ORANGE COUNTY SANITATION DISTRICT

phone:
(714) 962-2411
fax:
(714) 962-0356
www.ocsd.com

mailing address:
P.O. Box 8127
Fountain Valley, CA
92728-8127

street address:
10844 Ellis Avenue
Fountain Valley, CA
92708-7018

October 8, 2003

To Whom It May Concern

SUBJECT: FOG Control Study Phase I Report

As a result of the California Regional Water Quality Control Board, Santa Ana Region's (RWQCB) Order No. R8-2002-0014, *General Waste Discharge Requirements* (Order), the Orange County Sanitation District (District), the County of Orange, and agencies in Orange County are conducting a Fats, Oil, and Grease (FOG) Control Study (Study) to promote regional compliance with the requirements of the Order. The Study will establish the technical and administrative building blocks of a FOG control program, while providing a regional, practical, and equitable approach throughout Orange County. Each co-permittee will be able to select from among the FOG control and ordinance building blocks to meet the requirements of the Order and local conditions. Currently under review is a Phase II, which will evaluate implementation of three newer technologies, such as biological additives.

Enclosed is a copy of the FOG Control Study Phase I Report. The overall report contains six sections:

1. The Executive Summary recaps all the pertinent findings, conclusions, and recommendations contained within the body of the report.
2. Section 1 introduces the subject of FOG control and the terms used in the report.
3. Sections 2 and 3 discuss the background of the issues and the research approach.
4. Section 4 summarizes the local conditions and practices within each jurisdiction.
5. Section 5 discusses major regional agencies and associations within Orange County and their potential roles in a FOG control program.
6. Section 6 contains the details of the individual building blocks that should be considered in assembling a FOG control program.

If you have any questions, please telephone the undersigned at (714) 593-7424.

Mark Kawamoto

Mark Kawamoto, P.E.
Engineer, Source Control Division

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Enclosure

ORANGE COUNTY

Fats, Oils, and Grease (FOG) Control Study

FOG Control Research Study Report
Phase I – Final Draft

FOG Control Building Blocks

June 2003

Prepared For

Environmental Engineering & Contracting, Inc.
501 Parkcenter Drive
Santa Ana, California 92705

Orange County Sanitation District
10844 Ellis Avenue
Fountain Valley, California 92708

ORANGE COUNTY
FATS, OILS, AND GREASE (FOG) CONTROL STUDY

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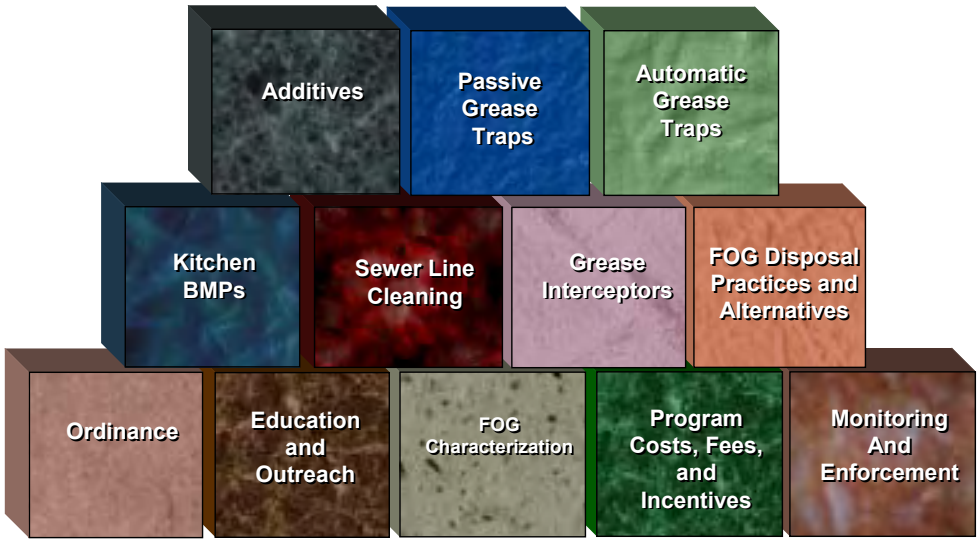

Prepared by:

Environmental Engineering & Contracting, Inc. (EEC)

John Shaffer
Stan Steinbach, P.E.
Tom Titus
Bart Hamlett
Mike Ijams
Wyatt Troxel, Consulting Engineer
Frank Dryden, P.E., Consulting Engineer
Nancy Wheatly, Esq., Environmental Consultant
Don McIntyre, Consultant

Prepared for:

Orange County Sanitation District

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EXECUTIVE SUMMARY

Environmental Engineering & Contracting, Inc. (EEC) has completed Phase I of the Fats, Oils, and Grease (FOG) Control Study on behalf of Orange County agencies (cities and special districts) to enable these agencies to develop effective FOG control programs to reduce sanitary sewer overflows (SSOs). The study is being administered and managed by the Orange County Sanitation District (OCSD) and is being funded jointly by Orange County cities and special districts, the County of Orange, and OCSD. The ultimate purpose of the study is to provide Orange County a regional response to the Waste Discharge Requirements (WDR) of the Santa Ana Regional Water Quality Control Board (RWQCB) Order No. R8-2002-0014. The study is to provide the entities named in the WDR (co-permittees) with programmatic and technical options (or "Building Blocks") in developing FOG control strategies for minimizing FOG discharges to the sewer system. Phase I is a research study that evaluates the current FOG control practices, technologies, and programs in the United States. A follow-up Phase II of the study would involve field-testing of selected FOG control technologies that are presented in Phase I before they are considered for adoption in local FOG control programs and ordinances.

BACKGROUND

Cooking grease in wastewater discharged from Food Service Establishments (FSEs)[1], multi-family housing, and single family homes is causing FOG (or grease) blockages in Orange County's sanitary sewer collection systems. These grease blockages, located in either the property owner's sewer lateral or the sanitary sewerage system, lead to SSOs, which can cause untreated sewage to flow onto streets and travel to storm drains, creeks, and other surface waters. Untreated sewage on private property or in the streets poses an obvious human health risk. If this sewage reaches the ocean, it often results in coastal contamination, beach closures, and the associated potential human health risks. This has made the control of grease blockages a priority and high profile concern for Orange County residents, agencies, environmental groups, businesses, and regulators. Because of this, the Orange County Grand Jury conducted an investigation and in 2001, the Grand Jury presented recommendations to Orange County cities

[1] Food Service Establishments (FSEs) are those establishments primarily engaged in preparing or serving food to the public such as restaurants, hotels, commercial kitchens, bakeries, caterers, schools, prisons, correctional facilities, and care institutions.

and agencies to evaluate, adopt, and implement regional measures to eliminate the environmental impact of the grease accumulation and blockage in the sewerage system.

In response to the regional problem of SSOs, the RWQCB Santa Ana Region issued Waste Discharge Requirements (WDR) in April 2002. A significant element of this WDR requires north and central Orange County cities and wastewater agencies to develop effective FOG control programs, including grease disposal alternatives, by December 2004. Similar RWQCB (San Diego Region) requirements direct south Orange County cities and wastewater agencies to reduce their SSOs, many of which are caused by grease blockages. The WDR named 32 co-permittees, which included local agencies, such as cities and special districts, and OCSD. In addition, OCSD was named as a facilitator for regional solutions to the WDR. According to the RWQCB, co-permittees and/or individual dischargers are potentially liable for fines of $10,000 or more per SSO.

To facilitate regional developments of FOG control programs, OCSD contracted Environmental Engineering & Contracting, Inc. (EEC) to conduct a comprehensive national research study to evaluate potential FOG control solutions for Orange County and to develop a basis of information to allow the region to implement practical and equitable FOG control programs. Phase I of this study provides FOG control Building Blocks for FOG control programs in the form of best management practices (BMPs); best conventional technologies (BCTs); promising new technologies; and program elements, such as ordinances, permitting, and monitoring. This Building Block concept allows cities and wastewater agencies to choose the appropriate FOG control solutions and programs for their specific needs.

This Phase I report presents twelve (12) FOG Control Building Blocks, regional issues, cost issues, and a "Backbone Ordinance" that can be used as a template for local FOG control ordinances in each jurisdiction.

STUDY APPROACH

FOG control efforts and programs throughout the United States were researched through Internet and literature searches, as well as nation-wide interviews with cities, agencies, associations, and technology suppliers. A partial list of those interviewed includes:

- United States Environmental Protection Agency (USEPA)
- States of North Carolina, Georgia, and Oregon
- California Regional Water Quality Control Board (RWQCB)
- Orange County Sanitation District (OCSD)
- County of Orange
- Orange County Health Care Agency (OCHCA)
- Honolulu, Hawaii; Everett, Washington; and the California cities of Los Angeles, San Diego, Laguna Beach, and Oxnard
- El Toro Water District
- California Restaurant Association (CRA)

The purpose of the interviews was not only to obtain data but also to gain insight from the experience of the interviewees with effective FOG control program elements.

Further information was solicited and received through a website (www.eecfogstudy.com) that was developed to provide a tool for collecting pertinent data. Grease control technology manufacturers and suppliers were located through the website, literature and Internet research, and interviews with agencies and associations. Many suppliers were also interviewed at the Water Environment Federation WEFTEC 2002 convention. In all, over 60 manufacturers and suppliers were contacted concerning technologies such as grease removal equipment, monitoring devices, and biological additives. The data from the study is managed in a database.

PHASE I RESULTS

Phase I observed and assessed the current local conditions as they relate to FOG, determined the Building Blocks of a FOG control program, and developed the elements of the Building Blocks. In the process, Phase I also discovered and opened for discussion and evaluation a number of regional technical, programmatic, and public policy issues. The following is a summary of the Phase I results.

Local Conditions

A survey of Orange County cities and wastewater agencies was conducted in the form of a comprehensive Request for Information (RFI). The RFI included questions about collection systems, FSEs, residential sources of FOG, and the causes of the known SSOs.[2] The combined results of the RFI survey and the annual OCSD operations and maintenance survey indicated that most grease blockages occur in 6- to 8-inch sewer lines and that the use of closed circuit television (CCTV) for monitoring sewer line cleaning is dramatically improving the success of sewer line cleaning. Data from OCHCA suggests that there are over 6,000 FSEs located in North and Central Orange County. Most of these are independent FSEs or part of a small chain.

Based on the responses to the RFI, cities and agencies are primarily relying on increased sewer line cleaning to prevent SSOs. It appears that most Orange County cities and wastewater agencies have insufficient data on their FSEs. For example, most Orange County cities and agencies do not have basic data on their FSEs (e.g., the number of FSEs with grease interceptors) in their service area. This indicates that most Orange County agencies lack the vital information to determine FOG control options for FSEs or to develop an effective FOG control program. The study has determined that gathering this type of information ("FOG Characterization") is a key Building Block.

FOG Control Building Blocks

Phase I identified and categorized 12 Building Blocks that should be considered individually and in various strategic combinations to develop an effective FOG control program. Each Building

[2] The RFI utilized and expanded the annual survey OCSD conducts with member agencies of sewer collection system operations and maintenance.

Block contains various elements that form the block. The Building Blocks are organized into four categories as follows:

Programmatic Building Blocks

- FOG Characterization (Section 6.1)
- Education and Outreach (Section 6.9)
- Monitoring and Enforcement (Section 6.10)
- Program Costs, Fees, and Incentives (Section 6.11)
- Ordinance (Section 6.12)

Best Management Practices (BMPs)

- Kitchen BMPs (Section 6.2)
- Sewer Line Cleaning (Section 6.3)

Regional and Watershed

- Grease Disposal Practices and Alternatives (Section 6.8)

Technologies

- Grease Interceptors (Section 6.4)
- Passive Grease Traps (Section 6.5)
- Automatic Grease Traps (Section 6.6)
- Additives (Section 6.7)

These Building Blocks include all of the administrative, BMP, and BCT elements of a comprehensive FOG control program (e.g., permitting, education, interceptors, and interceptor maintenance). After a city or wastewater agency has "characterized" the needs of its program, it can choose to what extent it will implement these Building Blocks and which of the technology Building Blocks will be effective in its service area to build a customized program. The study suggests that the Building Blocks that are fundamental to an effective program are FOG Characterization; Education and Outreach; Monitoring and Enforcement; Program Costs, Fees, and Incentives; Ordinance; Kitchen BMPs; Sewer Line Cleaning; Grease Disposal Practices and Alternatives; and Grease Interceptors. These are essential foundational Building Blocks to ensure that the program is effective. Other Building Blocks, such as Grease Traps, Additives, and various elements within a Building Block, can be considered as support blocks that can be used in various combinations and degrees depending on local conditions.

Key Findings and Recommendations

Based upon the national research, local surveys, and multiple interviews, the key findings are listed below along with conclusions or recommendations for each Building Block.

Building Block 1 - FOG Characterization

An effective and efficient FOG control program must be based on a good understanding and knowledge of the nature and extent of SSO problems. The scope of the program should include identification of all current or potential sewer line "hot spots,"[3] effectiveness of line cleaning, utilization of BMPs and technologies, and characterization of the FOG sources and their relationship to existing hot spots. The characterization of local FOG conditions is a foundational Building Block that establishes and justifies the scope of the FOG control programs to be developed and implemented by each city. Also, FOG sources, such as FSEs, will better understand the importance of controlling their FOG discharges through the use of kitchen BMPs or grease removal equipment, if they understand how their FOG discharges are contributing to a sewer line blockage at a specific hot spot. A properly conducted FOG characterization study will ensure that the FOG control program is not over- or under-designed.

The study provides specific guidelines on conducting a FOG characterization, which includes inspecting and categorizing FSEs, identifying and classifying sewer line hot spots, and evaluating the potential upstream sources of the hot spots. The study proposes a Hot Spot Scoring System (HSSS) which provides a mechanism to prioritize sewer line hot spots and to focus the FOG control efforts appropriately. If the Hot Spot Scoring System is adopted by the stakeholders, and the characterization finds it to be practical in its application, this system may become part of the regulatory and implementation framework.

BB1 FOG Characterization:
The study provides the following recommendations:
1) Cities and agencies that do not have this essential information should initiate a FOG Characterization Study of their respective service areas as a first priority.
2) The FOG characterization guidelines and Hot Spot Scoring System provided in this report are recommended for use by each city or agency to provide regional consistency.

Building Block 2 - Kitchen BMPs

Effective kitchen BMPs are those practices applied in the kitchen to reduce and eliminate FOG before it reaches the drain. BMPs also include those practices applied to optimize and improve the effectiveness of grease removal equipment, such as grease traps and interceptors (discussed in the Interceptor and the Passive and Automatic Grease Trap Building Blocks). The study determined that many of the kitchen BMPs are effective and economical methods of reducing the amount of FOG introduced into sewer collection systems. The majority of kitchen BMPs currently being promoted at FSEs are common-sense practices that are practical to implement. The kitchen BMPs can be divided into structural and non-structural BMPs. Structural BMPs are those BMPs that require a device or container to be installed or removed. The main structural BMPs are as follows:

[3] "Hot Spots" (or trouble spots) are areas in sewer lines that have experienced SSOs or must be cleaned or maintained frequently to avoid blockages.

Structural Kitchen BMPs:

- Use of a grease barrel for collecting liquid grease and recycling it rather than pouring it down a drain
- Removing food grinders (garbage disposal units)
- Using drain screens (strainers) to collect food solids

Non-structural BMPs are those BMPs that do not require a device to be installed or removed and depend upon the conscientiousness of the employee and extensive employee training. The main non-structural BMPs are as follows:

Non-structural Kitchen BMPs:

- Dry wiping or scraping of plates and cookware before washing
- Dry clean-up of floor mats and spills
- Keeping records of grease removal equipment (GRE) maintenance, proper waste disposal, and employee training

If included in a FOG control program, the FSE structural kitchen BMPs have the greatest potential to be implemented on a daily basis, and they are the most practical to monitor for the agencies. Verifying FSE records of GRE maintenance and employee training is also practical to monitor. Verifying daily dry clean-up of plates, cookware, floor mats, and spills is more difficult to monitor because they are employee practices that are not structural and are not tied to a record keeping system.

It is recommended that kitchen BMPs be promoted for all residences (particularly high-density housing) and all FSEs through a strong education and outreach effort (discussed further in the Education and Outreach Building Block). The level of effort associated with monitoring kitchen BMPs (e.g., FSE inspections) should be based on the degree to which these BMPs will truly reduce the amount of FOG being discharged into the sewer system. It should be noted that while the study found that there is considerable literature on kitchen BMPs to reduce the discharge of FOG into the sewer system, there is limited data on the success of these BMPs, or which of the non-structural BMPs are truly being implemented. Although kitchen BMPs are a crucial element of FOG control, it is not recommended that BMPs be solely relied upon as the basis for a FOG control program.

Due to the benefit to the FSEs and the agencies, the study recommends that, at a minimum, all FSEs be required to implement structural BMPs (e.g., using a grease barrel to collect and recycle cooking grease, removal of food grinders, utilizing drain screens) and to keep records on GRE maintenance, proper waste disposal, and employee training The promotion, requirements, and monitoring of other BMPs at FSEs and high-density housing should be discussed openly with their representatives to determine the cost vs. benefit of implementing and/or monitoring these BMPs.

BB2 Kitchen BMPs:
The study provides the following recommendations:

1) Kitchen BMPs should be promoted for all residences and FSEs.
2) At a minimum, all FSEs should be required to implement structural BMPs and to keep records on GRE maintenance, proper waste disposal, and employee training.
3) Before developing the kitchen BMP elements of a FOG control program and identifying the resources necessary for promoting or monitoring kitchen BMPs, Orange County cities and agencies should discuss their options and enlist the input and support of potential partners, such as the restaurant associations (e.g., California Restaurant Association), the hotel associations, property managers, regulators, environmental groups, and other involved agencies to help implement effective kitchen BMP program elements. The BMP recommendations from the report can be used as a baseline to begin these discussions.

Building Block 3 - Sewer Line Cleaning

Cleaning of sewers is performed to restore and maintain hydraulic capacity and prevent blockages or spills. Most cities or agencies have sections of their sewer lines where accumulations of solids or FOG occur quite rapidly after cleaning due to the nature of residential, industrial, or commercial discharges into those lines. These "hot spots" must be cleaned frequently. In most cities or agencies, such frequencies are based on inspection records and performance history for specific lines that may require cleaning semi-annually, quarterly, monthly, or even weekly. Increased cleaning is resource intensive and costly, and because the build up of grease at hot spots is inconsistent, increased cleaning may not prevent all grease–related SSOs at that hot spot. If cleaning is occurring at short intervals, more effort should be placed on controlling the source of the problems, such as promoting kitchen BMPs, installation and regular inspection of grease removal equipment, or replacing broken or inadequate sections of sewer pipe.

The RFI and OCSD surveys revealed that CCTV inspections are dramatically improving the success of sewer line cleaning. The surveys also identified that most grease blockages in Orange County occur in 6- to 8-inch diameter sewer lines. This finding points to the need to focus on solutions specific to 6- to 8-inch diameter lines, such as specialized CCTV equipment, combination cleaning trucks, and potentially the use of biological additives. The FOG Characterization work should pinpoint "hot spot" areas in sewer lines that will then become the primary focus of grease-related sewer line cleaning and CCTV monitoring.

A second type of cleaning is for sewer lateral lines from FSEs, multi-family housing, or homes, which are almost always owned and maintained by the property owner. These lateral lines can also experience blockages or SSOs upstream of the public agency owned and operated local sewer. To clear the lateral blockage, a plumber will commonly push, scour or scrape the grease mass (this is also true of other lateral blockages, including roots) into the local sewer, which may cause a subsequent blockage.

The finding that lateral cleaning activities can contribute to or cause blockages or SSOs in municipal sewerage systems is significant and suggests that many blockages and SSOs could be prevented if there were better coordination between the cleaning of laterals and the maintenance

of publicly owned sewers, particularly at hot spots. This could be accomplished through a notification program. In addition, if the frequency of lateral line cleaning incidents at FSEs can be monitored through this coordination system, this can serve as an indicator of the effectiveness of their BMPs and their trap and interceptor maintenance programs at preventing grease from entering the public sewers. Finally, note that this includes lateral cleaning activities for multi-family buildings. The study necessarily focuses on FSEs, where there are clear opportunities for FOG control programs. Multi-family buildings generally are much more difficult to regulate because they are residences rather than businesses, but it is possible to include these facilities in a lateral line notification program.

BB3 Sewer Line Cleaning:

The study provides the following recommendations:

1) Utilizing the BMPs and guidelines presented in this report, the Operations and Maintenance staffs from the cities and wastewater agencies should establish a strategy for grease-related sewer line cleaning, which includes:
   - Adopting minimum standard cleaning procedures,
   - Judicious use of CCTV to verify cleaning effectiveness,
   - Development of a hot spot rating system, and
   - Utilizing a database and/or GIS to store and manage the collection system cleaning and hot spot data.
2) A notification system between the plumbers performing lateral line cleaning and the agencies' sewer line cleaning departments should be developed. A strategy meeting should be conducted between the agencies and the representatives of the plumbers, FSEs, and multi-family building managers to develop this system of notification.

Building Block 4 - Grease Interceptors

Grease interceptors are underground or in-ground grease collection devices, which are generally described in the Uniform Plumbing Code (UPC) or the California Plumbing Code[4]. The terms "traps" and "interceptors" are often used interchangeably, which has created much confusion. Grease interceptors are typically a minimum of 750 gallons capacity and are located outside a FSE kitchen or multi-family building. Grease traps are much smaller than interceptors (usually 50 gallons or less) and typically are located above ground in the kitchen under a sink.

The grease interceptor is a proven grease collection device that the study lists as the best conventional technology (BCT) for grease control. However, interceptors must be maintained properly to perform effectively. Grease interceptors at FSEs will reduce grease blockages and SSOs, if the FOG control program includes inspection and verification of proper maintenance of the interceptor. This is evidenced by the success of some FOG control programs (e.g., Eastern Municipal Water District and the Cities of San Diego and Oxnard), which experienced a dramatic reduction in grease-related SSOs after implementing an inspection program for grease interceptors. Also, the study has identified that many city plan check departments have had difficulties in the past properly implementing the UPC requirements for the installation of

[4] The 2001 California Plumbing Code is based on the 2000 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials with California amendments. Note that California has not amended most provisions of the UPC pertaining to grease traps and interceptors.

interceptors at FSEs. This is particularly true when an FSE changes ownership or management, or when it is not clear which agency has jurisdiction over the UPC requirements. Also, many older FSEs were permitted when grease blockages were less frequent or were perceived as less of a problem. Therefore, many FSEs in Orange County do not have interceptors even though they discharge a significant quantity of grease.

Proper implementation of the UPC requirements and an inspection and regulatory program for interceptors is resource-intensive. However, it has been found, to date, to be a very effective approach to reducing grease-related SSOs. Therefore, the study recommends that new FSEs, and FSEs that pursue remodeling of over $50,000, must be required to install a grease interceptor according to the UPC requirements and provide proper maintenance of the interceptor. For existing FSEs with an interceptor, proper maintenance will be required. For existing FSEs without an interceptor, the study recommends a "conditional stay" of the requirement to install a grease interceptor for a period of up to two years (discussed further in the Ordinance Building Block). The study also recommends that small FSEs that meet a de minimis classification may receive a waiver from installing an interceptor. Additionally, interceptors should not be larger than 3,000 gallons (for cleaning purposes), unless there are special circumstances. The study provides recommendations for the proper design of an interceptor and guidelines for following the UPC requirements based on the study's recommendations. However, further input from building department representatives, plumbers, interceptor manufacturers, and grease haulers should be received before finalizing a standardized design and sizing requirement.

Monitoring an interceptor (e.g., measuring the grease and solids build-up) is difficult and unpleasant. Because of this, the study recognizes that FSEs will not typically monitor their own interceptors correctly, if at all. Without monitoring, many FSEs will establish a frequency for pumping out their interceptors based only on corporate recommendations, grease hauler suggestions, past lateral grease blockage frequency, or financial hardship. Some cities or agencies (e.g., the County of Orange unincorporated areas) have required minimum pump out frequencies (e.g., monthly to quarterly) based on the type of FSE or the fixtures in a FSE kitchen. Unfortunately, these approaches do not provide a reliable method of predicting the build-up of grease and/or solids in an interceptor at an individual FSE. This will lead to either under- or over-maintenance of interceptors at most FSEs. Under-maintenance of interceptors will lead to pass- through of FOG into the sewer system and odor and corrosion issues. Over-maintenance of interceptors will lead to unnecessary increased costs for FSEs and the need to dispose of excess waste FOG.

The study has found that proper monitoring of interceptors is required to avoid the discharge of FOG into the collection system. A specially-trained grease removal equipment (GRE) inspector can provide the monitoring that FSEs are not performing. This service has been successfully used elsewhere and is discussed further in the Monitoring and Enforcement Building Block.

One technology that shows great potential for automatically monitoring interceptors is an interceptor monitoring device. This device can continually measure the amount of grease and solids build-up and notify the FSE when it is time to pump out its interceptor. The approximate cost to purchase and install an interceptor monitoring device is $1,500.

In Orange County, the cost to purchase and install a medium-sized interceptor (1,500 gallons) for a new FSE is approximately $8,000. The cost to retrofit an existing FSE with a 1,500 gallon interceptor will typically range from $10,000 to $15,000. The cost to have a grease hauler pump-out and properly dispose of the waste grease from a 1,500 gallon interceptor is approximately $300 per event. Many grease producing FSEs pump out their interceptors quarterly, while some FSEs pump out their interceptors monthly or even twice per month. Therefore, grease producing FSEs with 1,500 gallon interceptors may pay $1,200 to $7,200 per year to properly maintain their interceptor. Grease-producing FSEs find that these costs are necessary to avoid lateral line grease blockages or downstream blockages. Many existing FSEs will find it difficult to retrofit their existing facility to install an interceptor due to space constraints, plumbing slope constraints, or economic hardship. However, this does not diminish the fact that installing, maintaining, and monitoring interceptors are necessary requirements for many FSEs, cities, and agencies to prevent grease-related blockages and SSOs.

BB4 Grease Interceptors:

The study provides the following recommendations:

1) The study recognizes grease interceptors as the best conventional technology (BCT) for controlling grease and preventing grease-related blockages and SSOs. Therefore, the installation and proper maintenance of grease interceptors should be promoted as the primary grease control solution for most FSEs.
2) New FSEs, and FSEs that pursue remodeling of over $50,000, should be required to install a grease interceptor according to the UPC requirements.
3) Existing FSEs without interceptors, should receive a maximum two-year "conditional stay" of the requirement to install a grease interceptor (see the Ordinance Building Block).
4) Small FSEs that meet a de minimis classification may receive a waiver from installing an interceptor.
5) Interceptors should not be larger than 3,000 gallons unless there are special circumstances.
6) A GRE Inspector should be utilized to monitor all FSE grease interceptors to ensure that FSEs are conducting proper maintenance of their interceptors.
7) A mandatory minimum interceptor pumping frequency for all FSEs should be once every 6 months, for sanitary and odor control, as well as to provide for regular inspection of its integrity, although most FSEs will need to pump-out their interceptors more frequently due to the rapid accumulation of grease. Interceptors should also be pumped out completely each time.
8) Due to the cities' and agencies' inconsistency in implementing the UPC requirements for interceptors at FSEs, the primary FOG specialist (the FOG Inspector) should be included in the plan check process for new and remodeled FSEs and existing FSEs that are required to install an interceptor.
9) A special workshop of representatives of the agencies' building departments, health departments, FOG control personnel, interceptor manufacturers, FSE plumbers, and grease haulers should be conducted to finalize the grease interceptor design requirements and the interceptor sizing guidelines provided in this report.

Phase II: Interceptor monitoring devices should be tested due to their potential role in monitoring interceptors as an alternative to the GRE Inspector.

Building Blocks 5 & 6 - Passive and Automatic Grease Traps

Grease traps are small grease collection devices (50 gallons or less), typically installed under a sink. Passive grease traps are relatively simple gravity separation devices that have been used by FSEs throughout the United States for many years. Automatic grease traps provide enhanced grease separation and automatic grease removal. Grease traps are an important FOG control option, particularly for those FSEs without interceptors, and the proper operation and maintenance of passive and automatic grease traps is required for them to be effective. As evidenced by the success of some FOG control programs (e.g. City of San Diego, California and the City of Everett, Washington), FSEs must have the option of installing grease traps (passive or automatic) if interceptors are not a feasible option for the FSE. Otherwise, FSEs will have no means of collecting the grease that is discharged into their drains. Any grease trap will provide some level of grease control, even if maintenance is not performed according to best management practices. Most FSEs in Orange County have not installed grease traps, though this is a common grease removal device in other parts of the country. This is largely due to an apparent belief by many cities and FSEs that grease traps are prohibited by the health department, the Orange County Health Care Agency (OCHCA).

OCHCA states that it does not prohibit the installation of grease traps within FSEs. It recommends that grease traps be located outside the facility whenever possible to maintain sanitary conditions in the food preparation areas. However, OCHCA stated that it will evaluate requests for the installation of grease traps located inside the facility and will assist in identifying installations that allow easy access for maintenance activities that promote sanitary conditions.

Automatic grease traps provide a very promising grease control solution for many FSEs that discharge a vast majority of the grease from their sinks.

The cost of purchasing and installing a passive grease trap can range from $500 to $1,200 for 10 to 50 gallon per minute (gpm) units, respectively. The cost of purchasing and installing an automatic grease trap can range from $3,000 to $8,000 for most models.

BB5&6 Passive and Automatic Grease Traps*:*
The study provides the following recommendations:

1) Grease traps should be utilized at FSEs if a grease interceptor is not a feasible option, because grease traps do provide some level of grease control.
2) Grease trap maintenance and cleaning BMPs should be promoted and monitored to reduce grease blockages and the potential health risks associated with grease traps. The study provides some recommended BMPs, which were designed in cooperation with the OCHCA.
3) A GRE Inspector should be utilized to monitor all FSE grease traps to ensure that FSEs are conducting proper maintenance of their interceptors.

Phase II: Automatic grease traps should be tested because they may provide additional or alternative options to grease interceptors for FSEs.

Building Block 7 - Additives

Additives include chemical and biological products used by FSEs to control grease in private lateral sewer lines and grease interceptors. Many cities and agencies have also used additives to control grease in their sewer lines and lift stations. Chemical additives have solved some lift station grease problems, but they have not yet been shown to prevent sewer line blockages. Therefore, chemical additives are not recommended to be pursued for further study or adoption in a FOG control program until more evidence is provided that they are effective in reducing sewer line blockages.

Biological additives are being used successfully for FOG control at many FSEs and by many cities. The most common products use bacteria and are added either in a sewer line (Sewer Line Application) or in a FSE kitchen drain (FSE Application) upstream of the sewer line. Other products add nutrients to provide proper conditions for the native bacteria to flourish. The bacteria slowly digest the FOG that builds up on sewer lines to prevent the FOG from blocking those lines. These biological additives are not to be confused with chemical products (often falsely called "enzymes") that may only emulsify the FOG temporarily and cause a problem further downstream. Some biological additive suppliers are now supplying turnkey services to cities or FSEs that may include adding the product, maintaining the feeders, monitoring interceptors, or training the FSEs on kitchen BMPs. Companies that supply a service along with their additive appear to be the most successful in preventing sewer line blockages.

Many cities and FSEs have experimented with biological additives with a wide variety of results, often depending upon the proper application of the product. Cities such as Placentia, Los Angeles, and San Diego report success in testing biological additives and services to control FOG in some of their sewer line hot spots. This is a key finding in the research. Some cities also claim that the cost of the biological additives is competitive with their sewer line hot spot cleaning costs. Although there are many cost and performance concerns regarding biological additives, the potential benefits of biological additives and services are significant:

- Control of sewer line hot spots
- Reduced sewer line cleaning
- Less waste grease to be managed or landfilled
- Reduced residential grease blockage problems
- Reduced FOG-related SSOs
- Reduced FOG loading at the POTW
- Potential cost savings for the FSE and the city or agency

Some biological additives may also have potential negative effects on the sewer system or the OCSD treatment plant, though this is very theoretical at this point.

EEC researched over 40 suppliers of biological additives and services and collected cost and performance data on over 25 biological products. The data was combined into a Technology Matrix, which is available to Orange County cities and agencies as a separate document.

The cost for a biological additive (service included) applied in a FSE kitchen is $80 to $150 per month for an average kitchen. The cost for a biological additive (service included) applied in municipal sewer lines is $150 to $800 per hot spot per month.

BB7 Additives:
The study provides the following recommendations:
Phase II: Biological additives and services should be tested to determine their true cost, performance, and potential role in local FOG control programs. The proposed scope of Phase II currently includes testing FSE Application products and services and Sewer Line Application products and services. Depending upon the results of Phase II, biological additives may provide additional or alternative options to grease interceptors for FSEs and an alternative option to sewer line hot spot cleaning for cities and agencies.

Building Block 8 - Grease Disposal Practices and Alternatives

Proper disposal of waste grease collected either from grease traps and interceptors or through kitchen practices is essential to a successful FOG control program. The development of effective FOG control programs in Orange County will lead to better utilization of kitchen BMPs, more installations of grease traps and interceptors, and increased maintenance of traps and interceptors. This will result in a significant increase in the volume of waste grease that will be collected and hauled to disposal or recycling sites in Orange County. The cost of rendering or recycling grease is increasing. Landfill disposal costs are also increasing. To manage this grease and ensure that FSEs and haulers have incentives to collect and dispose of grease properly, a variety of disposal options for waste grease must be available through both the private and public sectors.

The projected increase in kitchen grease waste (yellow grease) will most likely be addressed through the current practice of rendering. Converting yellow grease into bio-fuels is quickly becoming a viable alternative to rendering. To address the projected increase in interceptor waste (brown grease), OCSD conducted an In-Plant FOG Impact Study to evaluate alternative methods of handling liquid FOG at OCSD treatment facilities. The result of the study identified bio-fuel as the most appealing; however, this option is dependent upon private companies being able to produce bio-diesel from brown grease cost effectively. Until the bio-fuel option's technical and economic feasibility is validated, the study recommended hauling the waste FOG to the OCSD facility and feeding it directly to a dedicated digester. This was recommended to be initiated after verification of the efficacy of the process through pilot testing. A bench scale study of grease digestion in a dedicated digester was conducted by OCSD approximately 20 years ago and found it to be effective after several weeks of conditioning. The practice of feeding the waste FOG from FSEs into POTW digesters (although not a dedicated digester) is currently being conducted at the City of Oxnard.

To ensure that FSEs properly dispose of their waste FOG and that haulers and disposal/recycling sites are properly operated, a regulatory program consisting of a four-part manifest system could be implemented to effectively track the waste and its proper disposal.

BB8 Grease Disposal Practices and Alternatives:
The study provides the following recommendations:

1) The current practice of hauling the liquid waste FOG (brown grease) from the FSEs to the waste hauler station at the headworks of OCSD's wastewater treatment facility should be continued. This process should continue until the efficacy of utilizing a dedicated digester at OCSD is validated through pilot testing or until private companies provide a proven bio-diesel option for the brown grease.
2) The Orange County cities, agencies, haulers and disposal sites should conduct a regional discussion to determine how best to regulate haulers and disposal/recycling sites and to determine the most efficient and effective four-part manifest system for the region.
3) A pilot study of a computerized waste tracking system should be conducted to determine the practicality and true costs and benefits of such a system.

Building Block 9 - Education and Outreach

There are many examples of educational programs that have been developed for residential communities and FSEs from around the country. For public outreach, the programs contain advice such as pouring liquids into a container rather than the sink and scraping food solids into the trash rather than down the drain. Pacific Grove, California has developed a school and home education program titled "Grease, Put a Lid on It," which encourages pouring cooking oil and grease into coffee cans. Flyers have been developed such as the "The Grease Avenger" in Los Angeles and "Fat Free Sewers" from the Water Environment Federation, which can be used for bill stuffers, newspaper ads and articles, and web-site information.

Education for FSEs in the various programs is targeted to provide simple operating practices for food service employees. An example is the "Grease Goblin" program from the State of Georgia, which provides easily downloadable material for FSEs, including kitchen signage in three languages. An example of educational materials designed for agencies, which is website-based, was developed by the Oregon Association of Clean Water Agencies. This material, which is titled "FOG Best Management Practices Manual," includes Frequently Asked Questions and kitchen practice BMPs, as well as operations and maintenance of interceptors and traps, disposal options, check lists, and records.

EEC and OCSD are working with the County of Orange Pollution Prevention Program in its development of FSE education flyers to reduce stormwater pollution and sewer line blockages due to FOG. Additional education materials (e.g., flyers, posters, and videos) should be developed utilizing effective existing training material from other cities. Due to the language diversity in Orange County, particularly in FSEs, education materials must be provided in multiple languages. The City of Los Angeles provides its FOG control materials in five languages due to its language diversity.

During Phase I, the study conducted numerous interviews of representatives from the California Restaurant Association (CRA), the California Grocers Association (CGA), the hotel industry, grease control technology suppliers, waste grease haulers, and plumbers. A FOG Control Work Group was initiated that included representatives of CRA, CGA, hotel representatives, OCSD,

the County of Orange, and OCHCA. The FOG Control Work Group discussed the findings of the study to solicit input from the stakeholders that will be affected by the upcoming FOG control programs. The FOG Control Work Group can be utilized to expand the education and outreach efforts, including future BMP workshops.

BB9 Education and Outreach:
The study provides the following recommendations:

1) Additional regional educational materials should be developed for the upcoming FOG control programs utilizing existing training materials from other cities and agencies.
2) The County of Orange Pollution Prevention Program FSE education flyers and other educational resources that have been developed should be utilized in the FOG control programs.
3) The FOG Control Work Group should be expanded to include all the stakeholder groups affected by the upcoming FOG control programs. The Work Group can serve as the primary education and outreach tool for the development and implementation of the FOG control programs.
4) The development of educational and outreach programs should continue to be a joint effort of the stakeholders, pooling resources to develop the materials.

Building Block 10 - Monitoring and Enforcement

Most FOG control efforts must be monitored to ensure compliance with the permit conditions, ordinance, and program requirements. The monitoring strategies in a FOG control program must be logically structured and cost effective. The forms of monitoring identified as essential in Phase I include:

- Monitoring of kitchen BMPs (e.g., drain screens, collection of liquid grease, employee training)
- Grease trap and interceptor maintenance (e.g., monitoring solids and grease levels)
- FOG disposal (e.g., waste tracking through a four-part manifest)
- Sewer lateral cleaning (e.g., coordination between plumbers and the agencies)
- Municipal sewer line cleaning (e.g., post-cleaning CCTV monitoring)

Extensive resources will be invested in this element of a FOG control program. The level of resources required will be determined by the scope of the program and requirements of the ordinance, and by which Building Blocks and alternatives are adopted by the program. Each BMP and technology selected for adoption and use must be evaluated with an understanding of the level of monitoring and inspection required for success. The study suggests that the cities and agencies have several options in implementing and managing monitoring and inspection: individual agency programs and resources, regional monitoring or inspections, and a cooperative program between local and regional agencies.

For FSEs, the recommended monitoring approach is to utilize OCHCA inspectors to provide screening inspections during their normal FSE health inspections, to utilize grease removal equipment (GRE) inspectors to inspect grease interceptors and traps, and to utilize a highly trained FOG inspector, provided by each city or agency, to conduct detailed FSE inspections

focusing the majority of his or her time and efforts where they are needed most (e.g., FSE violations and hot spot areas). For cost purposes, some smaller cities or agencies cities may choose to combine the GRE and FOG inspector roles, if appropriate. Some cities or agencies may choose to contract out the services of the GRE inspector and/or the FOG inspector, if qualified contractors are available. Regardless of the approach, the GRE inspector and the FOG inspector roles and focus are substantially different and must be managed as such.

The recommended monitoring approach for sewer lateral line cleaning (e.g., coordination between plumbers and the agencies) and municipal sewer line cleaning (e.g., post cleaning CCTV inspections) was discussed in the Sewer Line Cleaning Building Block above. The recommended monitoring approach for FOG disposal (waste tracking through a four-part manifest) was discussed in the Grease Disposal and Alternatives Building Block above.

For FSE monitoring and inspections to be successful, there must be systematic enforcement that will implement requirements, ensure compliance, and ensure equitable application of the requirements. It must also have a strong, defendable ordinance to ensure authenticity and due process. The enforcement must also be practical to be implementable. Each city or agency should appoint a FOG Control Program Manager to provide this practical enforcement. The study recommends that the FOG Control Program Manager exercise discretion early in the program for FSEs and haulers and use a progressive enforcement strategy, similar to the OCSD industrial pretreatment program, to re-educate and eventually ensure long-term compliance.

BB10 Monitoring and Enforcement:

The study provides the following recommendations:

1) The study recommends that FOG control monitoring be conducted through the use of the following:
   - OCHCA screening inspections at FSEs
   - GRE Inspector to inspect grease traps and interceptors
   - FOG Inspector to conduct a minimum of annual FSE inspections while primarily focusing on FSEs in hot spot areas
   - Regional certification of haulers and disposal facilities and the regional management of a four-part manifest system for tracking waste FOG
   - Coordination between plumbers (or hydro-jetters) and the agencies to develop a logical notification system on private lateral line cleaning
   - Post sewer line cleaning CCTV monitoring
2) A progressive enforcement strategy for FSEs and haulers designed to re-educate and eventually ensure long term compliance.
3) The need for consistency and cooperation between regional and local agencies is critical to the success of the monitoring and enforcement programs. Therefore, the details of this cooperation should be discussed in a regional policy meeting for the benefit of all the stakeholders.

Building Block 11 – Program Costs, Fees, and Incentives

A FOG control program will require funding. Many agencies have struggled with developing an appropriate fee structure to recover its program costs. In fact, most agencies are currently providing this funding through their current water or wastewater funds without developing a separate fee or surcharge program. Ultimately, these funds are recovered through increased sewer use fees for specific dischargers or the general public.

To provide policy makers tools for funding their programs, the study has reviewed cost recovery models. Industrial Pretreatment Programs at Publicly Owned Treatment Works (POTWs) provide such a model for cost recovery from industries. The POTW model is based on the fact that industries discharge more flow and higher strength wastewater (i.e., more suspended solids or organics) than a common household. Therefore, industries pay a surcharge for this extra flow and strength. The industry surcharges recover the costs of treating the high strength wastewater and the costs of industry inspections and enforcement. A FOG control program could be similarly designed, where the funding is primarily supplied by those that discharge FOG into the collection system beyond that of a common household.

The FOG control program costs must first be calculated before determining how they will be recovered. The costs directly attributable to FSE FOG control may include the FSE monitoring and inspection costs (including the OCHCA screening inspection costs) and the cost of grease-related sewer line cleaning (i.e., increased sewer line cleaning due to grease) in the FSE areas. The other costs of the FOG control program (e.g., residential education and outreach, grease related sewer line cleaning in residential areas, and waste grease tracking) are not attributable to FSEs.

For a hypothetical medium-sized city, the following future FOG control cost calculation has been developed to provide an order of magnitude estimate of the potential future costs after a FOG control program is in effect (actual data will be different for each city or agency):

FOG Control Data for a Hypothetical City or Agency in 2005	
General Data	
Population	125,000
Miles of agency owned sewer line (not including laterals)	300
Number of FSEs with properly designed and maintained interceptors	200
Number of FSEs without properly designed and maintained interceptors	200
Annual Agency FOG Control Operating Costs	
Grease-related sewer cleaning and post-cleaning CCTV inspections in FSE areas	*$300,000 to $500,000
Grease-related sewer cleaning and post-cleaning CCTV inspections in other areas	*$60,000 to $140,000
FOG control FSE inspections, enforcement, and administrative costs	$150,000 to $250,000
Other FOG control program tasks (e.g., education and outreach, waste tracking)	$40,000 to $60,000
Grease-related fines and SSO clean-up costs not directly recovered from dischargers	$200,000 to $300,000
Total	$750,000 to $1,250,000

Note: The costs shown are future annual operating cost estimates for a hypothetical city and do not reflect the potential capital costs required. The actual costs will vary significantly from agency to agency depending upon the local conditions, and the method of cost recovery will need to be determined by each city and agency. The other sewer cleaning and CCTV inspection costs that are not FOG-related are not included in this table.

* Some of these costs are already incurred by cities and agencies that are performing increased sewer cleaning & post-cleaning CCTV inspections. Also, some of these costs may already be recovered.

Based on the data presented above for a hypothetical city or agency in 2005, the total annual FOG control cost to recover is $750,000 to $1,250,000. FOG control costs directly attributable to FSEs are the costs of grease-related sewer cleaning and CCTV inspections in FSE areas ($300,000 to $500,000) and the costs of the FOG control FSE inspections, enforcement, and administration ($150,000 to $250,000) for a total of $450,000 to $750,000.

For the FSE community, once the actual FOG control costs attributable to FSE are determined, a city or agency will need to decide whether to recover all of these costs from the FSEs or to share the recovery of these costs with other dischargers. Once a city or agency determines the amount to be recovered from the FSE community, this must be recovered equitably from the individual FSEs.

Based on the Industrial Pretreatment Program Model, individual FSE fees would be based on the amount of FOG that they discharge. However, since the sampling and analysis of FSEs is not typically practical or representative, an FSE's fee could be based on its volume of fresh water usage, with a discount for those FSEs that have installed and maintained a properly-designed

grease interceptor. The discount is due to the benefit those FSEs provide by paying for the proper maintenance of their interceptors to keep FOG out of the sewer lines. Kitchen BMPs should be a mandatory requirement for all FSEs, and therefore, should not be included in the discount. Depending on funding needs, cities and agencies may charge an FSE application fee in the form of a Notice of Intent to Discharge fee to provide the preliminary funding of the FSE FOG control program.

BB11 Program Costs, Fees, and Incentives:
The study offers the following conclusions:

1) The cities and agencies should determine the costs of their FOG control programs, the dischargers responsible for those costs, and a cost recovery strategy.
2) The fees for individual FSEs could be based primarily on their water usage with a discount for those FSEs with properly designed and maintained grease interceptors.
3) If necessary, a one-time FSE application fee could provide the preliminary funding of the FSE FOG control program.
4) The basis of the cost recovery, including the FSE fee structure, should be discussed in a regional policy meeting for the benefit of the region.

Building Block 12 - Ordinance

An ordinance, or set of regulations that establishes due process and specifies the obligations and rights of both the regulator and regulated entities, provides the legal framework and foundation for implementing a FOG control program. The ordinance is a foundational block of a program and is essential to establish conditions of discharge, requirements, and mechanisms for monitoring, enforcement, fees, incentives, and penalties. As part of this study, a "Backbone FOG Control Ordinance" (Ordinance) has been developed. This Ordinance includes recommended minimum standards and requirements for the program and the tools to implement the program. The two fundamental tools included in the Ordinance are (1) a General Permit, which establishes the detailed requirements for the program and (2) the Notice of Intent to Discharge, a form submitted by FSEs detailing the facility information and the type of food handling operation.

The primary requirement of the Ordinance is that "FOG shall not be discharged into the City's sanitary sewerage system in a quantity that will accumulate and/or cause or contribute to blockages in the City's sanitary sewerage system or in the sewer lateral, which connects the FSE to the City's sanitary sewerage system." The Ordinance and the General Permit include a requirement for the installation of a grease interceptor by all FSEs, whether new or existing (unless deemed to have a de minimis discharge). This underlying assumption is based on the fact that grease interceptors continue to represent the best conventional technology for FOG control. While it is possible that a city can improve FOG control and reduce SSOs with an aggressive program of kitchen BMPs by the FSE community, BMPs alone are unlikely to be sufficient. Nevertheless, because it will be difficult for many existing FSEs to install grease interceptors and because alternatives to grease interceptors have not been adequately evaluated, the Ordinance allows the FOG Control Program Manager to "conditionally stay" or delay the implementation of the requirement for installation of grease interceptors by existing FSEs for up to a two-year period to develop requirements for Alternative FOG Pretreatment Programs. The

stay is contingent upon the condition that the FSE display that it is not "causing or contributing to an SSO or blockage." If an FSE is shown to be "causing or contributing to an SSO or blockage" during the stay period, the requirement for an interceptor will be enforced before the stay period has concluded.

Further study of the alternatives may find that some alternatives do provide a sufficient level of control to prevent blockages. Some alternatives may perform well for certain types of FSEs or under certain conditions. The stay is specifically intended to allow time to pursue and examine a wide variety of alternative technologies and processes by the FSEs and cities. The Alternative FOG Pretreatment Program section of the Ordinance is intended to allow for approval of these programs, based on sound technical data. It is important to note that if an approved alternative is not provided by the FSE within the stay period, the FSE will be required to install an interceptor. Specific conditions and criteria for this program may be developed as part of the General Permit.

The Backbone Ordinance and General Permit Outline presented in this study are a first effort to provide structure for implementing a FOG control program. The issues and conditions for FOG control are similar in many cities and agencies and it is recommended that the cities and agencies in Orange County develop a regional model for the program utilizing the Backbone Ordinance, where the next step would be to develop a General Permit with input from stakeholders.

BB12 Ordinance:
The study provides the following recommendations:

1) The Backbone Ordinance should be utilized as a basis for a regional model or template and that a regional model for the General Permit should be developed by the stakeholders. This would include the development of fees and incentives and Alternative FOG Pretreatment Programs, which should be based on the results of Phase II testing and sound technical data from the FOG characterization efforts in each city or agency.

CONCLUSIONS

The goal of Phase I of the Orange County FOG Control Study was to provide Building Blocks for Orange County cities and agencies to use to develop coordinated and effective FOG control programs. FOG control programs should be based on sound information on the "hot spots" in the local sanitary sewers and an inventory of FSEs in the area. This vital information supports a much more effective and efficient FOG control program by allowing the community to target its resources to the source(s) of the problems. This information also supports building the partnerships, which contribute to the strength and success of the program. Potential partners include regulators and environmental groups, and, more importantly, restaurant associations, hotel associations, and other professional and industry groups. Assistance from industry partners will ensure that programs are designed with industry constraints and practices in mind and will facilitate the education and outreach necessary to ensure a successful program.

Phase I of the study has developed Building Blocks for a sound program, including programmatic components, best management practices, technology review, and proper disposal of waste FOG. The key programmatic component is legal authority for the program, which will

be created through a local ordinance. A Backbone Ordinance has been drafted which includes the standards and requirements for the program, as well as the tools for implementation. Other components provided by the study include basic strategies for monitoring and enforcement and for development of fees to fund the program.

On the technology side, the study assesses the status of various FOG control devices and additives. The grease interceptor, and to a lesser degree the grease trap, is presently the leading technology that has been found to be effective if properly maintained. While the effectiveness of grease interceptors for FOG control has been known for some time, there has not been aggressive or consistent enforcement of the Uniform Plumbing Code requirements to install interceptors. Therefore, many existing FSEs are faced with a need for better FOG control but find that the installation of a grease interceptor is either costly or difficult due to physical constraints, or both. The Backbone Ordinance and the recommended program include a conditional stay of requiring existing FSEs to install an interceptor, as long as they provide some alternative, effective FOG control. There are promising alternatives to grease interceptors which may offer reasonable control for some FSEs, particularly when combined with kitchen BMPs. Kitchen BMPs are an important component of any program. If done properly, they are effective in reducing grease discharged to the sewer. However, findings of this study indicate that it is unlikely that kitchen BMPs alone will provide effective FOG control. Thus, the investigation of alternatives to grease interceptors is a particularly important follow-up, and the stay will allow time for this investigation.

An often neglected area of FOG control is proper disposal of waste FOG. The cost of recycling or disposing of grease is increasing and, thus, the likelihood of improper disposal increases. Work is needed both to develop effective disposal alternatives, including new recycling opportunities, and to develop a County-wide regulatory program to ensure that haulers properly handle and dispose of this waste.

Finally, a key finding of the study was the connection between lateral line cleaning and downstream blockages, due to pushing grease, roots, and other debris from private lateral lines into the public sewers. The study suggests a notification and coordination system that ensures that those responsible for the public sewers are informed of private cleaning activities, since these can have major environmental and public health implications.

NEXT STEPS

These conclusions highlight the future steps for developing an effective FOG control program. Utilizing the information presented in this report, the next steps for individual agencies to undertake include the following:

- Conduct a FOG Characterization Study
- Adopt a FOG Control Ordinance
- Assign responsibility for the FOG control program by appointing a Program Manager
- Develop a FSE inspection program
- Establish fees to fund the FOG control program
- Establish incentives for implementation of FOG controls

- Develop BMP standards for sewer line cleaning
- Develop standard practical kitchen BMPs for FSEs
- Develop final interceptor design and sizing requirements for FSEs

Steps which are best continued through regional activities include the following:

- Pilot test FOG control devices and additives (Phase II)
- Research and develop grease disposal alternatives
- Convene regional meetings with stakeholders and partners, especially FSE partners, to develop education and outreach programs for all cities and agencies and to address regional issues identified in the report
- Investigate development of a County-wide regulatory program for grease haulers and a program to provide communication between plumbers and private sewer cleaning and city maintenance staff.

All of these activities will require funding. Outside funding sources, such as grants, may be available for some of the more innovative aspects of the program. While agencies can begin to fund their programs through fees, each will also have to ensure that necessary funding is available to meet the requirements of the WDR.

SECTION 1
INTRODUCTION

Beach closures in Orange County, California have become a major concern. One reason for the closures is sewer contamination of storm drains and surface waters resulting from sanitary sewer overflows (SSOs). From January 2000 to August 2001, there were approximately 250 SSOs in Orange County. Approximately 75% of these were from Orange County sewer collection systems owned by cities and local wastewater agencies. During this same period, Orange County experienced 31 beach closures due to SSOs, of which 17 were the result of SSOs from collection systems owned by the cities and wastewater agencies (RWQCB, WDR R8-2002-0014). According to a 2000-2001 Orange County Grand Jury Report entitled, "Sewage Spills, Beach Closures-Trouble in Paradise," most of these SSOs were caused by sewer pipes clogged with grease from restaurants[5] and high-density residential areas.

FIGURE 1-1 Sewer overflow (Courtesy of County Sanitation Districts of Los Angeles County)

In April 2002, the California Regional Water Quality Control Board, Santa Ana Region (RWQCB) issued Waste Discharge Requirements requiring north and central Orange County wastewater agencies and cities (as co-permittees) to develop and implement a plan to monitor and control SSOs. As part of the plan, permittees must begin implementing a fats, oils, and grease (FOG) control program, including grease disposal alternatives, by December 30, 2004. This FOG Control Study is designed to provide potential FOG control solutions and program elements for Orange County cities and wastewater agencies to use to develop their own FOG control programs based on their specific local conditions. This Phase I report provides a preliminary evaluation of nation-wide FOG control best management practices (BMPs), FOG

[5] The study assumes that the term "restaurant" was utilized as a general term in the Orange County Grand Jury Report and is intended to represent grease-producing food service establishments (e.g., restaurants, commercial kitchens, bakeries, hotels, schools, prisons, correctional facilities, and care institutions).

control technologies, and program elements that could potentially be used to develop an effective FOG control program.

1.1 REPORT OUTLINE

A brief outline of the sections of this report are provided as follows:

Section 1 Introduction – Study focus and keys to understanding the report
Section 2 Background – Regulatory background and study phases
Section 3 Approach – Study approach
Section 4 Local Conditions – A summary of the local conditions in Orange County
Section 5 Orange County Agencies and FSE Associations – The potential roles of local agencies and associations
Section 6 FOG Control Program Building Blocks – The potential FOG control program elements are presented as the following Building Blocks:

1) FOG Characterization
2) Kitchen Best Management Practices (BMPs)
3) Sewer Line Cleaning
4) Grease Interceptors
5) Passive Grease Traps
6) Automatic Grease Traps
7) Additives
8) Grease Disposal Practices and Alternatives
9) Education and Outreach
10) Monitoring and Enforcement
11) Program Costs, Fees, and Incentives
12) Ordinance

Section 7 Conclusions and Recommendations

Appendix A – References Cited
Appendix B – Local Condition Data
Appendix C – Backbone Ordinance
Appendix D – General Permit Outline
Appendix E – Notice of Intent (NOI) Example

1.2 HELPFUL KEYS TO UNDERSTANDING THE REPORT

There are many general statements made in this report that are based on the overall research conducted. However, there are also many specific references, particularly regarding BMPs, technologies, and suppliers, which refer the reader to a specific document in the database. The reference is displayed as a document number surrounded by brackets, e.g., [41]. The reference document can be found in Appendix A, References Cited, which displays the author or source and the title of the document.

To understand the terminology in this report, the following common terms and acronyms are explained:

Best Management Practice (BMP): A BMP is an optimal procedure for conducting a process. For example, in this report kitchen BMPs are the recommended methods to be implemented in kitchens to minimize the amount of FOG being discharged to the sewer system. BMP has become an acronym used loosely throughout many environmental programs in the United States. In reality, many BMPs are not validated and therefore, perhaps should not be considered "Best". This is also true for many BMPs presented in this report. For example, the scraping of food from plates into a garbage container to prevent FOG from being discharged to the sewer collection system is almost universally considered a BMP by the agencies, cities, and associations researched in this study. However, if minimizing the waste being disposed of at landfills is also a concern for a city or agency, this management practice may not ultimately be a positive practice. For the sake of consistency and to avoid inventing new terminology, this report also uses the BMP term. However, in many cases, the report elaborates on many practices to provide a more complete understanding of the benefits and potential limitations of the practice.

Best Conventional Technology (BCT): A BCT is the generally recognized technology that has been identified in the study as the de facto standard to control the discharge of FOG.

Brown Grease: Waste grease from grease traps or grease interceptors that cannot be rendered.

California Regional Water Quality Control Board (RWQCB): The RWQCB is the lead agency for monitoring and regulating sanitary sewer overflows (SSOs) in California.

FOG (Grease): Fats, oils, and grease (FOG) are any animal- or vegetable-based oils or greases that are discharged into a kitchen sink or drain. The terms "FOG" and "grease" are used interchangeably throughout this report.

FOG Characterization: FOG Characterization is the determination of the FOG-related sewer line "hot spots" and the causes of those "hot spots" in Orange County.

FOG Control Technology: A FOG Control Technology is a technology that can be used by a FSE or agency to control the discharge of FOG to the sewer through separation, treatment, or monitoring.

Food Service Establishment (FSE): FSEs are establishments engaged in preparing or serving food to the public such as restaurants, commercial kitchens, bakeries, hotels, schools, prisons, correctional facilities, and care institutions.

Grease Interceptor: A grease interceptor is a grease collection or removal device that is typically installed in-ground or underground and outside of the building with a minimum volume of 750 gallons. In most cities, these are required for FSEs based on the Uniform Plumbing Code requirements.

Grease Removal Equipment (GRE): GRE refers to grease traps and grease interceptors. The report may also use the term grease removal device.

Grease Trap (Passive and Automatic Trap): For the sake of this report, a grease trap is considered a grease collection or removal device that is typically located inside a kitchen, under a sink, and is usually less than 50 gallons in volume. A conventional trap or passive grease trap is not mechanical and requires frequent manual removal of grease. A non-conventional or automatic grease trap, in most cases, has features that remove the grease automatically.

Hot Spot (Trouble Spot): A hot spot or trouble spot is a sewer line location that is regularly blocked by grease, roots, or other obstruction. Many sewer agencies increase their cleaning frequency or line inspection in these areas to quarterly, monthly, or weekly in some cases.

Orange County Sanitation District (OCSD): OCSD is a co-permittee for the RWQCB waste discharge requirements (WDR) and is the facilitator and contracting agency for this study.

Orange County Health Care Agency (OCHCA): OCHCA is the health department for the County of Orange, California.

Request for Information (RFI): RFIs were issued to Orange County cities and wastewater agencies to determine the local conditions in Orange County. RFIs were also issued to FOG control technology suppliers to collect cost and performance data on the technologies.

Sanitary Sewer Overflow (SSO): A SSO is an overflow of sewage from the sanitary sewer system typically caused by blockage or restriction due to grease, roots, or pipe damage. SSOs often result in sewage flowing into storm drains or surface water bodies and can often lead to coastal contamination and beach closures.

Waste Discharge Requirements (WDR): WDR R8-2002-0014, issued by the RWQCB, Santa Ana Region, is the regulation requiring north and central Orange County cities and wastewater agencies to develop FOG control programs and grease disposal alternatives.

Yellow Grease: Waste cooking oils and greases that can be rendered or recycled, such as fryer grease.

SECTION 2
BACKGROUND

Fats, oils, and grease (FOG) of animal and vegetable origin are present in common food items, such as meats, cooking oil, lard, and butter. The major sources of FOG to the sewer are Food Service Establishments (FSEs)[6], multi-family housing, and single family homes. The FOG is discharged to the sewer during clean-up from food preparation, cook ware washing, and floor and equipment cleaning. As the wastewater flows through the property owner's sewer lateral or the sanitary sewerage system, it cools and the FOG deposits and accumulates in the pipes and pump stations, forming blockages that eventually result in backups and SSOs (Figures 2-1 and 2-2). These SSOs can cause untreated sewage to flow onto streets and to travel to storm drains, creeks, and other surface waters. Untreated sewage on private property or in the streets poses an obvious human health risk. If this sewage reaches the ocean, it often results in coastal contamination, beach closures, and the associated potential human health risks. The frequency of blockages is unpredictable, because the rate of deposit and accumulation depends on many factors, such as the frequency and volume of FOG discharges and the flow rate, slope of lines, accumulated matter, and low points in the sewer.

FIGURE 2-1 Sewer line grease blockage (Courtesy of Monterey Regional Water Pollution Control Agency)

[6] Food Service Establishments (FSEs) are those establishments primarily engaged in preparing or serving food to the public such as restaurants, hotels, commercial kitchens, bakeries, caterers, schools, prisons, correctional facilities, and care institutions.

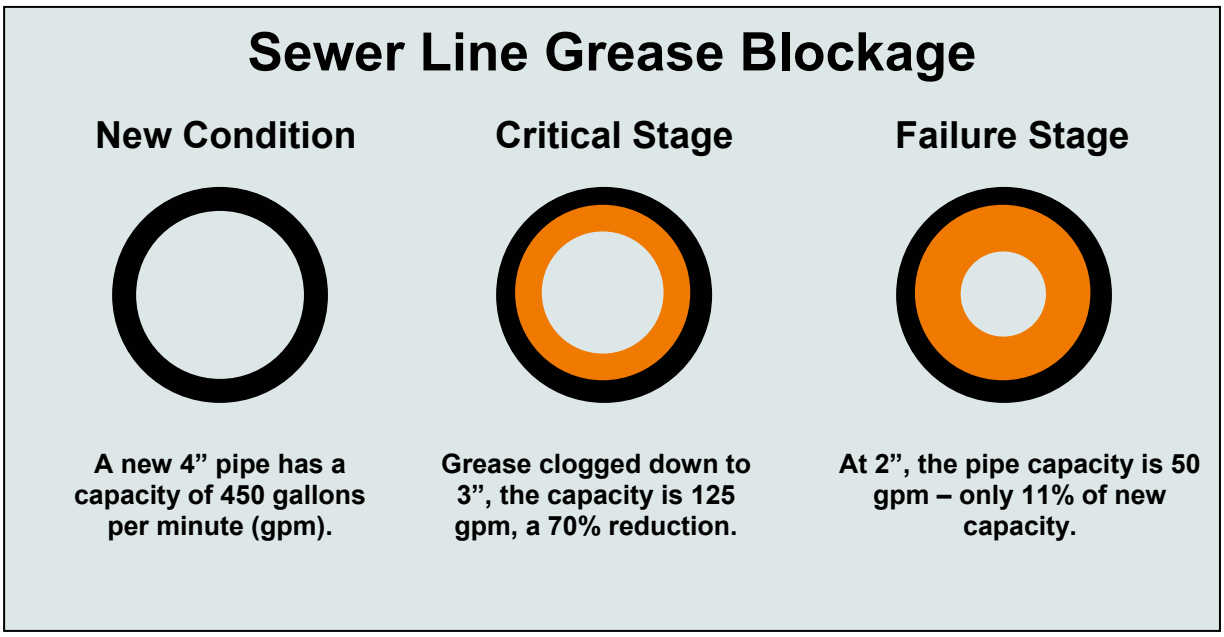


FIGURE 2-2 Example of reduction of flow in a sewer line due to grease blockage

2.1 FOG CONTROL PRACTICES AND PROGRAMS

Historically, "dealing with FOG" meant liquefying the FOG and flushing it out of the private lateral sewer line to the city's and county's sewer lines, thus moving the problem away from the private property. Common techniques employed for preventing blockages of private lines include using hot water, degreasers, detergents, strong chemicals, or biological additives. Commercial facilities often implement measures to reduce the FOG discharge to the sewer to avoid the costs associated with backups and cleaning. Many FSEs, particularly those that are part of a FSE chain, practice "grease recycling," where cooking oil ("yellow grease") is collected by a recycler for processing into animal feed, tallow, and other products. However, recyclers typically collect only "high quality" grease (e.g., used cooking oil), because the grease from grease traps and interceptors ("brown grease") contains decaying food solids and a high water content.

Many FSEs utilize grease removal devices such as grease interceptors and grease traps to limit the FOG discharged to the sewer. However, many other FSEs do not have these devices installed. In addition, many of these devices that are in use have not been an adequate solution due to inadequate design, lack of maintenance, and improper operation.

Many cities and agencies nationwide have made efforts to address the problem of FOG discharges, but the actions are typically based on "what everyone else is doing" and, at times, anecdotal information. To date, there have been few detailed, scientific investigations into source control and treatment methods for FOG. The U.S. Environmental Protection Agency (EPA) and the Water Environment Federation (WEF) have jointly developed a FOG training course "FOG Control – Making it Happen," which is a compilation of programs and program

elements throughout the United States to educate cities and wastewater agencies. This course also discusses BMPs, FOG control technologies, and waste FOG disposal.

In Orange County, FOG discharge control traditionally consisted of requiring interceptors through a local ordinance, often by reference to the Uniform Plumbing Code. However, except for this provision, there have been few administrative mechanisms in place to control or enforce proper design, installation, operation, and maintenance of the interceptors. In its findings on Orange County, the Grand Jury recommended "regular review of restaurant grease traps/interceptors maintenance logs by the Orange County Health Care Agency (OCHCA) and routine inspection of these devices by wastewater collection and/or treatment agencies' staff within their respective jurisdictions to assure proper emptying and cleaning frequency of these devices."

Given the large number of FSEs in Orange County, the implementation, administration, monitoring, and enforcement of a FOG control program requires resources, both in staff and budget, which are not available at this time. There are over 6,000 FSEs in Orange County. In comparison, the City of Los Angeles has over 10,000 FSEs, and to implement its FOG control program, Los Angeles hired 39 new staff members. Therefore, because of the high cost and the staffing and resource requirements of such a program, many cities and agencies have postponed taking action.

Cognizant of the SSO issues, some agencies have employed preventive measures, such as targeting "hot spots"[7] in sewer lines, to address the FOG-related SSOs. Historically, rather than controlling the problem at the source, agencies spend more effort, time, and money targeting hot spots by performing sewer line cleaning as frequently as monthly or weekly to prevent SSOs.

Recognizing the fragmented approach in the region, the Grand Jury made the following recommendations: "All Orange County wastewater collection and/or treatment agencies form a coalition for the purpose of formulating a standardized grease discharge ordinance for use by all affected wastewater collection and/or treatment agencies. This ordinance should carry enough enforcement power to effectively prevent cooking grease from being discharged by restaurants and should include a vigorous inspection schedule, maintenance criteria, and clearly-defined enforcement procedures and sanctions where violations are noted."

2.2 FOG CONTROL PROGRAM CHALLENGES

Several agencies and cities such as San Diego, Los Angeles, and New York have developed their own varied programs to control FOG discharges. While these cities typically report success, it is difficult for these cities to determine which elements of their programs are providing the most benefit. Although a reduction in SSOs is commonly used as a gauge of the success of a FOG source control program, the reduction in SSOs may be more attributable to increased frequency and proficiency of sewer line maintenance.

[7] "Hot Spots" (or trouble spots) are areas in sewer lines that have experienced SSOs or must be cleaned or maintained frequently to avoid blockages.

In the rush to implement some type of control measure, the complexities of implementing the program are often not thoroughly considered. Implementation of even a "common sense" program would produce some immediate benefit, but if the sources of grease are not well controlled, the program will not likely be successful in the long term.

Because of these unresolved complex issues, there appears to be a general reluctance by agencies and cities to fully address the problem. Among various factors for this reluctance are the requirement to devote a significant amount of resources, time, and money to understand the problems associated with controlling FOG; to develop practical, affordable solutions; and to implement the program. Further complications include a perceived resistance from FSEs, numerous non-validated technologies, legal issues, and a current lack of inexpensive disposal options or the resources necessary to evaluate new technologies.

2.3 REGULATORY STATUS AND REQUIREMENTS

In Orange County, controlling FOG is a high priority because of the numerous beach closures, SSOs, and the findings of the Grand Jury. In addition, many Orange County cities and agencies are facing a deadline of December 30, 2004 to address the problem of FOG-related SSOs from the California Regional Water Quality Control Board, Santa Ana Region (RWQCB). The RWQCB issued Waste Discharge Requirements (WDR Order R8-2002-0014) identifying 32 north and central Orange County co-permittees in April 2002, which included local agencies, such as cities and special districts, and Orange County Sanitation District (OCSD). In addition, OCSD was named as a facilitator for regional solutions to the WDR. According to the RWQCB, co-permittees and/or individual dischargers are potentially liable for fines of $10,000 or more per SSO. The WDR requires the co-permittees to develop and implement a plan to monitor and control SSOs. As part of the plan, permittees must begin implementing a "Fats, Oils, and Grease Control Program," including Grease Disposal Alternatives.

In its findings, RWQCB reported that many of the SSOs are preventable if proper proactive source control measures and routine operations and maintenance (O&M) of the sewer systems are performed.

2.4 REGIONAL STUDY STRATEGY

Environmental Engineering & Contracting, Inc. (EEC) was retained by the Orange County Sanitation District (OCSD)[8] to conduct a FOG Control Study to directly respond to the WDR. Although this WDR is not binding on the south Orange County cities and wastewater agencies that are outside the Santa Ana Region, the need to control SSOs and to determine solutions to SSOs is no less important for these cities and agencies.

To enable the development of a FOG control program that is practical, equitable, and implementable, OCSD and the County of Orange chose to conduct a countywide comprehensive study to evaluate FOG control technologies, management practices, and programs to establish

[8] The study is funded by OCSD, the County of Orange, and the cities and wastewater agencies in OCSD's service area.

the technical, administrative, and ordinance Building Blocks of a control program. Each city and wastewater agency in Orange County could then be able to use these FOG control Building Blocks to develop FOG control programs suited for each city's or agency's particular needs.

The scope of the study was developed based on the requirements of the WDR and discussions with OCSD, the County of Orange, RWQCB, and the Orange County cities and wastewater agencies. The study aims to accurately evaluate the benefits of FOG control solutions and their associated costs and potential negative secondary affects. The FOG Control Study consists of two phases.

2.4.1 Phase I

Phase I is a national research study with an initial goal of evaluating the current FOG control practices, technologies, and programs in the United States. Emphasis is placed on issues and conditions in Orange County. Phase I identifies BMPs and FOG control technologies and their benefits based on their documented results. An example of a commonly used BMP includes kitchen workers pouring liquid grease into a grease barrel rather than down the sink. An example of a commonly used FOG Control Technology includes the use of grease interceptors at a FSE. Examples of less commonly used FOG control technologies include the use of biological additives or non-conventional grease collection devices (automatic traps) installed under a sink.

The final goal of the study is to provide the Orange County cities and agencies with FOG control Building Blocks (including grease disposal practices and alternatives) to develop their own effective and practical FOG control programs. One Building Block will discuss the development of an Ordinance and will include a Backbone FOG Control Ordinance that may be utilized by the Orange County cities and agencies.

2.4.2 Proposed Phase II

The proposed Phase II is a field-based effort to test and measure the performance of various new or relatively undocumented technologies that report success in controlling FOG. The field testing will involve multiple pilot test applications for FOG control technologies selected and presented in this study[9] before they are considered for adoption in local FOG control programs and ordinances. For example, some biological additives claim to be successful when applied at the source (e.g., FSE kitchens) or directly in the sewer collection system using an automatic feeder. Therefore, the same biological additive may be pilot tested at a FSE or in the collection system.

The intent of Phase II is to supply Orange County cities and agencies with a comprehensive, functional, and cost effective approach to FOG control supported by scientific field-testing leading to a realistic plan for long-term reduction of SSOs associated with FOG buildup and blockages.

[9] The selected technologies will be discussed later in the report with recommendations provided in Section 7 – Conclusions and Recommendations.

SECTION 3
APPROACH

This section presents the research approach to Phase I. The approach consisted of two major activities - data collection and management and the FOG control Building Block development – that are presented below.

3.1 DATA COLLECTION AND MANAGEMENT

EEC conducted local and national research to obtain data on local conditions, FOG control technologies, BMPs, grease disposal practices and alternatives, and FOG control programs and ordinances. The data was collected through a request for information (RFI), interviews, and Internet and phone research. The data was organized in a document management system and was used as a reference to develop the FOG control Building Blocks.

EEC interviewed and/or received pertinent literature from several local and national cities, agencies, vendors, associations, and wastewater professionals. A partial list of these contacts is provided below:

- United States Environmental Protection Agency (USEPA)
- California Regional Water Quality Control Board – Santa Ana Region (RWQCB)
- American Society of Civil Engineers (ASCE)
- TRITAC
- Association of Metropolitan Sewer Agencies (AMSA)
- California Association of Sanitation Agencies (CASA)
- Water Environment Federation (WEF)
- California Water Environment Association (CWEA)
- California Restaurant Association (CRA)
- National Restaurant Association (NRA)
- North Carolina Task Force
- Cary, North Carolina
- City and County of Honolulu, Hawaii
- Oregon Department of Environmental Quality
- Savannah, Georgia
- Massachusetts Wastewater Resources Authority
- New York Department of Environmental Protection
- East Bay Municipal Water District
- City of Los Angeles Bureau of Sanitation
- City of San Diego Metropolitan Wastewater Department
- County Sanitation Districts of Los Angeles County
- Eastern Municipal Water District
- Monterey Regional Water Pollution Control Agency
- City of Oxnard
- County of Orange
- Orange County Sanitation District (OCSD)

- Orange County Health Care Agency (OCHCA)
- El Toro Water District

A complete list of these contacts is presented in Appendix A.

3.1.1 Request for Information (RFI)

EEC collected data and information related to SSOs in Orange County through a request for information (RFI) survey sent to Orange County wastewater agencies and cities. Follow-up telephone calls to several agencies and cities were made to confirm the survey results.

The RFI consisted of eight sections including:

- Contact Information
- City/Agency General Information
- Local Best Management Practices (BMPs)
- Local FOG Control Technologies
- FOG Control Programs and/or Ordinances
- Grease Disposal Alternatives
- History of SSOs
- Collection System Description/Information

The RFI data is presented in Appendix B and is discussed in Section 4. Data from the RFIs was reviewed and evaluated to develop a summary of local conditions and identify potential causes and solutions to SSOs.

3.1.2 Website – www.eecfogstudy.com

EEC developed a webpage to publicize the project, supplement the Internet and phone research, and provide a filter for data collection (Figure 3-1). The website was used to collect contact information and provide a means for contacts to summarize their data. The posted data was reviewed and follow-up calls were made to contacts with pertinent project data. The website[10] address is *www.eecfogstudy.com*.

[10] The website is no longer accepting data and is no longer operational. It may be reactivated in the future, if required by follow-up projects.

FIGURE 3-1 FOG Study Webpage

3.1.3 Document Management System

EEC developed a document management system to organize and store the project data, documents, and contact information (Figure 3-2). The system included a database used to organize the hard and electronic copies of the project documents. The system was used to summarize the data and identify data gaps.

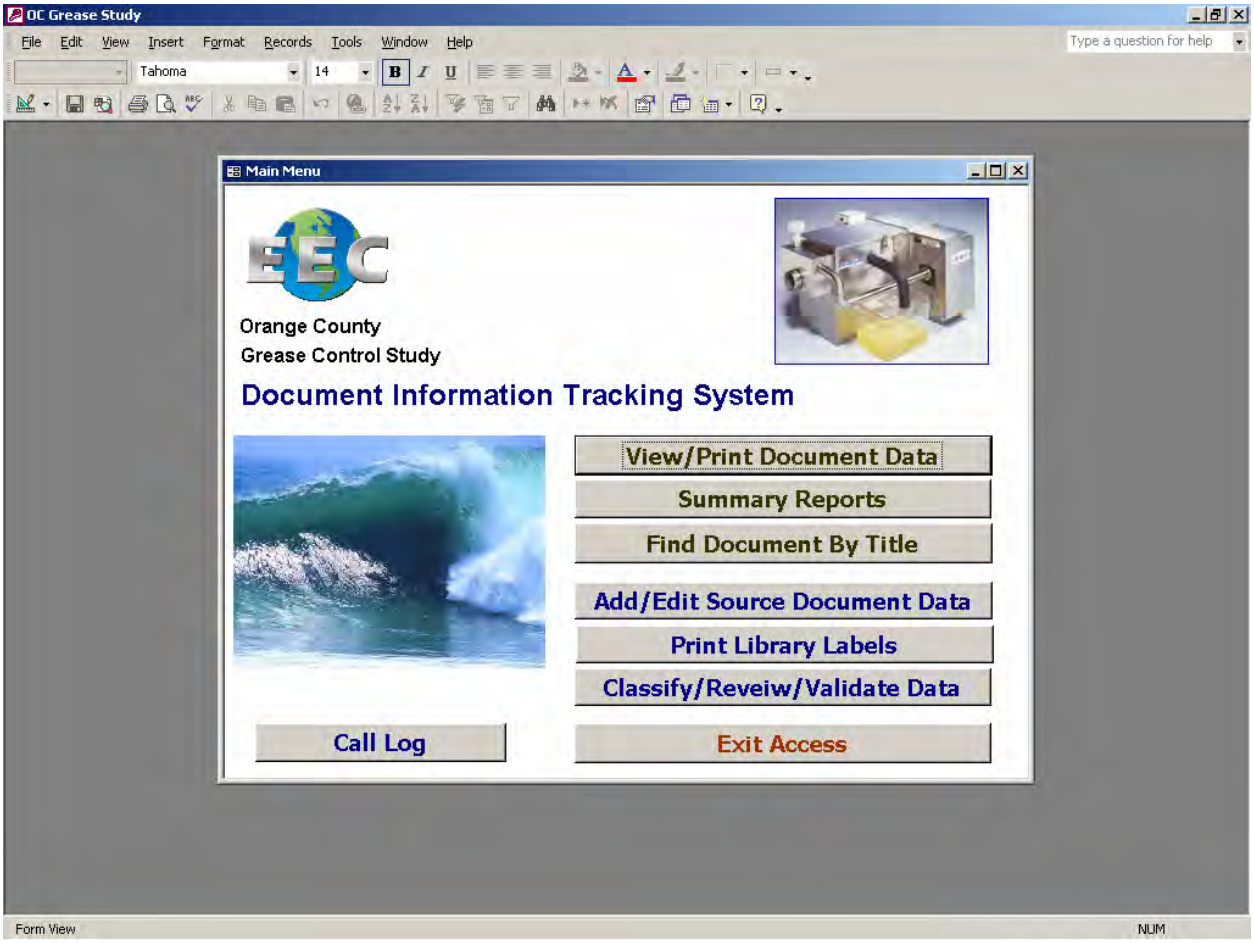


FIGURE 3-2 Database Interface

3.1.4 Data Summary and Review

EEC classified, summarized, and reviewed all of the project documents. The documents were classified according to the categories provided in Table 3-1. Upon classification, the contents of the documents were summarized. After classification and summarization, the documents were reviewed for unique, detailed, pilot-test, and/or reference information.

Table 3-1
Summary of Document Classification

Category	Sub-Category A
FOG Control Technology	Biological
FOG Control Technology	Chemical
FOG Control Technology	Physical – Conventional Traps/Interceptors
FOG Control Technology	Physical – Non-Conventional Traps/Interceptors
FOG Control Technology	Physical – Monitoring Devices
BMP	Grease Disposal
BMP	Kitchen Practices
BMP	Inspections
BMP	Education/Outreach
BMP	Trap/Interceptor Maintenance
Grease Disposal Practices/Alternatives	-
Local Condition Characterization	Current Conditions
Local Condition Characterization	History of SSOs
Local Condition Characterization	Other
Program/FOG Ordinance	Monitoring
Program/FOG Ordinance	Enforcement
Program/FOG Ordinance	Inspection
Program/FOG Ordinance	Fees - Fines
Program/FOG Ordinance	Fees - Incentives
Program/FOG Ordinance	Fees - Penalties
Program/FOG Ordinance	Fees - Surcharge
Program/FOG Ordinance	Other

3.1.5 Data Validation

EEC evaluated the scientific and reference information for each BMP and FOG control technology. Upon evaluation, EEC classified each BMP according to the following rating system:

A Document and section contain very detailed explanation of relevant practices and procedures. It may also contain some unique information.

B Document and section contain general details about relevant practices and procedures. It does not contain any unique information.

C Document and section contain very general descriptions of BMPs.

I Document and section contents are irrelevant to the study and contain no useful information.

The FOG control technologies were characterized primarily based on information supplied by vendors or by their references. EEC requested that each vendor supply the following information:

- Product Literature
- Case Studies/Pilot Studies/Scientific Data Supporting Product
- Client References/Testimonials from Cities and/or Agencies
- Client References/Testimonials from Restaurants/Hotels/Food Establishments
- Appropriate Cost Information

3.2 FOG CONTROL BUILDING BLOCK DEVELOPMENT

EEC developed the FOG control Building Block concept to summarize the project data and present an approach to FOG control that may be applicable to the conditions in Orange County. This was accomplished by reviewing the FOG control BMPs, FOG control technologies, and program elements that are utilized at several local and national cities and agencies to accomplish this task. The culmination of the Building Blocks is the development of a "Backbone FOG Control Ordinance" that can be utilized by the cities and wastewater agencies as the basis for legal authority for the development of the FOG control programs.

The individual Building Blocks are presented in Section 6.

SECTION 4
LOCAL CONDITIONS

This section presents a characterization of the local sewer collection systems and FOG control efforts in Orange County at the initiation of this study.[11] The characterization is based on the data collected from the requests for information (RFIs) that were completed prior to September 30, 2002 and the OCSD Operations and Maintenance 2001 – 2002 Survey. It includes a summary of the local conditions and lists the significant findings.

4.1 SUMMARY OF LOCAL CONDITIONS

The RFI was distributed to Orange County cities and wastewater agencies in July 2002 and twenty (20) responses were received. The north and central Orange County cities and wastewater agencies that responded include:

- Anaheim
- Buena Park
- Costa Mesa Sanitary District
- Cypress
- Fullerton
- Garden Grove Sanitary District
- Huntington Beach
- Irvine
- La Habra
- La Palma
- Newport Beach
- Orange
- Rossmoor/Los Alamitos Area Sewer District
- Santa Ana
- Seal Beach
- Sunset Beach Sanitary District
- Tustin
- Villa Park

The south Orange County cities and wastewater agencies that responded include:

- Aliso Viejo
- San Clemente

A summary of the RFI and OCSD data is presented in Appendix B. For discussion purposes, the data has been divided into the following sections:

- History of SSOs

[11] Many cities and agencies have improved their FOG control efforts or policies since the initiation of the study. Any improvements initiated after the RFI was distributed may not be reflected in this data.

- Current Conditions
- Maintenance Practices
- Administrative Practices
- FOG-related Ordinances
- Local BMPs
- Local FOG Control Technologies

4.1.1 History of SSOs

A summary of the SSO data is presented below:

- There were 242 SSOs in 2001[12] (north and central Orange County).
- 50-90% of SSOs in 2001 were caused by FOG blockages in most cities and agencies.
- The majority of the 2001 FOG-related SSOs were caused by FOG from food service establishments (FSEs) according to the RFI responses.

The main factors reported that influenced or precipitated these FOG-related SSOs include:

- Improper Grease Trap/Interceptor Maintenance
- Collection System Irregularities and Defects
- Root Intrusion
- Low Slope Sewer Lines
- Siphons
- Improperly Maintained or Damaged Laterals

Practices that were recommended to help reduce FOG-related SSOs include:

- Requiring Grease Traps/Interceptors
- Grease Trap/Interceptor Inspections
- More Frequent Sewer Line and Hot Spot Cleaning
- Line Cleaning with Root Elimination
- Kitchen BMPs
- Education Programs/Literature

4.1.2 Current Conditions

A summary of the characteristics of the current sewer systems within the OCSD service area is provided below:

- Total of 5,000 miles of sewer line
- Over 565,000 lateral connections
- Over 120 pump stations

A summary of the reported hot spots within the OCSD service area is provided below:

[12] The study recognizes the inconsistency of the quantity of SSOs reported by the RWQCB in Section 1 and the total quantity identified by the co-permittees in 2001.

- There are more than 1,400 hot spots within the OCSD service area.
- These hot spots are caused by:
  - FOG build-up
  - Siphons
  - System irregularities/defects
  - Roots
- Hot spots usually occur in 6- to 8-inch diameter sewer lines constructed of vitrified clay pipe (VCP).
- The average hot spot inspection and cleaning cycle is once every 2.63 months.

Based on seven respondents who had data available, 49% of the FSEs in their service areas have grease interceptors installed. The other respondents either did not answer the question or did not know how many FSEs had interceptors.

4.1.3 Maintenance Practices

A summary of the current maintenance practices within the OCSD service area is presented below:

- The average sewer cleaning cycle is once every 16.7 months.
- The most popular sewer line cleaning method is HydroFlush (high water pressure flushing).
- The majority of the sewer inspections and cleaning are conducted by city or agency staff.
- All of the RFI responders, except the cities of Cypress, Seal Beach, and Villa Park, utilize closed-circuit television (CCTV) cameras for sewer inspections.

A summary of the CCTV inspection coverage within the OCSD service area is presented below:

- Approximately 15% of the collections systems were inspected with CCTV in 2001.
- Approximately 38% of all collections systems have been inspected with CCTV.
- Five of the respondents (Brea, Costa Mesa Sanitary District, Irvine Ranch Water District, Rossmoor/Los Alamitos Area Sewer District, and Sunset Beach Sanitary District) have inspected all of their collection systems with CCTV.

4.1.4 Administrative Practices

A summary of general administrative practices is presented below:

- Five of the survey participants (Costa Mesa Sanitary District, Garden Grove, La Palma, Rossmoor/Los Alamitos Area Sewer District, and Santa Ana) have a public educational program or have public education brochures.
- Newport Beach is the only respondent of 19 total responses to have a waste disposal program.

A summary of the record keeping practices of the city and county agencies is presented below:

- Approximately 65% of respondents use databases to help manage their sewer systems.

- Approximately 35% use databases and Geographic Information Systems (GIS) to help manage their sewer systems.
- All of the respondents, except Sunset Beach Sanitary District, keep hard copy records of their sewer systems.
- All of the respondents, except Seal Beach and Sunset Beach Sanitary District, have hard copy maps of their sewer systems.

4.1.5 FOG-Related Ordinances

A summary of the cities and agencies with a FOG program or FOG control ordinance is presented below:

- San Clemente indicated it has a FOG program (20 total responses).
- Nine cities and agencies (Anaheim, Midway City Sanitary District, Newport Beach, Placentia, Rossmoor/Los Alamitos Sewer District, Stanton, Sunset Beach Sanitary District, Yorba Linda Water District, and Aliso Viejo) have a FOG ordinance specific to their jurisdictions.
- All of the survey participants with building inspection responsibilities indicated they have adopted the Uniform Plumbing Code, which addresses FOG control devices.
- Six cities or agencies (Anaheim, Fullerton, La Habra, Newport Beach, Sunset Beach Sanitary District, and San Clemente) require grease traps or interceptors for existing FSEs. A summary of this data is as follows:
  - Anaheim and Sunset Beach Sanitary District require grease traps or interceptors at problem sites
  - La Habra, Newport Beach, and San Clemente require interceptors if the site undergoes major renovation
  - Fullerton requires interceptors in all FSEs constructed after 1985
- Five cities or agencies (La Habra, Newport Beach, Rossmoor/Los Alamitos Sewer District, Sunset Beach Sanitary District, and San Clemente) require maintenance of existing grease traps or interceptors. The RFI did not address the enforcement requirements.
- All of the survey participants require some combination of grease traps and/or interceptors for new FSEs, except Costa Mesa Sanitary District and the City of Cypress.
- Four respondents (La Habra, Newport Beach, Sunset Beach Sanitary District, and San Clemente) require maintenance of new grease traps or interceptors. The RFI did not address the enforcement requirements.

All of the cities or agencies that require grease traps and/or interceptors require an inspection of the device at the time of installation. Newport Beach, San Clemente, and Sunset Beach Sanitary District require additional grease trap/interceptor inspections after the initial installation inspection of the device. The frequency of these inspections and who performs them was not asked in the RFI.

4.1.6 Local BMPs and FOG Control Technologies

The local best management practices (BMPs) currently being implemented are presented below:

- Grease Trap/Interceptor Installation and Maintenance
- Kitchen BMP Educational Materials
- Kitchen BMPs Including Dry Scraping of Plates and Using Grease Containers
- Sewer Collection System Cleaning (listed separately from the BMPs in the report)

The BMPs and/or FOG control technologies that Orange County cities and agencies would like to evaluate are presented below:

- Use of Biological/Chemical Products
- Maintenance and Inspection Programs
- Food Service Employee Training
- Standardized Educational Materials Outlining BMPs

Some chemical and biological additives are currently being used by the respondents. However, no data was provided in the RFI responses by any of the cities or agencies to document the success or failure of the technologies listed above in reducing grease blockages in sewer lines. However, phone calls and/or letters of reference were received from the Cities of Santa Ana and Placentia acknowledging their recent use of biological additives is reducing grease blockages in their sewer lines. EEC was also asked to monitor a biological additive pilot test being conducted in Costa Mesa for the Costa Mesa Sanitary District. More details on biological additives are included in Section 6.7.

4.2 SIGNIFICANT FINDINGS

An evaluation of the results from the RFI and OCSD Operations and Maintenance 2001 – 2002 Survey (and follow up interviews) suggests the following findings:

1) Most SSOs are caused by FOG discharged from FSEs.

2) There are more than 1,400 sewer line hot spots in the OCSD service area, most of which occur in 6- to 8-inch diameter sewer lines constructed of vitrified clay pipe (VCP).

3) The average trouble spot inspection and cleaning cycle is once every 2.63 months while the average overall sewer cleaning cycle is once every 16.7 months.

4) The most popular sewer line cleaning method is HydroFlush.

5) Approximately 15% of the collection systems were inspected with CCTV in 2001.

6) Cities and agencies that have inspected their entire system with CCTV generally have fewer SSOs than those that have not inspected their entire systems with CCTV.

7) The Uniform Plumbing Code, which addresses FOG control devices, has been widely adopted by Orange County cities.

8) Most cities require some combination of grease traps and/or interceptors for new FSEs.

9) Few cities are using or testing biological or chemical additives.

10) The cities of Santa Ana and Placentia reported positive results with biological additives and services.

11) Only eight respondents supplied data on the number of FSEs in their service area and only seven respondents knew how many of their FSEs have interceptors.

SECTION 5
ORANGE COUNTY AGENCIES AND FSE ASSOCIATIONS

Orange County regional and local agencies and associations currently have roles defined by jurisdiction, legislative charter, and in some cases by the WDR itself. As the FOG control programs are developed and implemented in Orange County and regional issues are addressed and resolved, there are opportunities for these various agencies and associations to play expanded roles to benefit the local FOG control programs. The basic purpose of these expanded roles would be to improve efficiency, equity, and consistency to control FOG discharges in the region. This section discusses the current activities and potential future roles of the agencies and associations and two south Orange County agencies that have already developed their own FOG control programs.

5.1 REGIONAL AGENCIES

Orange County Sanitation District (OCSD), Orange County Health Care Agency (OCHCA), and the County of Orange were interviewed to establish their current FOG-related roles, expertise, and activities and to determine their potential future roles in FOG control programs for Orange County cities and agencies.

5.1.1 Orange County Sanitation District

The information that follows is based on interviews with Orange County Sanitation District staff and management.

Orange County Sanitation District (OCSD) treats all of the wastewater for the north and central Orange County cities and agencies. The Board of Directors for OCSD is comprised of representatives from its member cities and agencies. With the exception of the City of Tustin and a few small unincorporated areas, the member cities and agencies own and maintain their own sewer lines that feed into the larger OCSD trunk lines throughout the region. A map of OCSD's service area and the main sewer lines that are owned and maintained by OCSD are presented as Figure 5-1:

FIGURE 5-1 OCSD Service Area and Sewer Lines

OCSD administers a pretreatment program, called Source Control, for the industries in its service area, which includes source control activities such as permitting, monitoring, and enforcement. Homes, multi-family housing, and FSEs are not included in this program. OCSD works closely with its member cities and agencies on all sewer-related issues. As a result of the jurisdictional demarcations of the sewerage system, OCSD is named by the WDR as one of the co-permittees and the agency responsible where it owns the local sewers (City of Tustin and a few small unincorporated areas). Because of its regional expertise and role, OCSD was also designated as a regional facilitator. In the capacity of facilitator, OCSD heads the collection system committee that is coordinating the effort to respond to the RWQCB's WDR requirements, which includes the FOG control requirements. OCSD is also the contracting agency for this study with financial support from the County of Orange and other co-permittees.

Because of its regional role under the Clean Water Act as an agency designated as the Control Authority under the Code of Federal Regulations (40 CFR 403), and because OCSD is ultimately responsible to treat and safely discharge all sewage generated in its regional jurisdiction, OCSD is directly impacted by any potential FOG control programs or technologies. Specifically, OCSD is concerned about changes in the characteristics of the wastewater that may result from FOG control technologies or programs implemented. For example, if a biological or chemical additive is used in the collection system, the potential byproducts of these additives may interfere with OCSD's treatment process, pass through in the discharge to the ocean, or impact OCSD's ability to reuse and recycle the effluent from its treatment facilities.

OCSD's Potential Role - A FOG control program may include permitting, monitoring, and enforcement, which are all elements of a source control or pretreatment program, such as the one OCSD has instituted since 1973 for the industrial dischargers. Based on the national research, most cities or agencies that have adopted inspection, monitoring, or enforcement in their FOG control programs have chosen to utilize the source control departments of their local sewering agencies. For example, the City of Los Angeles created a separate FOG control department within its Department of Public Works, Bureau of Sanitation, Industrial Waste Management Division, which conducts its FSE inspections and the enforcement activities. The City of Los Angeles hired 39 new staff members and inspects over 10,000 FSEs, conducting 4 to 5 FSE inspections per day. The City of Los Angeles used its industrial waste inspection and enforcement program as a model for its FOG control program, which relies on a greater emphasis on education and outreach.

Similarly, because of its advanced source control program and because of the size of this program, OCSD has the expertise to develop and to administer a FOG control program regionally. However, OCSD considered the possibility of serving as the administrator for a regional FOG control program for its member cities and agencies and has found that under the current jurisdictional and legal conditions, it is not in a position to assume this role. OCSD's position may be revisited, if jurisdiction, liability, funding, and staffing issues are addressed and resolved.

For example, OCSD has no jurisdiction over the maintenance, cleaning, and operation of the local sewerage system in north and central Orange County, except for the systems it owns. As discussed in this study, SSOs are caused by a combination of factors. One very significant factor

and a precursor of an SSO is the condition (age, diameter, material, and slope) of the sewer line. Unlike the City of Los Angeles, OCSD does not own or maintain the vast majority of the sewer lines where grease blockages occur. Furthermore, as discussed in future sections of the report (e.g., the FOG Characterization Building Block, Section 6.1), the study finds that the source control activities and the sewer line maintenance activities must be closely integrated to focus the FOG control efforts effectively. In north and central Orange County, sewer line maintenance is currently being performed by the individual cities and special districts. Therefore, because it has no jurisdiction over the local collection system, OCSD cannot implement a full FOG control program that may include critical controls, such as the abilities to limit the addition of new grease dischargers to a sewer line and to specify sewer line cleaning, maintenance, and repairs. As a result, according to OCSD, it might incur significant liabilities for SSO events that would be beyond its control to mitigate, based on the current legal and WDR structures, if it administered a regional program.

Since some type of regional approach toward meeting the requirements of the WDR would help establish equitable and consistent FOG control throughout the region, OCSD should continue to use its expertise and resources, combined with those from the other co-permittees, to help coordinate, develop, and provide direction and resources for the development and implementation of effective FOG control programs.

5.1.2 Orange County Health Care Agency

The information that follows is based on interviews with Larry Honeybourne and Jim Miller of the Orange County Health Care Agency (OCHCA).

The Orange County Health Care Agency (OCHCA) services the entire County of Orange, including the unincorporated areas, and currently has a relatively minor role in controlling FOG in Orange County. It performs health inspections of the FSEs approximately two to three times per year, which typically includes items such as observing and noting food temperatures, food preparation and handling, sanitation practices, vermin infestation, and evidence of sewage system backup. It does not include FOG control issues, such as verifying the dry clean up of plates, the use of food grinders, or the maintenance of interceptors. Although not directly related to FOG control, OCHCA inspectors are trained to look for nuisance issues, such as uncovered outdoor grease barrels or trash containers. Other health departments in the United States are also currently playing very limited FOG control roles.

The design or stipulations for requiring grease removal equipment, such as grease interceptors or grease traps, is also not currently a role of the OCHCA. However, when a new or remodeled FSE applies for a building permit, OCHCA will typically review a duplicate set of the building plans. The local building department determines whether the FSE requires a grease interceptor or grease trap based on its own FOG control philosophies and plumbing code interpretation. If a grease trap is included in the plans, the OCHCA stated that it provides recommendations on the location of the grease trap based on maintaining sanitary conditions. Although this being the reported process and although grease traps are a common grease removal device in other parts of the country, most FSEs in Orange County have not installed passive or automatic grease traps.

This is largely due to an apparent belief by many FSEs and cities that grease traps are prohibited by the health department.

Grease Trap Policy - OCHCA states that it does not prohibit the installation of grease traps within FSE's. It prefers that grease traps be located outside of the facility whenever possible to maintain sanitary conditions in the food preparation areas. However, OCHCA stated that it will accept the installation of grease traps located inside the facility and will work with the local building officials and the operators in identifying installation sites that allow easy access for maintenance activities and that promote sanitary conditions. It also recommends complying with the following minimum requirements during the maintenance of indoor grease traps:

- Ensure food preparation is not occurring in the area during these times, preferentially, or that the activities be performed during non-peak hours;
- Ensure that adequate sanitary controls are utilized in the kitchen/food preparation areas;
- Ensure vehicles (trucks) and equipment utilized for the pump-outs are properly maintained to ensure that sanitary conditions are maintained; and
- Post signage displaying these best management practices in the vicinity of the grease trap.

OCHCA's Potential Role - Although the OCHCA does not currently play a role in FOG control inspections, there is potentially a great benefit if the OCHCA is more directly involved in these FOG control areas. OCHCA has stated that it is concerned about FOG control since it plays a direct role in the effects of SSOs, beach closures, and their related health issues. OCHCA also has concerns about the possible conflicting FOG control role of its agency and inspectors, since it currently focuses on health issues in FSEs, such as sanitation and cross-contamination. Based on discussions, OCHCA has stated that its inspectors could potentially provide screening inspections during their normal FSE health inspections (currently approximately two to three times per year) to assist in the FOG control program. This screening role could consist of:

- Reviewing grease trap or grease interceptor maintenance and disposal records;
- Reviewing employee training records;
- Verifying the utilization of drain screens and a grease barrel;
- Distributing educational material; and
- Reaffirming the importance of the FOG control program.

If OCHCA screening inspections are included in a FOG control program in Orange County, the overall cost for these inspection elements will be significantly less than if the local city or special district was required to perform these activities. This could provide significant cost savings to the FOG control program. Therefore, it is recommended that some portion of the fees collected for the FOG program be utilized to fund these screening inspections.

For an inspection program to be successful, it is typically supported by enforcement. However, the OCHCA's FOG control inspection role does not necessarily require it to become the enforcement agency. OCHCA could forward a deficiency report to another local agency, which would perform a follow-up inspection and provide the enforcement support. OCHCA would not have to issue violations, but its inspection reports could be used by the enforcement agency as a

tool to locate the FSEs that may require the most attention. This strategy would utilize the OCHCA inspector's knowledge of the FSE and his or her frequent presence, while providing the enforcement agency with an invaluable tool to focus its limited resources.

5.1.3 The County of Orange

The information that follows is based on an interview with Mike Wellborn, formerly the manager of the Water Resources Programs, Office of Strategic & Intergovernmental Affairs of the County of Orange.

In response to the Orange County Grand Jury Recommendations discussed in Section 2, the County of Orange has developed a FOG control program and ordinance dated November 2002 for the unincorporated areas of Orange County. The County of Orange was interviewed to discuss the features of the County's program and ordinance for the unincorporated areas and its potential role in local FOG control programs.

The County of Orange's FOG Control Ordinance - The County's program is applicable to the approximately 100 FSEs in the unincorporated areas. The County's proposed ordinance does not apply to residential, industrial, or office uses. The general features of the County's program are as follows:

- Existing FSEs that do not have a grease interceptor installed must either install an interceptor or pay an annual Grease Disposal Mitigation Fee that is based on the approximate annual cost of maintaining an interceptor appropriately sized for that FSE based on the Uniform Plumbing Code recommendations. The funds collected from the Mitigation Fees will be used to offset the cost of the program.
- Interceptors are required for new FSEs based on the Uniform Plumbing Code recommendations. FSEs that change ownership, operations, or pursue large remodeling may also be required to install an interceptor.
- FSEs with interceptors must develop an interceptor maintenance plan and must record and document their interceptor maintenance practices.
- Food grinders are prohibited and must be removed from FSEs.
- The introduction of additives to the FSE's wastewater system is prohibited unless approved by the Planning and Development Services Department or the sanitary sewer agency.
- New County Code Enforcement inspectors will be hired to inspect and educate the FSEs. Inspection of interceptors and maintenance logs will be included in the inspection.
- The County Code enforcement is planning to get assistance from the OCHCA and its health inspectors concerning the education of FSEs (e.g., handing out flyers) and inspection of interceptor maintenance logs.
- Based on inspection reports, the County will develop and maintain a database on the 100 FSEs that will characterize and monitor each FSE and its FOG control status.

Note – The features listed above are generalized statements and do not include many of the details of the program and ordinance.

The County of Orange's Potential Role - The County of Orange has a vested interest in controlling FOG and reducing SSOs due to its concerns with clean water, beach closures, and their impacts on the County as a whole. The County is also already directly involved in the control of FOG-related issues as part of its role in the County's National Pollutant Discharge Elimination System (NPDES) program. For example, the County is developing a restaurant inspection program that includes inspecting devices designed to separate grease from wastewater (e.g., grease traps and interceptors) to insure adequate capacity and maintenance. The County is also developing an education flyer for FSEs which combines stormwater and FOG control BMPs.

As a co-permittee and a lead in the NPDES program and as a part of its commitment to clean water and watershed management, the County of Orange logically has a potential role in local FOG control programs. The potential roles include the following:

- Assisting the cities and agencies in their development of FOG control programs and ordinances.
- Sharing, developing, and/or maintaining databases for the permitting, characterization, or monitoring of FSEs.
- Facilitating regional field studies of FOG control technologies for the benefit of its unincorporated area program and the programs in Orange County.
- Participating in regional discussions with other stakeholders and partners, especially industry partners, to develop education and outreach programs.
- Participating in regional discussions with other stakeholders and partners to investigate the potential development of a County-based regulatory program for grease haulers (refer to Section 6.8) and a program to provide communication between plumbers performing private sewer lateral cleaning and city maintenance staff (refer to Section 6.3).

5.2 SOUTH ORANGE COUNTY FOG CONTROL PROGRAMS

The south Orange County cities and agencies do not have one common agency that treats their wastewater or provides industrial waste inspections, monitoring, or enforcement. Most of the cities and wastewater treatment agencies in southern Orange County do not have formal industrial waste programs due to the small number of industries in south Orange County. Therefore, some south Orange County cities and special districts have developed their own FOG control ordinances and inspection, monitoring, and enforcement programs based on their own specific situations. The El Toro Water District and the City of Laguna Beach FOG control programs are discussed below.

5.2.1 El Toro Water District

In August 2002, Ralph Palomares, of the El Toro Water District, reported that the District previously experienced 4 or 5 grease-related SSOs per month in the 1980s. Since then, its control program has been effective in reducing or eliminating SSOs. Its program includes an industrial waste ordinance (Revised in 1997), which establishes five types of permits, one of

which is just for FSEs. It also establishes an enforcement program comprised of stages, starting with a Notice of Violation (NOV), then revoking the permit, and finally disconnecting water service. FSEs must take a grab sample of their wastewater discharges every month and have it analyzed for oil and grease (FOG). The FOG discharge limit is 300 milligrams per liter (mg/L). Interceptors are each required to have a suitable sampling point and to be properly sized. If there is no interceptor, there is a 50% increase in sewer service fees. A FSE can obtain a 50% reduction in the fee if, upon inspection, it can show:

- A manifest for interceptor pumping showing the destination for the grease
- The food grinder has been removed
- Grease barrels are in use and locked when not in use
- Double screens in sinks to keep food scraps and utensils out of the sewers

One inspector conducts all inspections for the district, 90% of which are for FSEs (inspected at least three times per year). Inspections are increased if there are problems with interceptor pumping frequency or large volumes of grease.

El Toro Water District is in the process of completing a CCTV inspection of the entire 150 miles of its sewer system. The CCTV program has led to over 100 repairs of lines during the past several years. Roots are now the major cause of its problems, but there are also problems with poor grades, sags, and siphons. All lines are cleaned by HydroFlushing once per year, with hot spots cleaned as frequently as weekly.

5.2.2 City Of Laguna Beach

According to an interview in August 2002 with John Pietig, Assistant City Manger, the City of Laguna Beach recently adopted its own FOG control program. Laguna Beach's program has the following features:

- Existing FSEs are not required to install interceptors
- Interceptors are required for new FSEs
- Food grinders are prohibited
- Emphasis is placed on Best Management Practices (e.g., dry clean up of plates and pans, pouring liquid grease into a barrel) with frequent inspector verification of training records, proper signage, removal of food grinder, and evidence of spill clean-up materials
- FSEs are educated on BMPs through the use of educational flyers and videos
- FSEs inspections are being conducted twice per year by an outside contractor
- FSE grease interceptors are being inspected once per month by an outside contractor
- FSEs are required to maintain record logs for tracking grease waste management
- For non-compliant FSEs, the city may issue Notices of Non-compliance, Administrative Citations, misdemeanor action, or disconnection
- Increased sewer line cleaning

Mr. Pietig reported that the City does not have a SSO problem in the residential areas (most likely due to high slope lines) and that its SSOs were recently reduced significantly due to increased line cleaning.

5.3 FSE MANAGEMENT AND ASSOCIATIONS

To receive input from the FSEs that would be affected by new FOG control programs in Orange County, EEC interviewed the California Restaurant Association (CRA) and FSE managers. EEC also formed a FOG Control Work Group to receive input on the study's findings and recommendations.

5.3.1 California Restaurant Association (CRA)

Mr. Andrew Casana, CRA Director of Local Government Affairs, was interviewed in July 2002. Data was requested from the CRA related to FOG, particularly specific data that may not be readily available elsewhere. These requests included items such as disposal cost information and lists of BMPs and technology vendors. The CRA was also asked if it was aware of any effective FOG control programs or features of programs in the United States.

The CRA did not have its own published recommendations for BMPs or FOG control programs. However, Mr. Casana reported that the CRA worked very closely with the City of Los Angeles as it developed its FOG control program. Mr. Casana believed that the City of Los Angeles developed an overall reasonable approach to a serious problem. The main features of the City of Los Angeles FOG control program include:

- Most of the restaurants are required to pay for and obtain a permit
- Existing restaurants are not required to install interceptors
- Interceptors are required for new and remodeled restaurants based on the Uniform Plumbing Code recommendations
- Food grinders are prohibited and restaurants are educated on ways to retrofit their sinks
- Emphasis is placed on BMPs (Best Management Practices) (e.g., dry clean up of plates and pans, pouring liquid grease into a barrel)
- Educating restaurants on BMPs through the use of educational flyers and videos in multiple languages
- Hiring many new specially-trained FOG control inspectors to educate and inspect restaurants
- Restaurants are required to maintain a logbook for tracking waste management
- Increased sewer line cleaning

A summary of the other issues and topics addressed by Mr. Casana are presented below:

One Agency for Health and FOG Issues - Mr. Casana explained that restaurants do not look at health and FOG inspections as separate issues; therefore, he stated that it would be beneficial if there were one agency to administer both inspection programs. This would also make it more practical for a restaurant owner or manager to appeal an inspection issue.

Grease Traps and Interceptor Maintenance - Mr. Casana addressed the importance of grease trap and interceptor maintenance. Restaurants have difficulty in maintaining grease traps, and the CRA is hoping better technologies become available to reduce the amount of maintenance.

The CRA believes that interceptor maintenance frequency should be based on the sales volume or number of meals produced in a kitchen of a restaurant rather than a set time each month. According to Mr. Casana, the reason for this is that busy restaurants produce more grease than slower restaurants. Mr. Casana was concerned about depending on a mechanical device, such as an interceptor monitoring device, to determine when an interceptor should be maintained. According to Mr. Casana, relying on a device to tell you when to empty your interceptor could lead to more problems, if the device were to fail and then, in turn, the interceptor is not serviced in time. Mr. Casana recommended that Best Management Practices (BMPs) should be used by keeping a current log of when interceptors are maintained.

Biological Additives - Mr. Casana was aware that some restaurants and cities/agencies are using biological additives or services to control grease, but he was not aware of any particular biological additive or service that is more effective than the others. He expressed hope that these additives and services will prove to be effective.

5.3.2 FSE Management

EEC conducted interviews and kitchen tours with restaurant managers and accompanied FOG control inspectors from the City of San Diego and the City of Los Angeles during routine FSE FOG control inspections to witness the FOG control challenges that FSEs face in those two cities. Those interviewed were aware of the grease blockage problem and the fact that their establishments could potentially be contributors of FOG to the sewer system. The major concerns expressed by those interviewed dealt with the high fees or potential fees of the FOG control program or the tendency to treat all of the restaurants in a similar manner without consideration to the size of the restaurant. Those interviewed also expressed a desire for the FOG control program to emphasize and educate on kitchen BMPs. Those FSEs with grease interceptors felt that they should not have to pay FOG control program fees as high as those without interceptors. This was primarily due to the fact that they are already paying for regular interceptor pump-outs and disposal, while FSEs without interceptors avoid this cost. Those interviewed also expressed interest in an interceptor monitoring device, if it can accurately measure the grease and solids loading in their interceptors. This was because FSEs do not typically monitor their own interceptors correctly, if at all, and they would prefer to know when they should pump out their interceptors rather than following a corporate guideline or having the frequency dictated by an agency. If they practice effective kitchen BMPs, they would like to reduce the frequency of pumping out their interceptors and save money. They were interested in biological additives, but they were also skeptical of many of the claims made by suppliers. They also expressed that they would like enforcement to be on a case-by-case basis based on facts.

5.3.3 FOG Control Work Group

A FOG Control Work Group was initiated that included representatives of CRA, the California Grocers Association (CGA), hotel representatives, OCSD, the County of Orange, and OCHCA. The FOG Control Work Group met on two occasions to discuss the findings of the study to solicit input from the stakeholders that will be affected by the upcoming FOG control programs. All of the significant findings and recommendations of the study were discussed with the Work Group.

The Work Group provided valuable input on issues such as the sources of grease, interceptor requirements, program costs and fees, lateral line sewer cleaning, kitchen BMPs, education and outreach, waste grease hauling and disposal, monitoring and enforcement, and a FOG control ordinance. Some of the significant comments were as follows[13]:

- The program should identify the sources of grease other than just restaurants or hotels that may be causing blockages (e.g., apartments, food manufacturers, bakeries, and laundries)
- Removal of a food grinder is a logical requirement, but the program will need to promote and educate on the proper handling and disposal of the increased food waste and not conflict with the County of Orange Pollution Prevention Program to reduce stormwater pollution
- The program will need to address the proper disposal of waste liquid oils and greases that are not recyclable (e.g., sauces and gravies)
- Some sewer lateral line cleaning activities (e.g., flushing grease, roots, or other debris into the municipal sewer line) may be causing downstream problems, particularly at FSEs without interceptors
- Tracking and regulating waste grease haulers may be beneficial due to the concerns over accurately reporting or removing the volume of waste being invoiced and improper waste grease disposal (i.e., "pumping and dumping")
- The ordinance should allow for appeals of certain requirements
- Basing an FSEs FOG control fee on water usage is logical as long as there is a landscaping or special situation allowance for certain FSEs
- A discount for those FSEs with interceptors is logical based on the fact that they will already be paying for the cleaning and waste grease disposal
- The development of the FOG control FSE fees should consider the burden they will place on the FSE industry
- The true agency program costs should be examined regularly (e.g., annually) to avoid potentially overcharging FSEs in the future
- The ordinance should allow for appeals of certain requirements if a FSE believes that a requirement does not apply to its facility
- When asked if it would be beneficial, the Work Group stated that it would like to meet on a regular basis to discuss these issues further as the FOG programs are developed
- When asked if it would be beneficial, the Work Group stated that the group should be expanded to include waste grease haulers and plumber representatives

5.3.4 FSE Management and Associations' Potential Roles

It is important that the restaurant perspective, as well as the perspective of hotels, property managers, and homeowners, be taken into consideration in the development of any FOG control program since those are the stakeholders most affected. More specifically, working with FSEs

[13] The general comments are listed, but this is not to imply that there was agreement by all present on these issues.

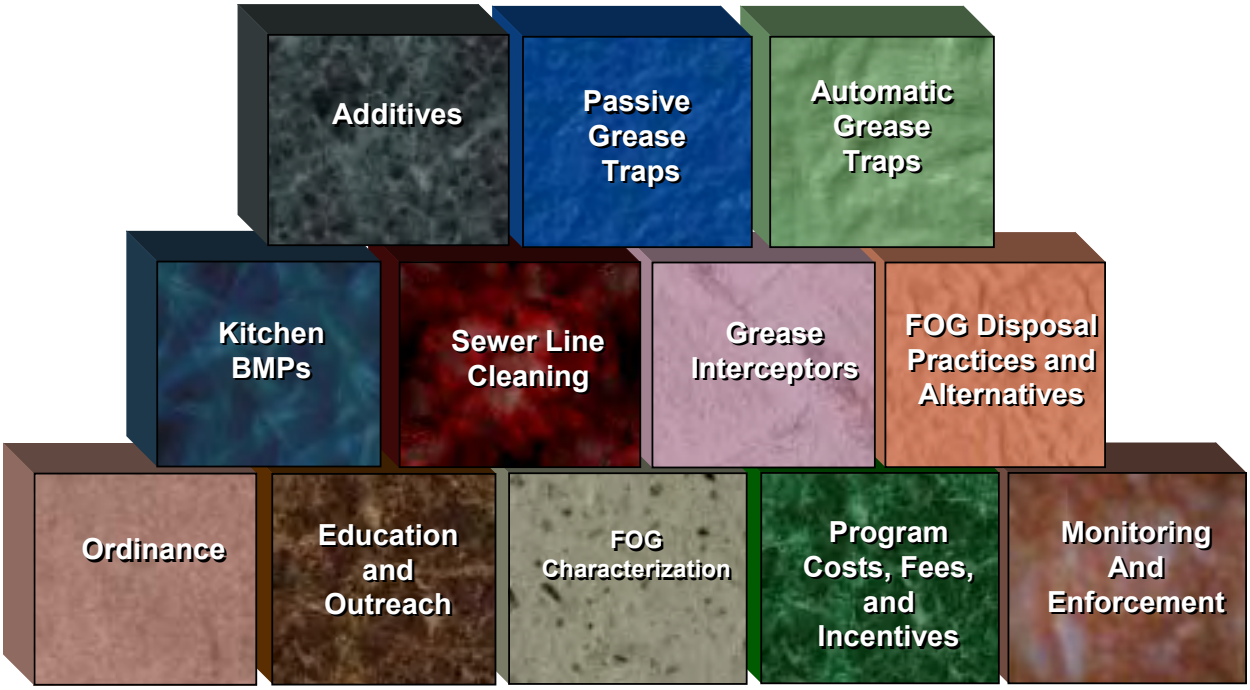
on an effective BMP or inspection program can be more realistic and effective if there is a true collaborative effort between the agency, the FSEs, and their associations.[14]

If a FOG control program gains the support of FSEs and their associations, the potential for success is that much greater. Finding real solutions to FOG control is becoming more of a direct concern for FSEs because of the potential liability now faced by FSEs that are found to cause an SSO[15]. Therefore, one key to gaining support from FSEs and their associations is developing a logical program where the FSEs efforts are seen as directly limiting their own liability as well as helping the environment.

[14] In Orange County, these associations may include the local chapter of the California Restaurant Association, the California Grocers Association, and the Hotel and Motel Association.

[15] According to Ken Theisen of the RWQCB, Santa Ana Region, FSEs face a potential fine or penalty of $10,000 per day if a sewage spill caused by the FSE reaches a storm drain or surface water body. Additional penalties are possible if a beach closure results from the sewage spill.

SECTION 6
FOG CONTROL PROGRAM BUILDING BLOCKS



The basic approach for this study has been to compile information on the various components of existing FOG control programs and to examine the way these components can be used as Building Blocks for FOG control programs in the Orange County cities and agencies. It is important to note that the unique characteristics of a specific community will affect both the nature of the problems caused by FOG and the opportunities to manage or to control them. The study identified and categorized 12 Building Blocks that should be considered individually and in various strategic combinations to develop an effective FOG control program. Each Building Block contains various elements that form the block. The Building Blocks are organized into four categories as follows:

Programmatic Building Blocks

- FOG Characterization (Section 6.1)
- Education and Outreach (Section 6.9)
- Monitoring and Enforcement (Section 6.10)
- Program Costs, Fees, and Incentives (Section 6.11)
- Ordinance (Section 6.12)

Best Management Practices (BMPs)

- Kitchen BMPs (Section 6.2)
- Sewer Line Cleaning (Section 6.3)

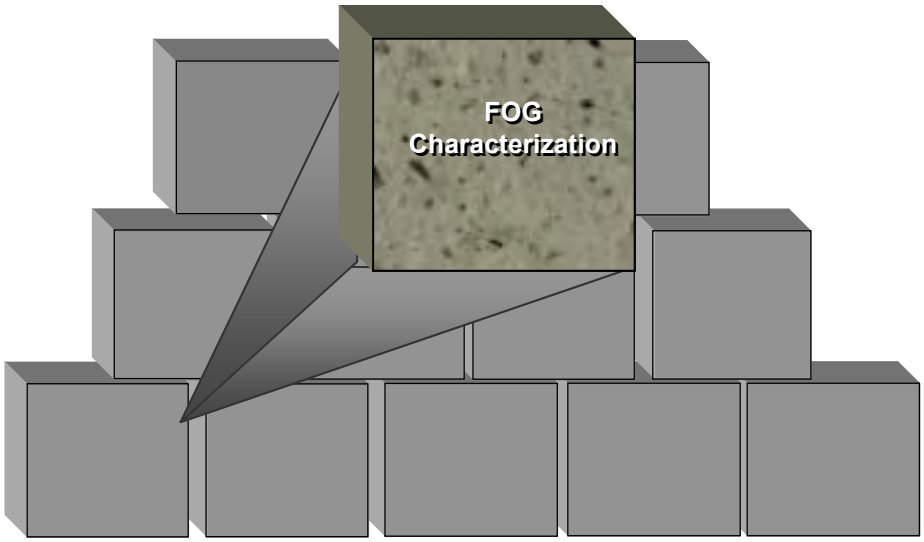
Regional and Watershed

- Grease Disposal Practices and Alternatives (Section 6.8)

Technologies

- Grease Interceptors (Section 6.4)
- Passive Grease Traps (Section 6.5)
- Automatic Grease Traps (Section 6.6)
- Additives (Section 6.7)

These Building Blocks include all of the administrative, BMP, and FOG control technology elements of a comprehensive FOG control program (e.g., permitting, education, interceptors, and interceptor maintenance). After a city or wastewater agency has "characterized" the needs of its program, it can choose to what extent it will implement these Building Blocks and which of the technology Building Blocks will be effective in its service area. The study suggests that the Building Blocks that are fundamental to an effective program are FOG Characterization; Education and Outreach; Monitoring and Enforcement; Program Costs, Fees, and Incentives; Ordinance; Kitchen BMPs; Sewer Line Cleaning; Grease Disposal Practices and Alternatives; and Grease Interceptors. These are essential, foundational Building Blocks to ensure that the program is effective. Other Building Blocks, such as Grease Traps, Additives, and various elements within a Building Block, can be considered as support blocks that can be used in various combinations and degrees depending on local conditions.



6.1 FOG CHARACTERIZATION

Before a city or agency can develop a solution to grease blockages, it must know where the grease is coming from and where the grease blockages are likely to occur. An effective and efficient FOG control program must be based on a good understanding and knowledge of the nature and extent of SSO problems. The scope of the program should include identification of all current or potential sewer line "hot spots,"[16] effectiveness of line cleaning, utilization of BMPs and technologies, and characterization of the FOG sources and their relationship to existing hot spots. The characterization of local and regional FOG conditions is a foundational Building Block that establishes and justifies the scope of the FOG control programs to be developed and implemented by each city. Also, FOG sources, such as FSEs, will better understand the importance of controlling their FOG discharges through the use of kitchen BMPs or grease removal equipment, if they understand how their discharges of FOG are contributing to a sewer line blockage at a specific hot spot. A properly conducted FOG Characterization Study will ensure that the FOG control program is not under-designed or over-designed.

As discussed in Section 4.2, the responses to the Request for Information indicated that only 7 out of 20 respondents knew how many of their FSEs have interceptors. Since FSEs are currently the most controllable source of grease, this lack of basic pretreatment information reveals that these cities or agencies must gather this information to determine the direction of their FOG programs. The cities and agencies also do not know what specific sources are contributing to their sewer line hot spots. This type of "characterization" information is critical to develop an effective strategy for monitoring and enforcement or sewer line cleaning.

Some cities or agencies have conducted limited FOG characterization by mapping their sewer line hot spots or inspecting their FSEs. The study recommends that every city or agency should identify and map its sewer line hot spots, locate potential sources of grease, inspect or audit their FSEs, and integrate this information so that each city or agency can effectively develop and

[16] "Hot Spots" (or trouble spots) are areas in sewer lines that have experienced SSOs or must be cleaned or maintained frequently to avoid blockages.

manage its FOG control program. Based on the responses to the RFI and the OCSD operation and maintenance survey, the majority of cities and agencies have not conducted adequate FOG characterization; therefore, this should be initiated as soon as possible.

Industrial Pretreatment Program Model - The best-fit model for FOG characterization is the Industrial Pretreatment Program method of characterization used by publicly owned treatment works (POTWs). If a POTW is experiencing problems with high concentrations of copper entering the treatment plant, then the POTW must identify and classify (i.e., characterize) the industrial discharges to determine the sources of the copper and the possible solutions. In this case, the POTW may sample the wastewater at key points in the sewer system, inspect and sample the industries that are known to discharge copper, and integrate this data to develop a strategy for reducing the copper concentrations in the wastewater. The inspection of the industries would involve evaluating waste minimization or pollution prevention best management practices (BMPs) and the proper design and operation of any pretreatment technologies. The primary focus of this characterization is to locate the largest sources of the copper and reduce those sources as quickly as possible.

Grease Blockages are a "Middle-of-the-Pipe" Problem - High concentrations of contaminants, such as copper, discharged into the sewer system are an "end-of-the-pipe" problem, because the problem is encountered at the end of the sewer system, the treatment plant. Grease blockages are a "middle-of-the-pipe" problem, because the problem is encountered in the sewer lines themselves. The characterization challenge for this "middle-of-the-pipe" problem is somewhat more difficult than the "end-of-the-pipe" copper problem. This is because there are many dischargers of FOG; BMPs and pretreatment technologies are not being utilized at many of the sources; and the blockage problems are encountered in many areas in the pipe. Whether the problem is at the "end-of-the-pipe" or the "middle-of-the-pipe," the greatest chance of success is to solve the problem at the "front-of-the-pipe," the sources of the grease.

6.1.1 FOG Characterization Approach

The FOG characterization that a city or agency is recommended to accomplish can be segregated into a four step approach. This approach is as follows:

1) Hot Spot Characterization – Identifying, classifying, and mapping sewer line hot spots
2) FOG Source Characterization - Evaluating the potential upstream sources of the hot spots
3) FSE Characterization - Inspecting and categorizing FSEs
4) FOG Characterization Data Integration – Database and Geographic Information System (GIS) integration

6.1.1.1 HOT SPOT CHARACTERIZATION

The sewer line maintenance department and the FOG control personnel should evaluate the sewer system in their city or agency and identify the potential grease-related hot spots. The hot spot segments of sewer line that are identified should then be classified and mapped. This information could be mapped on paper or in a GIS (discussed further in section 6.1.1.4). A potential Hot Spot Scoring System (HSSS) for these hot spots is provided as follows:

6.1.1.1.1 Hot Spot Scoring Strategy

To assist in identifying and classifying sewer line hot spots, a potential Hot Spot Scoring System (HSSS) has been drafted for municipal sewer lines. The HSSS is designed to categorize hot spots, so that the FOG control program can prioritize its hot spots and the potential upstream sources based on the risk of a sewer line blockage or SSO. A city or agency can then use this HSSS rating for each of its sewer line hot spots to easily differentiate between hot spots in its area. The sewer line cleaning staff and the FOG control staff will be able to use the same system to prioritize their efforts and communicate effectively with each other. The proposed HSSS is as follows:

Cleaning Frequency of Municipal Sewer Lines:
0 = Standard cleaning frequency (e.g., every 2 years), no increased cleaning
1 = Cleaning every 9 months to 1 year
2 = Cleaning every 3 months to < 9 months
3 = Cleaning more often than every 3 months or more than one SSO in the last year

Primary Cause of Increased Cleaning:
G = Grease
O = Other

Source Control Factor:
Y = Majority of upstream sources are inspected in the FOG control program - Yes
N = Majority of upstream sources are not inspected in the FOG control program - No

Example #1:
Hot spot cleaned every 1 month, 2 SSOs in the last year = 3
Primary cause is due to grease = G
Majority of upstream sources are FSEs = Y
HSSS = 3/G/Y

In this example, a level 3 grease-related hot spot is a serious issue and must be addressed either through increased sewer cleaning, improved sewer cleaning practices, effective source control (e.g., FSE kitchen BMPs and interceptor maintenance), or a combination of all three. The FOG inspector[17] will prioritize his or her inspection, enforcement, and education efforts at the upstream FSE sources. The sewer line cleaning staff may increase post-cleaning CCTV inspections in this line. The FOG inspector and the sewer line cleaning staff will closely coordinate their efforts to attempt to reduce this hot spot to a level 2 hot spot as quickly as possible.

Example #2:
Hot spot cleaned once every 9 months = 1
Primary cause is due to roots = O

[17] The FOG inspector is the FOG source control specialist in each city or agency (discussed further in the Monitoring and Enforcement Building Block).

Majority of upstream sources are multi-family housing = N
HSSS = 1/O/N

For this example, the sewer line cleaning staff would know that the hot spot is not going to improve significantly due to the efforts of the FOG control program, since the primary cause of the increased cleaning is due to roots and the multi-family housing will not be inspected in the FOG control program. In this example, the agency's resources will need to be focused on root control.

6.1.1.2 FOG SOURCE CHARACTERIZATION

For all significant hot spot areas, the city or agency should assess the sewer line hot spots using closed circuit television (CCTV) inspection to confirm the cause of the hot spot (e.g., FOG, roots, damage to the pipe) and to locate potential upstream sources. This may involve some lateral sewer line CCTV inspections as well as the main sewer line inspections.

6.1.1.3 FSE CHARACTERIZATION

The city or agency should physically inspect or audit the FSEs within its jurisdiction to determine the current FOG control status of the FSEs. The inspection may include evaluating the following:

- Kitchen equipment (deep fryer, wok, grill, etc.)
- Kitchen drains (sinks, food grinder, dishwasher, etc.)
- Grease Removal Equipment
  - Grease Interceptors, if any (size, design, location)
  - Grease Traps, if any (size, design, location)
  - Others
- Evidence of Kitchen Best Management Practices (BMPs) (employee training, drain screens, yellow grease collection, signage, etc.)
- Trap or interceptor maintenance (inspect interceptor, records, brown grease collection manifests)
- Spill prevention/clean-up practices
- Examining the menu and FOG usage (Material: oil, grease, shortening, fat, etc.; Sources: beef, poultry, seafood, etc.)
- UPC items (maximum meals per hour, retention time, and storage factor)
- Feasibility of installing an interceptor or trap
- Grease disposal practices

This information could be entered into a database to provide a FOG control inventory of the FSEs in the service area. The FSE inspections could also be an opportunity to educate and inform the FSEs of: the importance of minimizing FOG in the sewerage system and the requirement to minimize SSOs to protect the environment, the upcoming FOG ordinance, and provide recommendations for improving BMPs and reducing FOG discharge at the FSE.

6.1.1.4 FOG CHARACTERIZATION DATA INTEGRATION

The data generated from the first three characterization steps is recommended to be entered into one central database that is linked to GIS. The GIS will allow the data to be easily managed, retrieved, and updated. The sewer line cleaning staff and the FOG control staff could utilize and retrieve the same information to assist each other in the FOG control efforts. For example, the FOG control inspector could query the GIS on the most current status of all level 3 hot spots based on the sewer line cleaning staff's monthly data entry. The inspector could further query the grease removal equipment status of the FSEs upstream of these hot spots. The inspector could then print this information and present it to the FSEs to educate them on the importance of kitchen BMPs and installing and maintaining their grease removal equipment. Together, they can work to reduce the level 3 hot spot to a level 2 or level 1 hot spot for the benefit of the agency and the FSEs. An example of a GIS map displaying hypothetical hot spots (with their HSSS ratings) and the potential upstream sources is shown in Figure 6-1.

6.1.2 Conclusions and Recommendations

FOG characterization is critical for a city or agency to design an effective FOG control program. The study provides specific guidelines on conducting a FOG characterization, which includes identifying and classifying sewer line hot spots, evaluating the potential upstream sources of the hot spots, and inspecting FSEs and their FOG control technologies and BMPs. Each city or agency that does not have this essential information should initiate a FOG Characterization Study of its service area as a first priority utilizing these guidelines. Integrating this information utilizing a database and GIS would allow a city or agency to manage their FOG control data efficiently and effectively.

The study proposes a Hot Spot Scoring System (HSSS) which provides a mechanism to prioritize sewer line hot spots and to focus the FOG control efforts appropriately. If the Hot Spot Scoring System recommendation is adopted by the stakeholders, and the characterization finds it to be practical in its application, this system may become part of the regulatory and implementation framework.

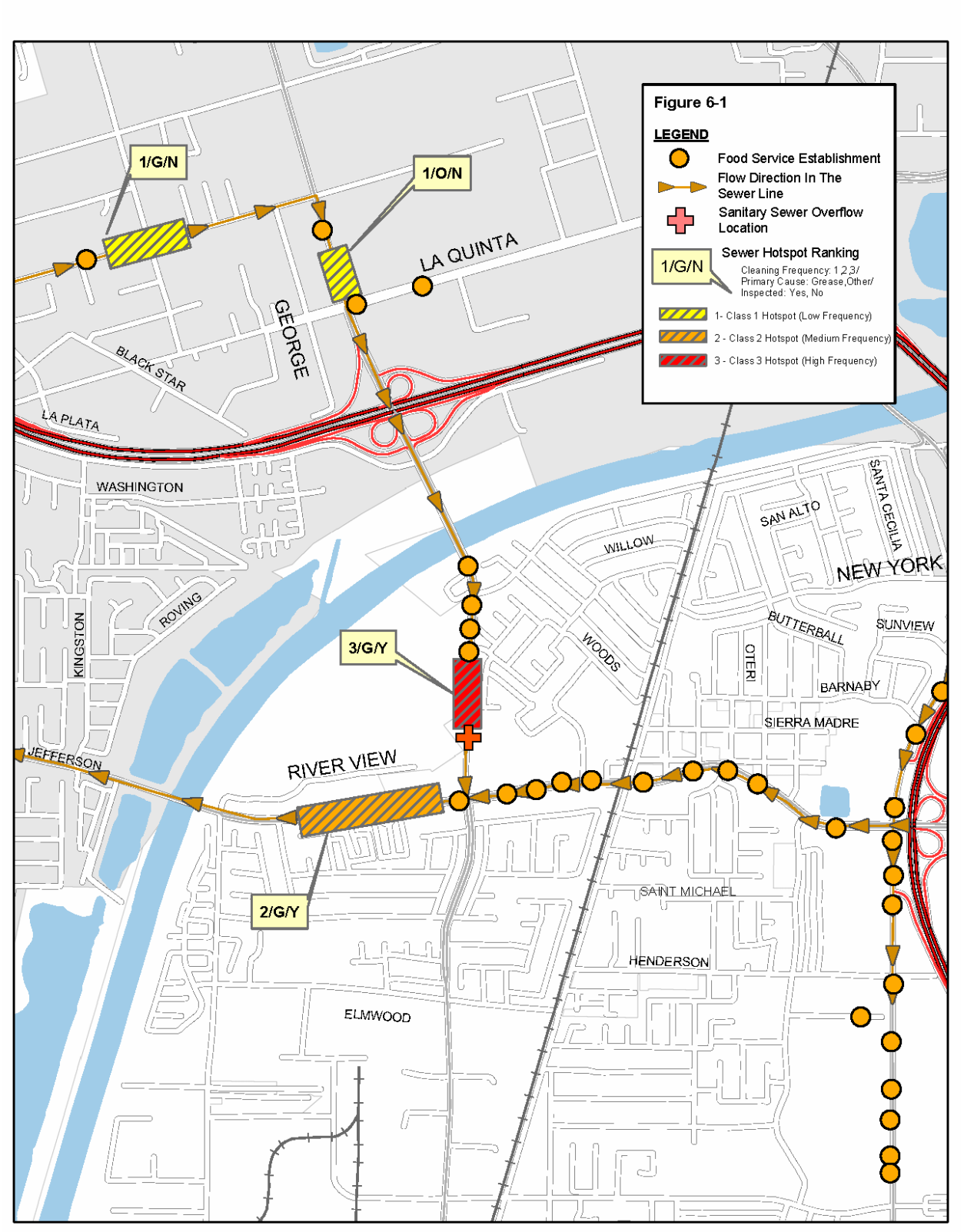
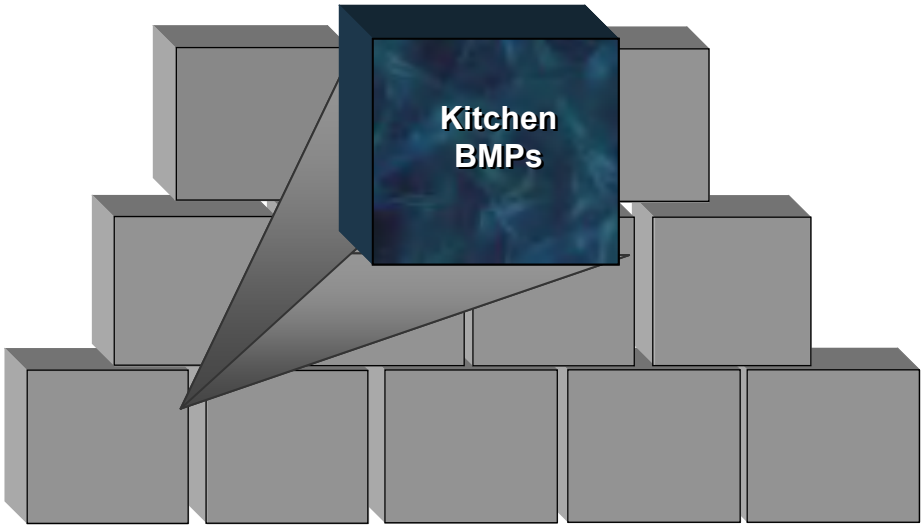


Figure 6-1
LEGEND
Food Service Establishment
Flow Direction In The Sewer Line
Sanitary Sewer Overflow Location
1/G/N
Sewer Hotspot Ranking
Cleaning Frequency: 1,2,3/ Primary Cause: Grease,Other/ Inspected: Yes, No
1- Class 1 Hotspot (Low Frequency)
2 - Class 2 Hotspot (Medium Frequency)
3 - Class 3 Hotspot (High Frequency)
1/G/N
1/O/N
3/G/Y
2/G/Y
LA QUINTA
GEORGE
BLACK STAR
LA PLATA
WASHINGTON
KINGSTON
ROVING
JEFFERSON
RIVER VIEW
WILLOW
WOODS
SAN ALTO
SANTA CECILIA
NEW YORK
BUTTERBALL
SUNVIEW
OTERI
BARNABY
SIERRA MADRE
SAINT MICHAEL
HENDERSON
ELMWOOD



6.2 KITCHEN BEST MANAGEMENT PRACTICES (BMPs)

Effective kitchen BMPs are those practices applied in the kitchen to reduce and eliminate FOG before it reaches a drain. BMPs also include those practices applied to optimize and improve the effectiveness of grease removal equipment, such as grease traps and interceptors (discussed in the Interceptor and the Passive and Automatic Grease Trap Building Blocks). Homeowners, multi-family dwellings, and FSEs are contributors of FOG to the sewer systems, and incorporating kitchen BMPs at these locations is an effective, economical method of reducing the amount of FOG introduced to sewer systems.

This section presents the residential and commercial BMPs identified through numerous interviews and data obtained from various cities and agencies throughout the country. A partial list of these cities and wastewater agencies with data on kitchen BMPs are listed below:

- Alameda County Clean Water Program [52]
- Bay Area Pollution Prevention Program [160]
- City and County of Honolulu Division of Environmental Quality [56 and 58]
- City of Bellevue Utility Department [61]
- City of Colorado Springs Utilities [189]
- City of Hopewell Public Works Sewer Maintenance Department [166]
- City of Laguna Beach [198]
- City of Los Angeles Department of Public Works [197]
- City of Oxnard Wastewater Division [113]
- City of Palo Alto Regional Water Quality Control Plant [184]
- City of San Diego Metropolitan Wastewater Division [34]
- County Sanitation Districts of Los Angeles County [2 and 6]
- El Toro Water District [111]
- Greensboro Water Resources [170]
- Lexington-Fayette Urban County Government – Division of Sanitary Sewers [65]
- Massachusetts Water Resources Authority [41]

- Monterey Regional Water Pollution Control Agency [79]
- New York Department of Environmental Quality [150]
- North Carolina Department of Environmental and Natural Resources [80]
- North Carolina FOG Task Force [82]
- Oregon Department of Environmental Quality [106]
- Tennessee Department of Environment and Conservation [146]
- Trabuco Canyon Water District [172]
- Victoria British Columbia Regional Source Control Program [67]

6.2.1 Kitchen BMP Descriptions and Evaluations

The study evaluated each BMP identified during the research and provided recommendations as to the significance of each BMP reviewed for utilization in a FOG control program. These recommendations are provided to allow the FOG control program to utilize all of the pertinent BMPs and to focus the efforts of the FOG control program on the critical or essential BMPs. Each BMP was identified as either essential, recommended, or not applicable. In addition, each BMP was also further evaluated and identified as either being a "structural" or "non-structural" BMP. A "structural" BMP is defined in this study as a BMP that requires a physical element to be installed or removed, such as a device or container. A "non-structural" BMP is defined as a BMP that does not require a device to be installed or removed and depends upon the conscientiousness of the employee and extensive employee training.

For ease of presentation and discussion, the kitchen BMPs have been segregated into the categories listed below. The description of each kitchen BMP along with the recommended applicability[18] for utilization in a FOG control program and whether it is a structural BMP is presented in the following sections.

Kitchen BMP Categories

- Employee Education
- Sinks
- Grease Containers
- Dishwashing
- Spill Prevention and Clean-up
- Absorbent Materials and Towels
- Food Waste
- Food Grinders

6.2.1.1 EMPLOYEE EDUCATION

Employee education is the key to the implementation of kitchen BMPs. Employees who know and understand the problem, procedures, and benefits will be more willing to support, and be able to implement, the kitchen BMPs. Employee education should emphasize the following:

[18] Note - the recommendations are based primarily on reviewing kitchen BMP education literature and video tapes and on the information received during interviews with cities, agencies, and FSE management.

- Problems created by FOG discharge to the sewer system
- Kitchen BMP procedures
- Benefits to following the kitchen BMP procedures

Employee education is accomplished through employee training and kitchen signage. A summary of the employee education BMPs with the applicability of each BMP is presented in Table 6-1.

Table 6-1
Summary of Employee Education BMPs

Kitchen BMP	Structural*	FSE Applicability	Residential Applicability
New Employee Training Program	-	Essential	Not Applicable
Frequent Refresher Training Program	-	Essential	Not Applicable
Employee Award Program for Following BMPs	-	Recommended	Not Applicable
Employee Idea/Suggestion Program	-	Recommended	Not Applicable
Kitchen Signage	Yes	Essential	Not Applicable

* Only "Yes" responses will be indicated.

Kitchen Signage

Kitchen signage serves as reminders to help employees follow proper kitchen BMPs and procedures. They emphasize the importance of keeping FOG out of sinks and drains. Signage includes "No Grease" signs posted above sinks and on the front of dishwashers. It also includes BMP signs posted in the appropriate food preparation and dishwashing areas. These signs should be produced in several languages, so that non-English speaking employees are aware of the BMPs.

Sources

Cities, agencies, and suppliers that have significant employee education BMPs include:

- Alameda County Clean Water Program [52]
- City of Bellevue Utility Department [61]
- City of Los Angeles Department of Public Works [197]
- Environmental Biotech, Incorporated [24]
- Lexington-Fayette Urban County Government – Division of Sanitary Sewers [65]
- Monterey Regional Water Pollution Control Agency [79]
- North Carolina Department of Environmental and Natural Resources [80]
- Oregon Department of Environmental Quality [106]
- Tennessee Department of Environment and Conservation [146]
- Victoria British Columbia Regional Source Control Program [67]

6.2.1.2 SINKS

Most kitchen-generated FOG is introduced to the sewer system via the sink. Therefore, sink BMPs are essential to reducing FOG. Sink BMPs include three-sink dishwashing systems and drain screens. A summary of the sink BMPs with the applicability of each BMP is presented in Table 6-2. A brief description of three-sink dishwashing systems and drain screens is presented below.

Table 6-2
Summary of Sink BMPs

Kitchen BMP	Structural	FSE Applicability	Residential Applicability
Three-Sink System	Yes	Recommended	Not Applicable
Drain Screens	Yes	Essential	Recommended

Three-Sink System

A three-sink system utilized in FSEs consists of designating separate sinks for washing, rinsing, and sanitizing (Figure 6-2). The amount of FOG and food waste being introduced to the sewer system can be controlled by the three-sink dishwashing systems. For example, before the wash sink is drained, the kitchen worker can remove the free floating FOG or food solids. These systems also control the introduction of utensils, including knives, forks, spoons, cups, straws, etc. to the sewer system.

Drain Screens

The introduction of food scraps, solids, and other materials to the sewer system can be eliminated through the proper use of drain screens. Drains screens should be utilized for common sink drains and floor sink drains (Figure 6-3). In addition, when a food grinder is not present, the sink drain screens are an absolute necessity to prevent food solids from collecting in the piping, grease trap, or grease interceptor. Drain screens should:

- Be installed on all drains
- Have openings between 1/8” and 3/16”
- Be removable for ease of cleaning
- Be frequently cleaned (dispose of the screened solids to the trash)

They should also be large enough to capture all food solids before the screen is removed. Double screens can also be installed to prevent solids from entering the drain while the first screen is being cleaned

FIGURE 6-2 A Three-Compartment Sink Discharging to a Floor Sink with a Drain Screen

FIGURE 6-3 Floor Sink with a Drain Screen

Sources

Cities and agencies that have significant sink BMPs include:

- City of Bellevue Utility Department [61]
- City of Hopewell Public Works Sewer Maintenance Department [166]
- City of San Diego Metropolitan Wastewater Division [34]
- El Toro Water District [111]
- Greensboro Water Resources [170]
- Monterey Regional Water Pollution Control Agency [79]
- North Carolina Department of Environmental and Natural Resources [80]
- Oregon Department of Environmental Quality [106]
- Trabuco Canyon Water District [172]

6.2.1.3 GREASE CONTAINER USAGE

The use of grease containers (e.g., bins, barrels, or drums) will significantly reduce the amount of FOG entering the sewer system (Figure 6-4). A summary of the grease container BMPs with the applicability of each BMP is presented in Table 6-3.

Table 6-3
Summary of Grease Container BMPs

Kitchen BMP	Structural	FSE Applicability	Residential Applicability
Pour All Liquid Oil and Grease from Pots, Pans, and Fryers into a Waste Grease Container*	-	Essential	Essential
Prior to Washing, Scrape Solidified Fats and Grease from Pots, Pans, Fryers, Utensils, Screens, and Mats into a Container	-	Essential	Recommended
Use Recycling Barrels with Covers for Onsite Collection of Grease and Oil	Yes	Essential	Not Applicable
Empty Grill Top Scrap Baskets or Boxes into a Container	-	Essential	Not Applicable

* Most liquid oils and greases can be rendered or recycled unless they are from grease traps or interceptors. Solidified fats and greases, as well as sauces and gravies, cannot typically be rendered or recycled. Sauces and gravies should not be poured down a sink; therefore, they must be mixed with absorbent materials and disposed of properly in the trash.

It is important to note that if food grinders are installed in a FSE kitchen, the motivation to scrape grease and food solids from pots, pans, and utensils is greatly diminished.

Sources

Cities and agencies that have significant grease container BMPs include:

- Alameda County Clean Water Program [52]
- El Toro Water District [111]
- Monterey Regional Water Pollution Control Agency [79]

- North Carolina Department of Environmental and Natural Resources [80]
- Oregon Department of Environmental Quality [106]
- Trabuco Canyon Water District [172]
- Water Environment Federation [41]

FIGURE 6-4 Yellow Grease Recycling Bin (Courtesy of County Sanitation Districts of Los Angeles County)

6.2.1.4 DISHWASHING

The introduction of FOG and other waste materials to the sewer system can be controlled with proper dishwashing BMPs. These BMPs include dry scraping and monitoring the rinse- and wash-water temperature. A summary of these BMPs with the applicability for each is presented in Table 6-4.

Table 6-4 Summary of Dishwashing BMPs			
Kitchen BMP	**Structural**	**FSE Applicability**	**Residential Applicability**
Use Rubber Scrapers, Squeegees, or Towels to Remove Food and FOG from Cook and Serving Ware Prior to Dishwashing	-	Essential	Recommended
Dry Wipe Food and FOG into Trash Can Prior to Dishwashing	-	Essential	Recommended
Do Not Discharge Wastewater with Temperatures Above 140° F*	-	Essential	Not Applicable

* This does not apply to wastewater discharged from commercial dishwashers which usually discharge wastewater at temperatures up to 160 °F. (Refer to the local health care regulations for specific temperature requirements.)

Dry Scraping

Dry scraping pots, pans, and dishware before dishwashing significantly reduces the amount of grease discharged into the drains and sewer system (Figure 6-5). Wet wash methods typically wash the waste materials into the drains where it eventually collects on the interior walls of the drainage pipes. The success of dry scraping is dependent upon the training and motivation of the employee and availability of the tools for removal of food waste before washing.

Sources

Cities, agencies and suppliers that have significant dishwashing BMPs include:

- City and County of Honolulu Division of Environmental Quality [56 and 58]
- City of Bellevue Utility Department [61]
- City of Colorado Springs Utilities [189]
- City of Hopewell Public Works Sewer Maintenance Department [166]
- City of Oxnard Wastewater Division [113]
- City of San Diego Metropolitan Wastewater Division [34]
- County Sanitation Districts of Los Angeles County [2 and 6]
- Environmental Biotech, Incorporated [24]
- Lexington-Fayette Urban County Government – Division of Sanitary Sewers [65]
- Monterey Regional Water Pollution Control Agency [79]
- North Carolina Department of Environmental and Natural Resources [80]
- North Carolina FOG Task Force [82]
- Oregon Department of Environmental Quality [106]
- Tennessee Department of Environment and Conservation [146]

FIGURE 6-5 Grease and Solids on Non-Scraped Cookware

6.2.1.5 SPILL PREVENTION AND CLEAN-UP

Spill prevention BMPs reduce the amount of grease that may enter a floor drain (or a storm drain). A summary of these BMPs with the applicability for each is presented in Table 6-5.

Table 6-5
Summary of Spill Prevention BMPs

Kitchen BMP	Structural	FSE Applicability	Residential Applicability
Empty Containers Before They Are Full to Avoid Accidental Spills	-	Essential	Essential
Use a Cover to Transport Grease Materials to a Recycling Barrel	-	Recommended	Not Applicable
Provide Proper Conveyance Devices to Transport Materials Without Spilling (Figure 6-6)	-	Recommended	Not Applicable

FIGURE 6-6 Portable Fryer Grease Transfer Container

If a spill does occur, the risk of grease entering a drain can be minimized by the following proper spill clean-up procedures. A summary of these BMPs with the applicability for each is presented in Table 6-6.

Table 6-6
Summary of Spill Clean-up BMPs

Kitchen BMP	Structural	FSE Applicability	Residential Applicability
Block Off Sinks and Floor Drains Near the Spill	-	Essential	Not Applicable
Clean Spills with Towels and Absorbent Material	-	Essential	Essential
Use Wet Cleanup Methods Only to Remove Trace Residues	-	Essential	Essential

A summary of proactive spill prevention and clean-up procedure BMPs with the applicability for each is presented in Table 6-7.

Table 6-7 Summary of Proactive Spill Prevention and Clean-Up Procedure BMPs			
Kitchen BMP	**Structural**	**FSE Applicability**	**Residential Applicability**
Develop and Post Spill Procedures for Different Types of Spills	-	Recommended	Not Applicable
Develop Schedule for Training and Refreshing Employees about Procedures	-	Essential	Not Applicable
Designate a Key Employee Who Monitors Clean-Up	-	Recommended	Not Applicable
Maintain Ample Spill Containment and Absorbent Supplies	-	Essential	Recommended
Create "Spill Kits" and Have Them Well-marked and Readily Accessible	Yes	Recommended	Not Applicable

Sources

Cities and agencies that have significant spill prevention and clean-up BMPs include:

- Alameda County Clean Water Program [52]
- City of Colorado Springs Utilities [189]
- City of Palo Alto Regional Water Quality Control Plant [184]
- County Sanitation Districts of Los Angeles County [2 and 6]
- Greensboro Water Resources [170]
- North Carolina Department of Environmental and Natural Resources [80]
- Victoria British Columbia Regional Source Control Program [67]

6.2.1.6 ABSORBENT MATERIALS AND TOWEL USAGE

The use of disposable absorbent materials and towels reduces the amount of FOG introduced to the sewer system. A summary of the absorbent materials and towel usage BMPs with the applicability for each is presented in Table 6-8.

Table 6-8 Summary of Absorbent Materials and Towel Usage BMPs			
Kitchen BMP	**Structural**	**FSE Applicability**	**Residential Applicability**
Use Disposable Absorbent Materials to Clean Areas where Grease May Be Spilled or Dripped	-	Essential	Recommended
When Using Paper Towels, Use Food Grade Paper to Soak Up Oil and Grease Under Fryer Baskets	-	Recommended	Not Applicable
Use Towels to Wipe Down Work Areas	-	Essential	Recommended
Use Absorbents Under Colanders in Sinks when Draining Excess Meat Fat	-	Essential	Recommended

Sources

Cities, agencies and suppliers that have significant absorbent materials and towel usage BMPs include:

- City and County of Honolulu Division of Environmental Quality [56 and 58]
- City of Oxnard Wastewater Division [113]
- Environmental Biotech, Incorporated [24]
- North Carolina Department of Environmental and Natural Resources [80]
- Oregon Department of Environmental Quality [106]

6.2.1.7 FOOD WASTE DISPOSAL/RECYCLING

Food waste can be disposed of by recycling and/or solid waste removal. Used or spent oil and grease generated from fryers and other equipment can be recycled through a rendering or recycling company. A more formal discussion of grease disposal practices/alternatives is presented is Section 6.8.

Sources

Cities, agencies and suppliers that have significant food waste disposal/recycling BMPs include:

- Alameda County Clean Water Program [52]
- City and County of Honolulu Division of Environmental Quality [56 and 58]
- City of Bellevue Utility Department [61]
- City of Colorado Springs Utilities [189]
- City of Palo Alto Regional Water Quality Control Plant [184]
- County Sanitation Districts of Los Angeles County [2 and 6]
- Environmental Biotech, Incorporated [24]
- Lexington-Fayette Urban County Government – Division of Sanitary Sewers [65]
- New York Department of Environmental Quality [150]
- North Carolina Department of Environmental and Natural Resources [80]
- North Carolina FOG Task Force [82]
- Oregon Department of Environmental Quality [106]
- Tennessee Department of Environment and Conservation [146]
- Victoria British Columbia Regional Source Control Program [67]

6.2.1.8 FOOD GRINDERS

A summary of the use of food grinders (garbage grinders or garbage disposal units) by FSEs and homeowners is presented in Table 6-9.

Table 6-9 Summary of Food Grinder Use BMPs			
Kitchen BMP	**Structural**	**FSE Applicability**	**Residential Applicability**
Discontinue Use of Grinders	Yes	Essential	Not Applicable

Food grinders should not be used in FSEs because the resulting large volume of food solids may clog drain pipes and/or fill grease traps and interceptors.

As discussed in section 6.2.1.2, when food grinders are not in use, the use of drain screens becomes a critical kitchen BMP to avoid food solids and FOG from being discharged into a trap, interceptor, or directly to the sewer system.

Sources

Cities and agencies that have significant food grinder BMPs include:

- City and County of Honolulu Division of Environmental Quality [56 and 58]
- City of Colorado Springs Utilities [189]
- County Sanitation Districts of Los Angeles County [2 and 6]
- North Carolina Department of Environmental and Natural Resources [80]
- Tennessee Department of Environment and Conservation [146]
- Victoria British Columbia Regional Source Control Program [67]
- Water Environment Federation [41]

6.2.2 Conclusions and Recommendations

The utilization of kitchen BMPs designed to prevent or limit the amount of food and FOG introduced to the sewer system via the sink or floor drains is essential to any FOG control program. The direct benefits of kitchen BMPs may include a reduction in grease trap/interceptor maintenance costs, a reduction in grease-related plumbing problems including sewer back-ups, and a reduced liability due to spills.

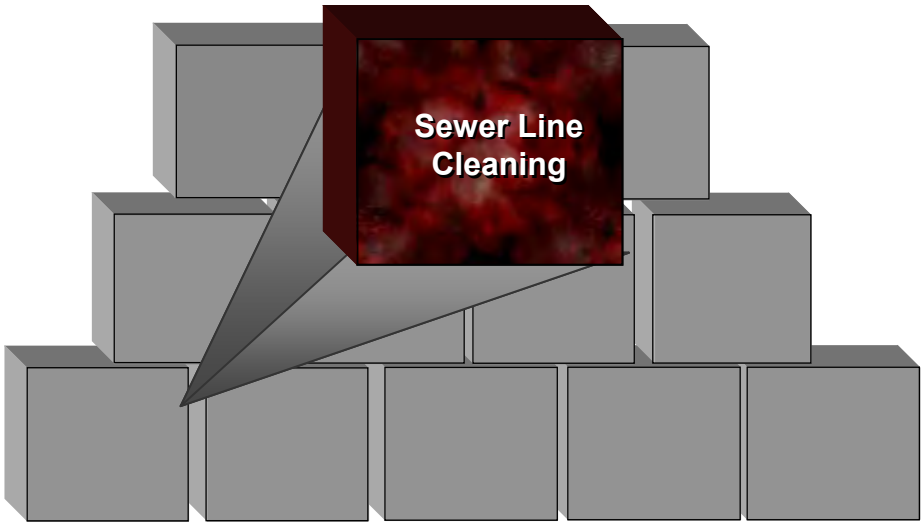
The study identified that the majority of kitchen BMPs currently being implemented in FSEs and residences appear to be common-sense practices that are very practical to implement (e.g., the use of drain screens). FOG control programs should utilize the pertinent kitchen BMPs and focus on the "essential BMPs."[19] In addition, the study recognizes that the kitchen BMPs identified as structural BMPs may have the greatest potential to be implemented on a daily basis and may be the most practical to monitor for the agencies. The non-structural BMPs of verifying FSE records of GRE maintenance and employee training are also relatively practical to monitor (information on record keeping is located in the Monitoring and Enforcement Building Block). However, verifying daily dry clean-up of plates, cookware, floor mats, and spills is more difficult

[19] The recommendations in the study for each BMP should be further evaluated by the stakeholders and partners (e.g., FSE owners or managers and multi-family property managers) and updated as appropriate.

to monitor, because they are employee practices that are not structural and are not tied to a record-keeping system.

It is recommended that kitchen BMPs be promoted for all residences (particularly high-density housing) and all FSEs through a strong education and outreach effort (discussed further in the Education and Outreach Building Block). The level of effort associated with monitoring kitchen BMPs (e.g., FSE inspections) should be based on the degree to which these BMPs will truly reduce the amount of FOG being discharged into the sewer system. It should be noted that while the study found that there is considerable literature on kitchen BMPs to reduce the discharge of FOG into the sewer system, there is limited data on the success of these BMPs, or which of the non-structural BMPs are truly being implemented. Although kitchen BMPs are a crucial element of FOG control, it is not recommended that BMPs be solely relied upon as the basis for a FOG control program.

Due to the benefit to the FSEs and the agencies, the study recommends that, at a minimum, all FSEs be required to implement structural BMPs (e.g., removal of food grinders, utilizing drain screens, using a grease barrel to collect and recycle cooking grease) and to keep records on GRE maintenance, proper waste disposal, and employee training. The promotion, requirement, and monitoring of other BMPs at FSEs and high-density housing should be discussed openly with FSE representatives to determine the cost vs. benefit of implementing and/or monitoring these BMPs. In addition, before finalizing the kitchen BMP elements of a FOG control program and identifying the resources necessary for promoting or monitoring kitchen BMPs, Orange County cities and agencies should discuss their options and enlist the input and support of potential partners, such as the restaurant associations (e.g., California Restaurant Association), the hotel associations, property managers, regulators, environmental groups, and other involved agencies to help implement effective kitchen BMP program elements. The tables presented in this section may serve as the starting point for these discussions.



6.3 SEWER LINE CLEANING

Sewers can accumulate solids and grease from the wastewater they convey and must be cleaned periodically to maintain their hydraulic capacity and performance (Figure 6-7). Cleaning on a regular schedule is typically sufficient to prevent SSOs, if the condition of the sewers and the nature of the discharges are compatible with that approach. In other situations, even regular and frequent cleaning may not prevent accumulations that result in nuisances, blockages, and SSOs.

FIGURE 6-7 Sewer Line Cleaning (Courtesy of County Sanitation Districts of Los Angeles County)

Small diameter (6- through 12-inch) sewers are more prone to blockages by FOG than larger diameter sewers, because even small accumulations of solidified grease on the inside walls of small sewers will significantly reduce their capacities. This is consistent with the results from the RFI and OCSD surveys that revealed that the majority of grease blockages occur in 6- to 8-inch diameter sewer lines in Orange County. However, larger diameter lines (above 12 inches in diameter) and structures, such as inverted siphons and pump station wet wells, are also affected by grease accumulations sticking to their walls. Chunks of grease attached to such structures will eventually break off and may cause downstream blockages or clog pump station pumps. FOG accumulations may also cause odors.

Private businesses or home owners can also experience blockages in their lateral lines upstream of the public agency owned and operated local sewer. To clear the lateral blockage, a plumber will commonly cut and push the grease mass into the local sewer, which may cause a subsequent blockage. It is also possible for a grease mass in the lateral to dislodge on its own and enter the local sewer, thereby contributing to downstream blockages and nuisances and to increased costs to the public.

6.3.1 Cleaning of Private Lateral Sewer Lines

Private lateral sewer lines convey wastewater from businesses and homes to the public sewer and are almost always owned and maintained by the property owner. FSEs or apartment buildings that discharge significant quantities of FOG often build up an irregular coating of grease in their laterals, which can plug their lines and cause backups into their kitchens or bathrooms and often on-site SSOs. For FSEs, this can cause closure of the establishment. Therefore, many FSEs have their laterals cleaned on a routine preventive maintenance schedule (e.g., every 3 months). Others only have them cleaned when blockages occur. The normal cleaning process is carried out by plumbing contractors using spring-loaded cutters mounted on rotating flexible coiled snakes or hydrojetting techniques which push, scour, or scrape the grease from the sides of the mostly 4- to 6-inch diameter laterals and transfer it into the public sewer to which the lateral is connected. The chunks of grease and debris that enter the public sewer can also contribute to additional blockages. Currently, there is no statute or ordinance for communication or coordination of lateral cleaning activities with the maintenance activities for municipal sewers.

The finding that lateral cleaning activities can contribute to or cause SSOs in municipal sewerage systems suggests that some SSOs could be prevented, if there were better coordination between the cleaning of laterals and the maintenance of publicly owned local sewers—particularly at hot spots. A potential method requiring more public agency resources and staff for achieving this coordination would be to require all plumbers and/or facility owners to notify the jurisdictional agency by phone of the address and timing of any impending lateral cleaning activity. This may allow the public agency to ascertain whether the public sewer to which the lateral is connected might be susceptible to clogging. As discussed in Section 6.10, Monitoring and Enforcement, the frequency of lateral cleaning incidents at FSEs will also be an indicator of the effectiveness of their BMPs and their trap and interceptor maintenance programs at preventing grease from entering the public sewers.

6.3.2 Cleaning of Public Sewer Lines

6.3.2.1 INSPECTIONS

All sewers should be inspected at frequencies based on the diameter, loading, age, condition, and operating history of each line. Inspection techniques include visual inspections, lamping, and closed circuit television (CCTV). In recent years, the use of closed circuit television (CCTV) to inspect sewers has greatly improved the efficiency and effectiveness of sewer cleaning practices. CCTV inspection of known trouble spots can assist in evaluating the rate of accumulation of FOG or the presence of other defects in the sewers that may contribute to FOG accumulations or blockages (Figure 6-8). CCTV inspection of the trouble spot after normal cleaning will establish the effectiveness of the cleaning technique used and may reveal whether the cleaning restored the full capacity of the sewer or only provided partial hydraulic relief without removing all of the accumulated deposits.

FIGURE 6-8 CCTV Inspection of sewer line with grease build-up

Although CCTV inspections give the best picture of the condition of a sewer, the cost of CCTV inspections is substantially higher than for other techniques and must be used in a judiciously prioritized approach. Some agencies may choose to TV their entire system to discover potential problems and to document the condition of each sewer at some point in time as part of its asset management strategy. Others may choose to only TV known trouble spots or use TV to verify the effectiveness of cleaning procedures by randomly inspecting 5% to 10% of the lines that are cleaned. Some agencies, such as the City of San Diego, do not inspect before cleaning, because they do not want to expose their CCTV cameras to potential damage from encounters with roots or grease deposits in dirty lines. Some of the newer cameras can also look into laterals to evaluate their conditions, or small CCTV cameras can be used directly in laterals where there is suitable access.

The sewer operation and maintenance (O&M) supervisors for each agency must work with staff and the data to plan the cleaning program and review the records for each sewer so that when crews are assigned to clean sections of line, the preventative maintenance (PM) procedures specify the types of equipment to be used and any special procedures to be followed, such as CCTV verification of effectiveness.

6.3.2.2 CLEANING TECHNIQUES

There are a variety of cleaning techniques and equipment available, and most agencies or their cleaning contractors select the types of equipment best suited for their sewers and topography based on factors such as the size, age, and material of their sewers and the nature of the problems encountered, such as grease deposits, root intrusions, or excessive sediment accumulation. In the past five to ten years, several manufacturers have developed new and more effective sewer cleaning equipment than previously available.

Combination cleaning trucks utilize both high pressure water jets to scour the sides of sewers and vacuum hoses extending to the bottom of manholes to withdraw debris cleaned from the sewer. This is the type of equipment commonly used in Orange County to clean lines less than 15 inches in diameter. The trucks can operate from a single manhole, because the hoses carrying the water are able to move upstream under the force of the water jets, and the flushed materials flow down to the same manhole where the vacuum system is in operation. Trucks can be sized and arranged to suit the individual specifications of sewerage agencies and are equipped with a variety of nozzle designs and sizes to tackle almost any type of cleaning problem. Some even have rotating saws and rotating chain or cable attachments operated by water pressure to remove roots and other debris problems besides those of grease. Although the combination cleaning trucks may cost several hundred thousand dollars per unit, the trucks require less manpower, are more efficient, and clean more effectively than earlier cleaning devices, such as rods, balls, and bags. However, this equipment and associated nozzles and tools have a useful life and must be adequately maintained to ensure maximum performance. The employees operating and maintaining these systems also need to be adequately trained.

Additional techniques include the root saw that can be effective in cutting the grease mass to a circular cross-section at or near the original pipe wall diameter. Care must be taken not to damage the pipe (such as PVC) when using these types of tools. For larger diameter sewers, special cleaning techniques may be employed, such as balling, winch-operated tires, or even physically entering the sewer manhole structure (under appropriate confined space procedures) to remove large chunks of grease.

Cleaning methods which break solid grease balls and slabs off the sewer walls can contribute to downstream stoppages unless the grease is intercepted and removed. The combination cleaning process prevents most of these materials from being carried downstream. The solid waste from the combination truck can be disposed of at the OCSD treatment plant in Huntington Beach.

6.3.2.3 CLEANING FREQUENCY

Cleaning of sewers is intended to maintain their design hydraulic capacities and performances and prevent stoppages or spills by cleaning at a frequency that restores capacity before problems occur. In most systems, such frequencies are based on inspection records and performance history for specific lines. Most agencies in OCSD's service area practice preventive maintenance by routinely cleaning all their small lines at a frequency of once in 12 to 24 months.

The cleaning frequency is based on factors such as the pipe diameter, material, and age; sewer slope and alignment deficiencies; rate of sediment and grease accumulations; and susceptibility to root intrusion. Not all parts of the system may need to be cleaned at the same frequency. The use of CCTV to inspect the entire system may also reveal potential problems where none have occurred previously and where alternative inspection techniques are inadequate to reveal the impending conditions, such as cracked lines not visible from manholes.

Based on the responses to the RFIs, cities/agencies have line segments where accumulations of solids or FOG occur quite rapidly due to the nature of residential, industrial, or commercial discharges into those lines. These "hot spots" must be cleaned more frequently than once per year. Based on OCSD data, the agency may clean semi-annually, quarterly, monthly, or even weekly. Such frequent cleaning is usually associated with the discharge from one or more industries, FSEs, or apartment buildings. If cleaning is occurring at very short intervals, more effort should be placed on determining and controlling the source of the problems, such as promoting FSE best management practices, increasing inspections of grease interceptors, or replacing broken sections of pipe.

Most cities have regular maintenance schedules and procedures for their hot spot locations. Based on interviews, establishing hot spot maintenance schedules is more intuitive, and some cities adjust their maintenance schedules to take into account predictable factors, such as seasonal grease loading (e.g., Christmas and Thanksgiving holidays). The hot spot list prepared by the sewer maintenance department should be shared with the source control group or city/agency code enforcement inspectors on a regular basis, so they are informed of problems and causes seen by the maintenance staff or contractors.

6.3.2.4 COST ISSUES

Sewer line cleaning costs vary depending upon many factors, including the increased use of CCTV inspections, cleaning equipment, and methods. Generally, cleaning costs are spread among all users of the system, but some agencies charge specific industries or FSEs for cleaning costs clearly associated with a specific discharge. Other agencies may surcharge FSEs as a group to recover the costs of increased cleaning in their commercial areas. Such supplemental assessments for sewer line cleaning costs attributable to grease should be assessed based on the additional capital and operational costs incurred, including the manpower and equipment required for the increased cleaning frequency and CCTV inspections related to grease. Cleaning can be expensive and the cost stimulates the search for less costly BMPs and technologies to prevent blockages and SSOs. To be cost effective, alternative technologies to control FOG (e.g., biological additives) must generally be competitive or cost less than the grease-related cleaning

and CCTV costs incurred by the agency. It is important that cost accounting procedures adopted by the agency include all relevant cost factors for each approach to assure a fair comparison.

6.3.2.5 RECORD KEEPING

Effective sewer maintenance and cleaning programs are founded upon trained and knowledgeable staff, good communication, and good record keeping in an accurate and retrievable form. The information should be organized to identify every sewer and every manhole in the system with all of the relevant data on pipe diameter, slope, material, age, condition, cleaning history, spill/stoppage/problem history, and any other pertinent information supplied by inspectors, cleaning crews, or CCTV records. Most agencies find that this type of record keeping can best be maintained in a suitable computerized system, which provides ready information access to planners, designers, inspectors, and O&M personnel.

6.3.3 Conclusions and Recommendations

Adopt Minimum Standard Cleaning Procedures: Some agencies have developed standardized grease-related sewer cleaning practices that their collection system maintenance workers are required to follow for routine cleaning of 6-inch to 15-inch sewers. They include hydrojetting lines with high pressure nozzles combined with the removal of all solids released by the cleaning process by using high capacity vacuuming equipment mounted on combination cleaning trucks. Some agencies believe that the cleaning process should include the use of rotating chain and cable scrapers or saw blades with the goal of recovering at least 95% of sewer capacity. Cleaning of the larger diameter lines that may be at capacity, if grease is present, should be done at the low flow times of day for maximum jetting force on the exposed pipe surface.

Utilize CCTV to Verify Cleaning Effectiveness: Unless a cleaned line is inspected with CCTV, it is impossible to be certain how effective the cleaning procedure was. Some cities utilize CCTV on 5% to 10% of the lines their crews have cleaned to verify cleaning effectiveness and provide feedback to the crews. OCSD utilizes CCTV on a random 10% of the 6- through 12-inch diameter lines. The inspections are conducted randomly, so that staff or contractor crews cannot put special effort into cleaning lines they know will be inspected.

Develop a Hot Spot Rating System: The Cities of Orange and Newport Beach have initiated FOG characterization and have identified their hot spots, mapped them, and color coded them to distinguish between roots, grease, or other, which is reportedly very beneficial. A hot spot rating system is recommended to be developed building upon this concept and incorporating sewer line cleaning frequency and difficulty into the rating system. This will likely enhance the process of communicating the seriousness of potential SSO situations to staff and customers. A potential hot spot rating system is discussed in the FOG Characterization Building Block, Section 6.1.

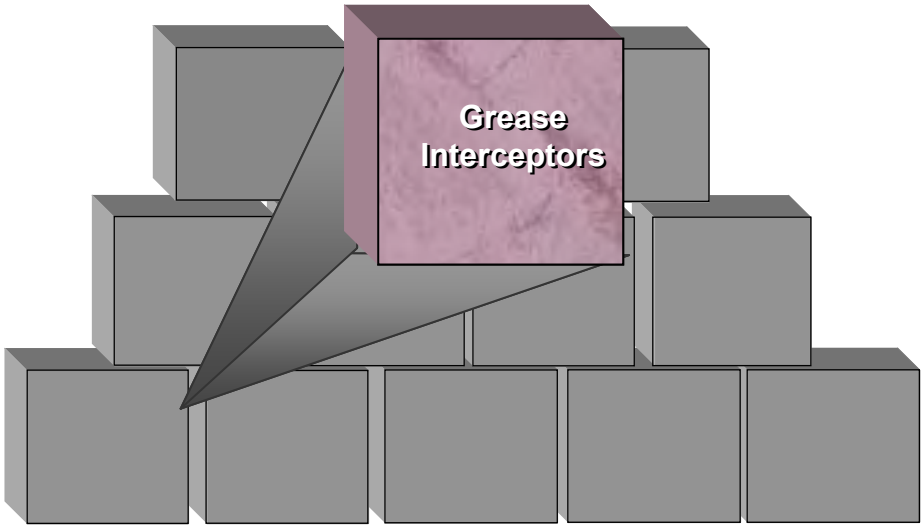
Provide Hot Spot Tracking and Information Coordination: Utilize computerized databases employing GPS and GIS information input and retrieval from all sources, including FOG inspectors, engineers, and O&M personnel, to assure that everyone knows the conditions and scheduled activities for hot spot segments.

Develop a Lateral Cleaning Reporting System: Since the frequency and severity of lateral cleaning is an indicator of the effectiveness of BMPs and the quantities of FOG reaching the municipal sewers, agencies should consider establishing a program that will inform them of when specific laterals are being cleaned to help monitor the effectiveness of industry FOG control programs and to ascertain whether the solids released from lateral cleaning might impact a hot spot condition.

Adequately Fund the Program: Adequate funding is required for the capital equipment and annual operating costs associated with sewer cleaning. See the next item for funding recommendations.

Recover FOG-related Sewer Cleaning and Management Costs: Since SSOs are frequently caused by discharges of FOG from FSEs, and the costs of preventing such SSOs includes the development of inspection and maintenance programs specifically for that purpose, it is reasonable to establish FOG-related fees to help recover the costs. It is recommended that the fees be two-tiered, with lower fees for FSEs that have interceptors and higher fees for those who do not. Refer to the Program Costs, Fees, and Incentives Building Block (Section 6.11) for more details.

Improve Cleaning and Monitoring Programs Throughout the County: The newest cleaning equipment and techniques now available should be employed by all agencies faced with FOG problems in their sewers. OCSD staff is available to assist in both recommending appropriate equipment and assisting in defining training needs for city and agency maintenance staff, if requested.



6.4 GREASE INTERCEPTORS

Grease interceptors are underground or in-ground grease collection devices, which are generally described in §1014.8 of the Uniform Plumbing Code (UPC, 2000 Edition) or the California Plumbing Code[20] as "Grease Interceptors for Commercial Kitchens." Detailed requirements are described in Appendix H of the UPC. The terms "traps" and "interceptors" are often used interchangeably, which has created much confusion. Grease interceptors are typically a minimum of 750 gallons in capacity and are located outside a FSE kitchen or multi-family building. Grease traps are much smaller than interceptors (usually 50 gallons or less) and typically are located aboveground in the kitchen under a sink.

The grease interceptor is a proven grease collection device as long as it is maintained properly. In Orange County, the cost to purchase and install a medium-sized interceptor (1,500 gallons) for a new FSE is approximately $8,000. The cost (purchase and install) to retrofit an existing FSE with a 1,500 gallon interceptor will typically range from $10,000 to $15,000.

6.4.1 Design and Function

The grease interceptor separates FOG (or grease), solids, and water based on the principle of Stoke's Law. Stoke's Law describes the rising or settling of a particle in a fluid (water in this case). Simply put, under non-turbulent conditions in an interceptor given enough time, particles that are lighter then water (grease) will rise to the surface and particles that are heavier than water (solids) will settle to the bottom. A typical conceptual interceptor design is illustrated in Figure 6-9.

[20] The 2001 California Plumbing Code is based on the 2000 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials with California amendments. Note that California has not amended most provisions of the UPC pertaining to grease traps and interceptors.

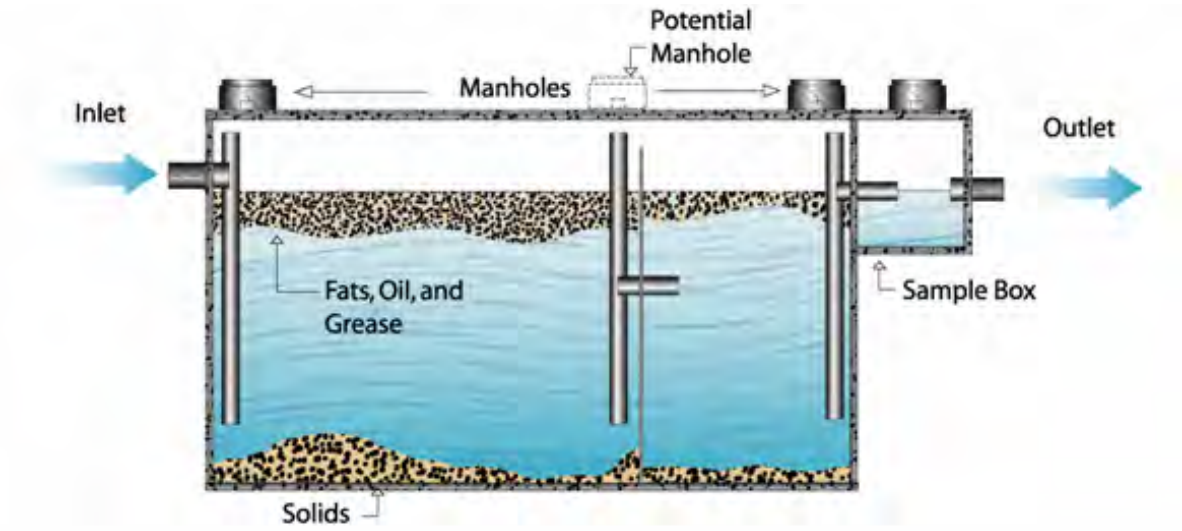


FIGURE 6-9 Typical Conceptual Grease Interceptor Design – Side View

The proper plumbing and placement of baffles will provide the non-turbulent conditions. The proper dimensions and volume of the interceptor will provide sufficient retention time to allow the particles to fully rise or settle before they pass-through to the outlet of the interceptor. Over time, the grease and solids layers thicken and will eventually fill the first chamber if they are not removed. If the grease and solids are not removed regularly, the interceptor no longer functions for its intended purpose, and grease will be carried into the sewer system. Emulsified or partially emulsified particles will rise or settle slower, which is why soaps and other emulsifiers may cause some grease or solids to pass-through an interceptor.

Since an interceptor is not self-cleaning or free of maintenance, it is critical that an interceptor be suitably designed with manholes in the right locations to facilitate maintenance and that it be cleaned and pumped at a frequency that maintains its design removal efficiency.

Grease interceptors must be maintained properly to perform effectively. Grease interceptors at FSEs will reduce grease blockages and SSOs, if the FOG control program includes inspection and verification of proper maintenance of the interceptor. This is evidenced by the success of some FOG control programs (e.g., Eastern Municipal Water District and the Cities of San Diego and Oxnard in California), which experienced dramatic reductions in grease-related SSOs after implementing inspection programs for grease interceptors.

An interceptor will only remove grease from the wastewater plumbed to the interceptor. It is important to note that not all wastewater from a FSE flows through an interceptor. No sanitary wastes from toilets, urinals, and other similar fixtures are permitted to be plumbed to the sewer system through a grease interceptor. Floor drains are also not plumbed to an interceptor at some FSEs.

Provided that a FSE does not discharge wastewater higher than 140°F to the interceptor and that it is cleaned at a suitable frequency, grease interceptors are very efficient at trapping particulate grease and soluble oils. Based on the proven effectiveness of the interceptor design and the fact that in most cases the most grease-laden waste streams are plumbed to the interceptor, a properly

designed interceptor is a proven and effective grease collection device that the study lists as the best conventional technology (BCT)[21] for grease control.

Local Implementation of the UPC Requirements - Based on the RFI research, 15 of the 17 cities that responded (88%) indicated that they require new FSEs to install traps and/or interceptors. One hundred percent (100%) of the north and central Orange County cities that responded reported that they follow the UPC specifications for interceptors. Despite these requirements, many FSEs in Orange County are not equipped with interceptors. For example, based on the RFI research, 7 of the 20 respondents reported that less than 50% of their FSEs are equipped with interceptors. The study has found that many city plan check departments have had difficulties in the past properly implementing the UPC requirements for the installation of interceptors at FSEs. Many older FSEs were permitted when grease blockages were less frequent or were perceived as less of a problem. Many other FSEs are overlooked when there are changes in ownership or management, or when it is not clear which agency has jurisdiction over the UPC requirements. Therefore, many FSEs in Orange County do not have interceptors even though they discharge a significant quantity of grease.

6.4.1.1 GREASE INTERCEPTOR SIZING

Most cities and agencies use Appendix H, Table H-1 of the UPC (Figure 6-10) for sizing grease interceptors. It is based on the number of meals served per peak hour, the waste flow rate, and retention time and storage factors. In §H105.2.2, the UPC specifies that the interceptor shall have two compartments and that the first compartment shall be two-thirds of the total capacity of the interceptor and have a minimum volume of 333 gallons, which means the minimum interceptor size shall be 500 gallons. The UPC (§H105.2.3) specifies that there shall be at least one square foot of surface area for every 45 gallons of liquid capacity[22].

[21] The study is using the term Best Conventional Technology (BCT) rather than Best Available Technology (BAT), because the grease interceptor has been shown to be the most effective conventional grease control technology at most FSEs. Other "available" technologies (e.g., biological treatment or automatic grease traps) are to be tested in Phase II. Therefore, the term "conventional" is more appropriate until that testing is completed.

[22] The design and maintenance information in this section is intended to be used as a guidance document and not a specific reference for cities or agencies to use for their ordinance development.

TABLE H-1
Sizing of Grease Interceptors

Number of meals per peak hour[1]	x	Waste flow rate[2]	x	retention time[3]	x	storage factor[4]	=	Interceptor size (liquid capacity)

1. Meals Served at Peak Hour

2. Waste Flow Rate
   - a. With dishwashing machine..... 6 gallon (22.7 L) flow
   - b. Without dishwashing machine..... 5 gallon (18.9 L) flow
   - c. Single service kitchen..... 2 gallon (7.6 L) flow
   - d. Food waste disposer..... 1 gallon (3.8 L) flow

3. Retention Times
   - Commercial kitchen waste
     - Dishwasher..... 2.5 hours
   - Single Service kitchen
     - Single serving..... 1.5 hours

4. Storage Factors
   - Fully equipped commercial kitchen..... 8 hour operation: 1
   - ..... 16 hour operation: 2
   - ..... 24 hour operation: 3
   - Single Service Kitchen..... 1.5

FIGURE 6-10 Uniform Plumbing Code (2000 Edition) Interceptor Sizing Table

Some cities or agencies use the US EPA Grease Interceptor Sizing Formula criteria to determine the need for, and sizing of, an interceptor (Figure 6-11).

EPA Grease Interceptor Sizing Formula

Recommends 750 gallon as minimum volume

The following equation is recommended by the United States Environmental Protection Agency for grease interceptor sizing at restaurants.

Size (gallons) = D x GL x HR/2 x LF

D = number of seats in dining room
GL = 5 gallons of waste per meal
HR = number of hours restaurant is open
LF = loading factor: 1.25— interstate highway, 1.0- other freeways and recreational areas,
0.8- main highway, 0.5 - other highways

EXAMPLE:
A small restaurant open for lunch and dinner has 35 seats. It is open from 10:30 AM until 9:30 PM; a total of 11 hours. Kitchen drainage units: one 3-compartment pot sink and one meat prep sink. It is located on Pennsylvania Ave. in Washington DC. If Pennsylvania Ave. is considered "other highway", the grease interceptor would have to be

(D) (GL) (HR) (LF)
35 x 5 x 11/2 x 0.5 = 481 gallon grease interceptor

FIGURE 6-11 EPA Grease Interceptor Sizing Formula

UPC and EPA Formula Concerns - Many cities and agencies throughout the United States have concerns with the UPC or EPA formulas for sizing interceptors. In fact, many cities have developed their own interceptor sizing criteria (e.g., Honolulu, Hawaii and Cary, North Carolina) based primarily on retention time and flow rate. Honolulu has developed a relatively simple interceptor sizing formula based on a retention time of 30 minutes, a storage factor of 1.25, and the maximum flow rate of the influent. The formula is provided as Figure 6-12.

Honolulu, Hawaii Grease Interceptor Sizing Formula

V(min) = R x S x F

where:

V(min) = Minimum grease interceptor volume in minutes
R =30 minutes
S = 1.25 (25% allowance)

F = Maximum Flow Rate of the influent (gallons per minute, gpm), based on Drainage Fixture Units (DFU)

The Maximum Flow Rate (F) is determined by the number of drainage fixture units according to the UPC guidelines as follows:

F = (0.7 x DFU), for Drainage Fixture Units $\leq$ 40
F = (0.2 x DFU) + 20, for Drainage Fixture Units > 40

The total DFUs are based on the total flow from all equipment and plumbing fixtures connected to the interceptor. The DFUs can be determined by: the UPC, 1997 edition, Table 7-3; Drainage Fixture Unit Values, Section 702.0 maximum trap loading; or Table 7-4, discharge capacity (gpm) for intermittent flow only, as appropriate.

Figure 6-12 Honolulu, Hawaii Grease Interceptor Sizing Formula

Based on the study's research, there are at least 15 cities and agencies in the United States that have either adopted, or are looking to adopt, an interceptor sizing criteria other than the UPC or EPA formula. The common complaint about the UPC or EPA formulas is that their criteria are too general to be representative of the actual conditions in a specific kitchen. These general criteria also lead to local agencies using their own interpretations to calculate an interceptor size. For example, the UPC asks for the number of meals per peak hour. The UPC does not define a meal. Therefore, agencies often rely on their own interpretation of a "meal." Additionally, there is often no objective approach to determining the number of meals per peak hour. The agency often counts the number of seats at an FSE and makes an estimation of the meal turnover time at peak hour to determine number of meals per peak hour. Of course, for many FSEs (e.g., FSEs that specialize in take-out or delivery orders), this is completely inappropriate. In any of these situations, the opportunity for subjective differences between plumbing inspectors' interpretations is a concern.

The National Precast Concrete Association (an association that represents interceptor manufacturers) published a paper called "Design Considerations and Discussion of Large Outdoor Grease Interceptors" to address the different sizing criteria in the country. The paper described three hypothetical restaurants (Table 6-10) as follows:

Table 6-10
National Precast Concrete Association - Restaurant Characteristics

Restaurant	Seats	Meals/ peak hour	Sinks	Double Sinks or (S)ingle	Dishwashers	Dishwasher Capacity (EPA) (gal)	Floor Drains	Influent Discharge Rate (EPA)	Influent Discharge Rate (UPC)	Total Fixture Units
A	20	20	2	S	1	30	1	45	50	11
B	100	100	3	D	2	40	3	140	123	30
C	200	200	6	D	5	75	5	400	275	67

The paper then calculated the size (in gallons) of a grease interceptor for the three hypothetical restaurants using sizing criteria from four different municipalities and the UPC and EPA formulas (Table 6-11):

Table 6-11
National Precast Concrete Association – Grease Interceptor Sizing (gallons)

Restaurant	Johnson County, Kansas Sanitation	UPC	EPA	Washington Suburban Sanitary Commission	Austin, Texas	Stockton, California
A	1350	600	680	432	396	450
B	4200	3000	3400	1344	1080	1400
C	12000	6000	6800	3840	2412	4000

Table 6-11 shows the dramatic differences in sizes depending upon the formula used. Other comparisons have shown the EPA formula will often calculate much larger sizes than the UPC formula for the same FSE.

Bigger Is Not Necessarily Better - The larger an interceptor, the larger the retention time. Although it is important to make sure that no interceptor is undersized, if the retention time is too long in an interceptor, the wastewater may become septic, which leads to nuisance odors and corrosive conditions. The City of Honolulu, Hawaii has expressed a concern that the UPC and EPA formulas lead to interceptors that are much larger than necessary for many medium- and large-sized FSEs (James, Baginski, City and County of Honolulu). The study recognizes this concern, particularly if there are monitoring requirements in place that ensure proper maintenance of the interceptors. Based on interviews with waste grease haulers who pump out interceptors, haulers have stated that many interceptors are too large or the floor is too deep to be cleaned out properly with conventional cleaning techniques.

Minimum Interceptor Volume and De Minimis Dischargers – The study evaluated the implementation of the UPC interceptor sizing formula by many agencies. Eastern Municipal Water District (EMWD) in Riverside County, California requires an interceptor of 750 gallons if the UPC Table H-1 interceptor size calculation is greater than 375 gallons (Judy Lankey, Senior Source Control Inspector, EMWD). A minimum volume of 750 gallons is widely recommended throughout the United States. Using 375 gallons as a minimum criteria, it is reasonable to suggest that any FSE calculation below 375 gallons should be considered a de minimis FOG discharger and, therefore, would not be required to install an interceptor.

Interceptor Sizing Considerations - Until a better interceptor sizing formula is established or approved by the EPA or other recognized expert, the UPC sizing formula should continue to be utilized in Orange County, with the following general considerations[23]:

1) If the UPC sizing calculation exceeds 1,000 gallons, the calculation should be compared against formulas such as the Honolulu formula to ensure that the interceptor is not over-sized. If the results are dramatically different, the study recommends that the agency use its best judgment based on other factors at the FSE (e.g., menu, frequency of use of the drainage fixture units) to determine the final size of the interceptor.

2) The floor of the interceptor should not be too deep to allow for proper cleaning and/or the interceptor should not be larger than 3,000 gallons for most installations. If an interceptor is required to be much larger than 3,000 gallons, the agency should consider the feasibility of the FSE installing two smaller interceptors in parallel.

3) An FSE calculation of 375 to 750 gallons should require an interceptor of 750 gallons. FSE calculations less than 375 gallons should be considered a de minimis FOG discharger and those FSEs should not be required to install an interceptor unless there are extenuating or unusual circumstances.

6.4.1.2 GREASE INTERCEPTOR PLUMBING

Another requirement which is often inconsistent from agency to agency is the plumbing specifications of the interceptor. Some plumbing inspectors require all kitchen drains to be plumbed to the interceptor; others do not require certain floor drains to be plumbed to the interceptor. Some agencies have different venting specifications. Some agencies require sampling boxes; others do not. Additionally, the interior plumbing requirements of the interceptor (inlet and outlet tee design) can vary from agency to agency. There are many factors involved in these design considerations, but there is clearly a lack of consistency among many Orange County agencies concerning interceptor plumbing issues. Regardless, the study offers the following considerations for interceptor plumbing design (see footnote below):

1) The approval agency must ensure that all kitchen drains that may contain FOG-bearing wastewater are plumbed to the interceptor.

2) The inlet tee (or primary baffle) of the interceptor must be designed to ensure that the wastewater does not flow directly across the interceptor. The outlet tee of the interceptor must be designed to ensure that the floating grease does not flow out the interceptor.

3) The manhole placement and the plumbing tees shall be designed in such a way to allow for thorough cleaning of the interceptor and the tees.

[23] A special meeting or workshop involving knowledgeable representatives from the agencies' building and health departments, the interceptor manufacturers, FSE plumbers, grease haulers, and FOG control personnel could provide a forum to evaluate and finalize these considerations for the benefit of the region.

4) A sample box should be required for the effluent of the interceptor to allow visual monitoring of the effluent and possible future sampling.

6.4.2 Interceptor Maintenance

For the sake of this report, interceptor maintenance is considered the regular cleaning and pumping out of an interceptor to maintain the effectiveness of the interceptor. Once an interceptor is filled with solids and/or grease, the interceptor will not be able to remove grease and the benefit of the interceptor will be lost completely. Determining the proper time to clean or maintain an interceptor is based on inspections and experience. FSEs often try to estimate the thickness of the solids and grease in their interceptor with a pipe or stick. Some FSEs or inspectors use a clear pipe or "sludge judge" device to accurately measure the grease and sludge thickness (discussed below). The grease and solids layers combined should not exceed 25% of the total interceptor liquid depth to avoid overloading the interceptor. This "25% Rule" is widely accepted as a best practice throughout the United States. When an interceptor is cleaned, the interceptor should be completely pumped out to ensure that all the solids are removed and to provide an opportunity to inspect the interceptor baffles and tees.

Some agencies specify the maintenance schedule (e.g., once per quarter), but the FSE is generally responsible for determining the maintenance schedule and contracting with a private interceptor cleaning company (i.e., grease hauler) to perform the work (Figure 6-13).

Cost of Proper Maintenance - The cost to have a grease hauler pump-outpump out and properly dispose of the waste grease from an average-sized interceptor (1,500 gallons) is approximately $300 per event. Many grease-producing FSEs pump out their interceptors quarterly. Some FSEs need to pump out their interceptors monthly or even twice per month. Therefore, grease-producing FSEs with 1,500 gallon interceptors may pay $1,200 to $7,200 per year to properly maintain their interceptor. Grease-producing FSEs with interceptors find that these costs are necessary to avoid nuisance odors, overflows of the interceptor, or back-ups into their kitchen.

Potential Causes of Under-Maintenance - Since the interceptor is outdoors and underground, many FSEs simply forget that their interceptors require regular maintenance. In other words, "out of sight, out of mind." The other inherent problem associated with interceptor maintenance is the cost of pumping out the interceptor. The less an FSE maintains its interceptor, the more money it saves. Until an FSE experiences unpleasant odors or plumbing back-ups due to delayed maintenance of an interceptor, many FSEs will under-maintain their interceptor to save money. Under-maintenance of interceptors will lead to pass-through of FOG into the sewer system and potential odor and corrosion issues. Maintaining an interceptor to reduce the amount of grease being discharged to the sewer is not currently perceived as an important business issue for most FSEs—particularly if the penalty for failure to take appropriate action is non-existent or less costly than the cost of cleaning. To address this issue, agencies must decide how they are going to encourage and/or monitor the proper maintenance of interceptors at FSEs.

FIGURE 6-13 Interceptor Maintenance – Interceptor being cleaned and pumped (Courtesy of County Sanitation Districts of Los Angeles County)

6.4.3 Interceptor Monitoring

Monitoring an interceptor (e.g., measuring the grease and solids build-up) is difficult and unpleasant. Because of this, the study recognizes that FSEs will not typically monitor their own interceptors correctly, if at all. Without monitoring, many FSEs will establish a frequency for pumping out their interceptor based on corporate recommendations, grease hauler suggestions, past lateral grease blockage frequency, or financial hardship. Some cities or agencies (e.g., the County of Orange unincorporated areas) have required minimum pump out frequencies (e.g., monthly to quarterly) based on the type of FSE or the fixtures in a FSE kitchen. Unfortunately, these approaches do not provide a reliable method of monitoring or predicting the build-up of grease and/or solids in an interceptor at an individual FSE. This will lead to either under- or over-maintenance of interceptors at most FSEs. In addition, when performing interceptor maintenance, many grease haulers do not monitor the condition of inlet tees or baffles (damage to these is a common problem with many interceptors).

There are three approaches that FSEs can take to monitoring their interceptor:

FSE Approach #1 - Interceptor Self-monitoring
FSE Approach #2 - Contracting-out Interceptor Monitoring
FSE Approach #3 - Use of an Interceptor Monitoring Device

There are also three approaches agencies can take to monitor the proper maintenance of interceptors at FSEs:

Agency Approach #1 - Inspection of FSEs
Agency Approach #2 - Agency Supplied Interceptor Maintenance
Agency Approach #3 - Use of an Interceptor Monitoring Device

Elements of one approach can be combined with another approach to provide the best overall monitoring program.

FSE Approach #1, Interceptor Self-monitoring - Self-monitoring is not being practiced at most FSEs. Surprisingly, very few agencies have developed educational materials for FSEs to determine how to monitor their interceptor or when to maintain their interceptor. Typically, agencies simply require that interceptors must be cleaned regularly (e.g., once per quarter) to avoid problems. However, monitoring the grease and solids layers is somewhat complicated for the average FSE employee or manager. The proper method of using a clear tube or "sludge judge" to measure the grease layer must be easily explained and understood by the FSE (Figure 6-14).

FIGURE 6-14 Interceptor – Solids and grease accumulation being measured with a clear pipe device called a "Sludge-Judge" (Courtesy of County Sanitation Districts of Los Angeles County)

One guideline for determining when to clean an interceptor was presented in the BMP Manual from the Oregon Association of Clean Water Agencies [106]. From the manual, interceptors should have:

- No more than ¼ the depth as grease[24]
- No more than ¼ the depth as sediment
- No more than ¼ of the depth should be a combination of grease (top) and sediment (bottom)

It is not known how these guidelines were developed, but the intention is clearly to provide a conservative measurement to avoid overloading the interceptor with grease and solids.

If the self-monitoring approach is to be promoted in Orange County, FSEs must be provided with guidance on proper monitoring (e.g., proper measurement technique and grease/sludge depth guidelines). Without this guidance, many FSEs would monitor their interceptors on an occasional basis at best, or when they are forced to due to unpleasant odors or a back-up occurs in their plumbing due to grease blockages.

The limitation of the self-monitoring approach is that if it is not reinforced and supported by a follow-up verification that the guidelines are being followed, many FSEs will stop following them.

FSE Approach #2, Contracting-Out Interceptor Monitoring - Some FSEs are contracting-out the monitoring of their interceptors to grease haulers or biological additive service companies. These contractors may include this service in their overall service to the FSEs. If the contractor is qualified and there is trust between the FSE and the contractor, this monitoring approach may be very successful. If the contractor is not qualified or honest, this approach can be problematic for the FSE and the sewer system.

FSE Approach #3, Use of an Interceptor Monitoring Device - One approach that is available to FSEs in Orange County, but is not currently being utilized, is an interceptor monitoring device (Figure 6-15). An interceptor monitoring device automatically and continuously measures the volume of solids and grease in an interceptor and notifies the FSE when it is time to maintain the interceptor. The cost to purchase and install an interceptor monitoring device is approximately $1,500.

[24] The manual stated no more than 1/3 depth as grease; however, technically it is required to be ¼ based on the final requirement in the cleaning criteria of a maximum of ¼ of the depth from the combination of the grease (top) and sediment (bottom).

FIGURE 6-15 Interceptor Monitoring Device (Courtesy of Worldstone, Inc.)

An interceptor monitoring device serves as a grease and solids accumulation monitoring system that is installed in grease interceptors. The device can automatically transmit data to the FSE's office or kitchen area, which provides a constant update and historical record of the temperature in the interceptor and the thickness of the solids and grease layers. Monitoring of the temperature can help a FSE determine if any employees are discharging high temperature wastewater to the interceptor.

The devices can be installed in a new or existing interceptor. Figure 6-16 displays a possible location for the device.

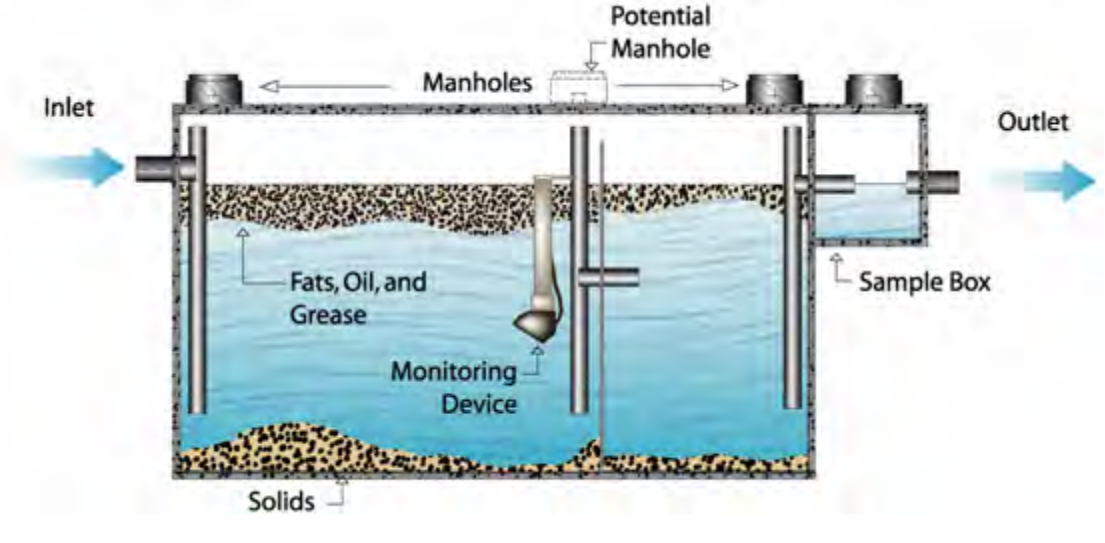


FIGURE 6-16 Grease Interceptor with Monitoring Device installed (location may vary)

Currently these devices are being used by many FSEs in the country, primarily in the eastern United States, to monitor their interceptors and to notify them when it is time to maintain their interceptors. FSEs reportedly use this technology for their own benefit to prevent line back-ups due to grease and, in some cases, to save money by avoiding maintaining an interceptor more frequently than necessary.

Although there are always limitations and/or complications involved with depending upon a mechanical monitoring device, the potential benefits in reduced costs and potential liability for the FSE and enhanced protection of the sewer system from grease accumulations for the agency are significant. Although FSEs have testified to the benefits of this interceptor monitoring device, there have been no objective studies found that determine the amount of grease that is actually prevented from flowing to the sewer due to the use of this device. Nor have any objective studies been found to determine the accuracy or the reliability of the technology. This information can be provided through field tests performed in Phase II of the study.

Agency Approach #1 - Inspection of FSEs - Many agencies inspect FSEs to monitor the maintenance of the interceptors. Inspectors can examine interceptor maintenance logs (including haulers receipts or pump truck tickets) to verify that the interceptor is being maintained regularly. The City of San Diego requires FSEs to keep interceptor maintenance records available for inspectors review at any time [34]. Some agencies require FSEs to maintain their interceptors at a minimum frequency determined by the rate of grease or solids buildup revealed during agency inspections. In this case, each inspector must either personally measure the grease and sludge in the interceptor or witness an FSE employee measuring the grease and sludge.

In south Orange County, California, the cities of Laguna Beach, San Clemente, San Juan Capistrano, and the Moulton Niguel Water District retain an outside contractor to inspect FSEs and their interceptors. In Laguna Beach, the interceptors are inspected once each month (John Pietig, City of Laguna Beach). The Eastern Municipal Water District (EMWD) began annually inspecting FSE interceptors and maintenance logs in 1995 (Judy Lankey, EMWD). The grease-related SSOs in their commercial areas dropped from 20 in 1994 to 0 in 2001, primarily due to inspection of FSEs' interceptor and maintenance logs and educating the FSEs on kitchen BMPs and interceptor maintenance.

Inspection forms typically include the following information:

- Interceptor size and location
- Grease and sludge depth guidelines
- Maintenance records
- Haulers information
- Name of person responsible for monitoring the interceptor

Many cities and agencies follow up these inspections with warnings and/or notices of violation (NOVs) to provide an incentive (or penalty) for FSEs to properly maintain their interceptors.

Agency Approach #2, Agency Supplied Interceptor Maintenance – Based on an interview with Mark Pumford of the City of Oxnard Wastewater Division, the City of Oxnard has provided

its own vacuum truck and crew to clean and pump FSE interceptors to improve the quality of the maintenance programs. The current grease control program started approximately 10 years ago when new digesters were added to the wastewater treatment plant. They were designed with sufficient mixing energy to handle and digest grease. The City then started its own waste grease collection service and offered it to the FSEs in its service area. The service started with the modification of a 3,000-gallon vacuum truck so it could carry three 30-foot sections of 3" hose, and an 85-gallon fuel tank on the truck was converted to a 1900 psi high pressure washer that can clean the waste grease out of FSE interceptors.

At this time, many Oxnard FSEs use the optional City collection service for maintenance of interceptors. The waste grease is hauled to the wastewater treatment plant and mixed with sludge entering the digesters. Recently the main digester was inspected and no grease accumulation or scum blanket was present after 8 years of service. The grease also contributes to increased gas production for generation of power at the plant. The remaining FSEs have their interceptors pumped by private haulers who take the grease to one of three rendering plants in the area. The city charges $200 per pumping event and will pump every 2, 4, 6, or 12 months, depending upon the activities of the FSE and their contract with the city. Private haulers charge more than $200 per pumping event and many do not clean the interceptors adequately. The City no longer allows private haulers to dump into the wastewater treatment plant digesters, because they have no control or knowledge of what the private haulers actually have in their tanks and have had some bad experiences. However, the City is trying to find and certify one or more private haulers who will be responsible enough to carry out the pumping and hauling to City standards. At this time, there is tremendous support from the FSE community with a high level of customer satisfaction with the program. It has eliminated most of the conflicts and Notices of Violations, which were common before the inception of the City's pumping program.

Problems encountered included scheduling (all the FSEs request early morning maintenance), changes of FSE ownership, inaccessibility of the interceptor, the FSE's desire for the City to take full responsibility for the interceptor, failure to notify the City when FSEs want to terminate service, and a desire to not be on a regular schedule. It is important to note that some FSEs in Oxnard do not use the interceptor maintenance service provided by the City due to concerns with having City inspectors in their establishment.

Agency Approach #3, Use of an Interceptor Monitoring Device - As discussed above, the strategy of using an interceptor monitoring device is only currently being utilized by FSEs. However, if this technology is reliable and has the benefits discussed above, the opportunity for cities and agencies to promote (or perhaps mandate) these types of technologies is worthy of consideration. Currently, cities and agencies that rely on the Interceptor Building Block must educate FSEs on the proper maintenance of an interceptor and then perform regular inspections to insure that the interceptors are being maintained properly. For an inspection program with a minimum of one inspection per year, an inspector can only judge the success of the interceptor maintenance during that inspection. For example, checking maintenance logs does not tell an inspector whether the interceptor was maintained before or after it was full, although the condition of the interceptor at the time of the inspection will reveal whether the most recently claimed cleaning occurred as indicated in the record. At best, an aggressive inspection program

can provide the FSE with an incentive to do the right thing and give the city a reasonable perspective on the level of responsibility being exercised by the owner and staff.

If an interceptor monitoring device was accurate and reliable, it could provide an inspector with continuous monitoring data of the interceptor and evidence of proper maintenance for many years. This concept is being used for flow and pH monitoring in industrial wastewater programs throughout the country. Continuous flow and pH monitoring devices are mandated to be installed at many industries. Paper strip charts (or data loggers) continuously document the flow or pH measurements. Inspectors use these strip charts to determine if the industry has exceeded its flow or pH requirements at any time between inspections. There is no reason to suspect that an effective interceptor monitoring device could not be utilized as a monitoring tool by agencies, similar to flow and pH monitoring equipment.

As discussed above, the interceptor monitoring device can be field tested in the proposed Phase II of the study.

6.4.4 Conclusions and Recommendations

Grease interceptors are recognized as the best conventional technology for grease control at FSEs. Therefore, the study recommends that all new FSEs and FSEs that pursue remodeling of over $50,000 should be required to install a grease interceptor according to the UPC requirements. The study also recommends interceptors for existing FSEs without an interceptor. However, for existing FSEs the study recommends a "conditional stay" of the requirement to install a grease interceptor for a period of up to two years (discussed further below and in the Ordinance Building Block).

The study also recommends that small FSEs that meet a de minimis classification may receive a waiver from installing an interceptor. Additionally, interceptors should not be larger than 3,000 gallons (for cleaning purposes), unless there are special circumstances. The study provides recommendations for the proper sizing and plumbing design of an interceptor, as well as guidelines for following the UPC requirements based on the study's recommendations. However, further input from building department and health department representatives, plumbers, interceptor manufacturers, grease haulers, and FOG control representatives should be received before finalizing a standardized design and sizing requirement.

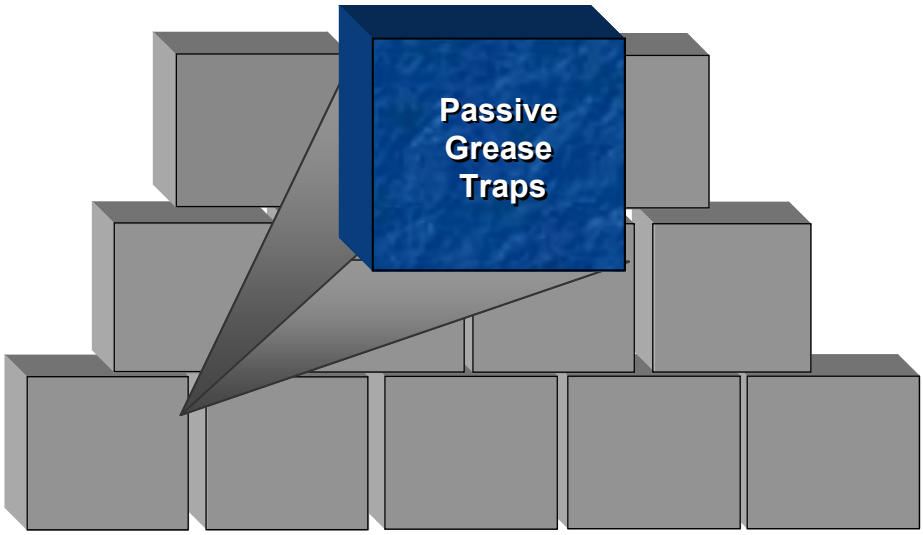
The study recommends that all FSEs with interceptors must provide proper maintenance of the interceptor. The study has determined that proper monitoring of interceptors is required to avoid under-maintenance of interceptors and the discharge of grease into the sewer system. A specially-trained grease removal equipment (GRE) inspector can provide the monitoring that FSEs are not performing. This service has been successfully used elsewhere and is discussed further in the Monitoring and Enforcement Building Block. A mandatory minimum interceptor pumping frequency for all FSEs should be once every 6 months, for sanitary and odor control, as well as to provide for regular inspection of its integrity. Most FSEs will need to pump their interceptors more frequently due to the monitoring activities of the GRE inspector. Interceptors should also be pumped out completely each time.

One technology that shows great potential for automatically monitoring interceptors is an interceptor monitoring device. This device can continually measure the amount of grease and solids build-up and notify the FSE when it is time to pump out its interceptor. Interceptor monitoring devices should be tested in Phase II due to their potential role in monitoring interceptors as an alternative or in addition to the GRE inspector.

Due to the cities' and agencies' inconsistencies in implementing the UPC requirements for interceptors at FSEs, the primary FOG specialist (the FOG inspector, discussed further in the Monitoring and Enforcement Building Block) should be included in the plan check process for new and remodeled FSEs and existing FSEs that are required to install an interceptor.

Grease interceptors are far superior to grease traps because they have much more retention time, and they treat the wastewater from floor drains and dishwashers as well as sinks. Grease interceptors are also superior to kitchen BMPs, because eventually, even with effective kitchen BMPs, some grease will be discharged into the sewer system. More specifically, properly designed and maintained grease interceptors will be consistently effective even when kitchen BMPs are not always effective. Ideally, the best grease control approach is a combination of effective kitchen BMPs and a properly designed and maintained interceptor.

"Conditional stay" of the requirement to install a grease interceptor for existing FSEs - The stay of up to 2 years is recommended to allow time for the FSEs and the agencies to evaluate alternative options to interceptors for some FSEs. The condition of the stay is that the FSE cannot "cause or contribute to a grease blockage or SSO." Many existing FSEs will find it difficult to retrofit their existing facility to install an interceptor due to space constraints, plumbing slope constraints, or economic hardship. However, this does not diminish the fact that installing, maintaining, and monitoring interceptors are necessary requirements for many FSEs, cities, and agencies to prevent grease-related blockages and SSOs.



6.5 PASSIVE GREASE TRAPS

The principal of a conventional indoor grease collection device, commonly referred to as a passive grease trap, is similar to that of an interceptor, except that the device is small enough to be located under a counter in an FSE kitchen. The relatively small size (generally 50 gallons or less) requires that the grease that accumulates ahead of the discharge baffle must be removed manually at frequent intervals to assure that grease is not carried through to the sewer. The cost of purchasing and installing a passive grease trap can range from $500 to $1,200 for 10 to 50 gallon per minute (gpm) units, respectively.

6.5.1 Design and Function

According to the Uniform Plumbing Code (UPC, 2000 Edition), a "trap" refers to a device that provides a hydraulic seal between the fixture and the sewer to which it is connected. "Grease traps", per the UPC, are intended for the capture of up to 100 pounds of grease in addition to providing the hydraulic seal. Grease traps are described in §1014.2-7 and are limited to serving from 1 to 4 plumbing fixtures per trap and flows between 20 gpm and 55 gpm (75 gpm in special circumstances). The UPC provides sizing requirements for a grease trap (Table 6-12), which is based on the number of fixtures connected to the trap.

Table 6-12
UPC (2000 Edition) Grease Trap Sizing Requirement

Total Number of Fixtures Connected	Required Rate of Flow per Minute (gallons)	Grease Retention Capacity (pounds)
1	20	40
2	25	50
3	35	70
4	50	100

A typical conceptual design for a passive grease trap is displayed in Figure 6-17, and a size comparison between a grease interceptor and a grease trap is displayed in Figure 6-18.

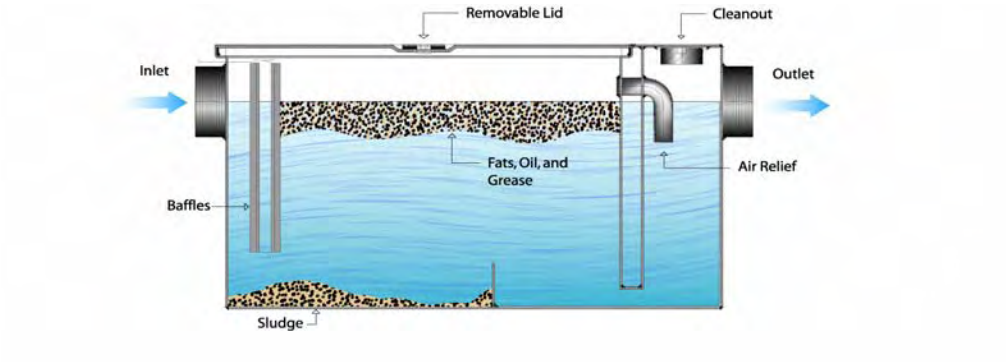


FIGURE 6-17 Typical Conceptual Grease Trap Design - Side View

FIGURE 6-18 Grease Interceptor and Passive Grease Trap – 2,000 gallon interceptor and 10 gallon grease trap comparison (Courtesy of Monterey Regional Water Pollution Control Agency)

Due to their small sizes and need for frequent maintenance, grease traps do not capture all of the grease from a sink or fixture. However, it has been estimated by many of the suppliers of grease traps that they are 80% effective in removing grease, if maintained properly.

It is important to point out that grease traps should never be installed below a sink that is equipped with a food grinder, because the solids will interfere with the performance of the trap. In addition, hot water (e.g., temperatures greater than 140^{o} F) should never be discharged to a trap, because the high temperature can emulsify the previously captured grease and allow it to pass through the trap.

6.5.2 Maintenance

On an as needed basis, the grease must be removed from the trap and manually transferred to a grease collection barrel, which should be equipped with a lockable lid. The responsibility for transferring the grease and keeping the lid locked when not receiving grease should be assigned to a specific kitchen employee. The effectiveness of indoor grease traps is dependent upon the level of responsibility assumed by management and the staff for its proper maintenance. Failure to properly maintain and clean the trap has been a frequent FSE problem. Figure 6-19 displays a grease trap that was not maintained correctly, and the trap became over-filled with grease.

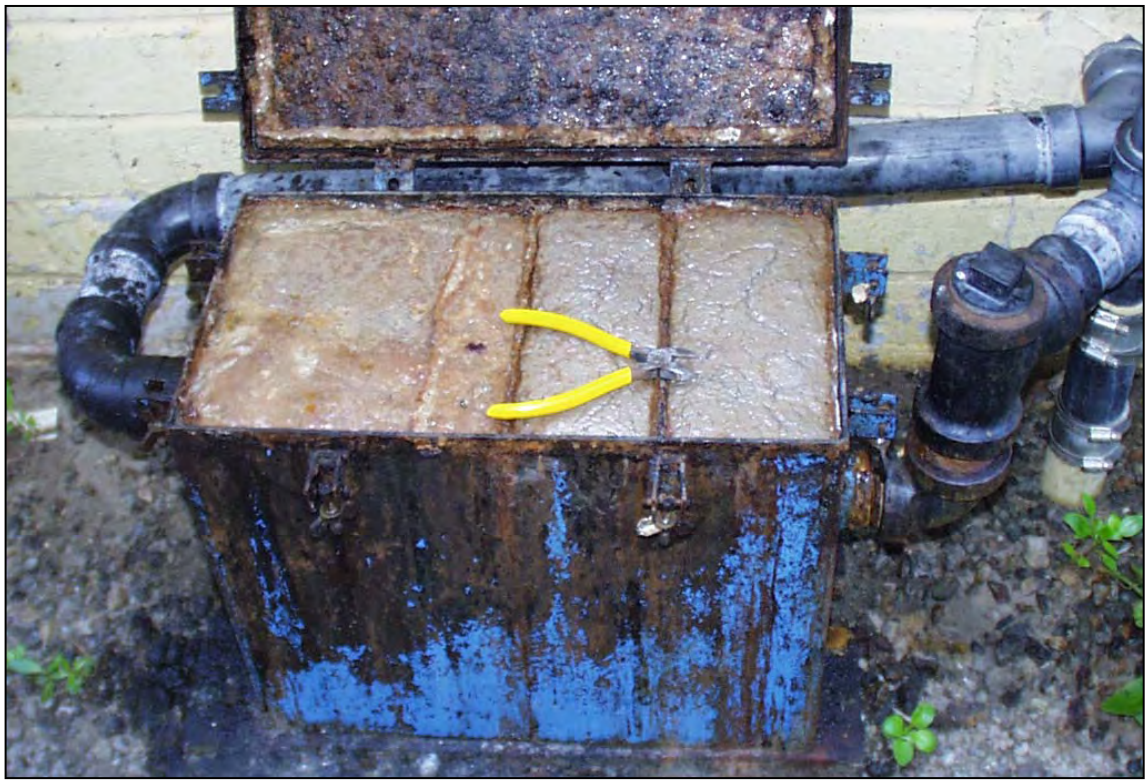


FIGURE 6-19 Passive Grease Trap requiring maintenance (Courtesy of Monterey Regional Water Pollution Control Agency)

Like the grease interceptor, a grease trap is often ignored by FSE employees because it is often "out of sight-out of mind." Therefore, a maintenance record log should be posted which requires the trap to be examined and/or maintained on a regular basis. Agencies can inspect these maintenance logs as part of their inspection programs.

6.5.3 Suppliers

The passive grease trap manufacturers that responded to the request for information are listed below along with some of the features they "claim" for their products:

Ashland Trap Distribution Co. [143]
Ashland provides a grease trap made from a unique resin. The trap is a leak proof, seamless tank, and the resin material can handle 212°F continually. The trap is lightweight yet durable and sturdy. The poly traps range in capacity from 7 gpm to 75 gpm. The 4800 series trap has a flow control device. All units have removable baffles.

Jay R. Smith [135]
Smith manufactures a conventional grease trap with semi-automatic-draw off for recessed installation. The draw off unit allows for the accumulated FOG to be removed from the trap without opening the lid. Sizes vary from 7 gpm to 50 gpm in capacity, and the large capacity units vary from 75 gpm to 500 gpm (used for food processing and packaging plants). Cleaning frequency is determined by the load factor of the unit, and cleaning should occur every several weeks.

Wade Manufacturing [138]
Wade manufactures conventional grease traps that range in capacity from 4 gpm to 50 gpm. These traps are installed flush to the floor or on the floor. They have a low profile unit that can be installed behind a sink. They also manufacture a conventional grease trap with a semi-automatic draw off valve.

Watts [137]
Watts manufactures conventional grease traps that are mounted on the floor or flush to the floor. The sizes range from 4 gpm to 50 gpm capacity. The units are epoxy-coated inside and are steel outside. All units include a one-piece removable baffle assembly, code-approved deep seal trap, secured and gasketed non-slip cover, and standard NH (no hub) inlet and outlets and external no hub flow control. Watts also manufactures a grease trap with a semi-automatic draw off and access housing. Sizes range from 7 gpm to 75 gpm.

Zurn [136]
Zurn manufactures a conventional trap constructed of fabricated steel with a corrosive-resistant coating. They have various sizes from 4 gpm to 50 gpm. These units are for mounting in the floor or next to the sink. They also provide a low profile grease trap designed for under the sink or in an area where space is limited. Sizes range from 20 gpm to 50 gpm. Zurn also manufactures a conventional trap constructed from polyethylene in sizes ranging from 4 gpm to 50 gpm. The unit can handle temperatures to 212°F. Zurn manufacturers another grease trap (Z-1173-TD) that has an accumulating cone and shut off valve.

6.5.4 Role in FOG Control Programs

Grease traps are an important FOG control option, particularly for those FSEs without interceptors. The proper operation and maintenance of passive grease traps is required for them to be effective. As evidenced by the success of some FOG control programs (e.g. City of San Diego , California and the City of Everett, Washington), FSEs must have the option of installing grease traps (passive) if interceptors are not a feasible option. Otherwise, FSEs will have no means of collecting the grease that is discharged into their drains. Any grease trap will provide

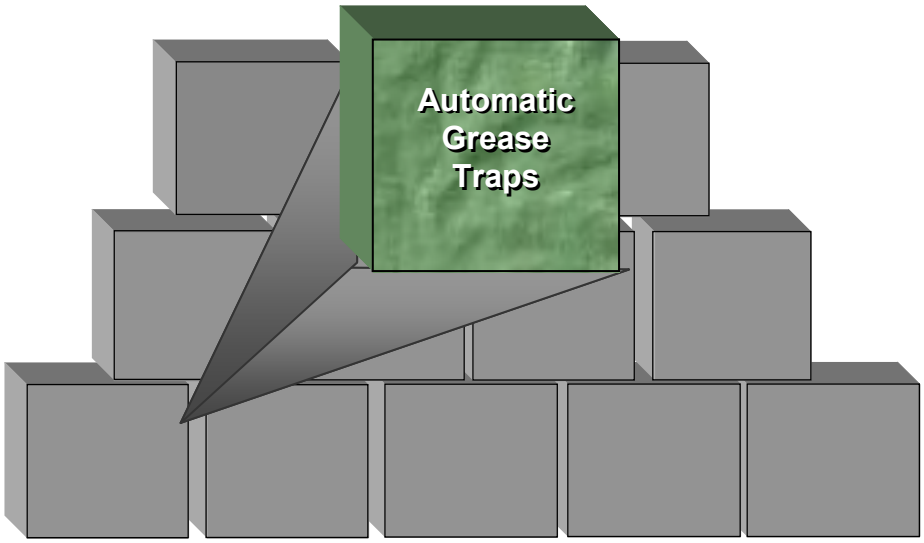
some level of grease control, even if maintenance is not performed according to best management practices.

Many agencies in the United States do not permit passive grease traps in the FSE kitchen area due to sanitation concerns created by the maintenance of the trap. Other agencies allow and encourage passive traps, particularly when a FSE does not have an interceptor. In Orange County, most FSEs have not installed grease traps, though this is a common grease removal device in other parts of the country. This is largely due to an apparent belief by many FSEs that grease traps are prohibited by the health department. OCHCA states that it does not prohibit the installation of grease traps within FSEs. OCHCA recommends that grease traps be located outside the facility whenever possible to maintain sanitary conditions in the food preparation areas. However, OCHCA stated that it will evaluate requests for the installation of grease traps located inside the facility and will assist in identifying installations that allow easy access for maintenance activities that promote sanitary conditions. Refer to Section 5.1.2 for OCHCA guidelines and recommended BMPs.

6.5.5 Conclusions and Recommendations

Passive grease traps are an important FOG control option and are utilized throughout the country. Proper maintenance of the grease traps is an essential requirement and is critical to the proper operation of this technology.

The study recommends the utilization of grease traps (passive) if interceptors are not a feasible option for the FSE. Otherwise, FSEs will have no means of collecting the grease that is discharged into their drains. Any grease trap will provide some level of grease control, even if maintenance is not performed according to best management practices. The program should require adequate monitoring and enforcement to ensure that maintenance is being performed as discussed in Sections 5.1.2 and 6.5.2.



6.6 AUTOMATIC GREASE TRAPS

Manufacturers have improved the design of passive grease traps to enhance grease removal efficiency and to reduce the maintenance requirements. Such devices have some form of automation or partial "self-cleaning" feature. Therefore, this report refers to such devices as "Non-Conventional" or "Automatic Grease" Traps. Based on input received from the manufacturers, the typical cost of purchasing and installing an automatic grease trap ranges from $3,000 to $8,000.

6.6.1 Design and Function

Although there are other designs in the market, in general these devices are made of stainless steel and have a skimming device and a small storage container for FOG removal. See Figure 6-20 for examples. Typically there is also a solids screening device on the inlet to capture solids to prevent reduction of the unit capacity and to delay the unit from going septic from decaying food solids. The screening device must be manually removed daily, and the contents disposed of into a trash bin. The plastic storage container must also be emptied manually, and the grease collected for eventual disposal or recycling. Some newer models use sensors to determine when to activate the grease removal cycle, whereas older versions are started once or twice a day with a timer. On some models the grease removal cycle starts with a heater raising the temperature in the chamber to at least 120^{o}F to liquefy the grease, and then the skimming devices divert the grease to the storage container. Additional skimming units may be installed in the unit to remove grease faster. Some automatic grease traps are not equipped with skimming devices, but utilize biological remediation to digest the grease. Note: This example discusses a common automatic grease trap based on research. This does not imply that the automatic grease trap is the most common or that it is the most effective.

Automatic grease traps are typically installed under or by a sink (See Figure 6-21).

FIGURE 6-20 Automatic Grease Traps (Courtesy of Thermaco and Highland Tank)

FIGURE 6-21 Automatic Grease Trap installed under a sink – lid removed for photo (Courtesy of County Sanitation Districts of Los Angeles County)

6.6.2 Maintenance

Maintenance requirements for many of these devices are minimal, but daily maintenance is recommended by most manufacturers. The maintenance typically consists of preventive maintenance items, such as cleaning the skimming device which is estimated to take 10 minutes or less to complete. The grease storage container provides an easy way for FSE employees to transfer grease into a collection barrel. Some agencies claim that these devices require more maintenance than advertised, and that the devices frequently clog with solids. Like any other device that requires maintenance, if the unit is not properly maintained, it will experience problems.

Ironically, many FSEs fail to follow even simple maintenance requirements for these Automatic Grease Traps, because they are marketed as "automatic," "self-cleaning," or "low maintenance."

Therefore, a maintenance record log should be required to be posted requiring that each trap is to be examined and/or maintained on a regular basis, just as with the passive grease traps. In addition to physical inspections of these devices during facility inspections, agencies can inspect the maintenance logs to check if adequate maintenance is being performed.

6.6.3 Suppliers

The automatic grease trap manufacturers that responded to the request for information are listed below with some of the features they claim for their products:

API Industries Inc. [177]
API produces an automatic oil and grease-removing unit for pretreatment of restaurant wastes before sewer discharge. Oil and grease are gravity fed through a two-stage solid filter. This solid filter removes both settable and suspended food particles. The wastewater is then directed to collection unit, which pumps the effluent stream to the oil and grease removal unit at a flow rate of up to 20 gpm. Effluent FOG concentrations are expected to remain below 35 mg/L.

Lowe Engineering (Highland Tank) [144]
Lowe Engineering manufactures automatic grease traps for installation close to where the FOG-laden wastewater is generated, such as the pot washing sink, dishwasher, or a sewer drain,. The trap is relatively small, allowing for installation in space-limited areas, such as under a sink. The greasy water flows into a screen basket and strikes the inlet baffle, which promotes solids settling and slows the water velocity, keeping it from disturbing the grease layer. In the retention area, grease separates by gravity and remains between the baffles. The grease is then heated to 140 ^{o}F, and the disk skimmer skims the liquefied grease into a collection container. Sizes range from 12.7 gallons to 4,550 gallons. Lowe Engineering responded to the study's request for cost and performance data.

IGRD (International Grease Recovery Unit) [139]
IGRD manufactures non-conventional grease traps that have an internal and optional external strainer basket assembly to strain food particles from the water. The wastewater continues to flow through the grease recovery cabinet, and the grease floats to the surface. A thermostat maintains a constant temperature (~120 ^{o}F) to prevent the oil and grease from congealing and to ensure maximum separation. The grease is then captured in the retention area of the IGRD unit and removal is activated automatically. IGRD responded to the study's request for cost and performance data.

Jay R. Smith Manufacturing Co. [135]
Jay R. Smith manufactures a non-conventional trap called the "Remediator" (grease trap system). The system uses a solids interceptor, Remediator (interceptor with media chamber), and a metering pump for adding media culture. The biological media allows the unit to digest the grease as it is collected. The vendor states that no cleaning or skimming of the unit is required. However, daily maintenance, such as ensuring the amount of the Remediator culture remaining, is still required.

Proceptor [140]
The Proceptor unit is a multi-cell separator designed for separation of free oil, grease, and solids from commercial, institutional, and industrial facilities. The units range in size from 50 gallons to 6000 gallons. There are accessories to improve the efficiency of the units, including electronic alarms, automatic shut down valve systems, automatic pump out systems, an oil draw off line, and injection of Bacta-pur microorganisms to reduce cleaning frequency and cost.

Thermaco [40]
Big Dipper is a non-conventional trap/interceptor that traps the food particles in a solids separator basket at the inlet to the trap. Then the FOG is separated in the interceptor compartment and the water flows out of the unit. During a slow period or at night, the unit heats and liquefies the grease, and the skimmer wheel transfers the grease into the collection tank. The units range in size from 30 gpm to 150 gpm. Thermaco responded to the study's request for cost and performance data.

Zurn [136]
Zurn manufactures a non-conventional grease trap, which is called the "Grease Eating Bacteria Dosing Unit" (Z-1174). This unit includes the solids separator, trap, and the pumping unit. The sizes range from 4 to 50 gpm. The manufacturer states that the grease and oil are consumed by bacteria that are pumped into the unit daily. Zurn responded to the study's request for cost and performance data.

6.6.4 Role in FOG Control Programs

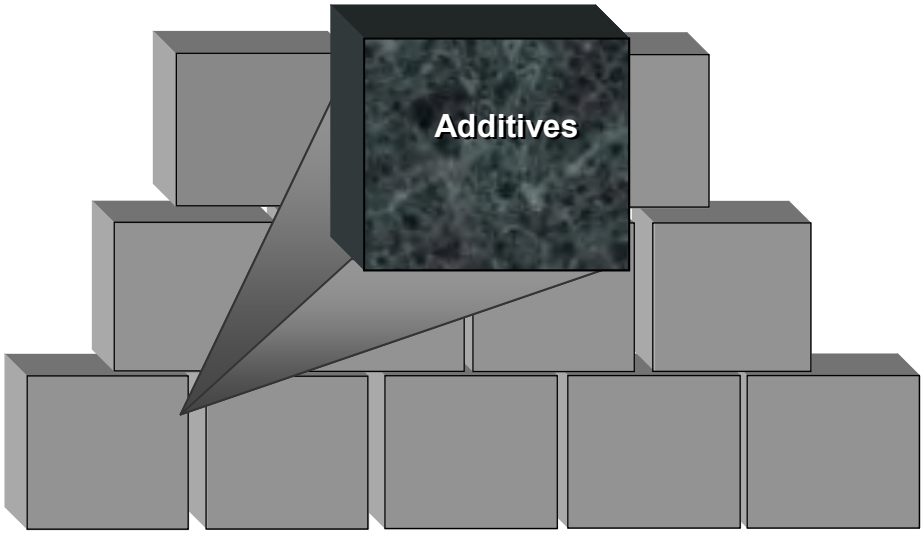
Many agencies in the United States allow the use of automatic grease traps, while others do not permit automatic or passive grease traps in the FSE kitchen area. This is due to concerns from some agencies and users that do not belief that they are effective in removing grease and/or due to sanitation concerns created by the maintenance of the traps. From interviews with manufacturers, they have stated that their respective automatic grease traps are effective (greater than 90%) in removing grease when the operation and maintenance guidelines are adhered to.

In Orange County, most FSEs have not installed automatic or passive grease traps, largely due to the apparent belief that grease traps are prohibited by the health department. OCHCA states that it does not prohibit the installation of grease traps within FSEs. OCHCA recommends that grease traps be located outside the facility whenever possible to maintain sanitary conditions in the food preparation areas. However, OCHCA stated that it will evaluate requests for the installation of grease traps inside a facility and will assist in identifying installations that allow easy access for maintenance activities that promote sanitary conditions.

6.6.5 Conclusions and Recommendations

Automatic grease traps may provide enhanced grease separation and automatic grease removal and may provide a very promising grease control solution for many FSEs that discharge a vast majority of their grease from their sinks. Automatic grease traps could be utilized at FSEs if a grease interceptor is not a feasible option, because grease traps do provide some level of grease control.

Prior to recommending automatic grease traps as a potential future alternative to grease interceptors for some FSEs, it is recommended that automatic grease traps be tested (Phase II) to validate their effectiveness in removing grease and to identify if there are any sanitary concerns during their normal operation at an FSE.



6.7 ADDITIVES

Additives include chemical and biological products used by FSEs to control grease in private lateral sewer lines and grease interceptors. Also, many cities and agencies have used additives to control grease in their sewer lines and lift stations. Chemical additives have solved some lift station grease problems, but the study could not locate data on chemical additives preventing sewer line blockages. Therefore, chemical additives are not recommended to be pursued for further study or adoption in a FOG control program until more evidence is provided that they are effective in reducing sewer line blockages. Furthermore, biological additives that are used primarily for lift station treatment were not heavily researched, because most SSOs are not caused by grease in lift stations.

Although considered experimental and/or unreliable by many FSEs and agencies, biological additives have been used to control grease at many other FSEs (FSE Application) and in municipal sewer lines (Sewer Line Application) for over 15 years. It is true that many biological additives have had little or no success in controlling grease. Many others are being used with limited scientific evidence that the product or service is truly working as advertised. On the other hand, there are many biological additives that have provided compelling evidence that they are controlling grease, keeping sewer lines clean, and satisfying customers with the results.

This section of the report will discuss how biological additives work and how they are used. It will also discuss the skepticism created by past experiences, the potential benefits, successful trials and pilot studies, concerns, costs, and how biological additives may be utilized in a grease control program. A summary table of the suppliers who responded to the study is also provided.

6.7.1 Description and Function

The most common biological products use bacteria to slowly digest the FOG that builds up on sewer lines and to convert the FOG into fatty acids and glycerol. This conversion prevents the

FOG from sticking to the pipes and blocking the sewer lines (Figure 6-22). With enough time, the bacteria will convert the FOG into carbon dioxide and water.

In a bacteria additive, bacteria produce enzymes to break down the FOG into digestible components for the bacteria. Years ago, the first such products on the market, and many still today, primarily consisted of emulsifying chemicals, or "enzymes," that break up the grease to keep grease traps or lift stations clean. This is why many of the newer bacteria additives are still called "enzymes" by many FSEs and municipalities.

FIGURE 6-22 CCTV Inspection of Placentia sewer line (Courtesy of Ennix)

1. Video image before Ennix pilot test, showing grease build-up.

2. Video image after 50 days of Ennix pilot test, without sewer line cleaning.

The biological products typically used for grease control belong in one or more of the following four classifications:

Non-native or Foreign Bacteria - These additives typically consist of specially-selected bacteria that work well in a low oxygen environment, such as a pipe or sewer line. There are many different bacteria used in each product. Typical bacteria strains include Bacillus and Pseudomonas. Suppliers strive to develop a blend of bacteria that works faster, provides more active bacteria, has a longer shelf-life, or is more suited to FOG digestion. These bacteria can be combined with catalysts or nutrients to provide the proper environment for rapid cell and population growth.

Catalysts - Some additives are classified primarily as catalysts, which serve to stimulate the growth and activity of native or existing bacteria in the wastewater. Some of these catalysts may also solubilize the FOG to allow the bacteria to digest the FOG. These additives are often combined with nutrients to provide the proper environment for rapid cell and population growth.

Enzymes - As discussed above, enzymes are produced by bacteria and are used to break down the FOG into digestible components for the bacteria. However, some additives consist primarily

of commercially prepared enzymes that are designed to solubilize the FOG without digesting it. These products usually do not contain much active bacteria.

Emulsifiers - Some additives, regardless of their classification, may include an emulsifier or surfactant. In this case, some of the FOG is not digested, but rather it is emulsified or suspended in the wastewater and is carried downstream to either the interceptor, another place in the sewer system, or to the headworks of the treatment plant. This may solve the grease problem in one location, such as at a lift station but may create a grease problem elsewhere. There is very little hard evidence (e.g., testing data) available on any of the additives researched to prove whether they contain emulsifiers. However, a few of the additives have been tested under monitored conditions, over an extended period of time, without any direct evidence that they are carrying the FOG downstream. The fact that a biological product may emulsify or solubilize the FOG before it is digested does not necessarily mean that it is problematic, but products should be tested for their emulsification properties before they are tested in the field to separate the emulsifying products from the non-emulsifying products. The study evaluated an emulsification test being performed by the City of Everett, Washington that could be used in Phase II.

6.7.1.1 FSE APPLICATION AND SEWER LINE APPLICATION

Until very recently, almost all biological additives were added in a FSE kitchen sink drain (FSE Application), because the main purpose was to keep the FSE's traps, interceptors, or lateral sewer lines from clogging. Now because of the sewer overflows in municipal sewer lines and the interest from agencies, many biological additives are being added in the sewer system (Sewer Line Application) to keep the municipal sewer lines free of excessive grease build-up and to reduce the need for sewer line cleaning. This is an important recent development, because most bacteria products are sensitive to high temperatures and strong oxidizers such as bleach. By feeding the additive further downstream, many of the temperature and oxidizing issues are diminished. This also allows the bacteria to be added directly upstream from a hot spot, which maintains a high concentration of live bacteria where it is needed most.

Some suppliers report that their FSE Application products can control grease both in the lateral and municipal sewer lines due to the high population of live bacteria that is carried through to the municipal sewer line. However, very few case studies were found to support this claim (one in San Diego is provided in Section 6.7.4). Other suppliers claim that their biological additives are best used in a Sewer Line Application to be effective on main sewer line grease blockages. More case studies were found to support this claim (also provided in Section 6.7.4). The reality is that few recognized tests have been conducted which researched the optimum application point for grease control.

Both application products are typically added by hand or through a feeder system and can be used in dry or liquid form. At least one supplier provides a feeder installed under a manhole to add its product.

6.7.1.2 TURNKEY SERVICES

One reason why many biological additives fail to provide consistent results is because they depend upon the FSE or agency to manually add the product or to maintain the feeder. Some biological additive suppliers are now supplying turnkey services to cities or FSEs that may include adding the product, maintaining the feeders, monitoring interceptors, or training the FSE on kitchen BMPs. Some suppliers periodically monitor grease conditions in the sewer lines they service using CCTV inspection. Based on the study research, companies that supply a service along with their additives appear to be the most successful in preventing sewer line blockages.

6.7.2 Skepticism vs. Potential Benefits

There is tremendous skepticism about biological additives, particularly from cities and agencies. This skepticism is the result of many reasons: previous reliance on FSEs or agencies to add the product; improper applications; poor representation from distributors; exaggerations from sales representatives; and overall poor science in evaluations and pilot tests. The fact that some additives act more as a surfactant has helped fuel this skepticism. Unfortunately, this has led to a severe obstacle to true research and development for suppliers of biological additives. In other words, it is difficult for suppliers to prove, or improve, their products if they are given few opportunities to test their products. In light of the recent successes of some biological additives and services (discussed below), Orange County cities and wastewater agencies should evaluate and be receptive to the benefits of biological additives and the role that they can play in grease control programs. Some cities also claim that the cost of the biological additives is competitive with their sewer line hot spot cleaning costs. Although there are many cost and performance concerns regarding biological additives, the potential benefits of biological additives and services are significant:

- Control of sewer line hot spots
- Reduced sewer line cleaning
- Less waste to be managed or landfilled
- Solution to residential grease blockage problems
- Reduced grease-related SSOs
- Reduced grease loading at the POTW
- Cost savings for the FSE and the city or agency

Because of these potential benefits, biological additives have the potential to significantly affect program choices on ordinances, monitoring and enforcement, grease interceptors, grease traps, sewer line cleaning, and grease disposal practices and alternatives.

6.7.3 Suppliers

The study has received data from thirty (30) suppliers[25] of biological additives and/or services in the United States. The additives they supply can be utilized for FSE Applications and/or Sewer

[25] This does not imply that this is a complete list of suppliers of biological products, nor does this imply any approval or endorsement of any of the mentioned suppliers.

Line Applications. Some of these suppliers may be manufacturers or distributors for very similar biological products, but they may also supply a specialized service to support the product. A request for information (RFI) was forwarded to each of these suppliers requesting specific information related to their experience in controlling grease. Twenty-one (21) suppliers responded to a follow up RFI that requested specific cost and performance information. Based on the information requested, or forwarded directly by the suppliers as of May 2003, a list of the suppliers and their general responses to the RFIs are presented in Table 6-13.

Table 6-13
List of Biological Additive Suppliers or Service Companies

Biological Additive Suppliers	Supplied Literature	Supplied City/Agency References	Supplied FSE References	Supplied Cost and Performance Data
ABC-Biosystems	Yes	No	No	No
Advanced BioCatalytics Corp.	Yes	Yes	Yes	Yes
AgriBioProducts Inc.	Yes	No	No	Yes
Alpha-Biotek	Yes	No	No	No
BioHumaNetics	Yes	Yes	No	No
Biostim LLC	Yes	Yes	Yes	Yes
Bio Clean Environmental	Yes	Yes	Yes	Yes
BioLinks Technologies	Yes	No	Yes	Yes
Charles Livingston	Yes	No	No	No
Custom Biologicals	Yes	No	No	Yes
Duke's Sales and Service. Inc.	Yes	Yes	No	Yes
Ennix	Yes	Yes	Yes	Yes
Environmental Biotech	Yes	Yes	Yes	Yes
Envirotech, Inc.	Yes	Yes	Yes	Yes
Enzymatic Solutions LLC	Yes	Yes	No	Yes
General Environmental Science	Yes	No	Yes	Yes
Great Lakes Bio Systems	Yes	No	No	No
Hydrologix, LLC	Yes	No	No	Yes
IET-Aquaresearch (BactaPur)	Yes	Yes	Yes	Yes
Maryland Biochemical Company	Yes	Yes	Yes	No
Micro-Bac	Yes	Yes	Yes	Yes
Neozyme International, Inc.	Yes	Yes	Yes	Yes
Novozymes Biologicals	Yes	Yes	Yes	Yes
NRP	Yes	Yes	No	Yes
R&D Supply, Inc.	Yes	Yes	No	Yes
Solmar Corporation	Yes	Yes	Yes	No
Strata International, Inc.	Yes	Yes	Yes	Yes
Tetelestai Environmental	Yes	No	No	No
United-Tech	Yes	Yes	Yes	Yes
Western Biotec Environmental	Yes	No	No	No

The specific data from the cost and performance RFI was combined into a Technology Matrix, which is available to Orange County cities and agencies as a separate document.

6.7.4 Successful Trials and Pilot Tests

Many of the suppliers provided EEC with case studies involving successful FSE and Sewer Line Applications. Since the primary focus of this study is preventing sewer line blockages, EEC requested information on successful trials or pilot tests on controlling sewer line grease blockages that can be confirmed by an agency or city. Suppliers provided letters from cities and agencies throughout the United States testifying to the success of biological additives and services[26]. EEC confirmed many of these through interviews. In Southern California alone, cities such as Running Springs, Groveland, Beaumont, Big Bear, Placentia, Santa Ana, and San Diego reported success in testing or using biological additives and services to control grease in some of their hot spot lines. Many of these cities believe that the cost of using biological additives on hot spots is competitive with their frequent line cleaning. The City of Los Angeles reported two successful pilot tests of a biological additive and service, but does not believe it is cost effective compared to their sewer line cleaning costs (interview with Carmelo Martinez, City of Los Angeles).

EEC was asked to witness a pilot test conducted by the Costa Mesa Sanitary District in July 2002. EEC photographed the feeder unit in-place (Figure 6-23) and reviewed CCTV evidence of the pilot test. The pilot test was not continued, because it was determined that the primary cause of the blockage in the sewer line was not due to grease. This pilot test demonstrated the importance of CCTV inspection in monitoring a biological additive.

EEC interviewed Mike Giehl of the City of San Diego Metropolitan Wastewater Department (MWWD) concerning a pilot test in Seaport Village involving multiple FSEs and the downstream sewer line. The results of the pilot test revealed that the bio-product and service being used by the FSEs "has been shown to be effective in reducing fat, oil, and grease discharge" in the sewer line downstream of the FSEs.

It is important to note that some cities and agencies reported that they had success with a biological additive or service for a period of 6 months to 2 years and then had poor results later. The reasons or theories for these poor results included a drop off in service or a switching of the product.

6.7.5 Cost Issues

Based on the RFI responses from suppliers, the cost for a FSE Application biological additive (service included) is $80 to $150 per month for an average kitchen. The cost for a Sewer Line Application biological additive (service included) is $150 to $800 per hot spot per month.

The cost/benefit analysis for an effective biological additive is somewhat complicated due to the fact that it is difficult to place a cost or savings on many of the benefits listed under Section 6-11. In addition, since biological products are dosage-based and many are combined with a service or maintenance program, the cost of using a biological additive or service varies in each application.

[26] The study is not providing the names of the companies or products used by these cities or agencies to avoid appearing to endorse any company or product.

1. Feeder location on 19th street.

2. Feeder mounted on ladder under the manhole.

3. Top of feeder removed to refill with additive.

4. Control panel opened to record or adjust feeder pumping rate.

FIGURE 6-23 Costa Mesa Sanitary District Biological Additive Pilot Test (Photos by EEC)

Regardless, many cities and agencies have tried to compare the cost of biological additives and/or services to their sewer line cleaning costs. Some have found the biological additive or service to be competitive to line cleaning; others have not. The study found that in many cases, if the biological additive and/or service is being used in a sewer line hot spot that was formerly cleaned quarterly or more often, the additive and/or service may be competitive or more economical than frequent cleaning. This is particularly true when sewer hot spots are cleaned as often as once per month or week.

One important fact that has been overlooked by many of the agencies contacted is that the cost of a successful biological additive and service must be compared with all of the costs associated with grease blockages. This includes more than just the grease-related sewer line cleaning costs. The cost impacts of responding to and managing grease-related SSOs, including potential fines and penalties, must also be considered. If the use of biological additives and services also

reduces FSE costs (e.g., interceptor installation or maintenance costs), this should also be considered in the cost evaluation.

6.7.6 Potential Secondary Effects

Many FSEs and agencies report successful grease control using biological additives and services. However, in most of these cases, the user is only looking at one effect of the additive, such as keeping grease traps, lift stations, or sewer lines free of grease. The possible secondary effects (positive or negative) are rarely evaluated.

Passing the Problem Downstream - As stated previously, some additives are designed to act more as an emulsifier or surfactant rather than provide a mechanism for digestion of the FOG. Enzyme products and some additives that contain high amounts of enzymes and surfactants were manufactured to move the grease from problem areas such as lift stations with grease mats, and traps and interceptors where the FSE wished to reduce the maintenance expenses. Cities and FSEs can test additives to determine if grease is being passed downstream by using CCTV inspection.

Toxicity - Most species of bacteria used are widely known cultures of Bacillus or Pseudomonas that can be found in soils and wastewater treatment systems. They come from fermentation processes where they are tested for pathogens and salmonella. The products provide MSDS's which address safe handling (e.g., gloves, sleeves, and safety glasses). Most bacteria are certified to be pathogen- and salmonella-free and are found to have low toxicity. Cultures and ingredients widely used in additives are also typically non-toxic. There is a misconception by the public and many agencies that some kind of "super bug" is used. In fact, the bacteria strains are mostly common bacteria found in soil, yogurt, cheese, or wine making.

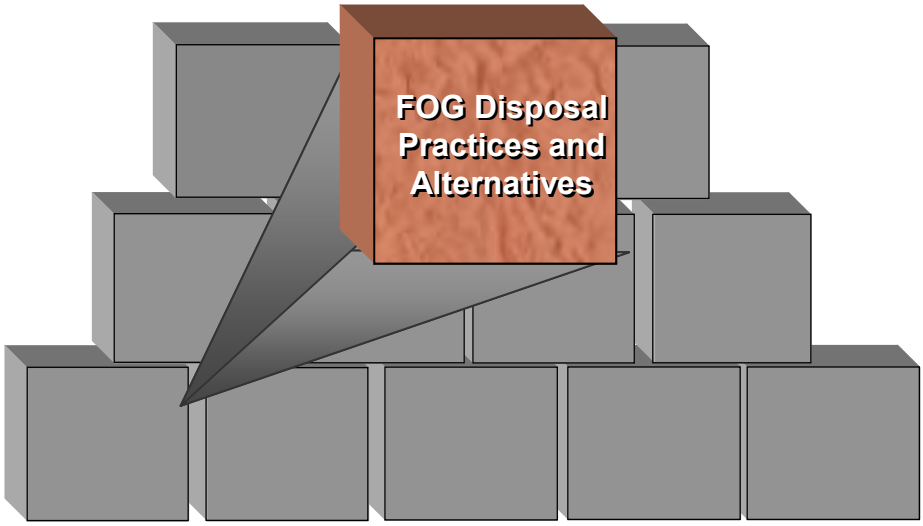
Gases - Biological additives can potentially reduce sewer gases by digesting settled solids in sewer pipes and interceptors and mitigating septic conditions. There is little evidence that the additives themselves contribute to sewer gases unless they are used in lieu of proper maintenance practices when maintenance is needed.

The Need for Testing - Regardless of the claims made by suppliers as to the nature of their products (e.g., species of bacteria or low toxicity), there is very little regulation or third-party testing of biological additives to provide objective proof of their claims. Therefore, controlled pilot tests with CCTV inspection and laboratory testing is required to truly determine the effectiveness and possible secondary effects of these additives.

6.7.7 Conclusions and Recommendations

Some biological additives and services have been used successfully by many FSEs, cities, and agencies to control FOG and reduce sewer line blockages, particularly in hot spot areas. However, there are still many questions concerning these products concerning cost, performance, reliability, and potential secondary effects. Therefore, the study recommends that a variety of biological additives that have proven success elsewhere should be field-tested in Phase II to determine their true cost, performance, and potential role in local FOG control programs. The

proposed scope of Phase II currently includes testing FSE Application and Sewer Line Application products and services. Depending upon the results of Phase II, biological additives may provide additional or alternative options to grease interceptors for FSEs and an alternative option to sewer line hot spot cleaning for cities and agencies.



6.8 FOG DISPOSAL PRACTICES AND ALTERNATIVES

Proper disposal of waste FOG, collected either from grease traps or interceptors or through kitchen practices, is essential to a successful FOG control program. The cost of rendering or recycling grease is increasing. Landfill disposal costs are also increasing. The development of effective FOG programs in Orange County will lead to better utilization of kitchen BMPs, more installations of grease traps and interceptors, and increased maintenance of traps and interceptors. This will result in a significant increase in the volume of waste grease that will be collected and hauled to disposal sites in Orange County. To manage this grease and ensure that FSEs and haulers have incentives to collect and dispose of grease properly, a variety of disposal options for waste FOG must be available through both the private and public sectors.

6.8.1 Disposal Practices

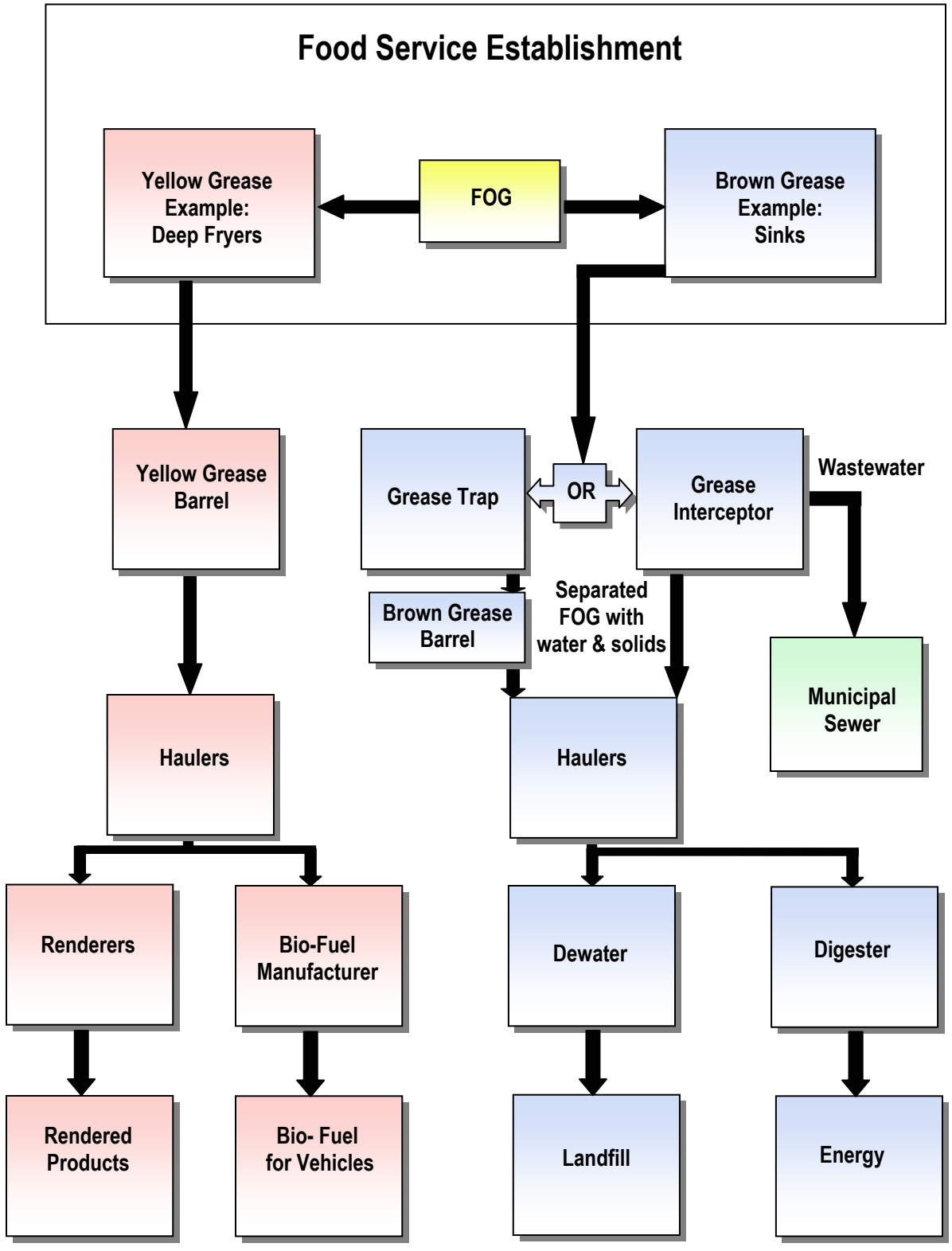
Waste FOG that is ready for disposal is generally classified as either "yellow grease," the inedible and unadulterated FOG that is removed from FSE kitchen operations (e.g., fryer grease) and "brown grease," the material recovered from grease traps and interceptors that has been adulterated by contacting agents, such as detergents and cleaning solutions used in FSEs. The typical waste FOG flow options are presented in Figure 6-24 (modified from Document #41, subsection: "Characterization of the Generation, Handling and Treatment of Spent Fat, Oil, and Grease (FOG) from Georgia's Food Service Industry"), which identifies the four main disposal options: landfilling, rendering, recycling as biofuels, and anaerobic digestion.

6.8.1.1 LANDFILLING

Brown grease and solid FOG collected in trash containers are typically landfilled. However, there are many landfills that prohibit, or are considering prohibiting, the receipt of liquid FOG because liquids are problematic at landfills, and they contribute to odors. Thus, the dewatering of brown grease (water content >50%, typically) is usually required prior to disposal in the landfills. Furthermore, there is essentially no beneficial energy recovery or product recycling

through landfilling of FOG (unless the landfill is large enough to be collecting its methane). Thus landfilling is considered to be the least desirable option for brown grease.

Figure 6-24 Typical Waste FOG Flow Options



6.8.1.2 RENDERING

Renderers are companies that collect animal by-products from livestock producers and FSEs and then process the materials to produce products that are used in the manufacture of chemicals, soap, cosmetics, plastics, lubricants, livestock and poultry feeds, pet foods, and leather goods. Yellow grease, derived from bulk deep-fat frying operations and oil/water separator units in FSEs, is estimated to comprise approximately 6% of the raw materials processed by the rendering industry in 1987 [41]. That percentage is believed to have subsequently increased as the amount of yellow grease recycled in the United States has been increasing and was estimated at 2.75 billion pounds per year in 2000 [41]. In 1990 there were an estimated 50 companies in the United States operating an estimated 150 rendering plants [41]. The study has identified five companies operating rendering facilities in Southern California:

- Imperial Western Products (IWP), Indio [196]
- Southwest Processors, Los Angeles [195]
- Darling Industries, Los Angeles [133]
- Baker Commodities, Los Angeles [131]
- Co-west Rendering, San Bernardino [194]

The costs of rendering are increasing due to many factors, including higher energy costs, because the rendering process requires substantial heating. In the recent past, haulers would pay FSEs for yellow grease, or it was rendered at no cost. Now, FSEs often must pay a small fee to have their yellow grease rendered. The increased cost reduces the potential use of rendering facilities as an economical outlet for yellow grease. The increased cost also discourages the collection of yellow grease by FSEs, which is counterproductive to the promotion of kitchen BMPs.

6.8.1.3 DIGESTION

Digestion is a biological process utilized in wastewater treatment that is usually conducted at municipal wastewater treatment facilities. The digestion process of interest is anaerobic and involves the decomposition of organic material. The decomposition process produces methane gas, which can be utilized in the operation of the wastewater facility. FOG (organic in composition) has been transported to wastewater treatment facilities at various agencies in California for treatment in the facility's anaerobic digesters as a viable and beneficial disposal option. The addition of the FOG may cause issues in the facility's wastewater piping, pumping, and digestion process and, therefore, should be evaluated prior to implementation at any wastewater treatment facility.

Two facilities identified in the study that accept FOG at the treatment facility are as follows:

- OCSD currently receives grease trap and interceptor waste (brown grease) from FSEs within its jurisdiction for disposal at the inlet works of their wastewater treatment plant for a fee of 3.5 cents per gallon and from Riverside or San Bernardino for a fee of 11 cents per gallon. Haulers discharge or dispose of the FOG at a dumping station at the headworks of the wastewater treatment facility. The FOG mixes with the sewerage

wastewater from the collection system and is processed through the normal wastewater process of screening, aerated grit removal, and primary sedimentation prior to digestion in the facility's anaerobic digesters.

- The City of Oxnard (as described in the Grease Interceptor Building Block, Section 6.4) pumps interceptors at FSEs and feeds the contents to its digesters for digestion of the FOG, which produces additional methane gas for the operation of the plant. The City of Oxnard identified a key to success is to prevent the hauler from mixing interceptor and other industrial or septic tank wastes in the same tank load. The City of Oxnard solved the problem by providing its own vacuum truck and staff to pump out the interceptor waste that is fed to the digesters.

6.8.1.4 BIOFUELS

Biofuels are developed from various sources and have a variety of uses. One biofuel, biodiesel, can be created from both yellow and brown grease, provided the grease content of the brown grease is above 30%. The conversion process most commonly used is called base catalyzed transesterification, which utilizes oil with methyl alcohol under alkaline conditions to produce biodiesel. This biodiesel has similar energy output to conventional diesel and can be used to fuel trucks. Reportedly, biodiesel also burns cleaner than conventional diesel. The product is also in competition with biodiesel fuels derived from soy beans, corn, and other agricultural crops. If the price of petroleum stays high, the energy value of FOG should continue to provide impetus for the expansion of this market.

The following Southern California companies have been identified as producers of biofuels:

- Imperial Western Products (IWP), Indio [194]
- Southern States Power, Riverside [195]
- American Bio-Fuels, Adelanto [196]

6.8.2 Disposal Alternatives in Orange County

The initiation of the FOG control program in Orange County will result in a significant increase in the volume of waste FOG, especially brown grease that will be collected and hauled to disposal sites in Orange County. To address this projected increase, OCSD conducted an In-Plant FOG Impact Study to evaluate alternative methods of handling liquid FOG (brown grease) at OCSD treatment facilities [149]. The study was completed in November 2002, and the report identified four alternative flow paths for processing truck-hauled FOG at the treatment facility, as well as the off-site alternatives of rendering, recycling as biofuel, or landfilling.

The result of the study identified the bio-fuel option as the most appealing; however, this option is dependent upon private companies employing technologies that concentrate the yellow grease portion of the FOG for use as feed stock for the bio-fuel refining process. The market economics for successful implementation of this technology will determine whether or not this option will be available. American Bio-Fuels, LLC reportedly was exploring opportunities in Mexico to operate a pilot facility for processing grease trap and interceptor waste for bio-fuel. The results

of this testing may identify the economic feasibility of this process. Two biodiesel companies, American Bio-Fuels, LLC and Southern States Power Company, Inc., expressed interest in forming a partnership with OCSD to produce biodiesel fuels from FOG at the OCSD wastewater facility. The benefit to OCSD is that it would provide an economical disposal option for FOG haulers and provide an improved fuel for operation of OCSD diesel powered vehicles.

Until the bio-fuel options' technical and economic feasibility is validated, the report recommended implementing hauling the waste FOG to the OCSD facility and feeding it directly to a dedicated digester. This was recommended to be initiated after verification of the efficacy of the process through pilot testing. A bench scale study of grease digestion in a dedicated digester was conducted by OCSD approximately 20 years ago and found it to be effective after several weeks of conditioning.

The study recommended the current practice of hauling the liquid waste FOG from the FSEs to the dumping station at the headworks of OCSD's wastewater treatment facility for digestion of the FOG be continued until the dedicated digester option is implemented.

6.8.3 Hauling, Recycling, and Disposal Issues

With increased rendering and landfill disposals costs, FSEs are being charged more for their yellow grease and their brown grease. This provides little financial incentive for FSEs to collect yellow grease through BMPs, and the proper maintenance of their grease traps and interceptors will become more and more costly. With very few regulations governing for waste grease haulers and minimal documentation requirements, this provides an environment for improper hauling and disposal practices. Grease haulers have recently been prosecuted for illegal dumping in Northern California. The concern over improper grease hauling and disposal is shared by most of the cities and FSEs interviewed by EEC regarding this issue. In fact, EEC interviewed waste grease haulers in Southern California, Colorado, and Florida who expressed the same concerns that many of their fellow haulers are dumping waste grease into the outlets of interceptors ("pump and dump") or into sewer or storm drain manholes or open fields at night. They report that some haulers are offering to pump interceptors at half the price of other haulers, yet they are not disposing of the waste grease at approved disposal sites. Because the hauling and disposal of waste grease is not heavily regulated and there is very little "cradle to grave" accountability, FSEs will often hire the hauler with the lowest price, because the FSE assumes that it is not responsible for the proper disposal of the waste grease.

To ensure that FSEs properly collect and dispose of their waste FOG and that haulers and disposal/recycling sites are properly operated, a regulatory program for haulers and disposal/recycling facilities is recommended. This may involve requiring haulers and disposal facilities to be certified and utilization of waste manifests to track waste FOG from cradle to grave.

OCSD currently requires waste grease haulers that dispose of their waste at OCSD to fill out a two-part manifest that is primarily designed to ensure that hazardous wastes are not being discharged. The manifest includes information such as: the generators name and address; waste haulers name and address; disposal facilities name and address; volume of waste

collected/disposed. No copies of the manifest are distributed to the generator, and there is very little cradle to grave accountability of the waste. Furthermore, OCSD's manifesting only tracks the waste grease that is disposed of at its facility. There is no assurance that other waste grease is not being dumped into the sewer or storm drain system or in some open field or ravine.

6.8.3.1 FOUR-PART MANIFEST SYSTEM

At this time, a four-part manifest would appear to provide the basic information necessary to monitor grease hauling activities from the source to the disposal site without being too onerous. The recommended requirements and possible tracking process for a four-part manifest are as follows:

- The haulers will be required to be certified and licensed to collect waste FOG from FSEs. They will be required to utilize only certified waste disposal facilities and will be required to properly manifest the waste in compliance with the waste tracking system for waste FOG.

- The disposal facilities will be required to be certified and licensed to dispose of FOG from FSEs. They will be required to dispose of waste FOG pursuant to an approved manner and to properly manifest the waste in compliance with the waste tracking system for FOG.

- The manifest would identify the generator, type and quantity of the waste; the hauler; the time of pickup; the name of the disposal site; and the date, time, and quantity disposed.

- The waste tracking process would be initiated by the generator. The generator would coordinate with a licensed waste hauler for servicing of their Grease Removal Equipment (GRE). After the hauler removes the waste FOG from the GRE, the hauler would document the generator information, the quantity of FOG removed, and the condition of the GRE. The hauler would then document the hauler information, where the waste will be disposed, and then sign the manifest. The hauler will have the generator sign the manifest if a representative is present, and then the hauler will provide the generator with the generator's copy of the manifest (a copy of the manifest may be dropped in the generator's mail slot). The hauler will transport the waste to the certified disposal site. The disposal site operator will document the volume of the waste and sign the manifest for receipt of the waste. The hauler and disposal facility will each retain a copy of the signed manifest. The hauler will send the fourth copy of the manifest to the responsible agency doing the monitoring, but the FSE and disposal site operators will retain their copies of the manifest and make it available to the site inspector during periodic inspections. The responsible agency will randomly verify that all manifest copies exist and coincide. Failure to have a properly filled out manifest or failure of the data to be consistent between copies of the same manifest will be grounds for enforcement actions, including penalties or loss of permit or license.

6.8.3.2 COMPUTERIZED WASTE FOG TRACKING SYSTEM

In the future, it is recommended that a computerized method for tracking waste be utilized to automate the waste tracking system. One such example is a system utilized in Sydney, Australia.

- The system utilizes bar codes or microchips located adjacent to the generator's GRE that would identify the owner of the GRE, the interceptor location, registration number, volume, and pump frequency. The hauler would scan the barcode or microchip with a portable hand-held data logger to collect the data concerning the generator. The hauler would then service the GRE and proceed to the next generator until the transporting vehicle was full. The hauler then transports the waste to an authorized disposal facility. The disposal facility has equipment that downloads the information to a computer from the haulers portable hand-held data logger and the transporter's identification card (hauler's vehicle license, registration, and capacity). A comparison of the volume identified from the data logger delivered is then compared with the actual volume of waste delivered. This is conducted by measuring the vehicle's full weight (through a weighing scale) or through a magnetic flow meter during off-loading of the waste. This comparison is performed electronically – the weighing scale or the magnetic flow meter is interfaced with a computer. The information from the disposal facility is linked through a modem to a centralized personal computer for the program.

- The system is able to generate reports from the database such as date and quantity of pumpouts for each generator, generators with infrequent pumpouts compared to the required frequency, volumes of waste collected by haulers, and volumes of waste received by disposal facilities.

This type of system would provide a complete cradle to grave accountability of the waste and could also be used to easily track the maintenance frequency of an FSE's grease trap or interceptor.

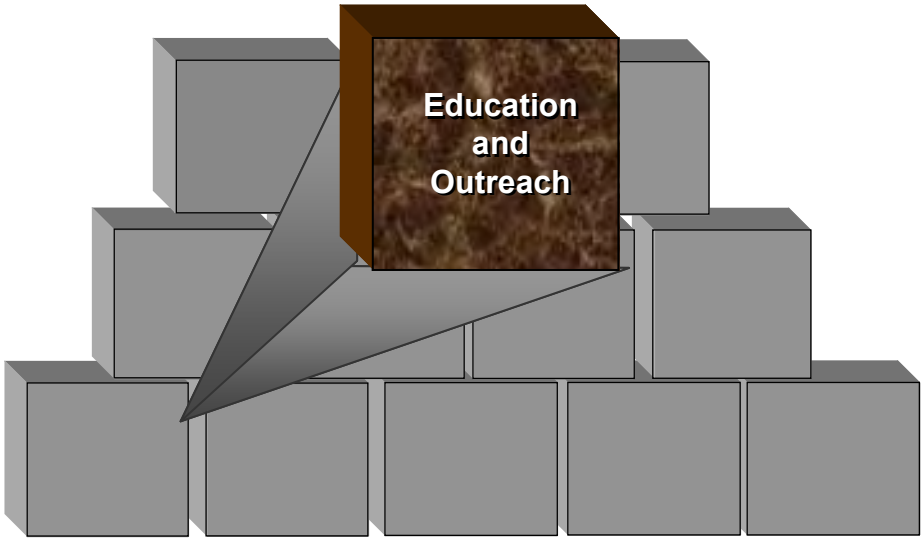
6.8.4 Conclusions and Recommendations

Proper disposal of waste FOG is essential to a successful FOG control program. To manage this waste FOG and to ensure that FSEs and haulers have incentives to collect and dispose of grease properly, the study has the following recommendations:

- The current practice of hauling the liquid waste FOG (brown grease) from the FSEs to the dumping waste hauler station at the headworks of OCSD's wastewater treatment facility for digestion of the FOG should be continued. This process should continue until the efficacy of utilizing a dedicated digester at OCSD is validated through pilot testing or until private companies provide a proven bio-diesel option for the brown grease.

- The Orange County cities, agencies, haulers and disposal sites should conduct a regional discussion to determine how best to regulate haulers and disposal/recycling sites and to determine the most efficient and effective four-part manifest system for the region.

- A pilot study of a computerized waste tracking system should be conducted to determine the practicality and true costs and benefits of such a system.



6.9 EDUCATION AND OUTREACH

The primary purpose or goal of a FOG education and outreach program is to raise the awareness of the issues and to educate for proper implementation and effectiveness of the FOG program. This will be accomplished by focusing the messages to the two prime audiences associated with FOG discharges - FSEs and the public. According to the responses to the RFIs, most grease blockages in Orange County are reportedly caused by grease discharged from FSEs. Some agencies, such as the Sacramento Regional Sanitation District, have provided data which shows that while many blockages are caused by residential discharges, blockages in commercial areas are considerably more costly and serious. Therefore, most outreach programs focus their material primarily on FSEs and the residential sectors.

In the development of this Building Block and to ensure that it provides the maximum potential benefit to FOG control programs, the study conducted interviews with cities and agencies that have developed their own education and outreach programs and representatives from the California Restaurant Association (CRA), grease control technology suppliers, waste grease haulers, and plumbers. A FOG Control Work Group was initiated that included representatives of CRA, the California Grocers Association (CGA), hotel representatives, OCSD, the County of Orange, and OCHCA. The FOG Control Work Group discussed the findings of the study to solicit input from the stakeholders that will be affected by the upcoming FOG control programs.

6.9.1 FSE Education and Outreach

The effectiveness of the education and outreach program to FSEs will have a large effect on the reduction of FOG discharges from FSEs. Thus, it is critical that the training and educational materials provided to the FSE management and its employees be informative concerning the critical requirements and still be simple and easy to understand. At a minimum, the materials should provide the purpose of the FOG control program, the potential impacts of FOG discharges to the environment, and what is required to minimize the discharge of FOG through

the use of kitchen BMPs and proper operation and maintenance of FOG removal technologies (e.g., grease interceptors and grease traps). It is also important to present the information in such a manner that the FSE understands that minimizing FOG discharges to the sewer is no more difficult than existing practices and also has the potential to reduce the cost of maintaining an interceptor or grease trap. By presenting the information in this way, there is more likely to be management and employee support for the program.

The basic approach that a program can utilize is to first identify the goals, BMPs, and FOG control technologies that the program will utilize based on the criteria in the ordinance and/or general permit. After this is defined, brochures or "fact sheets" can be developed and distributed that will educate the FSEs on specific requirements of the program (e.g., simple operating practices for FSEs and proper operation and maintenance requirements for interceptors). The City of Los Angeles and the City of San Diego, California programs are examples of programs with educational brochures and kitchen posters that explain the requirements of their programs. The State of Georgia has developed the "Grease Goblin" program that provides easily downloadable materials for FSEs, including kitchen signage in three languages [69]. Another excellent educational tool is training videos that should be provided for initial and ongoing training requirements for FSE employees. Examples of educational videos are: "Grease Control Training" from the City of Laguna Beach, California [197]; "Restaurant Oil and Grease BMPs" from the City of Greeley, Colorado [198]; and "Best Management Practices and You" from the City of Los Angeles, California (multiple languages) [199].

EEC and OCSD are working with the County of Orange Pollution Prevention Program in its development of FSE education flyers to reduce stormwater pollution and sewer line blockages due to FOG. Due to the language diversity in Orange County, particularly in FSEs, education materials (e.g., flyers, posters, and videos) must be provided in multiple languages. The City of Los Angeles provides its FOG control materials in five languages due to its language diversity.

6.9.2 Residential Educational and Outreach

There are many examples of educational programs from around the country that have been developed for residential communities, including property management and building associations. All of these programs contain advice on kitchen BMPs (such as pouring liquids into a container rather than the sink and scraping food solids into the trash rather than down the drain) and on the potential negative impacts of FOG (grease) to the sewer lines and the environment. The main methods of distributing the information has been through the use of flyers, such as the "The Grease Avenger" in Los Angeles [90] and "Fat Free Sewers" from the Water Environment Federation [41], which can be used for bill stuffers, newspaper ads and articles, and web-site information. Another method of distribution utilized is through a school and home education program, such as the program developed by Pacific Grove, California titled "Grease, Put a Lid On It." This program encourages pouring cooking oil and grease into coffee cans [54] (Figure 6-25). In addition, Pacific Grove developed radio advertisements ("jingles") to promote the FOG control program. The residential education materials in Orange County (e.g., flyers and posters) should be developed utilizing effective existing training material from other cities and should be published in multiple languages.

FIGURE 6-25 Grease Can Campaign – Educational/Outreach residential program to encourage pouring grease into a coffee can rather than down the sink (Courtesy of Monterey Regional Water Pollution Control Agency).

6.9.3 Agency Education and Outreach

Some educational materials are specifically designed for use by FSEs and the general public as discussed above and others are designed for agencies. Educational material for agency personnel are also essential and should include principles underlying the basis for regulation, the use of interceptors, and the components of BMPs that are most likely to remove grease from discharges. An example of educational materials designed for agencies is a website-based resource from the Oregon Association of Clean Water Agencies. This material, which is titled "FOG Best

Management Practices Manual," includes Frequently Asked Questions, kitchen practice BMPs, operations and maintenance of interceptors and traps, disposal options, check lists, and records [106]. Another potential resource is the Water Environment Federation (WEF) "FOG Control: Making it Happen; Tools for Implementing a Fats, Oils, and Grease Program Training Manual," which is under development.

6.9.4 "Partner" Participation

Because the success of the programs depends on many different groups or entities, the outreach program should seek partnerships. Such partners may be divided into two types: regulatory and others. Potential regulatory partners include other cities and agencies (especially those adjacent to the agency's jurisdiction); the local health, building, and community relations departments; and state and possibly federal regulators. In this report, the potential roles of the County of Orange, the Orange County Health Care Agency (OCHCA), and Orange County Sanitation District (OCSD) are discussed in Section 5. Within a sewering agency, although the regulatory aspects of the FOG control program may be run by the pretreatment program, the collection systems operations and maintenance department will have data on blockages, location of hot spots, CCTV records, cleaning practices, and many other factors that may help define the specific needs for FOG control. If an interceptor is required for an FSE, its design and construction must be reviewed and inspected by the building department, which is responsible for inspection of new construction (and renovations), to ensure compliance with the building code requirements. Some cities and agencies have community relations or communication personnel who have established methods for distributing information. Participation by regulators, who are responsible for developing specific regulatory requirements for sewer systems, can improve the understanding of the factors that drive regulation.

Non-regulatory partners include the local FSE associations, business or community organizations (i.e., waste hauling and plumber associations) and local environmentalist groups. The potential role of the FSE associations are discussed in Section 5. Environmental and community activists, once they understand the relationship of grease blockages to overflows from the sewer system, may wish to become partners in the program and in efforts to promote it.

6.9.5 Conclusions and Recommendations

Ultimately, the success of each FOG control program in reducing the FOG discharged to the sewer will depend largely on the success of the education and outreach to FSEs, residential dischargers, and agencies. This will require an effective education and distribution program from the regulating agency and the continued commitment of FSEs and agencies to follow the BMPs and regulations.

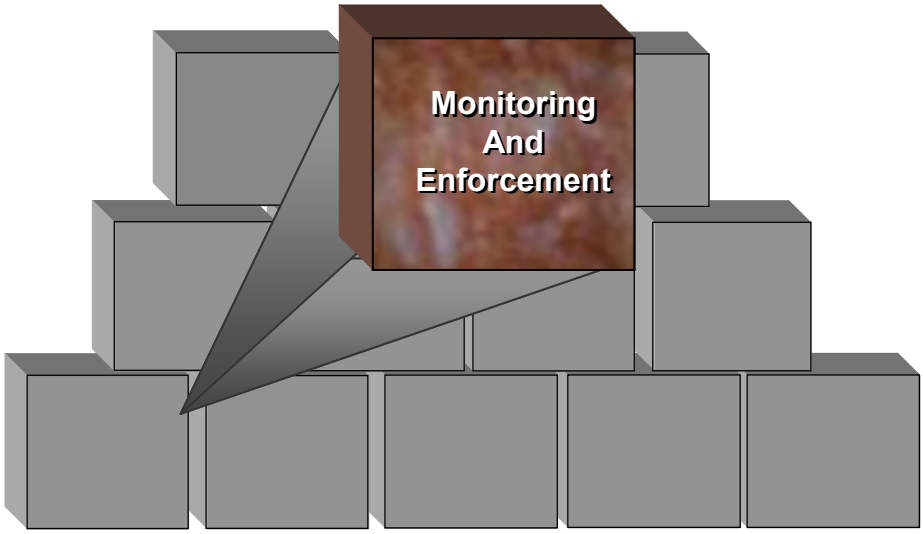
The FOG control education to FSEs should be initiated through the mailing out of fliers or promotion of a website. The initial visit and ongoing educational outreach can be conducted utilizing OCHCA inspectors during their normal FSE health inspections (2 to 3 times per year). Continuing education could then by conducted by a highly trained FOG inspector, provided by each city or agency, while conducting detailed FSE inspections. This inspector could also focus on refresher outreach targeted to those specific establishments that may be contributing to a hot spot.

The educational outreach for the general public should occur through mailing out of fliers or promotion of a website and, potentially, through movie theater, television, or radio advertisements. In addition, this should be enhanced by workshops, training courses, meetings, and other personal contacts with identified partners.

The educational outreach for other agencies should occur through letters and enhanced by workshops, training courses, meetings, and other personal contacts.

In conclusion, the study recommends that:

- Additional regional educational materials should be developed for the upcoming FOG control programs utilizing existing training materials from other cities and agencies. This should include "fact sheets" and training videos in multiple languages. The development of educational and outreach programs should continue to be a joint effort of the stakeholders.
- The County of Orange Pollution Prevention Program FSE education flyers and other educational resources that have been developed should be utilized in the FOG control programs.
- Either the FOG Control Work Group should be expanded to include many of the stakeholder groups affected by the upcoming FOG control programs or additional work groups could be established as needed to provide specific input into and feedback on the education and outreach programs. The existing FOG Control Work Group can serve as a model education and outreach tool for the development and implementation of the FOG control programs.



6.10 MONITORING AND ENFORCEMENT

Monitoring and enforcement procedures are essential for the successful implementation of FOG control programs, and the city or agency should identify and provide for the resources required to implement these services.

6.10.1 FOG Control Monitoring

Most FOG control efforts must be monitored to ensure compliance with the permit conditions, ordinance, and program requirements. The monitoring strategies in a FOG control program must be practical, logically structured, and cost effective. The various points of monitoring identified in Phase I include:

- Kitchen BMPs (e.g., drain screens, collection of liquid grease, employee training)
- Grease trap and interceptor maintenance (e.g., monitoring solids and grease levels)
- FOG disposal (e.g., waste tracking through a four-part manifest)
- Wastewater discharge sampling and analysis
- Sewer lateral cleaning (e.g., coordination between plumbers and the agencies)
- Municipal sewer line cleaning (e.g., post-cleaning CCTV monitoring)

Extensive resources will be invested in this element of a FOG control program. The level of resources required will be determined by the scope of the program and requirements of the ordinance, and by which Building Blocks and alternatives are adopted by the program. Each BMP and technology selected for adoption and use must be evaluated with an understanding of the level of monitoring and inspection required for success. The study suggests that the cities and agencies have several options in dealing with monitoring and inspection: individual agency programs and resources, regional monitoring or inspections, and a cooperative program between local and regional agencies.

The recommended approach for each of the six (6) key areas requiring monitoring is as follows:

6.10.1.1 KITCHEN BMPS

The most fundamental approach to prevent FOG from blocking sewer lines is to keep it from being discharged into kitchen drains through the use of kitchen BMPs (refer to the Kitchen BMP Building Block, Section 6.2). The study found that few local agencies in Orange County conduct monitoring and inspection of the kitchen BMPs. Monitoring of kitchen BMPs typically involves visual inspection of the use of grease containers, strainers, or screens; removal of a food grinder; or inspections of FSE records or logs. Records or logs may include verifying employee training or waste grease disposal or recycling. Many cities (e.g., San Diego, Laguna Beach) require kitchen BMP records to be readily available for inspectors to examine. The inherent limitation of inspecting kitchen BMPs is that the inspector can only verify structural BMPs, such as the removal of a food grinder or the use of screens. The non-structural BMPs (e.g., scraping of plates) cannot be well verified. The records or logs can be grossly inaccurate or exaggerated as well.

It is recommended that the monitoring of kitchen BMPs be performed utilizing a highly trained local FOG inspector supported by screening inspections conducted by the Orange County Health Care Agency (OCHCA) inspector, who currently inspects each FSE approximately 2 to 3 times per year. These inspectors are the one group most familiar with operations and practices of FSEs and are currently providing monitoring for the NPDES stormwater program during their site visits. Although not a practice identified as common in other programs throughout the country, the utilization of the OCHCA to assist in the FOG control program is recommended. The OCHCA inspectors could audit records and verify that structural BMPs are being followed. The local FOG inspector would conduct detailed inspections annually at the FSEs and receive input from the OCHCA inspector when issues are identified.

6.10.1.2 GREASE INTERCEPTOR AND TRAP MONITORING

Grease interceptor and trap monitoring is essential to the proper operational performance as discussed in Sections 4, 5 and 6. The initial inspection that should be conducted is to ensure that any required grease interceptor or trap is properly installed and that all plumbing requirements are met. This initial inspection may be done by a plumbing inspector as part of the plumbing permit process.

Once a grease interceptor or trap is installed, it is important to periodically inspect it to ensure that the FSE is following proper operation and maintenance practices. The interceptor itself should be regularly physically inspected to verify the integrity of the structure, baffles, and piping and to determine the levels of grease and solids in the device (Figure 6-26). All FSEs should be inspected regularly. FSEs that have been out of compliance should be visited on a more regular basis.

The study found that few cities or agencies in North or Central Orange County conduct maintenance inspections of the grease interceptors that they require in their local regulations. In South Orange County, the cities of Laguna Beach, San Clemente, San Juan Capistrano, and the Moulton Niguel Water District do conduct frequent maintenance inspections of the grease interceptors in their service areas. The maintenance inspections in these cities are being

performed by a specialized outside contractor in order to ensure that the interceptors are being maintained properly and, therefore, are not discharging significant FOG into the sewer lines.

It is recommended that a GRE inspector (city employee or outside contractor), be provided by every city and agency to ensure that grease traps and interceptors are properly maintained. Additionally, it is recommended that grease interceptor and trap maintenance records be reviewed as discussed above in kitchen BMP monitoring

FIGURE 6-26 Interceptor Monitoring – Solids and grease accumulation being measured with a clear pipe device called a "Sludge Judge" (Courtesy of County Sanitation Districts of Los Angeles County)

6.10.1.3 FOG DISPOSAL

The study identified that waste FOG hauling and disposal practices must be monitored to prevent illicit activities, such as dumping waste grease into grease interceptor outlets and into sewer and storm drain manholes. The study recommends that the haulers and disposal facilities be certified and licensed and that a four-part manifest system be utilized to track waste FOG (refer to Section 6.8). A responsible agency (potentially the County of Orange or OCHCA) would certify and license the haulers and disposal facilities and would institute a system to verify that manifest copies exist and coincide. Failure to have a properly filled out manifest or failure of the data to be consistent between copies of the same manifest could be grounds for enforcement actions, including penalties or loss of permit or license.

6.10.1.4 WASTEWATER DISCHARGE SAMPLING AND ANALYSIS

Some agencies have established a FOG discharge limit (e.g., 100 - 300 milligrams per liter) for FSEs that is based on sampling a wastewater discharge point at the FSE (e.g., the effluent of the interceptor). Most existing wastewater ordinances already contain FOG limits for permitted dischargers, but the limit is rarely enforced at FSEs. It is typically enforced only when there is a suspected problem at a FSE, such as poor maintenance of the interceptor. While this gives a specific basis for enforcement, the study has concluded that the technical bases for the numeric standards need to be further evaluated. In addition, sampling and monitoring protocols need to be enhanced and improved to increase the reliability of the results. In general without a sampling point or box, the collection of a representative sample is difficult to obtain, especially at facilities without interceptors. There is work ongoing nationally to establish technically-based numeric criteria, as well as reliable sampling and analytical procedures.

6.10.1.5 SEWER LATERAL CLEANING

The study identified private lateral line cleaning as a critical activity that is largely overlooked by most cities and agencies. When an FSE or multi-family building cleans its private lateral line to remove a grease build-up, it typically flushes the FOG into the municipal sewer line as a slug discharge (Note – This is also true of root balls being removed from laterals). Depending upon the amount of FOG (or the size of the root ball) flushed out and the pipe diameter, slope, flow, and FOG build-up in the receiving municipal sewer line, a blockage or SSO often may occur in the municipal sewer line. Furthermore, the frequency of private lateral line cleaning activity provides an indication of the daily FOG loading that an FSE or multi-family building has on its own lateral line and the municipal sewer line. Therefore, the study recommends that a notification and coordination system between the plumbers performing lateral line cleaning and the agencies' sewer line cleaning departments should be developed to monitor the lateral line cleaning. This will provide a warning system for cities and agencies to a potential blockage or SSO occurrence and allows the agencies to coordinate their own line cleaning activities. This will also provide a monitoring tool to identify the daily and slug discharge sources of FOG or the effectiveness of the kitchen BMPs or grease removal equipment (GRE) at FSEs.

6.10.1.6 MUNICIPAL SEWER LINE CLEANING

Municipal sewer line cleaning is the current primary approach to preventing sewer line blockages and SSOs. This will continue to be a key approach in the immediate future, until source control measures can be implemented. Due to its importance, the study recommends that municipal sewer line cleaning practices should be monitored through frequent post-cleaning CCTV inspections by the cities and agencies to verify the effectiveness of the cleaning practices and to develop better practices over time.

6.10.2 Inspection Approach

As noted above, on site, or physical inspections are important to ensure that all parties needed to make the program work are performing. However, significant compliance can also be achieved through the use of audits of operation and maintenance records. These audits may be done on

site or may also be accomplished by requiring FSEs to file periodic reports (quarterly or annually) with the agency. FSEs with past violations should be audited for at least one or two reporting cycles to ensure compliance. Random audits of all FSEs' reports will help to encourage compliance.

Meeting these inspection and audit goals is clearly a major challenge. Research has found that many cities and agencies have assigned only a single staff member to the FOG control program. Without sufficient staff to inspect, it is less likely that the regulated community will understand the requirements, or feel compelled to meet the requirements of the ordinance. Some communities have looked to restaurant health inspectors for assistance in inspections, but there are no examples where this has been formally and successfully implemented. Other communities (e.g., the City of Laguna Beach) have contracted for inspection services.

For FSEs in Orange County, the study recommends a three level monitoring approach utilizing OCHCA inspectors to provide screening inspections during their normal FSE health inspections, specialized grease removal equipment (GRE) inspectors to inspect grease interceptors and traps, and a highly trained FOG inspector, provided by each city or agency, to conduct detailed FSE inspections focusing the majority of his or her time and efforts where they are needed most (e.g., FSE violations and hot spot areas). For cost purposes, some smaller cities or agencies cities may choose to combine the GRE and FOG inspector roles, if appropriate. Some cities or agencies may choose to contract out the services of the GRE inspector and/or the FOG inspector, if qualified contractors are available. Regardless of the approach, the GRE inspector and the FOG inspector roles and focus are different and must be managed as such.

6.10.3 FOG Control Program Enforcement

An appropriate enforcement program, including suitable penalties for noncompliance, is also key to the success of an effective FOG control program. The formal requirements for enforcement must be included in the ordinance. Enforcement generally starts informally with a verbal warning from an inspector. One of the major goals of this verbal warning is to re-educate the FSE on the requirements of the FOG control program. The inspector should then follow-up to be sure that the verbal warning was acted upon. Once enforcement enters the formal process, it must follow the requirements of the ordinance and other relevant regulations. Enforcement actions can include mandatory civil penalties, flexible civil penalties based on the severity and impact of the violation, criminal penalties, injunctive relief, and many other options. Some communities require an FSE to pay damages associated with a collection system blockage, if that blockage can be attributed to that FSE. If individual permits are issued to FSEs, the permit would specify compliance requirements, and enforcement would be based on those specific requirements. If there are record keeping and reporting requirements as part of the program, these requirements could also form the basis for an enforcement action.

For FSE monitoring and inspections to be successful, there must be systematic enforcement that will implement requirements, ensure compliance, and ensure equitable application of the requirements. The enforcement must also be practical to be implementable. Each city or agency should consider appointing a FOG control program manager or administrator to provide this practical enforcement. It is important that each program should develop and institute an

enforcement management system that provides consistency and an equitable approach to enforcement. The study recommends that the FOG control program manager exercise discretion early in the program and use a progressive enforcement strategy, similar to the OCSD industrial pretreatment program[27], for FSEs and haulers to re-educate and eventually ensure long-term compliance.

6.10.4 Conclusions and Recommendations

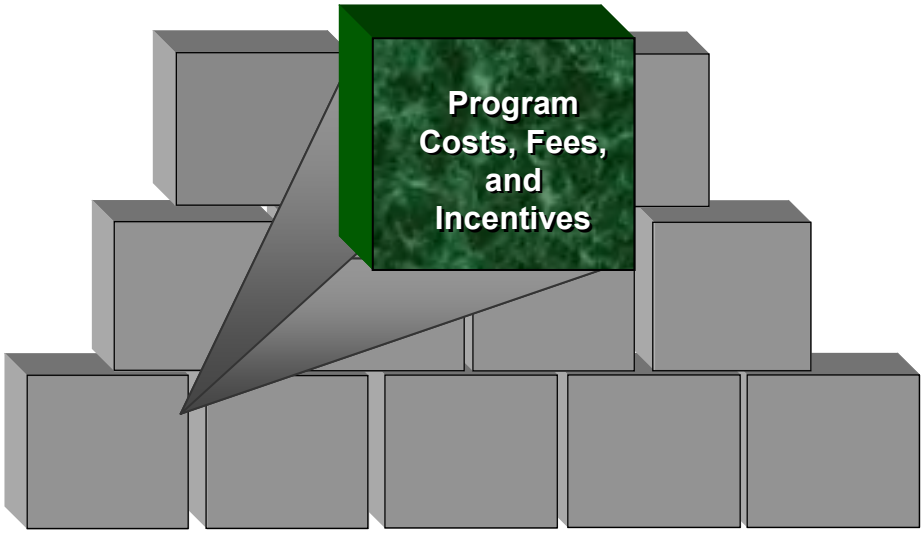
The study recommends that FOG control monitoring be conducted as follows:

- A three-tier inspection approach for FSEs utilizing OCHCA inspectors for screening inspections, a GRE inspector to inspect grease traps and interceptors, and a FOG inspector to conduct annual FSE inspections while primarily focusing on FSEs in hot spot areas.
- Regional certification of haulers and disposal facilities and the regional management of a four-part manifest system for tracking waste FOG.
- A logical notification system on private lateral line cleaning is recommended to be developed for coordination between plumbers (or hydro-jetters) and the agencies to minimize potential FOG blockages and SSOs in the sewer collection system.
- Post-sewer line cleaning CCTV monitoring.

The study also recommends a progressive enforcement strategy for FSEs and haulers designed to re-educate and eventually ensure long-term compliance.

The need for consistency and cooperation between regional and local agencies is critical to the success of the monitoring and enforcement programs. Therefore, the details of this cooperation should be discussed in a regional policy meeting for the benefit of all the stakeholders.

[27] OCSD's industrial pretreatment enforcement program often begins with a verbal or written warning for minor issues. This is typically followed by a Notice of Violation (NOV) which may or may not include a penalty or fee, depending upon the severity of the violation. Further enforcement will then lead to compliance meetings, compliance orders, administrative penalties or fines, and permit suspension.



6.11 PROGRAM COSTS, FEES AND INCENTIVES

The study has found that many agencies have struggled with developing an appropriate fee structure to recover its program costs. In fact, most agencies are currently providing this funding through their current water or wastewater funds without developing a separate fee or surcharge program. Ultimately, these funds are recovered through increased sewer use fees for specific dischargers or the general public.

Some agencies provide incentives to their FSEs by offering a discount on their sewer bill, if the FSEs demonstrate that they follow certain kitchen BMPs or supply evidence of proper interceptor maintenance. The El Toro Water District in south Orange County offers it's FSEs a 50% reduction in their sewer service fees, if upon inspection they can show:

- Manifests for interceptor maintenance
- Food grinder has been removed
- Grease barrels are in use and are locked when not in use
- Double screens are in sinks to keep food, knives, and forks out of the sewers

6.11.1 FOG Control Program Costs and Cost Recovery

To provide policy makers tools for funding their programs, the study has reviewed cost recovery models. Industrial Pretreatment Programs at Publicly Owned Treatment Works (POTWs) provide such a model for cost recovery from industries. The POTW model is based on the fact that industries discharge more flow and higher strength wastewater (i.e., more suspended solids or organics) than a common household. Therefore, industries pay a surcharge for this extra flow and strength. The industry surcharges recover the costs of treating the high strength wastewater and the costs of industry inspections and enforcement. A FOG control program could be similarly designed, where the funding is primarily supplied by those that discharge FOG into the collection system beyond that of a common household.

The FOG control program costs must first be calculated before determining how they will be recovered. The costs directly attributable to FSE FOG control may include the FSE monitoring and inspection costs (including the OCHCA screening inspection costs) and the cost of grease-related sewer line cleaning (i.e., increased sewer line cleaning due to grease) in the FSE areas. The other costs of the FOG control program (e.g., residential education and outreach, grease-related sewer line cleaning in residential areas, and waste grease tracking) are not attributable to FSEs. The FOG control program costs will change over time. They may decrease due to success in source control efforts or a reduction in SSOs. They may also increase due to new regulations. Therefore, the costs should be reevaluated regularly to determine the costs to be recovered.

For a hypothetical medium-sized city, the future FOG control cost calculation has been developed (Table 6-21) to provide an order of magnitude estimate of the potential future costs after a FOG control program is in effect (actual data will be different for each city or agency):

Table 6-21
FOG Control Data for a Hypothetical City or Agency in 2005

General Data	
Population	125,000
Miles of agency owned sewer line (not including laterals)	300
Number of FSEs with properly designed and maintained interceptors	200
Number of FSEs without properly designed and maintained interceptors	200
Annual Agency FOG Control Operating Costs	
Grease-related sewer cleaning and post-cleaning CCTV inspections in FSE areas	*$300,000 to $500,000
Grease-related sewer cleaning and post-cleaning CCTV inspections in other areas	*$60,000 to $140,000
FOG control FSE inspections, enforcement, and administrative costs	$150,000 to $250,000
Other FOG control program tasks (e.g., education and outreach, waste tracking)	$40,000 to $60,000
Grease-related fines and SSO clean-up costs not directly recovered from dischargers	$200,000 to $300,000
Total	$750,000 to $1,250,000

Note: The costs shown are future annual operating cost estimates for a hypothetical city and do not reflect the potential capital costs required. The actual costs will vary significantly from agency to agency depending upon the local conditions, and the method of cost recovery will need to be determined by each city and agency. The other sewer cleaning and CCTV inspection costs that are not FOG-related are not included in this table.

* Some of these costs are already incurred by cities and agencies that are performing increased sewer cleaning & post-cleaning CCTV inspections. Also, some of these costs may already be recovered in those cities.

Based on the data presented above for a hypothetical city in 2004/2005, the total annual FOG control cost to recover is $750,000 to $1,250,000. FOG control costs directly attributable to FSEs are the costs of grease-related sewer cleaning and CCTV inspections in FSE areas ($300,000 - $500,000) and the costs of the FOG Control FSE inspections, enforcement, and administration ($150,000 to $250,000) for a total of $450,000 to $750,000.

For the FSE community, once the actual FOG control costs attributable to FSEs are determined, a city or agency must decide whether to recover all of these costs from the FSEs or to share the recovery of these costs with other dischargers. Once a city or agency determines the amount to

be recovered from the FSE community, this must be recovered equitably from the individual FSEs.

6.11.2 FSE Surcharges or Fees

Based on the Industrial Pretreatment Program model, individual FSE fees would be based on the volume of FOG that FSEs discharge. However, since the sampling and analysis of FSEs may not be practical or may be too resource intensive, an FSE's fee could be based on its volume of fresh water usage.

6.11.2.1 FSE FEES BASED ON WATER USAGE

Until a practical and more reliable mechanism to measure FOG discharge is established, the agencies may consider basing the fees on each FSE's water usage. The water is what carries the FOG into the sewer lines. FSEs with properly designed and maintained interceptors are an exception to this (discount discussed in section 6.4.2.2).

There are three options to basing the FSE fee on water usage:

1) Number of plumbing fixture units in the FSE kitchen
2) Tied to the fresh water billing
3) Estimated water usage from reviewing water bills

Fixture Units in the Kitchen - This method of establishing a fee is based on adding up the number of plumbing fixtures in a FSE kitchen to determine the approximate water usage. Although this is relatively simple and objective, this may not be an accurate method for many FSEs, because some run water through their fixtures throughout much of the day, while others do not.

Tied to Fresh Water Billing - This method of sewer billing is the most common throughout the country. The sewer fee is charged based on the amount of fresh water usage (typically in cubic feet per month) from the water meter(s) at the facility. The main limitation in using this method for a FOG control fee is that the landscaping water usage is not in any way representative of the FOG discharge. Most FSEs do not have separate water meters for their kitchens and their landscaping. Therefore, this method would require FSEs to install separate water meters at a cost of $500-1,500 per meter, and the water utility would have to keep track of these separate meters in its billing to the FSE. Also, some cities and agencies do not have direct billing relationships with the water utilities. If a city or agency does have a direct billing relationship with its respective water utility, a landscaping credit (discussed below) could be deducted from the water usage for determining the FOG control fee.

Estimated Water Usage from Water Bills - This method of establishing a fee is based on determining the water usage through reviewing water bills and allowing a landscaping credit based on the approximate square footage of the landscaping. The landscaping credit is only necessary if the FSE does not have a separate water meter for its landscaping. For example, 3 to 4 months of water bills can be reviewed to determine the average monthly water usage of the

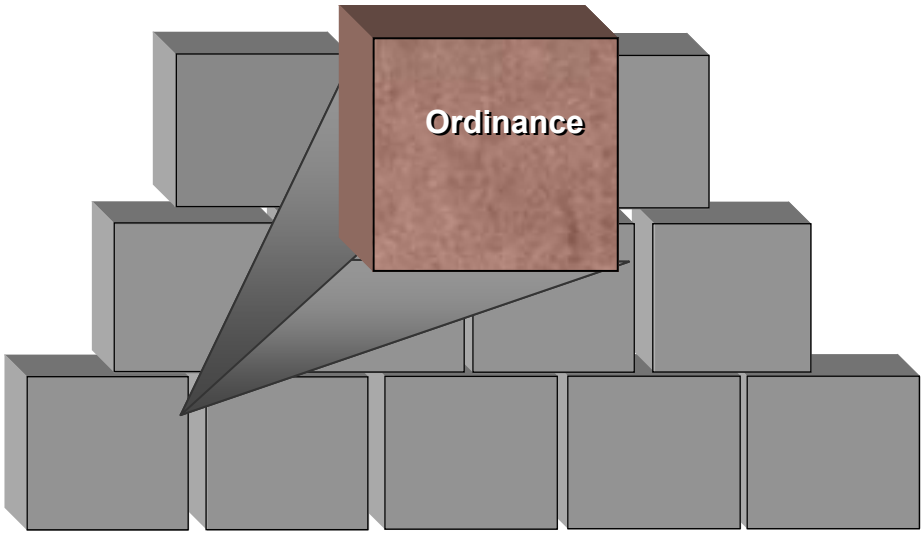
FSE. The approximate square footage of the landscaping can be determined and a rule-of-thumb water volume, based on the landscaping, can be deducted from the water bill totals. This can all be determined through FOG characterization or a Notice of Intent (discussed later in section 6.12). This can be made simple by providing 4 to 5 ranges of water usage (e.g., from 0 to 2000 cubic feet per month for the smallest water users and 50,000 to 100,000 cubic feet per month for the largest water users) and 4 to 5 ranges of landscaping credit. The city or agency would then bill the FSE accordingly.

6.11.2.2 FSE INTERCEPTOR DISCOUNT

The study suggests that a discount be offered for those FSEs that have installed and maintained a properly-designed grease interceptor. The discount is due to the benefit those FSEs provide by paying for the proper maintenance of their interceptors to keep FOG out of the sewer lines. Therefore, similar to the El Toro Water District, a 50% discount for those FSEs that have properly designed and maintained grease interceptors would serve as an incentive for FSEs. Kitchen BMPs, like those that are included in El Toro Water District's discount, should be a mandatory requirement for all FSEs and, therefore, should not be included in the discount. Depending on funding needs, cities and agencies may have to charge an FSE application fee in the form of a Notice of Intent to Discharge fee (see Ordinance Building Block) to provide the preliminary funding of the FSE FOG control program.

6.11.3 Conclusions and Recommendations

A FOG control program will require significant funding. The cities and agencies should determine the costs of their FOG control programs, the dischargers responsible for those costs, and a cost recovery strategy. The study provides some options for these efforts. The fees for individual FSEs could be based on their water usage with a 50% discount for those FSEs with properly designed and maintained grease interceptors. If required, an FSE application fee could provide the preliminary funding for the FSE FOG control program. The basis of the cost recovery, including the FSE fee structure, should be discussed in a regional policy meeting for the benefit of the region.



6.12 ORDINANCE

The legal framework for a FOG control program is one of the most fundamental decisions that must be made by a community wishing to implement a FOG control program. There are two basic strategies to address the legal basis for a FOG control program. The first would be a traditional "command and control" regulatory program, which defines specific legal requirements and provides for enforcement of these requirements and is generally implemented through an ordinance. The second is a voluntary program, which sets goals for FOG control and uses less specific programs, generally operating and maintenance procedures, to reduce the amount of FOG in discharges from an FSE. A model for a strict regulatory program is the Industrial Pretreatment Program, mandated by the Clean Water Act, which relies on frequent inspections, mandatory compliance of discharge standards, and requiring Best Available Technologies for treatment. An evolving model for a less structured regulatory program is the Stormwater program, which relies primarily on Best Management Practices (BMPs) and self-inspections to improve the quality of urban runoff.

For communities that need to achieve significant reductions in SSOs through FOG control, it will be necessary to implement a regulatory program that can provide and ensure compliance with FOG control requirements. An ordinance provides the legal basis and the structure for the regulation of discharges to the wastewater collection and treatment system. It is one of the most important Building Blocks of a program that must make significant reductions in SSOs. It is the foundation and the legal authority for the program, setting forth the standards and requirements for FOG control, as well as the administrative and enforcement procedures. The implementation of the FOG control program is accomplished through the program established in the ordinance, which includes the regulatory standards for the program and the tools to implement the program.

6.12.1 Backbone FOG Control Ordinance

As part of this study, a "Backbone FOG Control Ordinance" (Ordinance) has been developed (Appendix C). This ordinance includes recommended minimum standards and requirements for

the program and the tools to implement the program. The two fundamental tools included in the ordinance are: 1) a General Permit, which establishes the detailed requirements for the program; and 2) the Notice of Intent to Discharge, a form submitted by Food Service Establishments (FSEs) detailing the facility information and the type of food handling operation.

While the Industrial Pretreatment Program provides the model for this Ordinance, as just noted, it uses the approach of a General Permit, rather than individual permits used for most industrial dischargers. This approach lowers the administrative burden of the FOG control program by reducing the resources necessary to issue permits. This approach is used where there is a very large number, hundreds or thousands, of individual businesses operating with relatively well-defined operating practices, perhaps in a few categories, which are similar across the industry. An example where general permits are widely used is the photo-processing and printing industries. However, individual agencies may decide to issue permits to specific FSEs, if that is a practical or necessary approach for that particular area.

A General Permit is a legally binding permit, which sets forth the terms, conditions, and criteria for the FOG control program, which is applicable to a class of dischargers, in this case the FSEs. While the General Permit establishes the parameters of the program, the Notice of Intent to Discharge (NOI) provides the factual information on FSEs on the existing facilities and operating practices that establishes the potential for discharging FOG to the sanitary sewerage system. The NOI is also the legal document through which the FSE commits to being legally bound by the requirements of the FOG control program.

In addition to the General Permit and the NOI, the components of the Backbone FOG Control Ordinance include:

- The legal authority and purpose of the Ordinance
- Restrictions on discharges of FOG
- FOG control requirements, including the requirement for grease interceptors and Best Management Practices
- Definitions of relevant terms and components of the FOG control program
- Recordkeeping and reporting requirements for FSEs
- Authority to enter and inspect FSEs for compliance with the FOG control program
- Authority to enforce the Ordinance and the FOG control program requirements.

While much of the Ordinance can be adopted by a City as drafted, the Ordinance may be modified to meet the City needs. In particular, requirements which this model places in the General Permit may be moved to the ordinance, if the City Council or Board Members want to have greater control over the specific requirements under which the FOG control program operates. However, the ordinance must establish all necessary legal authority to implement the FOG control program. If the City wishes to reduce the level of detail in the ordinance, the City should take care to include sufficient detail to support implementation and enforcement of the program.

Following is additional discussion on both the requirements and tools found in the Backbone Ordinance.

6.12.1.1 FOG DISCHARGE RESTRICTION

One of the most important components of the Ordinance is the restriction on FOG discharges. The Ordinance restricts discharge of FOG that will cause or contribute to blockages of the sanitary sewerage system or the FSE's sewer lateral. This narrative requirement was chosen, because it is the blockage that has the potential to cause an SSO, and the FOG control program is generally implemented specifically to reduce SSOs. Many ordinances elsewhere include numeric limitations on the concentration of FOG in a discharge. FOG in commercial discharges is typically limited to 100-300 milligrams per liter (mg/L). Without some type of FOG control, it is likely that sampling of a FSE discharge would establish that the concentration of FOG exceeds this limit. Cities that have relied on this assumption in establishing FOG control programs, which are based on .grease traps and interceptors, include Cary, North Carolina [81] and Santa Fe, New Mexico [153]. While this gives a specific basis for enforcement, the technical bases for the numeric standards need to be further assessed and augmented. Moreover, the study found that sampling and monitoring protocols require further evaluation and changes to improve reliability. There is work ongoing to improve technically-based numeric criteria, as well as the reliability of sampling and analytical procedures. Limits should be considered and can be incorporated into an Ordinance, should the narrative standard prove difficult to enforce.

6.12.1.2 REQUIREMENT FOR A GREASE INTERCEPTOR

The Ordinance and the General Permit considered by this study are based on a requirement for installation of a grease interceptor by FSEs, whether new or existing. This underlying assumption is based on the fact that grease interceptors continue to represent the best conventional technology for FOG control. Unfortunately, as discussed in the Grease Interceptor Building Block, there is little agreement on the detailed aspects of the proper design of grease interceptors. For example, the Uniform Plumbing Code includes a formula and calculation for sizing grease interceptors. This formula is widely used, but it is also widely criticized as not representative of actual discharges. At the present time, the only substitute for the UPC formula with, arguably, some regulatory validity is the formula found in the EPA guidance on FOG control. However, there are a number of ongoing projects (e.g., Cary, North Carolina and Honolulu, Hawaii) to better define criteria to determine potential for FOG discharge from specific establishments. These efforts may lead to a formula that is based on sound technical principles. The recommendation is to begin with the UPC formula. The FOG control program Manager can adopt one of the new standards when, and if, one is found to have a strong technical basis.

There are FSEs that have de minimis discharges and little potential for FOG in their discharges to cause blockages. The FOG control program administrator should consider whether the requirement to install a grease interceptor should be waived. The Ordinance and General Permit outline discuss that the FOG control program manager will establish a point value from the UPC calculation, or other calculation, to define when this waiver would be issued. The Ordinance does require all FSEs, including those with waivers, to follow kitchen BMPs.

6.12.1.3 GREASE INTERCEPTORS FOR EXISTING FSES

Perhaps the most complicated aspect of the present program to improve FOG control is how to treat existing FSEs that do not have grease interceptors. Despite long established requirements in the Uniform Plumbing Code, many existing FSEs were built and permitted to operate without grease interceptors. Attempts in many cities (e.g., Los Angeles) to require facilities to install interceptors often have led to concerns that the cost and feasibility make this a burdensome requirement for the industry. This is seen as unfair, since initial failure to install a grease interceptor had to be at least tacitly approved during an inspection for compliance with the plumbing code.

Grease interceptors represent the best conventional technology, which suggests that all FSEs, unless deemed to have a de minimis discharge, ultimately should be required to install this technology. While it is possible that a city can improve FOG control and reduce SSOs with an aggressive program of BMPs by the FSE community, BMPs alone are unlikely to be sufficient. Nevertheless, because it will be difficult for many existing FSEs to install grease interceptors and because alternatives to grease interceptors have not been adequately evaluated, the Ordinance allows the FOG control program manager to delay the implementation of the requirement by developing requirements for Alternative FOG Pretreatment Programs.

6.12.1.3.1 Conditional Stay of Implementation of the Grease Interceptor Requirement

The Backbone Ordinance includes an opportunity for the FOG control program manager to "conditionally stay" the implementation of the grease interceptor requirement for existing FSEs. A stay is a legal term meaning the requirement may be delayed in being enforced for existing FSEs. The conditions under which an existing FSE would be excused from implementing the grease interceptor requirement should be included in the General Permit, which would include implementation of BMPs. In particular, any existing FSE should be allowed to operate without an interceptor during this period only so long as the basic discharge requirement, "not causing or contributing to a blockage," is achieved. In addition, it may be appropriate to establish criteria for requiring an FSE to install an interceptor based on violations of the kitchen BMP requirements or other components of the FOG control program. This will provide cities with the opportunity to address specific problems without causing wholesale disruption in the FSE community until alternative pretreatment programs are developed. It is recommended that the stay extend to a period of up to two (2) years.

6.12.1.3.2 Alternative FOG Pretreatment Programs

This study has examined alternative FOG pretreatment technologies / processes (e.g., automatic grease traps, biologic additives) to remove FOG or to reduce its effect in the sanitary sewerage system. To date, none of the these technologies / processes have been demonstrated to perform as well as a properly maintained grease interceptor (best conventional technology) for FOG control, nor is their sufficient data and/or appropriate monitoring requirements identified for their utilization as an alternative for a grease interceptor. Nevertheless, the Ordinance includes a section which contemplates that alternatives might ultimately be available. Should these alternatives be identified and approved, the Ordinance is structured to allow the FOG control program manager to provide a variance from the requirement to install a grease interceptor for

existing FSEs. This structure is proposed, because it maintains a proven best conventional technology - Grease Interceptor - as the standard for FOG control, while also providing flexibility to allow use of alternatives, so long as these alternatives are effective.

Further study of the alternatives may find that some alternatives do provide a sufficient level of control to prevent blockages. Some alternatives may perform well for certain types of FSEs or under certain conditions. For example, data presently available suggests that automatic grease traps may provide good control for specific fixtures that discharge FOG, and may be a good choice for some FSEs. However, it should be noted that an automatic grease trap is not equivalent to a grease interceptor, because this type of alternative would not control the discharge of FOG from floor drains or other fixtures that could not be connected to the automatic grease trap. The stay is specifically intended to allow time to pursue and examine a wide variety of alternative technologies and processes by the FSEs and cities. The Alternative FOG Pretreatment Program section of the Ordinance is intended to allow for approval of these programs, based on sound technical data. Specific conditions and criteria for this program may be developed as part of the General Permit.

6.12.1.4 GENERAL PERMIT

The regulatory structure used in the Ordinance is a General Permit supported by a Notice of Intent to Discharge, submitted by each FSE. An outline for a General Permit is included with this report (Appendix D). The General Permit is used to allow more flexibility in the FOG control program, by providing authority for a FOG Control Program Manager, designated by the City, to adopt the General Permit and generally implement the program. This allows management of the details of the program without requiring a City Council or Board vote for each change.

Detailed items which are anticipated to be part of the General Permit include such things as:

- Specific requirements for grease interceptors
- Calculation of de minimis discharges which will lead to a waiver of the requirement for an FSE to install a grease interceptor
- Details of a BMP program that will be required of all FSEs
- Requirements for operations and maintenance of grease control facilities and grease control operations (e.g., cleaning of sewer laterals)
- Conditions under which the requirement for installation of a grease interceptor may be delayed for existing FSEs
- Conditions under which an Alternative FOG Pretreatment Program, rather than a grease interceptor, may be used by an FSE
- The form and content of the Notice of Intent to Discharge
- Specific records which must be kept by an FSE to document its FOG control program
- The form and content of an annual certification by the FSE that it is in compliance with the FOG control program requirements
- Reporting requirements for spills and unauthorized discharges and
- Fee structure and specific fee

The level of detail included in the Ordinance may be changed prior to adoption by the City. Any of the items included in the General Permit may be made part of the Ordinance. For example, a City wishing to keep more strict controls of the program fees can include the specific fees, as well as the structure, in the Ordinance, rather that leaving it in the General Permit. In general, however, it is not good practice to remove components from the Ordinance, since it provides the legal basis for each element of the FOG control program.

6.12.1.5 NOTICE OF INTENT TO DISCHARGE

The Notice of Intent to Discharge, or NOI, is a fundamental component of the proposed FOG control program. Each FSE would be required to define its facilities configuration and its food handling operation in the NOI. The FSE also will be required to certify its commitment to implementing and continuing to comply with the requirements of the FOG control program. This information becomes the basis for regulation of the FSE, and the basis for enforcement against the FSE should a violation of any aspect of the program occur. An example of the information which should be included in the NOI is provided in Appendix E.

6.12.2 Next Steps

Once the Ordinance and General Permit have been developed, the next steps include (1) outreach to the regulated community to educate them on how to comply with the requirements of the Ordinance and General Permit (2) and the development of the staff resources necessary to manage the program.

Education and outreach is discussed further in the Education and Outreach Building Block, Section 6-9. No less important is the identification of the resources, both staffing and funding, for the program. The Ordinance specifies a fee structure, which includes both a one-time fee associated with submission of the NOI and an ongoing charge based on the water usage of the FSE and whether it has a grease interceptor. FSEs that have been determined to be de minimis, for their ongoing fee, will be assessed a minimal fixed annual fee. This fee structure would provide early funding for the program through the one-time fee.

The Backbone Ordinance and General Permit Outline presented in this study are a first effort to provide structure for implementing a FOG control program. The issues and conditions for FOG control are similar in many cities and agencies and it is recommended that the cities and agencies in Orange County develop a regional model for the program utilizing the Backbone Ordinance, where the next step would be to develop a General Permit with input from stakeholders.

SECTION 7
CONCLUSIONS AND RECOMMENDATIONS

The goal of Phase I of the Orange County FOG Control Study was to provide Building Blocks for Orange County cities and agencies to use to develop coordinated and effective FOG control programs. FOG control programs should be based on sound information on the "hot spots" in the local sanitary sewers and an inventory of FSEs in the area. This vital information supports a much more effective and efficient FOG control program by allowing the community to target its resources to the source(s) of the problems. This information also supports building the partnerships, which contribute to the strength and success of the program. Potential partners include regulators and environmental groups, and, more importantly, restaurant associations, hotel associations, and other professional and industry groups. Assistance from industry partners will ensure that programs are designed with industry constraints and practices in mind and will facilitate the education and outreach necessary to ensure a successful program.

Phase I of the study has developed Building Blocks for a sound program, including programmatic components, best management practices, technology review, and proper disposal of waste FOG. The key programmatic component is legal authority for the program, which will be created through a local ordinance. A Backbone Ordinance has been drafted which includes the standards and requirements for the program, as well as the tools for implementation. Other components provided by the study include basic strategies for monitoring and enforcement and for development of fees to fund the program.

On the technology side, the study assesses the status of various FOG control devices and additives. The grease interceptor, and to a lesser degree the grease trap, is presently the leading technology that has been found to be effective if properly maintained. While the effectiveness of grease interceptors for FOG control has been known for some time, there has not been aggressive or consistent enforcement of the Uniform Plumbing Code requirements to install interceptors. Therefore, many existing FSEs are faced with a need for better FOG control but find that the installation of a grease interceptor is either costly or difficult due to physical constraints, or both. The Backbone Ordinance and the recommended program include a conditional stay of requiring existing FSEs to install an interceptor, as long as they provide some alternative, effective FOG control. There are promising alternatives to grease interceptors which may offer reasonable control for some FSEs, particularly when combined with kitchen BMPs. Kitchen BMPs are an important component of any program. If done properly, they are effective in reducing grease discharged to the sewer. However, findings of this study indicate that it is unlikely that kitchen BMPs alone will provide effective FOG control. Thus, the investigation of alternatives to grease interceptors is a particularly important follow-up, and the stay will allow time for this investigation.

An often neglected area of FOG control is proper disposal of waste FOG. The cost of recycling or disposing of grease is increasing and, thus, the likelihood of improper disposal increases. Work is needed both to develop effective disposal alternatives, including new recycling

opportunities, and to develop a County-wide regulatory program to ensure that haulers properly handle and dispose of this waste.

Finally, a key finding of the study was the connection between lateral line cleaning and downstream blockages, due to pushing grease, roots, and other debris from private lateral lines into the public sewers. The study suggests a notification and coordination system that ensures that those responsible for the public sewers are informed of private cleaning activities, since these can have major environmental and public health implications.

NEXT STEPS

These conclusions highlight the future steps for developing an effective FOG control program. Utilizing the information presented in this report, the next steps for individual agencies to undertake include the following[28]:

- Conduct a FOG Characterization Study
- Adopt a FOG Control Ordinance
- Assign responsibility for the FOG control program by appointing a Program Manager
- Develop a FSE inspection program
- Establish fees to fund the FOG control program
- Establish incentives for implementation of FOG controls
- Develop BMP standards for sewer line cleaning
- Develop standard practical kitchen BMPs for FSEs
- Develop final interceptor design and sizing requirements for FSEs

Steps which are best continued through regional activities include the following:

- Pilot test FOG control devices and additives (Phase II)
- Research and develop grease disposal alternatives
- Convene regional meetings with stakeholders and partners, especially FSE partners, to develop education and outreach programs for all cities and agencies and to address regional issues identified in the report
- Investigate development of a County-wide regulatory program for grease haulers and a program to provide communication between plumbers and private sewer cleaning and city maintenance staff.

All of these activities will require funding. Outside funding sources, such as grants, may be available for some of the more innovative aspects of the program. While agencies can begin to fund their programs through fees, each will also have to ensure that necessary funding is available to meet the requirements of the WDR.

Note - Due to the nature of this report, EEC relied heavily on the data supplied by outside sources. The approach for the research conducted to develop this report is described in

[28]Detailed recommendations can be found in each of the Building Block sections and in the Executive Summary.

Section 3. Although EEC attempted to confirm the data that was collected, EEC cannot vouch for the accuracy of the data unless it was specifically listed as confirmed in the report. The findings and recommendations presented in this report are based on the information collected from the cities, agencies, Internet documents, suppliers, and personal interviews.

APPENDICIES

REFERENCES CITED

(Documents Sorted by Document Number)

Document Number	Author	Title
1	San Jose/Santa Clara Environmental Services Department	Restaurant Wastewater Discharge Questionnaire
2	County Sanitation Districts of Los Angeles County	Managing Food Materials
3	County Sanitation Districts of Los Angeles County	Grease & Oil Control Ordinance
4	County Sanitation Districts of Los Angeles County	Considerations in Establishing a Municipal Oil and Grease Program
5	County Sanitation Districts of Los Angeles County	Restaurant Oil and Grease Rendering
6	County Sanitation Districts of Los Angeles County	Best Management Practice for Fats, Oil, and Grease
7	Orange County Grand Jury	Sewage Spills, Beach Closures, Trouble in Paradise?
8	County Sanitation Districts of Los Angeles County	Grease Control: Inspection & Sewer Cleaning Guidelines
9	Orange County Sanitation District - O&M Department Collection - Facilities O&M Division	OCSD City and Agency Collection Facilities O&M Survey FY 1998 to 1999 Data
10	Orange County Sanitation District	Response to Grand Jury Report April 25, 2001
12	Chemical Emergency Planning and Response Commission	Emergency Release Follow-up Notice Reporting Form Instructions
13	GBA Master Series, Inc.	Wastewater Systems Management
14	Blue Ribbon Industrial Components Corporation	Brochure and Specifications for the Internet.Messenger Monitoring Device.
15	FLYGT	Submersible Solids Handling Pumps and MultiTrode Level Monitoring and Control Systems
16	Grande, Novac & Associates	Pollutant Separator for Combined and Separate Sewer Systems
17	Blackhawk Pipeline Assessment Services	SSET Sewer Scanner & Evaluation Technology
18	Duke	Fighting Sewer Grease? Duke It Out with Jet Power II
19	County Sanitation Districts of Los Angeles County	Training Program for Control of Grease in Sewer Collection Systems
20	City of Los Angeles - Department of Public Works - Bureau of Sanitation - Industrial Waste Management Division	Grease Interceptor and Grease Trap Waste Pumping and Transportation Companies and Rendering Companies
21	City of Los Angeles - Department of Public Works - Bureau of Sanitation - Industrial Waste Management Division	Grease Trap and Interceptor Manufacturers
22	California Association of Sanitation Agencies	CASA Membership Directory 2001/2002
23	MRC Technologies (Rep for Worldstone Inc.)	Grease Watch
24	Environmental Biotech	Biological Services
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27	Compliance Consulting, Inc.	FOG Program
28	N. Tanaka, T. Hvitved-Jacobsen, T. Ochi, N. Sato	Aerobic-Anaerobic Microbial Wastewater Transformations and Re-aeration in an Air-Injected Pressure Sewer
29	N. Padival - County Sanitation Districts of Los Angeles County	The Use of Iron Salts to Control Dissolved Sulfide in Districts' Trunk Sewers
30	California Sanitation Risk Management Authority	DRAFT Sewer Overflow Prevention and Response Guidelines
31	Tetelestai Environmental	BioMagic 500
32	Charles Livingston	Bioremediation The Natural Solution
33	WEF Collection Systems 2002 San Francisco Conference	Draft Guide for Conducting Evaluations of Municipal Wastewater Collection Systems, Operation and Maintenance Management Programs
34	City of San Diego	FEWD Program - City of San Diego
35	California Regional Water Quality Control Board	General Waste Discharge Requirements for Sewage Collection Agencies in Orange County - Tentative Order 01-99
36	California Regional Water Quality Control Board	General Waste Discharge Requirements for Sewage Collection Agencies in Orange County - Tentative Order No. R8-2002-0014
37	Ghayasuddin Ahmed Khan	Continuous Caustic Addition for Sewer Corrosion Control
38	J. Badia, C. Chen, W. Kimball, E. Esfandi	Caustic Spray for Sewer Crown Corrosion Control
39	BioStim	BioStim
40	Thermaco	Thermaco Big Dipper
41	Water Environment Federation	FOG Control: Making It Happen
42	Neozyme	Odor and Grease Control in Collection Systems
43	City of Huntington Beach	City of Huntington Beach RFI
44	City of Newport Beach Utilities	City of Newport Beach RFI
45	City of Santa Ana	City of Santa Ana RFI
46	City of Seal Beach	City of Seal Beach RFI
47	City of La Palma	City of La Palma RFI
48	City of Anaheim	City of Anaheim RFI
49	City of Tustin	City of Tustin RFI
50	Costa Mesa Sanitary District	Costa Mesa Sanitary District RFI

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51	City of Monterey Park	Sanitary Sewer Worksheet
52	Alameda Countywide Clean Water Program	Restaurant Best Management Practices Fact Sheet
53	Rossmoor/Los Alamitos Area Sewer District	Rossmoor/Los Alamitos RFI
54	Monterey Regional Water Pollution Control Agency	A Recipe for Fat-Free Sewers - Partnership in Residential Grease Reduction
55	City and County of Honolulu	Interim Policy for Grease Interceptor Program Compliance
56	City and County of Honolulu	Honolulu BMPs for Food Processing Industry
57	City and County of Honolulu	Environmental Information Bulletin for Restaurant and Food Services Industry
58	City and County of Honolulu	Policy for Interceptor Self Cleaners
59	NWRA Toxic Reduction and Control	MWRA Notice of Intent to Discharge for Food Processors
60	NWRA Toxic Reduction and Control	Group Permit for Food Processors
61	City of Bellevue Utility Department	City of Bellevue Washington, Preventing Backups in Your Business
62	County of Maui	Maui Restaurant Waste Minimization / Pollution Prevention Handbook
63	Maryland Biochemical Company	Bioaugmentation in WWTPs
64	Leon Holt	Town of Cary, North Carolina, Fats, Oils, and Grease Control Ordinance
65	Lexington-Fayette Urban County Government - Division of Sanitary Sewers	Lexington-Fayette Urban County Government, Division of Sanitary Sewers, Fats, Oil, and Grease
66	Industrial Separator Systems	VGS Grease Separator
67	Victoria BC Regional Source Control	Victoria BC Environmental Regulations and Best Practices for Food Services Operations
68	John M. Salonich	Options and Considerations for Handling and Disposing of FOG
69	Savannah Georgia Water and Sewer Planning Department	Savannah Georgia FOG Ordinance
70	Shikoku Corporation	Shikoku Corporation, Hipolka Series of Bacterial Enzymes
72	One Biotechnology Company	One Biotechnology Co.
73	Enviro-Tech Services	Enviro-Tech Service, Inc
79	Monterey Regional Water Pollution Control Agency	A Recipe for Fat-Free Sewers
80	North Carolina Department of Environmental and Natural Resources	Fact Sheet for BMPs for FOG, How Grease Causes a Blockage, How a Grease Interceptor Works, How a Sewer Blockage Affects the Sewer System

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82	North Carolina Task Force	Considerations for the Management of Discharge of Fats, Oil, and Grease (FOG) to Sanitary Sewer Systems
83	Community Compliance, Inc.	Understanding Kitchen Flows and Using Automatic Grease Removal Systems
84	City of La Habra	City of La Habra RFI
85	City of Orange	City of Orange RFI
86	City of Fullerton	City of Fullerton RFI
87	City of Cypress	City of Cypress RFI
88	City of Irvine	City of Irvine RFI
89	City of Los Angeles	Garbage Grinders
90	City of Los Angeles	Fats, Oil and Grease (FOG) Control Program
91	Loudmilla Vertanessian	Fats, Oil and Grease (FOG) Control Program - The City of Los Angeles' Experience
92	City of Los Angeles	Food Service Establishment Industrial Classification
93	City of Los Angeles	Policy Authorizing the Use of Garbage Grinders in Food Service Establishments
94	City of Los Angeles	FOG Program Implementation Report
95	City of Los Angeles	Excerpts from Section 64 of Los Angeles Municipal Code hereby Named the Los Angeles Industrial Waste Control Ordinance
96	City of Los Angeles	Rules and Regulations, Governing Disposal of Industrial Wastewater into the Publicly Owned Treatment Works of the City of Los Angeles
97	WEF Collection Systems 2002 San Francisco Conference	FOG Control Programs
98	WEF Collection Systems 2002 San Francisco Conference	Fees
99	City of Lexington, Kentucky	Grease Related Products and Services for Lexington, Kentucky
100	US EPA Office of Water	CMOM Program Assessment Checklist
101	Maryland Biochemical	Maryland Biochemical FOG and H2S Bacteria Client References
102	Sunset Beach Sanitary District	Sunset Beach Sanitary District RFI
103	City of Garden Grove	Garden Grove RFI
104	City of Aliso Viejo	Aliso Viejo RFI

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105	Oregon Department of Environmental Quality	Preventing Water Pollution, Proper Handling of FOG
106	Oregon Department of Environmental Quality	FOG BMP Manual
107	Orange County Sanitation District	OCSD City and Agency Collection Facilities O&M Survey FY 00-01 Data
109	NRP	NRP - The Bio-Stimulant for the World's Environmental Needs.
110	ABC Environmental	Brochure and Product Literature
111	El Toro Water District	El Toro Water District FOG Program
112	Strata International	Brochure and Product Literature
113	City of Oxnard	Grease Interceptor Pumping Project
114	BioHumaNetics	Brochure and Product Literature.
115	Great Lakes Bio Systems	GLB Story
116	Custom Biologicals	Brochure and product literature, case studies, and client referral list.
117	Bacta-Pur	Brochure and Product Literature.
118	Solmar Corporation	Solmar Formulations
119	Novozymes Biologicals (Manufactures product for Echo lab)	Novozymes
120	Bio Clean Environmental Services	Bio Clean Environmental Services
121	Micro-Bac	Brochure and product literature.
122	Alken-Murray (Rep is AquaBio Environmental Tech)	Brochure and product literature.
123	Western Bio-Tec	Western Bio-Tec Environmental Cleaning Natures Way
124	Ecological Laboratories	Pro-Pump Liquid-Live Bacteria
125	AgriBioProducts	BioClear Product Specification
126	Advanced BioCatalytics Corporation	Biotechnology for a Better Environment
127	Monterey Regional Water Pollution Control Agency	Turning Wastewater Into Safe Water
128	National Biodiesel Board	Biodiesel Production
129	Elisa Lynch	Realizing California's Biomass Fuel Potential
130	Mahoney Environmental	Mahoney Environmental
131	Baker Commodities	Baker Commodities
132	Griffin Industries	Griffin Industries

REFERENCES CITED

(Documents Sorted by Document Number)

Document Number	Author	Title
133	Darling International	Darling International
134	Jensen Precast	Jensen Precast Brochure and Product Literature.
135	Smith Manufacturing Company	Brochure and Product Literature from Smith Manufacturing Company
136	Zurn	Grease Traps/Interceptors
137	Watts	Watts Drainage Grease Interceptor
138	Tyler Pipe/Wade Division	Brochure listing grease traps/ interceptors sold by this manufacture.
139	IGRD	International Grease Recovery Device
140	Proceptor	Proceptor Product Literature on grease traps
141	MIFAB	MI-G Grease Interceptor
142	Pyramid Precast Company	Pyramid Precast Company Product Literature on grease interceptor
143	Ashland Trap Distribution Company	Ashland Poly Traps
144	Applied Process Equipment	Highland Tank Grease Removal Systems
145	Pro-Cast Products	Precast Concrete Products
146	Tennessee Department of Environment and Conservation	Tennessee Oil and Grease Control Guidance Document
147	Boston Water and Sewer Commission	Boston Water and Sewer FOG Program
148	Sacramento Regional County Sanitation District	Executive Summary of Sacramento Regional Proposal to Board for Grease Control Program
149	Brown and Caldwell	Brown and Caldwell Approach to FOG Control Program
150	New York Department of Environmental Protection	Grease Disposal Tips
151	City of Buena Park	Buena Park RFI
152	City of San Clemente	San Clemente RFI
153	City of Santa Fe, New Mexico	Santa Fe Industrial Pretreatment Program
154	McCutchen Enterprises	McCutchen Enterprises
155	Enviro-Zyme	Enviro-Zyme Biological Products
156	Brookside Agra	Bio-Blend Concentrate
157	City of Garden Grove	Fat-Free Sewers
159	Albuquerque Environmental Health Department (New Mexico)	Grease Management

REFERENCES CITED

(Documents Sorted by Document Number)

Document Number	Author	Title
160	Bay Area Pollution Prevention Group	Avoid Fines and Health Risks from Grease Overflows
161	Water Systems	Eliminate Grease From Sanitary Sewers in Food Preparation and Meat Retailing Facilities
162	EcoGrease	EcoGrease Interceptors
163	Unknown	Keep Your Drains Fat-Free
164	Monterey Herald	Serious About Pacific Grove Sewers
165	Orange County Register	The Price of Neglect
166	City of Hopewell, Virginia	Fat-Free Sewers
167	Advanced BioTech	Why Add Microbes? Biostimulation vs. Bioaugmentation
169	Michael Ivanovich	Grease is the Word, Illegal Dumping is Blocking Nation's Sewers
170	Water Resources	Fats, Oil, and Grease
171	South East Water	Sewage System Management
172	Trabuco Canyon Water District	Fat-Free Sewers
173	Trisynergy	Drain Maintain
174	Water Resources Research Institute	In a FOG: Wastewater System Managers Struggle with FOG
175	United-Tech	Restaurant Grease Trap
176	EEC USA	EEC Bio Systems
177	API Industrial Inc.	Unique Grease Removal Unit
178	Golden Bell	Product Literature
179	City of Los Angeles	City of Los Angeles FOG Program Information
180	Enzymatic Solutions	Biocope - Biological Treatment Solution
181	City of Burlington, California	Burlington, California City Ordinance Relating to Water and Sewers
182	RWCQB	General Waste Discharge Requirements Prohibiting Sanitary Sewer Overflows, Order NO. 96-04, San Diego Region
183	California Regional Water Quality Control Board	Monitoring and Reporting Program No. R8-2002-0014 for General Waste Discharge Requirements (WDR) for Sewer Collection Agencies in Orange County
184	City of Palo Alto	Water Quality Protection Guidelines for Food Handling Facilities
185	City of Palo Alto	Selecting and Installing a Grease Removal Device

REFERENCES CITED

(Documents Sorted by Document Number)

Document Number	Author	Title
186	City of Woodland	City of Woodland Pollution Prevention Program Oil and Grease Project
187	BIOX Corporation	BIOX Grease Disposal Process
188	Worldstone	Cutting Grease With Ongoing Monitoring and Maintenance
189	City of Colorado Springs	Best Management Practices Requirements for Fat, Oil, and Grease
190	Southern California Association of Governments	Local Condition Summary Report
191	Linko Data Systems	Linko Data Systems - Information Management System for Sewer Systems
192	California Integrated Waste Management Board	Summary of Waste Disposal Practices/Alternatives for FOG Program
193	City of Villa Park	City of Villa Park RFI
194	Imperial Western Products	Biotane - Renewable Bioenergy
195	Southern States Power	OxEG Biodiesel
196	American Bio-Fuels	Lonox Biodiesel
197	City of Laguna Beach	Grease Control Training
198	City of Greely, Colorado	Restaurant Oil and Grease BMPs
199	City of Los Angeles, CA	Best Management Practices and You

Table B-1 Summary of SSOs* 2001		
City	**2001**	**2001 % Grease Caused**
NORTH ORANGE COUNTY		
Anaheim	26	25
Brea	1	0
Buena Park	3	90
Costa Mesa Sanitary	16	53
Cypress	4	100
Fountain Valley	3	100
Fullerton	34	30
Garden Grove	45	90
Huntington Beach	13	52
Irvine	NA	NA
Irvine Ranch Water District	3	0
La Habra	9	90
La Palma	0	0
Midway City Sanitary	14	90
Newport Beach	21	90
Orange	20	55
Placentia	3	90
Rossmoor/Los Alamitos	0	0
Santa Ana	13	90
Seal Beach	2	NA
Stanton	0	0
Sunset Beach Sanitary	0	0
Tustin	4	0
Villa Park	0	0
Yorba Linda Water District	0	50
SOUTH ORANGE COUNTY		
Aliso Viejo	NA	NA
San Clemente	8	15

Explanation:
NA = RFI Question Not Answered
Data for North Orange County from OCSD City and Agency Collection Facilities O&M Survey FY '00-01 Data, June 2002
Data for South Orange County from RFI
*Based on interviews with many of the cities and agencies listed above, some cities or agencies reported private property SSOs as well as the SSOs in their sewer lines.

Table B-2 Summary of Sewer Systems						
City	**Population Served**	**Area (square miles)**	**Sewer Length (mile)**	**Man-Holes**	**Lateral Connections**	**Pump-Stations**
NORTH ORANGE COUNTY						
Anaheim	320,000	50	510	9,000	58,729	0
Brea	36,400	-	109	-	9,542	1
Buena Park	75,000	10.29	250	3,800	19,250	0
Costa Mesa Sanitary	110,000	15.7	326	4,450	25,000	20
Cypress	47,300	6.9	90	NA	12,000	1
Fountain Valley	55,000	-	130	-	16,000	1
Fullerton	128,500	22.5	283.7	6,404	26,000	0
Garden Grove	165,000	18.8	327	NA	37,000	3
Huntington Beach	196,300	28	580	7,700	44,100	27
Irvine	148,000	46	NA	NA	NA	NA
Irvine Ranch Water District	266,000	-	553	-	70,542	12
La Habra	59,000	7.3	106	2,195	13,505	0
La Palma	16,400	2	25	NA	4,300	0
Midway City Sanitary	90,000	-	300	-	30,000	4
Newport Beach	75,000	24	220	5,341	25,000	20
Orange	133,000	26.9	314.2	6,997	40,000	2
Placentia	43,000	-	76	-	14,000	0
Rossmoor/Los Alamitos	24,000	56	56.4	NA	8,000	0
Santa Ana	338,000	27.2	450	8,000	43,900	2
Seal Beach	29,000	11.6	40.3	NA	4,350	9
Stanton	33,000	-	55	-	5,000	1
Sunset Beach Sanitary	4,000	0.25	5.48	NA	685	2
Tustin	69,000	13	51.52	NA	25,000	0
Villa Park	6,800	2	28	NA	2,000	1
Yorba Linda Water District	54,376	-	138	-	15,536	1
SOUTH ORANGE COUNTY						
Aliso Viejo	45,000	10.3	NA	NA	NA	NA
San Clemente	46,500	16	170	3,000	16,491	10

Explanation:
NA = RFI Question Not Answered
Data for Population Served, Sewer Length, Lateral Connections, and Pumpstation Fields for North Orange County from City and Agency Collection Facilities O&M Survey FY '00-01 Data, June 2002
All Other Data from RFI

Table B-3 Summary of Trouble Spots					
City	**Number of Trouble Spots**	**Cause of Trouble Spots**	**Trouble Spot Pipe Type**	**Trouble Spot Pipe Diameter (inches)**	**Trouble Spot Cleaning Cycle (Months)**
NORTH ORANGE COUNTY					
Anaheim	227	NA	NA	6	1 – 6
Brea	-	-	-	-	3
Buena Park	13	Grease	VCP	8	3
Costa Mesa Sanitary	25	Siphons and Grease	VCP	8	0.25
Cypress	34	Siphons and System Irregularities and Defects	VCP	8	3
Fountain Valley	-	-	-	-	1
Fullerton	350	Grease and System Irregularities and Defects	VCP	6	1 – 3
Garden Grove	120	NA	NA	NA	0.25 – 2
Huntington Beach	235	Grease, Roots, Debris, and Siphons	Clay	8	1 – 12
Irvine	NA	NA	NA	NA	NA
Irvine Ranch Water District	-	-	-	-	0.25 – 2
La Habra	28	Grease	VCP	6 and 8	3
La Palma	7	Grease and System Irregularities and Defects	NA	NA	2
Midway City Sanitary	-	-	-	-	0.25 – 1
Newport Beach	96	Slopes and Roots	NA	8	1
Orange	26	Grease and Roots	VCP	8	2 – 4
Placentia	-	-	-	-	3
Rossmoor/Los Alamitos	7	Grease	NA	NA	6
Santa Ana	52	Grease and Siphons	VCP	6 and 8	1
Seal Beach	58	Grease	Clay	6 and 8	1 – 3
Stanton	-	-	-	-	3
Sunset Beach Sanitary	3	Grease	NA	NA	3
Tustin	30	NA	NA	NA	NA
Villa Park	-	NA	NA	NA	6
Yorba Linda Water District	-	-	-	-	1 – 3
SOUTH ORANGE COUNTY					
Aliso Viejo	NA	NA	NA	NA	NA
San Clemente	104	Grease and Roots	VCP	NA	1 – 6

Explanation:
NA = RFI Question Not Answered
Data for Trouble Spot Cleaning Cycle Field for North Orange County from City and Agency Collection Facilities O&M Survey FY '00-01 Data, June 2002
All Other Data from RFI

Table B-4 Summary of Maintenance Practices					
City	**Cleaning Methods**	**Clean Frequency (months)**	**CCTV Inspections**	**Inspected By**	**Cleaned By**
NORTH ORANGE COUNTY					
Anaheim	HydroFlush and Combination Cleaning	18	Yes	Staff	Contractor
Brea	Combination Cleaning	12	Yes	Staff/Contractor	Staff/Contractor
Buena Park	HydroFlush	24	Yes	Staff	Staff
Costa Mesa Sanitary	Combo Jetter and Vacuum	12	Yes	Staff	Staff
Cypress	HydroFlush	24	No	Staff	Staff
Fountain Valley	Combination Cleaning	18	Yes	Staff	Staff
Fullerton	HydroJet and Combination Cleaning	24	Yes	Staff	Staff/Contractor
Garden Grove	HydroJet	24	Yes	Staff	Staff
Huntington Beach	HydroFlush and Combination Cleaning	24	Yes	Staff	Staff
Irvine	NA	NA	NA	IRWD	IRWD
Irvine Ranch Water District	Combination Cleaning	12	Yes	Staff	Staff
La Habra	HydroFlush	12	Yes	Staff/Contractor	Contractor
La Palma	HydroFlush	24	Yes	Staff/Contractor	Contractor
Midway City Sanitary	Combination Cleaning	24	Yes	Staff	Staff
Newport Beach	HydroJet and Root Foaming	18	Yes	Staff	Staff
Orange	HydroFlush	12	Yes	Staff	Contractor
Placentia	HydroFlush	3	Yes	Staff/Contractor	Contractor
Rossmoor/Los Alamitos	HydroFlush	12	Yes	Contractor	Contractor
Santa Ana	HydroFlush and Vacuum	12	Yes	Staff	Staff
Seal Beach	HydroFlush	12	No	Staff	Contractor
Stanton	HydroFlush	6	Yes	Staff	Staff
Sunset Beach Sanitary	HydroFlush	12	Yes	Staff	Contractor
Tustin	HydroFlush and Combination Cleaning	18	Yes	OCSD/IRWD	OCSD/IRWD
Villa Park	HydroFlush	24	NA	Staff/Contractor	Contractor
Yorba Linda Water District	HydroFlush	12	Yes	Staff	Staff
SOUTH ORANGE COUNTY					
Aliso Viejo	NA	NA	NA	NA	NA
San Clemente	HydroFlush and Vacuum	24	Yes	Staff	Staff

Explanation:
NA = RFI Question Not Answered
Data for North Orange County from City and Agency Collection Facilities O&M Survey FY '00-01 Data, June 2002
All Other Data from RFI

Table B-5 Summary of CCTV Inspections		
City	**Percent of System Inspected 2001**	**Percent of System Inspected Whole System**
NORTH ORANGE COUNTY		
Anaheim	13	50
Brea	100	100
Buena Park	10	90
Costa Mesa Sanitary	1	100
Cypress	0	0
Fountain Valley	0	50
Fullerton	1	5
Garden Grove	1	2
Huntington Beach	0	40
Irvine	NA	NA
Irvine Ranch Water District	4	100
La Habra	40	60
La Palma	0	2
Midway City Sanitary	10	35
Newport Beach	5	15
Orange	5	22
Placentia	0	0
Rossmoor/Los Alamitos	45	100
Santa Ana	4	6
Seal Beach	0	0
Stanton	10	10
Sunset Beach Sanitary	100	100
Tustin	10	20
Villa Park	0	0
Yorba Linda Water District	5	5
SOUTH ORANGE COUNTY		
Aliso Viejo	NA	NA
San Clemente	25	NA

Explanation:
NA = RFI Question Not Answered
Data for North Orange County from City and Agency Collection Facilities O&M Survey FY ’00-01 Data, June 2002
All Other Data from RFI

Table B-6 Summary of General Administrative Practices				
City	**Waste Disposal Program**	**Public Education Program/Documents**	**Financial Incentive/ Penalty Program**	**Industrial/ Commercial Source Control Program**
NORTH ORANGE COUNTY				
Anaheim	No	No	No	No
Brea	-	-	-	-
Buena Park	No	No	No	No
Costa Mesa Sanitary	No	Yes	No	Yes
Cypress	No	No	No	No
Fountain Valley	-	-	-	-
Fullerton	No	No	No	No
Garden Grove	No	Yes	No	No
Huntington Beach	No	No	No	No
Irvine	No	No	No	No
Irvine Ranch Water District	-	-	-	-
La Habra	No	No	No	No
La Palma	No	Yes	No	No
Midway City Sanitary	-	-	-	-
Newport Beach	Yes	No	Yes	No
Orange	No	No	No	No
Placentia	-	-	-	-
Rossmoor/Los Alamitos	No	Yes	No	No
Santa Ana	No	Yes	No	No
Seal Beach	No	No	No	No
Stanton	-	-	-	-
Sunset Beach Sanitary	No	No	No	No
Tustin	No	No	No	No
Villa Park	No	No	No	No
Yorba Linda Water District	-	-	-	-
SOUTH ORANGE COUNTY				
Aliso Viejo	No	No	No	No
San Clemente	No	No	No	No

Explanation:
Data from RFI

Table B-7 Summary of Record Keeping Practices				
City	**Database**	**GIS**	**Hard Copy Files**	**Hard Copy Maps**
NORTH ORANGE COUNTY				
Anaheim	Yes	Yes	Yes	Yes
Brea	-	Yes (ArcView)	-	-
Buena Park	No	No	Yes	Yes
Costa Mesa Sanitary	No	No	Yes	Yes
Cypress	Yes	No	Yes	Yes
Fountain Valley	Yes (Oracle)	Yes (Geomedia)	No	No
Fullerton	Yes (Access)	No	Yes	Yes
Garden Grove	Yes	Yes	Yes	Yes
Huntington Beach	Yes (Access)	Yes	Yes	Yes
Irvine	NA	NA	NA	NA
Irvine Ranch Water District	Yes (ArcInfo)	Yes (ArcView)	No	No
La Habra	No	No	Yes	Yes
La Palma	No	No	Yes	Yes
Midway City Sanitary	-	No	-	-
Newport Beach	Yes (Oracle)	Yes (ArcView)	Yes	Yes
Orange	Yes (ArcInfo)	Yes (ArcView)	Yes	Yes
Placentia	-	No	-	-
Rossmoor/Los Alamitos	Yes	Yes (ArcView)	Yes	Yes
Santa Ana	Yes	No	Yes	Yes
Seal Beach	No	No	Yes	No
Stanton	-	-	-	-
Sunset Beach Sanitary	-	No	-	-
Tustin	Yes	No	Yes	Yes
Villa Park	No	No	Yes	Yes
Yorba Linda Water District	-	No	-	-
SOUTH ORANGE COUNTY				
Aliso Viejo	NA	NA	NA	NA
San Clemente	Yes	No	Yes	Yes

Explanation:
NA = RFI Question Not Answered
Data for GIS Field for North Orange County from City and Agency Collection Facilities O&M Survey FY ’00-01 Data, June 2002
All Other Data from RFI

Table B-8 Summary of FOG Program and Ordinances			
City	**FOG Program**	**Grease Control Ordinance**	**Requires Grease Control Device Per Uniform Plumbing Code**
NORTH ORANGE COUNTY			
Anaheim	No	Yes	Yes
Brea	-	No	Yes
Buena Park	No	No	Yes
Costa Mesa Sanitary	No	No	No
Cypress	No	No	Yes
Fountain Valley	-	No	Yes
Fullerton	No	No	Yes
Garden Grove	No	No	Yes
Huntington Beach	No	No	Yes
Irvine	No	No	Yes
Irvine Ranch Water District	No	No	No
La Habra	No	No	Yes
La Palma	No	No	Yes
Midway City Sanitary	-	Yes	Yes
Newport Beach	No	Yes	No
Orange	No	No	Yes
Placentia	-	Yes	Yes
Rossmoor/Los Alamitos	No	Yes	No
Santa Ana	No	No	Yes
Seal Beach	No	No	Yes
Stanton	No	Yes	Yes
Sunset Beach Sanitary	No	Yes	No
Tustin	No	No	Yes
Villa Park	No	No	Yes
Yorba Linda Water District	-	Yes	Yes
SOUTH ORANGE COUNTY			
Aliso Viejo	No	Yes	No
San Clemente	Yes	No	Yes

Explanation:
All Other Data from RFI
Data for Grease Control Ordinance and Grease Control Ordinance Per Uniform Plumbing Code Fields for North Orange County from City and Agency Collection Facilities O&M Survey FY ’00-01 Data, June 2002
All Other Data from RFI

Table B-9 Summary of Grease Ordinance Requirements				
City	**Existing GT/GI Installation Requirements**	**Existing GT/GI Maintenance Requirements**	**New GT/GI Installation Requirements**	**New GT/GI Maintenance Requirements**
NORTH ORANGE COUNTY				
Anaheim	Problem Sites	No	GT and GI	No
Brea	-	-	-	-
Buena Park	No	No	GT and/or GI	No
Costa Mesa Sanitary	-	-	-	-
Cypress	-	-	-	-
Fountain Valley	-	-	-	-
Fullerton	Buildings Constructed After 1985	No	GT or GI	No
Garden Grove	No	No	GI	No
Huntington Beach	No	No	GI	No
Irvine	No	No	GT and GI	No
Irvine Ranch Water District	-	-	-	-
La Habra	Site Improvements	Yes	GT or GI	Yes
La Palma	No	No	GT and GI	No
Midway City Sanitary	-	-	-	-
Newport Beach	Site Improvements	Yes	GT or GI	Yes
Orange	No	No	GT and GI	Yes
Placentia	-	-	-	-
Rossmoor/Los Alamitos	No	Yes	GI	No
Santa Ana	No	No	GT or GI	No
Seal Beach	No	No	GT and GI	No
Stanton	-	-	-	-
Sunset Beach Sanitary	Problem sites	Yes	GT or GI	Yes
Tustin	No	No	GI	No
Villa Park	No	No	GT or GI	No
Yorba Linda Water District	-	-	-	-
SOUTH ORANGE COUNTY				
Aliso Viejo	No	No	GI	X
San Clemente	Ownership and/or Site Improvements	Yes	Yes	Yes

Explanation:
GT = Grease Trap
GI = Grease Interceptor
All Data from RFI

Table B-10 Summary of Local BMPs	
City	**BMP**
NORTH ORANGE COUNTY	
Anaheim	None
Brea	-
Buena Park	None
Costa Mesa Sanitary	Require GT/GI Require Separators for Auto Shops Residential Educational Brochure for Kitchen BMPS
Cypress	None
Fountain Valley	-
Fullerton	Require GT/GI
Garden Grove	Require GI Require GI Maintenance Public Outreach Program
Huntington Beach	Require GT/GI
Irvine	None
Irvine Ranch Water District	-
La Habra	Require Grease Containers Require GT/GI
La Palma	None
Midway City Sanitary	-
Newport Beach	Require GT/GI Require GT/GI Maintenance Require Maintenance Logs
Orange	Yearly Cleaning of System More Frequent Cleaning of Trouble Spots
Placentia	-
Rossmoor/Los Alamitos	None
Santa Ana	Require GT Require GT for Apartments
Seal Beach	None
Stanton	-
Sunset Beach Sanitary	Require GT/GI Require GT/GI Maintenance
Tustin	None
Villa Park	None
Yorba Linda Water District	-
SOUTH ORANGE COUNTY	
Aliso Viejo	None
San Clemente	GT/GI Inspections Kitchen Spills Absorbed with Towels Instead of Mopped Dry Scraping Barrels for Kitchen Grease Collection

Explanation:
GT = Grease Trap
GI = Grease Interceptor
All Data from RFI

Table B-11 Summary of Potential BMPs/FOG Control Technologies	
City	**BMP/FOG Control Technology**
NORTH ORANGE COUNTY	
Anaheim	None
Brea	-
Buena Park	None
Costa Mesa Sanitary	Automatic Feed of Biological Products
Cypress	None
Fountain Valley	-
Fullerton	None
Garden Grove	Require GI Inspections
Huntington Beach	Utilize Biological and Chemical Products
Irvine	None
Irvine Ranch Water District	-
La Habra	Standard Educational Materials Outlining BMPs for Food Establishments
La Palma	None
Midway City Sanitary	-
Newport Beach	Kitchen Staff BMP Training Signage for Kitchens Relocate Grease Storage Containers Away From Catch Basins
Orange	None
Placentia	-
Rossmoor/Los Alamitos	None
Santa Ana	None
Seal Beach	GT/GI Maintenance Program Kitchen BMPs Formalize Employee Training
Stanton	-
Sunset Beach Sanitary	None
Tustin	None
Villa Park	None
Yorba Linda Water District	-
SOUTH ORANGE COUNTY	
Aliso Viejo	None
San Clemente	None

Explanation:
GT = Grease Trap
GI = Grease Interceptor
All Data from RFI

Table B-12 Summary of Local FOG Control Technologies Currently Being Utilized			
City	FOG Control Technologies		
	Physical	Biological	Chemical
NORTH ORANGE COUNTY			
Anaheim	None	None	None
Brea	-	-	-
Buena Park	None	None	None
Costa Mesa Sanitary	None	Ennix	Plug Away
Cypress	None	None	None
Fountain Valley	-	-	-
Fullerton	None	None	None
Garden Grove	None	Ennix	Golden Bell Degreaser
Huntington Beach	None	None	None
Irvine	None	None	None
Irvine Ranch Water District	-	-	-
La Habra	Grease Sock	None	None
La Palma	None	None	None
Midway City Sanitary	-	-	-
Newport Beach	None	None	ALCO T-204
Orange	None	None	None
Placentia	-	-	-
Rossmoor/Los Alamitos	None	None	None
Santa Ana	None	Ennix	None
Seal Beach	None	None	None
Stanton	-	-	-
Sunset Beach Sanitary	None	None	None
Tustin	None	None	None
Villa Park	None	None	None
Yorba Linda Water District	-	-	-
SOUTH ORANGE COUNTY			
Aliso Viejo	None	None	None
San Clemente	None	None	None

Explanation:
All Data from RFI

FOG CONTROL PROGRAM

BACKBONE ORDINANCE

I. Purpose and Applicability

The purpose of this ordinance is to prevent clogging and blocking of the City's[1] sanitary sewer lines through the establishment of regulations for the discharge of fats, oils, and grease, and other insoluble waste discharges from food service establishments into the sanitary sewerage system for the City. The purpose of the ordinance is further to implement procedures for recovering costs associated with FOG discharges and blockages, to establish administrative requirements for FSEs, and to establish enforcement procedures for the regulations.

II. Definitions

A. *Fats, Oils, and Grease (FOG)*

FOG shall mean any substance such as a vegetable or animal product that is used in, or is a byproduct of, a cooking or food preparation process, and that may solidify with a change in temperature or other circumstance, adhere to the walls of a sewer, and create or contribute to a blockage in a sewer lateral or sanitary sewerage system component.

B. *Food Service Establishment (FSE)*

A food service establishment (FSE) shall mean any entity operating within **THE CITY** in a permanently constructed structure, such as a room, building, place, or portion thereof, maintained and used or operated for the purpose of storing, preparing, serving, or manufacturing, packaging, or otherwise handling food for sale to other entities or for consumption by the public, its members, or employees and which has any process or equipment that uses or produces FOG.

C. *Food Grinder*

Food grinder or garbage grinder shall mean any device installed in the plumbing or sanitary sewerage system for the purpose of grinding food waste or food preparation byproducts for the purpose of disposing into the sanitary sewerage system.

[1] The City should be defined in this paragraph.

D. *Grease Interceptor*

A grease interceptor is a two or three compartment chamber that is generally required to be located, according to the Uniform Plumbing Code, underground, between an FSE and the sanitary sewerage system. These devices may be large and are intended to gravity separate FOG from wastewater as the wastewater moves through the chamber. To perform according to design specifications, the chamber requires periodic cleaning and maintenance, including removal of accumulated FOG and solids, which must be disposed in a proper manner at regular intervals.

E. *Grease Trap*

A grease trap is a device, generally much smaller than a grease interceptor, which is attached to no more than four individual plumbing fixtures, also intended to separate FOG from wastewater prior to discharge of the wastewater to the sanitary sewerage system. Grease traps must be cleaned regularly and the FOG and solids disposed in a proper manner.

F. *Automatic Grease Trap*

An automatic grease trap is a grease trap which is designed with a self-cleaning mechanism to remove grease from the chamber intermittently or continuously.

G. *Sewer Lateral*

A sewer lateral is a building sewer as defined in the Uniform Plumbing Code. It is the wastewater connection between the building's wastewater facilities and a public sewerage system.

H. *Sewer Lateral Line Cleaning*

Sewer lateral line cleaning is the flushing or rodding of the lateral connection between the FSE and the public sewerage system to remove FOG, roots, and other debris, whether it is conducted on a regular maintenance schedule or to remove a blockage on an emergency basis.

I. *Uniform Plumbing Code*

The Uniform Plumbing Code (UPC) refers to the California Code of Regulations, Title 24, Part 5.

J. *FOG Control Program Manager*

The FOG Control Program Manager is the individual or public agency designated by the City to administer the FOG Control Program. The FOG Control Program Manager is

responsible for all determinations of compliance with the program, including approval of discretionary variances and waivers.

K. *General Permit for Food Service Establishments*

The General Permit for Food Service Establishments (FSEs) is a legally-binding permit setting forth the terms, conditions, and criteria of the FOG Control Program. It is prepared and maintained by the FOG Control Program Manager under authority from the City, and its provisions may be modified from time to time by the FOG Control Program Manager.

L. *Grease Hauler*

Grease Hauler means any person or entity who collects the contents of a grease interceptor or grease trap for the purpose of transporting it to a recycling or disposal facility. A grease hauler may also provide grease interceptor or grease trap maintenance services.

III. FOG Control Program

A. *FOG Discharge Restrictions*

FOG may not be discharged into the City's sanitary sewerage system if it will accumulate and/or cause or contribute to blockages in the City's sanitary sewerage system or in the sewer lateral which connects the FSE to the City's sanitary sewerage system.

B. *General Permit for Food Service Establishments and Additional Permit Conditions*

The FOG Control Program Manager is authorized to prepare and maintain a General Permit for Food Service Establishments ("General Permit"). This General Permit will contain the specific requirements for the FOG Control Program. Its terms may be modified periodically by the FOG Control Program Manager, following a public hearing to provide an opportunity for interested parties to provide comments. Each FSE which discharges or proposes to discharge into the City's sanitary sewerage system must submit a Notice of Intent to Discharge to the FOG Control Program Manager and must agree to comply with the terms of the General Permit. Failure to comply with the General Permit conditions will constitute a violation of this ordinance.

Notwithstanding the existence of the General Permit, the FOG Control Program Manager may also issue individual permit conditions to any FSE. In the event the FOG Control Program Manager issues individual permit conditions to an FSE, the basis for those permit conditions shall be disclosed to the FSE in writing along with the permit

conditions. Failure to comply with the individual permit conditions will constitute a violation of this ordinance.

C. *FOG Pretreatment Required*

1. New FSEs

On or after the effective date of this ordinance, all newly constructed FSEs, FSEs which change ownership, and FSEs which undergo remodeling in excess of a dollar value of more than $$[2] or resulting in an increase in flow or waste generation of XX%[3] or more shall be required to install a grease interceptor, according to requirements set forth in the General Permit for Food Service Establishments, unless a waiver is granted under Section III.C.3 below, and shall be required to follow all requirements of the grease control program of this ordinance.

2. Existing FSEs

All existing FSEs may be required to install and to properly operate and maintain a grease interceptor according to the requirements set forth in the General Permit, unless the FSE has obtained a waiver as described in Section III.C.3 below, and shall be required to follow all requirements of the grease control program of this ordinance. The requirement to install and to properly operate and maintain a grease interceptor may be conditionally stayed, that is delayed in its implementation, by the FOG Control Program Manager for a period of up to two years from the date of adoption of this ordinance. Terms and conditions for application of a stay to an FSE shall be set forth in the General Permit.

a) Alternative FOG Pretreatment Program

Any existing FSE may submit an application to the FOG Control Program Manager for approval of an Alternative FOG Control Program in lieu of installation of an interceptor. If the Alternative FOG Control Program is approved by the FOG Control Program Manager, the FSE will be required to implement this program and will be granted a variance from the requirement to install, operate and maintain a grease interceptor, for as long as the FSE demonstrates to the satisfaction of the FOG Control Program Manager that the FSE meets the FOG discharge requirements of Section III.A of this ordinance and as detailed in the General Permit. The terms and conditions for approval of an Alternative FOG Pretreatment Program and a variance from the requirement to install a Grease Interceptor shall be specified in the General Permit.

The FSE must comply with other requirements of this ordinance and the General Permit, to the extent that they are applicable.

[2] Cities have used dollar values from $25,000 to $100,000 to trigger the loss of the grandfather exception.
[3] This waste flow option may be utilized in the program.

3. Application for Waiver of Requirement for Grease Interceptor

Any FSE may obtain a waiver of the requirement to install, operate and maintain a grease interceptor from the FOG Control Program Manager, if the FOG Control Program Manager determines that its operation will not generate sufficient FOG to have the potential for causing or contributing to a blockage of the sanitary sewerage system or the sewer lateral. The factors on which the FOG Control Program Manager will evaluate the FSE operation to determine whether a waiver will be granted will be based on analysis utilizing Uniform Plumbing Code calculations which estimate potential for generating FOG and when discharges are de minimis. The specific factors and procedures for applying for a waiver shall be set forth in the General Permit. Any waiver granted under this section is valid only as long as the FSE continues to operate according to the information contained its Notice of Intent to Discharge.

The FSE shall comply with other requirements of this ordinance, including annual reporting and inspection requirements, to the extent they are applicable.

4. Operations and Maintenance Requirements

All grease interceptors and grease traps shall be maintained in efficient operation at all times by the FSE at the FSE's expense. Details of required maintenance shall be specified in the General Permit.

Maintenance of the sewer lateral, whether through hydrojetting or rodding, shall not cause or contribute to blockages in the City's sanitary sewerage system. Terms and conditions for this maintenance work, including, but not limited to, notification requirements, shall be specified in the General Permit.

5. Best Management Practices

Each FSE shall implement a program of Best Management Practices in its operation to minimize the discharge of FOG into the sanitary sewerage system. The General Permit shall include Best Management Practices for kitchen practices, food preparation and cleanup areas and for the design, operation and maintenance of grease interceptors, grease traps and other facilities.

Every food service employee of the FSE must be trained in the BMP Program as specified in the General Permit.

6. Food Grinders

The use of a food grinder which discharges food wastes from an FSE into the sanitary sewerage system is prohibited.

D. *Program Administration*

1. Notice of Intent to Discharge

Each existing FSE shall submit a **"Notice of Intent to Discharge"** (NOI) to the FOG Control Program Manager within 180 days of the effective date of this ordinance. The information to be provided on the NOI shall be specified in the General Permit. The NOI shall contain a certification by the FSE that it intends to comply with all requirements of this ordinance and the General Permit.

Any existing FSE which substantially changes its menu or operation shall submit a revised NOI at least 30 days prior to commencing service under the new operation. The applicability of an existing waiver, stay or variance from the requirement to install, operate and maintain a Grease Interceptor will be assessed by the FOG Control Program Manager based on the information contained in the new NOI.

All newly constructed FSEs, FSEs which change ownership, and FSEs which undergo remodeling in excess of a dollar value of more than $$[4] or which results in an increase in flow or waste generation of XX%[5] or more shall submit an NOI at least 60 days prior to startup. The NOI shall include a certification that the FSE will operate in compliance with all provisions of this ordinance. Any FSE which fails to submit the required NOI in a timely manner may be prohibited from discharging to the sanitary sewerage system.

2. Recordkeeping Requirements

Each FSE shall maintain records for its FOG Pretreatment Program as specified in the General Permit.

3. Annual Program Certification

At least once annually, each FSE shall submit a certification to an inspector, at the inspector's request, that its operation has not changed from the conditions documented in its NOI, that all logs and documents maintained on site are true and correct, and that the FSE is in compliance with all requirements of this ordinance. A copy of the form of this certification shall be included in the General Permit.

4. Reporting Requirements

Each FSE shall report to the FOG Control Program Manager any spills of FOG and any unauthorized discharges into the sanitary sewerage system within the time period following the occurrence of the event as specified in and according to the requirements set forth in the General Permit.

[4] See, footnote 2.
[5] See, footnote 3.

5. Right to Enter and Inspections

Upon showing proper credentials, a person authorized by the FOG Control Program Manager shall have the right to enter and inspect the FSE's premises for announced or unannounced inspections. Such person shall have access to any facilities and records necessary for determining compliance with this ordinance. An inspection may include review of all logs and documentation of the FSE's FOG Management Program, inspection of all kitchen facilities, and inspection of any and all grease pretreatment facilities and devices.

Orange County Health Care Agency inspectors are authorized to act for the FOG Control Program Manager as inspectors during regular OCHCA FSE inspections. Orange Country Heath Care Agency inspectors will review FOG Control Program Records for each FSE at least once annually.

IV. Fees

Each FSE shall pay a one time Application Fee for each NOI submitted pursuant to Section III.D.1 of this ordinance, including the initial NOI, and an NOI submitted following change of ownership, for a substantially changed operation, or due to remodeling which results in excess of a dollar value of more than $$[6] or an increase in flow or waste generation of XX%[7] or more. The Application Fee must be paid when the NOI is filed with the City. The amount of the Application Fee shall be specified in the General Permit.

Each FSE shall pay an annual fee established by the FOG Control Program Manager for the FOG Control Program. The amount of the fee shall be based on the FSE's potable water use and on the classification of the FSE in one of three categories:

- FSE with approved grease interceptor;
- FSE without an approved grease interceptor; and
- FSE with waiver of requirement to install approved grease interceptor.

The factors for calculating the fee for each category of FSE shall be included in the General Permit.

V. Enforcement

Failure to comply with the City's FOG Control Program, the terms of this ordinance and the General Permit, and any individual permit conditions will result in enforcement action against the FSE. The FOG Control Program Manager shall be responsible for enforcement actions.

[6] See, footnote 2.
[7] See, footnote 3.

Violations of this ordinance, the General Permit and individual permit conditions may result in fines and/or penalties. Fines and/or penalties shall be set forth in the General Permit.

1. Appeal of FOG Pretreatment Requirement

Any FSE may appeal the decision of the FOG Control Program Manager with respect to the FOG Pretreatment Requirements, including, the requirement to install a grease interceptor, the sizing requirements for a grease interceptor, the denial of a proposed Alternative FOG Pretreatment Program, and the addition of individual permit conditions.

(1) Appeals shall be submitted to the FOG Control Program Manager within thirty days after the FSE has been notified of the decision by the FOG Control Program Manager. The decision of the FOG Control Program Manager on the appeal shall be in writing.
(2) The decision of the FOG Control Program Manager can be appealed within fifteen days of the issuance of the FOG Control Program Manager's decision.[8]

2. Violations

Failure to comply with the provisions of this ordinance, the terms of the General Permit, and any individual permit conditions may result in one or more of the following:

(1) Notices of noncompliance may be issued with a specified period for correction;
(2) Administrative citations may be issued for violations in the amounts and manner established by the FOG Control Program Manager;[9]
(3) The FSE may be assessed for all expense, loss, and damage associated with a blockage in the sanitary sewerage system resulting from the FSE's failure to comply with this ordinance, the General Permit, and individual permit conditions;
(4) The FSE may be charged a compliance fee, following determination that an FSE was in violation, as established by the FOG Control Program Manager; and
(5) The FSE may be prohibited from discharging to the sanitary sewerage system.

3. Appeals of Violations

Determination of violations resulting in fines, penalties, or requirements to install grease interceptors may be appealed in the following manner:

(1) Appeals of fines, penalties, or other corrective actions shall be submitted to the FOG Control Program Manager within thirty days after the FSE has been notified of the penalty and/or corrective actions. The decision of the FOG Control Program Manager shall be in writing.

[8] The appeals process must be consistent with the City's procedures.
[9] This must be consistent with the City's procedures.

(2) The decision of the FOG Control Program Manager may be appealed within fifteen days of the issuance of the FOG Control Program Manager's decision.[10]

[10] See, footnote 8.

GENERAL PERMIT
OUTLINE

I. Applicability of Permit
- Who, how long
- NOI

II. Discharge Restrictions
- Discussion on grease accumulation in lateral or sewerage system that could cause or contribute to a blockage
- Discussion on frequency of lateral line cleaning as a potential indicator of compliance with the permit

III. Grease Pretreatment Requirements
- Description of calculation of grease interceptor requirement
- Definition of waiver
- Description of grease interceptor sizing requirements
- Description of any alternatives now existing

IV. Best Management Practices
- Should define those which are required (i.e., which can lead to violation)
- Practices which improve performance but are not required can be included in an attachment or fact sheet

V. Food Grinders
- Prohibition for all FSEs
- Time period for implementation for existing FSEs

VI. Maintenance Requirements
- Interceptors
- Grease Traps

VII. Inspections
- Who, how often, authority (FOG Inspector, OCHCA Inspector, GRE Inspector)

VIII. Recordkeeping Requirements
- Grease interceptor and grease trap maintenance logs
- Cooking oil logs (amount purchased)
- Hauler manifests (grease barrel removal and interceptor and trap pump outs) and hauler certification
- Training logs
- Sewer cleaning log and plumber certification
- BMP program

IX. Reporting Requirements
- Spills and unauthorized discharges
- Water and tax bills

X. Fee Structure

XI. Fines and Penalties

XII. Contact Information
- For NOI and permit-related contacts
- Emergency contacts (including for sewer lateral cleaning)

XIII. Authorized and Designated Signatories

XIV. Standard Permit Conditions

XV. Special Conditions

XVI. Notification Requirements
- Change in ownership
- Significant remodeling
- Lateral line cleaning
- Modification of alternatives

Notice of Intent to Discharge
Example

1) Is this a new or revised NOI for the FSE at this address?
   [ ] New [ ] Revised

2) Name of FSE

3) Name of Owner, Individual Authorized to sign for FSE, and Designated Contact

4) Address and phone number of FSE

5) Business Address and phone number (if different)

6) Volume of monthly water usage (if known).

7) Time of daily food preparation operations.

8) Description of food preparation:
   a) Type of food service:

   b) Number of meals served
      Per day
      Per peak hour

   c) Dining room capacity
      number of tables
      number of seats

   d) Take-out meals
      per day
      per peak hour

   e) Number of employees

9) Does your facility have a grease interceptor (i.e., large grease removal device located underground and outdoors)
   [ ] Yes
   [ ] No

10) List the location, size, and specifications for all grease interceptors at your facility

Location	Type (Interceptor)	Size	Additional Specifications

11) How often are they serviced?
Provide service frequency for each device listed in Item 10.

Device Location	Service Frequency

12) Does your facility have a grease trap (i.e., small grease removal device plumbed to one or more fixtures)

[ ] Yes
[ ] No

13) List the location, size, and specifications for all grease traps at your facility

Location	Type (Trap)	Size	Additional Specifications

14) How often are they serviced?
Provide service frequency for each device listed in Item 13.

Device Location	Service Frequency

15) List all major equipment used for food preparation at your restaurant (i.e., grills, fryers, woks, etc.): (Type and Size / Specifications)

Type	Size / Specifications

16) List all kitchen fixtures at your restaurant (i.e., dishwashers, sinks, floor drains, etc.): (Type and Size / Specifications)

Type	Size / Specifications

17) Provide a copy of the indoor and outdoor plumbing floor diagrams, which should include the location of all water meters, facility sewer connections, grease interceptors, sinks, floor drains, dishwashers, restrooms, etc. If no professional drawing exists, a hand-drawn copy in the format of the attached example is acceptable.

A blueprint of the facility showing the above items may also be attached.

18) Are there additives placed into the kitchen drains or grease interceptor (i.e., enzymes, bacteria, etc.)?

[ ] Yes
[ ] No

a. How often are they added?

b. Location, Additive, Frequency

Device Location	Additive Name	Frequency of use

18) Do you have a Food Grinder?

[ ] Yes
[ ] No

19) Do you have screens on all sinks and floor drains?

[ ] Yes
[ ] No

If no, list each drain that is not equipped with a screen.

20) Do you have a Grease Barrel or Bin used to store and recycle grease?

[ ] Yes
[ ] No

21) What is the frequency and method utilized for sewer lateral line cleaning?

22) Are pesticides applied in the facility?
If yes, list all applied and frequency of application

Type	Frequency of application

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information contained herein is accurate, to the best of knowledge and belief.

By submitting this Notice of Intent to Discharge, I also certify that _____ will comply with provisions of the General Permit for Food Service Establishments, a copy of which was provided to me with this form.

_____ _____
Original Signature (No Copies Allowed) Date

_____ _____
Printed or Typed Name and Title Phone Number