Sewer System Management Plan

Prepared for

City of Davis

1717 Fifth Street
Davis, CA 95616

August 2012

City of Davis
Water Pollution Control Plant
Sewer System Management Plan

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Introduction

The City of Davis (City) sanitary sewer collection system conveys wastewater for the area within the city limits to the Water Pollution Control Plant (WPCP). The collection system includes 156 miles of sewer pipelines ranging in diameter from six inches to sixty six inches. In addition the City has six sewer lift stations in its service area to facilitate the flow of waste water to the WPCP.

The WPCP has a permitted average dry weather flow design capacity of 7.5 million gallons per day (MGD) and a peak wet weather flow of 12.6 MGD. The City has a population of about 65,622 (as of 2010) residents with a projected growth rate of less than one percent per year.

The City provides sewer collection services to El Macero, North Davis Meadows, Royal Oaks Trailer Park and Teichert Construction Company. The City does not own these satellite systems. El Macero and North Davis are residential areas within a golf course complex. The City has an agreement to provide the same level of service to the El Macero District as within the City. The City service and obligation to North Davis Meadows is limited to repairing the low-pressure line. Yolo County provides North Davis Meadows pump station maintenance services.

Teichert Construction Company has a three inch force main running under Highway 113 close to North Davis Meadows. This connection provides sewer service for Teichert's storage and repair facility located at Highway 113 and County Road 29. The Teichert force main connects to the City's service at the low pressure sewer lateral coming from North Davis Meadows.

The City also collects wastewater and stormwater from the Royal Oaks Trailer Park. The trailer park is located west of Richards Blvd outside the City limits. The City does not own this satellite system.

1 Sanitary Sewer Management Plan Goals

The City of Davis' Sewer System Management Plan (SSMP) goals were established and adopted in November 2007 and include:

- Provide uninterrupted sewer service to meet customers' desired service levels.
- Minimize the risk of Sanitary Sewer Overflows (SSOs) by reducing the impact and probability of SSOs.
- Mitigate any unforeseen SSOs to minimize water quality and environmental impacts.
- Ensure adequate sewer capacity to address the City's planned growth and storm flows.
- Sustain aging sewer infrastructures by implementing asset management program to extend asset lifecycle.
- Ensure adequate funding support and resources to sustain long-term asset management.

2 2012 Organizational Structure

Figure 2-1 presents the City's August 2012 SSMP organizational structure. The roles and responsibilities are described in Table 2-1. The City's organizational chart identifies City staff positions responsible for implementing, managing, and updating the SSMP. The organization structure chart is updated as necessary.

The SSO Emergency Response Plan (Section 6) includes the chain of communication for responding to and reporting SSOs.

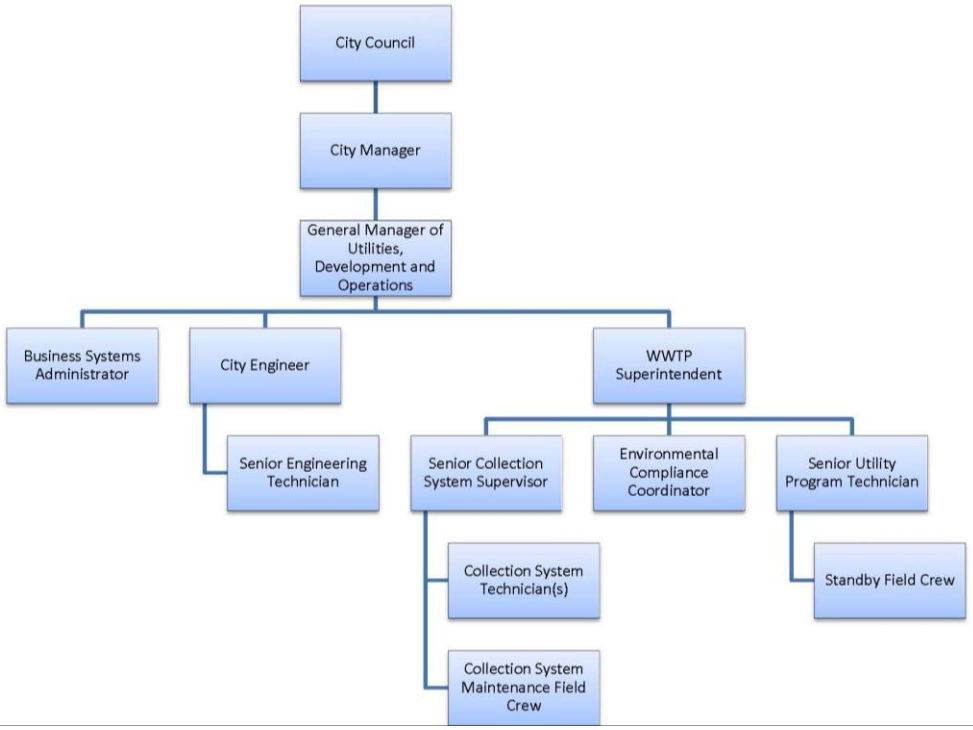


Figure 2-1. City of Davis 2012 Organizational Structure

TABLE 2-1. CITY'S SSMP ORGANIZATIONAL ROLES AND RESPONSIBILITIES

Roles and Responsibilities
City Council: Establishes policy.
City Manager: Plans, organizes and directs the overall administrative activities and operations of the City. Advises and assists the City Council, represents the City's interest with other governmental agencies, business interests, and the community.
General Manager of Utilities, Development and Operations: Provide general direction and oversight of the utility regulatory compliance activities to ensure compliance with local, state and federal laws and regulations.
City Engineer: Plans, coordinates, supervises, and participates in the performance of professional engineering activities of a complex nature involving engineering planning and design, construction project management.
Wastewater Treatment Plant Superintendent: Plans, directs, and reviews the activities, operations and programs of the Wastewater Treatment Plant. Provides professional and technical assistance to ensure public

Roles and Responsibilities
works department is in compliance with federal, state and local environmental regulations related to the WWTP, sanitary sewer collection system, stormwater conveyance system, fats, oil and grease program and the pretreatment program. Plans, coordinates, supervises, and participates in the performance of professional engineering activities of a complex nature involving engineering planning and design related to the WWTP.
Business Systems Administrator: Performs highly responsible, paraprofessional technical support duties related to specialized data management and retrieval. Assists in the preparation of reports as they relate to environmental compliance and sanitary sewer system operation and maintenance records. Manages the CMMS in order to help operations and maintenance to do their jobs more effectively and to help management make informed decisions. Specifically, manages such things as service requests, work orders, preventative maintenance reports, and asset management as they relate to the Public Works department services.
Senior Utility Program Technician (SCADA): Perform technical office or field engineering work. Specifically managing SCADA to perform data collection and control, overseeing the day-to-day operation, maintenance and repair/replacement of pump stations, managing flow monitoring activities for infiltration/inflow studies, capacity studies and wastewater flow monitoring.
Environmental Inspector: Environmental Inspector oversees the pretreatment program and the FOG program under direction of the WWTP Superintendent. Performs water quality assessments and special studies associated with the sanitary sewer. Lead role in implementation the city's fats, oils, and grease program. Coordinates and confers with federal and state regulatory agencies as well as with operation and maintenance division, consultants, and directly with sewer r users to ensure compliance with regulations and related reporting requirements. Prepares reports and communicates as needed with the public, commissions and the sewer users. Provides backup for the City's Stormwater Program.
Senior Public Works Collections Supervisor: Manages, plans, directs, coordinates, and evaluates all aspects of the operation, maintenance, and construction of the Wastewater Division; coordinates assigned activities with other divisions and departments.
Collection Systems Technician: Leads crews in the performance of duties related to sewer system operation and maintenance; and performs semi-skilled and skilled work related to maintenance, repair and operation of sanitary sewer lift stations, conveyance system.
Collection System Maintenance Field Crew: Performs semi-skilled and skilled labor in the construction, maintenance, repair, and inspections of wastewater collection systems. Cleans, unplugs, and repairs wastewater lines. Operates power equipment including hydraulic cleaning truck, sewer rodder, and closed circuit television system.
Stand-by Field Crew: Performs semi-skilled and skilled labor in the construction, maintenance, repair, and inspections of utility systems. Responds to service requests outside of department normal work week hours. Unplugs sanitary service laterals, secures site in the event of an overflow, and performs initial mitigation as needed. Operates power equipment including hydraulic cleaning truck, sewer rodder, backhoe, and other heavy equipment.
Senior Engineering Technician: Provides engineering and technical support to the Wastewater Division involving researching and collecting data, creating and maintaining a GIS mapping system in support of engineering and operational work activities, responsible for creating, collecting, compiling, manipulating and maintaining data for various GIS applications.

3 Legal Authority

This section demonstrates the City's legal authority to control infiltration and inflow (I/I) and to require proper construction, testing and inspection of the sewer system. The City's existing sewer use ordinance (SUO) contains municipal code that governs sewer connections, discharge requirements and charges for the use of the City's sewers. The current SUO prohibits the discharge of solid or viscous substances that may obstruct the collection system or affect operations of wastewater treatment facilities.

The City has standard specifications used for proper design/repair and construction of sewers. The City has easements (from the mainline to the lower laterals and backyard service laterals) to maintain and inspect all sewers.

The City has authority to enter buildings if there is a reasonable cause to believe that there is a violation of the ordinance. The SUO specifies general consequences to the violations of the ordinance. The SUO discharge requirement prohibits the discharge of grease into the sewer system but does not require commercial grease traps or interceptors.

The City's entire current Municipal Code can be viewed and searched through the City's webpage at http://qcode.us/codes/davis/. The SUO is Chapter 33 of the Municipal Code.

4 Operations and Maintenance Program

The City's Computerized Maintenance Management System (CMMS) complements the Preventive Maintenance and Operations & Maintenance Programs. All asset inventories are entered into the CMMS and a sewer Geographic Information System (GIS) map is pending use by the field crews. CCTV data will be combined with the CMMS program and GIS map.

4.1 Map of collection system

The City maintains a regularly updated collection system map (**Attachment 4-1**). The City maintains this map through GIS software. Using the GIS capability to locate collection system features and assets increases the maps accuracy. There are many different layers available for overlay. Multiple data sets can be displayed on the GIS map to visually present information for any number of needs. This includes planning, maintenance activities, scheduling, cleaning, repair and tracking of these activities.

4.2 Routine Operation and Maintenance practices

The City regularly updates its procedures and training operations and maintenance manual. The City has 4 field personnel dedicated to the preventative / corrective maintenance program. Preventative / corrective maintenance objectives include:

- Minimize the number of stoppages per mile of collection system.
- Minimize the number of odor complaints.
- Minimize the number of lift station failures.

4.3 Preventative / Corrective Maintenance

The City has an extensive preventative / corrective maintenance program that includes the following:

- Hydro clean all 6 inch to 15 inch sewers annually.
- Inspect all the maintenance holes every three (3) years.
- Hydraulic cleaning of the core area [downtown] collection system quarterly.
- Regular lift station inspection and maintenance.
- Utility connections inspection program.
- Root control program for service laterals.
- Mainline / Service line repair and replacement program.
- Maintenance Hole repair / replacement program.
- Service line lateral CCTV inspection program.
- Service line lateral location program.
- Service line lateral replacement / repair program.
- Emergency response / investigations program.

The preventative / corrective maintenance activities are prioritized through the City's CMMS. The City doesn't have a formal documentation of the criticality rating of its assets. The City has a dedicated Collection System Personnel focused on corrective maintenance and inspections.

4.3 Identification & Sewer Cleaning

The City uses the CMMS to collect information on SSOs caused by grease. The City uses this information to educate the Food Service Establishments (FSEs) on grease disposal. The City has identified the downtown core area as having the greatest potential FOG problems based on institutional knowledge. The City cleans the downtown core area quarterly as part of the preventative maintenance program. The remaining sewer system is currently cleaned on an annual basis. Similarly, annual cleaning appears to alleviate stoppages or SSO.

4.4 Collection System Inspection Program

The City uses Closed Circuit Television (CCTV) on sewers in the problem areas when required. The City's goal is to perform a complete CCTV of the entire system every fifteen (15) years. The City begins the CCTV cycle on the oldest collections lines and the reinforced concrete pipe sewer trunk lines. Maintenance hole inspections and updates of invert measurements are done routinely (every 12 to 18 months) when hydro cleaning is being performed on the collection system. The City inspects and performs maintenance on all six sanitary sewer lift stations routinely.

The City has a dedicated reserve fund of $125,000/year for maintenance holes and mainline repairs and is currently rehabbing all of the sewer trunk line leading to the WWTP. The approximate cost of trunk line rehab is $3.5 million.

4.5 Collection System Capacity

The City does not have a dynamic sewer hydraulic model. Sewer capacity is assessed with the use of land use mapping and associated sewer use records and supplemented with periodic direct measurements to access capacity. Growth within the sewer service area is significantly below regional figures and as such the City performs capacity assessment as needed when proposed developments may be connecting to the City's sewer system.

4.6 Contingency Planning

The City has adequate equipment for its operations and maintenance and keeps adequate parts for critical assets. A current list of available equipment is included as **Attachment 4-2**. The City also maintains a parts inventory for replacement parts of critical assets.

4.7 Staff Training

There are clearly defined and documented responsibilities of the Preventive Maintenance and O&M responsibilities in the City's Wastewater Collection Systems Manual (**Attachment 4-3**).

The City has a comprehensive standard operations and maintenance procedures documented for hydro cleaning, combination cleaning truck and maintenance hole inspections. The Table of Contents and path to the location of this extensive documentation on the City's public drive are included as **Attachment 4-4.**

Staff routinely attends conferences, seminars and classes that provide training on SSMP, SSOs, FOG, sewer cleaning, pretreatment issues or related subjects.

4.8 Computerized Maintenance Management System (CMMS)

The City uses Lucity™ as its CMMS to manage its maintenance program. All the collection system assets (sewers, maintenance holes and pump stations) are identified in the CMMS. The size and length of sewers are identified in the CMMS. No slope or invert elevations of sewers and no costs of assets currently are recorded in the CMMS. The CMMS is used to schedule and generate work orders.

The City uses the CMMS as a repository for asset history and may implement CMMS functions to manage the collection system. The City collects job costs for work orders and stores this information in the CMMS.

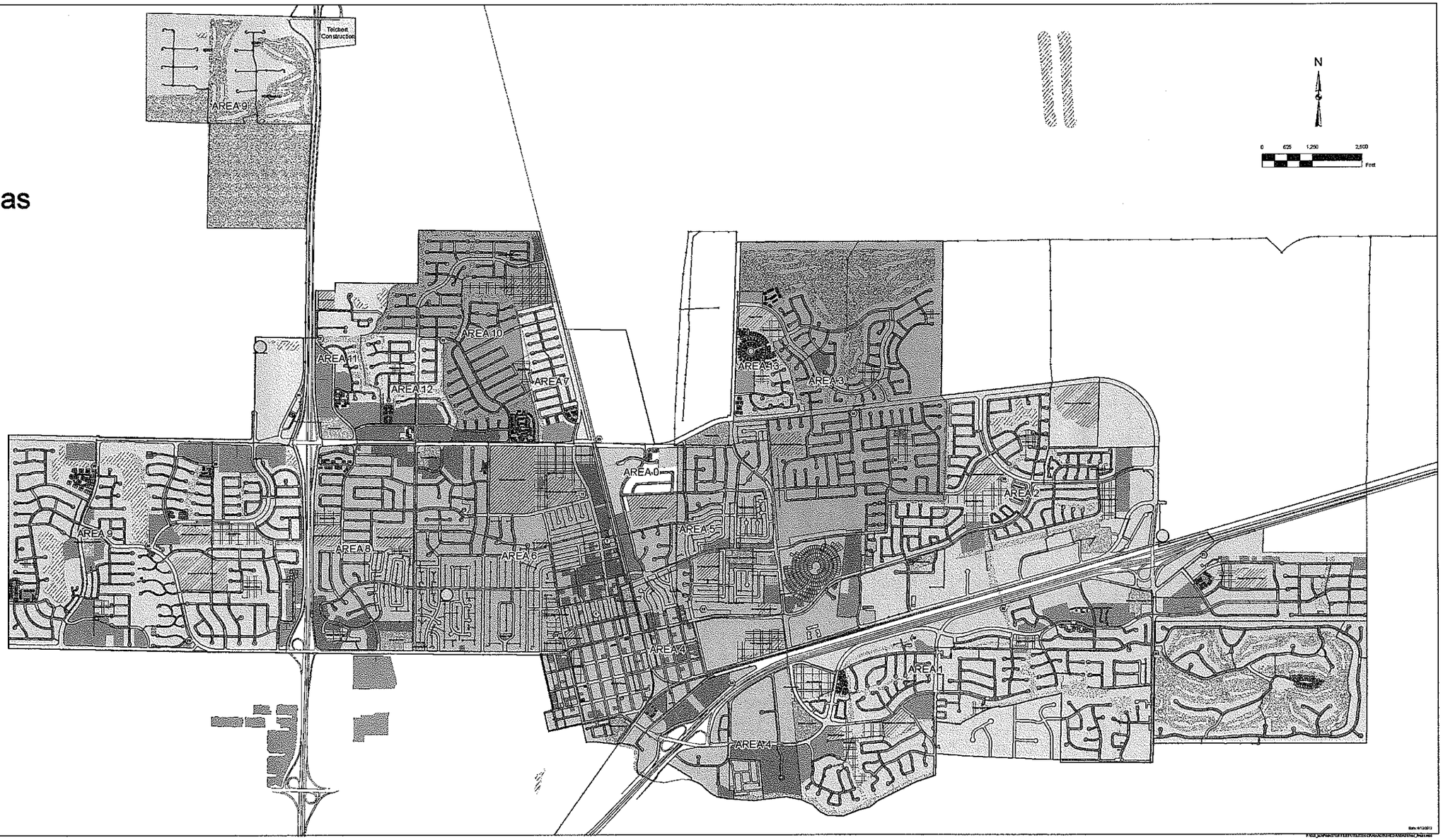
Through the use of CCTV records, wastewater collection crews and engineering staff can address structural deficiencies beginning with the older portions of the system.

Attachment 4-1

Map of Sewer Shed

Davis
California

Drainage Shed Areas



Drainage Shed Areas

- AREA 0
- AREA 1
- AREA 2
- AREA 3
- AREA 4
- AREA 5
- AREA 6
- AREA 7
- AREA 8
- AREA 9
- AREA 10
- AREA 11
- AREA 12
- AREA 13

Other Features

- Water Storage Tank
- Schools
- Well
- Sewer Manhole/Lift Station
- Sewer Main Lines
- Public Park
- Core Area Boundary
- Apartments
- Condo
- Greenbelts
- Retail
- Assisted Living

Date: 6/13/2013

Attachment 4-2

City Equipment Inventory

Attachment 4-2. City Equipment

Description	Number Available
Combination Cleaning Unit	1
Hydraulic Cleaning Unit	1
Backhoe	1
CCTV Unit	1
5 Yard Dump Truck	1
Utility Truck	3
Mechanical Rodder	3
6” Portable Trash Pump	1
2” Portable Trash Pump	3
Air Compressor	2
Lateral Camera Unit	2
Portable Generator	3
Lateral Chemical Treatment Unit	1

Attachment 4-3

Wastewater Collection Systems Manual Division of Responsibilities

Attachment 4-3
Wastewater Collection Systems Division of Responsibilities

Hydraulic Cleaning Section Maintenance Responsibilities Sanitary Sewer	Collections Section Sewer System Responsibilities	Utility Section Responsibilities Repair/Installation
Phone: 530-681-8970 (854)	Phone: 530-681-7974 (822)	Phone: 530-681-8612 (842)
Vehicles: 564, 558, 455	Vehicles: 495	Vehicles: 508, 446, 565, 931
Hydro-cleaning program: 3 month downtown and all mains to 21" 3 years/cycle	Sanitary sewer responsibility checks	Service stoppages
Main line stoppages/blockages	Sanitary sewer overflow investigations	Service line Locations
Hydro jet hose inspections/repairs	Emergency response calls	Clean-out repairs / replacements
Sewer map updating	USA tickets	Equipment checks/maintenance
Pump/Lift Station wetwell washdowns/inspections	Service line stoppages	CCTV inspection/Mains/Laterals
Tunnels - wash downs	Sewer lift stations inspections	Chemical treatment of service lines/main lines
Maintenance hole inspections 3 year cycle	Monitoring 5th & G St. groundwater treatment system	Sewer tap installations
	Odor complaints	Frame and lid installations (Maintenance holes)
	Utility connections inspection	Plugging isolation of main lines
	$H2^S$ testing	M.H. repairs/installation
	Flow monitoring	Mainline/service repairs/installation
	Sampling	Mainline/Service line repairs and replacements
	Pretreatment monitoring	Maintenance hole repair/Replacement
	dye/smoke testing	
	Lateral CCTV inspections	
	Service line location	

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REVISED: 09/08/2011

Attachment 4-4

Standard Operations and Maintenance Procedures Table of Contents

Hydraulic Cleaning Crew
Operations & Maintenance Manual

Table of Contents

Crew Expectation

1. Sanitary Sewer Preventative Maintenance Responsibilities
2. Instruction on Utility Maps, Maintenance Hole Inspection, General Safety
3. Mainline Hydro Cleaning Procedures, Recording and Updating of Sanitary Sewer System
4. Operations & Maintenance of Hydro-Cleaning Truck
5. Operations & Maintenance of Combination Cleaning Truck
6. Special Situations
7. Forms & Log Sheets
8. Standard Specification - Maintenance Hole Detail
9. Backyard Easement Hydraulic Cleaning Procedure
10. Traffic Control
11. North Davis Meadows Low Pressure Sewer System
    - Preventative Maintenance Task List
    - Backflushing Air/Vacuum Valve Procedures
12. Lock Out / Tag Out Policy
13. Hydro-Cleaning BMP Manual

5 Design and Performance Provisions

The City has standard design and construction specifications (as described in **Attachment 5-1,** and in full at http://cityofdavis.org/pw/Standards.cfm**)** for sewer mainlines and service laterals and for inspecting new or repaired sewer mainlines and service laterals. The City has made modifications to the Green Book protocols to meet the needs of the system. These adaptations can be found in **Attachment 5-2**.

The City has a Utility Crew of 3 field staff to repair and inspect sewer installations and repairs.

Attachment 5-1

Sanitary Sewer Design Standards (Section VII)

SECTION VII.

SANITARY SEWER DESIGN

A. GENERAL

The Project Engineer shall present all design information and calculations in a neatly written and well organized format. The design calculations shall be submitted with the initial submittal of the Improvement Plans. All design calculations shall be appropriately titled, dated, stamped and signed by the Project Engineer.

1. COMPUTER DESIGN AIDS

The Public Works Department has prepared several different computer spread sheets using Lotus® and SuperCalc® for sewer design. Disc copies of these sheets will be provided to the Project Engineer at no charge. Copies are provided on the condition that the Project Engineer assumes all risk and responsibility for their use and application.

B. DISCHARGE REQUIREMENTS

All users connecting to the City sanitary sewer system shall comply with the prohibitions on discharge of substances into the sanitary sewer system contained in Article III, Chapter 23, "Sewers and Sewage Disposal," of the Municipal Code. A summary of the Code requirements is contained in the Appendices to these Standards.

In general, the City sewer system is designed to convey and treat the waste from residential type uses or uses that are substantially equivalent. Waste discharge from most Commercial uses, such as Professional Offices and Retail, may also be acceptable. All industrial users are required to fill out a questionnaire and may be required to apply for a significant industrial user permit to connect to the City sewer system.

1. Permits

All users are required to obtain permits to connect to the City sewer system and discharge wastewater. Each user is classified according to the following sections and shall follow the requirements contained therein.

a. Single-Family Residential Permits

Individual Single-Family Residential permits are not issued for each unit. Prior to connection, the Map shall be recorded, connection fees shall be paid, public improvements shall be accepted by the City, and a Building Permit shall be issued by CDD. Each user shall connect to the service shown on the approved Plans. Any user which desires to install a new service or alter the existing service shall apply for and obtain a Utility Connection Permit from PW.

b. Multiple-Family Permits

Permits for this use will be issued after application for a Building Permit and payment of all connection fees. Each user shall apply to PW for a Utility Connection Permit.

c. Retail, Office, Commercial and Industrial Permits

Permits for these uses will be issued after application for a Building Permit. The connection fees for these uses are paid at recordation of any Map creating the lots or at application for a Building Permit, whichever is sooner. Each type of use shall submit information on the projected wastewater generation rates for review by PW. Each user shall apply to

PW for a Utility Connection Permit. All non-typical uses are required to fill out a discharge questionnaire. Any significant pollutants, toxic materials or large wastewater flows, will classify the user as a Significant Industrial User.

d. Significant Industrial User Permits

See the Appendices for the permit application requirements and definition of a Significant Industrial User.

C. FLOW RATES BY TYPE OF USE

The following flow rates shall be the basis for all sewer systems collection and conveyance facilities. Where possible, they are based on City records of flow, including reasonable increases to insure a conservative design.

1. Single Family Residential

Single Family Residential uses include single family lots, duplex lots, triplex lots, fourplex lots, and mobile home parks. Any condominium project in which 50% of the units are three bedroom or larger shall be considered single family for the purposes of calculating flow rates.

The Single Family average daily dry weather flow rate shall be 110 gallons per capita per day. All Single Family units shall be assumed to have 3.0 persons per unit.

2. Multiple Family Residential

Multiple Family Residential uses consist of residential uses not encompassed by the Single Family definition.

The Multiple Family average daily dry weather flow rate shall be 110 gallons per capita per day. All Multiple Family units shall be assumed to have 2.1 persons per unit.

3. Retail and Commercial uses

The average daily dry weather flow rate for Retail and Professional Office uses, except medical offices and clinics, shall be 15 gallons per employee per day.

4. Industrial uses

The average daily dry weather flow rate shall be based on a complete description of the proposed use. The design flow rate shall be at least 10% more than the actual projected rate. All Industrial design flow rates require approval of the City Engineer.

5. Table of Wastewater Flow Rates

The average daily dry weather design flow rate shall not be less than those listed in the following Table:

Land Uses and Wastewater Generation Rates			
Description of Source	Type of Use	Unit	Design Flow (gallons)
Auto Service Station	Commercial	Employee	15
Auto Service Station	Commercial	Auto	11

Land Uses and Wastewater Generation Rates			
Description of Source	Type of Use	Unit	Design Flow (gallons)
Bar	Commercial	Customer	2
Bar	Commercial	Employee	15
Country Club	Recreation	Member	55
Hospital	Industrial	Bed	175
Hospital	Industrial	Employee	15
Hotel	Commercial	Employee	15
Hotel	Commercial	Guest	55
Industrial Offices	Commercial	Employee	15
Laundry (self-serve)	Commercial	Machine	600
Laundry (self-serve)	Commercial	Wash	55
Motel	Commercial	Employee	15
Motel	Commercial	Guest	35
Motel with kitchens	Commercial	Guest	55
Office (Typical)	Commercial	Employee	15
Residential, Single-Family	Residential	Unit	330
Residential, Multiple-Family	Residential	Unit	230
Restaurant	Commercial	Meal	4
Retail (Typical)	Commercial	Employee	15
Retirement Home	Industrial	Employee	15
Retirement Home	Industrial	Resident	110
School	Industrial	Student	11
School with Cafeteria	Industrial	Student	16
School with Cafeteria and Gym	Industrial	Student	21
Shopping Center	Commercial	Employee	15
Shopping Center	Commercial	Toilet	550
Theater	Commercial	Seat	3

6. Miscellaneous Uses

Uses for which it appears that the information listed above is not applicable, will be determined based on wastewater generation and use patterns. This information may include, but is not limited to, analysis of manufacturing processes,

analysis of employee and patron use patterns, Code requirements, potential for accidental discharges, suitable factors to provide a conservative design, etc,. These flow rates are subject to special approval of the City Engineer.

D. LAND USES AND DENSITIES

The above flow rates for the various uses shall be applied to the Land Uses as contained in the General Plan. They shall be applied at the maximum allowable densities regardless of the approved or proposed uses.

1. Single Family

All Single Family uses will be calculated at the maximum allowable densities based on the current version of the City's General Plan (4.2 units per gross acre). If applicable, the General Plan Density bonus (up to 25%) allowed for affordable housing units shall also be included in this density calculation.

2. Multiple Family

All Multiple Family uses will be calculated at the maximum allowable densities based on the current version of the City's General Plan (30 units per gross acre - Core area, 15 units per gross acre - All other areas). If applicable, the General Plan Density bonus (up to 25%) allowed for affordable housing units shall also be included in this density calculation.

3. Retail, Commercial and Industrial Uses

The density of Retail and Professional Office uses shall be calculated by assuming 1 employee per 250 square feet of floor area. The floor area coverage shall be based on the Final Development Plan and/or approved Zoning. In the absence of the above, the waste water generation may be estimated using the following values:

Floor Area Coverage by Land Use Type		
Land Use	Core Area	Other City
Retail	100%	25%
Office	100%	35%
Industrial	N/A	40%
Business Park	N/A	35%
Service Commercial	N/A	40%

If the waste water flows are estimated using the above values, then the Project Engineer shall verify system capacity, with the uses based on the approved Building Plans, prior to hook up to the system.

E. PEAKING FACTORS

The flows generated from the above flow rates and land uses/densities shall be used in conjunction with the Peaking Factors to calculate the peak flows in the sewer system. The Peaking Factor shall be figured using one of the following methods.

a. Formula

The Peaking Factor shall be calculated based on the average daily dry weather flow using 0.

Equation (D) Peaking Factor for Sewer Flows

$$PF=7.67xADDF^{-0.93}$$

PF=Peaking Factor
ADDF=Average Daily Dry Weather Flow

b. Graph

0 is based on the above formula.

F. INFILTRATION/INFLOW ALLOWANCE

An Infiltration and Inflow allowance shall be added to the peak sewer flows to figure the design flow in the sewer system. The Infiltration/Inflow allowance for all new development areas shall be 600 gallons per gross acre per day. The area of streets and lots in all residential and commercial areas shall be included in the gross area. Areas such as parks and greenbelts which do not contain sewer facilities may be excluded from the gross area.

G. PIPE AND CONVEYANCE SYSTEM DESIGN

All sewer system pipes and conveyance facilities shall be sized and designed in accordance with the following criteria and formulas. All gravity sewer systems shall convey the design flow without surcharging any portion of the pipe system.

1. Design Flows

The flow for hydraulic design of the system shall be based on the Peak Wet Weather Flow and shall be calculated using 0.

Equation (E) Formula for Calculating Sewer Design Flow

$$PWWF=ADDFxPF+II$$

PWWF=Peak Daily Wet Weather Flow
ADDF=Average Daily Dry Weather Flow
PF=Peaking Factor
II=Infiltration and Inflow Allowance

2. Manning's Formula

Manning's Formula (0) shall be used to determine the design parameters such as, capacity, slopes, velocity, etc. Manning's "n" for vitrified clay sewer pipe shall be 0.013. Other pipe materials require special approval.

Equation (F) Manning's Formula

$$Q = \frac{1.486x\,R^{2/3}\,x\,S^{1/2}\,xA}{n}$$

$$Q \equiv Peak\ Flow\ (cfs)$$

$$R \equiv Hydraulic\ Radius\ (ft)$$

$$S \equiv Slope\ (ft/ft)$$

$$A \equiv Cross\text{-}sectional\ Area\ (\ ft^2\ )$$

$$n \equiv M'annings\ n$$

a. Variation of Manning's "n" with Depth

The variation of Manning's "n" with depth does not need to be considered for most normal design situations. Manning's "n" shall be appropriately adjusted for variation with depth whenever a Project Engineer is proposing to design a system which does not meet the minimum criteria for slope or velocity. It shall also be adjusted for depth of flow whenever flow monitoring results are being analyzed for hydraulic performance. The *Clay Pipe Engineering Manual, National Clay Pipe Institute*, contains information on the variation of Manning's "n" vs depth.

3. Minimum Velocity

All new sewer systems shall be designed to achieve a velocity of 2.0 feet per second when flowing 40% full or greater. All pipes flowing less than 40% full shall be designed to achieve a minimum velocity of 1.8 feet per second. Minimum size mains with limited upstream connections may be exempted from this requirement. Although, every effort shall be made to provide the highest velocity possible.

4. Minimum Sizes

The minimum size of sewer main shall be 6 inches in inside diameter. The minimum pipe slopes shall be as listed in the following table:

Minimum Pipe Sizes and Slopes	
Pipe Diameter	Minimum Slope
6"	0.0050
8"	0.0035
10"	0.0025
12"	0.0020
> 12"	as approved

The minimum slopes for pipe sizes not listed shall be approved by the City Engineer.

5. Oversizing of Sewer Mains

Oversizing of sewer mains to meet slope constraints in a project is not allowed. Pipes designed to be laid at less than the minimum slope require special approval of the City Engineer. When design constraints require a lesser slope than those listed above, preference shall be given to using the smaller size pipes at less than minimum slopes. Particular attention shall be paid to preventing excessive sedimentation and to preventing generation of sulfides in flatter than minimum pipes.

6. Maximum Slopes

The maximum allowable slope for a sewer main shall be 10.00%. A drop manhole shall be used when the design requires a steeper slope. Slopes which prevent separation of the liquids and solids in the waste stream shall be given preference over steeper slopes.

The maximum slope for sewer services may exceed this slope provided they are constructed in accordance with Standard Plan 201-4.

H. STRUCTURES AND APPURTENANCES

All structures and appurtenances shall be designed and placed in accordance with the following requirements.

1. Pipe Materials

Vitrified Clay Sewer Pipe shall be used on all sewer mains and services, unless shallow cover requires the use of Ductile Iron Pipe. Ductile Iron Pipe, conforming to the City requirements for water pipe, shall be used in areas with shallow cover. The use of any other types of materials will be subject to special approval by the City Engineer.

2. Sewer Manholes

Manholes shall be placed at intervals not to exceed 500 feet and at the intersections of all main lines. A drop of 0.10 feet through the manhole is required when the deflection angle between the inlet and outlet line(s) exceeds 45°. The deflection angle of a main or service into or through a manhole shall not exceed 90°.

A drop manhole shall be used when the vertical drop between the invert of the inlet main or service and the crown of the outlet main exceeds 12 inches.

All manholes shall be designed or placed to prevent storm water inflow through the top of the manhole.

The crowns of any inlet mains or services shall not be placed lower than the crown of the outlet main.

Sewer services shall be connected to trunk lines at a manhole.

An all weather access road shall be provided to all manholes outside of the public street right of way. The minimum width for the access road shall be 12 feet. Details of the access road design are subject to review and approval of the City Engineer.

3. Flusher Branches

Flusher branches may be used at the upstream terminus of 6" main lines when the distance to the downstream manhole is not greater than 250 feet. The branch shall be placed as near to the end of the street as is possible. All flusher branches shall be designed or placed to prevent storm water inflow through the top of the manhole.

4. Service Connections

A separate sewer service shall be provided from the sewer main to each legal parcel, except as otherwise provided in the Standard Specifications for duplex lots, single family attached units, and condominium units. The minimum size of service shall be 4 inches in inside diameter. The service shall be sized and designed to convey the Wet Weather Flows as calculated in accordance with this Standard or as may be otherwise required by the Building Code, whichever is greater.

I. ALIGNMENT REQUIREMENTS

The horizontal and vertical alignment for sewer mains and services shall be designed in accordance with the following provisions.

1. Mains in Streets

All new sewer mains shall be located in the public street right of way. Locations in easements require special approval of the City Engineer.

The Sewer line shall be placed opposite the storm line, 6 feet right or left of the centerline of the street. On streets with landscaped median islands, the sewer line shall be placed in the center of the lane adjacent to the island curb.

2. Mains in Easements

Sewer mains located in easements across private property require special approval of the City Engineer.

The minimum size easement shall be 10 feet wide with the main centered in the easement, if there are no manholes within the easement. The minimum width is 12 feet if there are manholes within the easement, in order to accommodate the required access road to each manhole. Additional width shall also be added to the easement when the sewer main is deeper than 10 feet and/or when the sewer is a trunk main, or when other parallel underground utilities share the same easement.

3. Horizontal Curves

Horizontal curves will be allowed provided that the summation of the angle of curvature between manholes does not exceed 90°. The allowable joint deflection and curve radii requirements for VCP Sewer Pipe are listed in the following table:

Curvature and Deflection Requirements for VCP Sewer							
Nominal Pipe Diameter (inches)	Allowable Deflection Angle (°)	Equation for Minimum Radius	Minimum Radius of Curvature, for Pipe Length L				
			2 ft.	4 ft.	6 ft.	8 ft.	10 ft.
3 to 12	2.0	R = 29 x L	58	116	174	232	N/A
15 to 24	1.5	R = 38 x L	76	152	228	304	380
27 to 36	1.0	R = 57 x L	114	228	342	456	570
39 to 42	0.75	R = 76 x L	152	304	456	608	760

Refer to the Water Design Section for horizontal curve and deflection requirements on Ductile Iron Pipe used in Sewer Mains.

4. Vertical Curves

Vertical curves shall be used to change the profile alignment grade of sewer mains between structures. The minimum vertical curve length is 25 feet. The algebraic sum of the horizontal and vertical deflections shall not exceed the values in the above table.

5. Services

Sewer services shall be located within the center one-third of the lot frontage on the street. The preferred location is 5 feet west or south of the center of the lot. The service shall generally extend at a right angle from the main to the lot. Services shall not enter the main or a manhole at a deflection angle greater than 90°.

6. Minimum and Maximum Cover

The following minimum depths of cover shall be provided for all Sewer Pipes:

Minimum Cover for Sewer Pipes			
Pipe Material	To street centerline	To gutter flow-line	To Right of Way
Vitrified Clay	5.0 feet	4.5 feet	4.0 feet
Ductile Iron	3.0 feet	2.5 feet	2.0 feet

The maximum depth of cover shall not exceed the manufacturer's recommendations. Any sewer depths exceeding 16 feet requires special approval by the City Engineer.

7. Clearance Requirements to Other Utilities

The sewer facilities shall generally be located lower than all other utilities, except when it can be shown that this is not feasible. When the sewer main is above other facilities, then the Project Engineer shall comply with any additional requirements of the City Engineer, including, but not limited to, the use of Ductile Iron Pipe for all sewers.

a. Horizontal and Vertical Clearances to Water Facilities

Sewer facilities shall be installed at least 12 inches below all parallel or crossing water mains and services. Placement of sewer facilities above water facilities requires special approval of the City Engineer.

The vertical clearance may be reduced provided that Ductile Iron is used in place of Vitrified Clay. The Ductile Iron Pipe shall conform to all of the requirements for pressure water pipe in the City Standard Specifications. Whenever the sewer main crosses a water main or service, the minimum pipe length between joints shall be 18 feet and shall be centered on the water main or service. The sewer main shall cross perpendicular to the water main. Skew angle crossings (more or less than 90°) require special approval of the City Engineer.

Sewer facilities shall be installed with at least 10 feet of horizontal clearance to all parallel water mains or water services. Any reduction in horizontal clearance requires special approval of the City Engineer.

b. Vertical Clearance to Other Utilities

The preferred location for sewer mains is below all underground utilities. A vertical clearance of not less than 12 inches shall be maintained between all sewer mains and all crossing utilities.

A vertical clearance of not less than 6 inches shall be maintained between all sewer services and all crossing utilities.

The vertical clearances required above may be reduced provided that Ductile Iron Pipe is used in place of Vitrified Clay at the utility crossing. The minimum pipe length shall be 10 feet and shall be centered on the crossing utility.

c. Horizontal Clearance to Other Utilities

A horizontal clearance of not less than 5 feet shall be provided between all sewer facilities and all parallel utilities or structures.

8. Sewer Main Clearance to Water Wells

New sewer mains shall not be placed closer than 100 feet to any proposed or existing public water well or operating domestic water well. Whenever practical or feasible the water well shall be destroyed and relocated to provide 100 feet of clearance to a sewer main located in a public street right of way.

J. OTHER CONSIDERATIONS

The Project Engineer shall design the sewer facilities for all types and conditions of use which can be reasonably expected during the life of the sewer facilities. The minimum design life for all passive or non-mechanical items shall be 50 years. The minimum design life for all moving or mechanical items shall be 20 years. The longest possible design life shall be provided for any item or facility whenever it can be reasonably and practically attained.

1. Connections to the Existing System

All projects shall connect to the existing system at the locations specified by the City Engineer. When required by the City Engineer, the Project Engineer shall verify the capacity of downstream portions of the existing City Sewer system. The Project Engineer shall specify on the Plans the methods and procedures to be used in tapping into the existing system. All connections to the existing system shall be designed to minimize disruptions in service to existing users.

2. Future Expansions of the System

When a project is to be followed by subsequent phases of a multi-phase project, the Project Engineer shall provide facilities to expand the system beyond the phase boundaries. Sewer mains shall be extended beyond the edge of pavements to minimize disruption of traffic or disturbance of existing improvements.

3. Trench loading

All sewer facilities shall be designed to withstand the imposed loads of trench backfill and traffic. The Project Owner and/or the Contractor assumes full responsibility for providing adequate cover during construction activities.

4. Sulfide Control

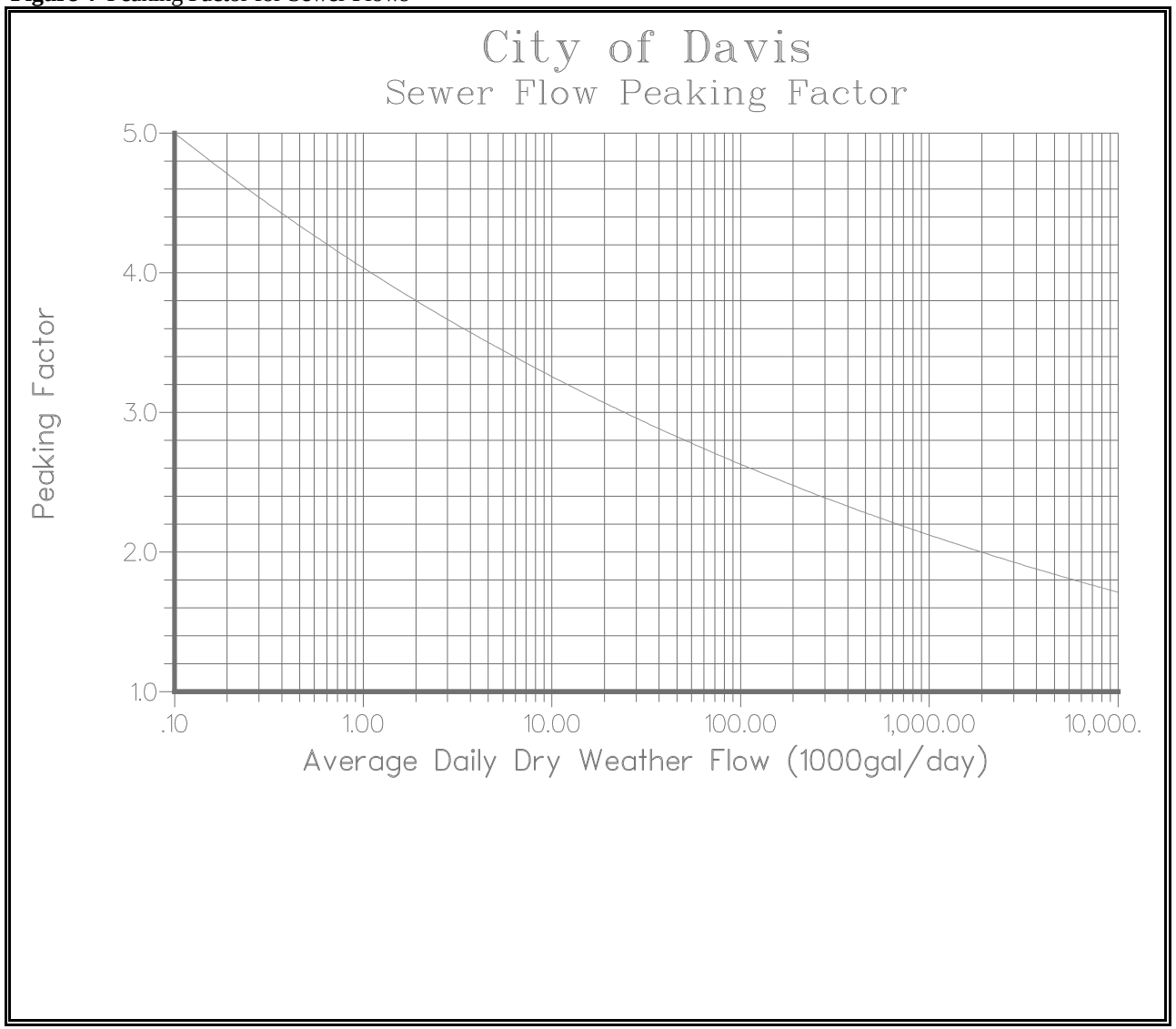
All new sewer systems shall be designed to resist the corrosive properties of the waste stream. In particular, every effort shall be made to design a system which is immune to sulfide corrosion. Whenever available, products such as Vitrified Clay and Plastic lining shall be used instead of any other materials.

New manholes on trunk facilities shall be Spirolite®, or substantially equivalent. All sulfide control measures shall be subject to review and approval of the City Engineer.

5. Sewer Lift Stations

All sewer lift stations require special review and approval of the City Engineer. They shall be designed by an appropriately experienced Engineer. Considerations in Lift Station design include: fully automatic control systems, connection to City SCADA system, redundant pumping capability, manufacturer of pumps and related mechanical equipment, location and placement of station, and provisions for use by other areas of the City.

Figure 4 Peaking Factor for Sewer Flows



Attachment 5-2

City Adaptations to Green Book

Section	Page	Detail	Title	Sheet	Comments:
ENGINEERING AND INSPECTION					
201-1.6	70	N/A	Polypropylene Fibers		Revise wording to include (Fibermesh 150, formerly Stealth®)
203-4.5 (5)	82	N/A	Locating Wire		Locating wire insulation color for water mains shall be white or "Blue"
300-2.2	100	N/A	Unsuitable Material		Item 2. "Wet" material: Method used to determined when material is deemed to wet.???
301-1.3	104	N/A	Subgrade Preparaton		Subsitute "processed" for "scarified"
303-1.2	114	N/A	Mixing & Delivery of Concrete		Delete "Hand Mixing"
303-1.4	115	N/A	Fibers in Concrete		Investigate use of "Steath" fibers in lieu of polypropylene. (Fibermesh 150, formerly Stealth®)
303-1.5	115	N/A	Subgrade		Change two (2) inches of A.B. to four (4) inches.
304-6.5.2	124	N/A	Compation By Water Jetting		Jetting no longer an accepted practice; suggest this section be deleted or reworded.
305-10.4	131	N/A	Service Line Installation		Delete wording regarding water drawn through service prior to installation of water meter. (Pressure test system prior to occupancy)
305-12	132	N/A	Disinfection and Flushing		Add detail reference: .. approved and tested Reduced Pressure Principal (RP) backfow assembly Std. Plan Detail 101-11.
					K.B. comment "..can not have above ground temporary (RP) where there is a water main tie-in at a street intersection would hve to be an in ground (RP).."
		101-6	Water Details	(1-6)	Water meter note callouts inconsistant with construction notes. See detail markups.
		101-9	Backflow (Fire Sprinkler)	2	Redraft Detail, discuss with Tim Annis.
		101-11	Backflow Prevention	(1-3)	Redraft Detail per markups.
		101-13	Parks Water Service		Parks water service - Suggest to eliminate this detail
		201-1	Trench Details	(1-7)	Redraft Detail per markups. Eliminate use of aggregate subbase material.
				(2)	VCP Bedding - Suggest eliminating "Crushed Rock"
				(3-4)	Revise Title block from "Existing Street" to " Existing Paved Areas"
				(5)	Eliminate use of "jetting"
		201-4	Sewer Service Connection		Suggest adding ABS pipe as an alternate material.
		201-5	Sewer Line Tap		Add reference for ABS pipe fitting.
		301-1	Curb Gutter Sidewalk		Add "Max" 2% cross slope.
					ADA cross slope: suggest a 1" depression from flow line to lip.
					Change compaction from 90% to 95%.
					Change two (2) inches of A.B. to four (4) inches.
					Add detail for "Window Pane" Scoring. Refer to Alternate design mix with lamp black.

Section	Page	Detail	Title	Sheet	Comments:
					Add sheet for retrofit/repair, plan view for doweling and 18" AC patch.
					Add sheet for heavy curb & gutter at bus stop locations.
		301-2	Barrier Curbs	(2)	Recommend to be used on case-by-case basis. Add vertical #4 rebar dowels.
		301-3	Curb Ramps	(1-4)	Eliminate / Substitute with Caltrans Std Plan A88A
					Note: Domes Shall be black unless specified on plan.
		301-4	Standard Driveways		Add detail for Historical Driveway
		301-5	Monument Box		Revise to meet accepted current industry standards.
		301-6	Street Barricade		Add pressure treated wood for rails and posts
		301-7	Bike Path Details		Complete Revision. Bollard locations to be determined on a case-by-case basis.
		301-8	Bollard Details	(1-2)	Suggest eliminating sheet 1. See transportaion comments.
		301-13	Standard Street Light		Handhole: Add "Minuim" size to be 2"x4"
		301-14	Post Top Street Light		Handhole: Add "Minuim" size to be 2"x4"
		301-16	Property Corner Marker		Revise to meet accepted current industry standards.
		301-17	Bus Stop Shelter		Complete Revision: See Landscapeforms "Curved Canopy Style" shelter. (Used on 8th Street CIP)

WATER DIVISION

203-4.5 (5)	82	N/A	Locating Wire		Locating wire insulation color for water mains shall be white or "Blue"
					Suggest to add wording for continuity testing (See City of Roseville Standards)
203-8.7.1	88	N/A	Construction Materials		Review wording in section.
					Add wording: Material other than "Bronze" to be reviewed on a case-by-case basis. Low lead content?
305-12	132	N/A	Disinfection and Flushing		Review wording in section: Is the stated method for disinfection sufficient???
					Add wording: Temporary RP to be tested above ground per Std Plan Detail 101-11
		101-12	Sacrificial Anode Installation	(1-2)	Redraft Detail. Prefer to have anode not in paved driveway area. Tracer wire clamped directly below angle meter stop
					and accessible from inside meter box.
		101-9	Backflow Assembly	(1-2)	Redraft Detail to show tracer wire .

WASTEWATER AND STORMWATER DIVISION

203-2.4	77	N/A	PVC Storm Drain Pipe		Allow use of PVC in road/street right-of-way???
306-13.2	140	N/A	Video Inspection		Item discussed. Video inspection of main prior to any construction work on line??
306-14	141	N/A	Abandonment of Services		Item 2. Subsitute plug at both ends with plug at back-of-walk.
					Rear Yard Main: Add wording that services to be abandon shall be plugged at the main and inspected by the city prior to backfill.

Section	Page	Detail	Title	Sheet	Comments:
TRANSPORTATION DIVISION					
		301-8	Bollard Details		Redraft sheet 2 with metal sleeve and padlock /hinged lid.? (Hugh has the sample)
		301-9	Traffic Signing Details	(2)	(Square Post) Redraft Sheet 2 per markups.
					Create new sheet for new street name sign detail/dimesions. See markup.
		301-10	Private Street Sign		Add (Square Post) as an option.
205-3	93		Traffic Signs		Recommmed to review wording in section. Add material spec for metal (Square Posts)
205-3.3	93		Wood Posts		Recommend to delete. No longer city standard but used for tempoary construction sign posts.
308-2	155		Traffic Signs		Recommmed to review wording in section and include street name signs aswell.
308-2.3	155		Post Installation		Recommend to add wording to include compation of subgrade for those posts installed in planter areas. Example 2nd Street CIP Bulbouts
ELECTRICAL DIVISION					
206-2	95		High Pressure Sodium Luminaires		Eliminate specification for high pressure sodium fixtures (HPS).
					All new fixtures will be LED or other type.
					Mast-arm mounted streetlights shall be Beta, Leotek, Cooper, or submitted approved equal.
					Post top fixtures shall be Hadco or submitted approved equal.
206-3	95		Poles		Need language describing decorative poles - See Butch
		301-12	Street Light Luminaires		POST TOP LUMINAIRES: Shall be Hadco or submitted approved equal. Delete "WATTS" & "BALLAST" columns.
					COBRA HEAD LUMINARES: Shall be LED . Approved manfacture shall be Beta, Cooper, Lectek or Equal.
					Delete "WATTS" & "BALLAST" columns.

6 Overflow Emergency Response Process and Roles

The City has a formal overflow emergency response plan on which staff are trained. A copy of the City's Sanitary Sewer Overflow Response Procedures (SORP) can be found as an attachment to this section (**Attachment 6-1**).

The City reports all SSOs according to the State's requirements summarized in Table 6-1.

TABLE 6-1. SSO REPORTING REQUIREMENTS

SSO Category	Reporting Requirements
1) Category 1 SSO - All discharges of sewage resulting from a failure in the Enrollee's sanitary sewer system that: a) Equal or exceed 1000 gallons or b) Discharge to a drainage channel and/or surface water; or c) Discharge to a storm drainpipe that was not fully captured.	The City shall, as soon as possible, but not later than two (2) hours after becoming aware of the discharge, notify the State Office of Emergency Services (OES), the local health officer or directors of environmental health with jurisdiction over affected water bodies, and the Central Valley Regional Water Quality Control Board. OES will provide the City with a control number. As soon as possible, but no later than twenty-four (24) hours after becoming aware of a discharge to a drainage channel or a surface water, the City shall submit to the Central Valley Regional Water Quality Control Board a certification that the State OES and the local health officer or directors of environmental health with jurisdiction over the affected water bodies have been notified of the discharge. Within five (5) business days, a written report shall be submitted to the Central Valley Regional Water Quality Control Board office documenting the discharge. Notify pretreatment staff to complete follow-up investigation of SSO and distribute BMP's as appropriate.
2) Category 2 SSO - All other discharges of sewage.	Report within 30 days after the end of the calendar month in which the SSO occurs. Notify pretreatment staff to complete follow-up investigation of SSO and distribute BMP's as appropriate.
3) Category 3 SSO - Private Lateral Sewage Discharges	Report at the City's discretion. Notify pretreatment staff to complete follow-up investigation of SSO and distribute BMP's as appropriate.

During business hours, the City's wastewater collections field crews respond to any SSOs. The City's wastewater collections field crews have been trained in the SORP and are knowledgeable in the procedures for responding to an SSO. The SORP contains a Wastewater Spill Report Form for the field crews to complete, which is also attached for easy access as **Attachment 6-2**. Also included is an example of documentation of an SSO (**Attachment 6-3**).

During non-business hours, the City uses its standby program that is staffed by a combination of field personnel and supervisors from the sewer, water, stormwater and transportation divisions. The Standby team is composed of advanced journey level employees. However, not all members are fully knowledgeable of the diverse range of practices (sewer, water, stormwater and transportation). Instances that require more than one person to respond or are outside of the standby employees' knowledge are addressed on a call-in basis. Standby personnel respond and will call the Wastewater Collection supervisor in the event of a SSO.

The City has a formal internal SSO notification process. The Public Works Collections Supervisor is notified of all SSOs. The City identifies the external agencies to notify in the event of a SSO on the Wastewater Spill Report Form. For the purpose of preparing an SSO response report, the pretreatment inspector is also notified of SSOs.

The City does periodic training that includes SSO response training. The City rotates their field crews and most receive training during the transfer process, if necessary. Training is also conducted anytime changes are made to the SORP.

Attachment 6-1

Sanitary Sewer Overflow Emergency Response Plan

City of Davis

Public Works Department

Collection Systems Division

Sanitary

Sewer

Overflow

Response

Procedures

Purpose & Scope

The purpose of this document is to provide procedures for the Department of Public Works Collection Systems Division to respond to City sanitary sewer overflows (SSO).

Goals:

- Protect public health and safety
- Prevent adverse impacts to the environment, waterways of the state and their beneficial uses
- Achieve timely and expeditious response to reports of all potential SSO's

Objectives:

- Minimize adverse impacts of SSO's
- Ensure corrective action is taken in a timely manner
- Ensure compliance with current regulatory requirements
- Provide uniform, clear and consistent SSO response

This is a living document and will be updated with revisions as necessary to ensure compliance with all current and future regulatory requirements.

Approved by:

Bob Weir
Public Works Director

Robert Weir
Signature

Date: 9-20-07

1. Acronym and Term Definitions

I. Acronyms

CCTV:	Closed Circuit Television
CMMS:	Computer Maintenance Management System
CMOM:	Capacity, Management, Operation and Maintenance
CSDFG:	California State Department of Fish and Game
EPA:	Environmental Protection Agency
F&G:	Fish and Game
FOG:	Fats, Oils and Grease
I/I:	Inflow and/or Infiltration
LAB:	Laboratory
NPDES:	National Pollutants Discharge Elimination System
OES:	Governor's Office of Emergency Systems
POTW:	Publicly Owned Treatment Works
RWQCB:	Regional Water Quality Control Board
SSO:	Sanitary Sewer Overflow
SSORP:	Sanitary Sewer Overflow Response Plan
WWTP:	Wastewater Treatment Plant

2. Term Definitions

Stoppage: Any obstruction in the sewer that impacts the flow of wastewater. Also referred to as blockage.

SSO: A Sanitary Sewer Overflow (SSO) is the discharge of any amount of untreated sewage from a collection system before it reaches a treatment plant. SSO's can occur at many different locations within the wastewater collection system: maintenance holes, broken pipes, clean-outs, siphons, air relief valves and diversion structures. SSO's can discharge to public and/or private property because of a pump stations failure or a blocked or surcharged private or municipal sewer.

Preventable SSO: SSO's that could have been avoided if reasonable preventative or corrective actions were taken.

Unpreventable SSO: SSO's that are beyond the control of the system operator. These include, but are not limited to, SSO's caused by vandalism, earthquakes, water main breaks, acts of nature, and contractor error.

Reportable SSO: A Reportable Sanitary Sewer Overflow is defined as a release of raw or inadequately treated sewage from a municipal sewer collection system prior to reaching the treatment plant, that is equal to or grater than 1,000 gallons or those reaching a surface water including creeks and channels (regardless of volume released).

Blockage caused SSO: An SSO that is caused by a blockage mainly due to grease, roots, debris or vandalism.

Capacity caused SSO: An SSO that is caused by a lack of sewer or pump station capacity to convey wastewater during dry or wet weather conditions.

Dry weather SSO: An SSO that is caused by a blockage primarily due to grease, roots or debris, a capacity deficiency, or a pump station failure. A dry weather SSO is not caused by excessive rain entering the sewer system.

Wet weather SSO: An SSO that is caused by excessive wet weather flow, which is mainly due to inflow and/or infiltration (I/I), that surcharges the system's normal design capacity.

Exfiltration: The leakage of sewage from buried collection systems that may not be detectable by Closed Circuit Television inspection.

Infiltration: The water entering a sewer system and service connections from the ground, through means including, but not limited to, defective pipes, pipe joints, connections, or maintenance hole walls.

Term Definitions (Continued…)

Inflow: Water (mainly runoff) discharged to a sewer system, including service connections, from sources including but not limited to the following: roof leaders, cellar, yard and area drains, crushed laterals, foundation drains, cooling water discharge, drains from springs and swampy areas, maintenance hole covers, summit maintenance hole plugs, cross connections from storm and combined sewer, tide gate leakage, catch basin laterals, storm water, surface runoff, street wash water, or drainage.

3. **Job Titles**

Assistant Public Works Director
Senior Public Works Collections Supervisor
Collection System Supervisor
Collection Crew
Emergency Standby
Utility Engineer
Wastewater Division Water Quality Supervisor

3. SSO Response Procedures

Collection Systems Division has developed the following procedures for responding to sanitary sewer overflow (SSO's). The purpose of these procedures is to ensure that all SSO responses are handled efficiently and effectively and that all regulatory requirements are met. Collection Systems Division staff are required to know and follow these procedures. These procedures are summarized in the SSO Flow Chart and are also presented in detail below.

I. Investigate and Assess Problem (Collections Crew/Collections System Supervisor/Emergency Standby)

Collections Crew, Collections Supervisor and/or Emergency Standby performs a quick investigation and assessment of the overflow and take pictures of the SSO and surrounding area to determine the extent of the overflow, what additional resources will be needed, and if notification of other agencies is required at that time. The following tabs (1 through 5) are provided as resources.

A. Locate SSO by address, cross street, latitude and longitude and point of overflow (i.e. maintenance hole, clean-out, pump station, pipe, Inside structure)

B. Determine the current magnitude of the SSO
- Flooded structure
- Storm water inlet or drainage way
- Potential for public exposure
- Related problems
  a. Is overflow related to a street collapse?
  b. Is overflow related to construction work?
  c. Is overflow causing a traffic hazard such as displaced maintenance hole cover or street flooding?
  d. Other
- Provide initial estimate of overflow rate using pictures and tables. Refer to tables 1, 2, 3 and 4
- **If SSO is a Reportable Quantity immediately contact the Senior Public Works Collections Supervisor and Assistant Public Works Director**

C. If overflow enters a creek, stream, river, or other body of water, sample receiving water to obtain baseline data. Sample should be taken upstream, at entry point and downstream of overflow location as determined by site-specific conditions.
1. Call Wastewater Treatment Plant (WWTP) Lab to obtain and handle samples.
2. If WWTP Lab is not able to respond, use trained Collections System personnel to obtain sample.

3. Contact laboratory personnel and transport sample for analysis alone with appropriate paper work.
4. Refer to table 5, SSO sampling procedure, flow chart and chain of custody record.

II. Traffic Control (**Collections Crew and/or Emergency Standby/ Collections Supervisor)**

Traffic control may be needed immediately to protect the public or M&O staff. Typically, immediate traffic control is needed if there is a street collapse or significant depression in the pavement that is related to the sewer, if the maintenance hole is ajar, or if the overflow causes flooding of the street. Traffic control may also be needed to prevent wastewater form being further disbursed and to protect the crew while containing the overflow and remove the blockage.

A. Provide traffic control per Department Standards.

B. If necessary, use other agencies including police to ensure proper traffic control.

III. Contain SSO (**Collections Crew and/or Emergency Standby/ Collections System Supervisor)**

The overflow must be contained. Containment becomes more difficult if the overflow reaches the storm drain system or drainage way since the overflow can rapidly contaminate receiving waters such as creeks, streams, rivers, and other water bodies. During dry weather, the storm drain system shall be used to store the overflow if it can be plugged downstream of the overflow or if the downstream storm drain pump station can be deactivated.

A. Options for containing overflow
   3. Overflow onto ground
      a. Rubber mats at catch basin or inlet
      b. Sand bags in gutter
      c. Dig trench in earth
   4. Overflow in building
      a. Evacuate affected people
      b. Sand bags/plastic sheet
      c. Avoid electrical shock: have power turned off
   5. Overflow into storm drain/drainage way
      a. Trace overflow in storm drainage system to downstream end point
      b. Plug all affected storm system outlets or block the creek and channels if necessary to contain spill
      c. Turn off storm water pump station

B. Post warning signs around contaminated area and follow directions from the Yolo County Health Department.

C. Required equipment for containing overflow
   1. Overflow onto ground and in buildings
      a. Rubber mats
      b. Sand bags
      c. Plastic Sheets
      d. Bypass pumps and pipe/hose
   2. Overflow into storm drain/drainage way
      a. Plugs
      b. Bypass Pump
   3. Overflow at pump station
      a. Emergency generator
      b. Bypass Pump
   4. Warning signs to post around contaminated areas.

IV. Correct Cause (**Collections Crew**)

The cause of the overflow may be located a considerable distance downstream of the actual overflow in areas with flat terrain. During large storms, overflows may occur because of infiltration and inflow (I/I) of storm water into the sewer system. I/I can greatly increase the flow in the collection system and cause overflows from pipes that are only partially blocked by roots, grease, or debris. However, during very large storms I/I can cause the flow in the collections system to exceed the hydraulic capacity of the pipes or pump stations. Under these conditions, it may not be possible to stop the overflow until the flows recede.

A. Locate cause of overflow
   1. Sewer main
      a. Check flow in maintenance holes
      b. Blockage should be between maintenance hole with sluggish flow or surcharging and maintenance hole with very little flow or is dry

   2. Sewer service
      a. Check flow in clean-out. If clean-out stoppage is located on private property, notify the property owner
      b. If there is no existing clean-out, notify property owner to call plumber

   3. Pump station (**Mechanical)**
      a. Check alarm system for indication of problem. Many alarms are telemetered by the SCADA system
      b. If power failure has occurred, determine if pump station has an emergency generator and if emergency generator is operating

B. Clear Blockage

1. Within Sewer Main
   a. Clear line from dry maintenance hole if possible with high pressure cleaning or power rodding equipment

   b. Determine cause of blockage (if possible)

2. Within Service line
   a. Dispatch Collections Crew or emergency standby to eliminate stoppage from service line clean-out

3. If blockage cannot be cleared
   a. Increase containment or initiate bypass pumping and
   b. Perform CCTV inspection to determine problem
   c. Repair broken sewer line or dig up blockage

C. Pump Station (**Mechanical**)

1. If pump station does not have power, connect portable emergency generator or portable bypass pump. Electricians are needed to connect a portable emergency generator to the pump station.

2. Check fuel for emergency generator or bypass pump

3. Make other repairs as necessary

V. Final Volume Estimate (**Sr PW Collection Supervisor**)

The final overflow volume is estimated to determine if additional reporting to regulatory agencies is required and for the City's records.

A. Estimate final overflow rate using tables and pictures

B. Overflow volume can also be estimated by multiplying the overflow duration by the overflow rate

VI. Initiate Clean-up (**Collections Crew**)

Disinfection of contaminated soil or drainage ways is only performed when directed by the appropriate agencies (e.g. Yolo County Environmental Health Dept., Dept. of Fish and Game)

A. Flooding building:

B. Storm drain or drainage way

1. Pump out wastewater
   2. Remove debris
   3. Wash concrete and contain wash water, pump out
   4. Remove contaminated soil/plants
   5. Remove all plugs/dams used to contain overflow

C. Street
   1. Remove debris
   2. Wash pavement and contain wash water
   3. Remove wastewater

VII. Receiving Water Sampling (**WWTP Lab**)

A. WWTP Laboratory will obtain and handle sample

B. If WWTP Laboratory is not able to respond, use trained Collections personnel to obtain sample.

C. Contact lab personnel and transport sample to WWTP Laboratory along with appropriate paper work.

VIII. Report(s) (**Utilities Engineer**)

Certain overflows are required by law to be promptly reported to regulatory agencies. The Utilities Engineer or his or her designated representative will make all notifications to regulatory agencies regarding reportable SSO's.

A. Prompt notification to regulatory agencies

B. Review, complete and sign required reports

   1. Reportable SSO Field Report Form

C. Documentation and Data Tracking hard copy reports

IX. Report(s) and Data Capture (**Sr PW Collections Supervisor/Collections System Supervisor**)

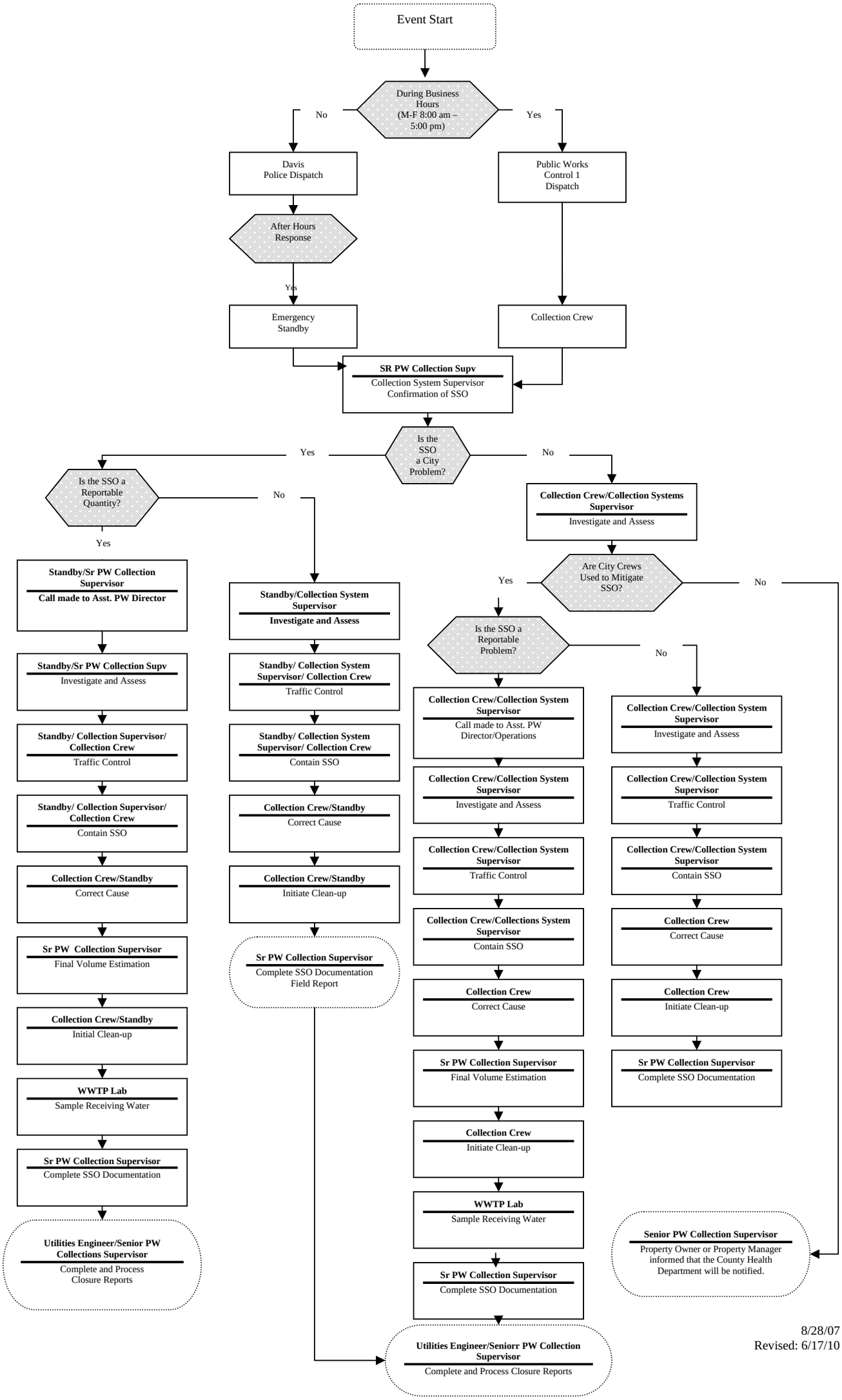
All SSO's must be tracked in the Computerized Maintenance Management System (CMMS) regardless of volume, District/Private, reportable or not.

A. Assure that all appropriate documentation has been completed in the CMMS

B. For private SSO provide copies of all job-sheets/time-sheets to Senior Public Works Collections Supervisor

Public Works Department – Collection Systems Division
Sanitary Sewer Overflow (SSO) Response Procedures

SSO Response Field Procedures Flow Chart



8/28/07
Revised: 6/17/10

TABLE 5

Sampling for Coliform (Total and Fecal), BOD and Ammonia

1. Put on all required personal protective equipment including safety gloves, eye protection and laboratory coat or uniform.
2. Use the SSO sample kit or sample bottles provided by the laboratory and consider the following prior sampling:

    - Three sets of samples are collected from each incident: upstream, entry point and downstream.
    - Each sampling point should include samples collected in and analyzed for: 1-liter plastic bottle for BOD (no preservative); 1-500ml plastic bottle for ammonia (Caution: Bottles contains sulfuric acid as preservative); and 1-100ml sterile bottle for Coliform (contain sodium thiosulfate salt/tablet).
    - Each bottle must be labeled appropriately to include: sampling point, date and time of collection, analysis, and sample collector name or initials.
    - All samples are grabs and are collected 6 inches below the surface.
    - Samples must be placed in coolers packed with blue or wet ice for storage during transport.
    - Samples must be delivered to the laboratory no later than 4 hours of collection time. It should be noted that samples for total coliform must be set up for analysis within 6 hours from collection time.

3. Sampling poles can be used for hard to reach sampling point.

    - For general sampling (BOD and ammonia), a sample bottle permanently attached at the end of the pole can be used. The sample must be pre-rinsed with DI water, rinsed at least once with the sample to be collected prior to actual sample collection or pouring of sample into the properly preserved bottle.
    - For Coliform sampling, use a sampling pole with a clamp at the end (especially designed for total Coliform sampling). The assigned bottle for Coliform shall be secured at the end of the pole. Once the lid is opened, the inside surface of the bottle or lid should not be touched. Care must be taken to keep the preservative tablet inside the coliform bottle.
4. Avoid sampling debris or scum layer from the surface. To avoid this, the surface may need to be agitated or cleared gently before sampling.
5. Once in position to collect the sample, face upstream of the spill and lower the bottle below the water surface (6”), then sweep the bottle upstream and out of the water. Be careful not to disturb the bottom sediment.
    - For general sampling (BOD and ammonia), dip pre-rinsed sample bottle into the sampling area or pool. Collect sample to rinse the inside of the container, pour out or discard content into a waste container or

downstream of the sampling area. Dip and collect sample then pour contents to properly preserved bottles for BOD and ammonia. Care must be taken to keep the preservative inside the sample bottle. Fill sample bottle to the neck, leaving enough space should sample reacts with the preservative.

- For Coliform sampling, do not remove lid of the Coliform bottle until ready to dip the sample bottle to the sampling area. Once the cap or lid had been removed, the inside surface of the bottle or lid should not be touched. Care must be taken to keep the preservative or tablet inside the bottle. Collect sample up to the line marking of the bottle, do not overfill.

6. Replace lid securely, shake gently to homogenize the sample with the preservative.
7. Complete sample bottle label and fill up chain of custody.
8. Place water samples inside a cooler packed with blue or wet ice, notify the laboratory of incoming samples and deliver to the laboratory as soon as possible (no later than 4 hours from collection).
    - For total and fecal coliform, analysis must be initiated within 6 hours of collection to meet the analytical holding time. After 6 hours, the probability of bacteria dying off or becoming too stressed to be cultured is greatly increased.

9. The laboratory must be notified of the event as soon as it occurred and before samples are delivered to ensure lab personnel are available to receive and set-up the samples for analysis. Use the following table as guide for whom to call depending on day and time of the event of delivery.

WWTP Laboratory Personnel Contact List:

Business Hours (7:00am – 330pm, M-F)		**Weekends, Holidays, Non-Business Hrs (M-F)**	
Josie Tellers	756-5960/681-3268	Josie Tellers	661-3733/304-9149
Aubrey Livingston	756-5960/681-6667	Aubrey Livingston	(707) 437-4855/344-2030
Ruth Boynton	756-5960/681-6667	Ruth Boynton	668-4338/681-8609
Karen Loser	756-5960/681-6667	Karen Loser	792-7397/681-0820

NOTE: In the event that WWTP lab personnel cannot be reached within 30 minutes, the collection crew will collect the samples. Additional attempt must be made beyond the 30 minutes window as follow up to ensure meeting sample receipt and analysis holding time requirements.

City of Davis **Internal Chain of Custody - General Purpose** **Page: _____**

WWTP Laboratory

I. Sample Receipt @ WWTP Lab: Today's Date: _____ Work Group: _____

Chain of Custody Information					
Delivered to WWTP Lab by:		*Total # of bottles: _____*			*Accompanied by COC*
Time Delivered:		*Labelled properly:* ☐ *yes*	☐ *no*		☐ *Yes* ☐ *No*
Received @ WWTP Lab by:		*Sample condition: _____*			
Time Received:		*Sample Type:*	☐ *site-comp*	☐ *grab*	☐ *24-composite*
Pretreatment Information		*Matrix*	☐ *WW*	☐ *Aqeuous*	
Performed by:			☐ *Soil*	☐ *Other* : _____	
Performed on:		*Preservative:*	☐ *using contract lab bottles (preserved)*		
Pretreatment done on the sample:			☐ *in-house supplied bottles*		
		Temperature: ☐ *cold storage at 0-6 ° C*	☐ *room temp.*		

II Sample Information and Analysis Needs

Sampling Point or ID or Location Code	**Sampling Date and Time**	**Preservative**	**Collected by**	**Analysis Requested**

(*) ***If samples are to be sent out*** , the contract laboratory's chain of custody (COC) must be filled out and the sent out date information must be noted under the section III on this page.

III. Subbed out information - analysis name, contract lab name and sent out date:

_____

_____

City of Davis
Public Works Department
Wastewater Collections Division
Sanitary Sewer Overflow Field Report

Date: _____ Time Call Received: _____ ☐ AM ☐ PM

Call Received By: _____ Caller's Name: _____

Caller's Phone #: _____ ☐ Home ☐ Other: _____

Caller's Address: _____

Overflow Location: _____ ☐ Street ☐ Backyard ☐ Field

☐ Parking Lot ☐ On-Site ☐ Front yard ☐ Alley ☐ Other:

Cross Street: _____

Overflow Start Date: ___/___/___ (M/D/Y)
Time Overflow Started: _____ ☐ AM ☐ PM

Overflow End Date: ___/___/___ (M/D/Y)
Time Overflow Ended: _____ ☐ AM ☐ PM

Time Arrived At Site: _____ ☐ AM ☐ PM

Responders / Crew Names: _____

Was Overflow From: ☐ Serviceline ☐ Mainline ☐ Private ☐ On-site lateral
Estimated Overflow Rate: _____ (gallon per minute)

Estimated Volume of Spill: _____ Gallons

Estimated volume of Spill Recovered: _____ Gallons

U/S M.H. # _____ Quad: _____ D/S M.H. # _____ Quad: _____

Size of Main: _____ Length of Main: _____

Size of Lateral: _____ Length of Lateral: _____

Geographic Coordinates Latitude: _____ Longitude: _____

Cause of Overflow: (circle one)

Roots	Vandalism	Hydraulic Loading
Grease	Maintenance Hole Failure	Broken Service Riser
Blockage	Construction	Missing CO Cap
Flood Damage	Pump Station Failure	Other
Line Break	Water Main Break	Unknown Cause
Power Failure	I / I	

Overflow Cause - Detailed Description: _____

City of Davis
Public Works Department
Wastewater Collections Division
Sanitary Sewer Overflow Field Report

Did Overflow Enter: ☐ Yes ☐ No ☐ Storm Drain ☐ Detention Pond ☐ Channel ☐ Ditch
☐ Receiving Waters ☐ Creek ☐ Stormwater Pumping Station Wetwell

Private Lateral Spill: ☐ Yes ☐ No
Name of Responsible Party
(for Private Lateral Spill Only) If Known: _____ Phone #: _____ Address: _____

Containment Method: ☐ Blocked Drain Inlet ☐ Diked Gutter ☐ Covered Drain Inlet

☐ Plugged Storm Drain ☐ Shut Down Storm Drain Station ☐ Other _____

☐ Diked Drainage Channel ☐ Diked Drainage Ditch

☐ Containment Not Needed

Clean-up Method: ☐ Hydro/Vacuum ☐ Wash Down/Vacuum ☐ Picked Up Solids ☐ Dry Vacuum

Final Spill Destination: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Storm Water Pump Station

☐ Stormwater Pond ☐ Drainage Creek ☐ Drainage Channel ☐ Drainage Ditch

☐ Other: _____

Warning Signs Posted: ☐ Yes ☐ No Barricaded: ☐ Yes ☐ No
Notify Neighbors: ☐ Yes ☐ No
Pictures Taken: ☐ Yes ☐ No
Samples Taken: ☐ Yes ☐ No
Samples Taken By: _____
Location of Samples: _____
Time Samples Taken: _____
Category 1 ☐ Category 3 ☐
Category 2 ☐

Regulatory Agencies Notified:
Electronic Report: https://ciwqs.waterboards.ca.gov/ciwqs/

OES
(800) 852-7550 ☐ Yes ☐ No Date: _____ Time: _____
RWQCB (Region 5)
Fax: (916)464-4645 ☐ Yes ☐ No Date: _____ Time: _____
County Health
(530) 666-8646 – Day
(530) 666-8920 – After Hours ☐ Yes ☐ No Date: _____ Time: _____

Measures Taken To Eliminate Future Problems: ☐ CCTV To Determine Problem
☐ Replacee/Repaired Structure ☐ Chemically Treated Structure ☐ Hydro-Cleaned Structure ☐ Mechanically Rodded Structure

Report Completed By: _____ Date: _____
Report Certified By: _____ Date: _____

SSO Flow Estimation Chart

TABLE 1
ESTIMATED SSO FLOW OUT OF MH WITH COVER IN PLACE

24" COVER

Water Height above M/H frame	S S O FLOW **Q**		Min. Sewer size in which these flows are possible
H in inches	in gpm	in MGD	
1/4	1	0.001	
1/2	3	0.004	
3/4	6	0.008	
1	9	0.013	
1 1/4	12	0.018	
1 1/2	16	0.024	
1 3/4	21	0.060	
2	25	0.037	
2 1/4	31	0.045	
2 1/2	38	0.054	
2 3/4	45	0.065	
3	54	0.077	
3 1/4	64	0.092	
3 1/2	75	0.107	
3 3/4	87	0.125	
4	100	0.145	
4 1/4	115	0.166	
4 1/2	131	0.189	
4 3/4	148	0.214	
5	166	0.240	
5 1/4	185	0.266	
5 1/2	204	0.294	
5 3/4	224	0.322	6"
6	244	0.352	
6 1/4	265	0.382	
6 1/2	286	0.412	
6 3/4	308	0.444	
7	331	0.476	
7 1/4	354	0.509	
7 1/2	377	0.543	
7 3/4	401	0.578	8"
8	426	0.613	
8 1/4	451	0.649	
8 1/2	476	0.686	
8 3/4	502	0.723	
9	529	0.761	

36" COVER

Water Height above M/H frame	S S O FLOW **Q**		Min. Sewer size in which these flows are possible
H in inches	in gpm	in MGD	
1/4	1	0.002	
1/2	4	0.006	
3/4	8	0.012	
1	13	0.019	
1 1/4	18	0.026	
1 1/2	24	0.035	
1 3/4	31	0.044	
2	37	0.054	
2 1/4	45	0.065	
2 1/2	55	0.079	
2 3/4	66	0.095	
3	78	0.113	
3 1/4	93	0.134	
3 1/2	109	0.157	
3 3/4	127	0.183	
4	147	0.211	
4 1/4	169	0.243	
4 1/2	192	0.276	
4 3/4	217	0.312	6"
5	243	0.350	
5 1/4	270	0.389	
5 1/2	299	0.430	
5 3/4	327	0.471	
6	357	0.514	
6 1/4	387	0.558	8"
6 1/2	419	0.603	
6 3/4	451	0.649	
7	483	0.696	
7 1/4	517	0.744	
7 1/2	551	0.794	
7 3/4	587	0.845	10"
8	622	0.896	
8 1/4	659	0.949	
8 1/2	697	1.003	
8 3/4	734	1.057	
9	773	1.113	

The formula used to develop Table A measures the maximum height of the water coming out of the maintenance hole above the rim. The formula was taken from hydraulics and its application by A.H. Gibson (Constable & Co. Limited).

Example Overflow Estimation:

The maintenance hole cover is unseated and slightly elevated on a 24" casting. The maximum height of the discharge above the rim is 5 ¼ inches. According to Table A, these conditions would yield an SSO of 185 gallons per minute.

FLOW OUT OF M/H WITH COVER IN PLACE

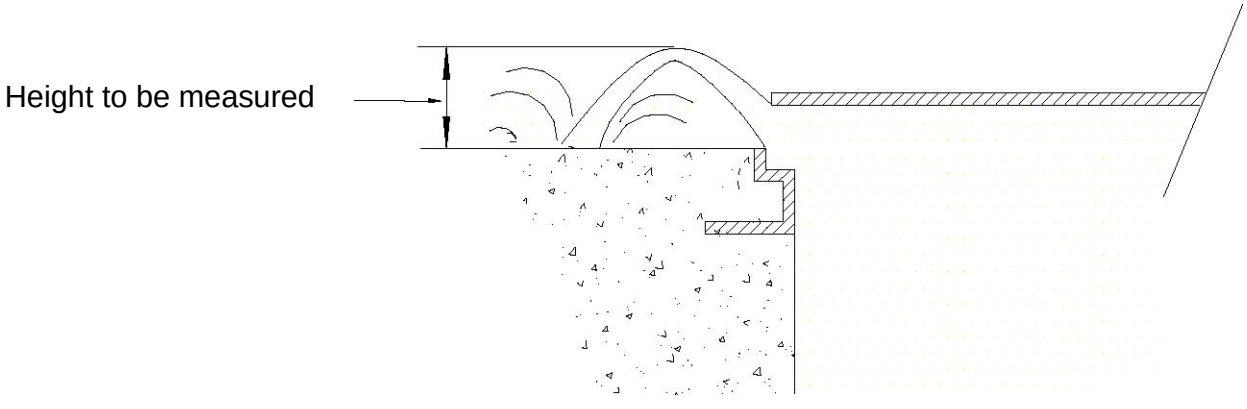


TABLE 2
ESTIMATED SSO FLOW OUT OF MH WITH COVER REMOVED

24" FRAME

Water Height above M/H frame	S S O FLOW **Q**		Min. Sewer size in which these flows are possible
H in inches	in gpm	in MGD	
1/8	28	0.04	
1/4	62	0.09	
3/8	111	0.16	
1/2	160	0.23	
5/8	215	0.31	6"
3/4	354	0.51	8"
7/8	569	0.82	10"
1	799	1.15	12"
1 1/8	1,035	1.49	
1 1/4	1,340	1.93	15"
1 3/8	1,660	2.39	
1 1/2	1,986	2.86	
1 5/8	2,396	3.45	18"
1 3/4	2,799	4.03	
1 7/8	3,132	4.51	
2	3,444	4.96	21"
2 1/8	3,750	5.4	
2 1/4	3,986	5.74	
2 3/8	4,215	6.07	
2 1/2	4,437	6.39	
2 5/8	4,569	6.58	24"
2 3/4	4,687	6.75	
2 7/8	4,799	6.91	
3	4,910	7.07	

36" FRAME

Water Height above M/H frame	S S O FLOW **Q**		Min. Sewer size in which these flows are possible
H in inches	in gpm	in MGD	
1/8	49	0.07	
1/4	111	0.16	
3/8	187	0.27	6"
1/2	271	0.39	
5/8	361	0.52	8"
3/4	458	0.66	
7/8	556	0.8	10"
1	660	0.95	12"
1 1/8	1,035	1.49	
1 1/4	1,486	2.14	15"
1 3/8	1,951	2.81	
1 1/2	2,424	3.49	18"
1 5/8	2,903	4.18	
1 3/4	3,382	4.87	
1 7/8	3,917	5.64	21"
2	4,458	6.42	
2 1/8	5,000	7.2	24"
2 1/4	5,556	8	
2 3/8	6,118	8.81	
2 1/2	6,764	9.74	
2 5/8	7,403	10.66	
2 3/4	7,972	11.48	30"
2 7/8	8,521	12.27	
3	9,062	13.05	
3 1/8	9,604	13.83	
3 1/4	10,139	14.6	
3 3/8	10,625	15.3	36"
3 1/2	11,097	15.98	
3 5/8	11,569	16.66	
3 3/4	12,035	17.33	
3 7/8	12,486	17.98	
4	12,861	18.52	
4 1/8	13,076	18.83	
4 1/4	13,285	19.13	
4 3/8	13,486	19.42	

The formula used to develop Table B for estimating SSO's out of maintenance holes without covers is based on discharge over curved weir -- bell mouth spillways for 2" to 12" diameter pipes. The formula was taken from hydraulics and its application by A.H. Gibson (Constable & Co. Limited).

Example Overflow Estimation:

The maintenance hole cover is off and the flow coming out of a 36" frame maintenance hole at one inch (1") height will be approximately 660 gallons per minute.

FLOW OUT OF M/H WITH COVER REMOVED (TABLE 2)

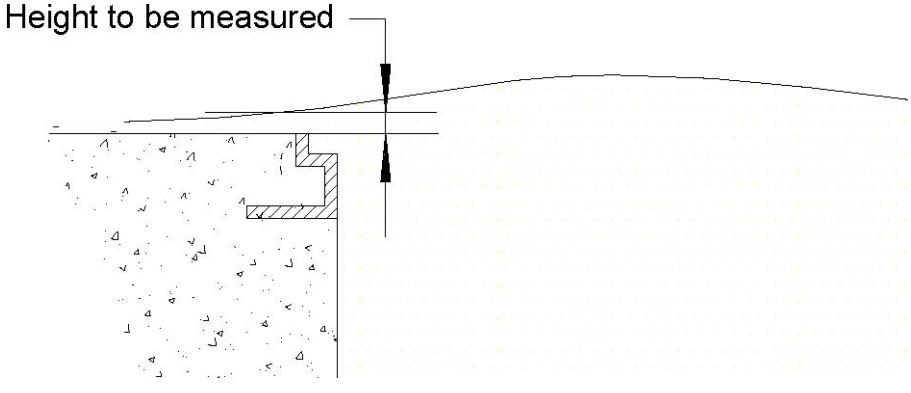


TABLE 3
ESTIMATED SSO FLOW OUT OF MH PICK HOLE

Height of spout above M/H cover **H** in inches	SSO FLOW **Q** in gpm
1/8	1.0
1/4	1.4
3/8	1.7
1/2	1.9
5/8	2.2
3/4	2.4
7/8	2.6
1	2.7
1 1/8	2.9
1 1/4	3.1
1 3/8	3.2
1 1/2	3.4
1 5/8	3.5
1 3/4	3.6
1 7/8	3.7
2	3.9
2 1/8	4.0
2 1/4	4.1
2 3/8	4.2
2 1/2	4.3
2 5/8	4.4
2 3/4	4.5
2 7/8	4.6
3	4.7
3 1/8	4.8
3 1/4	4.9
3 3/8	5.0
3 1/2	5.1
3 5/8	5.2
3 3/4	5.3
3 7/8	5.4
4	5.5
4 1/8	5.6
4 1/4	5.6
4 3/8	5.7
4 1/2	5.8
4 5/8	5.9
4 3/4	6.0
4 7/8	6.0
5	6.1

Height of spout above M/H cover **H** in inches	SSO FLOW **Q** in gpm	
5 1/8	6.2	
5 1/4	6.3	
5 3/8	6.3	
5 1/2	6.4	
5 5/8	6.5	
5 3/4	6.6	
5 7/8	6.6	
6	6.7	
6 1/8	6.8	
6 1/4	6.8	
6 3/8	6.9	
6 1/2	7.0	← Unrestrained M/H cover will start to lift
6 5/8	7.0	
6 3/4	7.1	
6 7/8	7.2	
7	7.2	
7 1/8	7.3	
7 1/4	7.4	
7 3/8	7.4	
7 1/2	7.5	
7 5/8	7.6	
7 3/4	7.6	
7 7/8	7.7	
8	7.7	
8 1/8	7.8	
8 1/4	7.9	
8 3/8	7.9	
8 1/2	8.0	
8 5/8	8.0	
8 3/4	8.1	
8 7/8	8.1	
9	8.2	
9 1/8	8.3	
9 1/4	8.3	
9 3/8	8.4	
9 1/2	8.4	
9 5/8	8.5	
9 3/4	8.5	
9 7/8	8.6	
10	8.7	

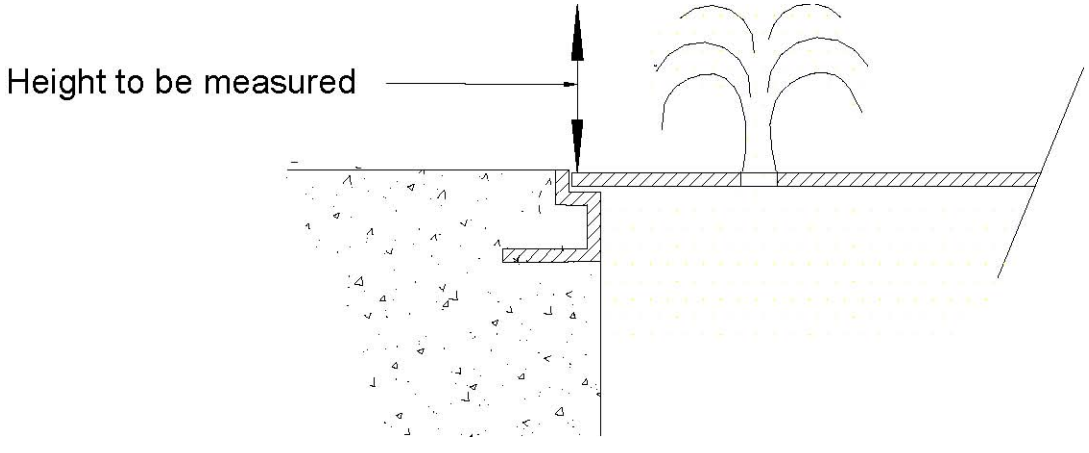
Note: This chart is based on a 7/8 inch diameter pick hole

The formula used to develop Table C is Q=CcVA, where Q is equal to the quantity of the flow in gallons per minute, Cc is equal to the coefficient of contraction (.63), V is equal to the velocity of the overflow, and A is equal to the area of the pick hole.[2] If all units are in feet, the quantity will be calculated in cubic feet per second, which when multiplied by 448.8 will give the answer in gallons per minute. (One cubic foot per second is equal to 448.8 gallons per minute, hence this conversion method).

Example Overflow Estimation:

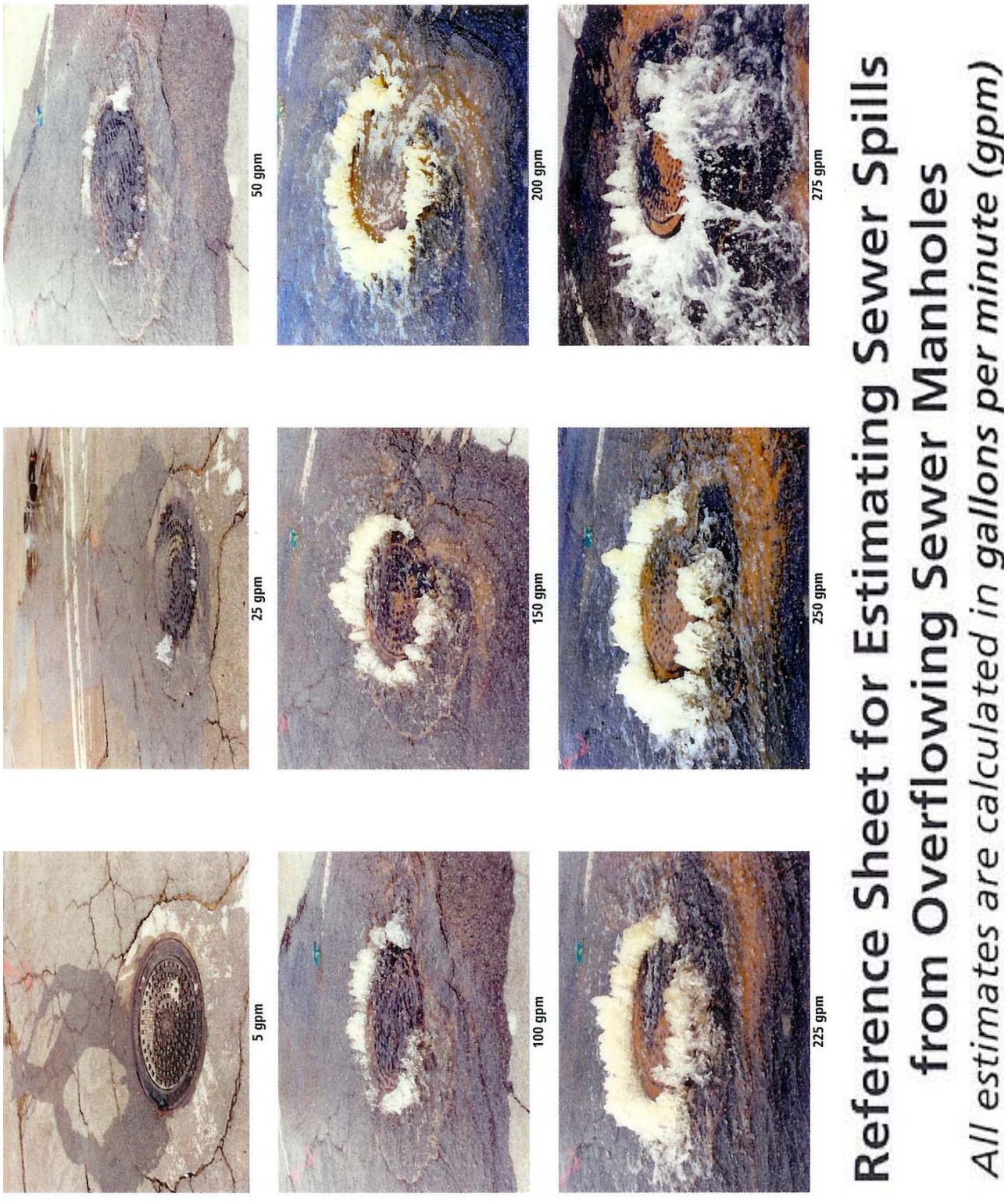
The maintenance hole cover is in place and the height of water coming out of the pick hole seven-eighths of an inch in diameter (7/8") is 3 inches (3”). This will produce an SSO flow of approximately 4.7 gallons per minute.

FLOW OUT OF VENT OR PICK HOLE (TABLE "C")



[2] Velocity for the purposes of this formula is calculated by using the formula h = v squared / 2G, where h is equal to the height of the overflow, v is equal to velocity, and G is equal to the acceleration of gravity.

TABLE 4


5 gpm
25 gpm
50 gpm
100 gpm
150 gpm
200 gpm
225 gpm
250 gpm
275 gpm
Reference Sheet for Estimating Sewer Spills
from Overflowing Sewer Manholes
All estimates are calculated in gallons per minute (gpm)

Attachment 6-2

Sanitary Sewer Overflow Field Report

City of Davis Public Works Department
Wastewater Collections Division
Sanitary Sewer Overflow Field Report

Date: _____ Time Call Received: _____ ☐ AM ☐ PM

Call Received By: _____ Caller's Name: _____

Caller's Phone #: _____ ☐ Home ☐ Other: _____

Caller's Address: _____

Overflow Location: ☐ Street ☐ Backyard ☐ Field
☐ Parking Lot ☐ On-Site ☐ Front Yard ☐ Alley ☐ Other: _____

Cross Street: _____

Overflow Start Date: _____ (M/D/Y)

Time Overflow Started: _____ ☐ AM ☐ PM

Overflow End Date: _____ (M/D/Y)

Time Overflow Ended: _____ ☐ AM ☐ PM

Time Arrived At Site: _____ ☐ AM ☐ PM

Responders / Crew Names: _____

Was Overflow From: ☐ Serviceline ☐ Mainline ☐ Private ☐ On Site Lateral

Estimated Overflow Rate: _____ (GPM)

Estimated Volume of Spill: _____ Gallons

Estimated Volume of Spill Recovered: _____ Gallons

U/S MH #: _____ Quad: _____ D/S MH #: _____ Quad: _____

Size of Main: _____ Length of Main: _____

Size of Lateral: _____ Length of Lateral: _____

Geographic Coordinates

Latitude: _____ Longitude: _____

Cause of Overlow: (Check One)

☐ Roots	☐ Vandalism	☐ Hydraulic Loading
☐ Grease	☐ Maintenance Hole Failure	☐ Broken Service Riser
☐ Blockage	☐ Construction	☐ Missing CO Cap
☐ Flood	☐ Pump Station Failure	☐ Other
☐ Line Break	☐ Water Main Break	☐ Unknown Cause
☐ Power	☐ I / I	

Overflow Cause - Detailed Description: _____

City of Davis Public Works Department
Wastewater Collections Division
Sanitary Sewer Overflow Field Report

Did Overflow Enter: ☐ Yes ☐ No ☐ Storm Drain ☐ Detention Pond ☐ Channel
☐ Ditch ☐ Receiving Waters ☐ Creek ☐ Stormwater Pumping Station Wetwell

Private Lateral Spill: ☐ Yes ☐ No

Name of Responsible Party (for Private Lateral Spill Only) If Known:

Name: _____ Phone #: _____ Address: _____

Containment Method: ☐ Blocked Drain Inlet ☐ Diked Gutter ☐ Covered Drain Inlet
☐ Plugged Storm Drain ☐ Shut Down Storm Drain Station ☐ Other _____
☐ Diked Drainage Channel ☐ Diked Drainage Ditch ☐ Containment Not Needed

Clean Up Method: ☐ Hydro/Vacuum ☐ Wash Down/Vacuum ☐ Picked Up Solids ☐ Dry Vacuum

Final Spill Destination: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Storm Water Pump Station
☐ Stormwater Pond ☐ Drainage Creek ☐ Drainage Channel ☐ Drainage Ditch
☐ Other _____

Warning Signs Posted: ☐ Yes ☐ No
Notify Neighbors: ☐ Yes ☐ No
Pictures Taken: ☐ Yes ☐ No
Samples Taken: ☐ Yes ☐ No
Samples Taken By: _____
Location of Samples: _____
Time Samples Taken: _____
Category 1 ☐ Category 3 ☐
Category 2 ☐

Regulatory Agencies Notified:
Electronic Report: https://ciwqs.waterboards.ca.gov/ciwqs

OES ☐ Yes ☐ No Date: _____ Time: _____
(800) 852-7550
RWQCB (Region 5) ☐ Yes ☐ No Date: _____ Time: _____
Fax: (916) 464-4645
County Health ☐ Yes ☐ No Date: _____ Time: _____
(530) 666-8646 - Day
(530) 666-8920 - After Hours

Measures Taken To Eliminate Future Problems: ☐ CCTV To Determine Problem ☐ Replaced/Repaired Structure
☐ Chemically Treated Structure ☐ Hydro-Cleaned Structure ☐ Mechanically Rodded Structure

Report Completed By: _____ Date: _____
Report Certified By: _____ Date: _____

Attachment 6-3

Core Area Sanitary Sewer Overflow Investigation

SSO response documentation

PUBLIC WORKS DEPARTMENT
1717 Fifth St Davis, CA 95616
Phone: (530) 757-5686, Fax: (530) 758-4738

Image G Street North

BACKGROUND

Sewer backup occurred on March 9, 2012 - 56 gallons. Backup was at cleanout on G Street located in the sidewalk in front of a manicurist. Multiple food service establishments are discharging to this section of the City's sewer. There are several non FSEs that occupy the building where the SSO occurred. The sewer line runs down the middle of G Street and these commercial businesses are located on the end of the sewer line.

A discharger inventory is provided in **table 1**. Backup is in the core area where there are many FSE with marginal grease removal capabilities, **see location map**.

Area is subject to periodic Hydro-jetting to clean grease from sewer by City crews.

FOLLOW-UP

With finalization of the Public Works best management practices (BMP) for FSEs the City will concentrate on the core area establishments. The recommendation will be to enforce the BMPs and retrofit as necessary the GRD's that are not in compliance with the adopted requirements of the Ordinance. City has identified each facility with an under-counter style grease removal device. The City has offered to demonstrate to all FSEs, how to clean and maintain their trap.
Public Works BMP will also be mailed to each identified FSE on the requirements contained in the revised sewer use ordinance.

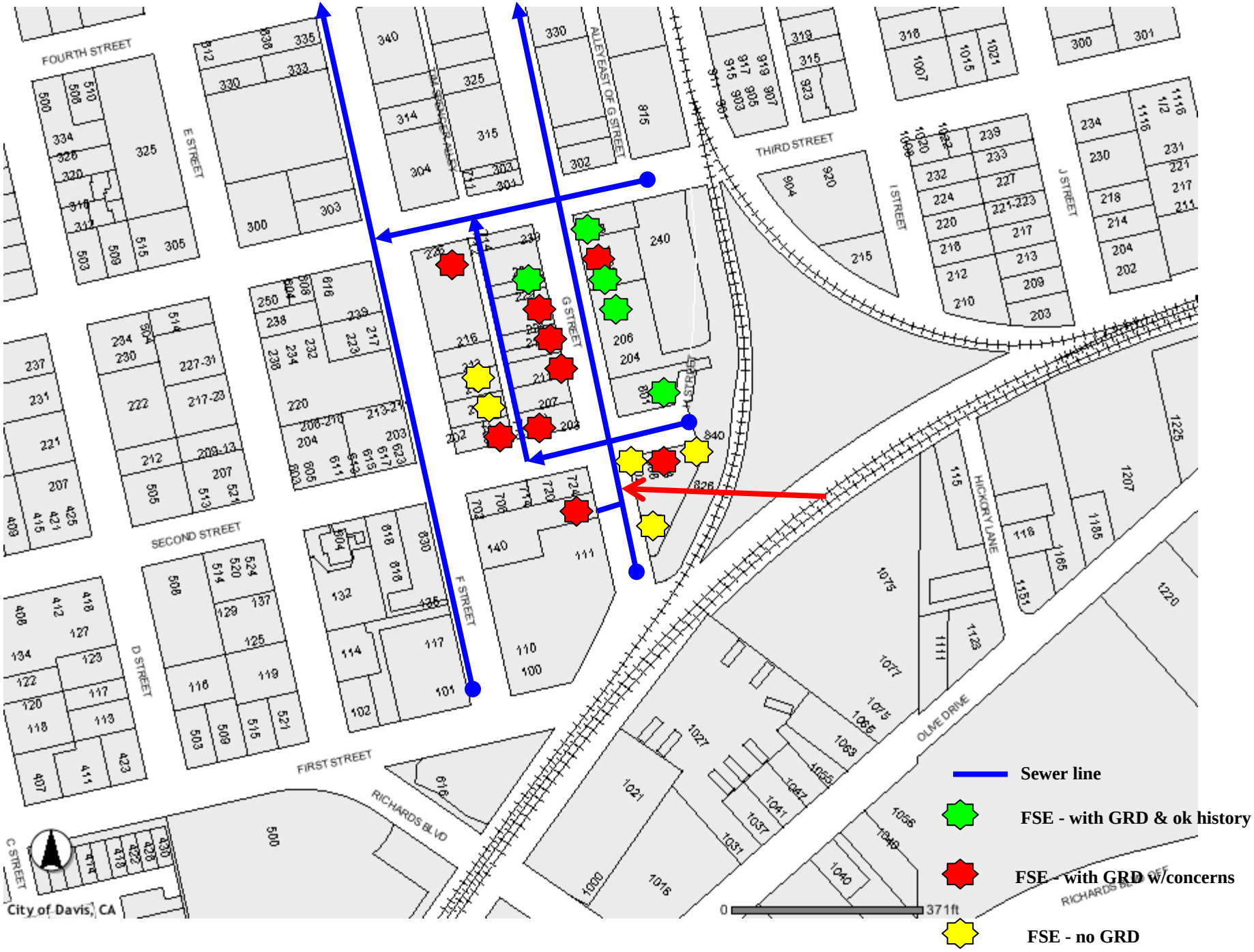
TABLE 1 – DISCHARGER INVENTORY

Name	GRD	History
Sunrise Restaurant	small trap 20 gpm	▪ Dishwasher through trap?
Red Noodle 88	small trap 20 gpm	▪ trap is hard to access under floor,
Fuji Sushi Boat	small trap 20 gpm	▪ dishwasher through trap ▪ busy location, previous correction to clean trap GRD
Woodstock's Pizza	small trap 20 gpm	▪ busy location, previous bldg. blockages dishwasher through trap
Starbucks Coffee	coffee - no GRD	▪ --
Posh Bagel and Coffee	coffee, sandwiches no GRD	▪ --
Davis Sushi	trap non-functional	▪ busy location, ▪ dishwasher through trap' ▪ previous correction to clean/fix GRD
Bombay Dreams	35 gpm	▪ GRD was downsized from what was approved, ▪ previous corrections to clean GRD <30 day needed cleaning recent backup under building
Katmandu	small trap 20 gpm	▪ busy location, ▪ 2- Previous corrections to clean GRD dishwasher through trap?
Jusco's Japanese	500 gallon GRD shared with G Street.	▪ repair exhaust hood
Taste of Thai	1000 gal interceptor	▪ regularly cleaned
Froggy's Bar and Grill	10 gpm	▪ small kitchen, limited hours small trap ▪ dishwasher through trap, ▪ pot sink to sewer no GRD
G street Pub	500 gallon interceptor	▪ limited hours shares with Jusco's restaurant
Tres Hermanos	small trap 20 gpm	▪ previous complaints about grease in wet sump
Bistro 33	1000 gal interceptor	▪ previous correction to clean GRD, ▪ mat washing outside
Village Bakery and Pastry	no GRD	▪ fairly small pizza/pastry shop ▪ busy location
Aioli Bodega	small trap 20 gpm	▪ limited hours, ▪ GRD design questions ▪ previous correction to clean GRD
Subway Sandwiches	no GRD	▪ --
Tuco's Wine Market	no GRD	▪ Small restaurant

Unused in-ground interceptor located in the commercial complex. Has not changed since the last time I was there. Conditions appear to be anaerobic in the separator. 03/12/12

End of sewer line just up from where the SSO occurred. Standing water in the line 03/12/12.

LOCATION MAP



7 Fats, Oils, and Grease (FOG) Control Program

The City has a fully functioning FOG program in place. This includes environmental control reviews and inventory, sampling, enforcement, surveillance, outreach material, source control sampling, reporting and revised legal authority.

A brief description on current practices is provided below. Staff continues to implement and adjust the program to incorporate ideas as they develop.

7.1 Environmental Control reviews

Reviews are typically conducted twice per year. The City mails a review letter with a time and date the facility will be reviewed and lists what will be inspected. The letter allows the facility time to prepare. Following the review the City mails the FSE the results of the review with any corrections.

City staff opens and checks each GRD when conducting a review with the manager/owner. Staff request access to the kitchen exhaust fan grease trays during the review. At the review staff discusses how the GRDs work and how often they should be checked. The City recommends a weekly check for the under counter style GRD and a three monthly check for the in-ground interceptors.

This review procedure was developed to identify and stress to the FSE the importance the City places on the review items identified. By the frequent contact with the FSE and by meeting the manager/owners, the City's corrective actions have been decreasing.

The City currently has 120 FSE and 31 conditional exempt facilities (current list included as **Attachment 7-1**).

Staff mail out invitations to the managers and/or owners of FSEs to have City staff demonstrate to the facility staff how to clean their under counter grease removal devices. The City also mails an invitation to the facilities with in-ground grease interceptors for City staff to check and determine if their in-ground interceptor is ready to be cleaned. There is no charge for this and there is no regulatory liability if they are ready to be cleaned.

In general, the City has written communication with the FSE a minimum of 4-6 times per year and two onsite visits. This frequent contact helps keeps the City interest in the forefront of the all the other issues businesses deal with.

Example control review documentation is provided as **Attachment 7-8**.

7.2 Sampling

Sampling is conducted on grease interceptors and on specific sewer lines that are predominantly from food service establishments. Interceptor samples are single grabs and composites during business hours. Samples are collected on average two times per year.

7.3 Enforcement

Any corrective items found at an environmental control review are summarized in a letter to the FSE. The letter lists the findings and requested corrections to be made. The City's may draft a specific enforcement letter requesting corrections with milestones noted if the conditions found at the review warrant such an action.

Example corrective review letter is provided as **Attachment 7-8**.

7.4 Surveillance

Surveillance reviews are completed in two ways. On occasion, staff reviews the core area after normal business hours (9pm-3am). During these hours staff observes the business practices and cleanup practices of the FSE establishments. These after-hours reviews are to verify exterior cleaning practices and kitchen mat cleaning practices. Observation of a specific restaurant may be prompted from a citizen complaint. Specific conditions found during the after-hours reviews are captured in field notes in the FSE file and may be addressed during normal business hours.

Example inspection documentation is provided as **Attachment 7-8**.

7.5 Outreach material

City staff has developed outreach material for distribution to FSEs. The outreach materials focus on fats, oil and grease issues at FSEs and select other locations. Best Management Practices (BMP) have been developed to optimize the effectiveness of the specific control equipment and a registering process of in-ground interceptors has been initiated to aid the City in reporting to the Regional Water Board if necessary.

- Food Service Establishment Tri-fold (**Attachment 7-2**)
- Food Service Establishment BMP Guide (**Attachment 7-3**)
- FOG BMP Table (**Attachment 7-4**)
- Highlights of FOG BMPs (**Attachment 7-5**)
- Food Service Establishment Grease Trap Maintenance (**Attachment 7-6**)
- Food Service Establishment Frequently Asked Questions (**Attachment 7-7**)

7.6 Source Control sampling

Staff have identified 13 sewer sheds (see map below) that are evaluated to determine each sewer sheds contribution to the loading seen at the WCPC head works.

In the core area, sewer shed 4 has a high concentration of FSE and commercial business. City records indicate that 47% of the FSE's are in the core area. For the core area the City collects samples for BOD, TSS, COD, metals, pH, temperature, EC, TDS, O&G and flow. Along with analyses results, data-loggers are used to monitor continuously for EC, temperature, pH and TDS at identified locations in the service area. Data and data logger readings help to characterize the discharges from the sewer sheds to the WWTP headworks.

Within the individual sewer shed areas City staff catalogue the number, type and size of environmental control equipment being used. In particular, control equipment related to FOG

or control equipment used at appropriate industrial/commercial applications (i.e. sand/oil separators) is catalogued. The inventory also includes known sources of salt discharges into the collection system.

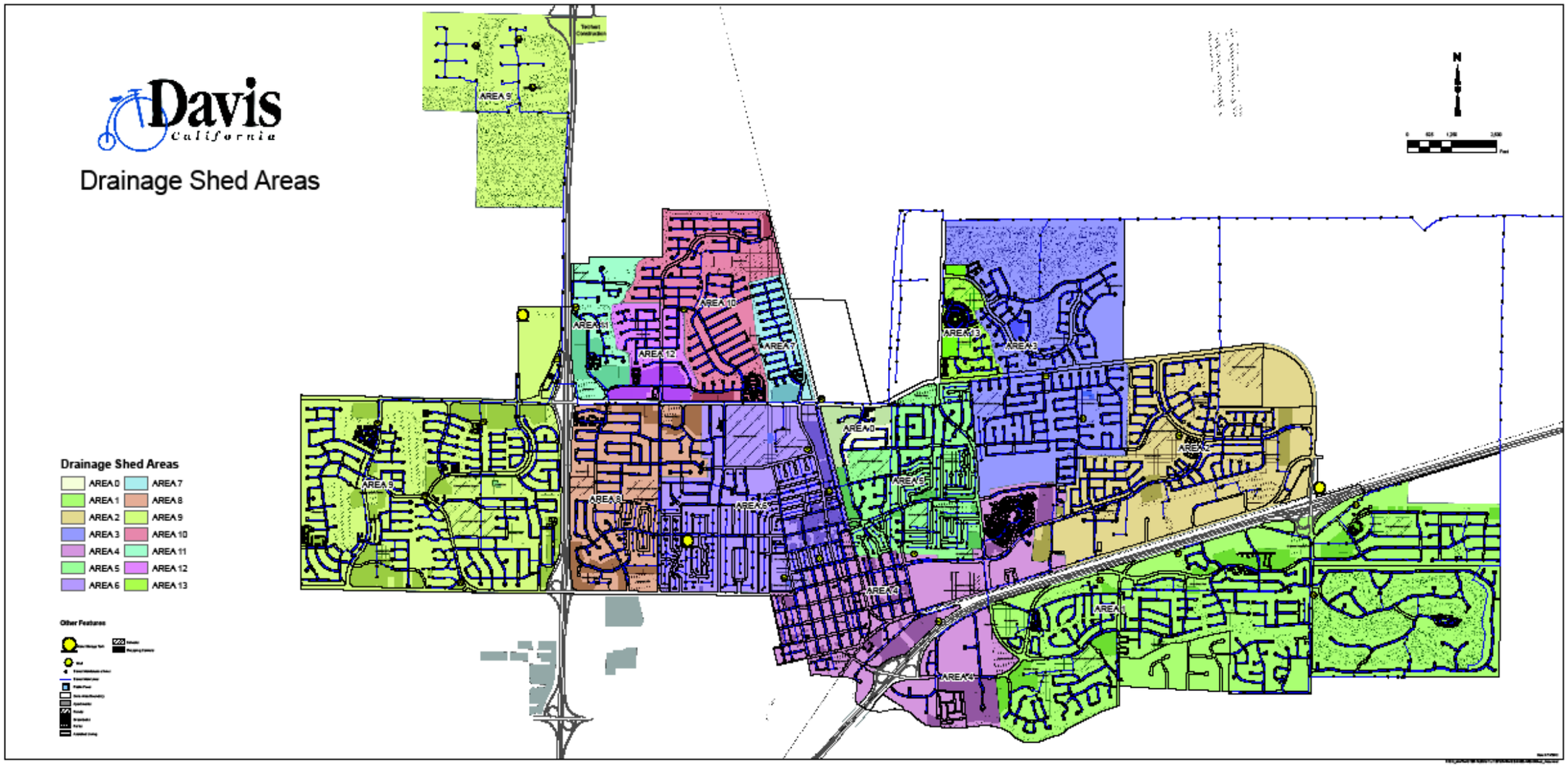
The parameters looked at are in TDS, pH, metals, H_2S, temperature, flow and conventional pollutants of concern. Source control sampling also includes specific point source dischargers as appropriate. Plant loading calculations include the contributions from the City's portable water sources, as appropriate.

7.7 Reporting

The State Water Board will require reporting associated with implementing the required FOG Program. As a result staff has initiated the use of a spreadsheet for the purpose of holding this information and will review software programs for analysis data storage, environmental control inventory, enforcement tracking and name/address of its facilities.

7.8 Revised Legal Authority

As necessary, the SUO is updated to strengthen the City's ability to govern the use of the collection system and include mandated legal provisions as outlined by the U. S. EPA Region Nine, the Central Valley Regional Water Quality Control Board and the State Water Resources Control Board. The current version of the SUO is posted on the City's website at: http://qcode.us/codes/davis. (Chapter 33)


Davis
California
Drainage Shed Areas
N
Drainage Shed Areas
AREA 0
AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
AREA 6
AREA 7
AREA 8
AREA 9
AREA 10
AREA 11
AREA 12
AREA 13
Other Features

Attachment 7-1

Food Service Establishment List & Statistics

	Trap				Interceptor					Landscape						General						
	trap	less than 25 GPM	greater than 25 GPM	staff cleaning	750 gallon	1000 gallon	1250 gallon	1500 gallon	2500 gallon	private surface cleaner	staff surface cleaning	staff landscaping	private landscaper	property manager	**averaged flow in gallons / day over bi-monthly read**	garbage disposal	dishwasher to GRD	salt softener	core area	employees	seats (includes banquet)	green business
Asian	27	21	7	23	5	5	0	0	0	2	7	2	2	21	42,651	1	14	9	20	309	2051	0
Chain Dining	4	4	0	0	2	1	0	2	1	1	2	1	0	5	13,989	0	7	5	5	209	763	0
Convalescent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Evening Dining	3	2	1	0	0	1	2	0	0	0	4	2	1	2	20,670	0	3	16	8	164	735	0
Conditional exemption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18,002	0	0	0	1	9	8	0
Groceries store	7	7	0	0	0	2	6	1	0	6	2	0	1	7	60,666	1	1	1	1	74	44	0
Hamburger	5	1	3	1	2	4	0	1	0	1	5	2	5	7	23,693	2	2	1	3	247	907	0
Italian	1	0	1	0	0	0	1	0	0	0	1	0	2	0	3,100	0	1	1	0	79	166	1
Mexican	9	3	7	2	0	2	0	0	0	0	3	1	5	9	12,316	0	0	1	2	130	534	2
Middle eastern	4	3	1	1	0	0	0	0	0	0	3	3	0	3	4,388	0	1	1	5	39	287	0
Pizza	5	2	4	1	0	1	0	0	0	0	2	0	0	4	7,304	1	2	0	3	110	488	0
Sandwiches	3	3	0	1	1	0	0	0	0	0	0	0	0	0	4,199	0	1	1	2	40	113	0
sum	68	46	24	29	10	16	9	4	1	10	29	11	16	58	210,978	5	32	36	50	1,410	6,096	3

	inspection mid - 2008	correction mid - 2008	# GRD corrections	# exhaust fan corrections	# mats cleaning corrections	# trash enclosure corrections	inspection 2009	correction 2009	# GRD corrections	# exhaust fan corrections	# mats cleaning corrections	# trash enclosure corrections	inspection 2010	correction 2010	# GRD corrections	# exhaust fan corrections	# mats cleaning corrections	# trash enclosure corrections	inspection 2011	correction 2011	# GRD corrections	# exhaust fan corrections	# mats cleaning corrections	# trash enclosure corrections	inspection 2012	correction 2012	# GRD corrections	exhaust # exhaust fan correctionsfan	# mats cleaning corrections	# trash enclosure/recycle corrections	#
Asian	11	5	4	3	1	0	31	16	12	9	3	1	38	14	10	7	1	2	35	6	7	0	1	2	33	7	7	0	1	1	38
Chain Dining	6	4	2	0	3	1	4	3	1	2	3	0	9	4	4	1	0	0	9	1	1	0	0	0	8		0	0	0	0	9
Convalescent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									0
Evening Dining	5	4	2	0	3	0	4	3	5	1	1	0	9	6	5	2	2	0	9	3	3	1	0	0	6		0	0	0	0	9
Conditional exemption			0	0	0	0	1	-	0	0	0	0	1		0	0	0	0			0	0	0	0			0	0	0	0	0
Groceries store	2	2	1	2	0	0	3		0	0	0	0	7		0	0	0	0	8		0	0	0	0	6		0	0	0	0	8
Hamburger	7	7	5	3	1	0	6	5	3	4	1	0	13	8	6	4	1	0	14	5	4	3	0	0	14	8	8	2	0	0	13
Italian	1	1	1	0	0	0	1	1	1	1	0	0	2	1	1	1	0	0	2		0	1	0	0	2		0	0	0	0	2
Mexican	8	5	2	3	1	0	2	2	1	1	1	0	10	5	3	1	1	0	12		0	0	0	0	12	6	3	4	0	0	10
Middle eastern	1	1	1	1	0	0	4	4	2	4	1	0	5	3	3	2	0	0	4	1	1	0	0	0	5	2	2	0	0	0	5
Pizza	2	2	1	0	1	0	4	2	2	1	0	0	7	2	1	1	0	0	7	2	2	0	0	0	6	1	1	1	0	0	7
Sandwiches			0	0	0	0	4	1	1	0	0	0	5	1	1	0	0	0	5	5	1	0	0	0	1		0	0	0	0	5
sum	43	31	19	12	10	1	64	37	28	23	10	1	106	44	34	19	5	2	105	23	19	5	1	2	93	24	21	7	1	1	106

total # traps	**70**	**# Interceptors**	**40**	**@ 4.75 MGD**	**% WWTP**	**4.49%**	**Enf 2008**	**72%**	**Enf 2009**	**58%**	**Enf 2010**	**42%**	**Enf 2011**	**22%**	**Enf 2012**	**26%**	
% of FSE w/traps	**66**	**% interceptors**	**38**	**# core area FSE**		**50**	**Insp 2008**	**41%**	**Insp 2009**	**60%**	**Insp 2010**	**100%**	**Insp 2011**	**99%**	**Insp 2012**	**88%**	**106**
% of Traps < 25 gpm	**66**			**percent core area FSE**		**47.17%**											

Attachment 7-2

Best Management Practices Trifold

Consider supporting the restaurant service providers that maintain a "Green Business Certificate" with the City. This certificate recognizes the service providers that perform environmentally friendly and responsible cleaning practices

THE CITY OF DAVIS

Best Management Practices,

Cost Saving Measures,

Practical tips,

for

Food Service Establishments

Support a Green Business & Support a Local Business

Public Works Office 757-5686
Restaurant
Program 757-5625

If possible, use a local business or a business licensed with the City of Davis. Locate those providers on the "Restaurant Service Provider list" or the City's website of local businesses.

Storm water

Facts

The City's Storm drain system is for the conveyance of rainfall only. The City has a permit to discharge Stormwater, and is regulated by the State of California for our Stormwater discharges.

Best Practice

Pour mop water into a mop closet, utility sink or curbed floor drain. Do not pour it onto a parking lot, in an alley, on a sidewalk or into the gutters.

Keep the area around outdoor trash bins litter free, trash, used food containers. This is a Health Code requirement and customers or employees are more likely to use them when they are kept clean

Do not put liquids in your dumpster or rinse it out – if needed request a change.

Keep dumpster lids closed to prevent rain from entering and it reduces pests/vermin. Bins should be water tight

Clean liquid spills promptly around tallow bins and dumpsters. Use absorbent material for liquid waste do not rinse area.

High pressure washing of parking lots must be contained, recaptured and disposed of into the sewer system. Check the BASMAA website for the correct procedures. Washing of shopping carts, food baskets etc must also be disposed of to the sewer system.

Outside eating areas must be sweep up / picked up first, then rinsing with water only is permitted.

Kitchen Mats

Best Practice

Clean/wash kitchen mats in a mop closet, utility sink. It is in violation of Health Codes to wash mats in food preparation sinks.

To ease cleaning, consider replacing and using smaller sized mats.

Consider washing mats at a coin operated wash.

Do Not

Do not wash, clean, rinse kitchen mats outside.

Grease Trap or Interceptor

Facts

A grease Interceptor is greater than 500 gallons in size and are usually located in-ground outside a building.

A grease Trap is smaller, and usually located under a counter and require more maintenance than an Interceptor does. A dishwasher may discharge into an Interceptor. A dishwashers may not discharge into a Trap.

Traps must be kept accessible for maintenance, inspection and cleaning at all times. Traps need to be sized appropriately. Smaller traps will clog quickly and pass grease into the buildings pipes or sewers.

Best Practice

Check or clean a grease *Trap* once a week.

Check or clean an *Interceptor* every other month.

Trap or Interceptor cleaning is required when they have accumulated floatable or settleable material accounting for 25% of its wetted volume.

Water temperatures over 140 F will dissolve grease. Use cooler water temperatures in prewash sinks.

Do not use a *Interceptor or Trap* to dispose of grease/oil, use your rendering bin.

Observe/check the cleaning of your interceptor to insure a through job is being done. Insure during the cleaning process, influent/effluent tees have not been damaged.

Grease *Trap* cleaning can be performed by staff, eliminating outside contractor costs. Frequent cleaning eliminates odors and clogging of building pipes.

Grease removed from a *Trap* may be recyclable, check with your grease recycler/rendering listed on the "Restaurant Service Providers" list.

When routinely performed, cleaning will greatly reduce the discharge of fats, oil and grease into the sewer system and keep odors down from traps/interceptors.

Use a licensed company for interceptor cleanout and disposal.

Dry scrap all plates, utensil, pots and pans before washing.

Do Not

Do not add surfactants, dispersants, degreaser, biological agents into your grease *Trap or Interceptors*.

Kitchen Exhaust Systems

Facts

Kitchen exhaust fans are required to be cleaned periodically by the Uniform Fire Codes. Cleaning includes the interior and exterior housing and grease collection tray.

Best Practice

Kitchen exhaust cleaning contractors should be trained and have available current training certificates available.

Roof exhaust vents should not be cleaned or rinsed to the roof surface, building gutters or the City's storm drain system. Verify your vent contractor captures all waste associated with cleaning the exhaust system.

Grease collection trays need to be checked regularly, and staff can clean them, eliminating outside contractor costs. Trays must be covered.

Regular routine cleaning of the inside grills by restaurant staff will help keep the ducts cleaner, and reduce the need for outside cleaning contractors.

Do Not

Do not clean exhaust grills outside.

Do not rinse roof exhaust cleaning waste to the building gutters.

Surface Cleaning

Facts

Surface cleaning rinse everyday dirt/grime from building surfaces. Surface cleaning keeps outside eating areas clean and sanitary.

Best Practice

Follow the procedures outline at the BASMMA website for surface cleaning.

Do Not

Do not use any soap, cleaners, sanitizers for outside cleaning and disposal to the storm drain system.

Attachment 7-3

Best Management Practices Guide

Best Management Practices for Food Service Establishments

City of Davis
Department of Public Works
June 2011

INTRODUCTION

The City of Davis Public Works Department (PW) is responsible for developing, implementing and reporting on the status of three State mandated regulatory programs aimed at reducing pollutants discharged into our sanitary sewer and our storm water collection systems.

The requirements of these programs are contained within the State Water Resources Control Board Order NO # 2006-0003-DWQ for wastewater collection agencies, the City's Phase II General Stormwater Permit CA 00004, and the City's NPDES Permit CA 0079049 issued to the Wastewater Treatment Plant.

The above regulatory programs all contain the general conditions to be implemented, and specific targeted pollutants for reduction or control. The City is required by law to address the targeted pollutants through established measures. These measures may be prohibiting discharges, numerical limits, and source control programs or establishing Best Management Practices (BMP).

Order NO # 2006-0003-DWQ requires the City to implement measures to reduce the discharges of Fats, Oils and Grease (FOG) into the sanitary sewer. Reduction of FOG discharges requires a grease removal device (GRD) and periodic checking of the GRD. A GRD is used to remove FOG from a food service establishment (FSE) discharges to the sanitary sewer. GRDs maybe an in ground gravity interceptor or the smaller grease trap usually located above ground.

PW has established written BMP's specifically for FSEs, and businesses that use a GRD (i.e. bakeries, car washes, pressure washing).

BMP's for an FSE were implemented to address the slowdowns, blockages and sanitary sewer overflows caused by FOG discharged into our collection system. The waste discharge requirements contain the regulations require Cities to develop and implement source control measure for FOG within their service area.

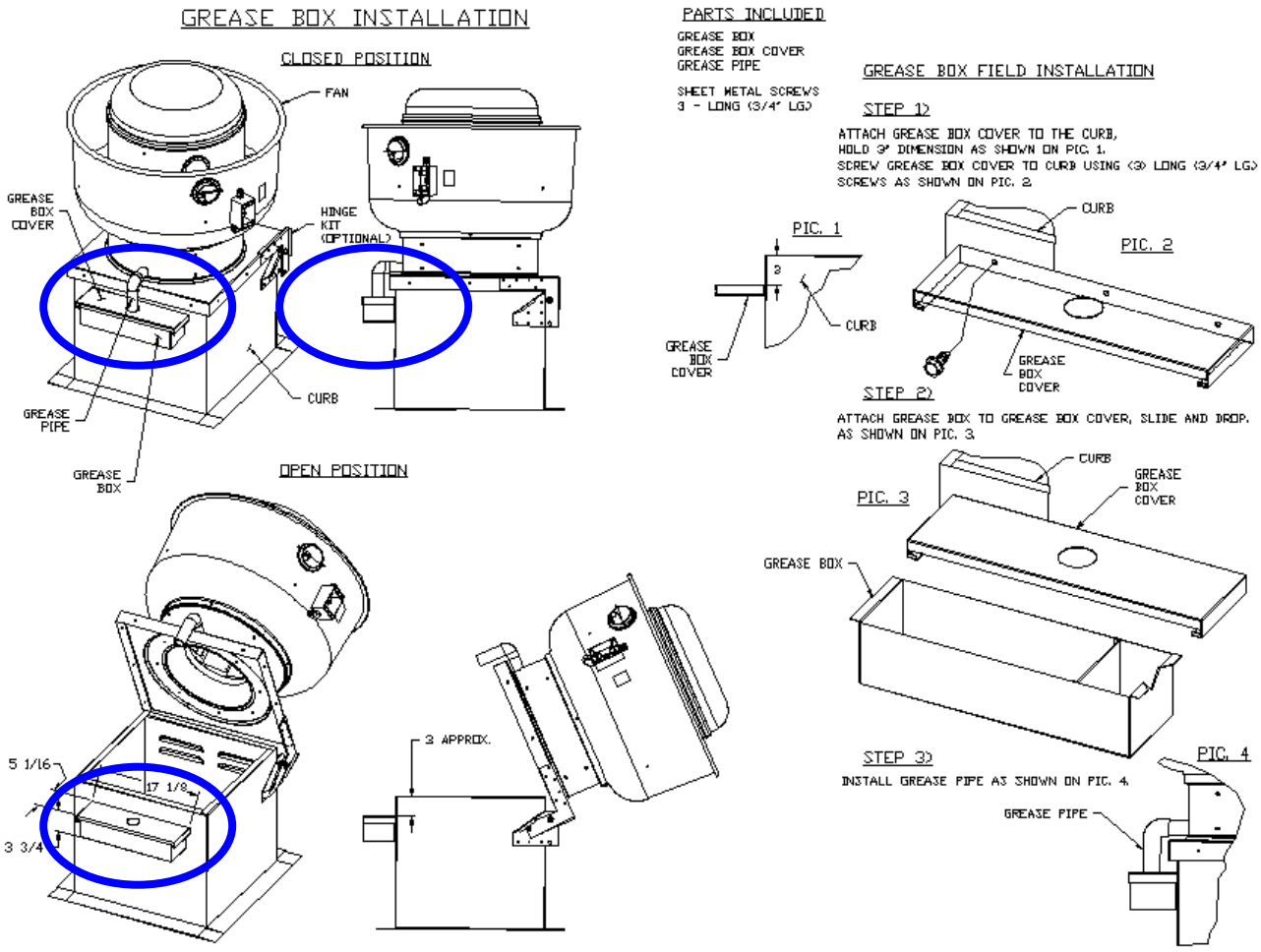
Implementing the BMPs is a source control measure will address overflows, slowdowns blockages attributable to FOG, and reduce the City's sewer maintenance costs attributable to FOG that is discharged by FSEs.

BMPs have established the frequency required for checking and cleaning these devices. BMP's also provide guidance for businesses and FSE in reducing discharges stormwater collection system.

BMPs are for the protection of the collection system, reducing City's sewer maintenance costs and providing environmental sound and economically responsible sewer service in our service area.

Kitchen exhaust Fan

BMP	*background*
Food service establishments must adhere to the cleaning frequency for kitchen exhaust hoods as outlined in the NFPA Table 11.3 **Type or Volume of Cooking**----------**Frequency** Systems serving solid fuel cooking operations----------**Monthly** Systems serving high-volume cooking operations--------**Quarterly** such as 24-hour cooking, charbroiling, or wok cooking. Systems serving moderate-volume cooking----------**Semiannually** operations. Systems serving low-volume cooking operations----------**Annually** such as churches, day camps, seasonal businesses, or senior centers.	*Kitchen exhaust hoods require periodic cleaning. Requirement are identified in the National Fire Protection Association, (NFPA) 96 Fire Codes Table 11.3 (see left) Public Works follows the cleaning frequency as specified in table 11.3 of the NFPA 96 codes.* *Cleaning may be specified as monthly, quarterly, semi annually or annual cleaning depending on the type of cooking.*
During the exterior cleaning process, any discharge of cleaning solution, rinse water or material to the roof surface or building gutters is prohibited.	*A collection system for the cleaning water and trained personnel must be used to prevent the accidental discharge or leaking of cleaning solutions from this procedure to the buildings roof or gutters.*
In between the required kitchen exhaust fan cleaning, the roof grease collection trays must be checked to ensure they do not overfill. Grease collection tray must be securely attached to the fan housing, covered and have a spout directing collected grease/oil into the covered collection tray.	*Grease collection trays are used to collect fugitive grease/oil discharge from the kitchen exhaust fan. Grease tray must be securely attached to the fan housing, covered to protect from the weather and have a downspout directing the material into the collection container.*
Contractors used for kitchen exhaust hood cleaning must be trained and have current certificates of training for exhaust hood cleaning.	*Copies of Training Certificates should be available upon request.*
The contractors invoice used for cleaning kitchen exhaust hoods, must note that the exterior grease collection tray was cleaned, securely fastened, covered to prevent rainfall intrusion and has a downspout present for routing fugitive grease into the grease collection tray.	*Roof grease collection trays must also be cleaned at the time of the hood cleaning and checked periodically.*
Contractors must maintain a current City of Davis business license and provide a copy with their cleaning invoice. Contractors must provide copy of their current, valid training certificate specializing kitchen exhaust cleaning	*Receipts from cleaning must be available upon request.*
Maintain records of cleaning/maintenance 3 years.	

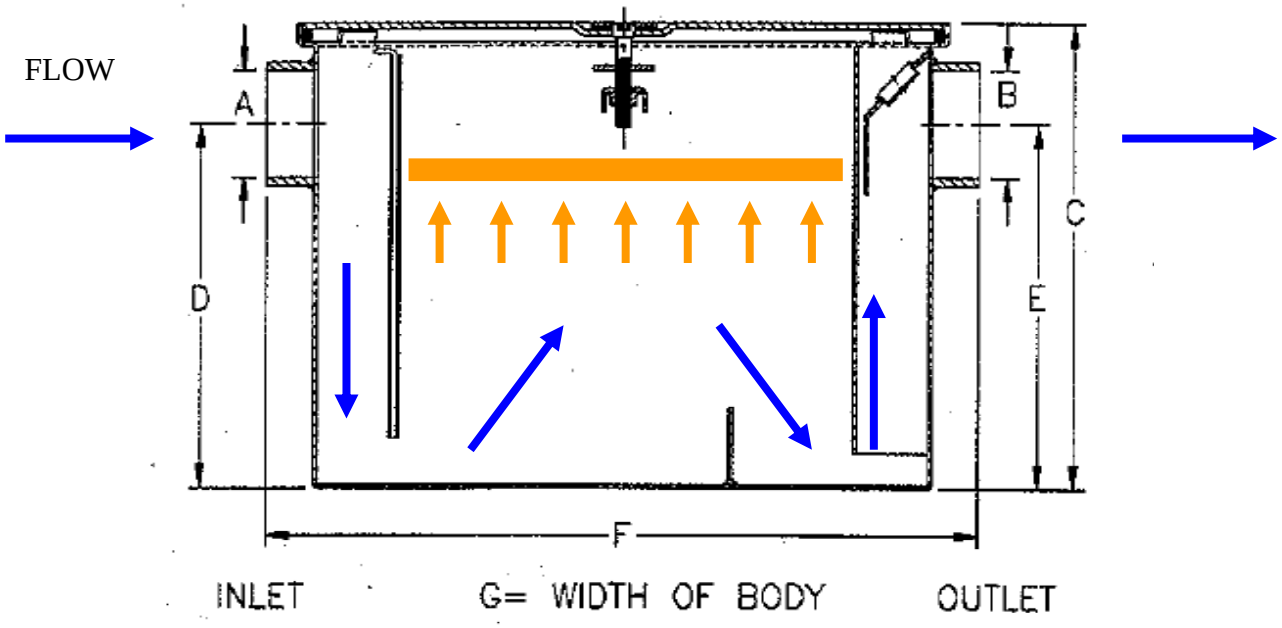


Example of one style of a grease collection tray on a kitchen exhaust fan.

Grease Trap maintenance

(Example cross-section & images below)

BMP	*background*
GREASE TRAP Grease traps must remain readily accessible for checking, cleaning or maintenance at all times.	*Cleaning and checking should be easy to accomplish and will be more readily done if trap is accessible. Complete and frequent cleaning will keep down odors from trap. Trap must not have material, kitchen utensils, soap containers etc on or blocking easy and frequent access for cleaning or checking the device in any manner.*
At a minimum, any size of grease *Trap* must be checked weekly.	*This reduces amount of grease entering the drain and protects sewers from grease blockages and overflows. Prevent City of Davis sewer use violations for improperly maintained Grease traps are smaller then interceptors and require frequent servicing. You may train staff to clean a trap and save the cost of a private contractor. City staff will demonstrate the correct method for cleaning traps.*
Any chemical/bacteriological additives to a grease interceptor are prohibited	*Emulsifiers, degreasers, bio-additives or solvents will cause grease to be carried through the trap into the building laterals or sanitary sewer where it will re-solidify and may cause blockages, slowdowns or overflows.*
Dishwashers/garbage disposal may not be discharged into a grease *Trap*.	*Dishwasher water temperature will dissolve and emulsify grease in a trap and wash out into the buildings laterals. Material from a garbage disposal will quickly fill a grease trap reducing efficiency.*
Establish a log of checking the trap and maintain records of cleaning/maintenance for 3 years.	*Required by City Sewer use ordinances*

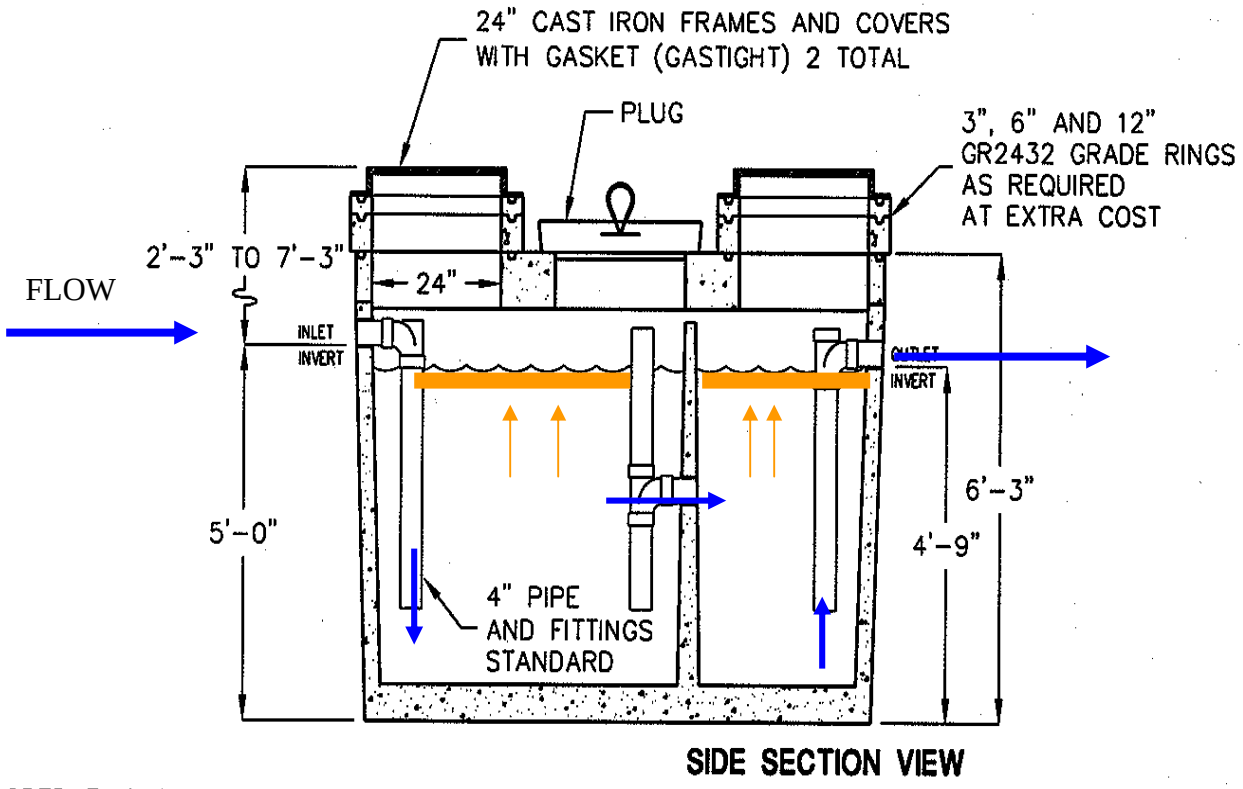


Example of a under counter style grease trap.

Grease Interceptor maintenance

(Example diagram below)

BMP	*background*
GREASE INTERCEPTOR At a minimum, grease interceptors must be checked monthly. City staff can assist in determining the frequency of cleaning needed in order to minimize the cost associated with cleaning the in-ground interceptors. Interceptor cleaning is required before it reaches 25% of its hydraulic capacity in the 1st stage from the accumulated grease/sludge.	*Inspect cleaning to ensure a complete job has been done by the contractor.*
Influent and effluent tees must be checked at each cleaning and noted as intact on the vendor's invoice.	*Cleaning contractor must indicate where they disposed of the material on the invoice*
Any chemical/bacteriological additives to a grease interceptor are prohibited.	*Do not use emulsifiers, degreasers, bio-additives or solvents in interceptors. Use of these agent cause grease to be carried into the sewer lines where it will solidify.*
Use companies that maintain a current City of Davis business license.	*Required by City municipal codes*
Establish a log of checking the interceptor and maintain records of cleaning/maintenance for 3 years.	*Required by City Sewer use ordinances*



SIDE SECTION VIEW

OPERATING CAPACITY: 1,000 GALLONS.

Trash enclosures

BMP	*background*
"Article 4, California Retail Food Code July 20, 2007 114245.1. **a)-**All refuse, recyclables, and returnable shall be kept in nonabsorbent, durable, cleanable, leak proof and rodent proof containers and shall be contained to minimize odor and insect development by covering with close-fitting lids or placement in a disposable bag that is impervious to moisture and then sealed. **d)-**Storage areas, enclosures, and receptacles for refuse, recyclables, and returnable shall be maintained in good repair. **e)-**Refuse, recyclables, and returnable shall be removed from the premises at a frequency that will minimize the development of objectionable odors and other conditions that attract or harbor insects and roaches."	*Public Works adopts the current established California Retail Food Codes June 2007- 114245.1 section a), d), e) for trash enclosures cleanliness.*
Pressure washing/rinsing of the trash enclosure or trash containers and discharging to the storm drain system is prohibited.	*Dry sweep and mop enclosure as necessary. Wipe down outside of container by hand.* *Train staff to exercise care when disposing of material in trash container to prevent spills or drips in, on or around trash container.* *Prevention of odors, vermin, insect, roach habitat. Prevent of visual distraction of customers.*
Container lids must be tight fitting and remain operational at all times. Do not fill containers to the point where the lids will not close.	*Call Davis Waste Removal company for replacement or repair if damaged. 756-4646*
Outside trash container must be watertight and leak proof.	*Liquid waste cannot be disposed of into trash containers.*

Exterior surface cleaning

BMP	*background*
Soap free & chemical free wash-water from sidewalk and Plaza cleaning may be discharged to the storm drain system provided the area(s) has been pre-swept and is free from visible significant pollutants.	*These exceptions are only available when discharges would not violate water quality standards and landscape disposal is not available.*
Soap free wash-water from exterior building washing or seating free from loose paint, may be discharged to the storm drain system when disposal to landscaping is not available.	*Copies of Training Certificates should be available upon request.*
Contractors / staff used for surface cleaning must be trained and have current certificates of training for surface cleaning (example below). Training is available on-line from BASMAA website.	*A 30-minute online pollution prevention training for surface cleaners is available at http://www.basmaa.org/*
Use only contractors that maintain a current City of Davis business license.	*Discharge should not wash material existing in gutter system into the storm drain inlets.*

Bay Area
Stormwater Management
Agencies Association

CERTIFICATE OF TRAINING

Kirk Freeman

a **Recognized Surface Cleaner**
agrees to follow, to the greatest practical extent, pollution prevention practices including techniques for proper cleaning and wash water disposal, as described in the BASMAA surface cleaners training program.

Training date: 4/7/2010

Training certificate expires: 4/7/2011

Training certificate number: 597

Dale Bower
Urban Runoff Program
Manager, CRWQCB San
Francisco Bay Region

Geoff Brosseau
Executive Director, Bay Area
Stormwater Management
Agencies Association

Kitchen mats

BMP	*background*
Kitchen mats may not be cleaned or rinsed outside where waters will discharge to the surface pavement, sidewalks, storm drains, streets, parking areas or gutters. Mats should be wash/cleaned at a mop closet, utility sink or possibly a coin operated wash.	*Prevent storm water violations with the City of Davis.* *It is a violation of State Health Codes to wash any mat in any food preparation sink.*

Kitchen Practices

BMP	*background*
Use water temperatures less than 140^0F for washing kitchen utensil in sinks/ triple sinks.	*Temperatures above 140^0 will dissolve grease. Grease may then cool and solidify in the building lateral or in the sewer system..*
Dry scrape/wipe cooking utensil, plates, food containers first, then pre-rinse and clean.	*"Dry scrape/wiping" will reduce the grease loading and solids material being discharged into a grease removal device and the sewer system.*
Dispose of spent greases, oils or meat drippings in a covered rendering bin.	*Pressure washing of rendering container and discharging to the storm drain system is prohibited.* *Use absorbent, dry sweep and mop as necessary. If needed, wipe down outside of container by hand.* *Reduce cleaning requirements and potential cleanup Orders by properly training staff to exercise care when disposing of material in container to prevent spills or drips in, on or around rendering container.*
Maintain an accessible spill kit(s) for oils/liquids at strategic locations within the kitchen area.	*Use a dry cleanup method such as cat litter or paper towels to pick up oil and grease spills before mopping.*
Fine mesh drain screens shall be used in all floor sinks receiving indirect waste from sinks, triple sinks, prep sinks mop sinks, or the like and capable of trapping particle greater then $1/16^{th}$ of an inch in any direction.	*Screens trap particles of food waste to prevent discharging to the building sewer laterals. Screens are available at most restaurant supply stores.*

Definitions

Best Management Practices (BMPs) – Practices that will help to reduce the quantity of fats, oil and grease discharged to grease removal devices from food handling operations.

Sanitary sewer – The sewer owned and operated by the City.

Fats, Oil, and Grease (FOG) – Fats, oil and grease generated from food preparation, food service, and kitchen clean up. Most types of restaurant and food service establishment generate FOG.

Food Service Establishment (FSE) – Includes but is not limited to any facility preparing and/or serving food for commercial use or sale. This includes restaurants, cafes, lunch counters, cafeterias, hotels, hospitals, convalescent homes, factory or school kitchens, catering kitchens, bakeries, grocery stores with food preparation and packaging.

Grease removal device (GRD) – a generic term for a grease interceptor, grease trap.

Grease interceptor – A large, partitioned vault made of various materials, installed to remove grease and food waste by trapping floatable and settleable solids so that they can be separated and removed before discharge to the community sewer. It is usually installed underground, outside of the establishment.

Grease trap – A device designed to retain grease before it enters sewer/building laterals. It is usually installed indoors in kitchen floors or under counters.

Permit Holder – Owner or operator of the food service establishment were the Pollution Prevention Permit was issued.

Public Works Department – A department within the City that is responsible for maintenance, operation and repair of the all public utilities with the City's limits.

Service Area – Area served by City's sanitary sewer.

Attachment 7-4

Best Management Practices Table

BMP's	REASON FOR	BENEFITS
Train all staff on BMPs	People are more willing to support an effort if they understand its basis	Trained staff will be more likely to implement BMPs and work to reduce grease discharges to the sewer.
Post "No Grease" signs above sinks and on the front of dishwashers.	Signs serve as a constant reminder for staff working in kitchens.	Reminders help minimize grease discharge to the sewer or grease removal device.
Check grease interceptor solids depth routinely. The combined thickness of the floating grease and the bottom solids should not be more than 25% of the total interceptor depth.	Grease interceptor will not meet performance standards when solids and floating grease levels exceed 25%	This will keep grease interceptor working at peak performance.
Collect and recycle waste cooking oil.	These actions reduce grease loading on grease removal devices and the sewer.	This will reduce cleaning frequency and maintenance costs for grease removal devices and reduce the amount of grease entering the drain.
"Dry wipe" pots, pans, and kitchen equipment, before cleaning.	"Dry wiping" will reduce the grease loading on grease removal devices and the sewer.	This will reduce cleaning frequency and maintenance costs for grease removal devices and reduce the amount of grease entering the drain.
Maintain a routine grease trap cleaning schedule.	If grease traps are not routinely cleaned, they do not work properly and do not prevent grease from entering the sewer. If the grease trap is not providing adequate protection, a grease interceptor may be required.	This reduces amount of grease entering the drain and protects sewers from grease blockages and overflows.
Use absorbent paper under fryer baskets.	This reduces the amount of grease during cleanup.	This reduces amount of grease entering the drain and protects sewers from grease blockages and overflows.
Use absorbents such as cat litter or paper towels to pick up oil and grease spills before mopping.	Decreases the amount of grease that will be put down the drain.	This reduces amount of grease entering the drain and protects sewers from grease blockages and overflows.
Do not use emulsifiers or solvents other than typical dishwashing detergents.	Emulsifiers and solvents will break down grease causing a problem in the sewer downstream.	Allows for proper removal of grease.

Attachment 7-5

Best Management Practices Highlights

Food Service Establishments

Best Management Practice

Highlights Only

In-ground grease interceptors

Check interceptor every 3 months. If greater then 25 % full, interceptor needs cleaning.

Check your interceptor after cleaning for the thoroughness of your cleaning service.

Public Works will provide assistance for checking or to determine if cleaning is needed call 757-5686 to schedule a time.

Under-counter grease traps

Establish an initial daily or weekly internal check to gauge grease accumulation.

Determining the frequency for cleaning. Daily once a week etc.

If greater then 25 % full of grease, trap needs cleaning.

Dispose of the removed material properly.

Public Works staff will demonstrate cleaning and checking procedures for you, please call 757-5686 to schedule a demonstration.

Kitchen mats

Kitchen mats must be cleaned/rinsed at a utility sink, mop closet, car wash etc.

It is never permissible to wash outside, at sidewalks, in the parking lot, back door or at the trash enclosures etc.

Kitchen exhaust hoods

Follow current Fire Codes for hood cleaning frequency.

Periodically check grease collection tray on the exterior exhaust hood for fullness.

Check your exhaust hood after cleaning for thoroughness of the service.

Public Works staff will demonstrate grease tray checking procedures, please call 757-5686 to schedule a demonstration.

Trash enclosures

Do not dispose of any liquids in the trash container(s).

Trash containers must be covered when not in use.

Train employees to exercise care when they are disposing of refuse to prevent spills etc

It is not permissible to power wash trash container or trash enclosure, only dry sweep, mop and/or wipe down exterior surfaces.

Damaged containers may be replaced by calling Davis Waste Removal @ 756-4646.

Attachment 7-6

Grease Trap Maintenance

FOOD SERVICE ESTABLISHMENT

How to maintain a under-counter grease trap

City of Davis
Public Works Department

Background

Maintenance staff or other employees of the food service establishment (FSE) may perform grease trap cleaning. The City *does not* require you to use an outside contractor to provide this service.

At a minimum, an FSE must clean/check their trap weekly, or sometimes even daily depending on the size and load to the trap. At no time may the trap be more than 25% full of grease, oil and /or solids. When performed properly and at the appropriate frequency, grease trap maintenance can greatly reduce the discharge of fats, oil and grease to the building lateral and the City's wastewater collection system. Frequent cleaning will also reduce the odor associated with these devices. Use of chemical/biological additives in the trap is prohibited, as is the use hot water, acids, solvents, caustics or emulsifying agents to help keep the trap clean.

Maintenance Instructions

Prepare ahead, a little preparation will save you time and an extra mess to clean up.

1. Spread multiple layers of newspaper on the floor next to the trap to place a plastic bucket on. The paper will catch drips/spills. In addition, protect another area with newspaper where you plan to place and clean the grease trap lid and the internal baffle(s).
2. Locate your plastic gloves, a scoop for grease removal, a putty knife or scraper for the sides and a container to scope the water.
3. Open a medium to heavy weight plastic bag and place it inside a 5-gallon plastic bucket. Drape the excess plastic bag over the sides. Place some type of absorbent material in the bottom of the bucket, inside the plastic bag. The material will absorb the oil/grease/water mixture when you remove it from the trap.

* Liquid material is prohibited from being disposed of in the trash containers.

Cleaning

1. Most material will float and congeal on the surface, or it will settle to the bottom of the trap. Clean the floating surface material first, and then remove any built up grease on the side(s) of the trap.
2. Bail out remaining water in the trap to facilitate cleaning the bottom and submerged sides. The "water removed" may be held in another container and discharge back to the system once the trap has been cleaned. Alternatively, water may be absorbed with sufficient amounts of absorbent (i.e. kitty litter) and disposed of in the trash container with the grease. Some of the grease removed may be recyclable, check with your rendering service to verify. (remember liquid material is prohibited from being disposed of in the trash containers)
3. Observe how the interior baffles are orientated and how they can be replaced, this will ensure the baffles will be replaced in the same manner.
4. Remove the baffles if possible.
5. Clean the inside of the trap and its components. Scrap sides, the bottom, the influent and effluent pipes as necessary to remove. Dispose of this material to the 5-gallon bucket with the other congealed surface grease mixture.
6. Clean interior baffles, the trap lid and any parts that you removed.
7. Clean the exterior of the trap and the surrounding area. Check the lid gasket. Replace or repair as necessary. A clean exterior will make it more inviting to routinely service the trap for you / staff next time.
8. Replace interior baffles; inspect to ensure re-assemble is correct. Replace lid and secure.
9. Pickup newspaper and place in plastic bag. Seal and carry to the trash container in the bucket and dispose off.
10. Clean dedicated tools, store scraper, putty knife, absorbent material and paper in dedicated 5-gallon bucket for use next time.
11. Record maintenance date.

Attachment 7-7

Food Service Establishment Frequently Asked Questions

FOOD SERVICE ESTABLISHMENTS

Frequently asked questions

City of Davis
Public Works Department

Frequently Asked Questions

How often must I clean/check my grease trap or interceptor?

Your under-counter grease trap should be checked weekly to establish a frequency of cleaning needed for your cooking type and customer load. Grease traps must never be more than 25% full of congealed grease, oil or sludge material. Your in-ground interceptor should be checked monthly to determine the cleaning frequency needed. As with traps, your interceptor can never be more than 25% full for grease, oil or sludge in any stages. City staff can assist you in determining the frequency needed.

Can I apply for a variance for my grease interceptor/trap cleaning/pumping frequency?

The City does not have a variance for cleaning. The City allows the individual food service establishment to set their cleaning scheduled based on their individual use, cooking type and customer loading. In any case traps/interceptors can never be more than 25% full of grease, oil sludge in any of its stages.

If requested, City staff will demonstrate how to clean a under-counter trap which would save your restaurant the cost of an outside contractor.

How often will my facility be reviewed?

1 or 2 times per year or as often as necessary to ensure proper maintenance is being applied to all grease pretreatment systems, exhaust fan grease collection tray(s), mat cleaning process, trash enclosures and kitchen BMP practices. You may or may not be informed ahead of time when a review is scheduled.

What will the inspector look for and do?

The inspector will open and inspect the grease trap or interceptor and may request to see all records pertaining to the maintenance and repair of the device. He will ask questions to ascertain whether procedures outlined in the “Best Management Practices” manual have been implemented. City staff will look at the kitchen exhaust fan on the roof and trash enclosure. Any findings from the review will be noted by the inspector and you will receive a written notice of the findings and the required corrective actions, if any.

What records do I need to keep?

Receipts/dates your trap/interceptor was cleaned, dates of exhaust hood cleaning.

How do I get help

Call Public Works front counter at 757-5686 and staff will direct your call.

What will this cost me?

The City does not charge for these services as long as BMPs are followed corrections are completed as agreed on.

How long do I have to make corrections?

Staff will allow ample time to complete corrections.

Attachment 7-8

Environmental Compliance Review Documents

City of Davis Public Works Department

Food Service Establishment

GBA - GENERAL 1

Date Inspected:		Inspected By:	*K Freeman*	Name and Address	

[PHOTO]

Contact:	Facility seats:
Phone:	Days: ☐M ☐T ☐W ☐ TH ☐F ☐S ☐S
Staff:	Hours:
Food:	DI:

Grease Interceptor ☐ Grease Trap ☐ Brand name:

Temperature F^0 -- pH su --

Is there damage, corrosion or modifications to the GRD?

Garbage Disposal to GRD? Yes ☐ No ☐ How determined?

Dish washer to GRD? Yes ☐ No ☐ unknown ☐

Is there a flow control fitting on the grease trap. Yes ☐ No ☐

Does the GRD need cleaning? Yes ☐ No ☐

Trap/Interceptor cleaning frequency: Company:

Additives used in Trap/Interceptor? Yes ☐ No ☐ type

Have there been sewer blockages at this address? Yes ☐No ☐ Date? --

Does the restaurant clean/inspected their GRD? Yes ☐ No ☐ --

Is there a sampling box or manhole for the grease removal device? Yes ☐ No ☐

(Diagram of GRD) See attached specification sheets
GRD sizing and capacity. x x = gpm

Intentionally left blank	*Intentionally left blank*
Intentionally left blank	Kitchen mat cleaning Frequency: -- company: -- where: --

Intentionally left blank	Rendering pick-up frequency: company:
Intentionally left blank	Salt Softener Y ☐ N ☐ ☐Timed ☐ Demand Service company Ion exchange Y ☐ N ☐ Service company: Ice treatment:
Intentionally left blank	*Intentionally left blank*
Exterior exhaust hood company: grease box? covered? full?	

Intentionally left blank	*Intentionally left blank*
Intentionally left blank	Dumpster Area Covered trash receptacle Y ☐ N ☐ Area housekeeping --
Triple sink ( ) @ x x w/ inch drain **Single sink** ( ) @ x x w/ inch drain **Floor sinks** ( ) @ x x w/ inch drain **Hand sink** ( ) @ x x w/ inch drain **Floor drains** ( ) w/ inch drain **Mop sink/closet** ( ) @ x x w/ inch drain **Coffee/drink station** ( ) @ x x w/ inch drain **-OTHER- (wok stove, buffet table etc)** ( ) @ x x w/ inch drain	
	Interior exhaust hood cleaning Frequency: Company:

Cleaning & Maintenance

Exterior building	frequency:	Company: --
Outside eating areas	frequency:	Company: --
Carpet cleaning	frequency:	Company: --
Cooling tower	frequency:	Company: --
Landscaping	frequency:	Company --

- ☐ Partners for a Greener Davis
- ☐ BMP Surface Cleaners
- ☐ Sizing Requirement Grease Trap
- ☐ GRD Maintenance Log
- ☐ Plate scrapper
- ☐ BMP Restaurant Practices
- ☐ BMP Grease Removal Device(GRD)

Exit interview inspection findings and comments

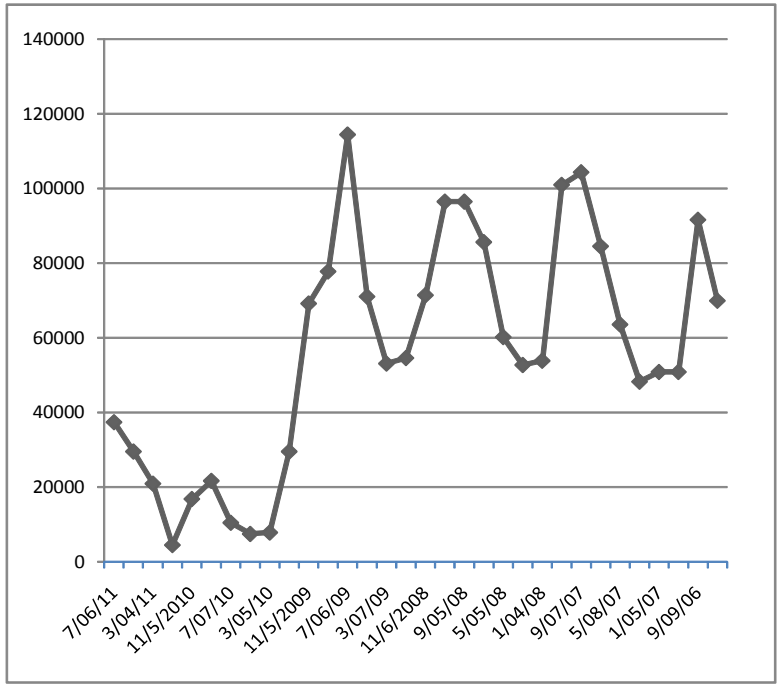
1.

2.

3.

Gallons per Day

day	ccf	days	gal	
7/06/11	100	62	74800	
5/05/11	79	62	59092	
3/04/11	56	58	41888	
1/05/11	12	61	8976	
11/5/2010	45	62	33660	
9/04/10	58	59	43384	
7/07/10	28	62	20944	
5/06/10	20	62	14960	
3/05/10	21	59	15708	
1/05/10	79	61	59092	
11/5/2009	185	62	138380	
9/04/09	208	60	155584	
7/06/09	306	60	228888	
5/07/09	190	61	142120	
3/07/09	142	58	106216	
1/08/09	146	63	109208	
11/6/2008	191	62	142868	
9/05/08	258	64	192984	
9/05/08	258	64	192984	
7/03/08	229	59	171292	
5/05/08	161	60	120428	
3/06/08	141	62	105468	
1/04/08	144	58	107712	
11/7/2007	270	61	201960	
9/07/07	279	63	208692	104346
7/06/07	226	59	169048	84524
5/08/07	170	68	127160	63580
3/01/07	129	55	96492	48246
1/05/07	136	60	101728	50864
11/6/2006	136	58	101728	50864
9/09/06	245	65	183260	91630
7/06/06	187	62	139876	69938



8 System Evaluation and Capacity Assurance Plan

A System Evaluation and Capacity Assurance Plan (SECAP) was developed and finalized in April 2009 (**Attachment 8-1**). In August 2009, the City completed an Infiltration/Inflow evaluation to calibrate the sewer spreadsheet model and determined that the City had adequate capacity. Updates are performed as necessary to keep all evaluations current.

Attachment 8-1

System Evaluation and Capacity Assurance Plant (SECAP)

Report

System Evaluation and Capacity Assurance Plan – Needs Assessment

Prepared for

City of Davis

1717 5th Street

Davis, CA 95616

April 2009

4010 Lennane Drive
Sacramento, CA 95834

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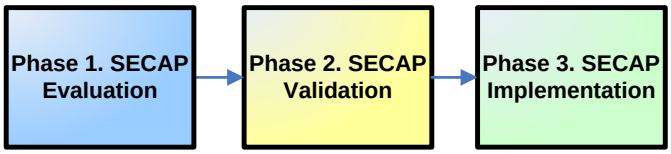
Executive Summary

This document presents the City of Davis' (City) Sewer Capacity Evaluation and Assurance Plan (SECAP) required as part of the state's Sewer System Management Plan (SSMP) regulations. The SECAP has been divided into 3 phases shown to the right.



Evaluate the City's current hydraulic models, historical SSO & identify tactical plans for future

Wet weather flow monitoring in 2009 – 2010 to validate actual flows & capacities

Rehabilitate or replace sewers to provide adequate capacity (if needed)

Evaluation results

- City's design standards meet capacity requirements
- Historical Sanitary Sewer Overflows (SSO) indicates that capacity is not an issue.
- The City's spreadsheet hydraulic model indicates that the City's main trunks have adequate capacity to accommodate peak flows.
- The Waste Discharge Requirements (WDRs) require the City select a design storm event. The City's data suggests the City can pass well over a 10 –year event.

Hydraulic analysis indicate that the City's main trunks have adequate capacity to handle the peak flows.

Recommended next steps

- The City should validate peak flows by performing a wet weather flow monitoring program.
- The City should prioritize its sewer collection system assets by risk.
  - Identify impact of failures of assets.
  - Identify probability of failure of assets by condition assessment and reviewing system reliability.
- Depending on the results, the City may need to implement capital improvement projects to increase sewer capacity or further reduce I&I.

The City is unable to validate its projected peak flows due to the lack of larger storm events in recent years.

Schedule

SECAP Phases	Start	End
Phase 1 – SECAP Evaluation	Aug 2008	Apr 2009
Phase 2 – SECAP Validation	Monitor during wet winters	Monitor during wet winters
Phase 3 – SECAP Implementation	As Needed	As Needed

Introduction

In 2007, the City of Davis (City) submitted its Sewer System Management Plan (SSMP) Workplan to allow the City to reduce Sanitary Sewer Overflows (SSOs) and comply with the State of California's General Waste Discharge Requirements (GWDR). One of the required SSMP elements was to complete a System Evaluation and Capacity Assurance Plan (SECAP) by August 2009. The City periodically experiences SSOs within the collection system. The purpose of the City's SECAP is to evaluate collection system capacity and develop a SECAP implementation plan to further minimize SSOs.

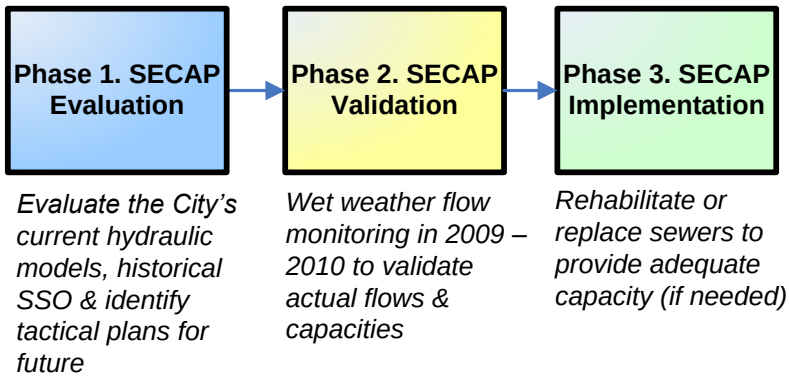
The two primary variables that affect the collection system capacities are:

1. Increased sanitary flow from City growth
2. Infiltration and Inflow (I/I)

> *General Plans: Concern about this growth rate was expressed by the electorate in June 1986, when 58 percent of those voting approved an advisory measure calling for Davis* ***"to grow as slow as legally possible."***

The City's 2010 General Plan's vision expects continued slow growth. With the exception of some infill projects and changes in existing land uses, the City doesn't expect significant new annexations. This current SECAP is required to be updated when the City updates it General Plans for beyond 2010. As shown in Figure 1, the focus of the City's SECAP is on the aging collection systems that are experiencing more I/I, which reduces the sewer capacities and could potentially cause SSOs. In a second phase, the City will validate the impacts of the I/I by measuring flows at key locations within the collection system. If required, a third phase will recommend rehabilitation or replacement of the collection systems to reduce I/I.

FIGURE 1. PHASED SECAP IMPLEMENTATION ALLOWS THE CITY TO CONFIRM AND MITIGATE CAPACITY REQUIREMENTS



Regulatory Context

The State Water Resources Control Board (SWRCB) defines a SECAP in Order No. 2006-0003 Section D.13. (viii), "***System Evaluation and Capacity Assurance Plan**: The Enrollee shall prepare and implement a capital improvement plan (CIP) that will provide hydraulic capacity of key sanitary sewer system elements for dry weather flow conditions, as well as the appropriate design storm or wet weather event. 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 from the system) associated with conditions similar to those causing overflow events, estimates of the capacity 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 shall include an implementation schedule and shall 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 shall be reviewed and updated consistent with the SSMP review and update requirements as described in Section D.14."*

Evaluation

Purpose

The purposes of this section are to evaluate the City's historical SSOs that are caused by hydraulic deficiencies in the collection system, review City's hydraulic model and identify the sources of the peak flows.

Historical Sanitary Sewer Overflows

A sanitary sewer overflow (SSO) is any overflow, spill, release, discharge, or diversion of untreated or partially treated wastewater from a sanitary sewer system. The State Water Resources Control Board (SWRCB) now requires each City to report SSOs into one of two categories.: Category 1 SSOs are categorized as "*(1) a discharge of sewage which equals or exceeds 1000 gallons, or (2) a discharge of sewage to a surface water and/or drainage channel, or (3) a discharge of sewage to a storm drain that was not fully captured and returned to the sanitary sewer system.*"

Beginning November 2007, the City has been required to document and enter all SSOs into the State's California Integrated Water Quality System (CIWQS). Prior to Nov 2007, the City had kept track of SSOs but did not consistently document the causes of the SSOs. Table 1 presents SSOs reported between November 1, 2007 and March 26, 2009.

TABLE 1. HISTORICAL SSO NOV 2007 – MAR 2009 INDICATE THAT SSO ARE NOT CAUSED BY CAPACITY DEFFICIENCIES

EVENT ID	SSO Cat	Start Date	SSO Address	SSO Vol	Vol of SSO Recovered	SSO Failure Point	Cause
734868	2	3/4/2009	945 Cypress	10	10		Grease
734424	2	1/20/2009	1012 J	38	38		Roots
734421	2	1/15/2009	433 F	20	20		Roots
734420	2	1/15/2009	122 B	50	50		Pipe structure
732662	2	1/12/2009	1333 Arlington	50	50		Grease
732661	2	1/9/2009	240 G	30	30		Grease
732660	2	12/29/2008	1423 Cornell	6	6		Roots
732659	2	12/26/2008	130 G	30	30	Lower Lateral	Grease
731335	2	12/22/2008	1107 Ovejas	20	20	Lower Lateral	Roots
731334	2	12/11/2008	725 Sycamore	2	2	Lower Lateral	Roots
729941	2	11/5/2008	1791 Oak	50	50	Lower Lateral	Roots
710513	2	11/1/2007	44076 El Macero	380	380		Roots

Between November 2007 and March 2009, the City experienced 12 SSOs where all were Category 2 SSO. The causes for the SSO are roots (7), grease (4) and pipe structural failure (1). Although the City has experience below average rainfall between 2007 and 2009, capacity did not cause any SSOs during this period. Based on the historical SSO data, one could conclude that the City's collection system doesn't have any hydraulic deficiencies.

Between 2007 – 2009, the City did not have any SSOs that were caused by capacity deficiencies.

Conclusion: Capacity limitations have not caused any SSOs between 2007 – 2009.

Hydraulic Analysis

The City currently uses a spreadsheet model to analyze its sewer capacity. The model provides an average dry weather flow based on the land use type within designated areas of the City. Table 2 shows the 17 different segments created with their associated dry weather and peak weather flows. The assumptions used for the spreadsheet model are as follows:

- 85 gal/cap-day
- 2.71 People/Du-sf
- 600 gal/ac-day (I/I) allowance
- 1500-2500 gal/ac-day commercial allowance

TABLE 2. CITY'S SPREADSHEET HYDRAULIC ANALYSIS

Area	Description	Area Type	Du	Area (Ac)	# People	Flow Calculations - Side Lateral ADF				Total Area	Total People	Flow Calculations - Trunk Main ADF			
A.	Stonegate and West	Res.-SF	1,120	252	3,035	0.258	**PF =**	2.23	15" @	252	3,035	0.258	**PF =**	2.23	18" @
	Manor	Res.-MF	1,200	55	3,252	0.276	**PDWF =**	1.233	0.150%	55	3,252	0.276	**PDWF =**	1.233	0.180%
1,500	*gal/ac-day(Commercial)*	Comm.		13	n/a	0.020	**I/I =**	0.192	VCP	13	n/a	0.020	**I/I =**	0.192	VCP
		School	-	-	-	-	**PWWF =**	1.425	n= 0.012	-	-	-	**PWWF =**	1.425	n= 0.012
		1,120	1,200			0.553	Cap =	1.75	81%	320	6,287	0.553	Cap =	3.12	46%
B.	Village Homes and east	Res.-SF	1,154	236	3,127	0.265	**PF =**	2.26	12" @	488	6,163	0.523	**PF =**	2.10	24" @
	to Hwy 113 & Aspen	Res.-MF	638	32	1,729	0.147	**PDWF =**	1.069	0.280%	87	4,981	0.423	**PDWF =**	2.159	0.090%
1,500	*gal/ac-day(Commercial)*	Comm.		19	n/a	0.028	**I/I =**	0.186	VCP	32	n/a	0.048	**I/I =**	0.378	RCP
		School	-	23	2,150	0.032	**PWWF =**	1.255	n= 0.012	23	2,150	0.032	**PWWF =**	2.537	n= 0.013
		2,274	1,838			0.473	Cap =	1.32	95%	630	11,144	1.026	Cap =	4.38	58%
BE.	Evergreen (some Future)	Res.-SF	358	47	970	0.082	**PF =**	2.49	12" @	535	7,133	0.605	**PF =**	2.07	24" @
		Res.-MF	360	39	976	0.083	**PDWF =**	0.429	0.280%	126	5,957	0.506	**PDWF =**	2.486	0.090%
1,500	*gal/ac-day(Commercial)*	Comm.		5	n/a	0.008	**I/I =**	0.054	VCP	37	n/a	0.055	**I/I =**	0.432	RCP
		School	-	-	-	-	**PWWF =**	0.483	n= 0.012	23	2,150	0.032	**PWWF =**	2.918	n= 0.013
		2,632	2,198			0.173	Cap =	1.32	37%	721	13,089	1.198	Cap =	4.38	67%
Sut	Sutter Hospital, Binnings, &	Res.-SF	153	115	415	0.035	**PF =**	2.54	12" @	649	7,547	0.641	**PF =**	2.05	24" @
	No. Davis Mdws #1, #2	Res.-MF	-	-	-	-	**PDWF =**	0.344	0.280%	126	5,957	0.506	**PDWF =**	2.739	0.090%
2,500	*gal/ac-day(Commercial)*	Comm.		40	n/a	0.100	**I/I =**	0.093	VCP	77	n/a	0.155	**I/I =**	0.525	RCP
		School	-	-	-	-	**PWWF =**	0.437	n= 0.012	23	2,150	0.032	**PWWF =**	3.264	n= 0.013
		2,785	2,198			0.135	Cap =	1.32	33%	875	13,504	1.334	Cap =	4.38	74%
D.	Portion of Senda Nueva	Res.-SF	213	36	577	0.049	**PF =**	2.54	12" @	685	8,125	0.690	**PF =**	2.04	24" @
	(incl No Davis Farms)	Res.-MF	292	35	791	0.067	**PDWF =**	0.341	0.150%	161	6,748	0.573	**PDWF =**	2.987	0.090%
1,500	*gal/ac-day(Commercial)*	Comm.		10	n/a	0.015	**I/I =**	0.053	VCP	87	n/a	0.170	**I/I =**	0.579	RCP
		School	-	8	200	0.003	**PWWF =**	0.395	n= 0.012	31	2,350	0.035	**PWWF =**	3.566	n= 0.013
		2,998	2,490			0.134	Cap =	0.97	41%	964	14,872	1.468	Cap =	4.38	81%
C.	Covell to Russell Blvd &	Res.-SF	1,097	238	2,973	0.252	**PF =**	2.13	15" @	923	11,097	0.942	**PF =**	1.95	30" @
	Hwy 113 to Anderson±	Res.-MF	2,596	80	7,035	0.597	**PDWF =**	1.947	0.280%	241	13,783	1.170	**PDWF =**	4.636	0.080%
1,500	*gal/ac-day(Commercial)*	Comm.		31	n/a	0.047	**I/I =**	0.220	VCP	118	n/a	0.217	**I/I =**	0.799	RCP
		School	-	18	1,300	0.020	**PWWF =**	2.167	n= 0.012	49	3,650	0.055	**PWWF =**	5.435	n= 0.013
		4,095	5,086			0.915	Cap =	2.39	91%	1,331	24,881	2.383	Cap =	7.49	73%

TABLE 2. CITY'S SPREADSHEET HYDRAULIC ANALYSIS (CONTINUED)

Area	Description	Area Type	Du	Area (Ac)	# People	Flow Calculations - Side Lateral ADF				Total Area	Total People	Flow Calculations - Trunk Main ADF			
E.	Covell Park west of Anderson	Res.-SF	333	58	902	0.077	**PF =**	2.38	10" @	981	12,000	1.018	**PF =**	1.93	30" @
	& east of And to 1st Gbelt	Res.-MF	842	51	2,282	0.194	**PDWF =**	0.657	0.250%	292	16,065	1.363	**PDWF =**	5.121	0.080%
1,500	*gal/ac-day(Commercial)*	Comm.		4	n/a	0.006	**I/I =**	0.068	VCP	122	n/a	0.223	**I/I =**	0.867	RCP
	greenbelt	School	-	-	-	-	**PWWF =**	0.725	n= 0.012	49	3,650	0.055	**PWWF =**	5.987	n= 0.013
		4,428	5,928			0.276	Cap =	0.77	95%	1,444	28,065	2.659	Cap =	7.49	80%
F.	Central Covell Park	Res.-SF	1,130	210	3,062	0.260	**PF =**	2.36	10" @	1,191	15,062	1.278	**PF =**	1.91	30" @
	(Catalina plus CP No_Star)	Res.-MF	191	16	518	0.044	**PDWF =**	0.716	0.200%	308	16,582	1.407	**PDWF =**	5.649	0.080%
1,500	*gal/ac-day(Commercial)*	Comm.		-	n/a	-	**I/I =**	0.136	VCP	122	n/a	0.223	**I/I =**	1.002	RCP
	Two parallel 10" sewers	School	-	-	-	-	**PWWF =**	0.852	n= 0.012	49	3,650	0.055	**PWWF =**	6.651	n= 0.013
	in Catalina (Anza to Covell)	5,558	6,119			0.304	Cap =	1.37	62%	1,670	31,645	2.963	Cap =	7.49	89%
G-1	South of Covell and	Res.-SF	64	18	173	0.015	**PF =**	3.07	08" @	1,209	15,236	1.293	**PF =**	1.91	30" @
	West of DHS	Res.-MF	-	-	-	-	**PDWF =**	0.054	0.360%	308	16,582	1.407	**PDWF =**	5.679	0.080%
1,500	*gal/ac-day(Commercial)*	Comm.		2	n/a	0.003	**I/I =**	0.012	VCP	124	n/a	0.226	**I/I =**	1.014	RCP
		School	-	-	-	-	**PWWF =**	0.066	n= 0.012	49	3,650	0.055	**PWWF =**	6.693	n= 0.013
		5,622	6,119			0.018	Cap =	0.51	13%	1,690	31,818	2.981	Cap =	7.49	89%
H.	Eastern Covell Park	Res.-SF	406	82	1,100	0.093	**PF =**	2.57	10" @	1,291	16,336	1.386	**PF =**	1.90	30" @
	('F' St.)	Res.-MF	95	12	257	0.022	**PDWF =**	0.304	0.260%	320	16,840	1.429	**PDWF =**	5.883	0.080%
1,500	*gal/ac-day(Commercial)*	Comm.		2	n/a	0.003	**I/I =**	0.058	VCP	126	n/a	0.229	**I/I =**	1.072	RCP
		School	-	-	-	-	**PWWF =**	0.362	n= 0.012	49	3,650	0.055	**PWWF =**	6.955	n= 0.013
		6,028	6,214			0.118	Cap =	0.78	46%	1,786	33,176	3.099	Cap =	7.49	93%
G.4	Central Davis, core area	Res.-SF	851	70	2,306	0.196	**PF =**	2.19	12" @	70	2,306	0.196	**PF =**	2.19	18" @
	and part of South Davis	Res.-MF	1,265	39	3,428	0.291	**PDWF =**	1.493	1.400%	39	3,428	0.291	**PDWF =**	1.493	0.050%
1,500	*gal/ac-day(Commercial)*	Comm.		131	n/a	0.197	**I/I =**	0.144	VCP	131	n/a	0.197	**I/I =**	0.144	VCP
		School	-	-	-	-	**PWWF =**	1.637	n= 0.012	-	-	-	**PWWF =**	1.637	n= 0.012
		851	1,265			0.683	Cap =	2.95	55%	240	5,734	0.683	Cap =	1.64	100%
G.2	Central Davis, Core Area &	Res.-SF	656	215	1,778	0.151	**PF =**	2.45	15" @	215	1,778	0.151	**PF =**	2.45	15" @
	Davis High School	Res.-MF	51	7	138	0.012	**PDWF =**	0.487	0.150%	7	138	0.012	**PDWF =**	0.487	0.150%
1,500	*gal/ac-day(Commercial)*	Comm.		-	n/a	-	**I/I =**	0.159	VCP	-	n/a	-	**I/I =**	0.159	VCP
		School	-	43	2,400	0.036	**PWWF =**	0.646	n= 0.012	43	2,400	0.036	**PWWF =**	0.646	n= 0.012
		1,507	1,316			0.199	Cap =	1.75	37%	265	1,916	0.199	Cap =	1.75	37%

TABLE 2. CITY'S SPREADSHEET HYDRAULIC ANALYSIS (CONTINUED)

Area	Description	Area Type	Du	Area (Ac)	# People	Flow Calculations - Side Lateral ADF				Total Area	Total People	Flow Calculations - Trunk Main ADF			
G.3	Central Davis, Core Area &	Res.-SF	611	62	1,656	0.141	**PF =**	2.20	15" @	347	5,740	0.487	**PF =**	2.03	27" @
@11th/H	Central Park	Res.-MF	1,710	30	4,634	0.393	**PDWF =**	1.415	0.150%	76	8,200	0.696	**PDWF =**	3.094	0.070%
2,000	*gal/ac-day(Commercial)*	Comm.		50	n/a	0.100	**I/I =**	0.089	VCP	181	n/a	0.297	**I/I =**	0.392	RCP
		School	-	7	650	0.010	**PWWF =**	1.504	n= 0.012	50	3,050	0.046	**PWWF =**	3.486	n= 0.013
		2,118	3,026			0.644	Cap =	1.75	86%	654	13,940	1.525	Cap =	5.29	66%
G.3	Central Davis, Core Area &	Res.-SF	-	-	-	-	**PF =**	2.81	08" @	1,638	22,076	1.874	**PF =**	1.83	36" @
@Covell	Central Park	Res.-MF	200	10	542	0.046	**PDWF =**	0.129	0.350%	406	25,582	2.171	**PDWF =**	8.533	0.070%
2,000	*gal/ac-day(Commercial)*	Comm.		-	n/a	-	**I/I =**	0.006	VCP	307	n/a	0.525	**I/I =**	1.470	RCP
		School	-	-	-	-	**PWWF =**	0.135	n= 0.012	99	6,700	0.101	**PWWF =**	10.003	n= 0.013
		2,118	3,226			0.046	Cap =	0.50	27%	2,450	47,658	4.670	Cap =	11.40	88%
I.	'J' Street Area	Res.-SF	100	27	271	0.023	**PF =**	2.49	12" @	1,665	22,347	1.897	**PF =**	1.82	36" @
		Res.-MF	606	25	1,642	0.139	**PDWF =**	0.419	0.350%	431	27,225	2.311	**PDWF =**	8.812	0.070%
1,500	*gal/ac-day(Commercial)*	Comm.		4	n/a	0.006	**I/I =**	0.034	VCP	311	n/a	0.531	**I/I =**	1.504	RCP
		School	-	-	-	-	**PWWF =**	0.453	n= 0.012	99	6,700	0.101	**PWWF =**	10.316	n= 0.013
		8,246	10,046			0.168	Cap =	1.48	31%	2,507	49,571	4.839	Cap =	11.40	90%
J.	Portions of East Davis	Res.-SF	669	152	1,813	0.154	**PF =**	2.32	15" @	1,817	24,160	2.050	**PF =**	1.81	36" @
		Res.-MF	681	14	1,846	0.157	**PDWF =**	0.823	0.150%	445	29,070	2.467	**PDWF =**	9.394	0.070%
1,500	*gal/ac-day(Commercial)*	Comm.		14	n/a	0.021	**I/I =**	0.120	VCP	325	n/a	0.552	**I/I =**	1.624	RCP
		School	-	20	1,500	0.023	**PWWF =**	0.943	n= 0.012	119	8,200	0.123	**PWWF =**	11.018	n= 0.013
		8,915	10,727			0.354	Cap =	1.75	54%	2,707	53,230	5.193	Cap =	11.40	97%
L.	Green Meadows &	Res.-SF	1,064	138	2,883	0.245	**PF =**	2.34	12" @	1,955	27,043	2.295	**PF =**	1.80	42" @
	Wildhorse (Future)	Res.-MF	374	39	1,014	0.086	**PDWF =**	0.786	0.200%	484	30,084	2.553	**PDWF =**	9.945	0.068%
1,500	*gal/ac-day(Commercial)*	Comm.		4	n/a	0.006	**I/I =**	0.109	VCP	329	n/a	0.558	**I/I =**	1.733	RCP
		School	-	-	-	-	**PWWF =**	0.895	n= 0.012	119	8,200	0.123	**PWWF =**	11.678	n= 0.013
		9,979	11,101			0.337	Cap =	1.12	80%	2,888	57,127	5.530	Cap =	16.95	69%
M	Covell Center (Future)	Res.-SF	830	200	2,249	0.191	**PF =**	2.37	12" @	2,155	29,292	2.486	**PF =**	1.79	42" @
		Res.-MF	300	16	813	0.069	**PDWF =**	0.686	0.150%	500	30,897	2.622	**PDWF =**	10.417	0.068%
1,500	*gal/ac-day(Commercial)*	Comm.		20	n/a	0.030	**I/I =**	0.142	VCP	349	n/a	0.588	**I/I =**	1.874	RCP
		School	-	-	-	-	**PWWF =**	0.828	n= 0.012	119	8,200	0.123	**PWWF =**	12.291	n= 0.013
		10,809	11,401			0.290	Cap =	0.97	86%	3,124	60,189	5.820	Cap =	16.95	73%

TABLE 2. CITY'S SPREADSHEET HYDRAULIC ANALYSIS (CONTINUED)

Area	Description	Area Type	Du	Area (Ac)	# People	Flow Calculations - Side Lateral ADF				Total Area	Total People	Flow Calculations - Trunk Main ADF			
K.	Remainder of East	Res.-SF	1,498	326	4,060	0.345	**PF =**	2.31	21" @	2,481	33,352	2.831	**PF =**	1.78	42" @
	Davis	Res.-MF	-	-	-	-	**PDWF =**	0.882	0.100%	500	30,897	2.622	**PDWF =**	11.035	0.082%
1,500	*gal/ac-day(Commercial)*	Comm.		12	n/a	0.018	**I/I =**	0.212	VCP	361	n/a	0.606	**I/I =**	2.087	RCP
		School	-	16	1,300	0.020	**PWWF =**	1.094	n= 0.012	135	9,500	0.143	**PWWF =**	13.121	n= 0.013
		12,307	11,401			0.382	Cap =	3.51	31%	3,478	64,249	6.202	Cap =	18.61	70%
N	Mace Ranch Development	Res.-SF	1,155	275	3,130	0.266	**PF =**	2.12	24" @	2,756	36,482	3.096	**PF =**	1.76	35" @
	(Some Future)	Res.-MF	550	35	1,491	0.127	**PDWF =**	1.989	0.056%	535	32,387	2.749	**PDWF =**	12.536	0.094%
2,500	*gal/ac-day(Commercial)*	Comm.		214	n/a	0.535	**I/I =**	0.319	VCP	575	n/a	1.141	***I/I =**	1.906	RCP
		School	-	8	650	0.010	**PWWF =**	2.308	n= 0.012	143	10,150	0.152	**PWWF =**	14.442	n= 0.010
		13,462	11,951			0.937	Cap =	3.75	62%	4,010	68,869	7.138	Cap =	15.93	91%
SD-5	Rosecreek, Oakshade,	Res.-SF	840	192	2,276	0.193	**PF =**	2.31	15" @	192	2,276	0.193	**PF =**	2.31	15" @
	University Village, etc.	Res.-MF	533	33	1,444	0.123	**PDWF =**	0.868	0.130%	33	1,444	0.123	**PDWF =**	0.868	0.130%
2,500	*gal/ac-day(Commercial)*	Comm.		20	n/a	0.050	**I/I =**	0.152	VCP	20	n/a	0.050	**I/I =**	0.152	VCP
	etc.	School	-	9	650	0.010	**PWWF =**	1.020	n= 0.012	9	650	0.010	**PWWF =**	1.020	n= 0.012
		840	533			0.376	Cap =	1.63	63%	254	3,721	0.376	Cap =	1.63	63%
SD-4	Willowcreek Area	Res.-SF	477	100	1,293	0.110	**PF =**	2.47	15" @	292	3,569	0.303	**PF =**	2.23	15" @
		Res.-MF	54	2	146	0.012	**PDWF =**	0.450	0.160%	35	1,591	0.135	**PDWF =**	1.242	0.160%
2,500	*gal/ac-day(Commercial)*	Comm.		24	n/a	0.060	**I/I =**	0.076	VCP	44	n/a	0.110	**I/I =**	0.228	VCP
		School	-	-	-	-	**PWWF =**	0.526	n= 0.012	9	650	0.010	**PWWF =**	1.470	n= 0.012
		1,317	587			0.182	Cap =	1.81	29%	380	5,160	0.558	Cap =	1.81	81%
SD-2	South Davis	Res.-SF	416	68	1,127	0.096	**PF =**	2.45	18" @	360	4,696	0.399	**PF =**	2.17	18" @
		Res.-MF	236	21	640	0.054	**PDWF =**	0.485	0.110%	56	2,230	0.189	**PDWF =**	1.635	0.110%
2,500	*gal/ac-day(Commercial)*	Comm.		19	n/a	0.048	**I/I =**	0.065	VCP	63	n/a	0.158	**I/I =**	0.293	VCP
		School	-	-	-	-	**PWWF =**	0.549	n= 0.012	9	650	0.010	**PWWF =**	1.928	n= 0.012
		1,733	823			0.197	Cap =	2.44	23%	488	6,927	0.755	Cap =	2.44	79%
SD-1	Pioneer Park Area	Res.-SF	500	128	1,355	0.115	**PF =**	2.24	15" @	488	6,051	0.514	**PF =**	2.06	18" @
		Res.-MF	397	27	1,076	0.091	**PDWF =**	1.153	0.150%	83	3,306	0.281	**PDWF =**	2.618	0.150%
2,500	*gal/ac-day(Commercial)*	Comm.		119	n/a	0.298	**I/I =**	0.170	VCP	182	n/a	0.455	**I/I =**	0.462	VCP
		School	-	9	650	0.010	**PWWF =**	1.322	n= 0.012	18	1,300	0.020	**PWWF =**	3.080	n= 0.012
		2,233	1,220			0.514	Cap =	1.75	76%	771	9,358	1.269	Cap =	2.85	108%

TABLE 2. CITY'S SPREADSHEET HYDRAULIC ANALYSIS (CONTINUED)

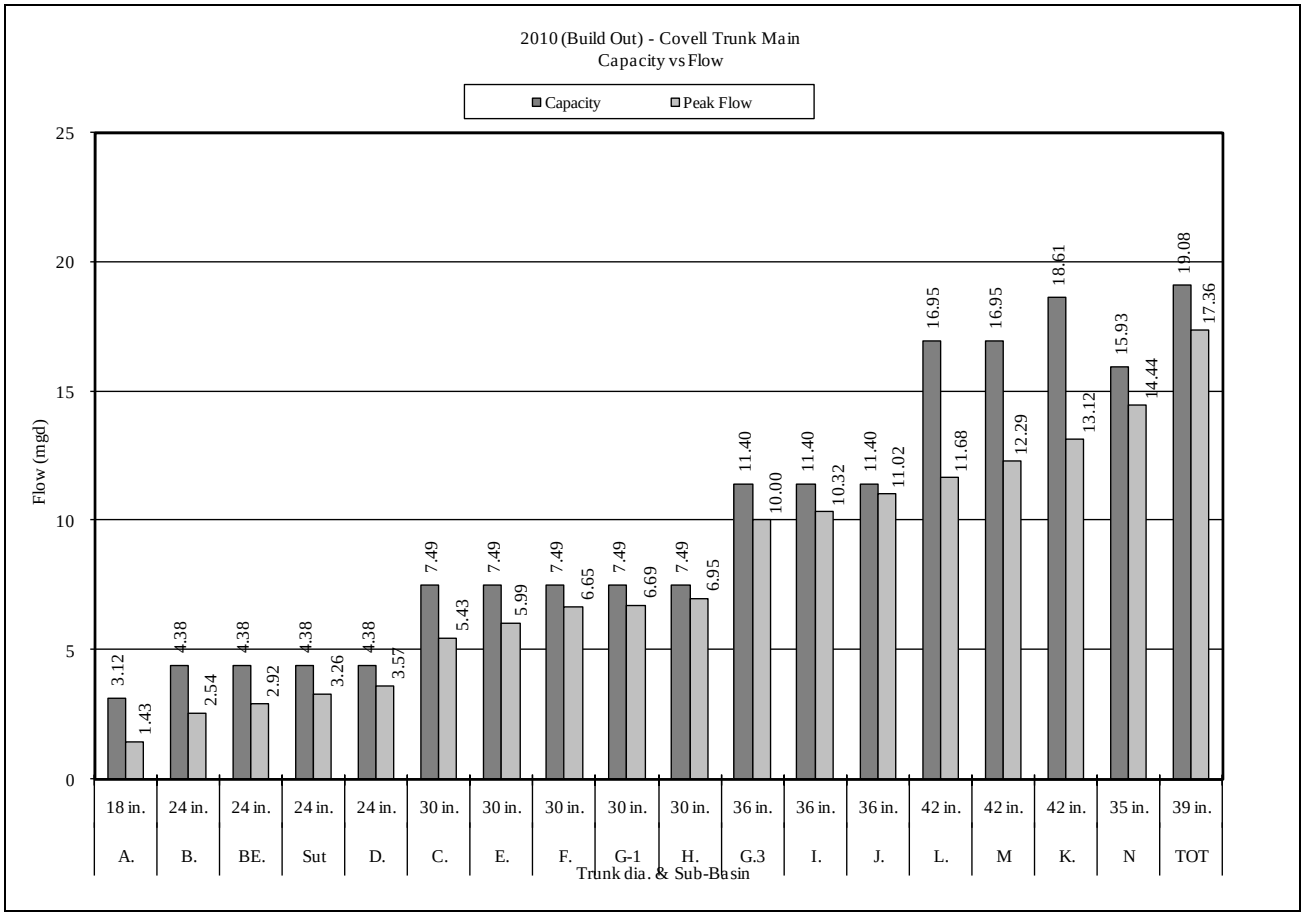
Area	Description	Area Type	Du	Area (Ac)	# People	Flow Calculations - Side Lateral ADF				Total Area	Total People	Flow Calculations - Trunk Main ADF			
SD-3	Willowbank	Res.-SF	172	40	466	0.040	**PF =**	2.63	12" @	528	6,518	0.553	**PF =**	2.05	21" @
		Res.-MF	-	-	-	-	**PDWF =**	0.249	0.150%	83	3,306	0.281	**PDWF =**	2.794	0.150%
2,500	*gal/ac-day(Commercial)*	Comm.		22	n/a	0.055	**I/I =**	0.037	VCP	204	n/a	0.510	**I/I =**	0.500	VCP
		School	-	-	-	-	**PWWF =**	0.286	n= 0.012	18	1,300	0.020	**PWWF =**	3.293	n= 0.012
		2,405	1,220			0.095	Cap =	0.97	30%	833	9,824	1.363	Cap =	4.29	77%
SD-6	El Macero	Res.-SF	445	177	1,206	0.102	**PF =**	2.61	12" @	177	1,206	0.102	**PF =**	2.61	12" @
		Res.-MF	-	-	-	-	**PDWF =**	0.267	0.150%	-	-	-	**PDWF =**	0.267	0.150%
2,500	*gal/ac-day(Commercial)*	Comm.		-	n/a	-	**I/I =**	0.106	VCP	-	n/a	-	**I/I =**	0.106	VCP
		School	-	-	-	-	**PWWF =**	0.373	n= 0.012	-	-	-	**PWWF =**	0.373	n= 0.012
		2,850	1,220			0.102	Cap =	0.97	39%	177	1,206	0.102	Cap =	0.97	39%
EM	El Macero	Res.-SF	-	-	-	0.656	**PF =**	2.04	14" @	705	7,724	0.656	**PF =**	2.04	21" @
	Sewer Lift Station	Res.-MF	-	-	-	0.281	**PDWF =**	2.984	1.068%	83	3,306	0.281	**PDWF =**	2.984	0.150%
2,500	*gal/ac-day(Commercial)*	Comm.	-	-	n/a	0.510	**I/I =**	0.606	FM	204	n/a	0.510	**I/I =**	0.606	VCP
		School	-	-	-	0.020	**PWWF =**	3.589	n= 0.013	18	1,300	0.020	**PWWF =**	3.589	n= 0.012
		2,850	1,220			1.466	Vel =	5.2 fps	113 ft	1,010	11,030	1.466	Cap =	4.29	84%
TOT	CITY TOTALS	Res.-SF	16,312			3.752	**PF =**	1.73	42" @	3,461	44,206	3.752	**PF =**	1.73	39" @
	29483	Res.-MF	13,171			3.029	**PDWF =**	14.849	0.076%	618	35,693	3.029	**PDWF =**	14.849	0.076%
		Comm.	-		n/a	1.651	**I/I =**	-	HDPE	779	n/a	1.651	***I/I =**	2.511	RCP
		School	-			0.172	**PWWF =**	14.849	n= 0.010	161	11,450	0.172	**PWWF =**	17.361	n= 0.010
		SF-OK	*MF-OK*			8.604	Cap =	23.25	64%	5,019	79,899	8.604	Cap =	19.08	91%

Hydraulic Analysis Summary

The spreadsheet hydraulic model only analyzes the main sewer trunks in the City's collection system. At the buildout of the 2010 General Plan, the City's collection system has the capacity to accommodate the peak wet weather flows. Figure 2 presents the comparisons of capacity versus peak flows for the main trunks.

Hydraulic analysis indicate that the City's main trunks have adequate capacity to handle the peak flows.

FIGURE 2. HYDRAULIC ANALYSIS INDICATES THAT THE CITY'S MAIN TRUNKS HAVE SUFFICENT CAPACITY TO CONVEY PEAK WET WEATHER FLOWS BASED ON CITY DESIGN STANDARDS

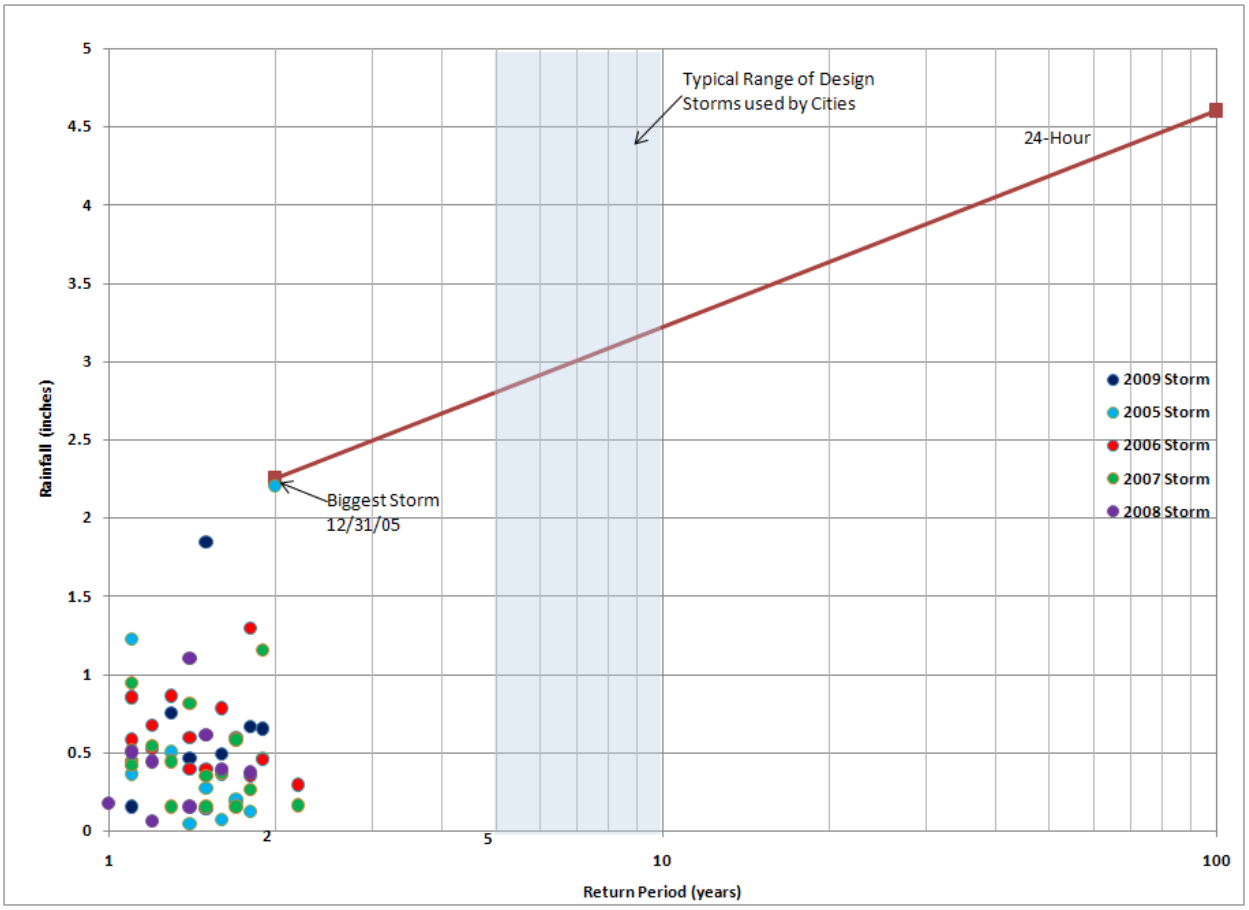


Conclusion: City's collection system has adequate capacity to accommodate calculated peak flows based on the City's design standards. City needs to now validate actual peaks flows by wet weather flow monitoring.

Historical Rainfall Trends

Historical rainfall data from 2005-current is shown on the City's IDF curve in Figure 8. Many communities use a design service level objective of between 5 and 10 years. The biggest storm was found to occur on 12/31/05 and was a 2 year – 24 hour type storm.

FIGURE 3. STATISTCIAL PLOTS OF THE RECENT RAINFALL DATA. THE CITY IS UNABLE TO VALIDATE ITS CAPACITY DUE TO LACK OF LARGER STORM EVENTS BETWEEN 2005-2009



As shown in Figure 3, most of the storm events that occurred between 2005 – 2009 have been between 1 and 2 year return periods. Typical range of design storms used by utilities is between 5 and 10 year return periods. Only 1 storm event on 12/31/2005 have been greater than the 2 year return period but still below the range of design storms. The lack of larger storm events has prevented the City from validating its capacity versus actual peak flows.

The City is unable to validate its projected peak flows due to the lack of larger storm events in recent years.

During that larger storm in December of 2005, the maximum daily flow at the WPCF was measured at 8.83 mgd[1]. The associated Average Dry Weather Maximum Monthly Flow (ADWMMF) was 6.47 mgd for 2005, creating a one-day I/I flow of 2.36 mgd. The City ahs about 5,000 acres within its service area. The 2.2 inches of rain falling over its 5,000 acrfe service area would represent about 300 MG of rainwater over a 24 hour period. Dividing the amount of rainfall dependent I/I by the volume of rainfall represents the percent of

[1] The City of Davis Water Pollution Control Plant Improvement Project Preliminary Design Report, April 2008,

rainwater leaking into the sewer system. This is commonly referred to as the system's "R Value". For that larger storm, the overall system would have an R Value of about 0.8 percent. Sewer Basins with R-Values <5% are often considered to be performing well.

The City does not have other flow data within the collection system. To provide a perspective on how the system would respond to larger events, the R Value was held constant at 0.8 percent and the rainfall was increased to 10, 25, and 50 year events. The resulting peak daily flows into the WPCF are shown in Table 3.

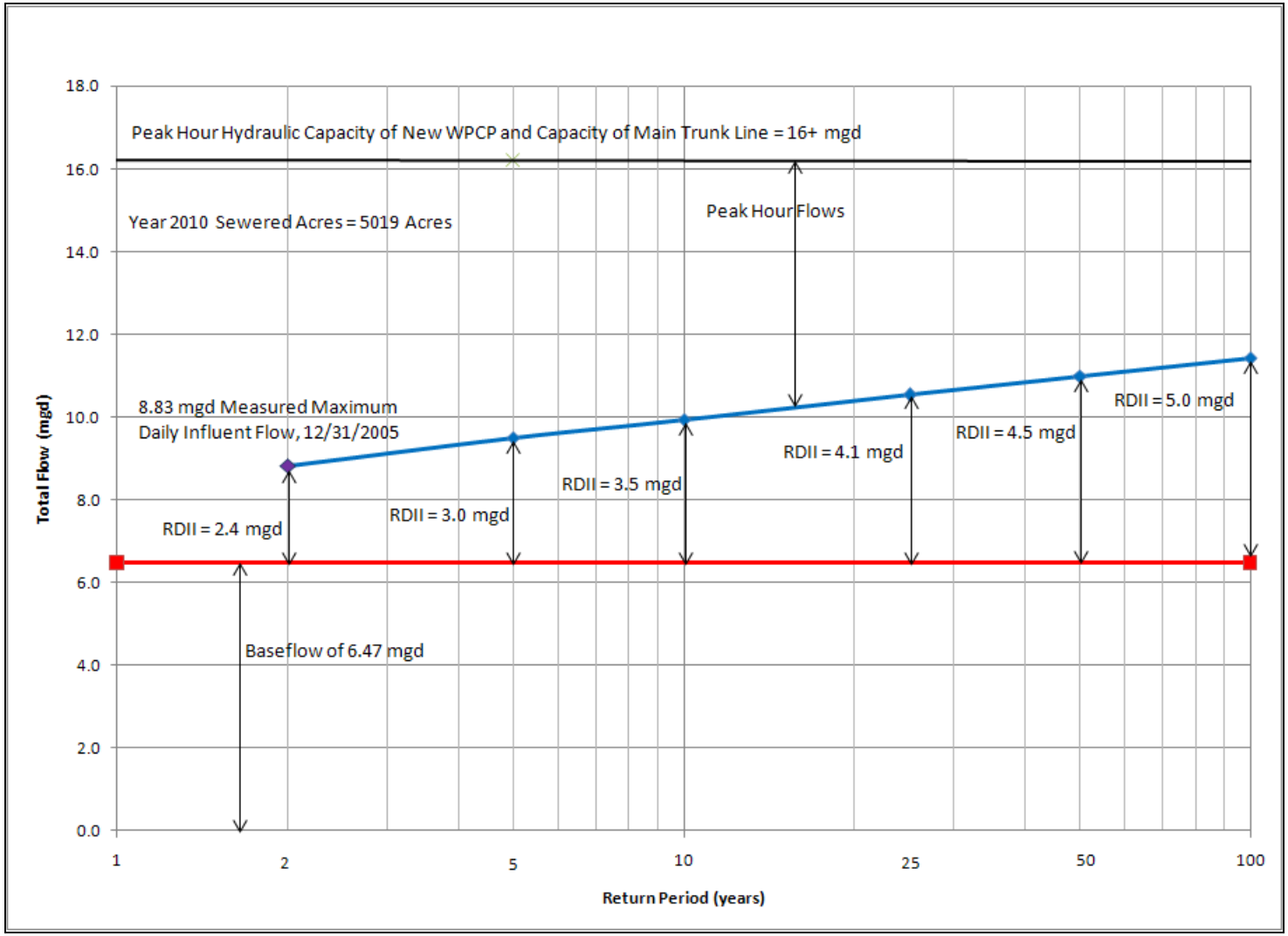
TABLE 3. USING THE 12/31/2005 STORM TO TREND PEAK FLOWS INTO THE WPCF AT LARGER EVENTS

5 YEAR - 24 HOUR		10 YEAR - 24 HOUR				25 YEAR - 24 HOUR				50 YEAR - 24 HOUR			
Rainfall (in.)	Total Flow (mgd)	Rainfall (in.)	Volume of Rain (MG)	RDII (mgd)	Total Flow (mgd)	Rainfall (in.)	Volume of Rain (MG)	RDII (mgd)	Total Flow (mgd)	Rainfall (in.)	Volume of Rain (MG)	RDII (mgd)	Total Flow (mgd)
2.8	9.50	3.2	436.1	3.46	9.93	3.76	512.4	4.06	10.53	4.18	569.6	4.52	10.99

The projected peak daily flows are plotted and compared to the hydraulic capacity of the 42-inch main trunk sewer near the WPCF. As shown in Figure 4, the peak daily flows are expected to remain well below the 16 mgd capacity of the trunk sewer. The City appears to have about 5-6 mgd of residual capacity to absorb the peak hourly flows in the main trunk sewer. If the City were collect additional wet weather flow data it can confirm these estimated leak rates and peak flow projections at other locations in the system.

The City 's collection system appears to have adequate peak flow capacity but requires validation on peak flow projections.

FIGURE 4. PREDICTED 24-HOUR FLOWS WITHIN THE CITY'S MAIN TRUNK SEWER BASED ON LIMITED RAINFALL DATA



Design Criteria

Purpose

The objectives of this section are to document and establish the design criteria for evaluating sewer capacities. We utilize a combination of City and industry design standards.

City Standards

The City has developed design standards for the collection system.

Design Flows

The flow for hydraulic design of the system shall be based on Peak Wet Weather Flow and shall be calculated as follows:

$$PWWF=ADDF \times PF + II$$

PWWF=Peak Daily Wet Weather Flow
ADDF=Average Daily Dry Weather Flow
PF=Peaking Factor
II=Infiltration and Inflow Allowance

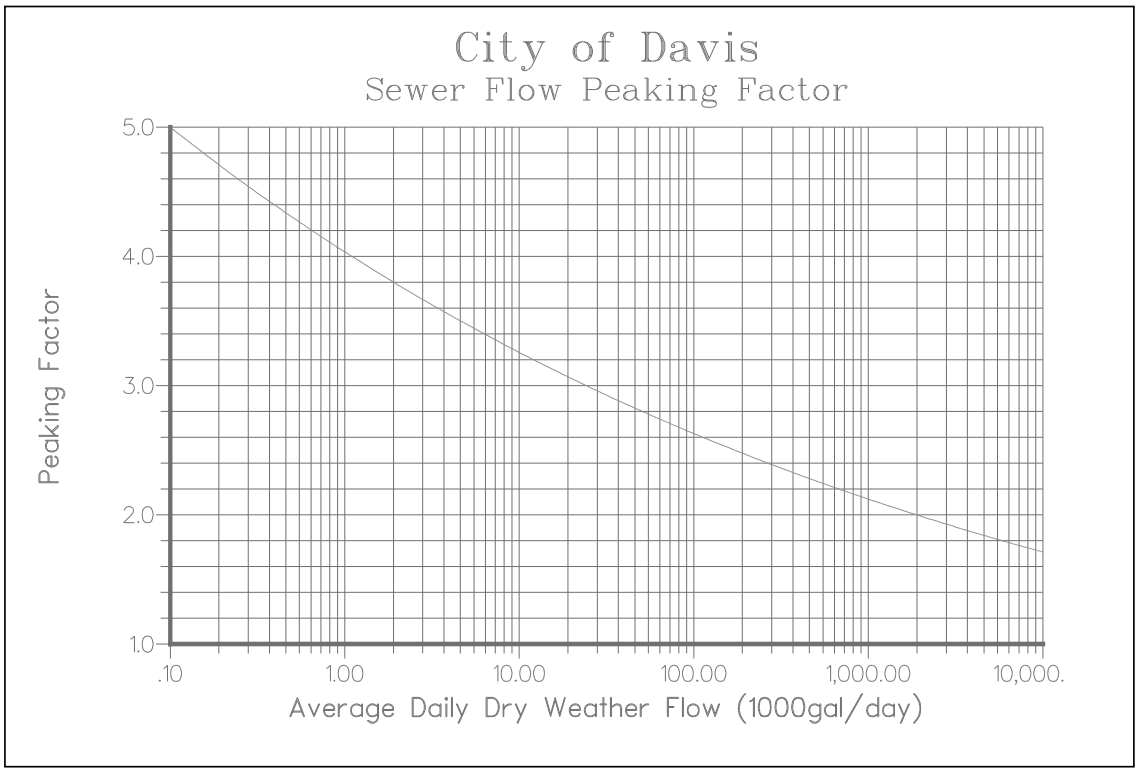
An Infiltration and Inflow allowance is added to the peak sewer flows to determine the design flow in the sewer system. The Infiltration/Inflow allowance for all new development areas shall be 600 gallons per gross acre per day. The area of streets and lots in all residential and commercial areas shall be included in the gross area. Areas such as parks and greenbelts which do not contain sewer facilities may be excluded from the gross area.

Figure 5 is the sewer flow peaking factor curve used by the City of Davis to size sewer pipes. The City has used this curve on past new development projects. The formula below is from the City Standards and was used to create Figure 5.

$$PF=7.67 \times ADDF-0.93$$

PF=Peaking Factor
ADDF=Average Daily Dry Weather Flow

FIGURE 5. PEAKING FACTOR FOR SEWER FLOWS



Land Use

The City's current sewer use factor is 330 gallons per day (gpd) Average Dry Weather Flow (ADWF) per single-family dwelling unit which is based on an assumed use of 85 gallons per person and an average of 2.7 people per household.[2] A single-family unit is considered one equivalent dwelling unit (EDU).

Table 5 provides wastewater generation rates for the different types of land uses within Davis.

[2] City of Davis Sewer Spreadsheet Model

TABLE 5. LAND USES AND WASTEWATER GENERATION RATES (FROM CITY OF DAVIS DESIGN STANDARDS)

Description of Source	Type of Use	Unit	Design Flow (gallons)
Auto Service Station	Commercial	Employee	15
Auto Service Station	Commercial	Auto	11
Bar	Commercial	Customer	2
Bar	Commercial	Employee	15
Country Club	Recreation	Member	55
Hospital	Industrial	Bed	175
Hospital	Industrial	Employee	15
Hotel	Commercial	Employee	15
Hotel	Commercial	Guest	55
Industrial Offices	Commercial	Employee	15
Laundry (self-serve)	Commercial	Machine	600
Laundry (self-serve)	Commercial	Wash	55
Motel	Commercial	Employee	15
Motel	Commercial	Guest	35
Motel with kitchens	Commercial	Guest	55
Office (Typical)	Commercial	Employee	15
Residential, Single-Family	Residential	Unit	330
Residential, Multiple-Family	Residential	Unit	230
Restaurant	Commercial	Meal	4
Retail (Typical)	Commercial	Employee	15
Retirement Home	Industrial	Employee	15
Retirement Home	Industrial	Resident	110
School	Industrial	Student	11
School with Cafeteria	Industrial	Student	16
School with Cafeteria and Gym	Industrial	Student	21
Shopping Center	Commercial	Employee	15
Shopping Center	Commercial	Toilet	550
Theater	Commercial	Seat	3

Pipe Capacity Criteria and Minimum Slopes

The selection of a pipe diameter to adequately convey peak flows is based on the pipe slope and d/D criteria. The d/D ratio is the peak measured depth of flow divided by the pipe diameter. A d/D ratio less than 0.75 is a common threshold value used for pipe design. A slope of 0.0008 is considered the minimum practical slope for construction. Flatter slopes are difficult to accurately construct. Table 2 presents the minimum slopes that are used for the City. The measure of hydraulic stability is shown graphically in Figure 6.

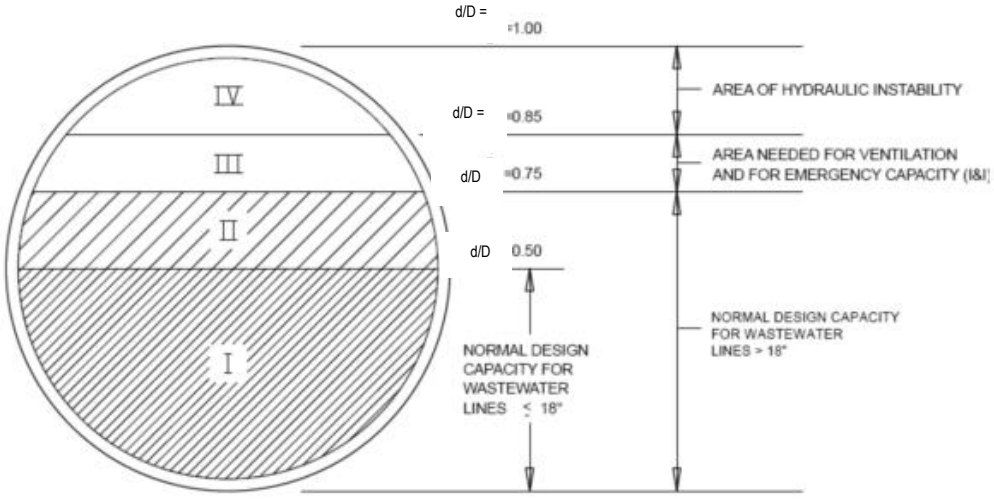
Minimum Pipe Sizes and Slopes

The minimum size of sewer main shall be 6 inches in inside diameter. The minimum slopes shall be as listed in Table 6:

TABLE 6. MINIMUM PIPE SIZES AND SLOPES

Pipe Diameter	Minimum Slope
6"	0.0050
8"	0.0035
10"	0.0025
12"	0.0020
> 12"	as approved

FIGURE 6. TYPICAL d/D CRITERIA FOR PIPE CAPACITIES



Pipe Materials and Roughness Coefficient

Vitrified Clay Sewer Pipe shall be used on all sewer mains and services, unless shallow cover requires the use of Ductile Iron Pipe. Ductile Iron Pipe, conforming to the City requirements for water pipe, shall be used in areas with shallow cover. The use of any other types of materials will be subject to special approval by the City Engineer.

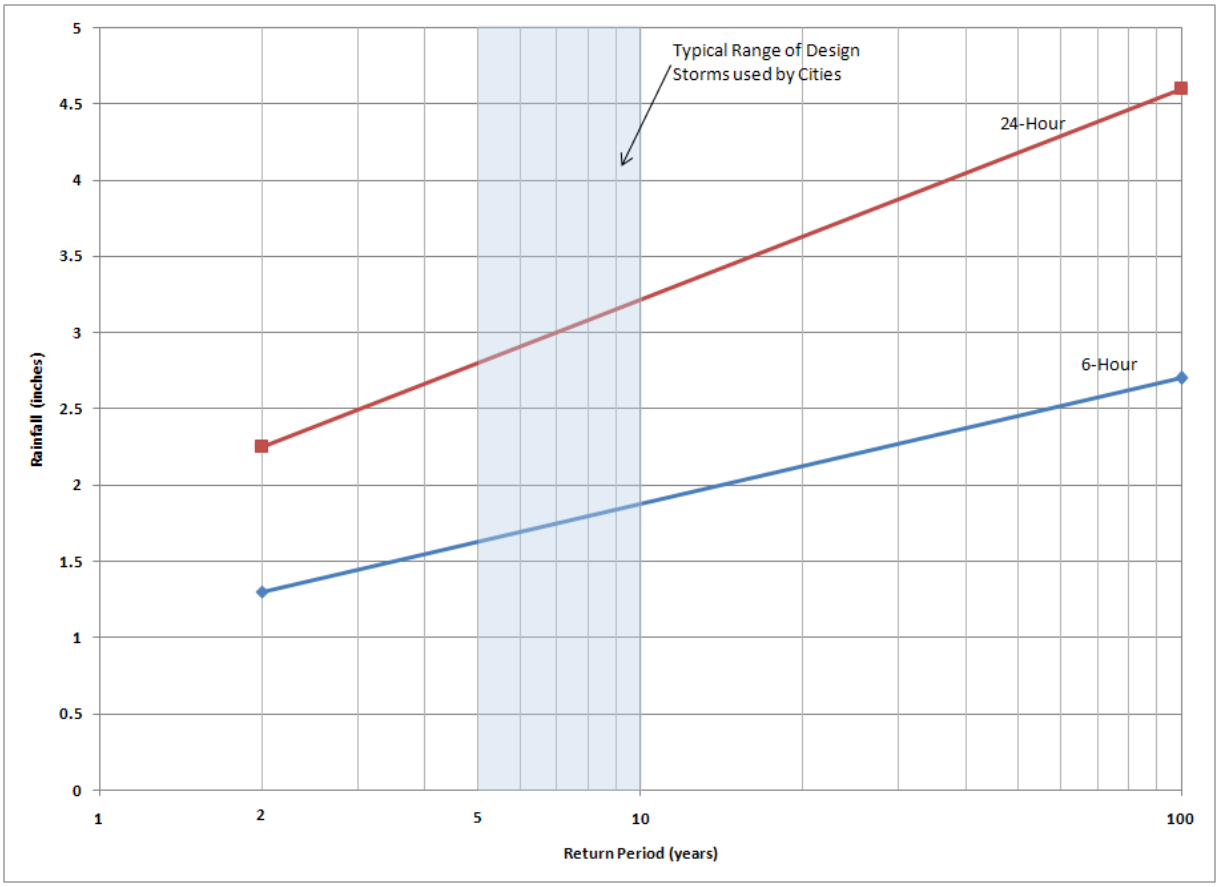
The roughness coefficient, or Manning's "n" value, used to calculate pipe capacity, is n equal to 0.013. This value is somewhat conservative if PVC pipe is used. An "n" value of 0.011 may be more appropriate for PVC. An "n" value of 0.013 is a commonly used value that assumes a buildup of a slime layer in any pipe material after many years of service and is consistent with City standards. By using this value, pipe sizes selected are not restricted to one material type.

Storm Sewer Criteria

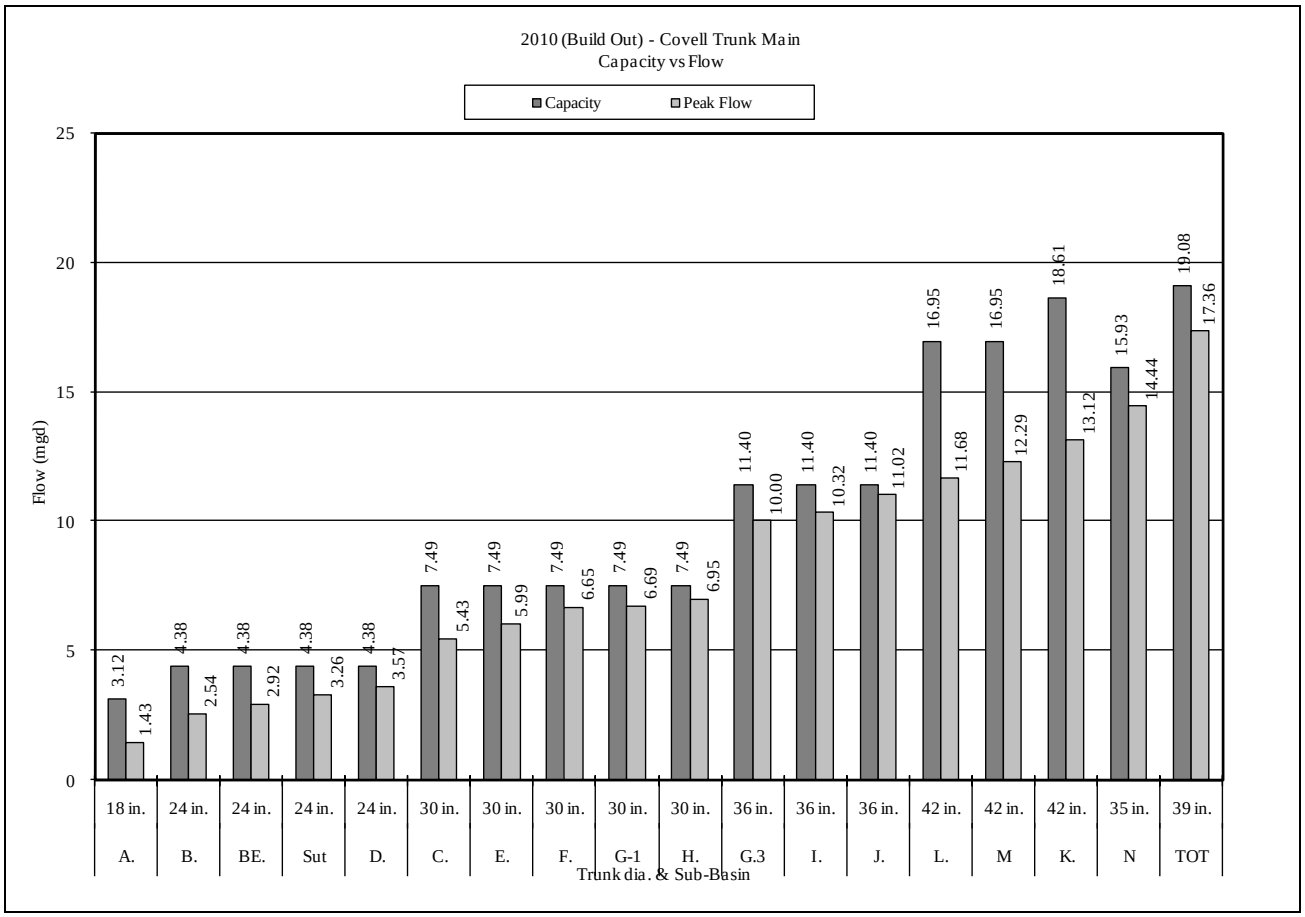
IDF Curve

The rainfall Intensity-Duration-Frequency (IDF) curve constitutes a relation between the intensity of precipitation, the duration or the aggregation of the rainfall (in hours) and the return period of the event (in years). The return period of an event indicates how frequent this event is. The common service level range is found within the return period of 5-10 years. This range is provided to understand the capacity service level for a City's sewer system. The collection system should have the capacity to experience flows within this range. The rainfall intensities of 24-hour and 6-hour duration storms are typically used for assessing sewer systems. Typical return frequencies vary between 5 and 10 years, Figure 7 represents the Intensity-Duration-Frequency relationship for the Davis area using the NOAA's Western U.S. Precipitation Frequency Maps.

FIGURE 7. DAVIS AREA IDF CURVES



Capacity Enhancement Measures



Given that City's collection system has shown adequate capacity to handle the projected peak flows, we would recommend that the City further validate the peak flows during wet winter periods and prioritize sewers by risk before investing in any capacity enhancement measures.

Prioritize Collection System Enhancements by Capacity

Table 7 presents the City's sewer trunks that are prioritized for capacity enhancements based on % capacity remaining.

Table 7. Sewer Trunks Prioritized for Capacity Enhancements

CIP Priority Rank	Trunk	Diameter (in)	Capacity (mgd)	Peak Flow (mgd)	Remaining Capacity (mgd)	% Capacity Remaining (%)
1	J	36	11.4	11.02	0.38	3%
2	H	30	7.49	6.95	0.54	7%
3	I	36	11.4	10.32	1.08	9%
4	N	35	15.93	14.44	1.49	9%
5	G-1	30	7.49	6.69	0.8	11%
6	F	30	7.49	6.65	0.84	11%
7	G-3	36	11.4	10	1.4	12%
8	D	30	4.38	3.57	0.81	18%
9	E	30	7.49	5.99	1.5	20%
10	Sut	24	4.38	3.26	1.12	26%
11	M	42	16.95	12.29	4.66	27%
12	C	30	7.49	5.43	2.06	28%
13	TOT	39	25	17.86	7.14	29%
14	K	42	18.61	13.12	5.49	30%
15	L	42	16.95	11.68	5.27	31%
16	BE	24	4.38	2.92	1.46	33%
17	B	24	4.38	2.54	1.84	42%
18	A	18	3.12	1.43	1.69	54%

Prioritize Collection System by Risk

Not all assets in the collection system are equal. Some collection systems serve more critical areas and have a higher consequence in the event of a failure or SSO. The City should prioritize its collection system assets by risk. Risk is the combination of Impact of failure and Probability of failure.

Impact

To identify the impact of asset failures, many benchmark utilities use a "Triple Bottom Line" approach to help with the ratings. A Triple Bottom Line approach uses a comprehensive rating that equally considers social, environment and economic impacts of asset failures. Table 8 presents the Triple Bottom Line ratings guides.

Table 8. Rate the City's assets for identify critical assets using the Triple Bottom Line approach

Impact	Social/Service	Environment/Regulatory	Economic/Financial
1	No operation and service interruptions.	No impact on environment and regulatory compliance.	No economic and financial impact.
2	Minimal operation interruptions but no service interruptions to customers.	Minor impact on environment and no violation of regulatory compliance.	Trivial loss of economic and financial revenue from productions or service interruptions.
3	Routine operation interruptions and minor service interruptions to customers.	Moderate impact on environment and minor violation of regulatory compliance.	Evident loss of economic and financial revenue from productions or service interruptions.
4	Major operation interruptions, service interruptions and potential public safety.	Major impact on environment and violation of regulatory compliance with fines.	Significant loss of economic and financial revenue from productions or service interruptions.
5	Extended operations interruptions, service interruptions to large number of customers and public safety.	Catastrophic environmental impact and violation of regulatory compliance with significant fines.	Extreme loss of revenue from productions or service interruptions.

Probability

The probability of failure is calculated through condition assessment and reliability of the assets in the collection system. We recommend that the City evaluate the condition of its collection system to identify its probability of failure. We also recommend that the City review its Computer Maintenance Management System to identify the number of corrective work orders on assets, which indicates the reliability of the assets.

Calculate Risk

The combination of the impact and probability ratings of each asset in the collection system will allow the City to further prioritize its Capacity Enhancement Measures by risk. We recommend starting the risk prioritization with the main trunks that are presented in Table 7.

Schedule

This project is focused on Phase 1 of the City's SECAP. The schedule for the City Phase 2 and 3 tasks are presented below in Table 9.

TABLE 9. CITY'S SECAP SCHEDULE

SECAP Phases	Start	End
Phase 1 – SECAP Evaluation	Aug 2008	Apr 2009
Phase 2 – SECAP Validation	Monitor during wet winters	Monitor during wet winters
Phase 3 – SECAP Implementation	As Needed	As Needed

Next Steps

The next steps for the City are to implement a Phase 2 SECAP Validation and a Phase 3 SECAP Implementation to satisfy the SSMP.

Phase 2 – SECAP Validation

The following is an outline of the tasks for SECAP Validation:

1. Identify & set up wet weather flow monitoring locations. The sewer ranking provided in Table 7 may provide a starting point for where to monitor first.
2. Collect flow monitoring data during wet winters.
3. Interpret flow monitoring data.
4. Calibrate hydraulic model analysis.
5. Review & interpret existing condition assessment data.
6. Rate collection system assets by criticality.
7. Calculate risk of collection system asset for prioritization.
8. Develop capacity enhancement CIP.

Phase 3 – SECAP Implementation

The following is an outline of the tasks for SECAP Implementation:

1. Schedule prioritized CIP for implementation.
2. Rehabilitate or replace collection system assets on CIP.

9 Performance Targets and Program Modifications

The City tracks performance measurements in a CMMS. The City has also established some performance metrics such as:

- Hydro clean 1 mile per day per crew
- Hydro clean all sewers annually and core areas quarterly
- Field crew expectations

The City continuously monitors, measures and adjusts practices to reduce SSOs. Relatively few SSOs have been recorded in the past, so there have not been many required adjustments. Formerly, the City only tracked SSOs greater than 1000 gallons. The City has experienced approximately 15 to 20 SSOs that occur on the lower service laterals, which in the past was not the City's responsibility, therefore, not a reportable SSO and not tracked. The City researches the cause of lower service lateral SSOs to determine the mitigating solutions.

9.1 Monitoring, Measurement and Program Modifications

Current monitoring and measurements tracked by the City include the following:

TABLE 9-1. CURRENT PERFORMANCE MEASUREMENTS AND METRICS

Performance Measurements	Performance Metrics
Number of Sanitary Sewer Overflows (SSO)	# SSO/month or # SSO/year
Causes of SSO	# SSO by each cause
Number of SSO caused by Fats, Oils and Grease (FOG)	# SSO by FOG/year
Category 1 SSOs (SSOs reached surface waters)	# Category 1 SSO/year
Category 2 SSOs (Contained SSOs)	# Category 2 SSO/year
Category 3 SSOs (optional)	# Category 3 SSO/year

For example purposes, results from tracking between 2007-1012 are provided here. The City has been tracking the SSOs by causes since 2007. Between 2007 and 2012, the City has averaged 16 SSOs per year, with the low of 10 SSOs (2010) and high of 27 SSOs (2008). Figure 9-1 presents the City's Category 1 SSOs from 2007 and 2012. Note that 2012 is a partial year as of the end of April 2012. The City SSMP implementation and SSO reduction efforts have resulted in a downward trend in the number of SSOs annually.

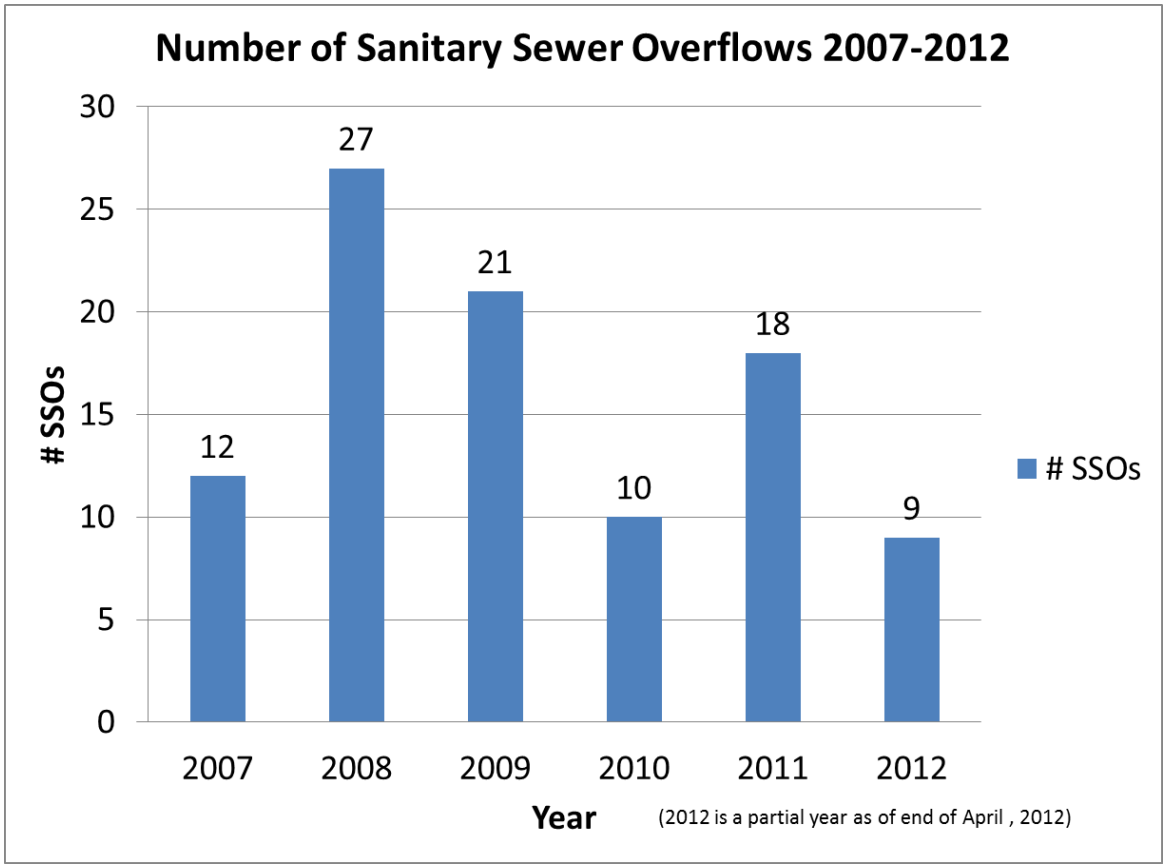


FIGURE 9-1. CITY SSOs FROM 2007-2012

Table 9-2 presents the total number of SSOs and causes from 2007 and 2012.

TABLE 9-2. CITY CATEGORY 1 SSO FROM 2007-2012

	Causes of SSOs						
Year	**Roots**	**Unknown**	**Grease**	**Broken Riser**	**Missing Cap**	**Collapsed Main**	**# SSOs**
2007	2	10					12
2008	14	12		1			27
2009	7	7	5	1	1		21
2010	2	8					10
2011	4	10	3	1			18
2012	5	3				1	9
Average	6	8	4	1	1	1	16

Note: 2012 is a partial year as of end of April 2012

Figure 9-2 presents the Causes of SSOs from 2007 to 2012. The primary causes of SSOs have been Roots (27%) and Grease (19%). The City's SSO reduction program has turned its focus to root and grease control programs. The City has implemented a root control program to minimize SSOs caused by roots.

The City has a proactive outreach program led by the City's industrial pretreatment program to educate Food Service Establishments to dispose grease properly in an effort to reduce SSOs cause by grease. If the grease SSOs begin occurring in residential areas in addition to commercial areas with Food Service Establishments, the City might extend its outreach program to customers in residential neighborhoods.

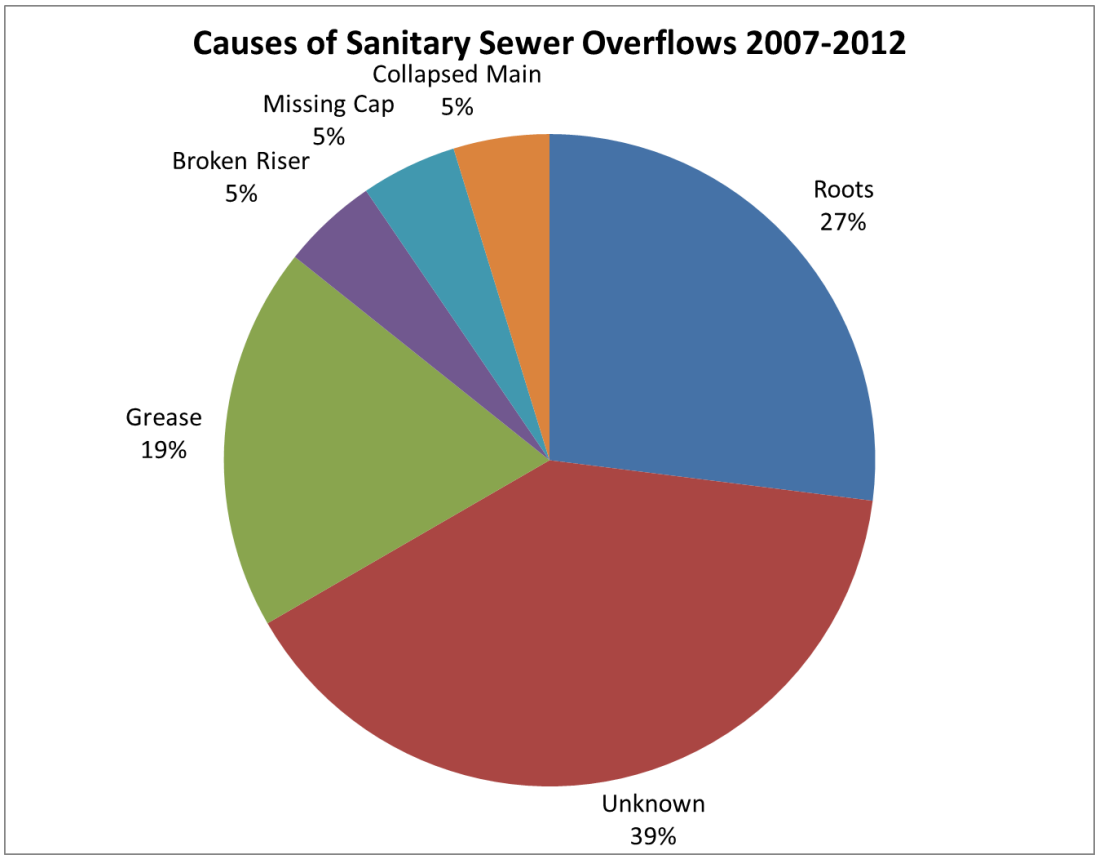


FIGURE 9-2. CITY CAUSES FOR SSOs 2007-2012

In addition to the City's current monitoring and measurements, the following measurements are tracked for the SSMP program.

TABLE 9-3. RECOMMENDED PERFORMANCE MEASUREMENTS AND METRICS

Performance Measurements	Performance Metrics
Amount of pipes cleaned	Feet cleaned/year
Work order (WO) costs. Track all labor, equipment, contractor and parts used for WO.	$ WO/year.
Effectiveness of Preventive Maintenance Program. Number of SSOs from sewers in the PM program.	# SSO/year from sewers in the PM program.
Amount of Condition Assessment via CCTV.	Feet CCTV/year
Percentage of system with condition assessment.	% Feet CCTV (within 5 years)/total feet of sewers
Condition assessment of sewer system.	Condition ratings. Asset Condition Index (i.e. 1-5 scale).
Amount of sewer system rehabilitation or replacement.	Feet of sewers rehabilitated or replaced/5 years
Percentage of WO by Corrective Maintenance (CM) or Preventive Maintenance (PM)	% WO by CM vs. % WO by PM
Percent of system on preventive maintenance program	Miles of pipe on PM program/Total Miles of Pipe

10 Program Audits

Order 2006-003-DWQ requires periodic internal audits to identify deficiencies in the SSMP and the proposed steps to correct any such deficiencies and to evaluate the effectiveness of the SSMP. This Order specifies that audits be conducted by a 3rd party every two years at minimum, with the results kept on file.

Staff will perform internal audits bi-annually and generate an audit report. The report can be used by the WWTP Superintendent to gauge the success of the SSMP program and as the basis for management updates on the program. Management updates may include the General Manager, City Manager, City Council and Natural Resources Commission. Further, the report would contain sufficient information and details for the WWTP Superintendent to gauge the effectiveness of the program and determine if any additional resource allocation is warranted.

Staff completes internal checks on files to maintain consistent records on the activities completed. The City maintains files which require fairly consistent staff attention.

In preparation for the audit program the City conducted an internal audit using an independent consultant. The current SSMP incorporates the recommendations from this initial audit. Future audits shall review the effectiveness of implementing the SSMP elements using the performance measures listed in Tables 9-1 and 9-2 and summarized again in Table 10-1, below.

TABLE 10-1. SSMP PERFORMANCE INDICATORS

Indicators	Performance Value
Number of Sanitary Sewer Overflows (SSO)	
Causes of SSO	
Number of SSO caused by Fats, Oils and Grease (FOG)	
Category 1 SSOs (SSOs reached surface waters)	
Category 2 SSOs (Contained SSOs)	
Category 3 SSOs (optional)	
Amount of pipes cleaned	
Work order costs. Track all labor, equipment, contractor and parts used for WO.	
Effectiveness of Preventive Maintenance Program. Number of SSOs from sewers in the PM program.	
Amount of Condition Assessment CCTV.	
Percentage of system with condition assessment.	
Condition assessment of sewer system.	
Amount of sewer system rehabilitation or replacement.	

Percentage of WO by Corrective Maintenance (CM) or Preventive Maintenance (PM)	
Percent of system on preventive maintenance program	

As indicated in Section 10.1, the performance measures are expected to provide information which results only when viewed over a number of years (i.e. long-term trends), and may show significant variability on a year-to year basis. The audits will also include a qualitative evaluation of the overall effectiveness of implementing SSMP elements. It will also describe improvements to the collection system completed during the past two years, and those proposed for the upcoming two years.

11 Communication Program

The City maintains a website (http://cityofdavis.org/) to inform the public about City activities. The City's website is an effective communication channel for providing alerts and news to the public. The website provides important announcements, public hearing notices, links to agendas and minutes for City Council meetings, and other key information for City residents. The City will publish the most up-to-date SSMP on the Public Works Department page of the City website (http://cityofdavis.org/pw/). The completed SSMP was first certified by the City Council during a public city council meeting on August 21, 2012.

When a revised SUO is approved, at the subsequent environmental review process at a Food Service Establishment (FSE) Public Works staff may deliver a copy of the revised SUO to the facility and include in the FSE review findings a reference to the SUO and a link to the City's website where they can find the document. When appropriate during the review process at a FSE, City staff verbally notifies the facility about SUO changes and how they may affect the facility. The City has been communicating with its businesses like this since 2008. This is a personal and effective way to communicate pending requirements to business owners.

The City also uses the website to notify the public of important upcoming activities related to sewer system management, any developments, implementation and performance of the programs. The City posts outreach materials on the website and includes them with customer billings, as appropriate. Finally, at a minimum, biannual updates on the SSMP will be to the Natural Resource Committee and City Council.