Fats, Oils & Grease (FOG) White Paper

By

NEWEA FOG Task Force

NEWEA
WORKING FOR WATER QUALITY

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EXECUTIVE SUMMARY

In February 2017, the new leadership of NEWEA's Collection System Committee gathered for a brainstorm session to consider topics for the committee to focus on during the following three years. After shortlisting and discussing over twenty topics, it was agreed that for at least the following two years the committee would apply significant interest and focus on the following two topics:

- Fats Oils and Grease (FOG) – Understanding and mitigating the pacts of buildup of fats, oils and grease in wastewater collection systems
- Private Inflow – Understanding and mitigating the impacts of water other than sanitary waste entering sanitary collection systems from private sources.

The Committee decided to convene a subcommittee (Task Force) to focus on each of these two topics.

This working document is part of the output of the FOG subcommittee for FOG.

Immediately following the convening of the subcommittee, a Subcommittee Charter/Mandate was developed to guide the subcommittee in its activities. The main activities were to be development of this informational white paper, and to inform NEWEA of the intended focus on FOG as a 'Hot Topic.' FOG is a major issue that impacts the ability of collection systems to perform as designed. When ignored, FOG can result in significant sanitary system surcharges and backups, with consequential public health and environmental impacts.

For almost two years, the subcommittee of volunteers has given their time to collect data, prepare written descriptions, develop and disseminate a survey and prepare a working draft of this white paper.

To be clear, the purpose of this document is to provide information to those interested in the topic of FOG. It is a result of collating information that could be readily located, and identifying and referring to existing documentation, issues, regulations and solutions that may be of help to those interested in or dealing with this topic/issue.

This document is not, and should not be considered or used as, a comprehensive text, guidance or direction on the topic of FOG.

I would like to thank the subcommittee leadership for their efforts in developing this working white paper – particularly Charles Gore and Kara Keleher.

Peter Garvey – Collection Systems Committee Chair

Disclaimer: This white paper is made available by New England Water Environment Association's (NEWEA) Collection Systems Committee. The sole purpose of this white paper is to inform on the outlined topic. The information included herein should not be considered exhaustive, definitive, and/or peer reviewed. The views and opinions expressed in this white paper are representative of participants of the survey and do not reflect the opinions of NEWEA, its employees, general membership, and/or Executive Committee.

1.0INTRODUCTION

1.1 What is FOG?

FOG consists of Fats, Oils and Grease generated from animal or vegetable sources. FOG discharges to sewer collection systems are limited by regulations and permits to prevent buildup of FOG within pump stations and sewers.

1.2 Benefits to FOG Management

Presence of FOG can cause significant challenges in the performance of wastewater collection systems. FOG in any amount reduces the effective capacity of the collection system and, as a result, impairs its performance and ability to convey wastewater. Significant FOG buildup can significantly reduce the capacity of collection systems, in some cases causing total blockage. Significant capacity reduction prevents the collection system from performing near its design point - in cases of severe FOG buildup or blockage, backups of wastewater can occur, resulting in Sanitary Sewer Overflows (SSOs). The consequences of SSOs are wastewater in basements, wastewater on streets, wastewater in water bodies, and the accompanying potential impacts on public health and pollution of the environment. From a regulatory perspective, occurrence of SSOs (from FOG or otherwise) will likely lead to infringement of the terms of a discharge permit, with potential legal and/or financial recourse.

The clear benefits to the management of FOG in a collection system are to maintain the performance of that system to convey wastewater as designed without impairment, or concern about potential SSO's with their obvious negative consequences.

1.3 Acknowledgements

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[1] Participants who completed Survey Round 1 and Survey Round 2. Apologies if anyone was inadvertently not included.

2.0 REGULATORY REQUIREMENTS

2.1 International Plumbing Code

The International Plumbing Code sets minimum regulations and requirements for plumbing systems for their design and performance and allows the acceptances of new plumbing-related technologies.

Chapter 10 of the International Plumbing Code covers Grease Traps/Interceptors and Separators. The following was taken from the 2012 version of Chapter 10 of the International Plumbing Code:

SECTION 1001 GENERAL

1001.1 Scope.
This chapter shall govern the material and installation of traps, interceptors and separators.

SECTION 1002 TRAP REQUIREMENTS

1002.1 Fixture traps.
Each plumbing fixture shall be separately trapped by a liquid-seal trap, except as otherwise permitted by this code. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches (610 mm), and the horizontal distance shall not exceed 30 inches (762 mm) measured from the centerline of the fixture outlet to the centerline of the inlet of the trap. The height of a clothes washer standpipe above a trap shall conform to Section 802.4. A fixture shall not be double trapped.

Exceptions:

1. *This section shall not apply to fixtures with integral traps.*

2. *A combination plumbing fixture is permitted to be installed on one trap, provided that one compartment is not more than 6 inches (152 mm) deeper than the other compartment and the waste outlets are not more than 30 inches (762 mm) apart.*

3. *A grease interceptor intended to serve as a fixture trap in accordance with the manufacturer's installation instructions shall be permitted to serve as the trap for a single fixture or a combination sink of not more than three compartments where the vertical distance from the fixture outlet to the inlet of the interceptor does not exceed 30 inches (762 mm) and the developed length of the waste pipe from the most upstream fixture outlet to the inlet of the interceptor does not exceed 60 inches (1524 mm).*

4. *Where floor drains in multilevel parking structures are required to discharge to a combined building sewer system, the floor drains shall not be required to be individually trapped provided that they are connected to a main trap in accordance with Section 1103.1.*

1002.2 Design of traps.
Fixture traps shall be self-scouring. Fixture traps shall not have interior partitions, except where such traps are integral with the fixture or where such traps are constructed of an approved material that is resistant to corrosion and degradation. Slip joints shall be made with an approved elastomeric gasket and shall be installed only on the trap inlet, trap outlet and within the trap seal.

1002.3 Prohibited traps.
The following types of traps are prohibited:

1. *Traps that depend on moving parts to maintain the seal.*

2. *Bell traps.*

3. *Crown-vented traps.*

4. *Traps not integral with a fixture and that depend on interior partitions for the seal, except those traps constructed of an approved material that is resistant to corrosion and degradation.*

5. *"S" traps.*

Drum traps.

> ***Exception:*** *Drum traps used as solids interceptors and drum traps serving chemical waste systems shall not be prohibited.*

1002.4 Trap seals.
Each fixture trap shall have a liquid seal of not less than 2 inches (51 mm) and not more than 4 inches (102 mm), or deeper for special designs relating to accessible fixtures. Where a trap seal is subject to loss by evaporation, a trap seal primer valve shall be installed. Trap seal primer valves shall connect to the trap at a point above the level of the trap seal. A trap seal primer valve shall conform to ASSE 1018 or ASSE 1044.

1002.5 Size of fixture traps.
Fixture trap size shall be sufficient to drain the fixture rapidly and not less than the size indicated in Table 709.1. A trap shall not be larger than the drainage pipe into which the trap discharges.

1002.6 Building traps.
Building (house) traps shall be prohibited, except where local conditions necessitate such traps. Building traps shall be provided with a cleanout and a relief vent or fresh air intake on the inlet side of the trap. The size of the relief vent or fresh air intake shall not be less than one-half the diameter of the drain to which the relief vent or air intake connects. Such relief vent or fresh air intake shall be carried above grade and shall be terminated in a screened outlet located outside the building.

1002.7 Trap setting and protection.
Traps shall be set level with respect to the trap seal and, where necessary, shall be protected from freezing.

1002.8 Recess for trap connection.
A recess provided for connection of the underground trap, such as one serving a bathtub in slab-type construction, shall have sides and a bottom of corrosion-resistant, insect- and verminproof construction.

1002.9 Acid-resisting traps.
Where a vitrified clay or other brittleware, acid-resisting trap is installed underground, such trap shall be embedded in concrete extending 6 inches (152 mm) beyond the bottom and sides of the trap.

1002.10 Plumbing in mental health centers.
In mental health centers, pipes and traps shall not be exposed.

SECTION 1003 INTERCEPTORS AND SEPARATORS

1003.1 Where required.
Interceptors and separators shall be provided to prevent the discharge of oil, grease, sand and other substances harmful or hazardous to the public sewer, the private sewage system or the sewage treatment plant or processes.

1003.2 Approval.
The size, type and location of each interceptor and of each separator shall be designed and installed in accordance with the manufacturer's instructions and the requirements of this section based on the anticipated conditions of use. Wastes that do not require treatment or separation shall not be discharged into any interceptor or separator.

1003.3 Grease interceptors.
Grease interceptors shall comply with the requirements of Sections 1003.3.1 through 1003.3.5.

> ***1003.3.1 Grease interceptors and automatic grease removal devices required.***
> *A grease interceptor or automatic grease removal device shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias and clubs. Fixtures and equipment shall include pot sinks, prerinse sinks; soup kettles or similar devices; wok stations; floor drains or sinks into which kettles are drained; automatic hood wash units and dishwashers without prerinse sinks. Grease interceptors and automatic grease removal devices shall receive waste only from fixtures and equipment that allow fats, oils or grease to be discharged. Where lack of space or other constraints prevent the installation or replacement of a grease interceptor, one or more grease interceptors shall be permitted to be installed on or above the floor and upstream of an existing grease interceptor.*

1003.3.2 Food waste grinders.
Where food waste grinders connect to grease interceptors, a solids interceptor shall separate the discharge before connecting to the grease interceptor. Solids interceptors and grease interceptors shall be sized and rated for the discharge of the food waste grinder. Emulsifiers, chemicals, enzymes and bacteria shall not discharge into the food waste grinder.

1003.3.3 Grease interceptors and automatic grease removal devices not required.
A grease interceptor or an automatic grease removal device shall not be required for individual dwelling units or any private living quarters.

1003.3.4 Hydromechanical grease interceptors and automatic grease removal devices.
Hydromechanical grease interceptors and automatic grease removal devices shall be sized in accordance with ASME A112.14.3 Appendix A, ASME 112.14.4, CSA B481.3 or PDI G101. Hydromechanical grease interceptors and automatic grease removal devices shall be designed and tested in accordance with ASME A112.14.3 Appendix A, ASME 112.14.4, CSA B481.1, PDI G101 or PDI G102. Hydromechanical grease interceptors and automatic grease removal devices shall be installed in accordance with the manufacturer's instructions. Where manufacturer's instructions are not provided, hydromechanical grease interceptors and grease removal devices shall be installed in compliance with ASME A112.14.3, ASME 112.14.4, CSA B481.3 or PDI G101. This section shall not apply to gravity grease interceptors.

1003.3.4.1 Grease interceptor capacity.
Grease interceptors shall have the grease retention capacity indicated in Table 1003.3.4.1 for the flow-through rates indicated.

TABLE 1003.3.4.1 – CAPACITY OF GREASE INTERCEPTORS

TOTAL FLOW THROUGH RATING (gpm)	GREASE RETENTION CAPACITY (pounds)
4	*8*
6	*12*
7	*14*
9	*18*
10	*20*
12	*24*
14	*28*
15	*30*
18	*36*
20	*40*
25	*50*
35	*70*
50	*100*
75	*150*
100	*200*

For SI: 1 gallon per minute = 3.785 L/m, 1 pound = 0.454 kg.

a. For total flow-through ratings greater than 100 (gpm), double the flow-through rating to determine the grease retention capacity (pounds).

1003.3.4.2 Rate of flow controls.

Grease interceptors shall be equipped with devices to control the rate of water flow so that the water flow does not exceed the rated flow. The flow-control device shall be vented and terminate not less than 6 inches (152 mm) above the flood rim level or be installed in accordance with the manufacturer's instructions.

1003.3.5 Automatic grease removal devices.

Where automatic grease removal devices are installed, such devices shall be located downstream of each fixture or multiple fixtures in accordance with the manufacturer's instructions. The automatic grease removal device shall be sized to pretreat the measured or calculated flows for all connected fixtures or equipment. Ready access shall be provided for inspection and maintenance.

1003.4 Oil separators required.

At repair garages, car-washing facilities, at factories where oily and flammable liquid wastes are produced and in hydraulic elevator pits, separators shall be installed into which all oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal.

***Exception:** An oil separator is not required in hydraulic elevator pits where an approved alarm system is installed.*

1003.4.1 Separation of liquids.

A mixture of treated or untreated light and heavy liquids with various specific gravities shall be separated in an approved receptacle.

1003.4.2 Oil separator design.

Oil separators shall be listed and labeled, or designed in accordance with Sections 1003.4.2.1 and 1003.4.2.2.

1003.4.2.1 General design requirements.

Oil separators shall have a depth of not less than 2 feet (610 mm) below the invert of the discharge drain. The outlet opening of the separator shall have not less than an 18-inch (457 mm) water seal.

1003.4.2.2 Garages and service stations.

Where automobiles are serviced, greased, repaired or washed or where gasoline is dispensed, oil separators shall have a capacity of not less than 6 cubic feet (0.168 m^3) for the first 100 square feet (9.3 m^2) of area to be drained, plus 1 cubic foot (0.028 m^3) for each additional 100 square feet (9.3 m^2) of area to be drained into the separator. Parking garages in which servicing, repairing or washing is not conducted, and in which gasoline is not dispensed, shall not require a separator. Areas of commercial garages utilized only for storage of automobiles are not required to be drained through a separator.

1003.5 Sand interceptors in commercial establishments.
Sand and similar interceptors for heavy solids shall be designed and located so as to be provided with ready access for cleaning, and shall have a water seal of not less than 6 inches (152 mm).

1003.6 Laundries.
Laundry facilities not installed within an individual dwelling unit or intended for individual family use shall be equipped with an interceptor with a wire basket or similar device, removable for cleaning, that prevents passage into the drainage system of solids $^1/_2$ inch (12.7 mm) or larger in size, string, rags, buttons or other materials detrimental to the public sewage system.

1003.7 Bottling establishments.
Bottling plants shall discharge process wastes into an interceptor that will provide for the separation of broken glass or other solids before discharging waste into the drainage system.

1003.8 Slaughterhouses.
Slaughtering room and dressing room drains shall be equipped with approved separators. The separator shall prevent the discharge into the drainage system of feathers, entrails and other materials that cause clogging.

1003.9 Venting of interceptors and separators.
Interceptors and separators shall be designed so as not to become air bound where tight covers are utilized. Each interceptor or separator shall be vented where subject to a loss of trap seal.

1003.10 Access and maintenance of interceptors and separators.
Access shall be provided to each interceptor and separator for service and maintenance. Interceptors and separators shall be maintained by periodic removal of accumulated grease, scum, oil, or other floating substances and solids deposited in the interceptor or separator.

SECTION 1004 MATERIALS, JOINTS AND CONNECTIONS

1004.1 General.
The materials and methods utilized for the construction and installation of traps, interceptors and separators shall comply with this chapter and the applicable provisions of Chapters 4 and 7. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow of the piping.

2.2 Federal

Federal regulatory requirements related to FOG are established and enforced by the Environmental Protection Agency (EPA). The EPA issues National Pollutant Discharge Elimination System (NPDES) permits to Publicly Owned Treatment Works (POTW) to establish allowable threshold limits for contaminant concentrations in effluent discharges. Additionally, excessive sanitary sewer overflows (SSO) in sewer collection systems can trigger clean water act violations from the EPA. FOG can be a direct or contributing factor to SSOs in sewer collection systems when FOG creates an obstruction to sewer flow. Violating the terms of the NPDES permit or the clean water act can result in fines and enforcement actions such as Consent Decrees issued by the EPA to the POTW. Enforcement actions by the EPA may require the POTW to perform increased capacity, management, operations, and maintenance (CMOM) activities, sewer collection

and treatment upgrades and enforcement actions to Food Service Establishments (FSE) to reduce FOG in the sewer collection system.

The EPA National Pretreatment Program implements Clean Water Act requirements to regulate pollutants in POTWs' influent flows. A major objective of the program is to promote General Pretreatment Regulations that require state and local pretreatment programs to control the pollutants that pass through or interfere with the POTW treatment process or possibly contaminate the POTW sewage sludge. In order to meet these requirements, the removal of FOG contributed by FSE may be necessary. In particular, the Pretreatment Program regulations in 40 CFR 403.5(b)(3) prohibit "solid or viscous pollutants in amounts which will cause obstruction" in the POTW and its collection system.

POTWs can use the EPA National Pretreatment Program to provide regulatory tools and authority for local pretreatment programs to control interference with the POTW treatment process. The provisions of Part 403.5(c)(1) and 403.5(c)(2) indicate that a POTW must establish and enforce specific local limits for industrial users to prevent interference with the operation of the POTW if there is an existing pretreatment program or if the POTW has experienced interference or pass-through violations.

General Pretreatment Regulations or local authority can be used by POTWs to establish and enforce FOG regulatory controls towards FSE such as numeric pretreatment limits and best management practices (e.g., interceptor/collector devices) to reduce interferences with POTW operations. POTWs can use fines and surcharges to FSE sewer bills to enforce violations of the FOG regulatory controls. EPA has identified typical numeric local limits controlling oil and grease in the range of 50 mg/L to 450 mg/L with an average of 100 mg/L. Each municipality or sewer enterprise has its own regulations that may be more stringent than federal regulations.

2.3 State

2.3.1 Connecticut

The Connecticut Department of Energy and Environmental Protection (DEEP) has developed a statewide Fats, Oils, and Grease (FOG) Model Program for discharges to sanitary sewerage systems to assist municipalities and private facilities with the collection and disposal of FOG. There are approximately 110 municipal, state and private Water Pollution Control Facilities (WPCFs) in Connecticut. The FOG Model Program produced by the City of Torrington and funded by the Connecticut DEEP identified the importance of creating a General Permit as the key administrative tool to assist communities in controlling FOG.

The purpose of the General Permit is to require and standardize the routine removal of FOG from all food service establishments including but not limited to restaurants, hotel kitchens, hospitals, school kitchens, and bars. The "No Registration - No Fee" General Permit as finalized, covers all Class III and IV food service establishments that discharge to sanitary sewers. Although the final enforcement authority will be with the DEEP, the municipalities are encouraged to utilize this General Permit to resolve FOG issues at the local level.

October 2015: DEEP has reissued the General Permit for the Discharge of Wastewater Associated with Food Service Establishments dated October 5, 2015. The FOG General Permit requires certain dischargers to municipal sewer systems to limit the amount of FOG of all Class III and IV food service discharges by installing either an outside grease trap/interceptor, an active grease recovery unit (AGRU) or Super-capacity grease interceptor (SCGI) in accordance with technical requirements specified in the general permit. The authorized agent approves the FOG management equipment to be installed.

The general permit is valid for a period of ten (10) years from the date of issuance.

The establishment owner is financially responsible for all charges including installation, maintenance, pumping, disposal and repair of treatment systems. The establishments are also responsible for any fines or cleanup costs associated with overflows or stoppages.

CONNECTICUT		
Description	**Wastewater**	**Other**
Regulatory Reference	The installation and design of FOG management equipment must be approved by the authorized agent. The installation and design are subject to the requirements of all applicable local plumbing/building codes, state building codes, state plumbing codes, Public Health Code and other laws of the municipality.	Local sewer ordinances
Permit Requirements	The CTDEEP General Permit is required and issued under the authority of section 22a-430b of the Connecticut General Statutes.	
Sampling and Monitoring	Section 22a-430-3: General Conditions Subsection (j) Monitoring, Records and Reporting Requirements -	
Inspection/Reporting Requirements	Section 22a-430-3: Subsection (c) Inspection and Entry	
Penalties/Enforcement	Section 22a-430-3: Subsection (p) Permit Revocation, Denial, or Modification	

Collection system O&M guide

Contacts at CTDEEP for More Information:
Iliana Raffa at 860-424-3758
mailto:Iliana.Raffa@ct.gov

MUNICIPAL WASTEWATER PROGRAM
PLANNING AND STANDARDS DIVISION
DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

Reference Information
https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fs2_treat_intercept.pdf

Guidance Documents:
https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fog_outreach_w_notes.pdf

https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fog_faq.pdf

https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fs1_compliance.pdf

https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fs5_p2bmp.pdf

https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/fs6_records.pdf

https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/industrial_wastewater/resourceguide.pdf

2.3.2 Maine

MAINE			
Description	**Wastewater**	**Plumbing Code**	**Other**
Regulatory Reference	06-696 ch 528-529 40 CFR 403.5	1014.1-3	N/A
Permit Requirements	Must follow NPDES or local POTW discharge regulations	GGI or AGCD must be present and properly sized	DEP has mandated that all sewer agencies in the State of Maine have a comprehensive FOG reduction and management program. SUO prohibits discharge of sewer-blocking substances.
Sampling and Monitoring	4 grab samples if POTW sets pretreatment standard	N/A	
Inspection/Reporting Requirements	Self-reporting	Must pull permit	
Penalties/Enforcement	N/A	Fine	

2.3.2.1 District/Municipality

2.3.2.1.1 Augusta

AUGUSTA, MAINE	
Description	**FOG Program**
Regulatory Reference	GAUD Grease Interceptor Standards
Permit Requirements	$25 application (includes sizing assessment), properly sized, BMPs
Sampling and Monitoring	If non-compliant (>100 mg/L)
Inspection/Reporting Requirements	$50 inspection, 4x per year, keep records 2 years
Penalties/Enforcement	Discontinuation of service, loss of license

2.3.2.1.2 Biddeford

BIDDEFORD, MAINE	
Description	**FOG Program**
Regulatory Reference	40 CFR 403) Sec. 70-241
Permit Requirements	$75 registration fee, properly sized, written BMP
Sampling and Monitoring	Subject to director
Inspection/Reporting Requirements	25% rule OR quarterly (waiver), 3yr records
Penalties/Enforcement	$25-200 fine per offense of any of above

2.3.2.1.3 Kennebunkport

KENNEBUNKPORT, MAINE	
Description	**FOG Program**
Regulatory Reference	
Permit Requirements	Properly sized
Sampling and Monitoring	None
Inspection/Reporting Requirements	None
Penalties/Enforcement	Fines

2.3.2.1.4 Portland

PORTLAND, MAINE	
Description	**FOG Program**
Regulatory Reference	As allowed in Chapter 24; Section 47, part 8, of the City's Code of Ordinances, and Chapter 2; Section 10, part C of the City's Rules and Regulations for Use of the Sewer System, the following rules are addressing the City's Fats, Oils, and Grease Program. City staff have right of entry for inspection and sampling as allowed by Chapter 24; Section 52.
Permit Requirements	Properly sized, BMPs
Sampling and Monitoring	None required
Inspection/Reporting Requirements	25% rule OR quarterly (waiver), 3yr records
Penalties/Enforcement	$1000 per day, charged double pumping cost

2.3.2.1.5 Other Communities

All other communities have focused entirely on outreach (BMPs, recommendations) including Bangor, Berwick, Bethel, Boothbay, and Eastport.

Bridgton – 25 mg/L, no program
Lewiston-Auburn has an AD with FOG added as feedstock

2.3.3 Massachusetts

MASSACHUSETTS			
Description	**Wastewater**	**Plumbing Code**	**Health Code**
Regulatory Reference	314 CMR 12.00 O&M and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	248 CMR 10.00 10.09 Sizing Criteria Included. O&M required.	105 CMR 590 590.006 Water, Plumbing and Waste Federal 1999 Food Code Chapter 5 2017 Food Code is most recent
Permit Requirements	NPDES Permit Specific or Municipal Compliance Program. Implement a program to manage the discharge of fats, oil, and grease (FOG) to the sewer system to make sure they are removed at the source to prevent problems downstream (like raw sewage overflows). Adopt a FOG ordinance and regularly inspect facilities that generate grease, such as restaurants, to make sure the owners are operating and maintaining their grease traps properly.		
Sampling and Monitoring	No specific criteria	No specific criteria	
Inspection/Reporting Requirements	No specific criteria	Required	
Penalties/Enforcement			

Collection system O&M guide
http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/omrguide.pdf
Contacts at MassDEP for More Information:

- David Ferris, MassDEP Boston, 617-654-6514.
- Kevin Brander, MassDEP Northeast Region, Wilmington, 978-694-3236
- Robert Kimball, MassDEP Central Region, Worcester, 508-767-2722
- Jeff Gould, MassDEP Southeast Region, Lakeville, 508-946-2757
- Paul Nietupski, MassDEP Western Region, Springfield, 413-755-2218

Reference Information

http://www.mass.gov/eea/agencies/massdep/water/regulations/municipal-compliance-fact-sheet-wastewater.html
http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-12-00-o-and-m-and-pretreatment-standards-for-wwtps.html
http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/sewerfax514.pdf
http://www.mass.gov/eea/agencies/massdep/water/wastewater/grease-traps.html
http://www.mass.gov/eea/docs/dep/water/wastewater/o-thru-v/pbgrease.pdf

2.3.3.1 District/Municipality

2.3.3.1.1 MWRA

http://www.mwra.com/trac/regulations/2009/360-cmr-10.pdf

2.3.3.1.2 Greater Lawrence Sanitary District

http://www.glsd.org/industrial-pretreatment/rules-regulations/

2.3.3.1.3 Taunton

https://www.taunton-ma.gov/taunton-fog-program/pages/fog-regulations

2.3.4 New Hampshire

NHDES/WATER Division/WRBP rules. As discussed, most control is local within the Winnipesaukee River Basin Program (10 communities). Please see the language in 1203.04. In addition, each of the member communities have their own Sewer Use Ordinances.

Additional Regulations at NHDES…
Please see section Env-Wq 704.01 (b) in this link:

https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-wq700.pdf

2.3.5 Rhode Island

RHODE ISLAND		
Description	**Plumbing Code**	**Health Code**
Regulatory Reference	International Plumbing Code and RI Plumbing Code: SBC-3	RI Food Code [23-1, 21-27-FOOD]
Permit Requirements	RI Plumbing Code: SBC-3 Chapter 8: Indirect/Special Waste exception to IPC section 802.1.1 Chapter 10: Traps 1003.1 Interceptors required 1003.2 Approval	Chapter 5: Water, Plumbing and Waste Section 5-2 Plumbing System 5-202.11(A) Approved System and Cleanable Fixtures Section 5-4 Sewage, Other Liquid Waste, and Rainwater 5-402.10 Establishment Drainage System 5-402.12 Grease Trap Chapter 8: Compliance and Enforcement Section 8-3 Permit to Operate
Sampling and Monitoring		
Inspection/Reporting Requirements		Chapter 8, Section 8-4 Inspection and Correction of Violations
Penalties/Enforcement		Chapter 8, Section 8-6 Enforcement

2.6 Vermont

VERMONT		
Description	**Plumbing Code**	**Health Code**
Regulatory Reference	International Plumbing Code and Vermont Plumbing Rules Appendix (E) Design of Interceptor – Reference 2012 IPC Section 1003	State of Vermont, Agency of Human Services, Department of Health, Chapter 5, Subchapter 2 Food Service Establishments, Sections 5-204 through 5-220
Permit Requirements	Appendix (E) Design of Interceptor – Reference 2012 IPC Section 1003	5-211 Plumbing Item 29: Plumbing- Properly Installed, Maintained D. Establishment Drainage System F. Grease Trap Item 30. Plumbing – No Cross-Connection, Backflow or Back Siphonage I. Establishment Drainage System
Sampling and Monitoring		
Inspection/Reporting Requirements		
Penalties/Enforcement		

3.0 PUBLIC OUTREACH

3.1 New England FOG Program Outreach

3.1.1 NEWEA Survey Round 1

The NEWEA CSC FOG Task Force conducted an Outreach Survey - ROUND 1. Survey contents are listed below.

Fats, oils and grease, more commonly known as FOG, currently represent one of the largest problems for wastewater utilities and their customers. Many communities are facing challenges associated with managing FOG discharges, the impacts they have on collection and treatment systems, educating sewer users on the impacts of FOG, and overcoming political hurdles associated with instituting local regulatory compliance and enforcement of FOG discharges.

The NEWEA Collection Systems Committee is studying the effects of FOG on collection system operations in order to produce a white paper that stakeholders can review for a clear understanding this issue. To this end, we would appreciate your participation in a brief survey on your professional experiences dealing with FOG in the collection system and beyond.

Would you consider yourself

- Collection system maintenance
- FOG program administration

<u>FOG-Related O&M Issues</u>

How frequently do you face pipe blockages per year due to FOG?

- 1-4 per year
- 5-10
- >10
- Other, please specify:

How frequently do sanitary sewer overflows (SSO) occur per year due to FOG?

- 1-4 per year
- 5-10
- >10
- Other, please specify:

How often do you jet sewer lines to remove FOG?

- Monthly
- Quarterly
- 6-mo
- Yearly
- Other, please specify:

How often do you treat sewer lines, e.g., introduce additives or products, to remove FOG?

- Monthly
- Quarterly
- 6-mo
- Yearly
- Other, please specify:

How frequently do you clean pump stations to remove FOG?

- Weekly
- Monthly
- Quarterly
- 6-mo
- Other, please specify:

What is your approximate yearly cost for collection system O&M related to FOG?

- <5K
- 5-10K
- 10-20K
- >20K
- Other, please specify:

FOG Program

Do you have a FOG program in place?

- Y
- N
- Program being prepared/drafted

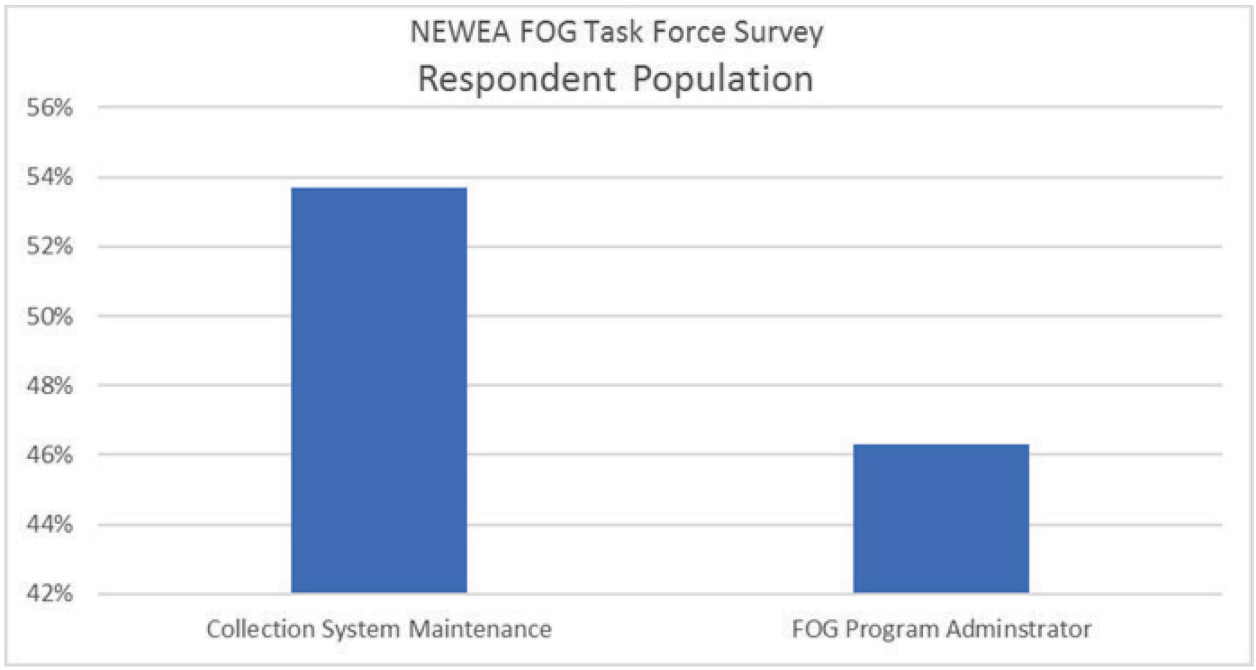
If Yes, which of the following is included in your program? (select all that apply)

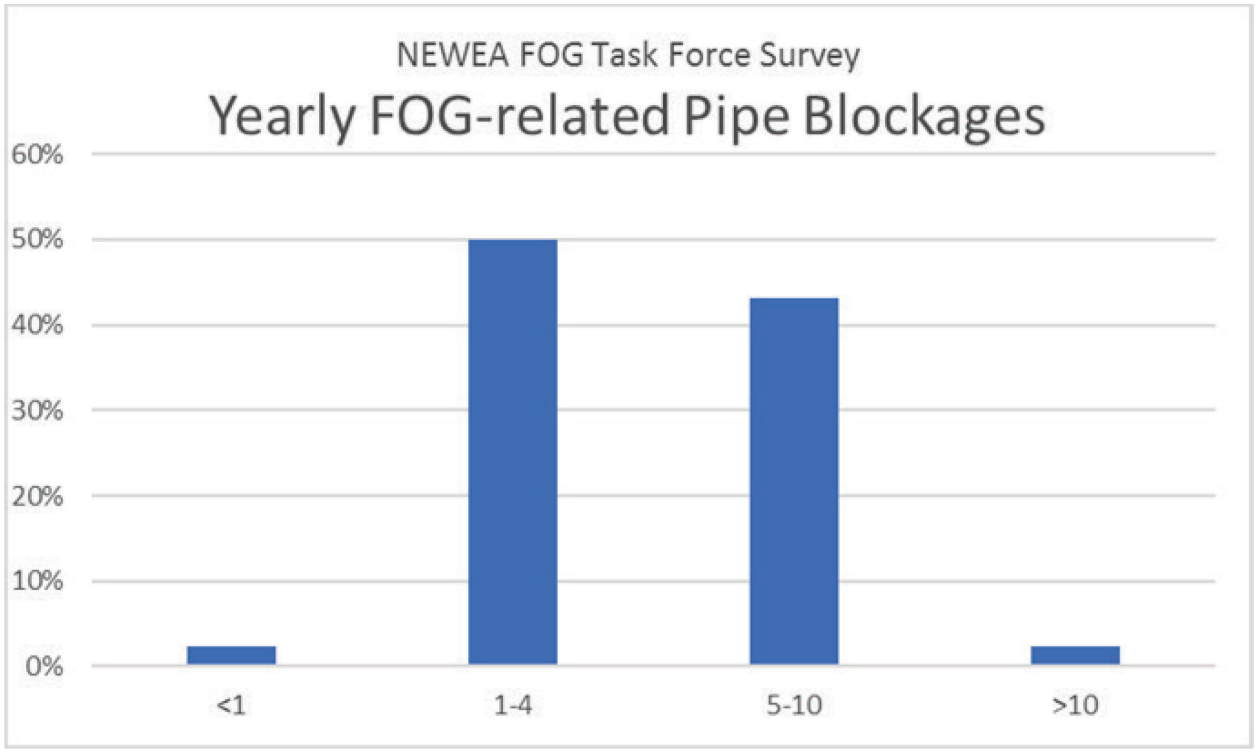
- Outreach/advertising
- Food Service Establishment / Kitchen BMPs
- Pretreatment program
- Effluent compliance limits
- Grease interceptor/trap/Grease Removal Unit (GRU) inspections
- Code enforcement

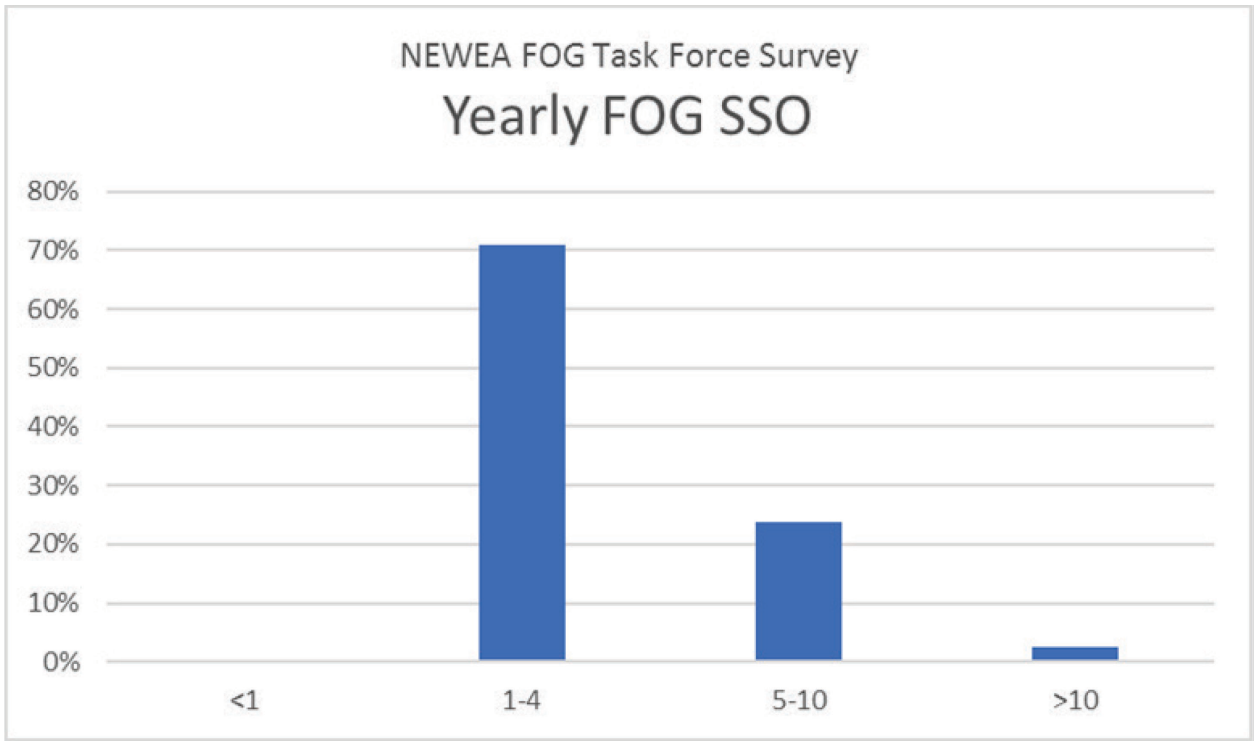
What challenges does the program face?

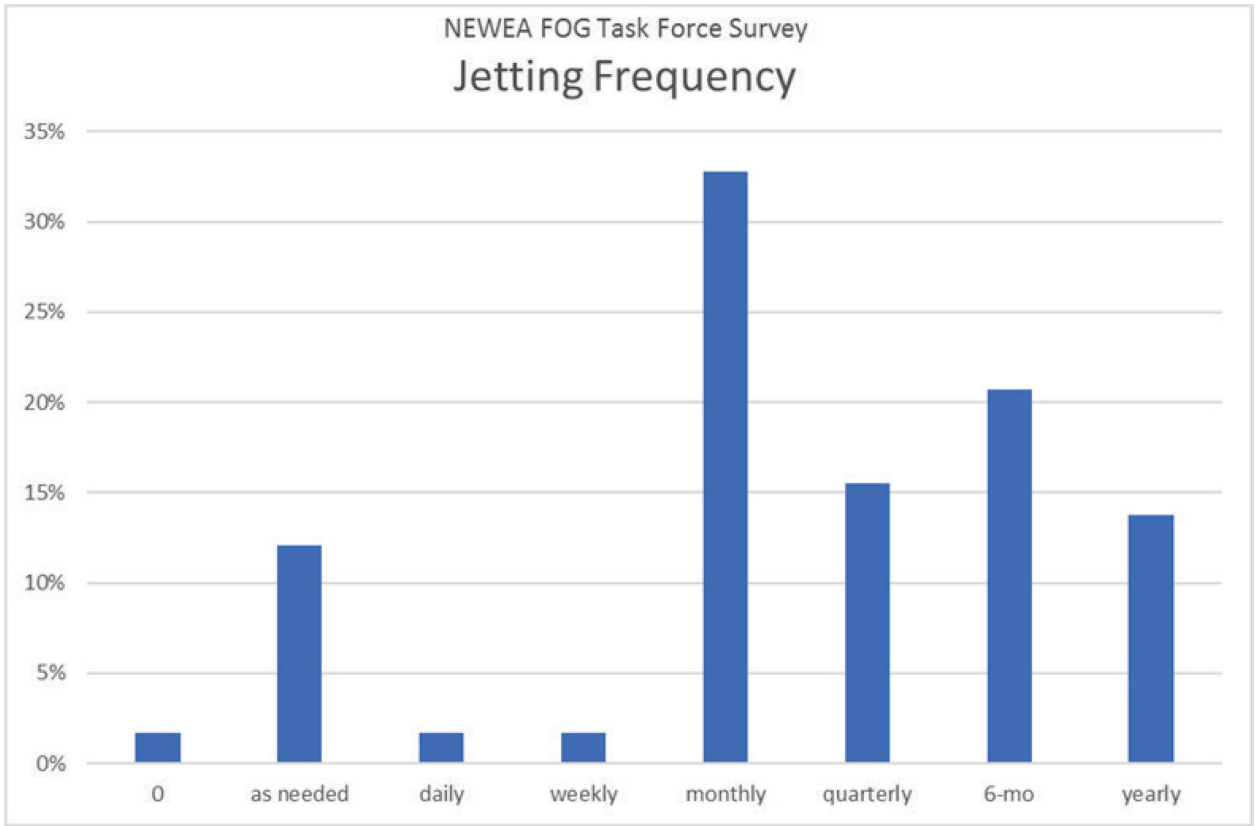
- Limited budget
- Limited staff
- Political hurdles/jurisdictional battles
- Lack of FOG-producer knowledge about problem
- Challenges from FOG producers
- Under-sized interceptor/trap/GRU
- Lack of interceptor/trap/GRU maintenance or record-keeping
- Lack of enforcement

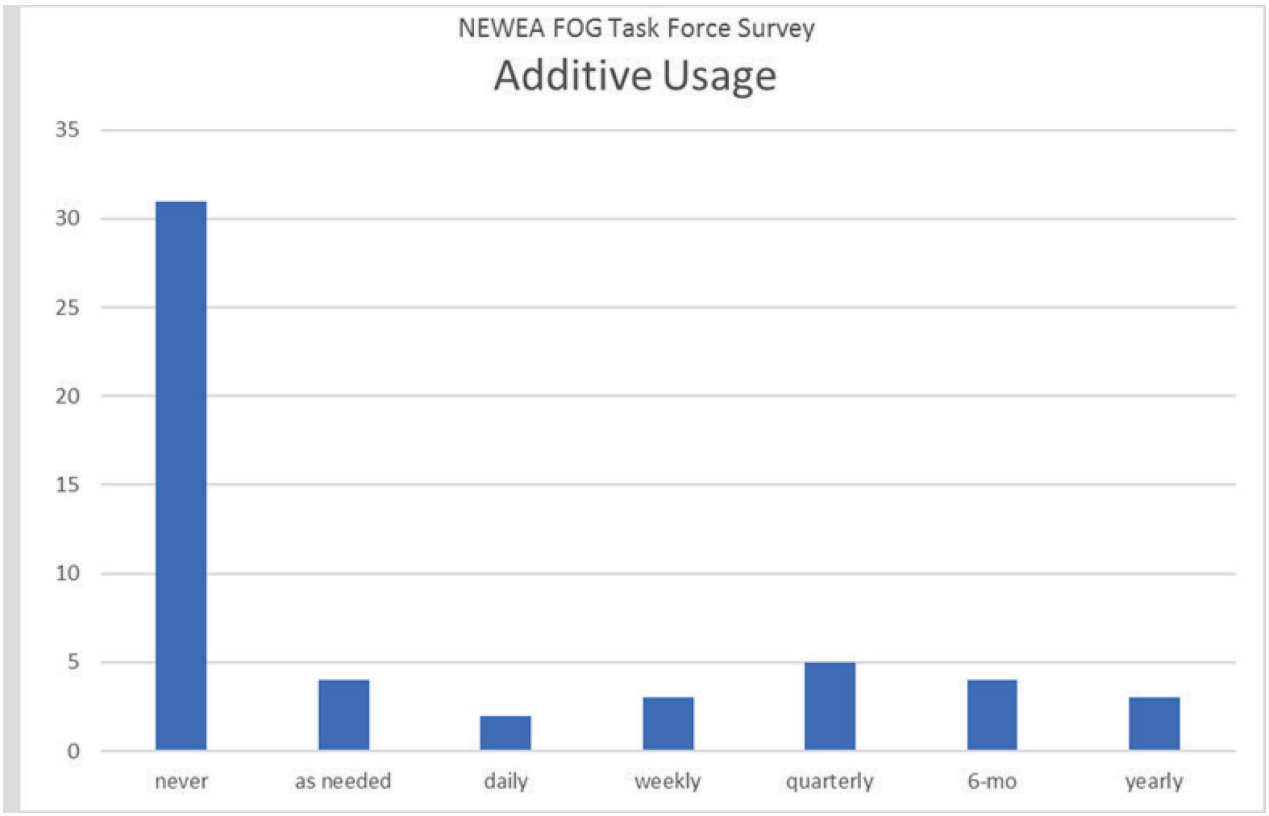
Round 1 Results are presented in the graphics below.

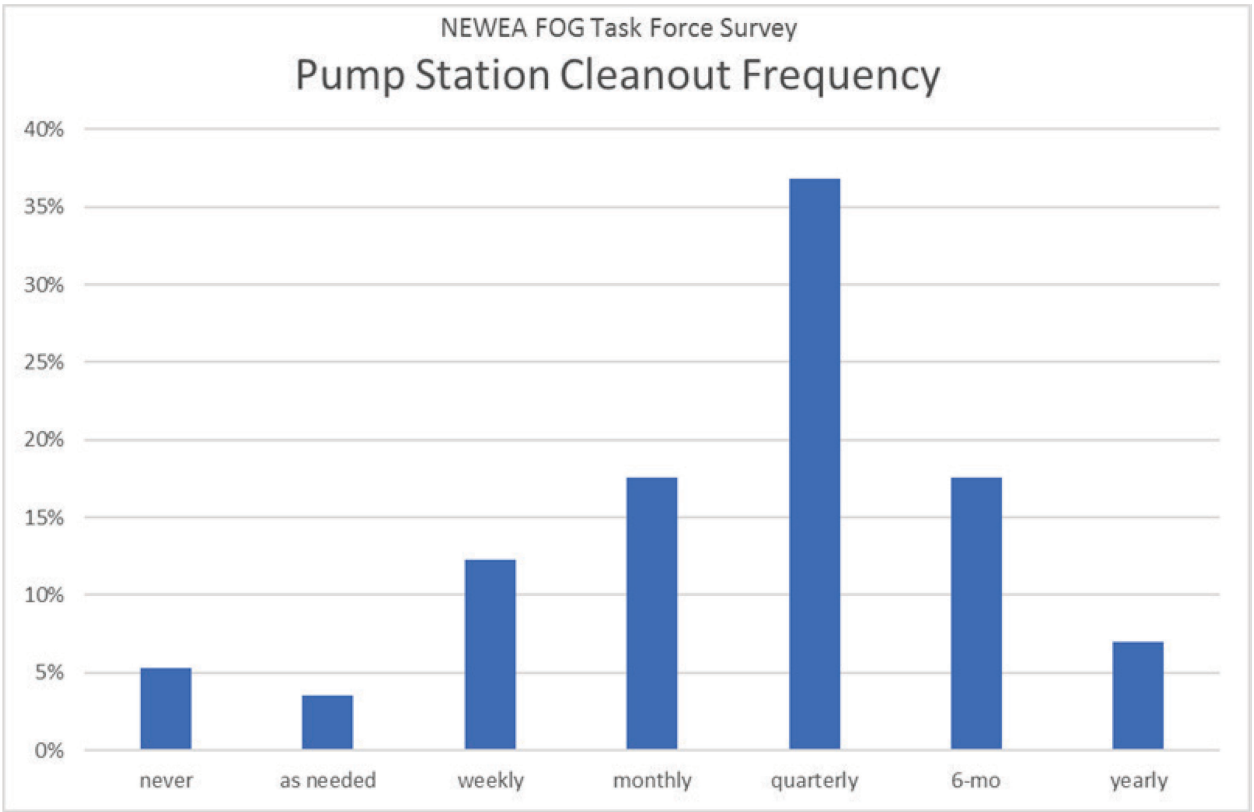

NEWEA FOG Task Force Survey
Respondent Population
56%
54%
52%
50%
48%
46%
44%
42%
Collection System Maintenance
FOG Program Adminstrator

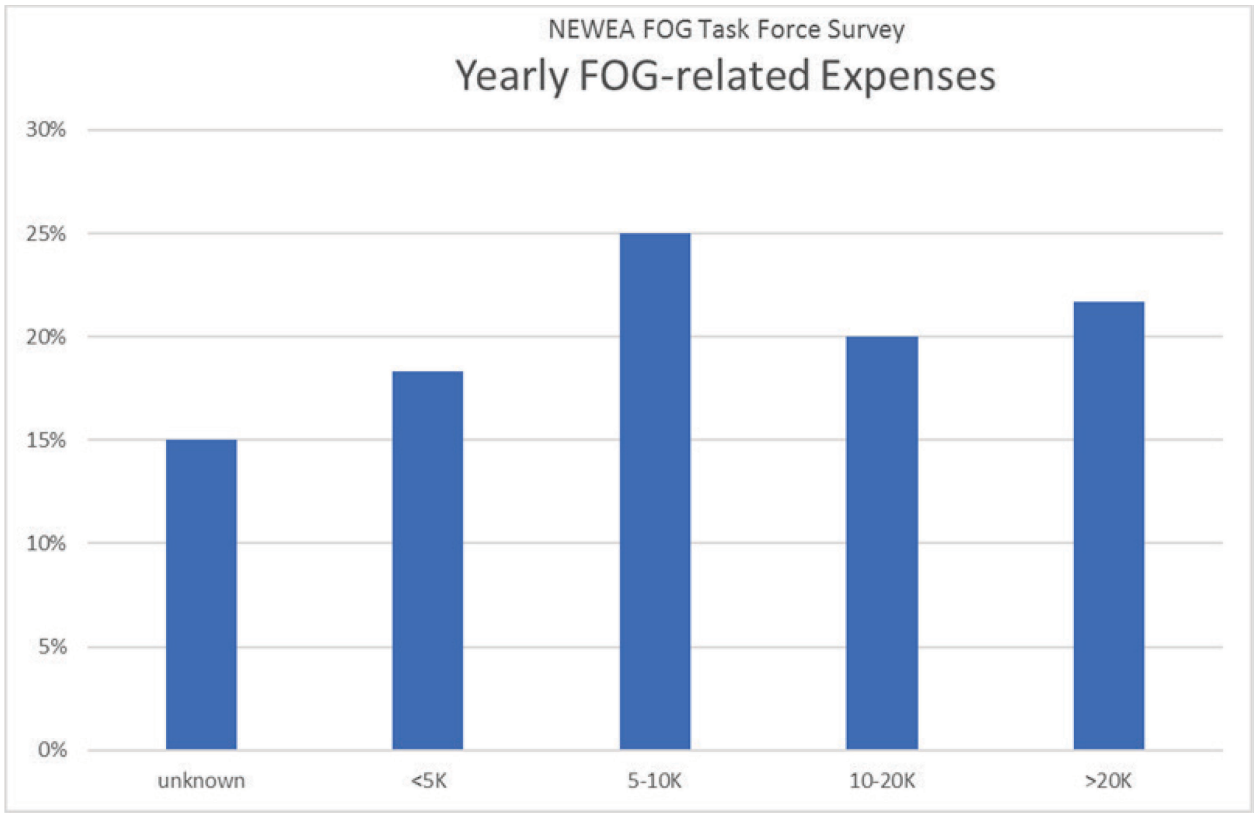

NEWEA FOG Task Force Survey
Yearly FOG-related Pipe Blockages
60%
50%
40%
30%
20%
10%
0%
<1
1-4
5-10
>10

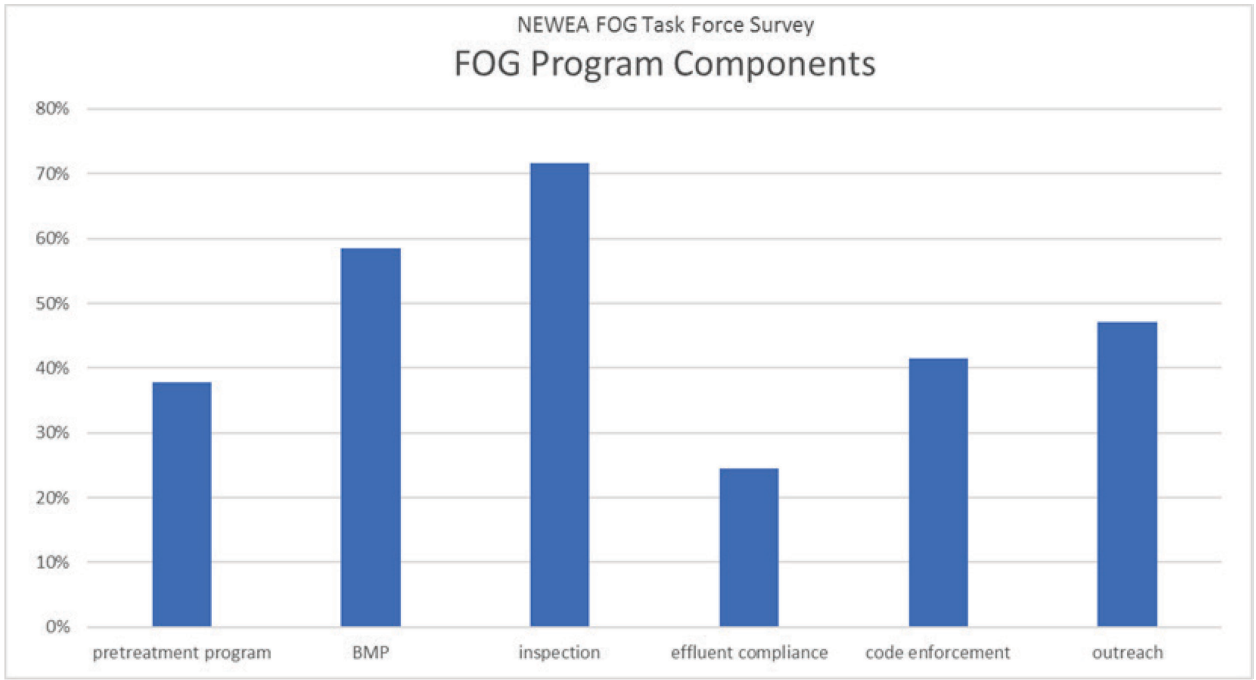

NEWEA FOG Task Force Survey
Yearly FOG SSO
80%
70%
60%
50%
40%
30%
20%
10%
0%
<1
1-4
5-10
>10

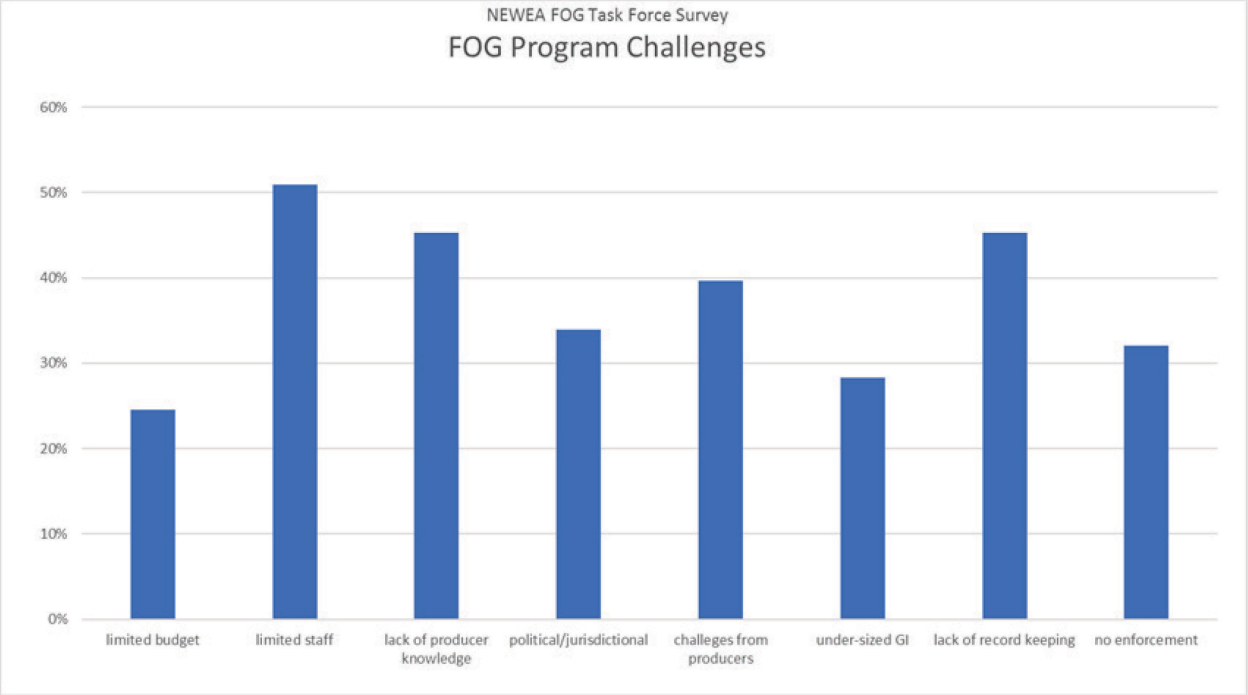

NEWEA FOG Task Force Survey
Jetting Frequency
35%
30%
25%
20%
15%
10%
5%
0%
0
as needed
daily
weekly
monthly
quarterly
6-mo
yearly


NEWEA FOG Task Force Survey
Additive Usage
35
30
25
20
15
10
5
0
never
as needed
daily
weekly
quarterly
6-mo
yearly


NEWEA FOG Task Force Survey
Pump Station Cleanout Frequency
40%
35%
30%
25%
20%
15%
10%
5%
0%
never
as needed
weekly
monthly
quarterly
6-mo
yearly


NEWEA FOG Task Force Survey
Yearly FOG-related Expenses
30%
25%
20%
15%
10%
5%
0%
unknown
<5K
5-10K
10-20K
>20K


NEWEA FOG Task Force Survey
FOG Program Components
80%
70%
60%
50%
40%
30%
20%
10%
0%
pretreatment program
BMP
inspection
effluent compliance
code enforcement
outreach


NEWEA FOG Task Force Survey
FOG Program Challenges
60%
50%
40%
30%
20%
10%
0%
limited budget
limited staff
lack of producer knowledge
political/jurisdictional
challeges from producers
under-sized GI
lack of record keeping
no enforcement

3.1.2 NEWEA Survey Round 2

The second round of the FOG Survey included two sets of questions targeted specifically to Collection Systems Maintenance Professionals and Regulators and FOG Program Administrators. Survey contents are listed below.

The NEWEA Collection Systems Committee hopes you will continue to provide your feedback for completion of this important initiative. Thank You.

ENTER NAME: _____
ENTER ORGANIZATION/MUNICIPALITY: _____

QUESTION 1: What best describes your role in combating FOG?

- A. Treatment/Collection System
- B. Pretreatment/FOG Program Coordination

If respondent answer is A:

Thank you for your valuable input to our initial survey on FOG within your community. To analyze this topic in more detail, we would appreciate any further information you can provide.

Please describe any equipment, product, and techniques that you've found to be effective in combating FOG:

- The only treatment we have used is various de-greasers in known problem areas.
- The 1,000 gallon exterior tanks work the best. For Class 3 and 4 food establishments, we require automatic approved AGRU manufacturers, Big-Dipper, Josem, Highland Tank and International. We recently started looking at Super Capacity units. We recently installed a Madoro mixing system in a couple pump station wet wells that seems to be beneficial in cutting grease.
- Stopping at the source through continued inspections, This includes working with business owners to explain the impacts of FOG entering the collection system and leading to issues with filaments during the winter, specifically M. Parvicella. We have historically always had some amount of M. Parvicella in the plant process each year from February to June. Last year we tried something different in that when we skimmed our secondary tanks of the M. Parvicella foaming it would be pumped back to one of the primary tanks. Unfortunately doing this kept the M. Parvicella in the plant process for much longer than we would prefer. What we decided to try last season, when the plant flows dropped below 0.4 MGD, was to take the primary tank off line that received the skimmed off foam. This allowed us to isolate the filamentous material and " kill" it in this tank before it could accumulate. The resulting primary sludge would be wasted out of the process. We are currently doing it right now to combat the M. Parvicella.
- Preventative maintenance cleaning of the sewer lines and enforcement of commercial grease trap regulations.
- Properly sized grease traps and regular good old fashion pump outs.
- Regular flushing.

- Product used in flushing of sewer lines is pretty effective.
- We use a chemical at our sewer pump stations that reportedly helps, but I don't know what brand it is.
- The department and the Town Plumbing inspector have been proactive in assigning generous capacity to standard box interceptors. This mitigates some of the regular maintenance issues that occur during the busy summer season. We have touted the benefits of hydromechanical interceptors on new food handling applicants, with fair success, which keeps their FOG out of the treatment facility altogether, instead of handling those grease trap pump outs.
- Our FOG program is tied to the victualers license. The restaurant has to prove to Code Enforcement that their grease trap has been maintained the previous year before they can renew their license.
- Combination vacuum/jetter truck

Please describe any equipment, product, and techniques that you've found to be less effective in combating FOG:

- The above units are only effective as the units are properly maintained.
- Have not seen any particular products that when used eliminate the problem.
- Degreasers, just moves the FOG to the WPCF causing process control issues.
- Most chemical methods simply transfer the product downstream for handling a second time.
- I have not purchased any chemical feed units for wet wells because I felt that they were expensive and the residence times could not be met. I only have six pump stations so it is easier to schedule the staff to clean each wet well quarterly
- Chlorinating the RAS. and several years ago we also purchased some product which did not work as advertised.
- Have not found chemical or biological wetwell additives to be effective.
- Powdered degreaser that companies sell that you put in manholes - doesn't work at all.

Do you see any trends in the number and location of FOG-related SSO (i.e., is the problem growing or receding)?

- We have noticed an increase of grease in areas with no commercial restaurant contributions.
- Grease is a problem in some areas of town. Yes, SSO and backups seem to be on the rise.
- Growing problem.
- Areas with high density of restaurants. Also some residential areas. Particularly we have been finding SSOs occur on lines near dead ends of the collection system where flow does not move the grease.
- Receding slightly
- Growing, often seen as a cultural matter in residential areas, not restricted to restaurants.
- We only own the larger diameter sewers. Because of this, I believe we are not exposed to the grease related problems that may exist in the smaller diameter pipes. Therefore, I have not seen much change.
- We can control it through proper FOG inspections, extensive jetting of lines from restaurants during the summer to prevent the FOG, that has built up in our pipes, from being flushed out of the collection system in the late winter/ early spring.
- No.
- Getting better.
- Our problems are receding.
- Steady.

To what extent do you perform proactive maintenance? (to prevent a problem before it happens)
What is the approximate cost breakdown of this maintenance?

- We only respond to problems areas.
- Periodically clean and flush problem areas. Video inspect and install cured in place sewer lining of clay pipe mains and interceptors. Performed Infiltration and Inflow study and partial SSES study.
- Areas that have SSOs occur we have commercial grease traps inspected and regulations enforced, violations and fines are then issued.
- Repeat areas are set up for regular inspections and preventative maintenance cleaning of the sewer lines.
- Rigorous inspection and pump out program.
- Hot spot flushing up to one time per month, restaurant and neighborhood visits, door hanger awareness postings, newsletters and electronic forums like Vermont's neighborhood Front Porch Forum, and any other means that may present itself.
- We do regular cleanings of our pump station wet well. The only other grease problems (that I have not yet addressed) are siphons. We also have a couple of areas near large housing facilities where we perform annual flushing.
- We do at least three FOG inspections per year. We are currently getting ready to purchase a new trailer jetter for proper preventative maintenance of our collection system.
- Not much! We intend to have our pump station wetwells pumped out periodically, but it has only been done once in the last several years to my knowledge.
- Annual gravity line jetting.
- We clean 2/3 of our system every year.
- Check problem areas monthly, send mailers if reoccurring issue, let Board of Health know of problem areas so they can investigate restaurants, we also are in the process of finishing our clean and CCTV efforts of the sewer system

Proactive Maintenance Cost

- $10,000/yr
- Approximately $500-600K per year.
- Significant costs.
- Pretty costly
- Not determined
- Each wet well cleaning takes about 3 Operators 4 hours to clean using a vacuum truck. For flushing of the siphons, I'm guessing that it would take three Operators about 8 hours because of the repeated, slow flushing that is needed to get the degreaser to soften the built up grease.
- In hours it can be close to 500-600 working hours per year. This would include time for the daily hosing of tanks that is required, to FOG inspections, to collection system preventative maintenance, to reporting any effluent noncompliance events that may occur.
- We also have to waste more, which increases costs for electricity, polymer and sludge disposal fee.
- Not sure.
- Around $6000/yr, on a $300,000 operating budget.
- $14,400 per year.
- $500,000 a year

To what extent do you perform reactive maintenance? (reacting to a problem)
What is the approximate cost breakdown of this maintenance?

- Town has approximately 210 mile of sewer, 10 pump stations and a wastewater Treatment Plant. Some of our mains go off road, along water courses or wetlands. We have the equipment to clear blockages, however, we cannot get to evaluate all areas of town that have sanitary sewers.
- Trying to become more proactive in preventing the problems before they occur with our newer CMOM/SSO programs.
- Seldom as we really stay on top of the preventative maintenance
- Minimized
- Very rarely. We have found that the grease accumulates when there is a structural problem to the pipe causing some sort of backup. We focus more of our efforts on resolving the structural problems.
- We had one FOG related blockage in January.
- Within pipelines, if we have a sewer main backup, we bring the jetter out to clear it. This is done a handful of times per year in various locations.
- Not very often. Maybe 3 times each year. We are a small system, with 3000 customers.
- 15% of time.

Reactive Maintenance Cost:

- $500K per year.
- Significant costs
- When it happens its very costly
- Not determined
- I don't have those details.
- Easily in the thousands per year.
- Not sure.
- $40,000 a year

What would make O&M:
Easier?
Less expensive?
Less time-consuming?
Less disruptive?
Less hazardous?

- Putting problem areas on a regular frequency with applications such as a drip pump.
- Regional mutual aid.
- Trying to eliminate the grease at the source before it gets into the collection system. More external grease traps where the property owners are responsible for removing grease.
- "Since we are a 0.8 MGD MLE waste activated sludge treatment plant, we are much more vulnerable to plant upsets caused by filamentous bacteria. More effectively units design for AGRU, to make cleaning and daily /weekly maintenance less dirty and time consuming for business owners. Many of our restaurant customers are utilizing third party vendors to clean and or pump out their indoor AGRUs.

- More public education to eliminate sources of FOG. We have one small neighborhood pump station that is always full of grease and only has about 20 residences tributary. We need to reach out to these people and tell them not to dump FOG down the drain. A water bill stuffer or something similar would probably be a good start, then some targeted outreach in the worst areas.
- Better operating procedures from the generators of FOG.
- If people would take proper care of their grease. Households are now our worst offenders.
- Degreaser that actually worked, eliminating grease at the source.

Do you believe that you would you save money by being more proactive?

- Yes=7
- No=4

Does maintenance in the CS save effort and cost in the WWTF?

- Yes=9
- No=1

For your community's FOG program, please discuss the following (Successes, Challenges, Cost-Benefit, Community Impact)

- The biggest problem is getting restaurant owners to abide by the ordinance and get their grease pumped regularly, mostly because it's a small summer community with many restaurants opened only between April/May to November and they don't want to pay for it. Especially since internal traps should be cleaned once a month, and the small independent businesses either don't have the funds or refuse to spend them. Our program is in its infancy, so there's no way to tell the long term effects of what we've been trying to do. Our biggest problem is compliance.
- Success: Having FSE's register with the department and the opportunity to educate and apply effective but not overly burdensome equipment to take care of actual issues.
- Challenges: Pumpers buy in to the program, not to pump late at night and go, but to remove all contents of the tank, stick the tank to measure % solids, inspect the tees and downstream sampling of manhole to determine if it is overloaded and passing grease."
- Successes: community has developed program and staffed part-time resulting mostly in compliance. Town has in some cases involved property owners to help bring their tenants into compliance.
- Challenges: 1) State issues permit but walks away from commitment- providing no outreach to local programs or the restaurants and refuses to enforce its own permit when provided with (even) statewide non-compliance issues. 2) Statewide permit has an end of pipe focus (Food Service Establishment) rather than focus consistent with federal mandated user charge system which targets connection/property owners thru local mandated and approved ordinance/regulations. This results in difficult town enforcement of local restaurateurs who come and go, and solutions to problems that focus on end of pipe (box in the kitchen) vs involvement of property owners providing properly designed pre-treatment (i.e. external FOG interceptors) for their buildings use. 3) Contract tank pumpers are unregulated, so skim pumping, infrequent pumping, and inadequate recordkeeping results. This results in them being part of the problem and not part of the solution. 4) Third party certification (PDI/ASME) and the shortcomings of its testing results in the proliferation of "alternative units."
- We have cleaned up the city very much so. Once you start a fog program you cannot stop - the FSEs need to know that you will be coming through the door every 4 months or so looking for cleaning records of grease interception equipment. That's what will make your program work.

- The challenges are numerous. The program is being built from scratch, which has its benefits. I would say the largest challenge so far has been reviewing and revising the District's Rules & Regulations. Trying to develop and add the correct language to the document that clearly outlines the new program and the consequences for not meeting the new expectations is a daunting task for someone not familiar with these types of legal documents.
- There are many other challenges that you also don't necessarily even consider. Creating a relationship and working with the Code Enforcement office, "branding" of the program, working with residents vs commercial users, to name a few. The largest success that I've had so far in my short tenure here has easily been the energy that everyone here at the district has for this project to succeed. I've been able to feed off that energy and it's pushing me to try and create what I hope is a model program.
- MDC has a robust grease trap program that requires food service establishments (FSEs) to install Active Grease Recovery Units or Outdoor grease interceptors. They need to clean each of these units out every 90 days and records of this must be maintained. MDC currently works with our towns' building departments and health departments to complete a plan review of any FSEs.
- The challenging part of this is that enforcement and compliance needs persistent staff inspections and due to lack of staffing and money this is not being done as much as it needs to be. Facilities need to be inspected and know that they will be inspected in the future. Due to high turnover in restaurants and the staff there is always a need to retrain and reinform the facilities of the requirements. In addition, even receiving grease trap cleaning manifests does not result in the units being maintained. Inspection is still necessary as not all pumpers are completing the required cleaning and our inspections are the only way to determine that.
- All facilities have in ground or automatic recovery equipment (275). Compliance is poor, no ordinance or management interest. No State oversight or direction, every town or district has a different approach to enforcement, education, equipment selection plan review etc., etc.
- A very poorly run program from the State level down to the local; some communities have support but they are far and few between.
- Presently the City does not have an official program; our challenge is that City officials have to buy into our program we have developed.
- Successful IPP - FROM OUR 2017 CMOM REPORT - Programs to Reduce Extraneous Flows and Fats, Oils, and Grease (FOG)
    - Review of the WSA's Industrial Pretreatment Program (IPP) Annual Report demonstrates that 636 commercial and industrial users are currently permitted by our Program. Our IPP is currently processing an additional 38 wastewater discharge applications. Of these total 674 commercial and industrial locations, 351 are Food Service Establishments (FSE's) (343 permitted, 8 applicants). As part of the permitting exercises, our IPP personnel meet with the business owner and/or consultant to review our Program's pretreatment requirements, especially those for FOG (fats, oils and grease) and solids removal.
    - IPP personnel inspect the facility (if existing), review plans and flow information in order to gauge the most appropriate grease/solids removal device(s) for the facility/operations. Most of our permittees are required to install (at a minimum) internal trap(s), however several of our larger, high volume/flow facilities have been instructed to install external, in-ground interceptors. Additionally, the WSA requires that new developments, as well as existing commercial locations at time of connection, install an "observation/sampling" manhole on their exiting wastestream(s). This manhole allows for discreet observation and detection of excessive conventional pollutant discharges include FOG and solids.

- During inspections and meetings with our permittees, our IPP personnel discuss ways to mitigate FOG and solids entry into our collection system. We require the removal of garbage grinders if present and we discuss ways to improve housekeeping practices which directly affect their wastestreams. Additionally, we review the permittees' preventive maintenance programs for their grease/solids removal device(s) and emphasize the forbidden use of enzyme-containing products. Our IPP personnel routinely provide these FOG permittees with our IPP brochure "Quick Guide to Restaurant Discharge Maintenance" which provides answers to commonly asked questions regarding FOG and solids removal.
- In 2016, our IPP staff logged 950 contacts with FOG permittees, including 161 facility and field inspections, 522 emails, 14 facsimiles and 253 phone calls with our FOG permittees in an effort to ensure their permit compliance. It should be noted that 62 of our 343 permitted FOG locations are required to monitor their process wastestreams quarterly and provide WSA with data reports.
- All permitted locations maintain a grease trap/interceptor cleaning/maintenance log which is posted in a conspicuous location in the facility and made readily available to IPP inspectors when requested. Our high volume/flow facilities with external, in-ground interceptors are required to perform quarterly monitoring on their interceptor effluent to ensure that proper preventive maintenance is being performed on the unit. These reports are provided to the WSA's IPP for review.
- When sampling results demonstrate that a pollutant or pollutants exceed the permitted discharge limit(s), the permittee must comply with the following requirements.
  - Immediately, within 24 hours of becoming aware of the violation, the permittee must notify the Warwick Sewer Authority. Phone call, facsimile and email are appropriate notification;
  - The permittee must supply the Authority with written documentation as to the events which may have caused the non-compliance and the steps the Permittee has taken to avoid a reoccurrence;
  - The permittee must immediately repeat the sampling and analysis activities for the non-compliant parameter(s);
  - The permittee must submit the results of the initial repeat sampling within fifteen (15) days of the sampling event and ensure that the date of the initial repeat sampling event provides for the results of this analysis to be received by the Authority within thirty (30) days after the Permittee first became aware of the violation.
- These requirements provide for a prompt and comprehensive response to non-compliance that could potentially impact the collections system leading to an SSO. Failure to comply with these reporting requirements will result in enforcement action for each infraction of the reporting requirements identified above. Enforcement actions may include, but are not limited to the following, Notice of Violation (NOV), Significant Non-Compliance Violation (SNC), Administrative Order (AO), Show Cause Order, Civil Action. Fines may also accompany any/all of the aforementioned enforcement actions. With regard to IPP enforcement requirements, the Pretreatment Coordinator, Superintendent, Executive Director and WSA Board have varying levels of involvement in the execution of enforcement actions taken in response to permitted user non-compliance. Our IPP's Enforcement Response Plan (ERP) clearly identifies those individuals responsible for executing enforcement actions as they pertain to specific events of non-compliance. A table has been provided at the end of this report which includes the O&G enforcement actions taken with regard to our Food Service Establishment (FSE) permittees over the last IPP reporting year.

- Routine permittee inspections and monitoring/sampling events are regularly conducted and tracked by hard copy report and electronic data entry. In addition to facility inspection activities, IPP personnel routinely examine the condition of our permittees' "observation/sampling" manholes at the time of our inspection and monitoring activities. Where excessive FOG and/or solids are observed, adjacent manholes are inspected as well. The frequency at which these events are scheduled is driven by the permittees' potential to impact the collections system and our treatment facility. More frequent inspections may be conducted where sampling events indicate elevated or non-compliant pollutant results. Information regarding the discharge of elevated pollutant levels, noncompliant discharges, slug discharges, damaged manholes (i.e., loosened mortar/bricks, crumbling tables/inverts, damaged covers and/or framework) is shared with appropriate WSA personnel for corrective action/repair follow-up in order to ensure the integrity of the collections system. When IPP staff identify FOG in our collection system they immediately notify senior WSA staff and cleaning/flushing ensues where warranted. In the event that grease/solids are suspected to be a contributing factor in a back-up, IPP personnel perform comprehensive follow-up inspections on all facilities which flow through the back-up location. Where permit non-compliance is observed, appropriate enforcement action is taken as described earlier in this report.
- IPP "hard-copy" inspection reports and enforcement action documents are maintained with the company's pretreatment permit records. Electronic files are also maintained. Our IPP uses an Access-based commercial software package (Linko's) for storing our permittee information/monitoring results and for tracking required IPP activities. Permittee information may be retrieved by several criteria, including plat/lot location. Plat/lot locations are used to determine the commercial and industrial user base serviced by specific areas of our collections system. The program is quite helpful in identifying those permittees which flow through "problem" areas within our collection system (i.e., areas of grease blockage). IPP findings are always reviewed with appropriate WSA personnel and follow-up activities (e.g., flushing/repair of lines) are scheduled as deemed necessary.
- The WSA contends that reducing or "eliminating" the introduction of O&G into the collection system is a challenge with no clear-cut or simple solutions due to the uniqueness of each permitted FOG location. Despite the elevated levels of FOG sporadically observed (>300 mg/L) in our Permittees' wastestreams, we find no direct correlation between O&G levels observed in our collection system and these "non-compliant FOG" locations. In fact, most of the O&G issues we have encountered in our collection system have been classified as "aggravated blockages" or those blockages associated with other blockage causing materials such as roots, damaged or malformed lines/inverts and construction debris. In some instances, O&G issues have been traced back to primarily residential developments with little or no commercial FOG user flow.
- As previously discussed in our last CMOM report submittal, back in 2013 we began an extensive review of our local limits including those for conventional pollutants and in 2014 we submitted our Local Limits Derivation Report (LLDR) to RI Department of Environmental Management (RIDEM). As part of this report, O&G levels were examined extensively in a three year study conducted for Food Service Establishments (FSE) using external, in-ground, grease interceptor(s). We wanted to determine what level of treatment practical control technology could reasonably be expected using a properly installed and maintained interceptor(s). The results revealed the current limit of 100 mg/l could only be achieved 50 % of the time. The evidence from the study showed that a level of 300 mg/l was achievable more than 80 percent of the time. The recommendation of the LLDR was to leave the Oil & Grease limit in place of 100 mg/l for surcharge purposes only and add an achievable upper limit of 300 mg/l as the daily

maximum limit. This level was determined to be practical and attainable with proper management practices. Since the parameter of oil and grease would not be believed to be a concern regarding treatment, the main purpose of the limit would be for the protection of the collection system. Administration of an O&G surcharge fee will assist in funding any increase maintenance of the collection system needed; the charges would be fairly and equitably placed on the users that discharge the most grease. The upper limit provides for the reasonable assessment of users that need to modify their management practices or pretreatment equipment.

- We received preliminary approval of the LLDR from RI DEM as part of a Substantial Industrial Pretreatment Program (IPP) Modification on July 30th, 2014. The City of Warwick was provided preliminary approval of our Request for IPP Modification from RIDEM on October 22nd, 2014. On December 18th, 2014, the WSA Board voted unanimously to endorse the Substantial IPP Modification and formal Amendment to our SUO. The formal endorsement statement (letter) was provided to RIDEM as required by our RIPDES Permit RI0100234, Section I.C.4.e on December 23rd, 2014. Formal approval was provided by RIDEM on February 18th, 2015 and the amendment to our SUO was adopted on April 1, 2015.
- Since adopting the 300 mg/L O& G limit, non-compliance has been reduced significantly and data support the evidence from the 2014 study which showed that a level of 300 mg/l was achievable more than 80 percent of the time. Over the past reporting period, only thirteen (13) of the 62 FSE monitoring locations, or 19%, violated the 300 mg/L, one time during the reporting year. Six (6) of the 62 FSE monitoring locations, or 10%, violated the 300 mg/L limit two times during the reporting year. As previously stated, the 300 mg/L upper limit provides for the reasonable assessment of users that need to modify their management practices or pretreatment equipment. During the previous reporting period, three (3) locations consistently failed (100%) to maintain compliance with the 300 mg/L limit. One of the locations closed, however the other two locations were rigorously evaluated to determine if they required an upgrade to their grease removal systems. Our findings demonstrated that lack of proper maintenance of their grease removal system and failure to coordinate sampling events with maintenance activities were contributing to their non-compliant results. Both companies introduced more stringent maintenance and monitoring protocols over the past year resulting in a significant improvement in their monitoring results. Each location experienced only one O&G violation (410 and 460 mg/L) and repeat analysis of their interceptors' effluent demonstrated compliance with the 300 mg/L limit (200 mg/L and 38 mg/L). It's important to note that neither location performed additional maintenance on the interceptors prior to resampling. We have found that sampling too soon following the maintenance/pump out event can result in non-compliant results. As the tank fills, residual TSS and O&G remaining on the bottom and walls of the tank become suspended in the effluent leaving the tank resulting in an elevated reading. Allowing the tank to completely fill and equilibrate (solids settle and FOG floats) will demonstrate if the tank is working optimally (i.e., compliant data). Two other companies from the previous reporting year that experienced O&G violations installed new, larger capacity interceptors at their facilities. Both locations have maintained compliance with all conventional pollutant (O&G, CBOD and TSS) discharge limits since installation of their new pollutant removal systems. Presently our Pretreatment staff are working with two other businesses to help identify the reason for their non-compliance (poor system maintenance and/or coordination of sampling events, inadequate system, other).
- We definitely have seen improvement through more consistent enforcement of the FOG Rules spelled out in our SUO. Lift stations have seen less build up of FOG; however rags continue to

be a problem as they are in many collections systems. The challenge has been keeping some users in compliance and the lengthy process of enforcement action. Some larger users tend to act only after you point out problems rather than proactively monitoring their systems and some restaurants would prefer to ask for forgiveness when they fail to comply with interceptor maintenance.

- Challenge: Educating food service establishments the importance of proper maintenance of devices.
- Successes - We have seen an impact on a number of Food Service Establishments with regard to their practices and bringing to the attention of staff ways to reduce the amount of grease going into the collection system. School presentations to grade school children have been a huge success in educating the general public about household practices to reduce FOG and Non-flushables.
- Challenges - Conveying to FSE's the need to cooperate with the requirements of the City SUO.
- Cost - Benefit and Community Impact - The program began 2 years ago and has not seen a noticeable difference as of yet. A long term goal is to see a reduction in the frequency of cleaning wet wells.
- The GNHWPCA service area is about 97% compliant in regard to restaurants and the CT DEEP FOG General Permit. We sample all AGRU and in-ground grease interceptor effluent for BOD, TSS and FOG. If restaurants are not meeting our limits for these pollutants, they are billed as high strength customers. This has been great motivation for restaurants to keep their grease interceptors and AGRU's maintained as required.
- We have a lot of grease in areas where we have many apartment buildings or condos. These customers can be difficult to reach out to. We currently target these areas with door hangers and can lid tops. Education is key in these areas, but for low income renters, it can be difficult to get them to care about this issue. High density residential areas in the city are definitely the hardest areas to make a difference."
- Code enforcement has typically worked with restaurants to reduce FOG. We at the treatment plant have done more with public outreach to address this issue.
- AGRU units installed and inspected per classification on food
- WE CURRENTLY HAVE A WRITTEN, BUT NOT ACTIVE PROGRAM IN PLACE. OUR ONLY INSPECTIONS ARE THROUGH THE HEALTH INSPECTOR WHO INSPECTS AGRU'S DURING FACILITY INSPECTIONS. WE HAVE BEEN EXPERIENCING AN INCREASE IN GREASE LOADING AT THE TREATMENT PLANT DURING THE PAST YEAR AND HAVE RECENTLY BEEN TRYING TO ACTIVATE OUR PROGRAM. ONE OF THE MAIN PIECES IS IDENTIFING OUR LARGEST GREASE DISCHARGES (COM/IND) THROUGH SAMPLING AND THEN REQUIRE THEM TO TAKE CORRECTIVE ACTION. THIS IS A SLOW PROCESS DUE TO STAFF LEVELS.
- WE HAVE ALSO BEEN TRYING TO EDUCATE THE RESIDENTIAL USERS THROUGH PUBLIC OUTREACH AND TARGETED LETTERS TO SPECIFIC NEIGHBORHOODS (LIMITED SUCCESS).
- The NBC Grease Control Program has been in place since the early 1990s. It started out with permitting FSEs in problematic areas. Over time it has expanded to all FSEs. Since the inception of the grease control program we have seen the number of grease related investigations of the sewer system decrease.
- We are in the early stages of setting up our FOG program.

3.1.3 Existing FOG Training and Public Education

3.1.3.1 NHDES Training Outline

Ray Gordon NHDES Training Outline

The program consists of:

1) Introduction - What is Fog?
2) Regulations for FOG
   a. International plumbing Code
   b. State Subsurface Regulations
   c. Sewer Use Ordinances
   d. QUIZ on Regulations

3) Design Considerations for Grease interceptors
   a. Water Environment Research Federation Report
   b. National Pre-cast Concrete Association Recommendations
   c. ASTM Standards for Grease interceptors
   d. Other design Features

4) FOG Program Basics
   a. Elements of FOG control
      i. Sewer Cleaning
      ii. Design Structural issues and Roots
      iii. Source Control

   b. Enhanced FOG Management Plans
      i. Education
      ii. Performance Based Standards
      iii. Enforcement
      iv. Disposal

5) How to set up a FOG program for homeowners

3.1.3.2 NEIWPC Training

http://neiwpcc.org/our-programs/wastewater/collection-systems/

4.0 EXISTING FOG PROGRAM CHALLENGES

4.1 Costs and Cost Sharing Methods

Proper maintenance of FOG equipment and enforcement of FOG programs can be costly. Costs incurred by FOG generators may include permitting, discharge fees, capital equipment expenses, recurring maintenance demands, staff training, and potentially monetary penalties. Program enforcement will require many recurring staff hours absorbed by the governing authority.

While the costs of proper maintenance and compliance are often times discouraging, the total cost of collection system failures associated with FOGcan be grievous.

As described previously, allowing FOG to enter a sanitary wastewater collection system can have severe short-term and long-term consequences. Those consequences bring significant financial burdens to the agencies charged with maintaining sanitary wastewater collection systems; financial burdens which are ideally and typically conveyed to the FOG generators themselves.

The immediate financial burden borne by the maintaining agency will include the cost of cleaning collection system piping, manholes, pump stations, and equipment. Additional immediate costs will include capital expenses on equipment that can, through over-sizing or specific design, handle the impacts of FOG in the collection system. In the long term, FOG in the sanitary wastewater collection system may lead to accelerated corrosion, premature equipment failure, and loss of asset capacity. The maintaining agency will also bear the costs of emergency response. Emergency operations may be in response to pump station failure or pipe blockages, with SSOs resulting in public health risk and property damage. The cost of asset repair under emergency conditions may be many times higher than similar work under normal operating conditions.

While the costs to the maintaining agency can be mitigated with the enforcement of a well-designed FOG program, some costs will unavoidably still remain. The performance limitations of FOG interception equipment, reluctance of FOG generators to comply with mandated requirements, and the small quantities of FOG released by residential discharges will inevitably lead to some residual costs.

Governing authorities have varying methods of collecting revenue to address the resulting costs. These methods may be as simple as flat recurring fees charged to all sanitary wastewater dischargers, or as complex as fees based on flow rates and concentration.

Examples of various types of FOG-related revenue collection include:

- Flat user rates for each sanitary wastewater discharger (Burlington, VT)
- Discharger and grease interceptor permit registration fees (Boston, MA)
- Volume-based discharge fees, approximated by city water consumption rates, and adjusted by discharge classification as food service, industrial, or commercial/medical (Springfield, MA)
- Established monetary fines for permit or code violations (Hartford, CT)
- Direct owner billing for costs incurred by the governing authority, typically adjusted by an established rate as a monetary consequence (Portland, ME)
- Quantity-based (flow and concentration) discharge fees with a case-by-case engineering studies paid for by the registrant to establish constituent concentrations (New Haven, CT)

4.2 Funding Sources

Funding for the management and removal of FOG is mainly supported by municipalities and sewer enterprises. Sewer enterprises fund for FOG management and removal through their operating budgets, while municipalities typically use the General Fund. Additional local funding can be obtained through FSE inspection fees and fines.

An alternative external funding mechanism used by municipalities and sewer enterprises for FOG management is the State Revolving Fund (SRF). The SRF provides low interest loans to support municipalities and sewer enterprises to fund their FOG management programs. Municipalities and sewer enterprises submit applications to the SRF to receive a determination of eligibility.

Communities such as Bangor, Maine have developed FOG grant programs for the FSE to provide a source of funds to offset the purchase and installation of FOG equipment for eligible FSEs where no or inadequate FOG interceptors are present. This funding approach is a proactive method to encourage the FSE to be compliant with their local required best management practices for FOG.

4.3 Technical Issues

Sampling – Grab samples are not always indicative of discharge characteristics.

Monitoring Locations – monitoring locations are not always readily available or provided at grease removal units at FSEs.

4.4 Safety

There are a number of safety issues to be aware of when considering the topic of FOG. Some of these are referenced below. This is not intended to be a comprehensive list or discussion of safety issues or safe practices.

4.4.1 Public Health and Sanitation

One of the most fundamental safety issues relating to FOG is the consequence of significant impact of FOG building up in a collection system. The immediate impact of FOG in a collection system is capacity reduction. When capacity is reduced, the ability of a system to convey the flow it was designed for becomes reduced. When extreme conditions occur, a system with significant capacity loss due to FOG may become susceptible to SSO (Sanitary Sewer Overflow). This term is defined in detail elsewhere, but essentially SSO refers to sanitary wastewater exiting the conveyance/collection system - into basements, onto street surfaces, into water bodies or elsewhere. Untreated sanitary waste existing outside of the collection system is a danger to public health.

4.4.2 Slip and Fall

FOG on surfaces where people and or equipment may travel can cause danger. Caution should be exercised.

4.4.3 Unfamiliar territory

FOG management programs will often include an aspect of inspection of private property and/or businesses. Care should be taken when planning and conducting these inspections to become familiar with surroundings and identify potential hazards such as leaks, electrical wiring, poor lighting and emergency exits.

4.4.4 High Crime locations

When planning for the management of FOG and potential site or system inspections required as a result of FOG, care should be taken to identify potential need for police details or other types of security details in areas where high crime may be a concern.

4.4.5 Vectors

The presence of FOG in a collection system is likely to attract the likes of rodents, cockroaches and others 'pest' vectors. Care and thought should be applied to dealing with these vectors when planning for management of FOG in a collection system. Preventative measures such as rodent control, personal safety and other proactive measures should form part of a FOG management program.

5.0 FOG BEST MANAGEMENT PRACTICES

5.1 Stakeholders and Interested Parties

Stakeholders and interested parties include but are not limited to:

- Public Works
- Sewer Department
- Plumbing Inspector/Building Inspector
- Board of Health/Health Department
- FSEs and commercial properties
- Schools with cafeterias and other institutional facilities
- General Public

5.2 Training/Education

5.2.1 Food Service Establishments

• Fully understand how using kitchen Best Management Practices (BMPs) to control Fats, Oils, and Grease (FOG) can prevent sewer blockages and Sanitary Sewer Overflows.
• Be able to properly clean and maintain a grease control device up to 50 GPM (100 lb).
• Understand background and purpose for the FOG Program.
• Understand the responsibility of the FSE for preventing illicit FOG discharge.
• Three (3) year certification with the Regional FOG program.
• Prohibited discharge of Fats, Oils and Grease (FOG) causes or significantly contributes up to 2/3 of all SSOs within a collection system
• Management, Operations and Maintenance (MOM) Program should be established to efficiently resolve SSOs.
• FOG Program should be developed within MOM to monitor and regulate FOG waste.
• Food Service Establishments (FSEs) and Grease Hauler training programs should be established to inform and train FSE employees, and Hauler owner/operators.
• The FOG Ordinance is one measure providing adequate regulation to enforce maintenance of grease control devices.
• Reduce FOG-related Sanitary Sewer Overflows
• Provide increased education and awareness of FOG and improve FOG remediation efforts at Food Service Establishments

5.2.2 Private Residential/Apartment Rental FOG

• Fully understand how using Best Management Practices (BMPs) to control Fats, Oils, and Grease (FOG) in private homeowners' and renters' properties can prevent sewer blockages and Sanitary Sewer Overflows.
• Where does FOG come from? Meat fats (bacon, sausage), lard, cooking oil, butter or margarine, food scraps, baking products, milk, ice cream, yogurt, sour cream, cream based sauces, salad dressings, cheeses, mayonnaise.
• Preventative Measures for Homeowners and Renters:
• NEVER pour grease down sink drains or toilets.
• Dispose of cooled cooking fats, oils and grease into a waxed food container such as a milk carton or container with a lid and dispose of it in the garbage.
• Minimize the use of your garbage disposal. Foods containing FOG can get caught in the plumbing and cause sewer backups,
• Use baskets or strainers in sinks to catch food scraps.
•Empty scraps into the trash can.

• Scrape food scraps from dishes and pans into the trash can for disposal, before washing.
• DO NOT use the toilet for disposal of food scraps, sanitary items, rags, cloths, or towels.
• Impacts of FOG from Private Residences and Apartments: Grease related blockages can:
    • Cause the sewer to backup into your home through sinks, drains and toilets.
    • Cause backup of sewer into streets, parks, yards and waterways causing a public health risk and environmental concern.
• Raw sewage contains disease causing organisms that can be harmful to children, adults, and pets.
• Clean up and repairs for damage caused by sewer backups are expensive, unhealthy, and unpleasant.
• FOG related grease blockages increase the Commission's operation and maintenance costs resulting in higher sewer bills for all.
• Liquid dish detergents that claim to dissolve grease may actually pass grease down the sewer line, which could cause a sewer backup. It is important to scrape grease off all dishes.

5.3 Grease Removal Design

Adequate design and features for monitoring, sampling, etc. are necessary to achieve grease removal goals.

Grease interceptors are more effective in grease removal but require larger space.

Grease removal units need to be designed in accordance with standards, regulations and manufacturer requirements.

5.4 BMPs and Signage

BMPs and signage will allow for corrective actions to be implemented should FOG control measures in place be unsatisfactory. Potential BMP and signage measures are described below

5.4.1 Education/Training

- Establish a FOG-related FSE employee training program to include:
    - Require signage for proper FOG disposal requirements
    - Benefits of oil/grease recycling
    - Dispose food waste separately

5.4.2 Best Management Practices

- Develop a BMP education flyer that describes:
    - Housekeeping and dry wiping
    - Spill control measures
    - Covered storage areas
    - Accessibility to Grease Control Units
    - Clean kitchen exhaust filters properly

5.4.3 Increased Maintenance and Plumbing Inspections / Modifications

- Use a 3-sink system
- Number of fixtures discharging to unit meets sizing requirements
- Do not discharge water hotter than 140 degrees F through a grease trap or interceptor
- Do not allow excessive grease build-up
- Clean frequently based on manufacturer recommendation and/or FOG production
- Provide for proper ventilation and operation
- Provide location for obtaining samples

5.4.4 New/Additional Grease Control Units

- Install additional units if grease control units are undersized or cleaned too frequently
- Install units to service one (1) single FSE
- Replace or upgrade units to comply with current plumbing codes
- Replace or upgrade units with new units that provide greater FOG storage or increased removal efficiency

5.5 Grease Removal O&M

Grease Removal Units O&M is performed per manufacturer recommendations.

Grease interceptors generally do not require O&M, but only require periodic inspection and cleanout.

Records of O&M activities should be recorded.

5.6 Grease Treatment and Additives

Grease treatments and additives should only be used if allowed by regulations and/or Authorities having jurisdiction.

Selection of alternatives should be based on effectiveness, ease of use, cost, safety and appropriate site-specific considerations.

Additives that simply break down FOG to allow for transport downstream should be prohibited.

The effectiveness of any products should be verified before continued use.

5.7 FOG Recycling and Disposal

FOG removal and disposal companies have the ability to recycle FOG.

FOG generators should be made aware of local companies that offer recycling and disposal.

5.8 Inspections

An inspection programs should obtain the following information.

5.8.1 General

- Contact person at time of inspection
- Type of establishment, number of seats

5.8.2 BMPs

- Signage to keep FOG out of sinks, drains, mop sinks, etc.
- Employee training on FOG control
- Good housekeeping practices
- Spill control measures
- Oil and Grease recycling, storage and disposal methods

5.8.3 Grease Control Units/Traps and Grease Interceptors

- Number, location and size
- Maintenance Information and Records
- Disposal methods and locations/companies
- Sewer discharge locations
- Potential sampling locations
- Observable plumbing related issues, e.g. dishwasher discharging to grease control unit

5.8.4 Implementation of Inspection Program

Implementation of an inspection program should consider the following:

- Make contact with property owner to determine appropriate contact person and schedule an initial inspection
- Include a reply card with the DPW mailer for FSE establishments to provide contact information for employee contacts to schedule inspections. Notify FSEs that grease units will need to be opened by the FSE or their maintenance company for inspection.
- Request FSEs to provide maintenance records prior to or at the time of inspection.
- Streamline an inspection form to reduce data entry time
- Consider using a tablet-based inspection form that is populated or auto-filled with FSE information and can be completed more easily in the field using check boxes and abbreviated notations and can be linked to an electronic database for storage and ease of tracking and sorting.
- Provide a means for photos to be tagged to inspection forms.

5.9 Enforcement

Enforcement actions will need to be consist with applicable sewer user regulations or other legal authorization. Typical enforcement actions could include the following:

- Notification of Inspection Results
- Request for Recommended Corrective Actions to be addressed within a specified number of days.
- Compliance Monitoring follow-up inspection after Corrective Actions have been implemented.
- Notice of Non-Compliance.
- Notice to perform effluent sampling and analysis to demonstrate compliance.
- Notice of violation.
- Notice of fines.
- Notice of service termination for non-compliance or non-payment of fines.

Sufficient legal and administrative staff is required to implement enforcement actions.

For larger dischargers, a pretreatment program is more often the appropriate means for implementing enforcement actions, rather than a FOG control or management program.

5.10 Sampling and Analytical Testing

The traditional method for measuring the FOG level is to insert a core sampling device, typically called a "sludge judge," into the interceptor. A valve at the bottom of the sludge judge opens to allow the contents of the trap to enter the tube and closes when the operator removes it for inspection. Best practice recommends that a few minutes are needed to allow the three phases of sediment, water and FOG to settle out. Figure 5-1 shows that the distinction between layers is not always obvious.
In this case emulsification of the FOG by dishwasher effluent resulted in extensive grease/oil in the water layer.

Figure 5-1 – Interceptor "core" sample using "sludge judge"

The sludge judge is an inexpensive, simple and easy-to-use device. Regulators rely on it for their inspections of FSE's. Its limitations are:

1. It requires the removal of the interceptor cover to take a measurement.
2. The insertion and withdrawal of the judge is messy and requires clean-up of the sampler both on the inside and outside.
3. The sampling and clean-up is time consuming.
4. Automating the sludge judge for real time monitoring is impractical.

Several products have been introduced over the past two decades to address the shortcomings of the sludge judge. All are based on two technologies:

1. The predominant technology is ultrasonic. A typical configuration of an ultrasonic analyzer is a transducer/receiver suspended from the top of the trap. The receiver analyzes the acoustic signal reflected by the three interfaces and deduces their positions in the sample column. This technology offers real time monitoring and can, with calibration of the signal return, distinguish between sludge and water. Fouling of the transducer weakens the signal and necessitates frequent cleaning. Pricing for them runs upwards of $2500.
2. Electrical measurements form the basis of the second set. One initial foray (SepSensor) used conductivity measurements to distinguish between highly conductive water and less conductive FOG. Unfortunately, coating of the electrodes used to measure conductivity quickly decreased the conductivity of the water column and rendered the product impractical. Subsequent approaches switched to capacitance measurements, which make measurements based on electrical fields that extend well beyond the surface of the electrodes. Capacitance based probes offer a much less expensive option to ultrasonic transducers. The main drawback to existing capacitance probes is that the capacitance difference between sludge and water is small, making it difficult to distinguish the interface between the two.

The table below includes existing technologies for measuring the FOG, water and sludge levels in interceptors.

Technology	Principle of Operation	Advantages	Limitations	Manufacturers
"Sludge Judge"	Core sampling	Portable, Inexpensive	Time consuming. Can't be automated. Messy.	Nasco, Hach, Pollard Water, US Bluebook, Global Water
Ultrasonic	Reflection of acoustic waves from interfaces	Real time monitoring. Distinguishes sludge and water	Fouls; needs cleaning, Expensive	FOGSwatch, ATS Greasewatch, Zurn SmartPro
Resistance	Resistance varies with medium.	Least expensive. Simple and robust.	Resolution limited. Easily fouled.	SEP
Capacitance	Capacitance varies with medium.	Less expensive than ultrasonic. Less prone to fouling	Resolution limited. Low sensitivity to solids-water boundary	Canplas, Josam

Implicit in both newer modes of operation is that they enable real-time, remote monitoring. The monitoring can be done inside the food service establishment or at a company that services grease interceptors (aka "pumper").

5.11 Record Keeping

Various regulations require that select known FOG generators (usually Food Service Establishments) maintain records of their discharges and performance. This includes maintaining records on inspection, cleaning, and maintenance as needed and as mandated for a specified duration. If required, analytical records may also need to be kept. The agencies charged with enforcing those requirements and/or treating those discharges should additionally maintain similar records on the discharges, and the associated waste generators. Discovery of a failure to maintain mandated records may result in fines.

Mandated or recommended record keeping may include:

A. Records by Overseeing Agencies and/or Receiving Facilities
    1. FOG Generators
        a. FOG Sources (Fixtures/Appliances/Equipment/etc.)
            i. Estimated Flow Rates
            ii. Estimated FOG Concentrations
            iii. Summary of Maintenance Requirements
        b. Inspection Date/Time, Results, Outstanding Issues
            i. Record Status
            ii. Equipment Status
        c. Violation Reports and Statuses
    2. Troubled Segments of Sewer System
        a. SSO/Jetting Events
        b. Local Known FOG Generators
        c. Suspected Cause
        d. Inspection Schedule

B. Records by FOG Generators
    1. Inspection
        a. Equipment Description
        b. By Whom (Company/Individual)
        c. Date/Time
        d. Notes
    2. Cleaning
        a. Frequency
        b. Equipment Description
        c. Occurrence Details
            i. Date/Time
            ii. By Whom (Company/Individual)
            iii. Quantities
            iv. Method of Disposal
            v. Notes

Records need to provide adequate detail to verify compliance with all discharge monitoring and control requirements. If necessary, records should document failures to meet established standards and requirements, as well as the responses to those failures. Both waste generators and enforcing agencies should view these records as resources and not as hindrances; proper record keeping can provide protection from liability, and guidance for facility operational optimization.

6.0 SUMMARY

6.1 Limitations of White Paper

This white paper is made available by New England Water Environment Association's (NEWEA) Collection Systems Committee. The sole purpose of this white paper is to inform on the outlined topic. The information included herein should not be considered exhaustive, definitive, and/or peer reviewed. The views and opinions expressed in this white paper are representative of participants of the survey and do not reflect the opinions of NEWEA, its employees, general membership, and/or Executive Committee.