25	1.2271	0.00180	260000	180.6	0.390	728,000	1.092	2.382	1.941	0.164	0.459	0.260	3.900	0.470	7.050	1.390	1.883
Grover Beach			410		420	566.19	1.00	0.7854	0.00200	260000	180.6	0.390	728,000	1.092	1.385	1.763	0.282	0.789	0.364	4.368	0.663	7.956	1.502	1.946

Appendix F - Table 2
Existing Conditions
(Gravity only)

SSLOCS
Trunk System Data

			From			To		A	B	D	E					F	G		H		I	J	K	L	M	N	O	P	Q	R
			Road	Manhole		Road	Manhole	Distance (ft)	Diameter (ft)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Future Additions Ave Flows (gpd)	Future Additions Ave Flows (Outside of AG/WWP Properties) (gpd)	Avg. Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D flow	d avg flow (in)	d/D peak flow	d peak flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
Line #	Location	Description	Road	Manhole		Road	Manhole	Distance (ft)	Diameter (ft)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Future Additions Ave Flows (gpd)	Future Additions Ave Flows (Outside of AG/WWP Properties) (gpd)	Avg. Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D flow	d avg flow (in)	d/D peak flow	d peak flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
1	WWTP		Honolulu	A1-A			A	509.16	2.50	0.0025	4101043				2847.95	6.152	12,303.129	8,544	18.455	9.031	18.062	3.680	0.341	1.022	0.404	12.120	0.830	24.900	3.312	4.195
2	Oceano			A			B	530.10	2.50	0.0025	2540543				1764.27	3.811	7,621.629	5,293	11.432	9.031	18.062	3.680	0.211	0.633	0.308	9.240	0.575	17.250	2.870	3.871
3	Oceano			B			C	809.32	2.50	0.0025	2540543				1764.27	3.811	7,621.629	5,293	11.432	9.031	18.062	3.680	0.211	0.633	0.308	9.240	0.575	17.250	2.870	3.871
4	Oceano			C			TR1-B	593.03	2.50	0.0025	2540543				1764.27	3.811	7,621.629	5,293	11.432	9.031	18.062	3.680	0.211	0.633	0.308	9.240	0.575	17.250	2.870	3.871
5	Oceano		Sand Dollar	TR1-B		Railroad	1	622.00	2.50	0.0025	2540543	9000	65000		1764.27	3.811	7,621.629	5,293	11.432	9.031	18.062	3.680	0.211	0.633	0.308	9.240	0.575	17.250	2.870	3.871
6	Oceano		Railroad	1			2	173.53	2.50	0.0025	2466543				1712.88	3.700	7,399.629	5,139	11.099	9.031	18.062	3.680	0.205	0.615	0.300	9.000	0.565	16.950	2.870	3.849
7	Oceano			2		Hwy 1	3	350.29	2.50	0.0025	2466543				1712.88	3.700	7,399.629	5,139	11.099	9.031	18.062	3.680	0.205	0.615	0.300	9.000	0.565	16.950	2.870	3.849
8	Oceano	Southside Trunk Lines	Hwy 1	3		TR7-C	4	752.60	2.25	0.0049	1189122	24200			825.78	1.784	3,567.366	2,477	5.351	9.537	19.074	4.797	0.094	0.281	0.202	5.454	0.364	9.828	2.974	4.087
9	Oceano	Southside Trunk Lines	Nipomo St	TR7-C			4	632.90	2.25	0.0058	1164922				808.97	1.747	3,494.766	2,427	5.242	10.386	20.773	5.225	0.084	0.252	0.189	5.103	0.340	9.180	3.009	4.326
10	Oceano	Southside Trunk Lines		4			5	602.42	2.25	0.0058	1164922				808.97	1.747	3,494.766	2,427	5.242	10.386	20.773	5.225	0.084	0.252	0.189	5.103	0.340	9.180	3.009	4.326
11	Oceano	Southside Trunk Lines		5		TR8-A	6	636.61	2.25	0.0042	1164922				808.97	1.747	3,494.766	2,427	5.242	8.859	17.719	4.457	0.099	0.296	0.202	5.454	0.372	10.044	2.763	3.850
12	Oceano	Southside Trunk Lines		TR8-A		TR8-B	495.00	2.25	0.0076	1164922					808.97	1.747	3,494.766	2,427	5.242	11.921	23.841	5.996	0.073	0.220	0.176	4.752	0.308	8.316	3.322	4.677
13	Oceano	Southside Trunk Lines		TR8-B		TR8-C	424.55	2.25	0.0076	1164922	8000				808.97	1.747	3,494.766	2,427	5.242	11.889	23.779	5.981	0.073	0.220	0.176	4.752	0.316	8.532	3.313	4.737
14	Oceano	Southside Trunk Lines		TR8-C		Elm St	Q1-A	391.00	2.25	0.0076	1156922				803.42	1.735	3,470.766	2,410	5.206	11.889	23.779	5.981	0.073	0.219	0.176	4.752	0.308	8.316	3.313	4.665
15	Oceano	Southside Trunk Lines	Hwy 1	Q1-A		Q1-Aa	89.45	2.25	0.0069	1156922		65000			803.42	1.735	3,470.766	2,410	5.206	11.329	22.657	5.699	0.077	0.230	0.176	4.752	0.316	8.532	3.157	4.513
16	Oceano	Southside Trunk Lines		Q1-Aa		Q1-Aa	200.15	2.25	0.0020	1091922	8000				758.28	1.638	3,275.766	2,275	4.914	6.099	12.198	3.068	0.134	0.403	0.236	6.372	0.440	11.880	2.049	2.884
17	Oceano	Southside Trunk Lines		Q1-A		TR9-A	476.62	2.25	0.0020	1083922	8000				752.72	1.626	3,251.766	2,258	4.878	6.099	12.198	3.068	0.133	0.400	0.236	6.372	0.434	11.718	2.049	2.853
18	Oceano	Southside Trunk Lines		TR9-A		TR10-A	532.31	2.25	0.0020	1075922	36250				747.17	1.614	3,227.766	2,242	4.842	6.099	12.198	3.068	0.132	0.397	0.236	6.372	0.434	11.718	2.049	2.853
19	Oceano	Southside Trunk Lines		TR10-A		6	412.57	2.25	0.0020	1039672					721.99	1.560	3,119.016	2,166	4.679	6.099	12.198	3.068	0.128	0.384	0.229	6.183	0.428	11.556	2.000	2.823
20	Oceano	Southside Trunk Lines		6		7	380.55	2.25	0.0020	1039672					721.99	1.560	3,119.016	2,166	4.679	6.099	12.198	3.068	0.128	0.384	0.229	6.183	0.428	11.556	2.000	2.823
21	Oceano	Southside Trunk Lines		7		8	275.65	2.25	0.0020	1039672					721.99	1.560	3,119.016	2,166	4.679	6.099	12.198	3.068	0.128	0.384	0.229	6.183	0.428	11.556	2.000	2.823
22	Oceano	Southside Trunk Lines		8		9a	287.95	2.25	0.0020	1039672					721.99	1.560	3,119.016	2,166	4.679	6.099	12.198	3.068	0.128	0.384	0.229	6.183	0.428	11.556	2.000	2.823
23	Oceano	Southside Trunk Lines		9a		9	134.20	2.25	0.0020	1039672					721.99	1.560	3,119.016	2,166	4.679	6.099	12.198	3.068	0.128	0.384	0.229	6.183	0.428	11.556	2.000	2.823
24	Oceano	Southside Trunk Lines		9		10	318.30	2.25	0.0042	1039672					721.99	1.560	3,119.016	2,166	4.679	8.880	17.761	4.467	0.088	0.263	0.189	5.103	0.348	9.396	2.573	3.699
25	Oceano	Southside Trunk Lines		10		11	426.80	2.25	0.0042	1039672					721.99	1.560	3,119.016	2,166	4.679	8.838	17.677	4.446	0.088	0.265	0.189	5.103	0.348	9.396	2.561	3.681
26	Oceano	Southside Trunk Lines	Halcyon	11		137	853.10	2.25	0.0042	1039672					721.99	1.560	3,119.016	2,166	4.679	8.838	17.677	4.446	0.088	0.265	0.189	5.103	0.348	9.396	2.561	3.681
27	Oceano	Southside Trunk Lines		137		135	397.03	2.25	0.0022	1039672		70000			721.99	1.560	3,119.016	2,166	4.679	6.440	12.881	3.240	0.121	0.363	0.229	6.183	0.416	11.232	2.112	2.948
28	Oceano(AG flows in)	Southside Trunk Lines		135		133	399.23	2.25	0.0022	969672		143712	6900		673.38	1.455	2,909.016	2,020	4.364	6.440	12.881	3.240	0.113	0.339	0.222	5.994	0.398	10.746	2.112	2.877
29	Oceano	Southside Trunk Lines	AG Creek	133	(inverse siphon)	131	163.15	1.50	0.0025	738808					513.06	1.108	2,216.424	1,539	3.325	2.313	4.626	2.618	0.240	0.719	0.324	5.832	0.625	11.250	2.105	2.832
30	Oceano	Southside Trunk Lines		131		129	158.77	2.25	0.0021	738808					513.06	1.108	2,216.424	1,539	3.325	6.265	12.529	3.151	0.088	0.265	0.189	5.103	0.348	9.396	1.815	2.609
31	Oceano	Southside Trunk Lines		129		127	301.76	2.25	0.0021	738808					513.06	1.108	2,216.424	1,539	3.325	6.250	12.499	3.144	0.089	0.266	0.189	5.103	0.348	9.396	1.811	2.603
32	Oceano	Southside Trunk Lines		127		125	626.37	2.25	0.0021	738808					513.06	1.108	2,216.424	1,539	3.325	6.250	12.499	3.144	0.089	0.266	0.189	5.103	0.348	9.396	1.811	2.603
33	Oceano	Southside Trunk Lines		125		123	123.68	2.00	0.0025	738808					513.06	1.108	2,216.424	1,539	3.325	4.981	9.962	3.171	0.111	0.334	0.222	5.328	0.398	9.552	2.068	2.816
34	Oceano	Southside Trunk Lines		123		123a	131.82	2.00	0.0025	738808					513.06	1.108	2,216.424	1,539	3.325	4.981	9.962	3.171	0.111	0.334	0.222	5.328	0.398	9.552	2.068	2.816
35	Oceano	Southside Trunk Lines		123a		121	344.85	2.00	0.0059	738808					513.06	1.108	2,216.4													

SSLOCS
Trunk System Data

Line #	Location	Description	Road	Manhole	To	Manhole	Distance (ft)	Diameter (ft)	Slope (ft/ft)	Avg. Flow (gpd)	Added Ave Flows (gpd)	Future Additions Ave Flows (gpd)	Future Additions Ave Flows (outside of ACWWMP Projections) (gpd)	Avg. Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Q _{full}	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg}	d _{avg} (in)	d/D _{peak}	d _{peak} (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
55	AG	Cherry Ave Trunk Lines		79		77	192.46	1.33	0.0026	611552				424.69	0.917	1,834,656	1,274	2.752	1.711	3.423	2.464	0.268	0.804	0.348	5.554	0.675	10.773	2.040	2.730
56	AG	Cherry Ave Trunk Lines		77		75	54.75	1.33	0.0032	611552			1040	424.69	0.917	1,834,656	1,274	2.752	1.899	3.797	2.733	0.242	0.725	0.332	5.299	0.630	10.055	2.230	2.974
57	AG	Cherry Ave Trunk Lines		75		73	158.69	1.50	0.0044	483216				335.57	0.725	1,449,648	1,007	2.174	3.068	6.137	3.473	0.118	0.354	0.222	3.996	0.410	7.380	2.264	3.160
58	AG	Cherry Ave Trunk Lines		73		69	103.01	1.50	0.0050	483216				335.57	0.725	1,449,648	1,007	2.174	3.271	6.542	3.702	0.111	0.332	0.222	3.996	0.398	7.164	2.414	3.287
59	AG	Cherry Ave Trunk Lines		69		67	467.81	1.50	0.0071	483216				335.57	0.725	1,449,648	1,007	2.174	3.898	7.795	4.411	0.093	0.279	0.202	3.636	0.356	6.408	2.735	3.706
60	AG	Cherry Ave Trunk Lines		67		61	902.65	1.50	0.0039	483216				335.57	0.725	1,449,648	1,007	2.174	2.889	5.777	3.269	0.125	0.376	0.229	4.122	0.422	7.596	2.132	3.008
61	AG	Cherry Ave Trunk Lines		61		2189	199.48	1.50	0.0025	386784				268.60	0.580	1,160,352	806	1.741	2.313	4.626	2.618	0.125	0.376	0.229	4.122	0.422	7.596	1.707	2.408
62	AG	Cherry Ave Trunk Lines		2189		53	439.03	1.50	0.0020	386784				268.60	0.580	1,160,352	806	1.741	2.069	4.137	2.341	0.140	0.421	0.243	4.374	0.452	8.136	1.601	2.224
63	AG	Cherry Ave Trunk Lines		53		49	908.34	1.50	0.0020	386784				268.60	0.580	1,160,352	806	1.741	2.069	4.137	2.341	0.140	0.421	0.243	4.374	0.452	8.136	1.601	2.224
64	AG	Cherry Ave Trunk Lines		49		47	132.01	1.50	0.0030	386784				268.60	0.580	1,160,352	806	1.741	2.534	5.067	2.868	0.114	0.343	0.222	3.996	0.404	7.272	1.870	2.581
65	AG	Cherry Ave Trunk Lines		47		45	208.69	1.50	0.0069	386784				268.60	0.580	1,160,352	806	1.741	3.842	7.685	4.349	0.075	0.226	0.176	3.168	0.316	5.688	2.409	3.444
66	AG	Cherry Ave Trunk Lines		45		41	252.36	1.50	0.0024	386784				268.60	0.580	1,160,352	806	1.741	2.266	4.532	2.565	0.128	0.384	0.229	4.122	0.428	7.704	1.672	2.360
67	Oceano	Sewer Farm Trunk Lines	Front St.	3		TR2-B	157.70	1.50	0.0040	1277421				887.10	1.916	3,832,263	2,661	5.748	2.936	5.873	3.324	0.326	0.979	0.392	7.056	0.796	14.328	2.951	3.782
68	Oceano	Sewer Farm Trunk Lines	17th	TR2-B		D1-A	497.30	1.50	0.0168	1277421	132900			887.10	1.916	3,832,263	2,661	5.748	5.996	11.991	6.786	0.160	0.479	0.250	4.500	0.482	8.676	4.750	6.650
69	Oceano	Sewer Farm Trunk Lines				D1-A	374.66	1.50	0.0174	1144521				794.81	1.717	3,433,563	2,384	5.150	6.102	12.203	6.906	0.141	0.422	0.243	4.374	0.452	8.136	4.724	6.561
70	Oceano	Sewer Farm Trunk Lines	Paso Robles	D		F1-A	498.27	1.50	0.0160	1144521	36250			794.81	1.717	3,433,563	2,384	5.150	5.851	11.702	6.622	0.147	0.440	0.243	4.374	0.464	8.352	4.530	6.357
71	Oceano	Sewer Farm Trunk Lines	19th Street	F1-A		TR4-A	438.64	1.50	0.0178	1108271	12100			769.63	1.662	3,324,813	2,309	4.987	6.171	12.343	6.985	0.135	0.404	0.236	4.248	0.440	7.920	4.666	6.566
72	Oceano	Sewer Farm Trunk Lines				TR4-B	244.25	1.50	0.0178	1096171	12100			761.23	1.644	3,288,513	2,284	4.933	6.171	12.343	6.985	0.133	0.400	0.236	4.248	0.434	7.812	4.666	6.496
73	Oceano	Sewer Farm Trunk Lines	Vista	TR4-B		J1-A	518.05	1.50	0.0060	1084071	12100			752.83	1.626	3,252,213	2,258	4.878	5.583	7.166	4.055	0.227	0.681	0.316	5.688	0.606	10.908	3.212	4.339
74	Oceano	Sewer Farm Trunk Lines				L1-E	513.33	1.50	0.0060	1071971	9700			744.42	1.608	3,215,913	2,233	4.824	5.583	7.166	4.055	0.224	0.673	0.316	5.688	0.599	10.782	3.212	4.315
75	Oceano	Sewer Farm Trunk Lines	22nd St.	L1-E		L1-A	398.63	1.50	0.0057	1062271				737.69	1.593	3,186,813	2,213	4.780	3.492	6.985	3.953	0.228	0.684	0.316	5.688	0.606	10.908	3.130	4.229
76	Oceano	Sewer Farm Trunk Lines	Wilmar	L1-A		N1-A	508.23	1.50	0.0027	1052571	43500			730.95	1.579	3,157,713	2,193	4.737	2.404	4.807	2.720	0.328	0.985	0.392	7.056	0.804	14.472	2.416	3.101
77	Oceano	Sewer Farm Trunk Lines	23rd St.	N1-A		M2	273.12	1.50	0.0027	1009071	9700			700.74	1.514	3,027,213	2,102	4.541	2.408	4.816	2.725	0.314	0.943	0.386	6.948	0.774	13.932	2.387	3.091
78	Oceano	Sewer Farm Trunk Lines	Tamara Dr.	M2		M3	331.11	1.50	0.0027	999371				694.01	1.499	2,998,113	2,082	4.497	2.404	4.807	2.720	0.312	0.936	0.386	6.948	0.768	13.824	2.383	3.079
79	Oceano (AG flows in)	Sewer Farm Trunk Lines		M3		291	593.91	1.50	0.0018	999371		111648		694.01	1.499	2,998,113	2,082	4.497	1.984	3.968	2.246	0.378	1.133	0.422	7.596	1.000	18.000	2.066	2.246
80	AG	Sewer Farm Trunk Lines		291		289	375.06	1.50	0.0018	999371				694.01	1.499	2,998,113	2,082	4.497	1.963	3.925	2.221	0.382	1.146	0.428	7.704	1.000	18.000	2.043	2.221
81	AG	Sewer Farm Trunk Lines		289	B-13	287	366.22	1.50	0.0018	999371				694.01	1.499	2,998,113	2,082	4.497	1.963	3.925	2.221	0.382	1.146	0.428	7.704	1.000	18.000	2.043	2.221
82	AG	Sewer Farm Trunk Lines		287	B-14	285	358.45	1.50	0.0018	999371				694.01	1.499	2,998,113	2,082	4.497	1.963	3.925	2.221	0.382	1.146	0.428	7.704	1.000	18.000	2.043	2.221
83	AG	Sewer Farm Trunk Lines		285	B-15	283	366.97	1.50	0.0018	999371				694.01	1.499	2,998,113	2,082	4.497	1.963	3.925	2.221	0.382	1.146	0.428	7.704	1.000	18.000	2.043	2.221
84	AG	Sewer Farm Trunk Lines		283	B-16	281	59.17	1.50	0.0018	999371				694.01	1.499	2,998,113	2,082	4.497	1.963	3.925	2.221	0.382	1.146	0.428	7.704	1.000	18.000	2.043	2.221
85	AG	Sewer Farm Trunk Lines		281	B-17	279	363.04	1.50	0.0026	846395				587.77	1.270	2,539,185	1,763	3.809	2.359	4.717	2.670	0.269	0.807	0.348	6.264	0.675	12.150	2.210	2.958
86	AG	Sewer Farm Trunk Lines		279	B-18	277	365.80	1.50	0.0026	846395			7338	587.77	1.270	2,539,185	1,763	3.809	2.359	4.717	2.670	0.269	0.807	0.348	6.264	0.675	12.150	2.210	2.958
87	AG	Sewer Farm Trunk Lines		277	B-19	275	500.37	1.50	0.0080	560369				389.15	0.841	1,681,107	1,167	2.522	4.137	8.275	4.683	0.102	0.305	0.215	3.870	0.380	6.840	2.978	4.102
88	AG	Sewer Farm Trunk Lines		275		273	494.83	1.50	0.0060	560369				389.15	0.841	1,681,107	1,167	2.522	3.583	7.166	4.055	0.117	0.352	0.222	3.996	0.410	7.380	2.644	3.690
89	AG	Sewer Farm Trunk Lines		273		271	207.20	1.50	0.0060	560369			41969	389.15	0.841	1,681,107	1,167	2.522	3.583	7.166	4.055	0.117	0.352	0.222	3.996	0.410	7.380	2.644	3.690
90	Oceano		Ocean Ave	A6-A		A1-C	N/A	1.00	0.0025	109000	109000			75.69	0.164	327,000	227	0.491	0.784	1.569	1.998	0.104	0.313	0.215	2.580	0.386	4.632	1.271	1.750
91	Oceano		Fountain	A1-C		A1-A	N/A	1.00	0.0025	136000	27000			94.44	0.204	408,000	283	0.612	0.784	1.569	1.998	0.130	0.390	0.236	2.832	0.434	5.208	1.334	1.858
92	Oceano		At WWTP	A1-A		110	432.76	2.00	0.0010	1424500				989.24	2.137	4,273,500	2,968	6.410	3.150	6.300	2.006	0.339	1.017	0.398	9.552	0.830	19.920	1.781	2.286
93	Oceano			110		S1-A	397.31	2.00	0.0010	1424500	8000			989.24	2.137	4,273,500	2,968	6.410	3.150	6.300	2.006	0.339	1.017	0.398	9.552	0.830	19.920	1.781	2.286
94	Oceano					S1-A	130	175.87	2.00	0.0010	1416500			983.68	2.125	4,249,500	2,951	6.374	3.150	6.300	2.006	0.337	1.012	0.398	9.552	0.830	19.920	1.781	2.286
95	Oceano		San Luis Pl.	130		140	326.82	2.00	0.0010	1416500				983.68	2.125	4,249,500	2,951	6.374	3.150	6.300	2.006	0.337	1.012	0.398	9.552	0.830	19.920	1.781	2.286
96	Oceano			140		150	317.68	2.00	0.0010	1416500				983.68	2.125	4,249,500	2,951	6.374	3.150	6.300	2.006	0.337	1.012	0.398	9.552	0.830	19.920	1.781	2.286
97	Oceano			150		160	482.32	2.00	0.0010	1416500				983.68	2.125	4,249,500	2,951	6.374	3.150	6.300	2.006	0.337	1.012	0.398	9.552	0.830	19.920	1.781	2.286
98	Oceano			160	Pier & Mendel	T1-A	313.69	2.00	0.0010	1416500				983.68	2.125	4,249,500	2,951	6.374	3.150	6.300	2.006	0.337							

SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	D	E	Added Ave Flows (gpd)	Future Additions Ave Flows (gpd)	Future Additions Ave Flows (outside of AGWISMP Projections) (gpd)	Avg. Flow (gpm)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (gpm)	Peak Flow (cfs)	Max Capacity (50%)	Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg}	d _{avg} flow (in)	d/D _{peak}	d _{peak} flow (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Slope (ft/ft)	Avg. Flow (gpd)																			
106	Grover Beach			240		250	326.18	1.75	0.0010	1340000				930.56	2.010	4,020,000	2,792	6.030	2.206	4.413	1.835	0.455	1.366	0.470	9.870	1.000	21.000	1.780	1.835
107	Grover Beach		Hwy 1	250		260	500.00	1.75	0.0018	1340000				930.56	2.010	4,020,000	2,792	6.030	2.960	5.921	2.462	0.339	1.018	0.398	8.358	0.830	17.430	2.186	2.806
108	Grover Beach			260		270	500.00	1.75	0.0018	1340000				930.56	2.010	4,020,000	2,792	6.030	2.960	5.921	2.462	0.339	1.018	0.398	8.358	0.830	17.430	2.186	2.806
109	Grover Beach			270		280	72.77	1.75	0.0018	1340000				930.56	2.010	4,020,000	2,792	6.030	2.960	5.921	2.462	0.339	1.018	0.398	8.358	0.830	17.430	2.186	2.806
110	Grover Beach			280		290	467.23	1.75	0.0010	1340000				930.56	2.010	4,020,000	2,792	6.030	2.206	4.413	1.835	0.455	1.366	0.470	9.870	1.000	21.000	1.780	1.835
111	Grover Beach			290		300	500.00	1.75	0.0010	1340000				930.56	2.010	4,020,000	2,792	6.030	2.206	4.413	1.835	0.455	1.366	0.470	9.870	1.000	21.000	1.780	1.835
112	Grover Beach			300		310	470.00	1.75	0.0010	1340000				930.56	2.010	4,020,000	2,792	6.030	2.206	4.413	1.835	0.455	1.366	0.470	9.870	1.000	21.000	1.780	1.835
113	Grover Beach			310		320	500.00	1.50	0.0022	1340000				930.56	2.010	4,020,000	2,792	6.030	2.170	4.339	2.456	0.463	1.390	0.476	8.568	1.000	18.000	2.382	2.456
114	Grover Beach			320		330	264.95	1.50	0.0022	1340000				930.56	2.010	4,020,000	2,792	6.030	2.170	4.339	2.456	0.463	1.390	0.476	8.568	1.000	18.000	2.382	2.456
115	Grover Beach		Cross Railroad	330		340	307.00	1.50	0.0022	1340000	770000	300000		930.56	2.010	4,020,000	2,792	6.030	2.170	4.339	2.456	0.463	1.390	0.476	8.568	1.000	18.000	2.382	2.456
116	Grover Beach		Railroad	340		350	319.78	1.25	0.0014	270000				187.50	0.405	810,000	563	1.215	1.064	2.129	1.735	0.190	0.571	0.290	4.350	0.536	8.040	1.325	1.776
117	Grover Beach			400		410	531.31	1.25	0.0018	270000				187.50	0.405	810,000	563	1.215	1.207	2.414	1.967	0.168	0.503	0.260	3.900	0.500	7.500	1.408	1.967
118	Grover Beach			410		420	566.19	1.00	0.0020	270000	260000	10000		187.50	0.405	810,000	563	1.215	0.702	1.403	1.787	0.289	0.866	0.364	4.368	0.718	8.616	1.522	2.005

Appendix F -Table 3
Future Conditions

SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	C	D	E	F	G	H	Max Capacity (50%)	I	J	K	L	M	N	O	P	Q	R
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)		Q _{full}	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg}	d _{avg} flow (in)	d/D _{peak}	d _{peak} flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
1	WWTP		Honolulu	A1-A		A	509.16	2.50	4.9086	0.00250	3782001	5.673	11,346,003	17.019	8.911	17.821	3.631	0.318	0.955	0.386	11.580	0.780	23.400	3.180	4.124
2	Oceano			A		B	530.10	2.50	4.9086	0.00250	2231501	3.347	6,694,503	10.042	8.911	17.821	3.631	0.188	0.563	0.280	8.400	0.528	15.840	2.658	3.689
3	Oceano			B		C	809.32	2.50	4.9086	0.00250	2231501	3.347	6,694,503	10.042	8.911	17.821	3.631	0.188	0.563	0.280	8.400	0.528	15.840	2.658	3.689
4	Oceano			C		TR1-B	593.03	2.50	4.9086	0.00250	2231501	3.347	6,694,503	10.042	8.911	17.821	3.631	0.188	0.563	0.280	8.400	0.528	15.840	2.658	3.689
5	Oceano		Sand Dollar	TR1-B	Railroad	1	622.00	2.50	4.9086	0.00250	2231501	3.347	6,694,503	10.042	8.911	17.821	3.631	0.188	0.563	0.280	8.400	0.528	15.840	2.658	3.689
6	Oceano		Railroad	1		2	173.53	2.50	4.9086	0.00250	2152501	3.229	6,457,503	9.686	8.911	17.821	3.631	0.181	0.544	0.280	8.400	0.516	15.480	2.658	3.660
7	Oceano			2	Hwy 1	3	350.29	2.50	4.9086	0.00250	2152501	3.229	6,457,503	9.686	8.911	17.821	3.631	0.181	0.544	0.280	8.400	0.516	15.480	2.658	3.660
8	Oceano	Southside Trunk Lines	Hwy 1	3		TR7-C	752.60	2.25	3.9760	0.00489	962431	1.444	2,887,293	4.331	9.410	18.819	4.733	0.077	0.230	0.176	4.752	0.324	8.748	2.622	3.806
9	Oceano	Southside Trunk Lines	Nipomo St	TR7-C		4	632.90	2.25	3.9760	0.00580	938231	1.407	2,814,693	4.222	10.248	20.496	5.155	0.069	0.206	0.163	4.401	0.300	8.100	2.742	4.021
10	Oceano	Southside Trunk Lines		4		5	602.42	2.25	3.9760	0.00580	938231	1.407	2,814,693	4.222	10.248	20.496	5.155	0.069	0.206	0.163	4.401	0.300	8.100	2.742	4.021
11	Oceano	Southside Trunk Lines		5		TR8-A	636.61	2.25	3.9760	0.00422	938231	1.407	2,814,693	4.222	8.741	17.483	4.397	0.080	0.241	0.189	5.103	0.332	8.964	2.533	3.689
12	Oceano	Southside Trunk Lines		TR8-A		TR8-B	495.00	2.25	3.9760	0.00764	938231	1.407	2,814,693	4.222	11.762	23.523	5.916	0.060	0.179	0.150	4.050	0.270	7.290	3.017	4.331
13	Oceano	Southside Trunk Lines		TR8-B		TR8-C	424.55	2.25	3.9760	0.00760	938231	1.407	2,814,693	4.222	11.731	23.462	5.901	0.060	0.180	0.150	4.050	0.270	7.290	3.009	4.319
14	Oceano	Southside Trunk Lines		TR8-C	Elm St	Q1-A	391.00	2.25	3.9760	0.00760	930231	1.395	2,790,693	4.186	11.731	23.462	5.901	0.059	0.178	0.150	4.050	0.270	7.290	3.009	4.319
15	Oceano	Southside Trunk Lines	Hwy 1	Q1-A		Q1-Aa	89.45	2.25	3.9760	0.00690	930231	1.395	2,790,693	4.186	11.178	22.355	5.623	0.062	0.187	0.163	4.401	0.280	7.560	2.991	4.116
16	Oceano	Southside Trunk Lines		Q1-Aa		Q1-A	200.15	2.25	3.9760	0.00200	852231	1.278	2,556,693	3.835	6.018	12.036	3.027	0.106	0.319	0.215	5.805	0.386	10.422	1.925	2.652
17	Oceano	Southside Trunk Lines		Q1-A		TR9-A	476.62	2.25	3.9760	0.00200	852231	1.278	2,556,693	3.835	6.018	12.036	3.027	0.106	0.319	0.215	5.805	0.386	10.422	1.925	2.652
18	Oceano	Southside Trunk Lines		TR9-A		TR10-A	532.31	2.25	3.9760	0.00200	844231	1.266	2,532,693	3.799	6.018	12.036	3.027	0.105	0.316	0.215	5.805	0.386	10.422	1.925	2.652
19	Oceano	Southside Trunk Lines		TR10-A		6	412.57	2.25	3.9760	0.00200	807981	1.212	2,423,943	3.636	6.018	12.036	3.027	0.101	0.302	0.215	5.805	0.380	10.260	1.925	2.652
20	Oceano	Southside Trunk Lines		6		7	380.55	2.25	3.9760	0.00200	807981	1.212	2,423,943	3.636	6.018	12.036	3.027	0.101	0.302	0.215	5.805	0.380	10.260	1.925	2.652
21	Oceano	Southside Trunk Lines		7		8	275.65	2.25	3.9760	0.00200	807981	1.212	2,423,943	3.636	6.018	12.036	3.027	0.101	0.302	0.215	5.805	0.380	10.260	1.925	2.652
22	Oceano	Southside Trunk Lines		8		9a	287.95	2.25	3.9760	0.00200	807981	1.212	2,423,943	3.636	6.018	12.036	3.027	0.101	0.302	0.215	5.805	0.380	10.260	1.925	2.652
23	Oceano	Southside Trunk Lines		9a		9	134.20	2.25	3.9760	0.00200	807981	1.212	2,423,943	3.636	6.018	12.036	3.027	0.101	0.302	0.215	5.805	0.380	10.260	1.925	2.652
24	Oceano	Southside Trunk Lines		9		10	318.30	2.25	3.9760	0.00424	807981	1.212	2,423,943	3.636	8.762	17.524	4.408	0.069	0.207	0.163	4.401	0.300	8.100	2.345	3.438
25	Oceano	Southside Trunk Lines		10		11	426.80	2.25	3.9760	0.00420	807981	1.212	2,423,943	3.636	8.721	17.441	4.387	0.069	0.208	0.163	4.401	0.300	8.100	2.334	3.422
26	Oceano	Southside Trunk Lines	Halcyon	11		137	853.10	2.25	3.9760	0.00420	807981	1.212	2,423,943	3.636	8.721	17.441	4.387	0.069	0.208	0.163	4.401	0.300	8.100	2.334	3.422
27	Oceano	Southside Trunk Lines		137		135	397.03	2.25	3.9760	0.00223	807981	1.212	2,423,943	3.636	6.354	12.709	3.196	0.095	0.286	0.202	5.454	0.364	9.828	1.982	2.723
28	Oceano(AG flows in)	Southside Trunk Lines		135		133	399.23	2.25	3.9760	0.00223	737981	1.107	2,213,943	3.321	6.354	12.709	3.196	0.087	0.261	0.189	5.103	0.348	9.396	1.841	2.647
29	Oceano	Southside Trunk Lines	AG Creek	133	(inverse siphon)	131	163.15	1.50	1.7671	0.00250	737981	1.107	2,213,943	3.321	2.282	4.564	2.583	0.243	0.728	0.332	5.976	0.630	11.340	2.108	2.810
30	Oceano	Southside Trunk Lines		131		129	158.77	2.25	3.9760	0.00211	737981	1.107	2,213,943	3.321	6.181	12.362	3.109	0.090	0.269	0.189	5.103	0.348	9.396	1.791	2.574
31	Oceano	Southside Trunk Lines		129		127	301.76	2.25	3.9760	0.00210	737981	1.107	2,213,943	3.321	6.166	12.333	3.102	0.090	0.269	0.189	5.103	0.348	9.396	1.787	2.568
32	Oceano	Southside Trunk Lines		127		125	626.37	2.25	3.9760	0.00210	737981	1.107	2,213,943	3.321	6.166	12.333	3.102	0.090	0.269	0.189	5.103	0.348	9.396	1.787	2.568
33	Oceano	Southside Trunk Lines		125		123	123.68	2.00	3.1415	0.00250	737981	1.107	2,213,943	3.321	4.915	9.829	3.129	0.113	0.338	0.222	5.328	0.398	9.552	2.040	2.776
34	Oceano	Southside Trunk Lines		123		123a	131.82	2.00	3.1415	0.00250	737981	1.107	2,213,943	3.321	4.915	9.829	3.129	0.113	0.338	0.222	5.328	0.398	9.552	2.040	2.776
35	Oceano	Southside Trunk Lines		123a		121	344.85	2.00	3.1415	0.00585	737981	1.107	2,213,943	3.321	7.518	15.036	4.786	0.074	0.221	0.176	4.224	0.316	7.584	2.652	3.791
36	Oceano	Southside Trunk Lines		121		119	501.62	2.00	3.1415	0.00598	737981	1.107	2,213,943	3.321	7.601	15.202	4.839	0.073	0.218	0.176	4.224	0.308	7.392	2.681	3.774
37	Oceano	Southside Trunk Lines	Valley Road	119		117a	527.49	2.00	3.1415	0.00476	737981	1.107	2,213,943	3.321	6.781	13.563	4.317	0.082	0.245	0.189	4.536	0.332	7.968	2.487	3.523
38	Oceano	Southside Trunk Lines		117a		117	326.84	2.00	3.1415	0.00470	737981	1.107	2,213,943	3.321	6.739	13.477	4.290	0.082	0.246	0.189	4.536	0.332	7.968	2.471	3.501
39	Oceano	Southside Trunk Lines		117		113	278	2.00	3.1415	0.00644	737981	1.107	2,213,943	3.321	7.888	15.776	5.022	0.070	0.211	0.176	4.224	0.308	7.392	2.782	3.917
40	Oceano	Southside Trunk Lines		113		111	622.17	2.00	3.1415	0.00650	660816	0.991	1,982,448	2.974	7.925	15.849	5.045	0.063	0.188	0.163	3.912	0.280	6.720	2.684	3.693
41	Oceano	Southside Trunk Lines		111		111a	99.83	2.00	3.1415	0.00650	660816	0.991	1,982,448	2.974	7.925	15.849	5.045	0.063	0.188	0.163	3.912	0.280	6.720	2.684	3.693
42	Oceano	Southside Trunk Lines		111a		109	190.45	2.00	3.1415	0.00790	660816	0.991	1,982,448	2.974	17.473	5.562	0.057	0.170	0.150	3.600	0.270	6.480	2.837	4.071	
43	Oceano	Southside Trunk Lines		109		107	622.84	2.00	3.1415	0.00787	660816	0.991	1,982,448	2.974	8.720	17.439	5.551	0.057	0.171	0.150	3.600	0.270	6.480	2.831	4.064
44	Oceano	Southside Trunk Lines		107		105	575.74	2.00	3.1415	0.00395	660816	0.991	1,982,448	2.974	6.178	12.355	3.933	0.080	0.241	0.189	4.536	0.332	7.968	2.265	3.209
45	Oceano	Southside Trunk Lines		105		103	442.64	2.00	3.1415	0.00395	660816	0.991	1,982,448	2.974	6.178	12.355	3.933	0.080	0.241	0.189	4.536	0.332	7.968	2.265	3.209
46	Oceano	Southside Trunk Lines		103		101	543.72	2.00	3.1415	0.00250	660816	0.991	1,982,448	2.974	4.915	9.829	3.129	0.101	0.303	0.215	5.160	0.380	9.120	1.990	2.741
47	Oceano	Southside Trunk Lines		101		97	555.54	2.00	3.1415	0.00250	660816	0.991	1,982,448	2.974	4.915	9.829	3.129	0.101	0.303	0.215	5.160	0.380	9.120	1.990	2.741

SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	C	D	E	F	G	H	Max Capacity (50%)	I	J	K	L	M	N	O	P	Q	R
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)		Q _{full}	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg}	d _{avg} flow (in)	d/D _{peak}	d _{peak} flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)
52	AG	Southside Trunk Lines		85		83	197.1	1.00	0.7854	0.00240	610512	0.916	1,831,536	2.747	0.758	1.517	1.931	0.604	1.811	0.560	6.720	1.000	12.000	2.020	1.931
53	AG	Southside Trunk Lines		83		81	230.44	1.20	1.1309	0.00240	610512	0.916	1,831,536	2.747	1.233	2.466	2.181	0.371	1.114	0.422	6.077	1.000	14.400	2.006	2.181
54	AG	Southside Trunk Lines		81		79	277.4	1.25	1.2271	0.00210	610512	0.916	1,831,536	2.747	1.286	2.572	2.096	0.356	1.068	0.410	6.150	0.870	13.050	1.908	2.373
55	AG	Cherry Ave Trunk Lines		79		77	192.46	1.33	1.3892	0.00260	610512	0.916	1,831,536	2.747	1.689	3.377	2.431	0.271	0.813	0.356	5.682	0.682	10.885	2.042	2.703
56	AG	Cherry Ave Trunk Lines		77		75	54.75	1.33	1.3892	0.00320	610512	0.916	1,831,536	2.747	1.873	3.747	2.697	0.244	0.733	0.332	5.299	0.635	10.135	2.201	2.934
57	AG	Cherry Ave Trunk Lines		75		73	158.69	1.50	1.7671	0.00440	483216	0.725	1,449,648	2.174	3.027	6.055	3.426	0.120	0.359	0.222	3.996	0.410	7.380	2.234	3.118
58	AG	Cherry Ave Trunk Lines		73		69	103.01	1.50	1.7671	0.00500	483216	0.725	1,449,648	2.174	3.227	6.454	3.653	0.112	0.337	0.222	3.996	0.398	7.164	2.381	3.243
59	AG	Cherry Ave Trunk Lines		69		67	467.81	1.50	1.7671	0.00710	483216	0.725	1,449,648	2.174	3.846	7.691	4.353	0.094	0.283	0.202	3.636	0.364	6.552	2.699	3.708
60	AG	Cherry Ave Trunk Lines		67		61	902.65	1.50	1.7671	0.00390	483216	0.725	1,449,648	2.174	2.850	5.700	3.226	0.127	0.381	0.229	4.122	0.428	7.704	2.103	2.968
61	AG	Cherry Ave Trunk Lines		61	2189	199.48	1.50	1.7671	0.00250	386784	0.580	1,160,352	1.741	2.282	4.564	2.583	0.127	0.381	0.229	4.122	0.428	7.704	1.684	2.376	
62	AG	Cherry Ave Trunk Lines		2189		53	439.03	1.50	1.7671	0.00200	386784	0.580	1,160,352	1.741	2.041	4.082	2.310	0.142	0.426	0.243	4.374	0.452	8.136	1.580	2.195
63	AG	Cherry Ave Trunk Lines		53		49	908.34	1.50	1.7671	0.00200	386784	0.580	1,160,352	1.741	2.041	4.082	2.310	0.142	0.426	0.243	4.374	0.452	8.136	1.580	2.195
64	AG	Cherry Ave Trunk Lines		49		47	132.01	1.50	1.7671	0.00300	386784	0.580	1,160,352	1.741	2.500	5.000	2.829	0.116	0.348	0.222	3.996	0.404	7.272	1.845	2.546
65	AG	Cherry Ave Trunk Lines		47		45	208.69	1.50	1.7671	0.00690	386784	0.580	1,160,352	1.741	3.791	7.582	4.291	0.077	0.230	0.176	3.168	0.316	5.688	2.377	3.398
66	AG	Cherry Ave Trunk Lines		45		41	252.36	1.50	1.7671	0.00240	386784	0.580	1,160,352	1.741	2.236	4.472	2.531	0.130	0.389	0.229	4.122	0.428	7.704	1.650	2.328
67	Oceano	Sewer Farm Trunk Lines	Front St.	3		TR2-B	157.70	1.50	1.7671	0.00403	1190070	1.785	3,570,210	5.355	2.897	5.795	3.279	0.308	0.924	0.380	6.840	0.762	13.716	2.873	3.712
68	Oceano	Sewer Farm Trunk Lines	17th	TR2-B		D1-A	497.30	1.50	1.7671	0.01680	1190070	1.785	3,570,210	5.355	5.916	11.831	6.695	0.151	0.453	0.250	4.500	0.470	8.460	4.687	6.494
69	Oceano	Sewer Farm Trunk Lines		D1-A		D	374.66	1.50	1.7671	0.01740	1057170	1.586	3,171,510	4.757	6.020	12.041	6.814	0.132	0.395	0.236	4.248	0.434	7.812	4.552	6.337
70	Oceano	Sewer Farm Trunk Lines	Paso Robles	D		F1-A	498.27	1.50	1.7671	0.01600	1057170	1.586	3,171,510	4.757	5.773	11.546	6.534	0.137	0.412	0.236	4.248	0.446	8.028	4.365	6.142
71	Oceano	Sewer Farm Trunk Lines	19th Street	F1-A		TR4-A	438.64	1.50	1.7671	0.01780	1020920	1.531	3,062,760	4.594	6.089	12.178	6.892	0.126	0.377	0.229	4.122	0.422	7.596	4.493	6.340
72	Oceano	Sewer Farm Trunk Lines		TR4-A		TR4-B	244.25	1.50	1.7671	0.01780	1008820	1.513	3,026,460	4.540	6.089	12.178	6.892	0.124	0.373	0.229	4.122	0.422	7.596	4.493	6.340
73	Oceano	Sewer Farm Trunk Lines	Vista	TR4-B		J1-A	518.05	1.50	1.7671	0.00600	996720	1.495	2,990,160	4.485	3.535	7.071	4.001	0.211	0.634	0.308	5.544	0.575	10.350	3.121	4.209
74	Oceano	Sewer Farm Trunk Lines		J1-A		L1-E	513.33	1.50	1.7671	0.00600	984620	1.477	2,953,860	4.431	3.535	7.071	4.001	0.209	0.627	0.300	5.400	0.570	10.260	3.121	4.209
75	Oceano	Sewer Farm Trunk Lines	22nd St.	L1-E		L1-A	398.63	1.50	1.7671	0.00570	974920	1.462	2,924,760	4.387	3.446	6.891	3.900	0.212	0.637	0.308	5.544	0.575	10.350	3.042	4.103
76	Oceano	Sewer Farm Trunk Lines	Wilmar	L1-A		N1-A	508.23	1.50	1.7671	0.00270	965220	1.448	2,895,660	4.343	2.372	4.743	2.684	0.305	0.916	0.380	6.840	0.756	13.608	2.351	3.033
77	Oceano	Sewer Farm Trunk Lines	23rd St.	N1-A		M2	273.12	1.50	1.7671	0.00271	921720	1.383	2,765,160	4.148	2.376	4.752	2.689	0.291	0.873	0.372	6.696	0.726	13.068	2.323	3.023
78	Oceano	Sewer Farm Trunk Lines	Tamara Dr.	M2		M3	331.11	1.50	1.7671	0.00270	912020	1.368	2,736,060	4.104	2.372	4.743	2.684	0.288	0.865	0.364	6.552	0.718	12.924	2.287	3.012
79	Oceano (AG flows in)	Sewer Farm Trunk Lines		M3			593.91	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
80	AG	Sewer Farm Trunk Lines		291		289	375.06	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
81	AG	Sewer Farm Trunk Lines		289		287	366.22	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
82	AG	Sewer Farm Trunk Lines		287		285	358.45	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
83	AG	Sewer Farm Trunk Lines		285		283	366.97	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
84	AG	Sewer Farm Trunk Lines		283		281	59.17	1.50	1.7671	0.00184	912020	1.368	2,736,060	4.104	1.958	3.915	2.216	0.349	1.048	0.404	7.272	0.850	15.300	1.994	2.526
85	AG	Sewer Farm Trunk Lines		281		279	363.04	1.50	1.7671	0.00260	912020	1.368	2,736,060	4.104	2.327	4.654	2.634	0.294	0.882	0.372	6.696	0.734	13.212	2.276	2.966
86	AG	Sewer Farm Trunk Lines		279		277	365.80	1.50	1.7671	0.00260	912020	1.368	2,736,060	4.104	2.327	4.654	2.634	0.294	0.882	0.372	6.696	0.734	13.212	2.276	2.966
87	AG	Sewer Farm Trunk Lines		277		275	500.37	1.50	1.7671	0.00800	518400	0.778	1,555,200	2.333	4.082	8.164	4.620	0.095	0.286	0.202	3.636	0.364	6.552	2.865	3.936
88	AG	Sewer Farm Trunk Lines		275		273	494.83	1.50	1.7671	0.00600	518400	0.778	1,555,200	2.333	3.535	7.071	4.001	0.110	0.330	0.215	3.870	0.392	7.056	2.545	3.553
89	AG	Sewer Farm Trunk Lines		273		271	207.20	1.50	1.7671	0.00600	518400	0.778	1,555,200	2.333	3.535	7.071	4.001	0.110	0.330	0.215	3.870	0.392	7.056	2.545	3.553
90	Oceano		Ocean Ave	A6-A		A1-C	N/A	1.00	0.7854	0.00250	109000	0.164	327,000	0.491	0.774	1.548	1.971	0.106	0.317	0.215	2.580	0.386	4.632	1.254	1.727
91	Oceano		Fountain	A1-C		A1-A	N/A	1.00	0.7854	0.00250	136000	0.204	408,000	0.612	0.774	1.548	1.971	0.132	0.395	0.236	2.832	0.434	5.208	1.317	1.833
92	Oceano		At WWTP	A1-A		110	432.76	2.00	3.1415	0.00100	1414500	2.122	3,960,600	5.941	3.108	6.216	1.979	0.341	0.956	0.404	9.696	0.780	18.720	1.781	2.248
93	Oceano			110		S1-A	397.31	2.00	3.1415	0.00100	1414500	2.122	3,960,600	5.941	3.108	6.216	1.979	0.341	0.956	0.404	9.696	0.780	18.720	1.781	2.248
94	Oceano			S1-A		130	175.87	2.00	3.1415	0.00100	1406500	2.110	3,938,200	5.907	3.108	6.216	1.979	0.339	0.950	0.398	9.552	0.780	18.720	1.757	2.248
95	Oceano		San Luis Pl.	130		140	326.82	2.00	3.1415	0.00100	1406500	2.110	3,938,200	5.907	3.108	6.216	1.979	0.339	0.950	0.398	9.552	0.780	18.720	1.757	2.248
96	Oceano			140		150	317.68	2.00	3.1415	0.00100	1406500	2.110	3,938,200	5.907	3.108	6.216	1.979	0.339	0.950	0.398	9.552	0.780	18.720	1.757	2.248
97	Oceano			150		160	482.32	2.00	3.1415	0.00100	1406500	2.110	3,938,200	5.907	3.108	6.216	1.979	0.339	0.950	0.398	9.552	0.780	18.720	1.757	2.248
98	Oceano			160	Pier & Mendel	T1-A	313.69	2.00	3.1415	0.00100	1406500	2.110	3,938,200	5.907	3.108	6.216	1.979	0.339	0.950	0.398	9.552	0.780	18.720	1.757	2.248
99	Oceano		Mendel Dr.	T1-A																					

SSLOCS
Trunk System Data

Line #	Location	Description	From		To		A	B	C	D	E	F	G	H	Max Capacity (50%)	I	J	K	L	M	N	O	P	Q	R	
			Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)		Qfull	Velocity (ft/s)	Q _{avg} /Q _{full}	Q _{peak} /Q _{full}	d/D _{avg}	d _{avg} flow (in)	d/D _{peak}	d _{peak} flow (in)	Avg Flow (ft/s)	Velocity Peak Flow (ft/s)	
100	Oceano		Norswing	U1-A		V1-A	282.84	2.00	3.1415	0.00100	1365000	2.048	3,822,000	5.733	3.108	6.216	1.979	0.329	0.922	0.392	9.408	0.762	18.288	1.757	2.240	
101	Oceano			V1-A		W1-A	266.50	2.00	3.1415	0.00100	1365000	2.048	3,822,000	5.733	3.108	6.216	1.979	0.329	0.922	0.392	9.408	0.762	18.288	1.757	2.240	
102	Oceano			W1-A		X1-A	266.50	2.00	3.1415	0.00100	1358750	2.038	3,804,500	5.707	3.108	6.216	1.979	0.328	0.918	0.392	9.408	0.756	18.144	1.757	2.236	
103	Oceano			X1-A		Y1-A	266.50	2.00	3.1415	0.00100	1352500	2.029	3,787,000	5.681	3.108	6.216	1.979	0.326	0.914	0.392	9.408	0.756	18.144	1.757	2.236	
104	Oceano			Y1-A		TR13-A	265.14	2.00	3.1415	0.00100	1346250	2.019	3,769,500	5.654	3.108	6.216	1.979	0.325	0.910	0.392	9.408	0.750	18.000	1.757	2.236	
105	Oceano	Coolidge Dr.		TR13-A			240	540.05	2.00	3.1415	0.00100	1340000	2.010	3,752,000	5.628	3.108	6.216	1.979	0.323	0.905	0.392	9.408	0.750	18.000	1.757	2.236
106	Grover Beach			240		250	326.18	1.75	2.4052	0.00100	1330000	1.995	3,724,000	5.586	2.177	4.354	1.810	0.458	1.283	0.470	9.870	1.000	21.000	1.756	1.810	
107	Grover Beach		Hwy 1	250		260	500.00	1.75	2.4052	0.00180	1330000	1.995	3,724,000	5.586	2.921	5.842	2.429	0.342	0.956	0.404	8.484	0.780	16.380	2.186	2.759	
108	Grover Beach			260		270	500.00	1.75	2.4052	0.00180	1330000	1.995	3,724,000	5.586	2.921	5.842	2.429	0.342	0.956	0.404	8.484	0.780	16.380	2.186	2.759	
109	Grover Beach			270		280	72.77	1.75	2.4052	0.00180	1330000	1.995	3,724,000	5.586	2.921	5.842	2.429	0.342	0.956	0.404	8.484	0.780	16.380	2.186	2.759	
110	Grover Beach			280		290	467.23	1.75	2.4052	0.00100	1330000	1.995	3,724,000	5.586	2.177	4.354	1.810	0.458	1.283	0.470	9.870	1.000	21.000	1.756	1.810	
111	Grover Beach			290		300	500.00	1.75	2.4052	0.00100	1330000	1.995	3,724,000	5.586	2.177	4.354	1.810	0.458	1.283	0.470	9.870	1.000	21.000	1.756	1.810	
112	Grover Beach			300		310	470.00	1.75	2.4052	0.00100	1330000	1.995	3,724,000	5.586	2.177	4.354	1.810	0.458	1.283	0.470	9.870	1.000	21.000	1.756	1.810	
113	Grover Beach			310		320	500.00	1.50	1.7671	0.00220	1330000	1.995	3,724,000	5.586	2.141	4.281	2.423	0.466	1.305	0.476	8.568	1.000	18.000	2.350	2.423	
114	Grover Beach			320		330	264.95	1.50	1.7671	0.00220	1330000	1.995	3,724,000	5.586	2.141	4.281	2.423	0.466	1.305	0.476	8.568	1.000	18.000	2.350	2.423	
115	Grover Beach	Cross Railroad		330		340	307.00	1.50	1.7671	0.00220	1330000	1.995	3,724,000	5.586	2.141	4.281	2.423	0.466	1.305	0.476	8.568	1.000	18.000	2.350	2.423	
116	Grover Beach	Railroad		340		350	319.78	1.25	1.2271	0.00140	260000	0.390	728,000	1.092	1.050	2.100	1.712	0.186	0.520	0.280	4.200	0.504	7.560	1.253	1.712	
117	Grover Beach			400		410	531.31	1.25	1.2271	0.00180	260000	0.390	728,000	1.092	1.191	2.382	1.941	0.164	0.459	0.260	3.900	0.470	7.050	1.390	1.883	
118	Grover Beach			410		420	566.19	1.00	0.7854	0.00200	260000	0.390	728,000	1.092	0.692	1.385	1.763	0.282	0.789	0.364	4.368	0.663	7.956	1.502	1.946	

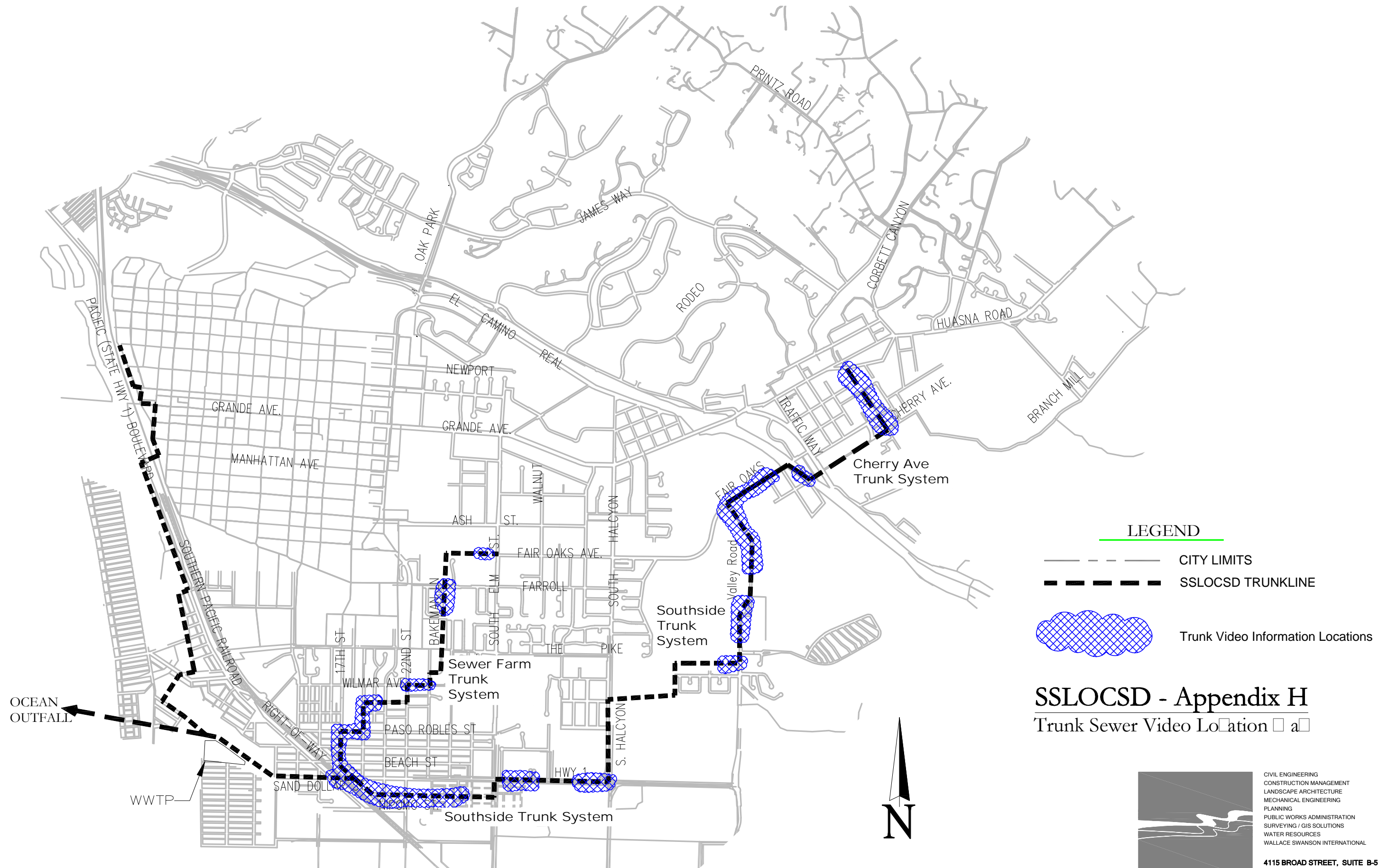
Appendix F - Table 4
Future Conditions
(Gravity Only)

SSLOCS
Proposed By-Pass
Trunk Sewer

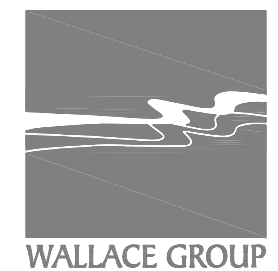
		From		To		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R		
Line #	Location	Road	Manhole	Road	Manhole	Distance (ft)	Diameter (ft)	Area (ft ²)	Slope (ft/ft)	Avg. Flow (gpd)	Avg. Flow (cfs)	Peak Flow (gpd)	Peak Flow (cfs)	Q _{full}	Velocity (ft/s)	Q _{avg} / Q _{full}	Q _{peak} / Q _{full}	d/D _{avg}	d _{avg} flow (in)	d/D _{peak}	d _{peak} flow (in)	Velocity Avg Flow (ft/s)	Velocity Peak Flow (ft/s)		
EXISTING CONDITIONS																									
Scenario 1 - 30" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.50	4.9086	0.0025	440784	0.661	1,322,352	1.984	17.821	3.631	0.037	0.111	0.110	3.300	0.222	6.660	1.452	2.367		
Scenario 2 - 27" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.25	3.9760	0.0025	440784	0.661	1,322,352	1.984	13.456	3.384	0.049	0.147	0.130	3.510	0.243	6.561	1.577	2.315		
Scenario 3 - 24" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.00	3.1415	0.0025	440784	0.661	1,322,352	1.984	9.829	3.129	0.067	0.202	0.163	3.912	0.300	7.200	1.665	2.440		
Scenario 4 - 21" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.75	2.4052	0.0025	440784	0.661	1,322,352	1.984	6.884	2.862	0.096	0.288	0.202	4.242	0.364	7.644	1.775	2.439		
Scenario 5 - 18" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.50	1.7671	0.0025	440784	0.661	1,322,352	1.984	4.564	2.583	0.145	0.435	0.243	4.374	0.458	8.244	1.767	2.454		
Scenario 6 - 12" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.00	0.7854	0.0025	440784	0.661	1,322,352	1.984	1.548	1.971	0.427	1.281	0.452	5.424	1.000	12.000	1.872	1.971		
FUTURE CONDITIONS																									
Scenario 1 - 30" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.50	4.9086	0.0025	535000	0.803	1,605,000	2.408	17.821	3.631	0.045	0.135	0.130	3.900	0.236	7.080	1.692	2.425		
Scenario 2 - 27" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.25	3.9760	0.0025	535000	0.803	1,605,000	2.408	13.456	3.384	0.060	0.179	0.150	4.050	0.270	7.290	1.726	2.477		
Scenario 3 - 24" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	2.00	3.1415	0.0025	535000	0.803	1,605,000	2.408	9.829	3.129	0.082	0.245	0.189	4.536	0.332	7.968	1.802	2.553		
Scenario 4 - 21" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.75	2.4052	0.0025	535000	0.803	1,605,000	2.408	6.884	2.862	0.117	0.350	0.222	4.662	0.404	8.484	1.866	2.576		
Scenario 5 - 18" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.50	1.7671	0.0025	535000	0.803	1,605,000	2.408	4.564	2.583	0.176	0.527	0.270	4.860	0.508	9.144	1.891	2.583		
Scenario 6 - 12" Trunk	Fair Oaks / S Elm St	S Elm St	271		291	3700.00	1.00	0.7854	0.0025	535000	0.803	1,605,000	2.408	1.548	1.971	0.518	1.555	0.504	6.048	1.000	12.000	1.971	1.971		
Note: MH 271 is the tie in point at Fair Oaks/ S Elm St MH 291 is the tie in point at The Pike Flows are based from the AGWWMP, adopted November 2001 Scenario 4 is the recommended by-pass relief trunk sewer diameter recommended																									
These flows take into account the flows upstream from Arroyo Grande as it enters the Fair Oaks & South Elm St intersection. All of these flows be conveyed by the proposed bypass sewer.																									n = 0.015

Appendix G -- Scenarios of Proposed Bakeman By-pass Relief Trunk Sewer Diameters

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Represent Entity	Street Location or Nearest Street Location	Description	Sewer Pipe Material	Manhole numbers		Approximate Length (feet)
				Upstream	Downstream	
Arroyo Grande	East Branch St	Cherry Ave Trunk Line	18" VCP	C-71	C-70	248
	Pacific Coast	Cherry Ave Trunk Line	18" VCP	C-70	C-67	800
	East Cherry Ave	Cherry Ave Trunk Line	18" VCP	C-65	C-64	210
		Cherry Ave Trunk Line	18" VCP	C-64	C-63	360
	West Cherry Ave/ Hwy 101	Cherry Ave Trunk Line	15" VCP	C-54	C-53	280
		Southside Trunk Line	15" VCP	C-53	C-52	228
	Fair Oaks Ave	Southside Trunk Line	12" VCP	C-40	C-39	168
		Southside Trunk Line	12" VCP	C-39	C-38	225
		Southside Trunk Line	12" VCP	C-38	C-37	456
		Southside Trunk Line	12" VCP	C-37	C-35	578
	Valley Rd	Southside Trunk Line	24" VCP	C-35	C-34	589
		Southside Trunk Line	24" VCP	C-34	C-33	515
		Southside Trunk Line	24" VCP	C-33	C-32	452
		Southside Trunk Line	24" VCP	C-32	C-31	540
		Southside Trunk Line	24" VCP	C-30	C-29	267
		Southside Trunk Line	24" VCP	C-29	C-28	659
	Leanna Dr	Southside Trunk Line	24" VCP	C-27	C-26	500
Oceano CSD	Ciennaga St	Southside Trunk Line	27" VCP	C-13	C-12	279
		Southside Trunk Line	27" VCP	C-12	C-11	318
		Southside Trunk Line	27" VCP	C-10	C-9	485
		Southside Trunk Line	27" VCP	C-9	C-8	521
	Barbados St	Southside Trunk Line	27" VCP	C-5	C-4	512
		Southside Trunk Line	27" VCP	C-4	C-3	711
		Southside Trunk Line	27" VCP	C-3	C-2	539
	Nipomo St	Southside Trunk Line	27" VCP	C-2	C-1	684
	Front St	Southside Trunk Line	27" VCP	C-1	A-9	803
Arroyo Grande	Fair Oaks Ave	Sewer Farm Trunk Line	18" VCP	B-21	B-20	538
	Farroll Ave	Sewer Farm Trunk Line	18" VCP	B-17	B-16	59
Oceano CSD	Wilmar Ave	Sewer Farm Trunk Line	18" VCP	B-9	B-8	510
	Vista St	Sewer Farm Trunk Line	18" VCP	B-6	B-5	510
	19th St	Sewer Farm Trunk Line	18" VCP	B-5	B-4	675
	Paso Robles St	Sewer Farm Trunk Line	18" VCP	B-4	B-3	495
	17th St	Sewer Farm Trunk Line	18" VCP	B-3	B-1	843
	Front St	Sewer Farm Trunk Line	18" VCP	B-1	A-9	100
Oceano CSD	RR x-ing		30" VCP	A-9	A-8	276

Appendix I -- Trunk Sewer Video Manhole and Street Locations

Appendix J

Bakeman Line Video Inspection Report including Pipe Bursting Discussion

SOUTH SAN LUIS OBISPO COUNTY SANITATION DISTRICT

Operations Address:
1600 Aloha
Oceano, California 93445
(805) 489-6666

Business Address:
Post Office Box 339
Oceano, California 93445
(805) 481-6903

MEMORANDUM

DATE: July 29, 2004

TO: John Wallace, District Administrator

VIA: Tom Zehnder, P.E.

FROM: Craig Taylor, Engineering Associate

SUBJECT: Bakeman Line Video Inspection - Condition of Pipe and Flow Characteristics

RECOMMENDATION:

1. Begin a rigorous annual flushing and cleaning program throughout the trunk collection system network.
2. Require the City of Arroyo Grande to haul their collection system debris to the plant and close the Soto Sports Complex Disposal Station.
3. Continue studying design alternates for enlarging or bypassing future flows.

DISCUSSION:

A VHS video inspection was made a few years ago (date unknown) to specifically inspect the 18-inch Vitrified Clay Pipe (VCP) adjacent to Bakeman Lane (logs attached). The video reveals flow ranging from slight turbulence to no turbulence. The video camera does not submerge during this particular inspection. It appears that debris is a main contributor to the restriction of flow. The sag is minor in respect to the overall slope of the pipe from Farroll Road to The Pike.

A DVD video inspection was made after the San Simeon Earthquake in March 2004. Attempts to inspect the line failed due to excess debris. In this most recent DVD inspection, the camera was submerged entirely from the manhole on the north side of Farroll Road to the south side of Farroll Road (58-linear feet). Obviously, debris is the greatest restriction to flow.

At the same time the March 2004 DVD inspections were made, the District hired the City of Arroyo Grande to assist with cleaning the trunk lines. An investigation was initiated to determine where the City was disposing the debris removed from District lines. Staff was led to a disposal station within the Soto Sports Complex and tributary to the Bakeman Trunk Line. We were told by City Staff that this disposal station was also used for cleaning operations of the City's collection lines.

As evident in both video inspections, the Bakeman Line is blocked by debris from Farroll Road to The Pike and is in need of further cleaning to conclude to sound judgments as to the urgency of the Bakeman Line. It is also evident that the Bakeman Line, on occasion, will reach maximum peak design levels d/D in segments throughout this reach. At the time of both video inspections, the flow rate appeared 2/3 of peak design.

A soils investigation was performed on Friday July 9, 2004 along the entire length of the Bakeman Line from Farroll Road to The Pike. Field observations of the soil material were found to be very fine/dense dune sand.

Density test results from the soils investigation have been submitted and reviewed. The sand within the pipe zone was highly compacted. For pipe bursting, densely compacted soils are less favorable ground conditions. This condition will increase the force required for bursting operations. Polymer lubricants injected into the annular space can reduce some friction drag.

Mr. John Heisler, a construction contractor with ARB specializing in pipe bursting met with staff at the Bakeman Lane jobsite on July 29, 2004. It was observed that access along the pipeline route is extremely limited and, for the most part, inaccessible.

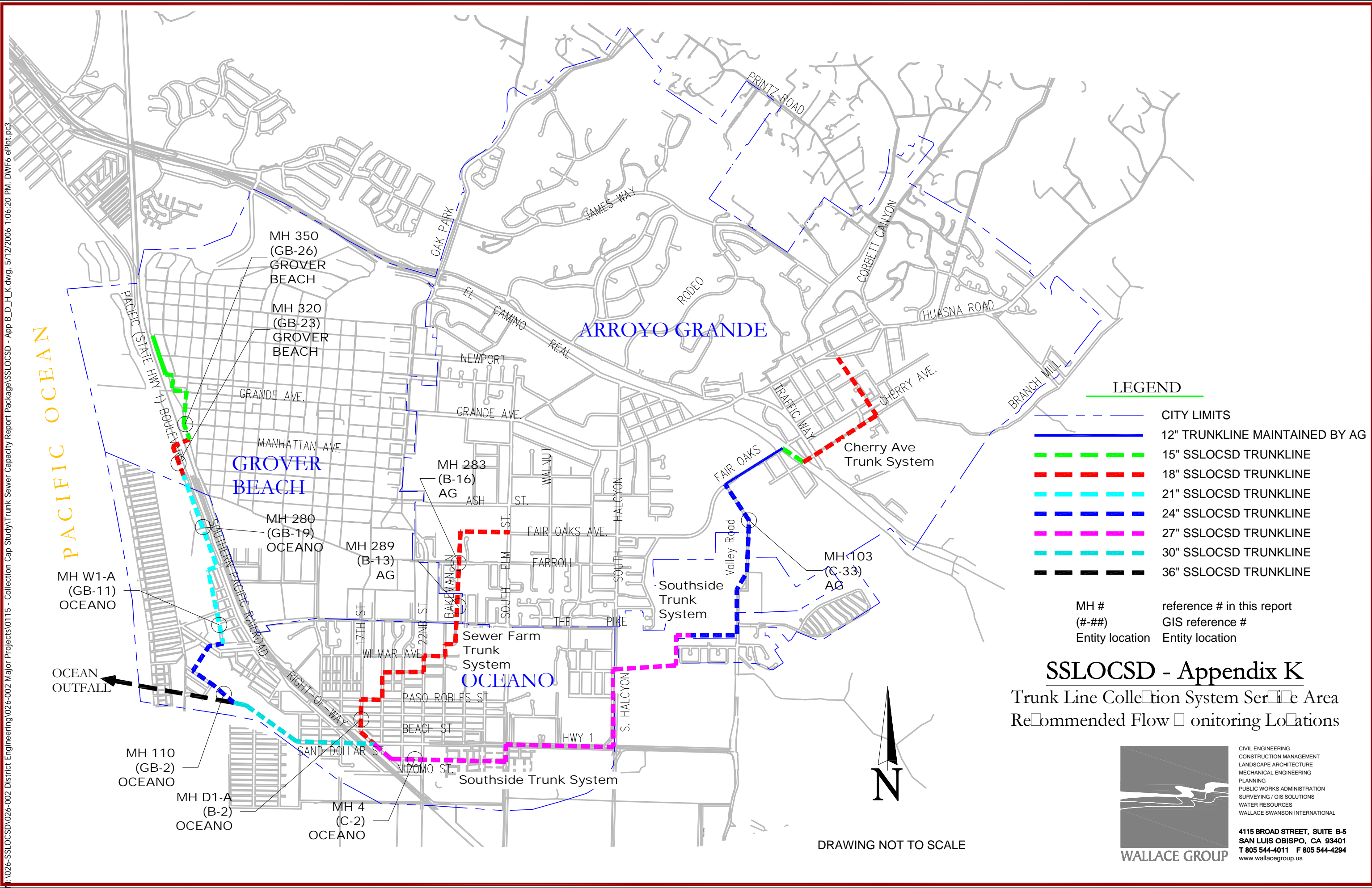
It appears as though the District's Trunk Line Easement comprises of the entire back yard of the homes. The easement is full of trees, decks, fencing and storage buildings. Spacing between the houses is also limited as well for getting equipment to and from the front and back yards. Adjacent to the back yard is a mobile home park that also has limited access.

Mr. Heisler stated that his company would be limited in pull lengths due to the depth and soil compaction and would have to excavate at each existing manhole. Each excavation would require a ramped ditch dug at 3:1, or 36-feet for a 12-foot depth trench. The pipe approach angle would require additional room for the heavy pulling equipment as well as laying out the pipe to be pulled. Heavy equipment would required access every 300-feet

In addition, the "air head" which performs the pipe bursting generates a lot of vibration that would be felt in the houses and will crack drywall and siding.

In summary, Mr. Heisler has recommended against pipe bursting as an alternative to replacing this line. If there is no other alternative, pipe bursting can be done. He just wouldn't recommend it due to the substantial impact to the neighbors and the many repairs to the properties that would have to be made.

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SSLOCSD - Appendix K

Trunk Line Collection System Service Area
Recommended Flow Monitoring Locations

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Appendix 8B

Bakeman Lane Trunk Line Analysis Update

APPENDIX ADDED 11/02/2011
AM

SOUTH SAN LUIS OBISPO COUNTY SANITATION DISTRICT

Operations Address:

1600 Aloha
Oceano, California 93445
(805) 489-6666

Business Address:

Post Office Box 339
Oceano, California 93475
(805) 481-6903

MEMORANDUM

DATE: September 19, 2007
TO: Board of Directors
FROM: John L. Wallace, District Administrator
SUBJECT: Bakeman Lane Trunk Line Analysis Update

RECOMMENDATION:

Staff recommends the Board:

1. Receive an update on the status of the Bakeman Lane Trunk Line Analysis
2. Direct Staff to continue investigation of this trunk sewer and identify any repairs/modifications needed.

FUNDING:

Funds are provided for these activities as part of the Operating Fund, Section 8060: Structure Maintenance - Regular

DISCUSSION:

The scope of work for this project included cleaning, video analysis and flow monitoring of the 18" Bakeman Lane trunk line. The purpose of this monitoring and analysis, after extensive cleaning of the line, was to determine flow carrying capacity of the line and to reveal any anomalies and/or needed repairs. This analysis will also provide recommendations to the City of Arroyo Grande as to the limitation of upstream development, and improvements/flow diversion required to accommodate that development. The section of line that is defined as the "Bakeman Lane" trunk line begins with manhole B-22 and ends with manhole B-12A. Please refer to the attached system map (Figure 1) for the locations of the manholes referenced in this report. The flow capacity of the line is defined as the d/D, or the ratio of depth of flow to diameter of pipe. This ratio, in a percentage form, defines the percentage of capacity at which the line is operating.

Cleaning

The first step in analyzing the trunk sewer in the Bakeman Lane area was to clean the line and remove any potential flow obstructions in areas that are known to have flow restrictions. The section of the line from Fair Oaks (Manhole B-22) to southwest of the ponds at Soto Park (Manhole B-19) was not cleaned due to the prohibitive cost of cleaning given the current limited access as well as not having a historic flow restriction problem. The section of the line from Manhole B-19 to Farroll Avenue (Manhole B-17) is new and did not require cleaning. The portion of the line from Manhole B-17 to The Pike (Manhole B-12A) required extensive cleaning and is the area with suspected flow restrictions. This cleaning yielded a substantial amount of large debris, which was preventing the line from flowing as smoothly as it could when cleaned.

Video Analysis

After cleaning, the trunk line from Manhole B-22 to Manhole B-12A was inspected via video analysis. Observations from the sewer videos were considered in this report. Table 1 shows a summary of the video inspection results. Portions of the line have damaged, bubbling, or nonexistent lining. Given the destructive

properties of sewer gases on unlined concrete, the liner should be repaired or replaced altogether where necessary.

Table 1 – Trunk Sewer Video Inspection Summary

Location	Sections	Pipe Material, Diameter	Video Date	Notes
Fair Oaks to Soto Park	B-22 to B-21	Lined Conc, 18"	3/26/07	Some bubbling of liner
Soto Park, near tennis courts	B-21 to B-20	Lined Conc, 18"	3/26/07	Severe bubbling of liner towards near B-20
Soto Park, near pond	B-20 to B-19	Lined Conc, 18"	3/26/07	Severe bubbling of liner near B-20
Southwest of pond	B-19 to B-19A	Lined Conc/PVC, 18"/21"	3/27/07	Overall good condition
Bakeman north	B-19a to B-19B	PVC, 24"	3/27/07	Overall good condition
Bakeman north/Glenbrook	B-19b to B-18	PVC, 24"	3/27/07	Overall good condition
Bakeman north/Glenbrook	B-18 to B-18A	PVC, 24"	3/27/07	Overall good condition
Bakeman north/Glenbrook	B-18A to B-18B	PVC, 24	3/27/07	Overall good condition
Bakeman to Farroll	B-18B to B-17	PVC, 24	3/27/07	Overall good condition
At Farroll	B-17 to B-17A	Lined Conc, 18"	3/28/07	Overall good condition
At Farroll	B-17A to B-16	Lined Conc, 18"	3/28/07	Overall good condition
Mobile home park	B-16 to B-15	Lined Conc, 18"	3/28/07	Liner missing at some joints
Mobile home park	B-15 to B-14	Lined Conc, 18"	3/28/07	Sections of slower flows near B-15, liner missing at some joints
Oceano School	B-14 to B-13	Lined Conc, 18"	3/28/07	Section of slower flows near B-14, liner missing at some joints, slower flows near B-13
Oceano School	B-13 to B-12B	Lined Conc, 18"	4/17/07	Liner missing at some joints, slow flow near B-13, and near B-12B
The Pike	B-12B to B-12A	Lined Conc, 18"	4/17/07	Pipe full of water even during times of low flows

Flow Monitoring

Staff chose two flow monitoring locations; one upstream of Bakeman Lane (at Farroll Avenue), and one downstream on The Pike (near North Oceano Elementary School). The attached Figure 1 shows the flow monitoring locations.

Table 2 shows the flow monitoring stations and the dates monitored.

Table 2 – Flow Monitoring Stations

Station Area	Station #	Dates Monitored
Farroll Ave (near corner of Bakeman Ln)	B-16	6/14/07 – 6/24/07
The Pike (near Oceano Elementary School)	B-12b	6/14/07 – 6/25/07

There were no rain events during the entire monitoring period that could skew the results.

B-16 – Farroll Ave. This flow monitoring station was located in manhole B-16 on Farroll Ave near Bakeman Lane. The flow data was erratic. The erratic nature was most likely due to typical sewer debris such as grit clogging up the flow channel intermittently. Only certain data points were usable, but graphing of these points showed that the data was consistent, and a diurnal curve could be observed.

To assist in the accurate interpretation of this data, past flow data, which also followed a typical wastewater diurnal curve, was also considered. Past diurnal curves showed peak flows occurring from 8 am to 11am, dropping to an average flow from 11 am to 4 pm, and a secondary peak from approximately 6 pm to 9 pm. The flows tapered off in the evening and resulted in low flows from approximately 12 am to 6 am. On the weekends, the peak flow was typically found between 10 am and 12 pm. tapering to an average flow from 12 pm to 5 pm and a secondary peak from 6 pm to 9 pm. The flows again tapered off in the evening and resulted

in low flows from approximately 12 am to 6 am. Since video footage showed this stretch to be in fairly good condition (i.e. no obstructions, sags, etc.), data points from peak and average times were chosen for this analysis. For example, peak flow data points were chosen from the time period between 8-11am and 6-9pm and average flow data points were chosen between 1-4pm. These results are summarized in Table 3.

Table 3 - Station B-16

	Weekday d/D	Calculated Flow (gpm)	Weekend d/D	Calculated Flow (gpm)	Peaking Factor
Peak	0.486	840	0.449	706	1.6
Average	0.380	540	0.410	640	1.1

As seen in Table 3, the weekday diurnal peaking factor (peak weekday dry/average weekday dry) is about 1.6, and the weekend diurnal peaking factor is 1.1. The highest flow rate was calculated to be 840 gpm with a d/D of 0.486. These values are consistent with flow data from March 2005, where the peak dry flow was 870 gpm. Since the highest peak flow had a d/D of 0.486, this shows that there is sufficient capacity for dry weather flows.

Further Analysis

Since there were no rain events during the recent period of flow monitoring, peak hour wet weather flow (PHWWF) was estimated by adding an estimated inflow value. From the March 2005 flow data, the observed inflow was about 275 gpm. This inflow value, added to the current dry peak flow, yielded a peak wet weather flow of 1,115 gpm. The computer model shows that this calculated PHWWF rate results in a d/D of 0.577 or **58%** of available capacity. Since peak wet weather flows for this trunk sewer are designed for 90% d/D, there is sufficient capacity for this stretch of 18" trunk sewer between Manholes B-22 and B-12A.

Station B-12b – The Pike – This flow monitoring station was located within The Pike near North Oceano Elementary School. Flow and video data revealed some issues, specifically sagging and debris accumulation for this stretch of sewer pipe. Manhole B-12b required dewatering during videoing to prevent submersion of the camera. In addition, flow data showed zero velocities for this stretch of pipe. The submerged stretch of pipe is between manhole B-12b (upstream) and manhole B-12a. This portion of the pipeline is in need of further analysis. Currently, this portion of the pipeline is at or near full capacity, due to either a dip in the line, surcharging due to obstruction downstream of this manhole, or a combination of the two. Staff recommends cleaning and performing video inspection of the rest of the trunk line downstream of this manhole to determine if flow obstruction is at the root of the problem. If there is no flow obstruction, or not enough to cause the surcharging of this line, Staff will recommend repairing or replacing this portion of the line to remove the existing sag.

Build-out Flow Projection

A flow depth of 90% d/D is the design criteria for maximum flow capacity (instantaneous peak flow) for large trunk sewers. To project build out flow capacity for this stretch of trunk sewer, an analysis was performed to determine the trunk capacity if the trunk sewer had a d/D of less than 90%. Computer model analysis showed that a flow rate of **1,880 gpm** would equate to a 90% d/D. Assuming storm water inflow remains constant, remaining build-out capacity flow can be calculated by subtracting 1,880 gpm from 1,115 gpm (the current PHWWF, discussed above) which equals 765 gpm. Therefore, this section of the Bakeman trunk sewer can convey an additional 765 gpm peak daily flow before it reaches the maximum allowable capacity (90%). Assuming an equivalent dwelling unit (EDU) contributes a daily peak flow of 0.55 gpm (Table 5 shows this calculation); there is capacity for an additional **1,390 EDUs**. Tables 4 & 5 summarize this analysis.

Table 4 – Flow Projections

	Calculated Peak Daily Flow (gpm)	Stormwater Inflow (gpm)	Calculated Peak Hour Wet Weather Flow, PHWWF (gpm)	Calculated d/D (PHWWF)
Current	840	275	1,115	58%
Max to 90% capacity	1,605	275	1,880	90%

Table 5 – Build-out Capacity Analysis

Additional Peak Daily Flows before 90% capacity (gpm)	Calculated Peak Flow per Equivalent Dwelling Unit (gpm)	No. of Equivalent Dwelling Units before Overcapacity of Trunk Sewer
765	0.55 ¹	1,390
<i>Note:</i> ¹ Assume 100 gallons per day per capita, 2.5 persons/edu, 3.0 peaking factor – $(100 \times 2.5 \times 3.0) \div 1440$ (gpd to gpm conversion) ~ 0.55 gpm		

Having determined the maximum amount of additional flow that the trunk line could handle, Staff met with City of Arroyo Grande staff to discuss actual build-out within the City and future potential annexations. The City of Arroyo Grande's staff provided a synopsis of where potential future development could take place, and the projected maximum size of each of these developments. SSLOCSD Staff then determined which future developments would flow through the Bakeman Lane trunk line (West Side). 1211 additional EDU's are projected to possibly be added to the West Side of the City of Arroyo Grande. This will result in a PHWWF of 1781 gpm, yielding a d/D of 85%. This is below the PHWWF design threshold of 90%. As shown in Table 6 there is therefore sufficient capacity in the Bakeman Lane trunk line to accommodate projected future build-out in the City of Arroyo Grande.

Table 6 – Arroyo Grande Build-out Analysis

Additional Projected EDU's to Arroyo Grande Build-Out (West Side)	Calculated Peak Flow per Equivalent Dwelling Unit (gpm)	Calculated d/D (PHWWF) at projected Arroyo Grande Build-Out
1211	0.55 ¹	85%
<i>Note:</i> ¹ Assume 100 gallons per day per capita, 2.5 persons/edu, 3.0 peaking factor – $(100 \times 2.5 \times 3.0) \div 1440$ (gpd to gpm conversion) ~ 0.55 gpm		

CONCLUSIONS AND RECOMMENDATIONS.

Analysis by District Staff concludes that there is sufficient flow capacity for most of the 18" trunk sewer until it approaches the Pike. The stretch of sewer between manholes B-12b and B-12a, about 20 feet in length, is submerged, even at low flow conditions. This "bottleneck" condition may be the result of a sag (which could be replaced) or downstream obstructions causing a surcharge of flow in this area.

However, as this area is on the downstream edge of the investigation area, further investigation is recommended prior to any repairs. It is possible that the “bottleneck” condition could be alleviated, in part or completely, by cleaning, videoing, and performing subsequent repairs downstream of this point.

Video inspection of this portion of the trunk line has shown that the line will require areas of re-lining. Downstream lines may also require re-lining so further investigation is warranted prior to contracting this work (to save on the costs associated with multiple mobilizations.) Staff is in the process of moving forward with the cleaning and videoing of the entire trunk line system to determine if the liner is compromised throughout, and if there are any areas of blockage which are limiting flow. This can be completed once the trunk line manhole raising project has been completed. Currently, the flow conditions in the line do not require emergency action and any rehabilitation can wait until the entire system has been analyzed.