SSO Response Plan

Kayenta Wastewater Treatment Plant

Navajo Tribal Utility Authority

SSO RESPONSE PLAN

For the

NAVAJO TRIBAL UTILITY AUTHORITY

Kayenta Wastewater Treatment Plant

NPDES Permit No. NN0020281

3.0 Miles Northeast of Junction US 160 & US 163

Kayenta, Arizona 86033

Date Authored: _____

	Date Revised/Reviewed	Reviser/Reviewer Signature and Title	Responsible Official Signature and Title
□ Revision □ Review			
□ Revision □ Review			
□ Revision □ Review			
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Administrative Procedures

The SSO Response Plan shall be kept at Kayenta Wastewater Treatment Facility. Training for any personnel required to implement the SSO Response Plan shall be provided by NTUA. Should significant revisions be made to the SSO Response Plan, training regarding the revisions shall be conducted as soon as possible. All training dates and locations shall be recorded below.

Training Date	Training Location	Description

General Utility Information

Approximate Population of Kayenta: **5,634**

Approximate Number of Customers Served: **5,500**

Estimated number of Linear Feet of Sanitary Sewer Pipe in System: **102,960**

Number of Pump / Lift Stations in the System: **2-pumps/1-Lift Station**

LS Name	LS ID	LS Address	Latitude	Longitude
Kayenta WWTP Lift Station	*Lift Station 1*	*Kayenat WWTP*	*36.733703*	*-110.237694*

If applicable, identify any subbasins designated by the Permittee below (attach maps if necessary):

Subbasin ID	Subbasin Name	HUC 8 Code
	San Juan River	

Responsibility Information

Contact List

Title	Name	Primary Phone	Alternate Phone	Email
Primary SSO Coordinator	*Wendell Murphy*	*(928) 729-4719*	*(505) 728-7670*	*Wendellm@ntua.com*
Secondary SSO Coordinator	*David White*	*(928) 729-6268*	*(928) 810-1069*	*Davidw@ntua.com*
Primary SSO Responder	*Clint Ahasteen*	*(928) 729-6753*	*(928) 278-1770*	*Clinta@ntua.com*
Secondary SSO Responder	*Reynelda Terry*	*(928) 729-6342*	*(928) 299-6431*	*ReyneldaT@ntua.com*
Public Affairs	*Deenise Becenti*	*(928) 729-6221*		*deeniseb@ntua.com*

Responsibility Descriptions

Wendell Murphy, Primary SSO Coordinator

Responsible for determinations concerning who to contact during an SSO to coordinate the response. Also responsible for assessing the SSO and initiating a series of response actions based on the type, severity, and destination of the SSO. Responsible for management and decision making for the sewer collection system.

David White, Secondary SSO Coordinator

In the absence of the Primary SSO Coordinator, the Secondary SSO Coordinator is responsible for the Primary SSO Coordinator duties.

Clint Ahasteen, Primary SSO Responder

Responsible for providing notification to HQ and District, the public, the county health department, and other affected entities such as public water systems. Also responsible for organizing crews for response and addressing public inquiries.

Reynelda Terry, Secondary SSO Responder

In the absence of the Primary SSO Responder, the Secondary SSO Coordinator is responsible for the Primary SSO Responder duties.

Important Contact Information

Contact List

Title	Name	Primary Phone	Alternate Phone	Email
IHS	*Kayenta Health Center*	*(928) 697-4000*		
NNEPA	*Patrick Antonio*	*(928) 871-7185*		*patrickantonio@navajo-nsn.gov*
NECA	*Monica Redhouse*	*(505) 210-7022*		*Monica@navajo.net*
Fire Department	*Kayenta Fire Department*	*(928) 697-3350*		
Police Department	*Navajo Nation Police Department*	*(928) 697-5600*		

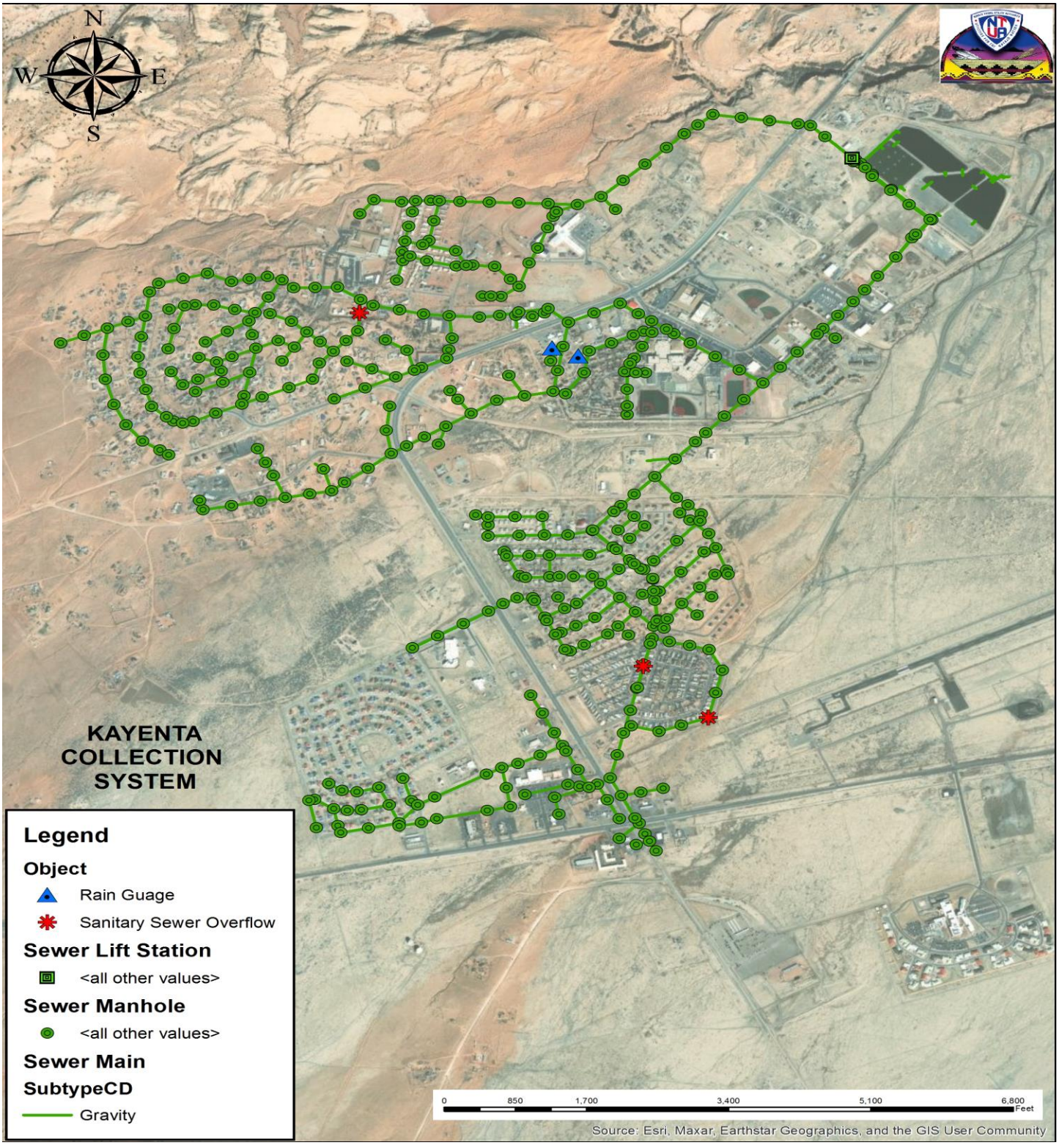
SSO and Surface Water Assessment

Probable SSO Event Location Table

Location ID / Name	Address	Latitude	Longitude	Evaluation Notes
Kayenta Frontier Office	*Kayenta AZ*	*36.727555*	*-110.258168*	
Kayenta Trailer Park 1	*Kayenta AZ*	*36.713856*	*-110.246686*	
Kayenta Trailer Park 2	*Kayenta AZ*	*36.711907*	*-110.244015*	

General Collection System Area Map

Includes surface waterbodies and the locations of public drinking water source(s). Mapping of all collection system piping, pump stations, etc. should be included if the information is already available. Any Swimming or locally known recreational waterbodies should be specifically identified on the map.



Surface Waterbodies Identification Table

Response to Notification of Spills

The **NTUA** has adopted service call/overflow response procedures requiring immediate response to minimize or eliminate an overflow.

When a notification of an SSO is received, it should be clearly communicated to the caller who will respond, the estimated time of arrival, and what areas will need to be accessed. The information provided by the caller should be verified before dispatching a field crew.

Public Observation of an SSO

Public observation is typically the most common way that a Utility is notified of blockages and spills. Contact information for reporting sewer spills and backups are as follows:

Primary Telephone Number: 1-800-528-5011

Information Required from the Public

At a minimum, the date and time of observation and location of the SSO should be obtained from the public along with their contact information, if possible.

Normal Working Hours

The regular working hours for NTUA employees are Monday through Friday from 8:00 a.m. to 5:00 p.m., except holidays. When a report of a sewer spill or backup is made, NTUA staff route the call directly to the SSO Coordinator, who records the information required from the public, and initiates the response actions. The SSO Coordinator communicates the information to the SSO Responder. If the Primary SSO Coordinator/Responder is not available, the Secondary SSO Coordinator/Responder will fulfil the role of the Primary SSO Coordinator/Responder.

After Normal Working Hours

After working hours, calls are automatically routed to the NTUA Utility Operation Control (UOC) who records the information required from the public and then notifies the SSO Coordinator, who initiates the response actions. The SSO Coordinator communicates the information to the SSO Responder. If the Primary SSO Coordinator/Responder is not available, the Secondary SSO Coordinator/Responder will fulfil the role of the Primary SSO Coordinator/Responder.

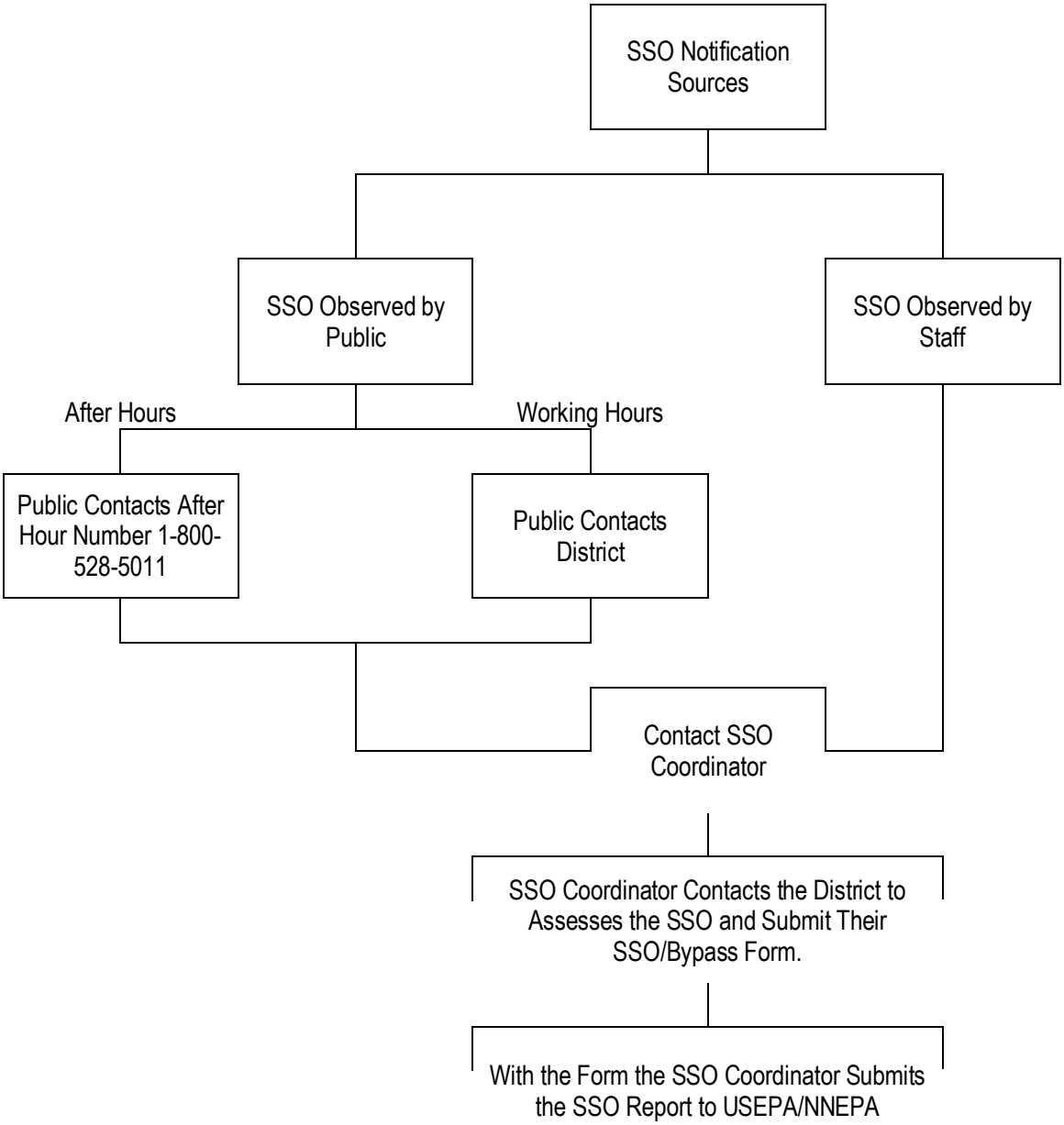
SCADA Alarms

No SCADA in Kayenta.

Staff Observation of an SSO

Field crews and contractors perform periodic work on its sewer system facilities. Any SSOs noted within the sewer system facilities are to be reported immediately to the SSO Coordinator.

Notification and Response Flow Chart



SSO Response Procedures

Customer Relations

As a representative of the System, you will occasionally have to deal with an agitated homeowner. A sewer backup can be a stressful event and even a reasonable homeowner can become upset if it is perceived that staff members as being indifferent, uncaring, unresponsive, and/or incompetent.

Although sometimes difficult, effective management of a sewage backup situation is critical. If it is not managed well, the situation can end up in a costly, prolonged process with the homeowner. The homeowner should feel assured that NTUA is responsive, and the homeowner's best interest is a top priority.

It is important for employees to communicate effectively with customers, especially in sewage backup situations. How we communicate – on the phone, in writing, or in person – is how we are perceived. Good communication with the homeowner results in greater confidence in our ability to address issues satisfactorily, giving less of a chance to have the homeowner prolong the claims process, and less chance of the customer exaggerating the damage done on the property.

Here are a few communication tips:

- Give the homeowner ample time to explain the situation or and express their frustration. Show interest in what the homeowner has to say, no matter how many times you have heard it before, or how well you understand the problem.
- As soon as possible, let the customer know that you will determine if the source of the issue and will have it corrected as quickly as you can.
- Acknowledge the homeowner's concerns. For example, if the homeowner seems angry or worried about property damage, say something like, "I understand that you're concerned about the possible damage to your property, but a professional cleanup crew can restore the area."
- Express understanding and empathy for any inconveniences caused by the incident, but do not admit fault. If it is determined that the System is at fault, the property owner has the right to file a claim for any reasonable repairs or losses resulting from the incident.
- As much as possible, keep the homeowner informed on what is being done and will be done to correct the problem.
- Keep focused on getting the job done in a very professional manner. Don't wander from the problem with too much unnecessary small talk with the homeowner.
- Don't find fault or lay blame on anyone.

Responder Priorities

The responder's priorities are:

- To follow safe work practices.
- To respond promptly with the appropriate equipment.
- To evaluate the cause of spill and determine responsibility.
- To restore the flow as soon as possible.
- To contain the spill whenever feasible.
- To minimize public access to and/or contact with the spilled sewage.
- To update the Primary SSO Coordinator.
    - If the Primary SSO Coordinator cannot be reached, contact the Secondary SSO Coordinator.
- To return the spilled sewage to the sewer system.
- To restore the area to its original condition (or as close as possible) and properly disinfect the area, if possible.

Safety

The responder is responsible for following safety procedures at all times. Special safety precautions must be followed when performing sewer work. Special consideration should be given to following all local traffic, confined space, and safety procedures.

Initial Response

All sewer system calls require a response to the reported location of the event in an attempt to minimize or eliminate an overflow. The responder must respond as soon as feasible after initial notification of the spill.

The responder should determine appropriate response measures based on the circumstances and information provided by the caller (e.g. weather and traffic conditions, small backup vs. sewage flowing on the ground, etc.). If additional help is needed, contact other employees, contractors, and/or equipment suppliers.

Upon arrival at the site, the responder should:

- Note arrival time at spill site.
- Verify the existence of a sewer system spill or backup.
- Verify the address and nearest cross street, ensure that the system it's part of the NTUA's sanitary sewer system.
- Identify and clearly assess the affected area and extent of spill.
- Comply with all safety precautions (traffic, confined space, etc.)
- Contact caller, if time permits.
- Notify the Primary SSO Coordinator if:
    - The spill appears to be large, in a sensitive area, or there is doubt regarding the extent, impact, or how to proceed; or

    - Additional help is needed for line cleaning or repair, containment, recovery, sampling, and/or site cleanup.
- If the Primary SSO Coordinator cannot be reached, contact the Secondary SSO Coordinator.
- It is recommended to document conditions upon arrival with photographs (given that the activity does not interfere with SSO recovery and clean up).

Restore Flow

Upon arrival at the location of a spill into a house or a building, the responder should evaluate and determine if the spill was caused by a blockage in the lateral or in the System-owned sewer main, caused either by a backup in the sewer main line or nearby operation and maintenance (O&M) or construction activities.

- If a blockage is found on a property owner's lateral that was not cause by the System, it should be clearly communicated that it is not NTUA's responsibility to work on a private lateral. Recommend that property owner or tenant contact a qualified plumbing contractor to remove the blockage.
- If a blockage is found in a property owner's lateral that was caused from the system, remove the blockage caused by the system and restore flow.
- If a backup in the main line is found to have caused the SSO in a house or building, relieve the blockage in the main line.

The responder should attempt to remove the blockage from the system and restore flow to the area. Using the appropriate cleaning tools, the field crew should set up downstream of the blockage and hydro-clean upstream from a clear maintenance hole. The flows should be observed to ensure that the blockage does not reoccur downstream.

If the blockage cannot be cleared within a reasonable time, or sewer requires construction repairs to restore flow, then initiate containment and/or bypass pumping. If assistance is required, immediately contact other employees, contractors, and equipment suppliers.

Pump Station or Forcemain Facilities

The responder to a potential pump station or forcemain failure should:

- Determine whether flow can be restored within a reasonable time.
- If it appears that flow cannot be restored within a reasonable time or if the conveyance system facility requires construction and/or repairs, then employ contingency plans covering containment, bypass pumping, portable electric generators, contractual assistance, etc.

If assistance is required, immediately contact other employees, contractors, and equipment suppliers as required.

Contain the Spill

The responder should attempt to contain as much of the spilled sewage as possible using the following steps:

- Determine the immediate destination of the overflowing sewage.
- Plug storm drains using available equipment and materials to contain the spill, whenever appropriate. If spilled sewage contacted with the storm drainage system, attempt to contain the spilled sewage by plugging downstream storm drainage facilities.
- Contain/direct the spilled sewage using dike/dam, sandbags, or other containment materials on hand.
- Pump around the blockage/pipe failure/pump station or vacuum flow from upstream of the blockage and dispose of downstream of the blockage to prevent further overflow.
- When an SSO occurs inside of a house or building, the property owner should be instructed to follow these guidelines:
    - Keep people and pets away from the affected area.
    - Place towels, rags, blankets, etc. between areas that have been affected and areas that have
      not been affected.
    - Do not remove any contaminated items
    - Turn off the HVAC system
    - Move any uncontaminated property away from the overflow area.
- NOTE: If an SSO reaches a water body, see Recovery and Clean Up Section for Water Quality Sampling requirements.

SSO Public Notification and Restricted Public Access

Barriers shall be installed to prevent the public from having contact with the sewage if possible. Signage should be posted at the spill to keep vehicles and pedestrians away from contact with spilled sewage. Do not remove the signs until directed by the Health Department or until the threat for human contact has ceased. A sample warning sign is included as Appendix A. (Note: This section is provided as an example. The feasible methods of public notification should be included in the specific utility SOP.)

Recovery and Clean Up

The recovery and clean up phase begin when the flow has been restored and the spilled sewage has been contained to the extent possible.

Recovery of Spilled Sewage

Vacuum up or pump the spilled sewage and discharge it back into the sanitary sewer system.

Clean Up and Disinfection

Clean up and disinfection procedures should be implemented to reduce the potential for human health issues and adverse environmental impacts that are associated with an SSO event. The procedures described are for dry weather conditions and should be modified as required for wet weather conditions.

Where clean-up is required inside a private property (e.g. back up into house), the Primary SSO Coordinator will arrange for an outside contractor to perform clean up.

Private Properties

Spills inside houses or buildings should be cleaned up by a professional cleaning company.

Hard Surface Areas

Collect all signs of sewage solids and sewage-related material with the use of rakes and brooms.

- Take reasonable steps to contain and vacuum up the wastewater.
- Disinfect all areas that were contaminated from the overflow using the disinfectant solution of household bleach diluted 10:1 with water. Apply minimal amounts of the disinfectant solution using a hand sprayer. Disinfectant should be applied in such a manner as to prevent runoff. Document the volume and application method of disinfectant that was employed.
- Allow area to dry. Repeat the process if additional cleaning is required.

Landscaped and Unimproved Natural Vegetation

- Collect all signs of sewage solids and sewage-related material either by hand or with the use of rakes and brooms.
- Allow the area to dry. Repeat the process if additional cleaning is required.

Natural Waterways

Clean up should proceed quickly in order to minimize SSO impacts to any creeks, gullies, or natural waterways. Any water that is used in the cleanup process should be de-chlorinated prior to use.

Wet Weather Modifications

Omit water quality sampling during heavy storm events with heavy runoff where water quality sampling would not provide meaningful results.

Water Quality Sampling Procedures

If required, water quality sampling during and/or after a SSO event, the steps for conducting those samples follow:

- The responder should notify the NTUA's Laboratory Technicians to collect samples. Samples should be collected as soon as possible after the discovery of the SSO event.
- At a minimum, water quality samples should be collected at the discharge point, 100 feet upstream, and 100 feet downstream.
- If a spill reaches a large water body, the water quality samples should be collected near the point of entry of the spilled sewage and every 100 feet along the shore of stationary water bodies or as directed by the Health Department.

Include details about the following:

- proper methodology for collecting samples
- materials needed to collect samples
- sample locations (provide GPS locations)

- sample collection procedures
- laboratory information
- alternative laboratory information
- documentation / reporting processes

Contract Laboratory Contact Information

Laboratory	Primary Lab Contact	Primary Phone	Alternate Phone	Email
Primary Lab	*Raquel Whitehorse*	*(928) 729-6239*	*(928) 209-6678*	*raquelw@ntua.com*
Alternate Lab	*Sherwin Curley*	*(928) 729-6242*	*(928) 204-4741*	*SherwinC@ntua.com*

Estimate the Volume of Spilled Sewage

Use the methods outlined in Appendix C to estimate the volume of the spilled sewage. Wherever possible, document the estimate using photos of the SSO site before and during the recovery operation.

Follow Up Activities

If sewage has reached the storm drain system, the combination sewer jet vacuum cleaning truck should be used to vacuum/pump out the catch basin and any other portion of the storm drain that may contain sewage.

In the event that an overflow occurs at night, the location should be re-inspected first thing the following day. The operator should look for any signs of sewage solids and sewage-related material that may warrant additional cleanup activities.

SSO Event Debriefings

These SSO events provide opportunities to evaluate response and reporting procedures. After these SSO events, all of the participants, from the person who received the call to the last person to leave the site, may meet to review the procedures used and to discuss what worked and where improvements could be made in responding to and mitigating future SSO events. The results of SSO event debriefings will be recorded and tracked to ensure the action items are completed.

Claims for Backups into a Building

Customers are responsible for handling backups into a customer's building.

Indian Health Service Department Notification

Health Department Notification Requirements

The SSO Responder shall contact the local Health Department (KHD) within 24 hours of the Permittee becoming aware of the SSO.

- Local KHD Environmental Services Telephone Number: (928) 697-4062
- Local KHD Environmental Services Fax Number: (928) 697-4058

Public Notification Requirements

Feasible Methods of Public Notification Available

- *Website and/or social media*
  - *The reported SSO will be placed on the NTUA website and Facebook page.*
- *Local print or radio and broadcast media*
  - *If the SSO is severe that it may do public harm it will be announced on KTNN radio (928) 871-3553.*

Required Information to Include in Public Notifications

Minimum information to be included in public notifications (e.g., identification that an SSO has occurred, date, duration if known, estimated volume if known, location of the SSO by street address or other appropriate method, initial destination of the SSO).

Procedures for Determining the Appropriate Method(s) of Public Notification

Procedures for determining the appropriate public notification method(s) based upon the potential for public exposure to health risks associated with the SSO should be included below. (An example might look like the following:)

Scenario 1: A spill occurs at a remote lift station. The spill is bad enough that waste escapes the enclosed area but does not reach a surface water.
Public Health Risk: Low
Public Notification Method(s):

- *Install safety barrier around the spill.*

Scenario 2: A major spill occurs during dry weather near a local swimming and recreational area. The spill enters the waterbody.
Public Health Risk: Very High
Public Notification Method(s):

- *Contact local authorities and KHD to discuss closure of the public recreation area.*
- *Deploy safety barriers around the spill at locations where contact with the public may occur.*

- *Provide press release to local radio station KTNN.*
- *Publish press release to website*

An example warning sign is included in Appendix A of this template.

Point of Contact

The SSO Coordinator shall be responsible for public notification via the media and other affected entities (such as public water systems), if necessary. NTUA Public Affairs – Deenise Becenti.

SSO Documentation and Reporting

All SSOs should be thoroughly investigated and documented for use in managing the sewer system and meeting established reporting requirements.

Internal SSO Documentation

- *Initial service call information*
- *Warning sign (Appendix A)*
- *Checklist for Plugged Sewer Line and Checklist Form (Appendix B)*
- *Methods for estimating spill volumes*

External SSO Documentation

The SSO Responder shall submit a notification to the Navajo Nation Environmental Protection Agency (NNEPA) within 24-hours of the Permittee becoming aware of the SSO. The SSO Responder shall submit the follow-up report within 5 days of the Permittee becoming aware of the SSO.

All publicly or privately owned wastewater treatment plants holding an NPDES permit are required to provide immediate notification to NNEPA, county public health officials, the public, and any other affected entity such as public water systems as soon as possible upon becoming aware of any notifiable sanitary sewer overflow (SSO) events.

A "notifiable SSO" is an overflow, spill, release or diversion of wastewater from a sanitary sewer system that either (1) reaches a surface water of the State or (2) may imminently and substantially endanger human health based on potential for public exposure including but not limited to close proximity to public or private water supply wells or in areas where human contact would be likely to occur. Immediate notification shall be provided within 24 hours of becoming aware of the event. This immediate notification must be made electronically through the NTUA's Electronic Reporting System. The follow-up report shall be submitted within five days of becoming aware of the SSO event.

For notifiable SSOs caused by an extreme weather event (e.g., hurricane) that floods the entire sewer system and are too numerous to count, the permittee is not required to provide information that cannot be practicably captured (e.g. latitude/longitude, source/structure, duration of the SSO, the estimated discharge volume, the receiving waterbody, the corrective actions taken, or the potential impacts).

Equipment Inventory

Equipment ID	Equipment Name	Equipment Description	Equipment Location
Jetter1	*"The Big Flush"*	*Trailer mounted Sewer Jetting Unit.*	*Sanitation Shop #1*

Appendix A

Example Warning Signs

KEEP OUT

CONTAMINATED WATER

STREAM/LAKE WATER
MAY
CAUSE ILLNESS

BY ORDER OF THE
IHS HEALTH DEPARTMENT
FOR FURTHER INFORMATION
CALL: (928) 697-4000
OR CALL
NTUA
1-800 528-5011

Appendix B

Internal Overflow Form

FORM COMPLETED BY:	DATE:
U/S MAINTENANCE HOLE #: D/S MAINTENANCE HOLE #:	WORK ZONE:
SIZE OF LINE:	LENGTH OF LINE:
GPS COORDINATES (IF AVAILABLE):	
EASEMENT: YES ☐ NO ☐	
DATE OVERFLOW STARTED: TIME OVERFLOW STARTED:	DATE OVERFLOW STOPPED: TIME OVERFLOW STOPPED:
ESTIMATED CITY STAFF ARRIVAL DATE AND TIME:	
DURATION OF SSO:	EST. TOTAL VOLUME (GALLONS):
DESCRIBE HOW OVERFLOW QUANTITY WAS CALCULATED (APPENDIX G OF SSORP): ☐ EYEBALL ESTIMATE ☐ DURATION / FLOW RATE ☐ MEASURED VOLUME ☐ OTHER:_____	
RETURNED TO SEWER SYSTEM (GALLONS):	
VOLUME TO WATERS & NOT RECOVERED, INCLUDING SURFACE WATER, DRAINAGE CHANNEL, OR NOT RECOVERED FROM STORM DRAIN (GALLONS):	
DID SSO REACH RECEIVING WATERS? YES ☐ NO ☐	

WEATHER: SUNNY ☐ CLOUDY ☐ DRY ☐ RAINY ☐ RAIN FOR SEVERAL DAYS ☐

APPROXIMATE TEMPERATURE: _____

PRIMARY CAUSE:

☐ ROOTS ☐ GREASE ☐ DEBRIS ☐ VANDALISM ☐ PIPE FAILURE

☐ CONSTRUCTION DAMAGE ☐ PUMP STATION FAILURE ☐ POWER FAILURE

☐ CAPACITY (HEAVY RAIN) ☐ OTHER:_____

ADDITIONAL INFORMATION:

SOURCE OF SSO:

☐ MAINTENANCE HOLE ☐ GRAVITY MAIN ☐ FORCEMAIN ☐ CLEAN OUT ☐ PRIVATE LATERAL

☐ PUMP STATION:_____(NAME) ☐ OTHER:_____

BLOCKAGE LOCATION:

UPSTREAM MH#: _____ DOWNSTREAM MH#: _____ OVERFLOW MH#: _____

SSO APPEARANCE POINT(S):

NUMBER OF POINTS:	DESCRIPTION OF POINT(S):
LOCATION(S) OF POINTS:	

WATER QUALITY MONITORING:

SAMPLES COLLECTED: YES ☐ NO ☐	BY WHO?	SAMPLE DATE: SAMPLE TIME:

SAMPLE LOCATION(S): ☐___ FT UPSTREAM ☐___ FT DOWNSTREAM ☐AT DISCHARGE

CONDITIONS THAT MAY INFLUENCE SAMPLE RESULTS:
☐ STORM DRAIN DISCHARGES ☐ STREAM DISCHARGES ☐OTHER:_____

PARAMETERS FOR ANALYSIS: ☐ AMMONIA ☐ FECAL COLIFORM ☐OTHER:_____
(ATTACH SAMPLE RESULTS OR RECORD ON LAST "ADDITIONAL NOTES" PAGE.)

FINAL SSO DESTINATION(S):

☐ STORM DRAIN ☐ BUILDING ☐ YARD/LAND ☐ SURFACE WATER (NAME:_____) ☐ NO WATER INVOLVED

☐ CAPTURED FROM STORM DRAIN (100%) ☐ OTHER:_____

DESCRIBE CLEANUP METHOD:

SPILL RESPONSE COMPLETION DATE:

PICTURES/VIDEO TAKEN: YES ☐ NO ☐	SAVED LOCATION:

AFFECTED AREA:

DESCRIBE PROPERTY DAMAGE:

SIGNS POSTED: YES ☐ NO ☐	NEIGHBORS NOTIFIED: YES ☐ NO ☐

BARRICADED: YES ☐ NO

REGULATORY AGENCY NOTIFIED YES ☐ NO ☐

DATE:	TIME:	SSO#:

CONTACTS/DETAILS:

CALLER/CUSTOMER NOTIFIED RE: STATUS: YES ☐ NO ☐

IF NOT, WHY:

FOLLOW-UP MEASURES:

SKETCH OF AREA: (INCLUDE MAINTENANCE HOLES, INTERSECTIONS, STOPPAGE LOCATION, ETC.)

ADDITIONAL NOTES:

Appendix C

Methods for Estimating Spill Volume

A variety of approaches exist for estimating the volume of a sanitary sewer spill. This appendix documents the three methods that are most often employed. The person preparing the estimate should use the method most appropriate to the sewer overflow in question and use the best information available. Photographs are critical in using any of the spill volume methods.

Method 1 Eyeball Estimate

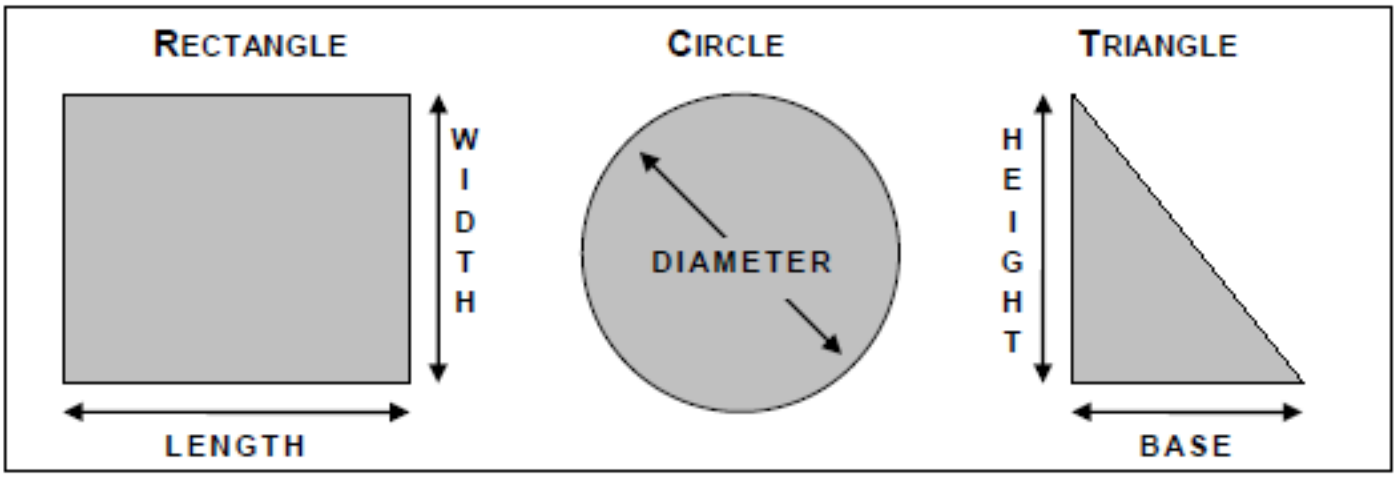
The volume of small spills can be estimated using an "eyeball estimate". To use this method, imagine the amount of water that would spill from a bucket or a barrel. A bucket contains 5 gallons and a barrel contains 50 gallons. If the spill is larger than 50 gallons, try to break the standing water into barrels and then multiply by 50 gallons. This method is useful for contained spills up to approximately 200 gallons.

Method 2 Area/Volume Calculations

The volume of most small spills that have been contained can be estimated using this method. The shape, dimensions, and the depth of the contained wastewater are needed. The shape and dimensions are used to calculate the area of the spills and the depth is used to calculate the volume.

- Step 1 Sketch the shape of the contained sewage (see Figure 1).
- Step 2 Measure or pace off the dimensions.
- Step 3 Measure the depth at several locations and select an average.
- Step 4 Convert the dimensions, including depth, to feet.
- Step 5 Calculate the area in square feet using the following formulas:
    a. Rectangle: Area = length (feet) x width (feet)
    b. Circle: Area = diameter (feet) x diameter (feet) x .785
    c. Triangle: Area = base (feet) x height (feet) x 0.5
- Step 6 Multiply the area (square feet) times the depth (in feet) to obtain the volume in cubic feet.
- Step 7 Multiply the volume in cubic feet by 7.5 to convert it to gallons.

Figure 1: Common Shapes and Dimensions



Method 3 Duration and Flowrate

Calculating the volume of larger spills, where it is difficult or impossible to measure the area and depth, requires a different approach. In this method, the separate estimates are made of the duration of the spill and the flowrate. The methods of estimating duration and flowrate are:

Duration: The duration is the elapsed time from the time the spill started to the time that the flow was restored.

Start time: The start time is sometimes difficult to establish. Here are some approaches:

- Local residents can be used to establish start time. Inquire as to their observations. Spills that occur in rights-of-way are usually observed and reported promptly. Spills that occur out of the public view can go on longer. Sometimes observations like odors or sounds (e.g. water running in a normally dry creek bed) can be used to estimate the start time.
- Changes in flow on a downstream flowmeter can be used to establish the start time. Typically, the daily flow peaks are "cut off" or flattened by the loss of flow. This can be identified by comparing hourly flow data during the spill event with flow data from prior days.
- Conditions at the spill site change over time. Initially there will be limited deposits of toilet paper and other sewage solids. After a few days to a week, the sewage solids form a light-colored residue. After a few weeks to a month, the sewage solids turn dark. The quantity of toilet paper and other materials of sewage origin increase over time. These observations can be used to estimate the start time in the absence of other information. Taking photographs to document the observations can be helpful if questions arise later in the process.
- It is important to remember that spills may not be continuous. Blockages are not usually complete (some flow continues). In this case the spill would occur during the peak flow periods (typically 10:00 to 12:00 and 13:00 to 16:00 each day). Spills that occur due to peak flows in excess of capacity will occur only during, and for a short period after, heavy rainfall.

End time: The end time is usually much easier to establish. Field crews on-site observe the "blow down" that occurs when the blockage has been removed. The "blow down" can also be observed in downstream flowmeters.

Flow Rate: The flowrate is the average flow that left the sewer system during the time of the spill. There are three common ways to estimate the flowrate:

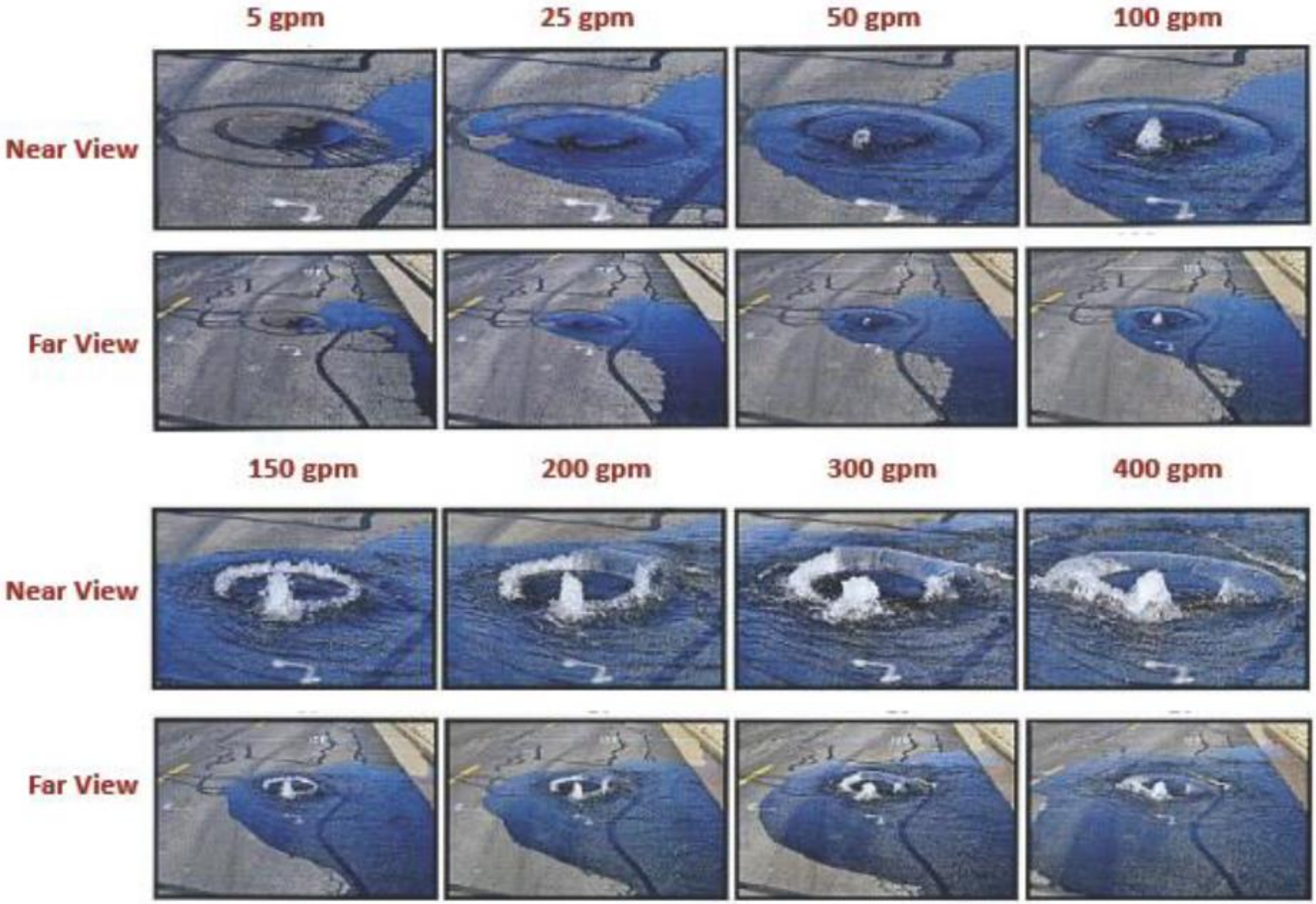
The Manhole Flowrate Chart: This chart, attached as Page 4, shows sewage flowing from manhole covers at a variety of flowrates. The observations of the field crew can be used to select the appropriate flowrate from the chart. If possible, photographs are useful in documenting basis for the flowrate estimate.

- Flowmeter: Changes in flows in downstream flowmeters can be used to estimate the flowrate during the spill.
- Counting Connections: Once the location of the spill is known, the number of upstream connections can be determined from the sewer maps. Multiply the number of connections by 200 to 250 gallons per day per connection or 8 to 10 gallons per hour per connection.

For example: 22 upstream connections x 9 gallons per hour per connection
= 198 gallons per hour / 60 minutes per hour
= 3.3 gallons per minute

Spill Volume: Once duration and flowrate have been estimated, the volume of the spill is the product of the duration in hours or days and the flowrate in gallons per hour or gallons per day.

For example:
Spill start time = 11:00
Spill end time = 14:00
Spill duration = 3 hours
3.3 gallons per minute X 3 hours X 60 minutes per hour = 594 gallons


5 gpm
25 gpm
50 gpm
100 gpm
Near View
Far View
150 gpm
200 gpm
300 gpm
400 gpm
Near View
Far View