

Ross Valley Sanitary District

Sanitary Sewer Overflow (SSO)
Response Packet

- If this is a Category 1 SSO over 1,000 gallons, immediately contact the following within 2 hours:
 - CALOES (800) 852-7550
- If this is SSO is equal to or greater than 1,000 gallons, immediately contact the following within 2 hours:
 - Notify One of the Following:
 - O&M Manager
 - GM, AGM, or a Supervisor

Work Order and/or Address:

COLLECTIONS SYSTEM WORKER:

- Open this envelope.
- Follow the instructions on the Overflow Response Flowchart.
- Complete the chain of custody record (to the right) and deliver this package to the O&M Manager or Line Maintenance Supervisor.

CHAIN OF CUSTODY:

Print Name:

Initial: _____

Date: _____

Time: _____

DATA SUBMITTER:

- Open this envelope and review forms. Contact the Collection Systems Worker if needed to obtain additional information.
- Enter data into CIWQS.
- File and notify LRO of this package.

CHAIN OF CUSTODY:

Print Name:

Initial: _____

Date: _____

Time: _____

SSO Regulatory Reporting Guide

Reporting Instructions

Deadline	<u>See reverse side for contact information and definitions of the overflow categories.</u>		
	Category 1	Category 2	Category 3
2 Hours after awareness of an Overflow	If SSO is equal to or greater than 1,000 gallons, call CAL OES and Marin County Environmental Health Department Make internal RVSD notifications.	Notify Marin County Environmental Health Department *	-
As soon as possible	If SSO impacts private property that may be a failure of the sewer main and/or if a claim for damages may be submitted against the District, notify Carl Warren and Co.		
48 hours after awareness of an Overflow	If 50,000 gallons or more were not recovered, begin water quality sampling	-	-
3 Business Days after awareness of an Overflow	Submit draft spill report in the CIWQS database.	Submit draft spill report in the CIWQS database.	-
15 Days after response conclusion	Certify spill report in CIWQS database. Update as needed until 120 days after overflow end date.	Certify spill report in CIWQS database. Update as needed until 120 days after overflow end date	-
30 Days after end of calendar month in which Overflow occurred.			Certify spill report in CIWQS database. Update as needed until 120 days after overflow end date
45 Days after Overflow end date.	If 50,000 gallons or more was not recovered, submit CIWQS SSO Technical Report in CIWQS.	-	-

* Unless volume/impact is minimal

In the event the CIWQS database is not available, do the following until the database becomes available:

- Management Only: Make required notifications to the SF Regional Water Quality Control Board and notify the State Water Resources Control Board by phone or email.

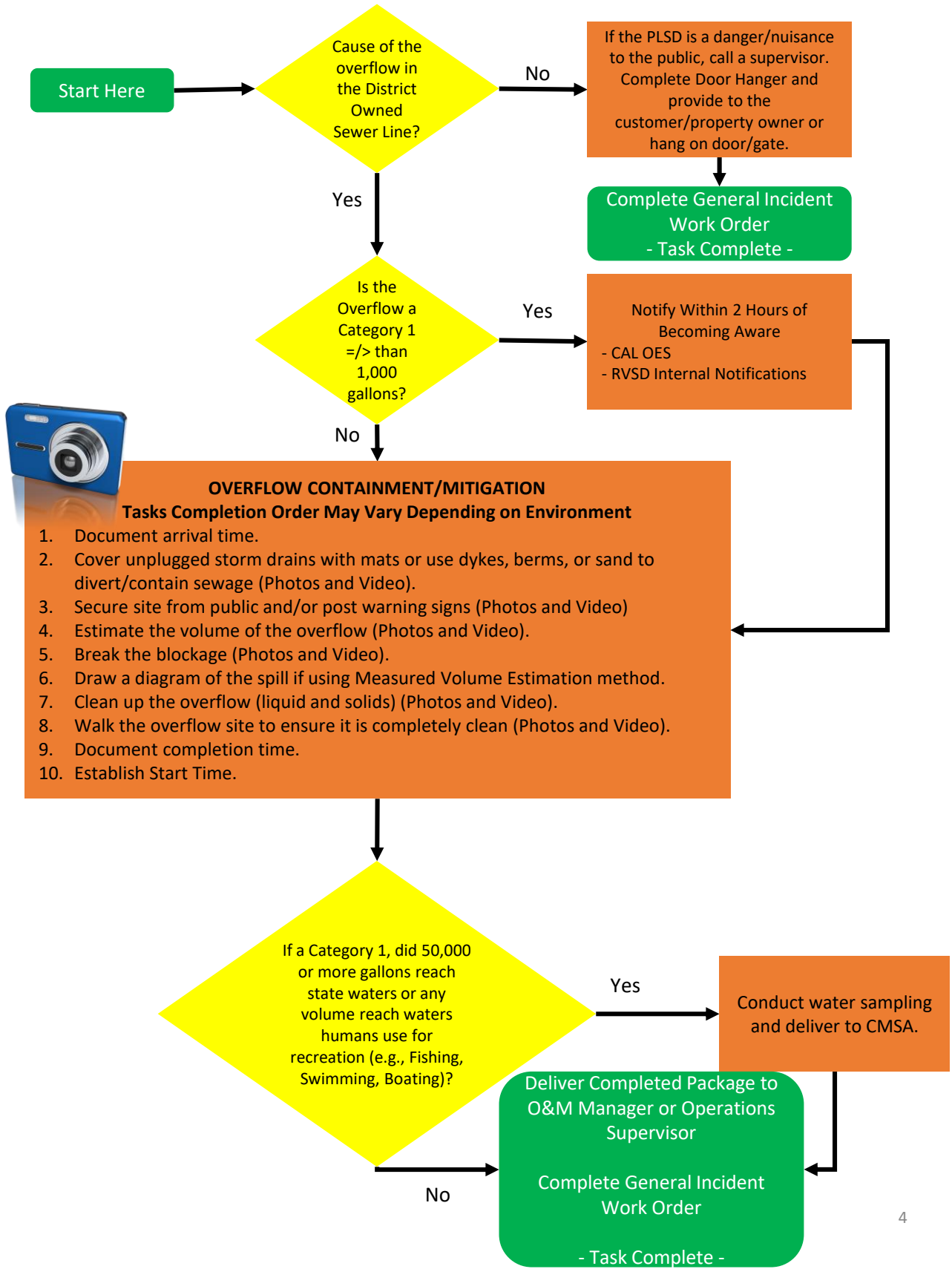
Regulatory Notifications Packet
Regulatory Reporting Guide

CONTACT INFORMATION

CAL OES	(800) 852-7550
Marin County Environmental Health Department	(415) 473-6907
Carl Warren and Co.	(800) 759-8798
San Francisco Regional Water Quality Control Board (SFRWQCB)	Phone: (510) 622-2369
State Water Resources Control Board (CIWQS)	(916) 322-1400

Category	Definition
1	Discharges of untreated or partially treated wastewater of any volume resulting from an enrollee’s sanitary sewer system failure or flow condition that: - Reach surface water and/or reach a drainage channel tributary to a surface water; or - 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).
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.
3	All other discharges of untreated or partially treated wastewater resulting from an enrollee’s sanitary sewer system failure or flow condition.
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.

Sanitary Sewer Overflow Flowchart



NOTIFICATIONS

CAL OES (800) 852-7550

Notification Date/Time:

Name of Who You Spoke To:

OES Control Number:

Marin County Environmental Health Department (415) 473-6907

Notification Date/Time:

Name of Who You Spoke To: Left Message:

SF Regional Water Quality Control Board (510) 622-2300

Notification Date/Time:

Name of Who You Spoke To: Left Message:

Carl Warren and Co. (800) 759-8778

Notification Date/Time:

Name of Who You Spoke To: Left Message:

Sanitary Sewer Overflow Initial Report and Start Time Determination

SSO FIELD REPORT

PHYSICAL LOCATION DETAILS

Spill Location Name

Latitude of spill location

37. _____ North

Longitude of spill location

122. _____ West

County

Marin

Regional Water Quality Control Board

Region 2 – San Francisco Bay

VOLUMES BY DESTINATION

Volume Spilled
(Gallons)

Volume Recovered
(Gallons)

2.a/2.b Estimated spill volume that reached a separate storm drain that flows to a surface body of water? (If not all recovered, this is a Category 1)

2.c/2d Estimated spill volume that directly reached a drainage channel that flows to a surface water body? (Any volume spilled is a Category 1)

2.e/2.f Estimated spill volume discharged directly to a surface water body? (Any volume spilled is a Category 1)

2.g/2.h Estimated spill volume discharged to land? (Includes discharges directly to land, and discharges to a storm drain system or drainage channel that flows to a storm water infiltration/retention structure, field, or other non-surface water location. Also, includes backups to building structures).

Volume Spilled

Volume Recovered

Total Volume Spilled (Verify this matches the table in between 2.h and 3 in CIWQS)

Sanitary Sewer Overflow Time Milestones

DATE/TIME DETERMINATIONS

	DATE	TIME
Start of SSO (Use Start Time Determination/Notes Below)		
RVSD Notified		
Collections Worker Dispatched		
Collections Worker Arrival		
End of SSO		
End of Spill Response		

Reporting Party/Start Time Determination/Notes

RP Name: _____ RP Phone: _____

Location of Overflow: _____

Caller Interview: Where did you see sewage spill from? Manhole Inside Building

Vent/Clean Out Catch Basin Wet Well/Lift Station Other _____

Comments: _____

Last Time Caller Observed NO Spill occurring: _____ AM / PM Date ____ / ____ / ____

Comments: _____

If the volume of the SSO and rate of flow are known, divide volume by rate of flow to get duration of SSO event.

_____ Gallons ÷ _____ GPM = Minutes (SSO Duration). Subtract the Duration from the SSO End Date/Time to establish the SSO Start Date/Time.

Other Comments/Efforts to Determine Start Time: _____

Estimated SSO Start Time: _____ AM / PM Date: ____ / ____ / ____

SSO End Time: _____ AM / PM Date: ____ / ____ / ____



Sanitary Sewer Overflow Location, Appearance Points, and Destination

SSO FIELD REPORT

CATEGORY 1, 2, OR 3

11. Spill location description.

12. Number of appearance points.

13. Spill appearance points. (Circle all that are apply) Backflow Prevention Device
 Force Main Gravity Mainline Inside Building/Structure Lateral Clean Out (Private / Public)
 Lower Lateral (Private / Public) Manhole Pump Station Upper Lateral (Private / Public)
 Other Sewer System Structure

14. Spill appearance point explanation. (Enter information here if "Other" or multiple appearance points were selected):

Final spill destination. (Circle all that apply). Beach Building/Structure
 Combined Storm Drain Drainage Channel Other (Specify Below) Paved Surface
 Separate Storm Drain Street/Curb and Gutter Surface Water Unpaved Surface

Explanation of final spill destination. (Enter information if "Other" was selected.

Sanitary Sewer Overflow Cause

SSO FIELD REPORT

Spill cause: (Circle One)

- Air Relief Valve (ARV)/Blow Off Valve (BOV) Failure
- Construction Diversion Failure
- CS Maintenance Caused Spill/Damage
- Damage by Others Not Related to CS Construction/Maintenance (Specify Below)
- Debris from Construction
- Debris from Lateral
- Debris-General
- Debris-Rags
- Debris Wipes/Non-Dispersables
- Flow Exceeded Capacity (Separate CS Only)
- Grease Deposition (FOG)
- Inappropriate Discharge to CS
- Natural Disaster
- Operator Error
- Other (Specify Below)
- Pipe Structural Problem/Failure
- Pipe Structural Problem/Failure – Installation
- Pump Station Failure – Controls
- Pump Station Failure – Mechanical
- Pump Station Failure – Power
- Rainfall Exceeded Design, I and I (Separate CS Only)
- Root Intrusion
- Siphon Failure
- Surcharged Pipe (Combined CS Only)
- Vandalism

Spill cause explanation: (Required if Spill Cause is “Other”)

RVSD: Overflow Emergency Response Plan

D-5

Sanitary Sewer Overflow Failures, Association, Asset, and Response Activities

SSO FIELD REPORT

Where did failure occur?

Air Relief Valve (ARV)/Blow Off Valve (BOV) Failure Force Main Gravity Mainline
 Lower Lateral (Public) Manhole Other (Specify Below) Pump Station Failure – Controls
 Pump Station Failure – Mechanical Pump Station Failure – Power
 Siphon Upper Lateral (Public)

Explanation of where failure occurred: (Required if Where Failure Occurred is “Other”)

Was Spill associated with a storm event?

YES

NO

Diameter of sewer pipe at the point of blockage or failure.

Inches

Material of sewer pipe at the point of blockage or failure.

Estimated age of sewer asset at the point of blockage or failure (if applicable):

YEARS

Spill Response Activities. (Circle all that apply) Cleaned-Up Mitigated Effects of Spill
 Contained All or Portion of Spill Other (Specify Below) Restored Flow
 Returned All Spoil to Sanitary Sewer System Property Owner Notified
 Other Enforcement Agency Notified

Explanation of spill response activities: (Required if spill response activities is “Other”)

RVSD: Overflow Emergency Response Plan

D-6

Sanitary Sewer Overflow Corrective Actions, Investigation, Signage, and Closures

SSO FIELD REPORT

Spill corrective action taken: (Circle all that apply)

- Added Sewer To Preventive Maintenance Program
- Adjusted Schedule/Method of Preventive Maintenance
- Enforcement Action Against FOG Source
- Inspected Sewer Using CCTV to Determine Cause
- Other (Specify Below)
- Plan Rehabilitation or Replacement of Sewer
- Repaired Facilities or Replaced Defect

Explanation of corrective action taken: (Required if spill corrective action is "Other" and required to enter number of health warnings that are posted)

Is there an ongoing investigation?

YES

NO

Health warnings posted?

YES

NO

Did spill result in beach closure

YES

NO

Name of Impacted Beach(es): (Enter N/A if none)

Name of impacted surface waters:

Sanitary Sewer Overflow Water Quality Samples and Volume Estimation Method

SSO FIELD REPORT

Water quality samples analyzed for: (Circle all that apply)

- Dissolved Oxygen
- Other Chemical Indicators(s) – Specify Below
- Biological Indicator(s) – Specify Below
- No Water Quality Samples Taken
- Not Applicable to the Spill
- Other (Specify Below)

Explanation of water quality samples analyzed for: (Required if water quality samples analyzed for is "Other chemical indicator(s)", "Biological indicator(s)", or "Other")

Water quality sample results reported to: (Circle all that apply) County Health Agency
 Regional Water Quality Control Board Other (Specify Below) No Water Quality Samples Taken
 Not Applicable to this Spill

Explanation of water quality sample results reported to: (Required if water quality sample results reported to is "Other")

Method and explanation of volume estimation methods used: (Circle all that apply)
 Eyeball Estimate Measured Volume Duration and Flow Rate PUC SSO Flow Rate
 Estimating Tool Other (Explain): _____

Sanitary Sewer Overflow Estimation Method Calculations

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 Gallon Water Jug		X 1	
5 Gallon Bucket		X 5	
32 Gallon Trash Can		X 32	
55 Gallon Drum		X 55	
Total Volume Estimated Using Eyeball Method			

Measured Volume Method: This may take several calculations as you may have to break down the Odd shaped spill to rectangles, triangles, and circles. It is important that, if possible, measure depth in several locations and use an average depth. Use the SSO Volume Estimate by Area Work Sheet to Sketch the shapes and show your work.

Duration and Flow Rate Method:

Start Date and Time	1.
End Date and Time	2.
SSO Event Total Time Elapsed (Subtract Line 1 from Line 2. Show in minutes)	3.
Average Flow Rate GPM (Account for diurnal flow pattern)	4.
Total Volume Estimated Using Duration and Flow Method (Line 3 x Line 4)	5.

Sanitary Sewer Overflow Containment

SPILL CONTAINMENT

Containment Implemented: _____ AM PM

Date: _____ / _____ / _____

Containment Measures: Plugged Storm Drain(s) Washed Down

Vacuum Up Sewage Other Measures: _____

Comments: _____

TAKE PHOTOS OF CONTAINMENTS EFFORTS/OUTCOMES



Sanitary Sewer Overflow Clean Up/Milestones/Reporting

CLEAN UP

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

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

Describe Clean Up Operations: _____

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: _____ / _____ / _____

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

CAUSE OF SPILL

Spill Cause: Roots Grease Debris Vandalism Pump/Lift Sta Failure Other: _____

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

Final Cause Determination: _____

Proper Operation and Maintenance Determination:

Date Last Cleaned: _____ Date Last TV'd: _____ Date Last Replaced/Rehabilitated: _____

Follow-up or Corrective Action Taken: _____



Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

WS-4

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:

Inches to Feet

Wet Asphalt	=	.0013
Wet Concrete	=	.0026
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'

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet**GEOMETRY**

For the purpose 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 various collection agencies. 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 with consistent outcomes.

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)

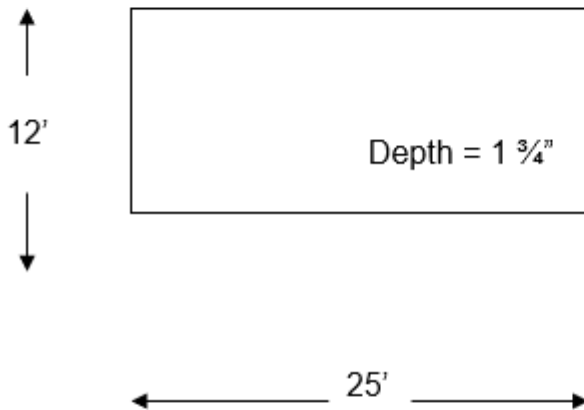
Volume is three dimensional and is represented as Cubic Feet (CU/FT)

One Cubic Foot = 7.48 Gallons

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

WS-6

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

Chart A

Conversion:

Inches to Feet

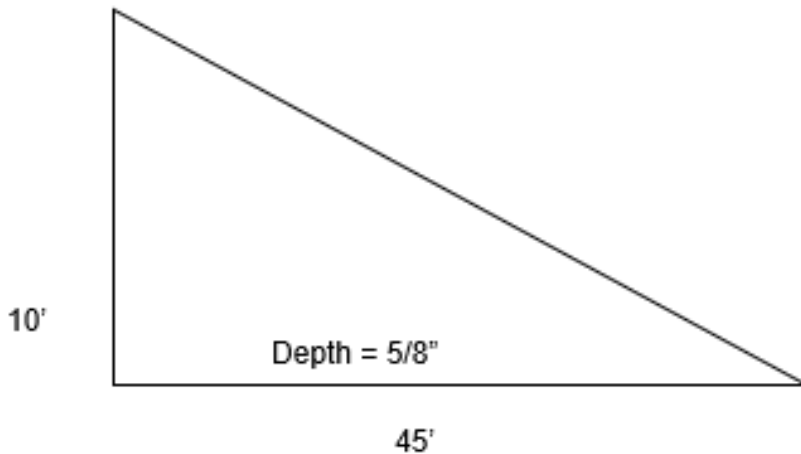
Wet Asphalt	=	.0013
Wet Concrete	=	.0026
1/8"	=	0.01'
1/4"	=	0.02'
3/8"	=	0.03'
1/2"	=	0.04'
5/8"	=	0.05'
3/4"	=	0.06'
7/8"	=	0.07'
1"	=	0.08'
2"	=	0.17'
3"	=	0.25'
4"	=	0.33'
5"	=	0.42'
6"	=	0.50'
7"	=	0.58'
8"	=	0.67'
9"	=	0.75'

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

WS-7

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.

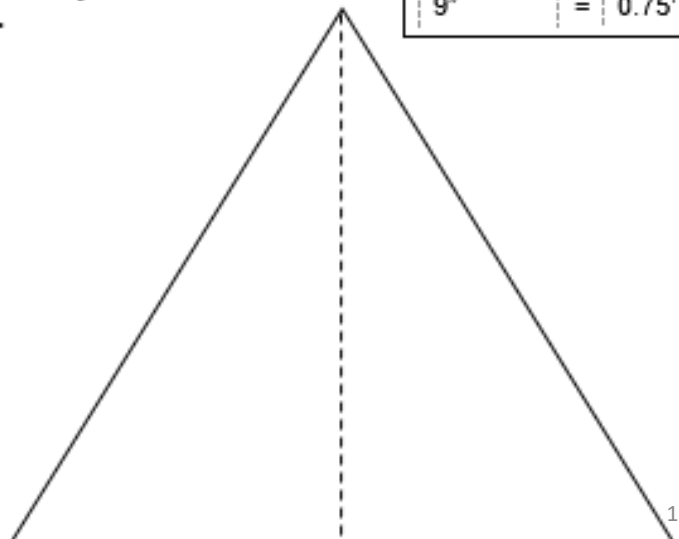


Chart A

Conversion:

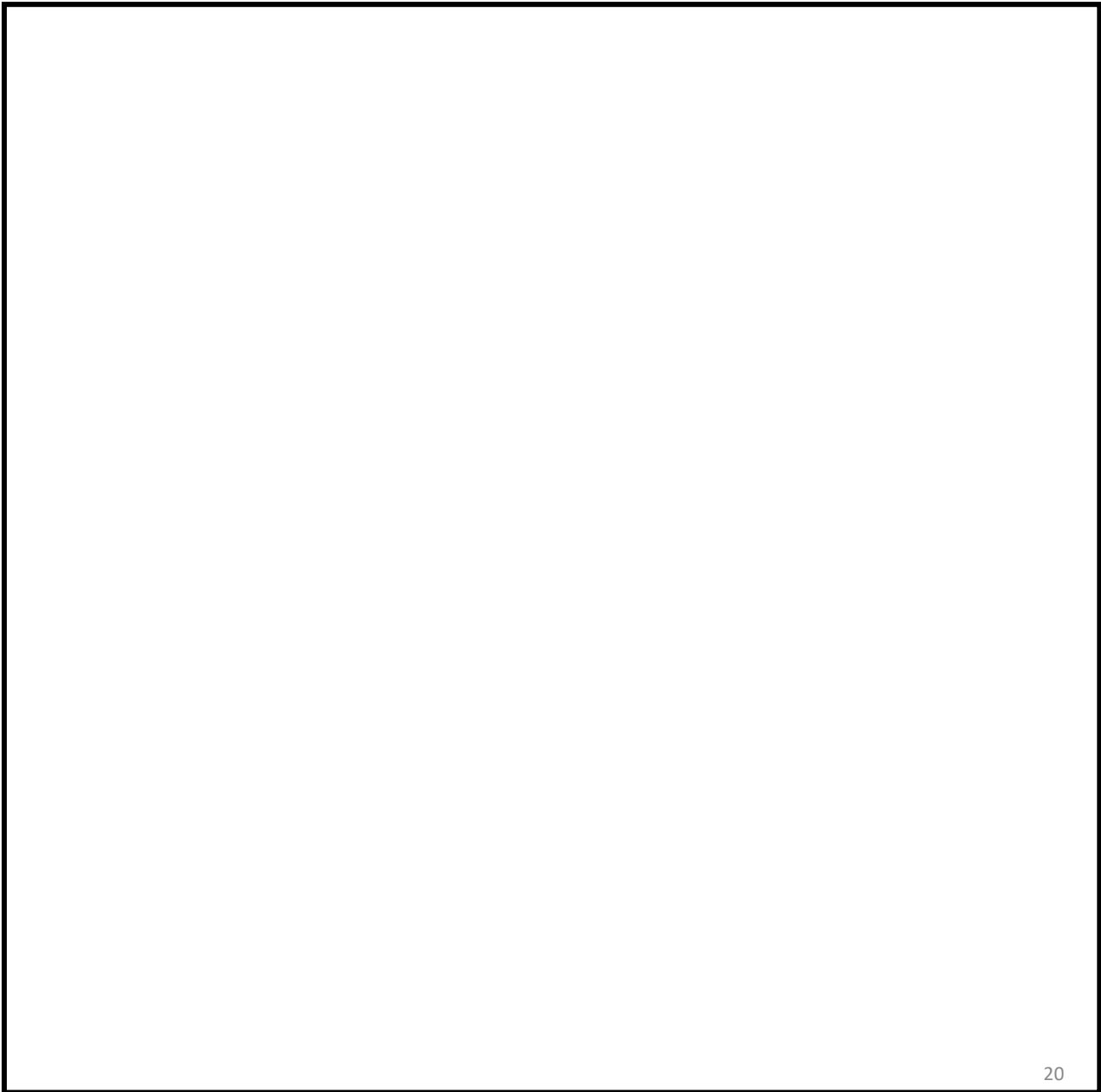
Inches to Feet

Wet Asphalt	=	.0013
Wet Concrete	=	.0026
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'

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

Surface: Asphalt Concrete Dirt Landscape Inside Building
 Other _____

1. Draw a sketch on this page using the **SSO Volume Estimate by Area Work Sheet** immediately after this page, or use a copy of the PUC Block Book to draw on and attach it to this package.
2. Draw shapes and dimensions used on your sketch.
3. Use correct formula for various shapes.



**Sanitary Sewer Overflow Volume by Area Estimation
Worksheet**

**WS-8
Side A**

Area #1 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

Area #2 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

Area #3 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$

3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

**Sanitary Sewer Overflow Volume by Area Estimation
Worksheet**

**WS-8
Side B**

Area #4 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

Area #5 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

Area #6 (Rectangle) $L \times W = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Triangle) $L \times W \times .5 = \underline{\text{SQ FT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 Length _____ x Width _____ x .5 x Depth _____ x 7.48 x _____ %Wet = _____ Gallons

(Circle) $3.14 \times R \times R = \underline{\text{SQFT}} \times \text{Depth} = \text{Volume} \times 7.48 \times \% \text{Wet} = \underline{\text{Gallons}}$
 or
 3.14 _____ x Radius _____ x Radius _____ x 7.48 x _____ %Wet = _____ Gallons

Total Volume: #1 _____ + #2 _____ + #3 _____ + #4 _____ + #5 _____ + #6 _____
 = _____ Gallons Spilled

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

**WS-9
Side A**

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.

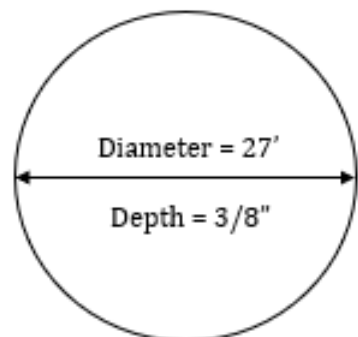
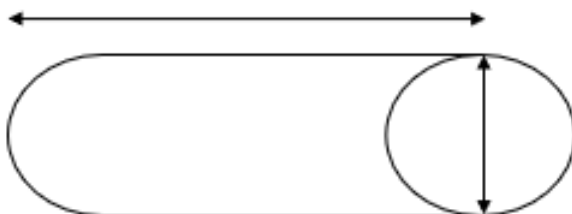
$$D^2 \times 0.785 \times \text{depth} = \text{Volume in cubic feet}$$

Example:

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

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

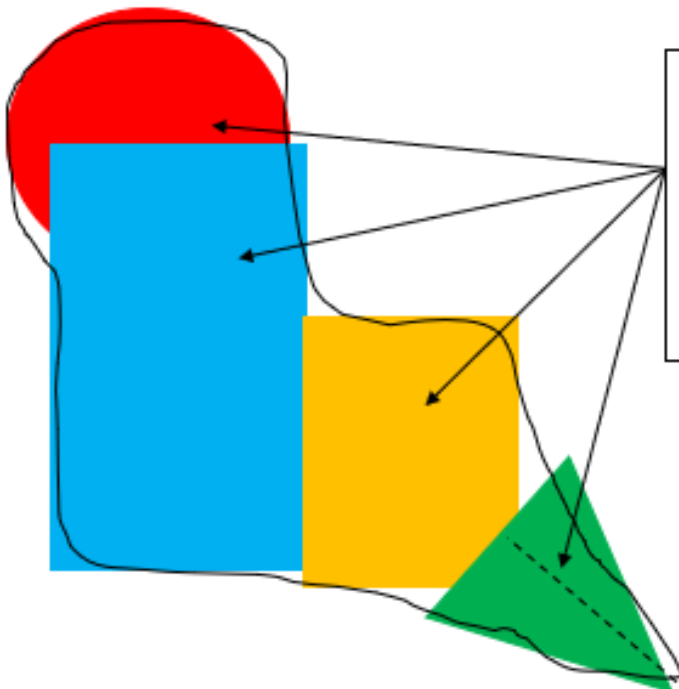
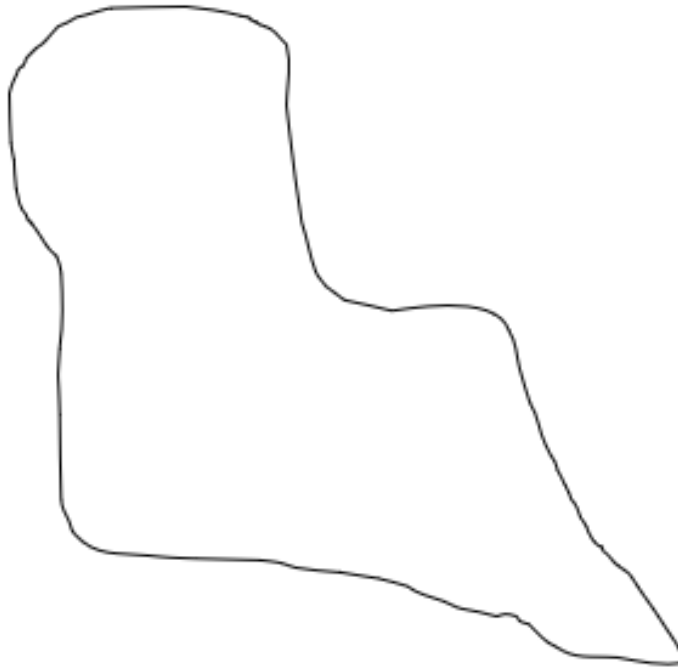
Chart A	
Conversion:	
<u>Inches to Feet</u>	
Wet Asphalt	= .0013
Wet Concrete	= .0026
1/8"	= 0.01'
1/4"	= 0.02'
3/8"	= 0.03'
1/2"	= 0.04'
5/8"	= 0.05'
3/4"	= 0.06'
7/8"	= 0.07'
1"	= 0.08'
2"	= 0.17'
3"	= 0.25'
4"	= 0.33'
5"	= 0.42'
6"	= 0.50'
7"	= 0.58'
8"	= 0.67'
9"	= 0.75'



Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

WS-9
Side B

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.



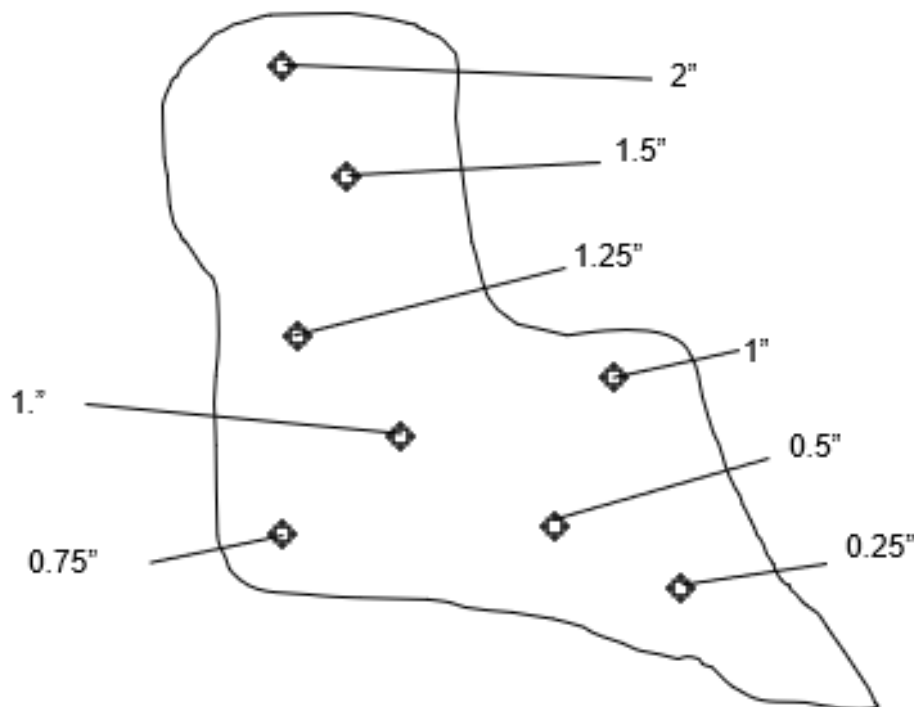
1. Determine the volumes of each shape.

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

Sanitary Sewer Overflow Volume by Area Estimation
WorksheetWS-10
Side A

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



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

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

Average Depth = 1.03''

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

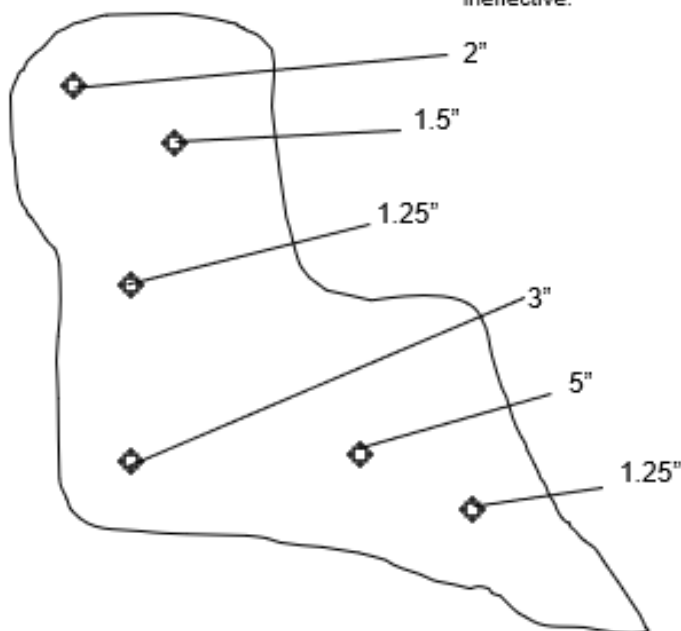
WS-10
Side B

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

$$2'' + 1.5'' + 1.25'' + 3'' + 5'' + 1.25'' = \underline{14.0''}$$

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

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

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:

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

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

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

Sanitary Sewer Overflow Volume by Area Estimation
Worksheet

WS-11

Drawing Worksheet

