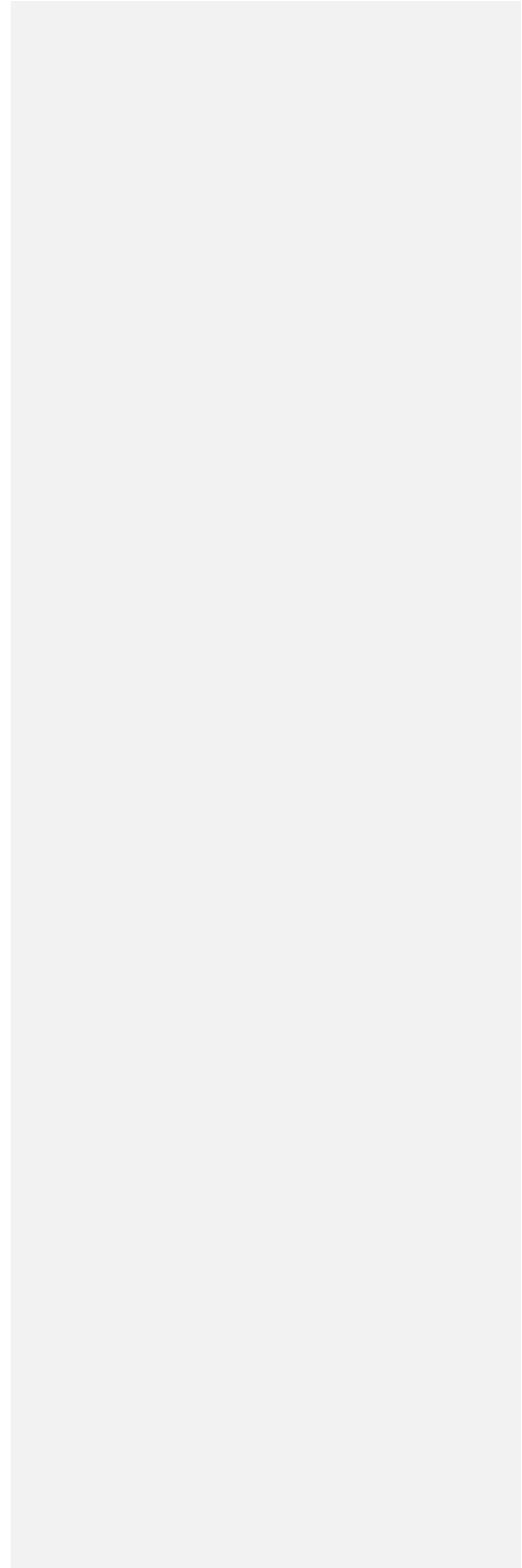


APPENDIX G
SSOURGP
SANITARY SEWER OVERFLOW UNIFIED RESPONSE GUIDANCE PLAN
April 27, 2021



SPILL RESPONSE MISSION STATEMENT

Excellence in service to its residents and customers within the City of Chino's Sewer Collection System combined with the utmost protection of public health, safety, and the environment.

PURPOSE OF THIS DOCUMENT

- To comply with the regulatory requirements and procedures established within the City's Sanitary Sewer Management Plan.
- Provide a standard response procedure for the City of Chino that meets regulatory and statutory requirements for sanitary sewer overflows.

GOALS

- Protect the public health, the environment and all beneficial uses of receiving waters.
- Mitigate as quickly as possible any adverse impacts of a Sanitary Sewer Overflow on the public and the environment.
- Provide timely and effective response.
- Maintain the upmost professionalism at all times.
- Prompt preventative and corrective actions for future spills.

Definition of a Sanitary Sewer Overflow (SSO):

A Sanitary Sewer Overflow (SSO) is defined as an unauthorized discharge of partially treated, completely treated or untreated wastewater not regulated by Waste Discharge Requirements (WDRs) issued by the Santa Ana Regional Water Quality Control Board or the State Water Resources Control Board.

References:

1. Health and Safety Code Sections 5410-5416, 5460-5464
2. California Code of Regulations, Title 23, Section 2250
3. California Water Code, Sections 1050-1062, 13260-13274, 13300-13308, 13350-13351, 13370-13389
4. California Fish and Game Code, Section 5650-5656
5. Regional Water Quality Control Board, NPDES Permit Nose. R-8-2015-0036 & R-8-2009-0021
6. State Water Resources Control Board, Order No. 2006-0003 and any amendment thereafter (Statewide General Waste Discharge Requirements For Sanitary Sewer Systems).
7. State Water Resources Control Board, Monitoring and Reporting Program No. 2006-0003, Statewide General Waste Discharge Requirements For Sanitary Sewer Systems.

Contacting Agencies

Site reporting procedures and responsibilities during emergencies are described in this Appendix and previously discussed within the SSMP document. The following agencies shown in the table below may need to be notified during or after an SSO, depending on the volume released.

| Agency and normal business hours* | Contacts ** | Hours of Operation |
|--|--|---|
| County of San Bernardino County Health Department 8:00 AM to 5:00 PM (M-F) | (800) 442-2283 | Answered on a 24-hour, 7-day basis. |
| State Office of Emergency Services 8:00 AM to 5:00 PM (M-F) | (800) 852-7550 or (916) 845-8911 | Answered on a 24-hour, 7-day basis. |
| Santa Ana Regional Water Quality Control Board (Region 8) 8:00 AM to 5:00 PM (M-F) | (951) 782-4130 or spillreportR8@waterboards.ca.gov | Answered only during normal working hours |
| San Bernardino County Flood Control District 8:00 AM to 5:00 PM (M-F) | Tel. (909) 387-7906 | Answered only during normal working hours |
| <i>*Caller must leave a message after business hours</i> | <i>** Contact information should be updated every six months</i> | |

Media Relations

It is the policy of the City that all media contacts are referred to the City’s designated Public Information Officer (PIO) or City Manager. All employees are expected to be polite, courteous, and professional when dealing with the media in the field, and to direct media inquires to the City’s PIO.

Responsibility

It is the City’s responsibility (specifically, its Public Works Field staff at all levels) to operate and maintain the sewerage collection systems, lift stations, and other ancillary system in a manner that ensures all systems operate as designed.

It is our responsibility to protect public health, the environment, and public and private property from sanitary sewer overflows. We are responsible for restoring the affected area and returning them to their normal state as quickly as possible.

It is our legal responsibility to report all sanitary sewer overflows to proper reporting agencies. Reporting of spills is mandated by federal, state, and local laws and regulations.

It is our duty to use all the appropriate resources that are available through the City's own forces and its contractors to mitigate all sanitary sewer overflows. We are held accountable to make every honest effort to contain, control, and clean-up after all sanitary sewer overflows.

It is also our responsibility to ensure that after a sanitary sewer overflow has occurred that all measures are implemented to prevent future recurrence at the site of spill.

NOTE: City staff must be notified immediately of any spill or the potential of a spill. This notification must be done 24 hours a day, 7 days a week.

Sanitary Sewer Overflow Reporting

The table below provides details regarding the SSO Category, the notification and reporting requirements associated with the SSO.

| SSO Category | Type or Description of Discharge | Notification | Notification Method | Reporting Requirement | Reporting Method |
|--------------|---|--|---|---|---|
| 1 | Discharges of untreated or partially treated wastewater of any volume resulting from an enrollee's sanitary sewer system failure or flow condition that: | Within two hours of becoming aware of any Category 1 SSO greater than or equal to 1,000 gallons discharged to surface water or spilled in a location where it probably will be discharged to surface water, notify the California Office of Emergency Services (Cal OES) and obtain a notification control number. | Call Cal OES at: (800) 852-7550 | Category 1 SSO: Submit draft report within three business days of becoming aware of the SSO and certify within 15 calendar days of SSO end date. | Enter data into the CIWQS Online SSO Database (http://ciwqs.waterboards.ca.gov/), certified by enrollee's Legally Responsible Official(s). |
| | Conduct water quality sampling within 48 hours after initial SSO notification for Category 1 SSOs in which 50,000 gallons or greater are spilled to surface waters. | | | | |
| | A. Reach surface water and/or reach a drainage channel tributary to a surface; or | | | SSO Technical Report: Submit within 45 calendar days after the end date of any Category 1 SSO in which 50,000 gallons or greater are spilled to surface waters. | |
| | B. Reach a Municipal Separate Storm Sewer System (MS4) and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly. Any volume of wastewater not recovered from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or groundwater infiltration basin (e.g., infiltration pit, percolation pond). | | Notify Santa Ana Regional Water Quality Control Board | Provide copy of report to Regional Board staff. | Via email to: Nam Nguyen, Environmental Scientist, at Nam.Nguyen@waterboards.ca.gov |
| 2 | Discharges of untreated or partially treated wastewater of 1,000 gallons or greater resulting from an enrollee's sanitary sewer system failure or flow condition that do not reach surface water, a drainage channel, or a MS4 unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly. | | | Category 2 SSO: Submit draft report within 3 business days of becoming aware of the SSO and certify within 15 calendar days of the SSO end date. | Enter data into the CIWQS Online SSO Database (http://ciwqs.waterboards.ca.gov/), certified by enrollee's Legally Responsible Official(s). |
| 3 | All other discharges of untreated or partially treated wastewater resulting from an enrollee's sanitary sewer system failure or flow condition. | | | Category 3 SSO: Submit certified report within 30 calendar days of the end of month in which SSO the occurred. | Enter data into the CIWQS Online SSO Database (http://ciwqs.waterboards.ca.gov/), certified by enrollee's Legally Responsible Official(s). |
| PLSD | PRIVATE LATERAL SEWAGE DISCHARGE (PLSD) Discharges of untreated or partially treated wastewater resulting from blockages or other problems within a privately owned sewer lateral connected to the enrollee's sanitary sewer system or from other private sewer assets. PLSDs that the enrollee becomes aware of may be voluntarily reported to the California Integrated Water Quality System (CIWQS) Online SSO Database. | | | The enrollee is strongly encouraged to notify Cal OES of discharges greater than or equal to 1,000 gallons of untreated or partially treated wastewater that result or may result in a discharge to surface water resulting from failures or flow conditions within a privately owned sewer lateral or from other private sewer asset(s) if the enrollee becomes aware of the PLSD. | Enter data into the CIWQS Online SSO Database (http://ciwqs.waterboards.ca.gov/), certified by enrollee's Legally Responsible Official(s). |

Spill Response Procedures

1. Upon arrival at the location of the reported SSO, assess the spill and what is needed to contain, control, and make the work area safe. Note your time of arrival. If spill occurs after regular working hours or weekends and holidays, follow the Emergency Reporting Procedures Memo.
2. Contact the office immediately after your assessment: explain what is needed to mitigate the situation (pump truck, extra employees, bypass pump, sandbags, etc.). If sewage has entered, or has the potential to enter, any receiving waters or dry waterways, emphasize this in your reporting to the office.
3. Make your work area safe. Utilize your Personal Protective Equipment (PPE), then work on containing/controlling the spill.
4. If a building or structure is flooding with sewage due to a problem in sewer lines, locate the house connection clean out cap and remove the cap to mitigate damage to the property.
5. If a digital camera is available, photograph the affected area. If no camera is on site, request that a camera is brought out to the location or use your smart phone camera.
6. Sampling of the sewage may be required. Contact the office and the designated city supervisor for further details.
7. Begin the necessary steps to relieve the stoppage. Always use a trap. If the house connection clean-out cap was removed, don't forget to re-install cap. Note the time the spill was relieved and the cause of the stoppage.
8. Perform a rough estimate on the number of gallons of the spill. Take all necessary measurements, flow depths, distances, size of pooling water, etc. Use of the spill estimation template is encouraged. (See attached Spill Volume Worksheet)
9. Notify the office if any school (public or private) is in the vicinity of the affected spill area. The office will contact the school and inform them of the current situation.
10. Post area with the proper warning signage (if instructed).
11. Continue to thoroughly proof (clean) the mainline sewer from structure to structure.
12. After the mainline sewer has been proofed (cleaned), inspect the downstream structure(s) to ensure that no other problems will occur.
13. Perform clean up measures. Ensure that all liquid and solids are removed from the affected area, including washdown water.
14. If damage to private property has occurred or a customer has made a claim for damage, **DO NOT ATTEMPT ANY CLEAN UP WORK UNTIL THE AREA HAS BEEN**

PHOTOGRAPHED AND THE W&S MAINTENANCE SUPERVISOR IS ON SITE.

15. CCTV the line section(s) immediately following the proofing (cleaning) process (if CCTV unit is available). If line is need of repair, complete “Sewer Line Repair Request Form.”
16. Complete the Spill Report Form and all other documents related to the incident. If a spill occurred inside a building or structure, issue a Backwater Valve Notice to the resident/property owner.

Containment

Containment of a sewage spill is a very critical element of an SSO response. We are required under numerous laws and regulations to contain and recover discharges for all sewage spills. There are many variables in containing a spill including logistics, inclement weather, traffic control issues and others.

The goal of containment is to prevent the spread of the SSO any farther than necessary. Containment should prevent the SSO from crossing driveways, streets or other locations where vehicle traffic can further spread or track-out the SSO into adjacent areas, thus increasing the area that must ultimately be cleaned and sanitized. The goal also should be to prevent the SSO from entering either storm drain catch-basins, utility vaults or private property from the public right of way. Staff must work quickly but effectively in determining the potential impact areas of an SSO and place temporary containment quickly to limit the size of the SSO exposure area.

It is important to determine the direction of flow of an SSO, and installation of containment structures ahead of the SSO should be placed as quickly as possible. Simple dirt berms installed across the flow line in an arching pattern to create an impoundment area can be quickly placed, pending additional use of sandbags or other containment elements. Traffic control devices such as traffic cones or A-frame barricades should be placed to prevent vehicles from entering into the SSO flows or containment area.

Most spill sites will have similar characteristics such as natural low areas, berms, curbs, storm drain basins, culverts, vacant lots or fields, excavations, basements, etc. Use these variables to your advantage while performing the containment procedures.

Normal Containment Equipment and Materials:

1. Sandbags
2. Plastic Sheeting (Visquene) or Rubber Sheeting
3. Boom
4. Dirt, Sand
5. Cold Patch (Bagged Asphalt)

6. Plywood
7. Etc.

The most commonly used device is a sandbag. Sandbags are a great aid in directing or holding a spill. The use of plastic sheeting in conjunction with sandbags produces a better seal for controlling and containing an SSO. As noted above, simple dirt berms using adjacent vacant property as a borrow source can be an effective initial response if followed up by installation of sandbags to increase the containment capacity and strengthen the impound area.

Control

Control of a sewage spill is normally obtained by clearing the pipeline blockage by hydro flushing or rodding. If these methods fail, it may be necessary to set up a temporary bypass of the blockage through the use of trailer mounted debris pumps or the use of multiple pump truck methods to remove enough volume that can then be transferred to an adjacent sewer manhole downstream of the blockage.

Clean-Up

Cleaning up after a spill is a tough job. We are required to remove the liquid and solid debris from every spill site. Before the area is cleaned, it is advisable to photograph the affected area. This includes any damage to public or private property. After the clean-up work has been completed, re-photograph the affected area.

A sewage sample may also be required from a spill location. Check with your office before disposing of the removed liquids. (See Sampling Procedures on following page.)

General Clean-Up Procedures:

1. Spillage on paved street: sweep and vacuum up sewage and debris. Wash down the street with clean water and remove wash down water. Do not allow the wash down to flow into receiving waters or storm drain catch basins, or other storm drain system elements.
2. Spillage on unimproved roads, vacant lots, dry waterways, private property, etc.: remove all liquid and solids by means of a pump or vacuum truck, wash down surface area (if feasible), remove wash down, and rake area. It may be appropriate to use an approved sanitizer in areas that may be inaccessible to the vacuum operations in order to minimize public health exposure. Discuss the type of sanitizer and its use with the supervisor or manager to determine if such use is allowable and appropriate for the circumstances.
3. Supervisor or designee is on site and determines that the SSO is the result of City operations. If it is determined that the SSO is on private property and is the result of a failure of the property owner, advise Code Enforcement or other enforcement officers; such SSOs are the responsibility of the property owner and the City should

Commented [LM1]: AS A NOTE: This is a very bad suggestion since we could inadvertently cause a soil contamination on private property since we do not absolutely know what's in an SSO.

only take actions in the event that the SSO threatens the public health or has entered the public right of way. Take photographs and document any damage before clean-up begins. Mop, squeegee, and wet vac surfaces. Flush surfaces with clean water, re-mop and wet vac. Issue a backflow device test notice to the affected domestic water customer to ensure that SSO materials do not inadvertently enter the domestic water supply through cross-contamination. After the clean-up work has been completed, re-photograph the affected area.

Sampling Procedures

When sewage enters into receiving waters (lakes, streams, creeks, pools, etc.), both the San Bernardino County Environmental Health Department and Santa Ana Regional Water Quality Control Board must be notified as set forth above. Additional notifications may be required; see above table. Bacteriological sampling must be performed. The samples must be taken from three different sites.

Site 1: Upstream of entry point.

Site 2: Just below entry point.

Site 3: Distance downstream of entry point.

The individual sampling points will be on a case-by-case basis. The samples will be generally tested for the following:

- 1) Total Coliform
- 2) Fecal Coliform
- 3) Fecal Strep

Additional constituents of concern (COCs) may be added. Please check with supervisor.

In most cases, the City public works staff will perform all the required sampling procedures. When the public works staff is unavailable to perform the required sampling procedures, notify the Office for direction from the appropriate staff for further instructions on how and where to collect the samples and other further direction as needed.

Please note proper chain-of-custody procedures must be followed. Discuss with your analytical laboratory for further direction.

Corrective Actions

1. Management and the Field Supervisor will evaluate every spill.
2. Each line segment will be inspected by CCTV after the event. The CCTV inspection will be done in a timely manner. All "Sewer Line Repair Request Forms" will be reviewed/processed. If an outside contractor is hired to do the sewer cleaning, they will be on call to complete such tasks in a timely manner and are expected to follow the City required protocols for dealing with all SSOs.

3. Each spill location will have an assigned preventive maintenance schedule. The type of scheduled cleaning will be determined by the conditions found through the CCTV inspection.
4. All spill locations will have follow-up CCTV inspections performed. Each inspection will be scheduled at three-month intervals to determine the effectiveness of the scheduled cleaning. Adjustments of the scheduled cleaning will be made when necessary.
5. Details of each spill will be reviewed to help identify and recommend any necessary improvements to the spill response and notification procedure.
6. Define and recommend necessary follow-up actions such as sewer repair or system upgrade through capital improvements.

Training

All staff designated for spill response will be properly trained and mock training sessions will be conducted on a regular schedule. A record of training will be maintained in hard bound record book or on computer data base. All records must be maintained for a minimum period of 5-years and would be readily accessible for review by regulatory agency staff on as needed basis.

Funding

There will be sufficient monetary, staffing, and other resources available to accomplish an effective and efficient implementation of SSOs response. All records should be reviewed at least once yearly to determine if the frequency and/or magnitude of SSOs have decreased or further follow up actions need to be taken. All measures taken should be documented.

APPENDIX
Spill Volume Worksheet

SPILL VOLUME WORKSHEET

The purpose of this worksheet is to capture the data and method(s) used in estimating the volume of an SSO. Since there are many variables and often unknown values involved, this calculation is just an estimate. Additionally, it is useful to use more than one method, if possible, to validate your estimate.

The following methods and tools are the approved methods in the SOP CS-103 SSO *Response*. Check all methods and tools that you used:

- Eyeball Estimate Method
- Measured Volume Method
- Duration and Flow Rate Method (Account for diurnal flow pattern for long duration)
- USD SSO Flow Rate Estimating Tool
- Other (explain) i.e.; estimated daily use per capita upstream or meter @ Pump Station.

Eyeball Estimate Method- Imagine a bucket(s) or barrel(s) of water tipped over.

| Size of bucket(s) or barrel(s) | How many of this Size? | Multiplier | Total Volume Estimated |
|---|------------------------|------------|------------------------|
| 1 gal. water jug | | X 1 | |
| 5 gal. bucket | | X 5 | |
| 32 gal. trash can | | X 32 | |
| 55 gal drum | | X 55 | |
| Total Volume Estimated Using Eyeball Method | | | |

Measured Volume Method (this may take several calculation as may have to break down the odd shaped spill to rectangles, circles, and polygons) It is important when guessing depth to measure, if possible in several locations and use an average depth. Use the SSO Volume Estimate by Area Work Sheet , if necessary, to sketch the shapes and show your work.

1. Draw a sketch of the spill SSO Volume Estimate by Area Work Sheet, or use a photo copy of USD block book to draw on and attach it.
2. Draw shapes and dimensions used on your sketch
3. Use correct formula for various shapes

| | |
|------------------------------|----------------------------|
| Rectangle | $L \times W \times D$ |
| Circle | $3.14 \times R^2 \times D$ |
| Polygons see reference chart | Show formula used |

Duration and Flow Rate Method worksheet:

| | |
|---|----|
| Start Date and Time | 1. |
| End Date and time | 2. |
| Total time elapsed of SSO event (subtract line 1 from line 2. Show time in minutes) | 3. |
| Average flow rate GPM (account for diurnal pattern) | 4. |
| Total volume estimate using duration and flow rate method (Line 3 x Line 4) | 5. |

CAUSE OF SPILL

Spill Cause: Roots Grease Debris Vandalism Lift Station Fail Other _____

Spill cause to be determined by CCTV inspection (Attach TV Report to this form)

Final Cause Determination:

Follow-up or Corrective Action Taken:

SPILL CONTAINMENT

Containment Implemented: _____:_____ AM PM Date: _____/_____/____



Containment Measures: Plugged Storm Drain Washed Down Vacuum Up Water/Sewage

Other Measures: _____

CLEAN UP

Clean Up Begin: _____:_____ AM PM Date: ____/____/____



Clean Up Complete: _____:_____ AM PM Date: ____/____/____

Describe Clean Up Operations:

_____ Gallons – Estimate Volume of Spill Recovered (do not count wash down water)

OTHER IMPORTANT MILESTONES

Contacted Supervisor: _____:_____ AM PM Date: ____/____/____

Requested Additional EE's/Equip: _____:_____ AM PM Date: ____/____/____

Requested Additional EE's/Equip: _____:_____ AM PM Date: ____/____/____

Requested Additional EE's/Equip: _____:_____ AM PM Date: ____/____/____

Departure Time: _____:_____ AM PM Date: ____/____/____

_____:_____ AM PM Date: ____/____/____

_____:_____ AM PM Date: ____/____/____

_____:_____ AM PM Date: ____/____/____

REPORTING

Report to Cal-EMA: Date: _____ : _____ AM PM (Cat.1 Only) (800) 852-7550 By: _____

→ Control Number provided by Cal-OES: _____

→ Name of Person Contacted: _____ or Left Message:

Report to _____ Date: _____ : _____ AM PM Phone: 668-4200 By: _____

→ Name of Person Contacted: _____ or Left Message:

Notes: _____

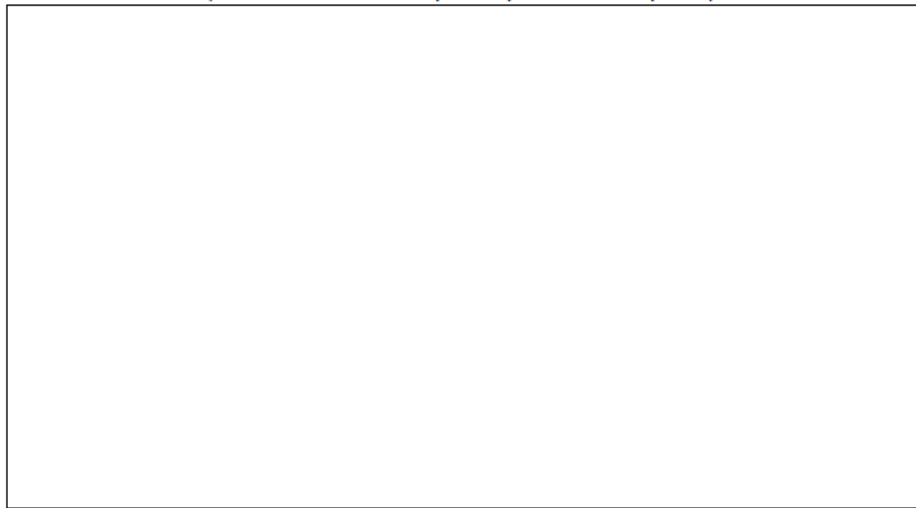
Response Crew: _____, _____, _____

SSO Volume by Area Estimation Work Sheet

2.6.7.2 SSO Volume by Area Estimation Work Sheet

Surface: Asphalt Concrete Dirt Landscape Inside Building Other _____

(Draw / Sketch outline of Spill 'Footprint' and attach photos)



~~ Breakdown the 'Footprint' into Recognizable Shapes and Determine Dimensions of Each Shape ~~

Area #1 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

Area #2 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

Area #3 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

Area #4 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

Area #5 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

SSO Volume by Area Estimation Work Sheet

Area #6 _____ % Wet _____

Stain. Depth1 _____ Depth2 _____ Depth3 _____ Depth4 _____ Depth5 _____ Depth6 _____

Area #1 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Area #2 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Area #3 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Area #4 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Area #5 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Area #6 Square Feet: _____ x % Wet _____ = _____ Sq/Ft

Ave Depth: _____ Concrete 0.0026' Asphalt 0.0013'

Volume: _____ Cu/Ft

Total Volume:

#1 _____, #2 _____, #3 _____, #4 _____, #5 _____, #6 _____ = _____ *cu ft

_____ *cu ft x 7.48 gallons = _____ gallons Spilled.

SSO Volume by Area Estimation Work Sheet

Page 3

CONVERSIONS

** To convert inches into feet: Divide the inches by 12.

Example: $27'' / 12 = 2.25'$

Or Use Chart A

Example: $1 \frac{3}{4}'' = ?$

$1'' (0.08') + \frac{3}{4}'' (0.06') = \underline{0.14'}$

** One Cubic Foot = 7.48 gallons of liquid.

| Chart A | | |
|---------------|----|-------------|
| Conversion: | | |
| <u>Inches</u> | to | <u>Feet</u> |
| 1/8" | = | 0.01' |
| 1/4" | = | 0.02' |
| 3/8" | = | 0.03' |
| 1/2" | = | 0.04' |
| 5/8" | = | 0.05' |
| 3/4" | = | 0.06' |
| 7/8" | = | 0.07' |
| 1" | = | 0.08' |
| 2" | = | 0.17' |
| 3" | = | 0.25' |
| 4" | = | 0.33' |
| 5" | = | 0.42' |
| 6" | = | 0.50' |
| 7" | = | 0.58' |
| 8" | = | 0.67' |
| 9" | = | 0.75' |
| 10" | = | 0.83' |
| 11" | = | 0.92' |
| 12" | = | 1.00' |

SSO Volume by Area Estimation Work Sheet

Page 4

GEOMETRY

For the purposes of this work sheet, the unit of measurement will be in feet for formula examples.

Area is two-dimensional - represented in square feet. (Length x Width)

Volume is three-dimensional - represented in cubic feet. (Length x Width x depth) or (Diameter Squared) $D^2 \times 0.785 \times \text{depth}$.

A Note about Depth

Wet Stain on a Concrete Surface - For a stain on concrete, use 0.0026'. This number is 1/32" converted to feet. For a stain on asphalt use 0.0013' (1/64"). These were determined to be a reasonable depth to use on the respective surfaces through a process of trial and error by SPUD staff. A known amount of water (one gallon) was poured onto both asphalt and concrete surfaces. Once the Area was determined as accurately as possible, different depths were used to determine the volume of the wetted footprint until the formula produced a result that (closely) matched the one gallon spilled. 1/32" was the most consistently accurate depth on concrete and 1/64" for asphalt. This process was repeated several times.

Sewage "Ponding" or Contained - Measure actual depth of standing sewage whenever possible. When depth varies, measure several (representative) points, determine the average and use that number in your formula to determine volume.

Area/Volume Formulas

Area is two dimensional and is represented as Square Feet (Sq. Ft.)

Volume is three dimensional and is represented as Cubic Feet (Cu. Ft.)

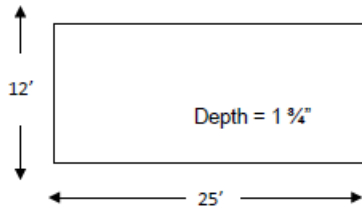
One Cubic Foot = 7.48 gallons

SSO Volume by Area Estimation Work Sheet

Page 5

AREA/VOLUME OF A RECTANGLE OR SQUARE

Formula: Length x Width x Depth = Volume in Cubic Feet



Length (25') x Width (12') x Depth (0.14')

$25' \times 12' \times 0.14' = 42$ Cubic Feet.

Now the Volume in Cubic Feet is known.

There are 7.48 Gallons in one Cubic Foot

So, 42 Cubic Feet x 7.48 gallons/cubic feet = 314 Gallons

Chart A

Conversion:

Inches to Feet

1/8" = 0.01'

1/4" = 0.02'

3/8" = 0.03'

1/2" = 0.04'

5/8" = 0.05'

3/4" = 0.06'

7/8" = 0.07'

1" = 0.08'

2" = 0.17'

3" = 0.25'

4" = 0.33'

5" = 0.42'

6" = 0.50'

7" = 0.58'

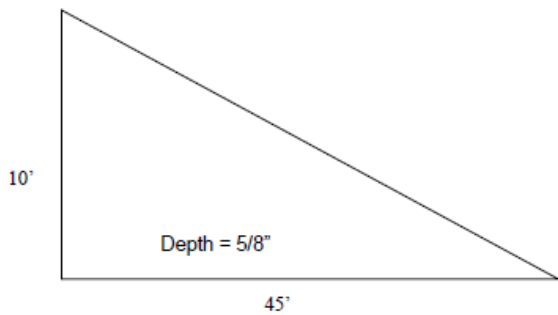
8" = 0.67'

9" = 0.75'

SSO Volume by Area Estimation Work Sheet

AREA/VOLUME OF A RIGHT TRIANGLE

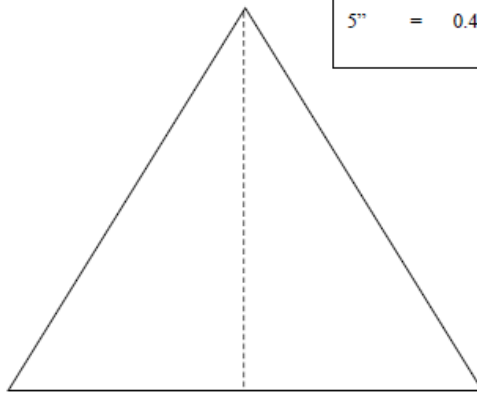
Base x Height x 0.5 x Depth = Volume in Cubic Feet



Base (45') x Height (10') x 0.5 x Depth (.05') x 7.48 gallons/cubic foot = 84 gallons

For Isosceles Triangles (two sides are equal lengths),
Break it down into two Right Triangles and compute area
as you would for the Right Triangle above.

| Chart A | | |
|-------------|----|-------|
| Conversion: | | |
| Inches | to | Feet |
| 1/8" | = | 0.01' |
| 1/4" | = | 0.02' |
| 3/8" | = | 0.03' |
| 1/2" | = | 0.04' |
| 5/8" | = | 0.05' |
| 3/4" | = | 0.06' |
| 7/8" | = | 0.07' |
| 1" | = | 0.08' |
| 2" | = | 0.17' |
| 3" | = | 0.25' |
| 4" | = | 0.33' |
| 5" | = | 0.42' |



SSO Volume by Area Estimation Work Sheet

AREA/VOLUME OF A CIRCLE/CYLINDER

$$D^2 \times 0.785 \times d$$

Diameter Squared x 0.785 x Depth = Volume in cubic feet.

Diameter = Any straight line segment that passes through the center of a circle.

For our purposes, it is the measurement across the widest part of a circle.

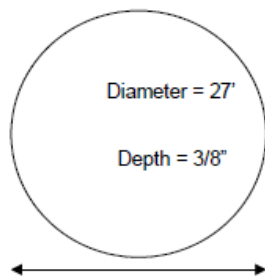
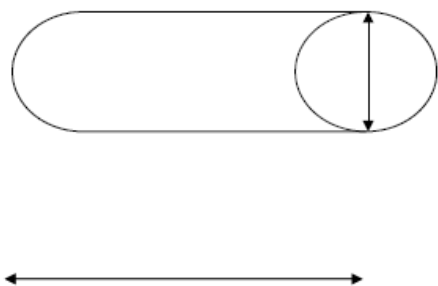
$D^2 \times 0.785 \times \text{depth} = \text{Volume in cubic feet}$

Example:

$$27' \times 27' \times 0.785 \times 0.03 = 17.17 \text{ cubic feet}$$

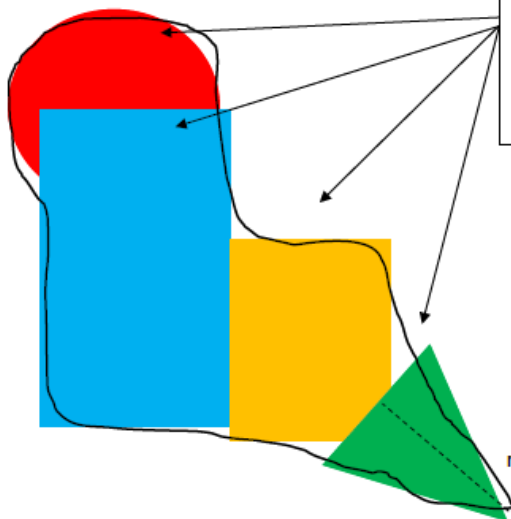
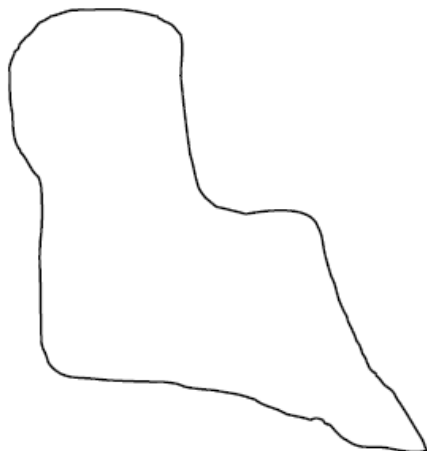
$$17.17 \text{ cubic feet} \times 7.48 \text{ gallons/cubic foot} = 128 \text{ gallons}$$

| Chart - A | |
|----------------|---------|
| Conversion: | |
| Inches to Feet | |
| 1/8" | = 0.01' |
| 1/4" | = 0.02' |
| 3/8" | = 0.03' |
| 1/2" | = 0.04' |
| 5/8" | = 0.05' |
| 3/4" | = 0.06' |
| 7/8" | = 0.07' |
| 1" | = 0.08' |
| 2" | = 0.17' |
| 3" | = 0.25' |
| 4" | = 0.33' |



SSO Volume by Area Estimation Work Sheet

Find the geometric shapes within the shape. If this was the shape of your spill, break it down, as best you can, with the shapes we know.

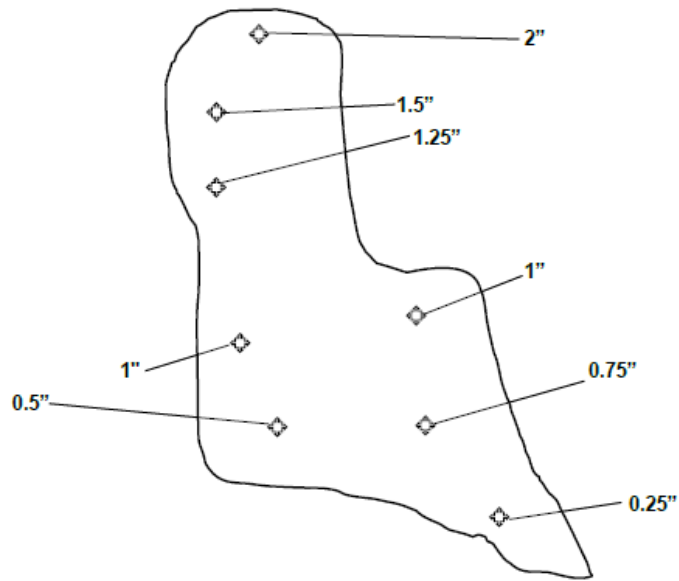


1. Determine the volumes of each shape.
In this example, after the volume of the circle is determined, multiply it by 55% (+/-) so that the overlap area won't be counted twice.
2. Add all the volumes to determine total spill volume.

If the spill depth is of varying depths, take several measurements at different depths and find the average.

SSO Volume by Area Estimation Work Sheet

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$$2" + 1.5" + 1.25" + 1" + 1" + 0.75" + 0.5" + 0.25" = 8.25"$$

$$8.25" / 8 \text{ measurements} = 1.03"$$

Average Depth = 1.03"

SSO Volume by Area Estimation Work Sheet

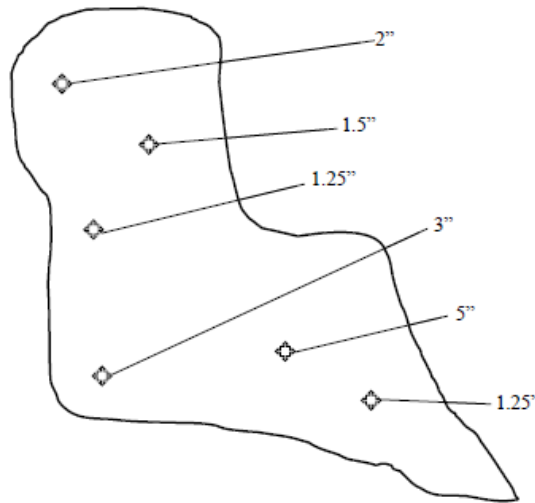
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Step 1

If the spill affects a dry, unimproved area such as a field or dirt parking lot, determine the Area of the wetted ground in the same manner as you would on a hard surface. Using a round-point shovel, dig down into the soil until you find dry soil. Do this in several locations within the wetted area and measure the depth of the wet soil. Average the measurement/thickness of the wet soil and determine the average depth of the wet soil.

NOTE: This can be used in a (Dry) dirt or grassy area that is not regularly irrigated like a field or a dirt parking lot.

Wet weather would make this method ineffective.



Step 2

Take a Test Sample

EXAMPLE:

If the Area of the spill was determined to be 128 Sq/Ft and the average depth of the wet soil is 2.33 inches:

$$128 \text{ Sq/Ft} \times 0.194' = 24.83 \text{ Cu/Ft}$$

$$24.83 \text{ Cu/Ft} \times 7.48 \text{ Gals/Cu/Ft} = 185.74 \text{ gallons}$$

$$185.74 \times 18\% = \underline{33 \text{ Gallons}} \text{ (water in soil)}$$

$$2" + 1.5" + 1.25" + 3" + 5" + 1.25" = 14.0"$$

$$14.0" / 6 \text{ measurements} = 2.33"$$

$$\text{Average Depth} = 2.33" (0.194')$$

