

Enhancing a Fats, Oils, and Grease Program Utilizing ArcGIS

Xavier V. Davis

GIS Specialist / FOG Program Coordinator

Peachtree City Water and Sewerage Authority



Abstract

ArcGIS has aided Peachtree City Water and Sewerage Authority (PCWASA) in reducing fats, oils, and grease (FOG) from entering the local wastewater collection system and treatment facilities. Through geovisualization, ArcGIS has become a problem analysis tool to help identify possible root causes of sewer line backups and sanitary sewer overflows (SSOs) due to grease from FOG generators. In addition, ArcGIS has simplified the routing and planning of required grease trap inspections. The Authority's ArcGIS serves as the central database for all FOG generators in which attributes are captured and locations are mapped.

ArcGIS has truly enhanced the PCWASA's FOG program by quick identification of clogged sewer lines due to grease, reduction of planning time and improved customer service.

Enhancing a Fats, Oils, and Grease Program Utilizing ArcGIS

Xavier V. Davis

GIS Specialist / FOG Program Coordinator

Peachtree City Water and Sewerage Authority



Fats, Oils, and Grease (FOG) can be a nuisance for any sanitary sewer system. FOG is one of the major causes of sewer line backups and sanitary sewer overflows (SSOs) in sanitary sewer systems. Peachtree City Water and Sewerage Authority (PCWASA) has benefited tremendously from ArcGIS in identifying heavy FOG areas in Peachtree City, Georgia. ArcGIS is helpful in locating sewer line backups and SSO areas. ArcGIS is also beneficial in grease trap mapping and inspection planning for our FOG program. The powerful combination of a successful FOG program with the mapping resources of ArcGIS delivers a one-two punch in the reduction of FOG in the PCWASA wastewater collection system.

PCWASA is a publicly owned utility charged with the collection and treatment of public, commercial, and industrial wastewater within the city of Peachtree City. The Authority owns and operates the entire sewer system infrastructure located in Peachtree City, Georgia. Georgia Utilities privately owned the city's sanitary sewer before the Authority purchased the system in 1996. The city's potable water supply infrastructure is owned and operated by the Fayette County Water System. The current sewer system infrastructure in Peachtree City consists of two [wastewater treatment plants](#), 35 pump stations, approximately 78,000 linear feet (14.5 miles) of force main, and approximately 900,000 linear feet (171 miles) of gravity sewer. PCWASA is overseen by a board that consists of five citizens appointed by the City Council. The Authority is divided into three divisions: Collections, Operations, and Technical Services.

The PCWASA FOG Program ensures that FOG generators are in compliance with the PCWASA Sewer Use Ordinance through proper grease trap installations, accurate grease trap FOG inspections, and adherence to established grease trap cleaning schedules. In addition, the FOG program educates the general public on residential grease problems.

The PCWASA FOG Program consists of a FOG Program Coordinator who administers and directs the FOG program. The FOG Program Coordinator performs grease trap inspections of approximately 150 FOG generators in Peachtree City, Georgia. The FOG Program Coordinator also reviews, inspects, and approves grease trap installations.

FOG is produced by meat processors, restaurants, food preparation businesses, cafeterias (located in places such as schools, hospitals, & prisons), and residential homeowners. It is derived from the living cells of animal and vegetable matter. FOG is used to aid in food preparation (i.e. deep-fryer fat) and is also produced during food preparation (i.e. bacon grease). FOG is generally broken down into two categories: yellow grease and brown grease. Yellow grease is inedible oil. It is grease that is used for or generated by cooking (i.e. pots, pans, grills, deep fryers) and has not been mixed with water. Yellow grease is a term from the rendering industry. Rendering is a process that converts waste animal tissue into stable, value-added materials such as biodiesel, animal feed for domestic livestock, soap making, and candle making. Brown grease consists of floatable FOG and settled solids that are recovered from grease traps. It is generated from the cleaning of equipment and utensils used in food preparation and food serving. Brown grease has generally come in contact with detergents, cleaning solutions, pesticides, and water. This type of grease is more difficult to reuse.

FOG can be a big problem for a wastewater collection system. As a result of FOG being produced from commercial facilities (restaurants, cafeterias, etc.) and residential areas (homes, apartments, etc.), FOG can accumulate in sanitary sewer systems which can lead to sewer line blockages and SSOs. Figure 1 illustrates how a sewer blockage affects the sewer system.

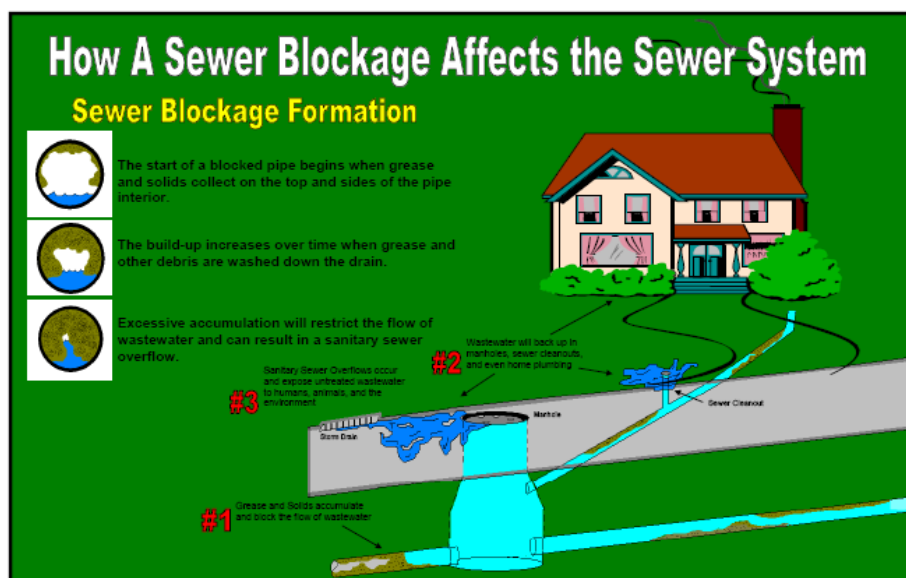


Figure 1: How a Sewer Blockage Affects the Sewer System
 (Retrieved from <http://www.georgiafog.com/>)

To help manage the FOG problem, PCWASA has incorporated ArcGIS as a tool to aid in identifying possible root causes of sewer line backups and SSOs due to grease from FOG generators. ArcGIS assists in the mapping of grease trap locations and capturing its attributes. Also, ArcGIS aids in the simplification of routing and planning of required grease trap inspections.

In identifying the root cause of sewer line backups and SSOs in the PCWASA sanitary sewer, a sewer basin map is created with ArcEditor and the ESRI Developer Sample Map Book program software (see Figure 2) by the PCWASA GIS Specialist/FOG Program Coordinator.

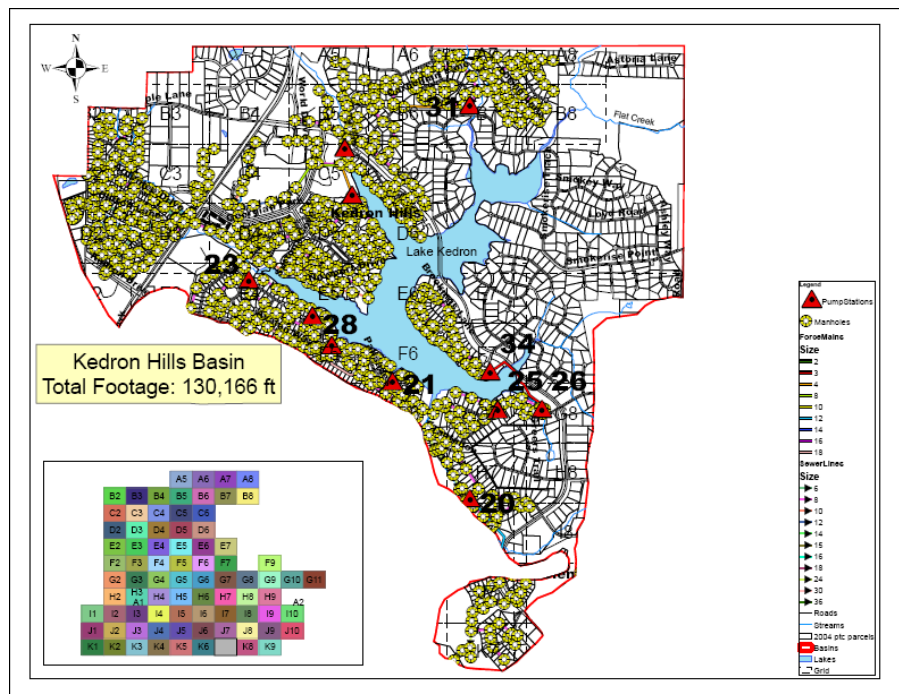


Figure 2: Example of a Sewer Basin Map used by the PCWASA TV Crew to film for possible root causes of Sewer Line Blockages and SSOs in PCWASA sanitary sewer.

The sewer basin map illustrates pump stations, sewer lines, force mains, manholes, etc. The sewer basin map also indicates the total footage of the sanitary sewer inside the basin area. This total footage is calculated in the sewer line attribute table using the Statistics function (performed by right-clicking on the Length field in the attribute table) to obtain a sum total length of the sewer line layer (see Figure 3).

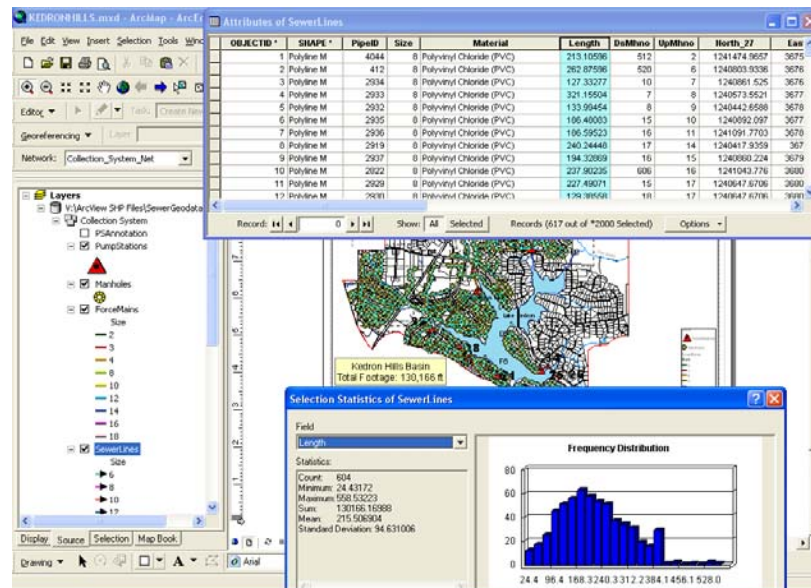


Figure 3: Summation of sanitary sewer line calculation to obtain total footage in sewer basin map.

Using the ESRI Developer Sample Map Book program, the sewer basin map is then divided into mini-basin maps. The mini-basin map provides detailed information on sanitary sewer flow direction, manhole location, and sewer line footage (see Figure 4).

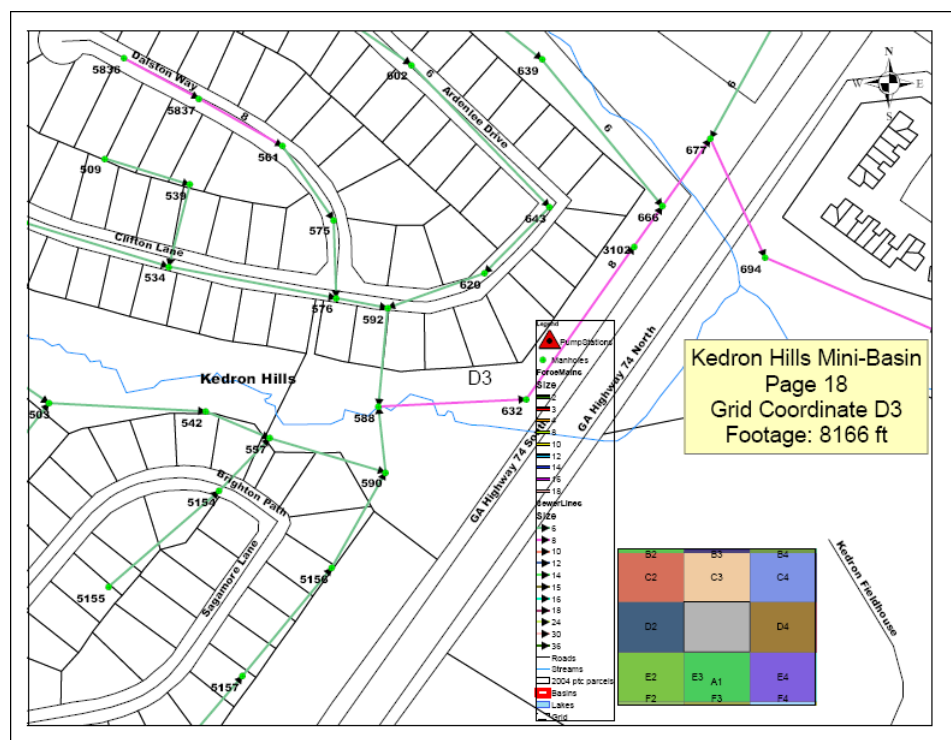


Figure 4: Example of a mini-basin map used by the PCWASA TV Crew to focus in on sewer line directional flow and manhole locations for sewer line blockage identification.

Case Study # 1: Sewer Line Backup Identification through the Assistance of ArcGIS

In May 2008, the PCWASA TV Crew was filming sanitary sewer near an apartment complex in the Kedron Hills Basin. Filming was postponed due to a huge volume of FOG found in the sanitary sewer.

The PCWASA GIS/FOG Program Coordinator was contacted regarding the aforementioned problem and produced a mini-basin map of the area for the clogged sewer line, manhole, and road information indicated by the TV Crew Supervisor. The map was reviewed for flow direction and possible FOG generators. In addition, commercial waste haulers were contacted to inquire about recent grease trap pumping activity in the Peachtree City area.

The commercial waste haulers that were contacted indicated that no recent grease trap pumping activities were performed in the Peachtree City area. Therefore, illegal FOG dumping was not performed. Illegal FOG dumping is unauthorized dumping of FOG inside a wastewater collection system. This type of dumping will potentially lead to SSOs in the sanitary sewer. The apartment complex shown on the map (see Figure 5) was identified as a potential FOG generator. The PCWASA Collections Crew Supervisor indicated that the nearby apartment complex had a private pump station which pumped into a PCWASA pump station servicing this area.

From these results, the PCWASA GIS Specialist/FOG Program Coordinator met with the Apartment Community Manager concerning the heavy volume of FOG in the nearby sewer line. As a result of the meeting, the PCWASA GIS Specialist/FOG Program Coordinator agreed to design a PCWASA FOG Reduction brochure for apartment residents. This PCWASA brochure would indicate the **do's** and **do not's** of proper grease disposal. In addition, the PCWASA Collections Crew cleaned the manhole to unclog the sewer line blockage.

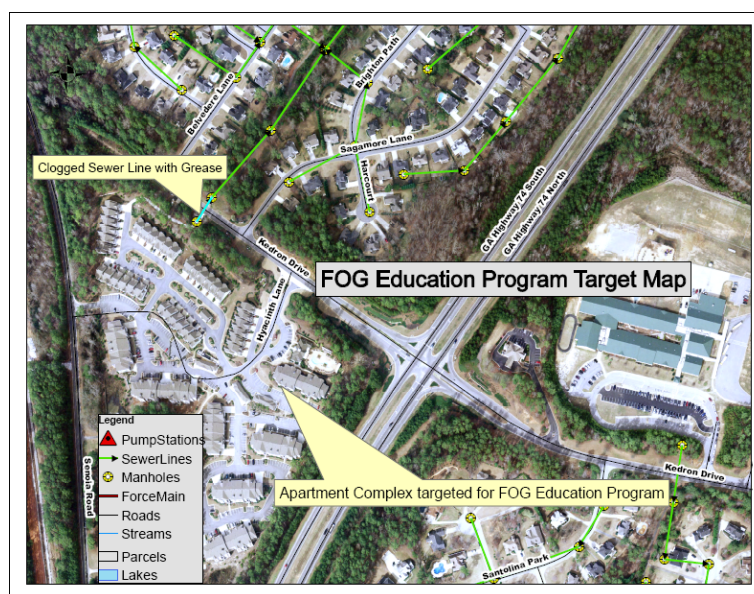


Figure 5: FOG Education Program Target Map

Case Study# 2: SSO Event Illustrated through ArcGIS

On January 2, 2007, the PCWASA Collections Manager informed the PCWASA GIS Specialist/FOG Program Coordinator that a SSO occurred in a Peachtree City residential area on New Year's Day (January 1, 2007). A Sanitary Sewer Overflow Map which indicates the SSO event was produced (see Figure 6).

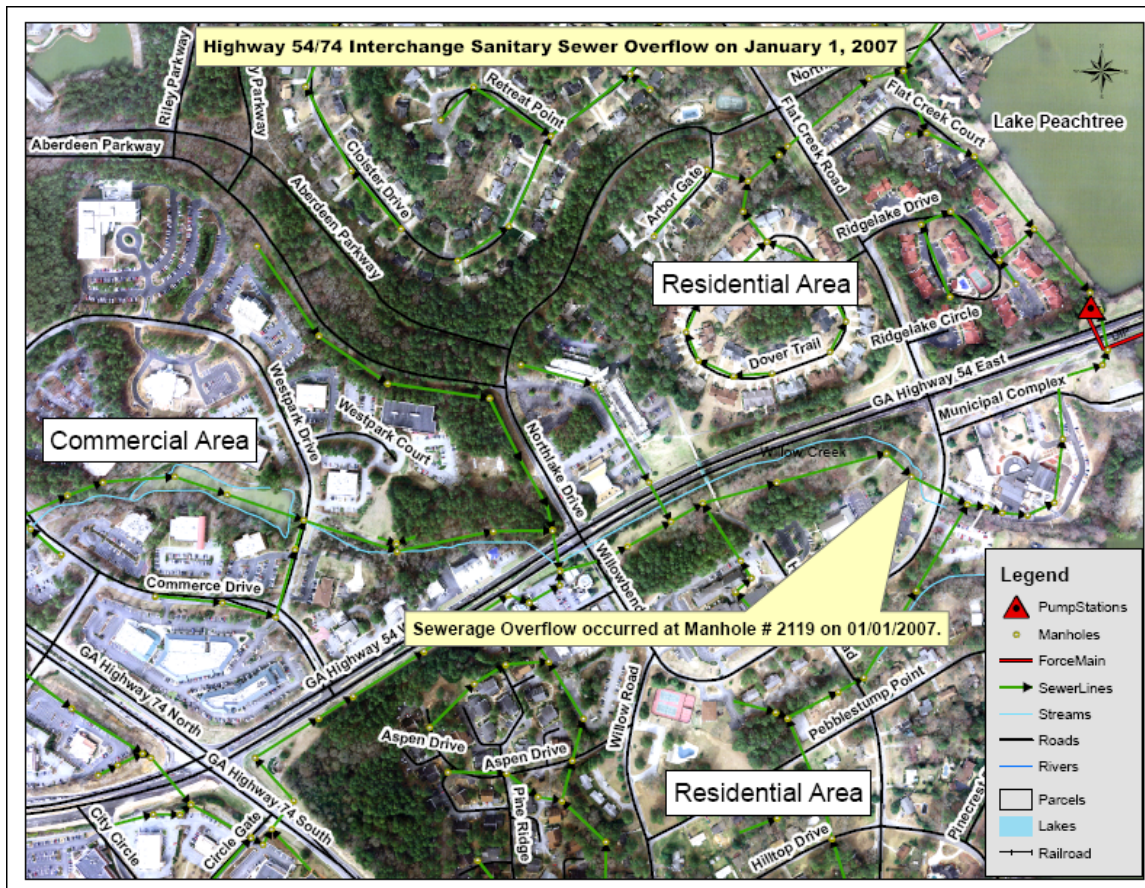


Figure 6: Sanitary Sewer Overflow Map

The PCWASA GIS Specialist/FOG Program Coordinator contacted several commercial waste haulers that pumped grease traps in Peachtree City during the 2006 holiday season. Out of the several commercial waste haulers contacted, only one (1) company had performed FOG pumping activity during the holiday season and faxed commercial waste manifests to the PCWASA GIS Specialist/FOG Program Coordinator.

A commercial waste manifest is a receipt form which indicates FOG pumping and disposal information for a grease trap.

The manifests did indicate that the FOG was pumped and properly disposed of. As a precautionary measure, the PCWASA GIS Specialist/FOG Program Coordinator decided to schedule and monitor FOG pumping activity with this particular commercial waste hauler for the next eight (8) months.

Over the next several months after the incident, the PCWASA GIS Specialist/FOG Program Coordinator investigated the SSO case.

The results of the investigation are as follows:

1. Heavy amounts of FOG in the commercial vicinity nearby the SSO area was found and observed by the PCWASA TV Crew.
2. The PCWASA TV Crew also filmed footage of the sanitary sewer lines in the residential vicinity of the SSO area. The TV Crew again discovered heavy amounts of FOG that possibly remained in the sewer lines for a long period of time and had not been cleaned.

Evidence of the investigation showed that the FOG may have not only come from the commercial areas but also from the residential areas. The cause of the SSO was due to old FOG that had not been cleaned from the investigated commercial and residential areas. As a result, the sanitary sewer lines became clogged which resulted in the SSO. These sanitary sewer lines would need to be put on a more frequent cleaning schedule conducted by the PCWASA Collections Crew.

From this evidence, ArcGIS will assist in providing mapped resources of commercial and residential heavy FOG areas for the GIS Specialist/FOG Program Coordinator, TV Crew, and Collections Crew. These mapped areas will aid in the preventive maintenance and emergency planning for the PCWASA sanitary sewer. This will prove beneficial in present and future situations of potential SSO events.

Using ArcEditor, mapping of PCWASA grease trap locations has been performed through the process of geocoding. Geocoding has given the PCWASA FOG Program the ability to identify grease trap locations for the purpose of planning and routing grease trap inspections. Geocoding is a GIS operation that converts street addresses into spatial data. This spatial data can be displayed as features on a map. The street address information is referenced in GIS from the street data layer.

To develop the PCWASA Grease Trap Locations Map (see Figure 7), a FOG Generator address layer was referenced against a street address GIS layer to geocode the map through the use of an address locator. An address locator is a dataset in ArcGIS that stores address attributes for translating non-spatial descriptions of places such as street addresses into spatial data. This spatial data can be displayed as features on a map. An address locator contains a snapshot of the reference data used in geocoding which matches addresses (see Figure 8).

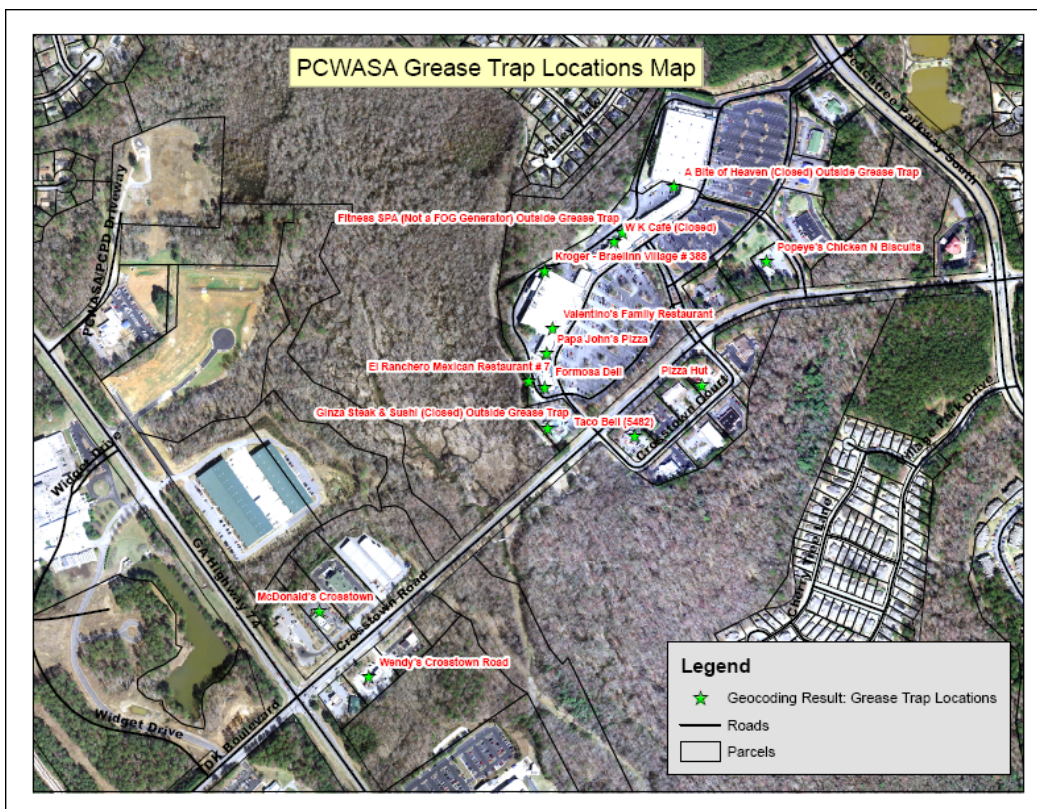


Figure 7: PCWASA Grease Trap Locations Map

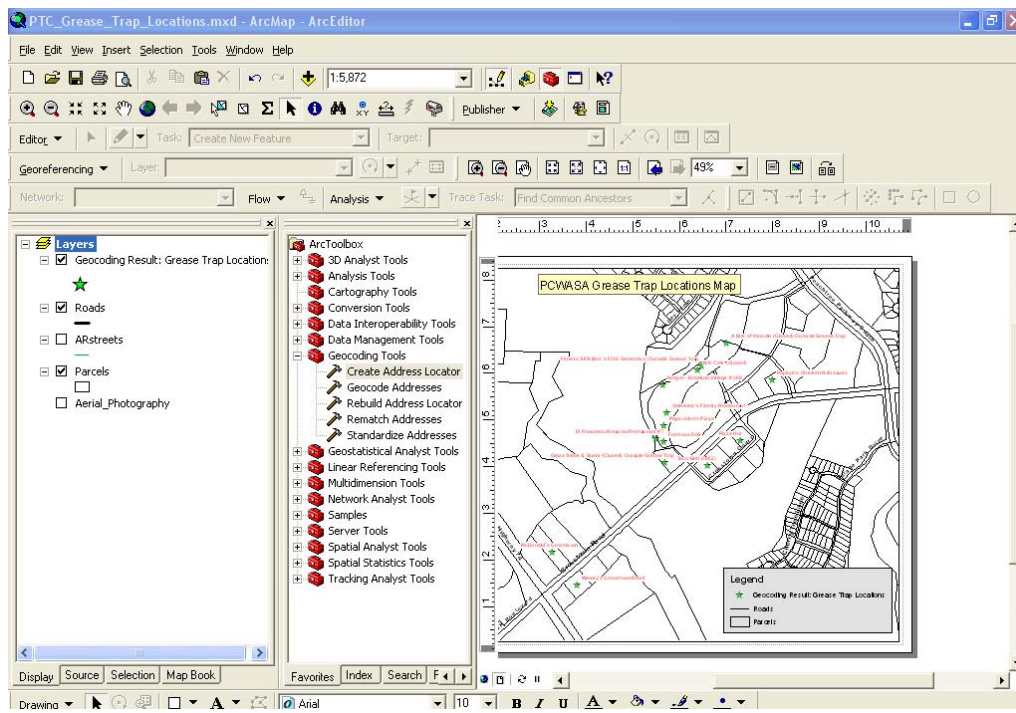



Figure 8: Creating an address locator using the “Create Address Locator” tool highlighted under Geocoding Tools in ArcToolbox.

From the addresses that has been geocoded, the data can now be maintained in ArcGIS in the attribute table under **Attribute of Geocoding Result: Grease Trap Locations** (see Figure 9).

FID	Shape	Status	Score	Side	Match_addr	ARC_Street	Establishment	Establishment
1	Point	M	26	L	490 CROSSTOWN RD	526 CROSSTOWN DRIVE	A Bite of Heaven (Closed) Outside Grease Trap	536 Crosstown
2	Point	M	100	L	134 STHY 74	133 HIGHWAY 74	Amey's Peachtree City	133 Highway 74
3	Point	M	100	L	441 PRIME PT	441 Prime Point	Ashley Glenn Assisted Living	441 Prime Point
4	Point	M	38		CITY CR	401 CITY CIRCLE	Atlanta Bread Company	401 City Circle
5	Point	M	34	L	146 STHY 74	147 HIGHWAY 74	Backyard Burgers (Closed) Outside Grease Trap	147 Highway 74
6	Point	M	75	L	100 PEACHTREE PKWY	100 Peachtree Pkwy North, Suite 100	Beer 'O' Brady's	100 Peachtree Pkwy
7	Point	M	39		CITY CR	300 CITY CIRCLE	Ben's Pizza Kitchen	300 City Circle
8	Point	M	13		CROSSING SW	101 CROSSING EAST	Big Daddy's Oyster Bar & Pub	101 Crossing East
9	Point	M	38		CITY CR	1280 CITY CIRCLE	Books-A-Million	1280 City Circle
10	Point	M	69	R	500 CLUB VIEW DR NE	500 Clubview Drive	Braslin Golf Club	500 Clubview Dr
11	Point	T	100	L	975 ROBINSON RD	975 Robinson Road	Braslin Elementary School	975 Robinson R
12	Point	M	75	R	103 LEXINGTON AVE	103 Lexington Circle	Bruster's	103 Lexington C
13	Point	M	56	L	1200 STHY 74	1200 HIGHWAY 74 SOUTH, SUITE 4	Buck's Pizza	1200 Highway 74 S
14	Point	T	75	L	100 LEXINGTON AVE	100 Lexington Circle	Burhead Brewery & Grill (Closed) Outside Grease Trap	100 Lexington C
15	Point	M	100	R	500 COMMERCE DR	500 Commerce Drive	Caribbean's Balan Grill	500 Commerce
16	Point	M	56	L	1200 STHY 74	1200 HIGHWAY 74 SOUTH, SUITE 12	Casa Vieja Mexican Restaurant	1200 Highway 74 S
17	Point	M	100	L	1239 ROBINSON RD	1239 Robinson Road	Chateau Deli (Braslin Village Chevron)	1239 Robinson
18	Point	M	100	L	1100 PEACHTREE PKWY	1100 Peachtree Parkway	Check-It-A - Kebab Village	1100 Peachtree
19	Point	T	100	L	700 HWY 54 W	707 Highway 54 West	Check-It-A - Peachtree Crossing	707 Highway 54
20	Point	M	56	L	1222 STHY 74	1222 HIGHWAY 74 NORTH	Check-It-A - Village	1222 Highway 74 N
21	Point	M	70	L	250 MARKET PLACE BL	250 MARKETPLACE	Chili's	250 Marketplac
22	Point	M	75	L	2100 HWY 54 W	2100 HIGHWAY 54	Chin Chin Chinese Restaurant	2100 Highway 54
23	Point	M	75	L	1018 PEACHTREE PKWY	1018 Peachtree Parkway North	China Cafe # 9	1018 Peachtree
24	Point	M	56	L	1200 STHY 74	1200 HIGHWAY 74 SOUTH	China House	1200 Highway 74 S
25	Point	T	75	L	100 PEACHTREE PKWY	100 Peachtree Parkway North, Suite #32 # 33	Chopsticks	100 Peachtree Pkwy
26	Point	T	77	R	101 PEACHTREE PKWY	101 North Peachtree Parkway	Christ Our Shepherd Lutheran Church	101 North Peach
27	Point	T	100	R	224 COMMERCE DR	224 Commerce Drive	City Subs and Deli (No Grease Trap Installed)	224 Commerce
28	Point	M	66	L	1200 STHY 74	1200 HIGHWAY 74 SOUTH	Coffee-N-Cones	1200 Highway 74 S
29	Point	M	66	R	1121 STHY 74	1121 HIGHWAY 74 SOUTH	Cooper's Lighting Cafeteria	1121 Highway 74 S
30	Point	M	53	L	22 PLANTERIA WAY	10 PLANTERIA WAY	Courtside Cafe & Bakery (PTC Tennis Center Pro Shop)	10 Planteria Way
31	Point	M	100	R	450 CRANFORD LN	450 Cranford Lane	Chapel Hill Elementary School	450 Cranford L
32	Point	M	64	L	300 PONTE	300 PONTE	Dairy Queen	300 Petrol Point
33	Point	M	75	R	203 NEVIGATE DR	203 Nevigate Road	Dive's Cafe Holiday Inn	203 Nevigate R
34	Point	T	100	L	2704 HWY 54 W	2705 Highway 54 West, Suite 7	DJ Gezozos Surt & Grill	2705 Highway 74 S
35	Point	M	75	L	201 ABERDEEN PL	201 Aberdeen Parkway	Dolce Atlanta-Peachtree (Formerly Aberdeen Woods Conference C	201 Aberdeen P
36	Point	M	75	R	2100 HWY 54	2100 Highway 54 East, Suite 104	Domino's Pizza	2100 Highway 54 E
37	Point	M	50	L	226 PEACHTREE PKWY	226 PEACHTREE EAST	Dustin Donalds	226 Peachtree E
38	Point	M	100	R	300 COMMERCE DR	300 Commerce Drive	El Rancho Mexican Restaurant # 5 - Westpark	300 Commerce
39	Point	M	53	L	612 CROSSTOWN RD	596 CROSSTOWN ROAD	El Rancho Mexican Restaurant # 7	596 Crosstown
40	Point	M	27	L	446 CROSSTOWN RD	408 CROSSTOWN DRIVE	Fitness SPA (Not a FOG Generator) Outside Grease Trap	408 Crosstown

Figure 9: Maintaining Grease Trap Location Attribute Data in ArcGIS

Once the address locator function is complete, an attribute table is generated (refer to Figure 9). The attribute table presently contains *Establishment* (Name of FOG Generator) and *Address* fields. Also, grease trap locations can be identified by selecting the **Identify** tool  in ArcEditor and then clicking a grease trap location (see Figure 10). Attributes of the selected grease trap will pop-up on the screen.

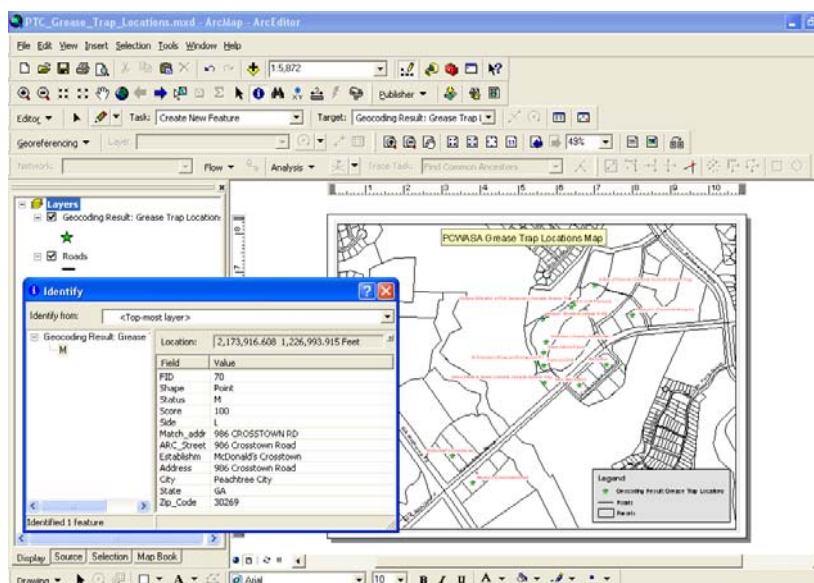


Figure 10: Identifying a Grease Trap Location using the "Identify" Tool

The PCWASA FOG Program is planning to expand the attribute table to including commercial waste hauler information, basin information, and grease trap location descriptions for each FOG generator in the near future.

With the ability to have grease trap locations identified through the process of geocoding, grease trap inspections can now be planned and routed. Using ArcReader, the PCWASA Grease Trap Locations Map helps the PCWASA FOG Program create a full-day schedule of grease trap inspection activity (see Figure 11). Grease trap inspections are usually performed once per week by the PCWASA GIS Specialist/FOG Program Coordinator. These inspections are normally routed based on several grease traps located in the same vicinity. Grease trap inspections are also planned and routed based on grease trap cleaning dates and grease trap inspection dates.

On a typical inspection day, for example, grease traps located in the same vicinity would be planned and routed with ArcGIS assistance by scheduling (see Figure 11) China House, Buck's Pizza, Coffee-N-Cones, Peoples Elementary, and Chick-Fil-A – Wilshire for morning inspection activity.

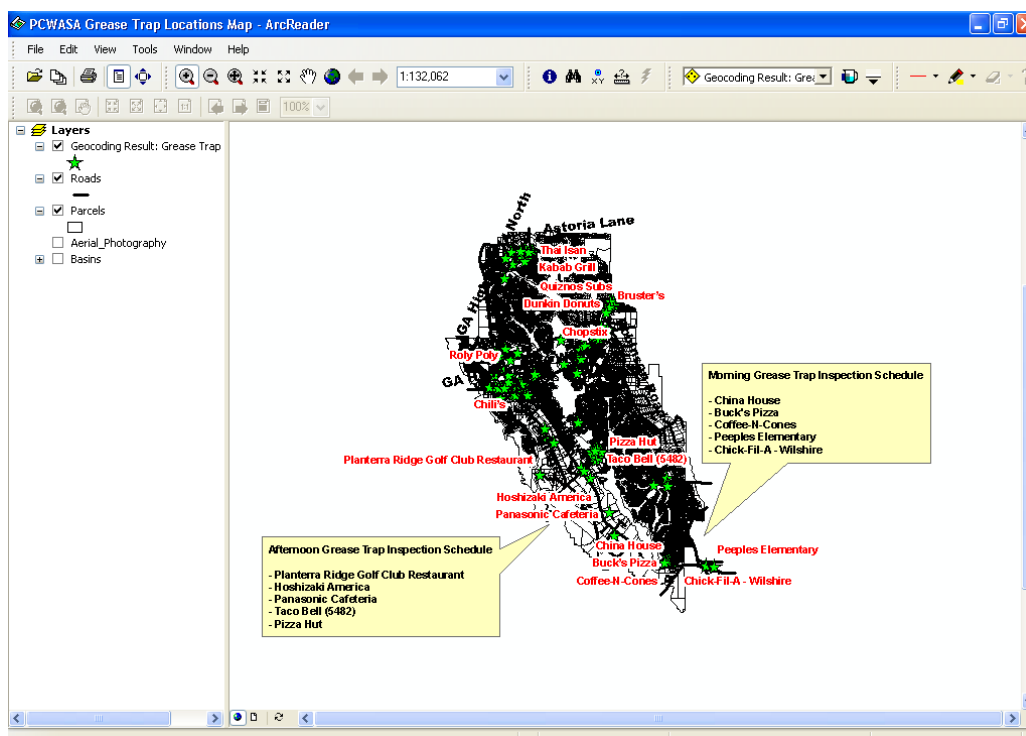


Figure 11: PCWASA Grease Trap Locations Map used in ArcReader

Likewise, Planterra Ridge Golf Club Restaurant, Hoshizaki America, Panasonic Cafeteria, Taco Bell (5482), and Pizza Hut grease trap inspections would be planned and routed in the afternoon based on vicinity location.

Grease trap inspections based on grease trap cleaning dates and grease trap inspection dates are currently being routed from a Microsoft Excel spreadsheet and a FOG database program. This grease trap data will also be included in the Grease Trap Locations Attribute Table (refer to Figure 9) in the near future.

Combining grease trap cleaning and inspection data together with grease trap location data will make grease trap inspection planning and routing simple. This combination will make the Grease Trap Locations Attribute Table (refer to Figure 9) a one-stop data source in ArcGIS. These grease trap attributes can then be viewed on a map by clicking on a grease trap location (refer to Figure 10).

ArcGIS has proven beneficial to PCWASA in the preventive maintenance and asset management of the wastewater collection system and FOG program. ArcGIS gives PCWASA the ability to map sewer line backup areas, SSO areas, and grease trap locations using the resources of ArcEditor, ArcReader, ESRI Sample Map Book program, and the ArcPublisher extension. By using ArcGIS in the everyday work schedule, PCWASA will continue to have an improving wastewater collection system that Peachtree City can be proud of and appreciate for years to come.

References

Peachtree City, GA – Official Web site (n.d.). *Water and Sewerage Authority*. Retrieved June 5, 2008, from <http://www.peachtree-city.org/index.asp?NID=145>

Wikipedia, the free encyclopedia (4 May 2008). *Yellow Grease*. Retrieved June 5, 2008, from http://en.wikipedia.org/wiki/Yellow_grease

Wikipedia, the free encyclopedia (5 April 2008). *Rendering (food processing)*. Retrieved June 5, 2008, from http://en.wikipedia.org/wiki/Rendering_%28industrial%29

Water Environmental Federation (2005, December 5-6). *Proceedings of FATS, OILS, & GREASE (FOG) MANAGEMENT WORKSHOP, Day One*. Charleston, SC: Author.

Water Environmental Federation (2002, June 19-20). *Proceedings of CONTROL OF FATS, OILS, & GREASE (FOG) ADVANCED TRAINING COURSE, Part One*. Atlanta, GA: Author.

How A Sewer Blockage Affects the Sewer System (30 March 2006). Retrieved June 5, 2008 from the Georgia FOG Alliance Web site: <http://www.georgiafog.com/>

Environmental Systems Research Institute Web site (31 October 2006). *Geocoding*. Retrieved June 11, 2008 from <http://support.esri.com/index.cfm?fa=knowledgebase.gisDictionary.search&search=true&searchTerm=geocoding>

Environmental Systems Research Institute Web site (31 October 2006). *Address locator*. Retrieved June 11, 2008 from <http://support.esri.com/index.cfm?fa=knowledgebase.gisDictionary.search&search=true&searchTerm=address+locator>