City of Houston

Design Manual

Chapter 13

GIS DATA DIGITIZATION STANDARDS

Chapter 13
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GIS Data Digitization Standards

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13.1.01.B. Feature Class requirements for city-owned storm water, wastewater, and water utility infrastructure assets, which includes lines and points.

13.1.01.C. Required field parameters and associated domain names and valid codes.

13.1.01.D. Quality Assurance processes to determine acceptance of final deliverable.

13.1.02 POLICY

The City of Houston has adopted geographic information systems (GIS) technologies in order to store, manage, and maintain spatially related geographic data. The database where Houston Public Works (HPW) stores the utilities system is called a geodatabase. It is a native data structure for ArcGIS, which is a collection of geographic datasets, including feature classes, geometric networks, raster data, attribute tables, annotation, topology, etc. It provides the ability to leverage data relationships, enforce data integrity, and data-rich features. Its benefits include centralized data storage, efficient data delivery, database management systems (DBMS) security and reliability, geodatabase replication, archiving, and multi-user editing.

This chapter provides guidance for contractors and design consultants in developing and delivering geospatial data for public infrastructure, included but no limited to Capital Improvement Projects (CIP) and Developer Participation Contracts (DPC) in the City of Houston Enterprise GIS geodatabase model format. Adherence to the guidelines outlined in this chapter is required in order to maintain compatibility between various projects. It is not the intent of this chapter to be a training guide for AutoCAD, ArcGIS or other geospatial software and associated products.

13.1.03 DEFINITIONS

13.1.03.A. GNSS - Global Navigation Satellite System which includes USA Global Positioning System (GPS), Russian Global Navigation Satellite System (GLONASS), and other regional systems.

SECTION 2 – STORM WATER GIS DIGITAL SUBMISSION REQUIREMENTS

13.2.01 STORM WATER FEATURE CLASSES

Currently there are 14 feature classes or layers in the storm water drainage system dataset.

Table 13.1 Storm Water Feature Classes

#	Layer	Feature Type
1	swAbandonedGravityMain	Line
2	swAbandonedOpenDrain	Line
3	swAbandonedPoint	Point
4	swDetention	Polygon
5	swDischargePoint	Point
6	swEasement	Polygon
7	swFitting	Point
8	swGravityMain	Line
9	swInlet	Point
10	swManhole	Point
11	swNetworkStructure	Point
12	swOpenDrain	Line
13	swUnderPass	Point
14	swVirtualDrainline	Line

13.2.02 STORM WATER ATTRIBUTES

13.2.02.A Storm Water Feature Class Fields

The Storm Water Maintenance Branch (SWMB) in 2018 completed a GIS data migration from an ArcFM data structure to the ESRI Local Government Information Model (LGIM) data structure. As part of the migration the geometric network was created to include both open and closed storm sewer systems. Features classes that do not participate in the geometric network are swAbandonedGravityMain, swAbandonedOpenDrain, swAbandonedPoint, swDetention, swEasement, and swUnderpass. The following table contains all fields found in the storm water features classes with corresponding description, alias name, and domain value names.

Table 13.2 Feature Class Fields

FieldName	Length	Description	AliasName	DomainName
ABANDONSTATUS	5	Indicates if abandoned or removed	Abandon Status	AbandonStatus
ACTIVEFLAG	2	Indicates if the feature is in use/active	Active Flag	BooleanDomain
ADDRESS	100	The street address	Address	
BEDMATERIAL	50	The material on the bed of the detention area	Bed Material	piOpenStructureMaterial
BEDMATERIAL	50	The material on the bed of the open drain	Bed Material	piOpenStructureMaterial
BNKMATERIAL	50	The material on the bank of the detention area	Bank Material	piOpenStructureMaterial
CHANNELNAME	50	Name of the Channel	Channel Name	
COMMENTS	200	Additional information or comments	Comments	
COMPANY	150	Group that project is assigned to	Company	AssignedTo
COUNCILDISTRICT	1	Council District the asset belongs to	Council District	piCouncilDistrict
CROSSINGTYPE	50	The type of crossing at underpass	Crossing Type	piCrossingType

DATASOURCETYPE	5	Type of source data used to capture the information	Data Source Type	piDataSourceType
DEPTH	8	The depth of the detention area in feet	Depth (in Feet)	
DISCHRGTYP	50	The type of storm water discharge point	Discharge Type	piDischargePointType
DOWNDEPTH	8	The downstream depth of the gravity main	Downstream Depth	
DOWNELEV	8	The downstream elevation where the pipe meets the manhole	Downstream Elevation	
DOWNSTMNODE	11	The downstream storm node Facility ID	Downstream Storm Node	
DRAINAGEAREA	5	Drainage area the asset belongs to	Drainage Area	
FACILITYID	20	Locally assigned Facility Identifier	Facility Identifier	
FITTINGTYPE	50	The type of fitting	Fitting Type	piFittingType
FLOODWARNINGLIGHT	5	Indicates whether there are flood warning lights	Flood Warning Gate?	YesNo
FLOWELEV	8	Flow Elevation	Flow Elevation	
FUNDINGNUMBER	24	The Departments Funding Number of the project	Funding Number	
FUNDINGTYPE	5	The Funding Type	Funding Type	piFundingType
HEIGHT	8	The height of the discharge point	Height (inches)	piPipeDiameter
HEIGHT	8	The height of the pipe in inches	Height (inches)	piPipeDiameter
INLETMAT	20	Construction material of inlet	Inlet Construction Material	piPipeMaterial
INLETTYPE	10	Type of inlet	Inlet Type	piInletType

INSTALLDATE	8	The date the asset was constructed or date of completion. Note if no Letter of Substantial Completion then use As-Built Date, then Record Drawing Date, then most recent signature date on Plan Set. For Field Verifications use Date of Verification.	Completion Date	
INVERTELEV	8	The flow elevation at the bottom of the inlet	Flow Elevation	
INVERTELEV	8	The flow elevation at the bottom of the manhole	Flow Elevation	
LENGTH	8	Pipe length from the plan	Pipe Length	
LINETYPE	25	The type of open drain	Line Type	piDrainType
LINETYPE	25	The type of virtual line	Line Type	piVirtualLine
LOCDESC	200	Text Description of the geographic location	Location Description	
MAINSHAPE	50	The shape of the gravity main	Main Shape	piPipeShape
MAINTBY	2	Indicates which organization maintains the asset	Managed By	AssetManager
MAINTBY	25	Indicates which organization maintains the asset	Managed By	piDitchOwner
MATERIAL	20	Material the asset is manufactured with	Material	piPipeMaterial
MHTYPE	15	The type of manhole	Manhole Type	piManholeType
NAME	200	The name and location description of detention pond	Name	
NAME	20	The name of the facility or location the network structure	Name	
NAME	100	Name of the Underpass	Name	

NUMBEROFCROSSINGS	2	Number of crossings	Number of Crossings	
OWNEDBY	2	Indicates which organization owns the asset	Owned By	AssetOwner
OWNEDBY	25	Indicates which organization owns the asset	Owned By	piDitchOwner
OWNEDBY	2	Indicates which organization owns the asset	Owned By	AssetOwner
PIPETYPE	50	The type of storm water pipe	Pipe Type	piPipeType
PLANNUMBER	10	The plan number	Plan Number	
PONDAREA	8	The area of the detention pond in acres	Area (in Acres)	
PUMPSTATION	5	Indicates whether there is a Pump Station	Pump Station?	YesNo
RAINGAUGE	5	Indicates whether there is a rain gauge	Rain Gauge?	YesNo
REHABDATE	8	Date of asset rehabilitation for open drains	Rehabilitation Date	
RIMELEV	8	The elevation at the top of inlet	Top Elevation	
RIMELEV	8	The elevation at the top of manhole	Top Elevation	
ROTATION	8	Map Symbol Rotation value	Rotation	
SCADA	5	Indicates whether there is a SCADA sensor at underpass	SCADA?	YesNo
SIDEMATERIAL	50	The material on the side of the open drain	Side Material	piOpenStructureMaterial
SLOPE	8	The slope of the main in percent	Slope (in percent)	null

STRUCTTYPE	30	Type of Sewer Network structure	Structure Type	swNetworkStructureType
UFID	8	The numeric FACILITYID, used by other business systems	UFID	
UPDEPTH	8	The upstream depth of the gravity main	Upstream Depth	
UPELEV	8	The upstream elevation where the pipe meets the manhole	Upstream Elevation	
UPSTMNODE	11	The upstream storm node Facility ID	Upstream Storm Node	
VOLUME	8	The volume of detention area in acre feet	Volume (Acre Feet)	
WALLMAT	25	Wall Material	Wall Material	piPipeMaterial
WATERSHED	25	Watershed where the retention basin is located	Watershed	
WIDTH	8	The width of the discharge point	Width (inches)	piPipeDiameter
WIDTH	8	The width of the pipe in inches	Width (inches)	piPipeDiameter
WIDTH	8	The width at the top of the open drain in feet	Width (feet)	

13.2.02.B Domain Codes and Values

The tables below contain all the domain values for the storm water feature classes.

Table 13.3 AdandonStatus Domain

Code	Description
AP	Abandoned In Place
REM	Removed
ID	Incorrect Digitization - No Spatial Change

13.2.02.B
continued

Table 13.4 AssignedTo Domain

Code	Description
AGS	Applied Geotech Solutions
TCI	Texas Correctional Industries
WTE	WatEarth
COH	City of Houston
PAR	Parsons
CIP	CIP Digital Deliverable

If company name is missing, a code will be assigned as new names are added.

Table 13.5 piPipeMaterial Domain

Code	Description
BR	Brick
CT	Clay Tile
CP	Concrete (Non-Reinforced)
CMP	Corrugated Metal
FRP	Fiberglass Reinforced
HDPE	High Density Polyethylene
MRC	Monolithic Reinforced Concrete
OTH	Other
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete
SP	Steel
UNK	Unknown

Table 13.6 piOpenStructureMaterial Domain

Code	Description
CP	Concrete
EARCP	Earth & Concrete
EAR	Earthen
OTH	Other
UNK	Unknown

13.2.02.B
continued

Table 13.7 piCouncilDistrict Domain

Code	Description
A	A
B	B
C	C
D	D
E	E
F	F
G	G
H	H
I	I
J	J
K	K

Table 13.8 piCrossingType Domain

Code	Description
Railroad	Railroad
Road	Road
Other	Other

Table 13.9 piDataSourceType Domain

Code	Description
AB	As Built
BM	Block Map
CS	Contracted Survey
EX	Existing
FV	Field Verified
Metro	Metro
P	Plan Set
TM	Taps and Meters
THD	Texas Highway Department
UN	Unknown
WD	Water Drawing

13.2.02.B
continued

Table 13.10 piDischargePointType Domain

Code	Description
Outfall	Outfall
Outfall with BFP	Outfall with BFP
Roadside Discharge Point	Roadside Discharge Point

Table 13.11 piFittingType Domain

Code	Description
Collection Point	Collection Point
Drain Node	Drain Node
Plug	Plug
Reducer	Reducer
Safety End Treatment	Safety End Treatment
Storm Interconnect	Storm Interconnect
Other	Other

Table 13.12 YesNo Domain

Code	Description
Yes	Yes
No	No
Partly	Partly
Offset	Offset

Table 13.13 piFundingType Domain

Code	Description
ILMS	ILMS
WBS	WBS
GFS	GFS

Table 13.14 piPipeDiameter Domain

Code	Description
Min	4
Max	168

13.2.02.B
continued

Table 13.15 piDrainType Domain

Code	Description
Bridge	Bridge
Irrigation Canal	Irrigation Canal
Low Flow Pilot Channel	Low Flow Pilot Channel
Off-road Channel	Off-road Channel
Rain Garden	Rain Garden
Railroad Open Drain	Railroad Open Drain
Roadside Ditch	Roadside Ditch
Swale	Swale
Unknown	Unknown

Table 13.16 piEasementType Domain

Code	Description
DR	Drainage
ELC	Electric Line
GAS	Gas Pipeline
HWY	Highway Right-of-Way
RR	Railroad
RDST	Road\Street
SS	Sanitary Sewer
TEL	Telecommunication
WL	Waterline
URW	Unimproved Right of Way
STM	Storm Sewer
UTL	Utility
UNK	Unknown

Table 13.17 piPipeShape Domain

Code	Description
RND	Round
ARCH	Arch
BOX	Box
Other	Other
Unknown	Unknown

13.2.02.B
continued

Table 13.18 AssetManager Domain

Code	Description
1	City
-1	Private
-2	Other

Table 13.19 piManholeType Domain

Code	Description
Junction Box	Junction Box
Stormceptor	Stormceptor
Standard	Standard Manhole
MH with BFP	Manhole with Backflow Preventer
Sample Well Basin	Sample Well Basin

13.2.02.B
continued Table 13.20 piDitchOwner Domain & piEasementOwner Domain

Code	Description
Army Corps of Engineers	Army Corps of Engineers
Bay Area Land Co.	Bay Area Land Co.
Bridge	Bridge
Center Point	Center Point
Chelford City MUD	Chelford City MUD
City of Deer Park	City of Deer Park
City of Laporte	City of Laporte
City of League City	City of League City
City of Pasadena	City of Pasadena
City of Seabrook	City of Seabrook
City of Webster	City of Webster
Clear Brook City MUD	Clear Brook City MUD
Clear Lake City	Clear Lake City
COH	COH
COH Bridge	COH Bridge
COH Parks	COH Parks
COH Roadside	COH Roadside
COH Storm Sewer	COH Storm Sewer
COH Enclosed	COH Enclosed
Ellington Airforce Base	Ellington Airforce Base
Fort Bend County	Fort Bend County
Harris County	Harris County
HCFCD	HCFCD
HOU Airport System	HOU Airport System
Montgomery County	Montgomery County
NASA	NASA
Other	Other
Private	Private
State of Texas	State of Texas
To Be Verified	To Be Verified
TXDOT	TXDOT
Union Pacific	Union Pacific
Waller County	Waller County

13.2.02.B
continued

Table 13.21 piInletType Domain

Code	Description
A	A Inlet
B	B Inlet
BB	BB Inlet
C	C Inlet
C1	C1 Inlet
C2	C2 Inlet
D	D Inlet
E	E Inlet
H2	H2 Inlet
Other	Other

Table 13.22 piPipeType Domain

Code	Description
Collector	Collector
Culvert	Culvert
Driveway	Driveway Culvert
InletLine	InletLine
Outfall	Outfall
Overflow	Overflow
Railroad	Railroad Culvert
Siphon	Siphon
TrenchDrain	TrenchDrain
Walkway	Walkway Culvert

Table 13.23 swNetworkStructure Domain

Code	Description
Pump Station	Pump Station
Detention Pond	Detention Pond
Virtual Junction	Virtual Junction

Table 13.24 piVirtualLine Domain

Code	Description
Virtual Line	Standard Virtual Line
Detention Pond	Detention Pond
Channel	Virtual Line from Outfall to Channel

13.2.02.B
continued

Table 13.25 piDetentionType Domain

Code	Description
Detention Pond	Detention Pond
Rain Garden	Rain Garden

13.2.02.C Manual and Auto Populated Fields

The tables below provide the required fields to be populated for the storm water feature classes.

Legend:

System Generated
Editable
Populated by Attribute Assistant in Staging Environment
Editor Tracking

The System Generated fields are:

Table 13.26 System Generated Fields

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
ROTATION	Double
GlobalID	Global ID
SHAPE.STLength()	Double

The following fields are common across all features classes and are populated by Editor Tracking when enabled in the geodatabase. Editor Tracking must be enabled.

Table 13.27 Editor Tracking Fields

Field Name	Data Type
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date

13.2.02.C
continued

The following fields are common across all features classes and are populated manually but will have the same value per assigned project:

Table 13.28 Fields with Same Values per Assigned Project

Field Name	Data Type
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
DATASOURCETYPE	Text
INSTALLDATE	Date

Once the submitted geodatabase passes QA/QC checks, the following fields are populated by the Attribute Assistant utilizing GenerateID and DynamicValue Tables in the Staging Environment:

Table 13.29 Fields Populated by Attribute Assistant

Field Name	Data Type	Notes
FACILITYID	Text	
UPSTMNODE	Text	
DOWNSTMNODE	Text	
COUNCILDISTRICT	Text	
SLOPE	Double	
COUNCILDISTRICT	Text	
DRAINAGEAREA	Text	
ADDRESS	Text	
LENGTH	Double	
UFID	Long Integer	
ACTIVEFLAG	Short Integer	
WIDTH	Double	Only for swDischargePoint
HEIGHT	Double	Only for swDischargePoint
MATERIAL	Text	Only for swDischargePoint
PONDAREA	Double	Only for swDetention

For abandoned and removed assets (**swAbandonedGravityMainLine, swAbandonedOpenDrain, and swAbandonedPoint)** field information other than Editor Tracking is copied over from original feature class.

13.2.02.C
continued

Table 13.30 swAbandonedGravityMainLine

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
MATERIAL	Text
WIDTH	Double
HEIGHT	Double
MAINSHAPE	Text
PIPETYPE	Text
DOWNELEV	Double
UPELEV	Double
SLOPE	Double
UPSTMNODE	Text
DOWNSTMNODE	Text
OWNEDBY	Short Integer
MAINTBY	Short Integer
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
DRAINAGEAREA	Text
LENGTH	Double
PLANNUMBER	Text
UFID	Long Integer
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ABANDONSTATUS	Text
COMPANY	Text
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.31 swAbandonedOpenDrain

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
LINETYPE	Text
WIDTH	Double
DEPTH	Double
BEDMATERIAL	Text
SIDEMATERIAL	Text
ABANDONSTATUS	Text
OWNEDBY	Text
COUNCILDISTRICT	Text
ADDRESS	Text
NAME	Text
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
UFID	Double
COMPANY	Text
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.32 swAbandonedPoint

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
INVERTELEV	Double
DEPTH	Double
RIMELEV	Double
WALLMAT	Text
POINTTYPE	Text
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
ROTATION	Double
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
UFID	Long Integer
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text
ABANDONSTATUS	Text
COMPANY	Text

13.2.02.C
continued

Table 13.33 swDetention

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
REHABDATE	Date
LOCDESC	Text
NAME	Text
DEPTH	Double
PONDAREA	Double
VOLUME	Double
BEDMATERIAL	Text
BNKMATERIAL	Text
COMMENTS	Text
WATERSHED	Text
COUNCILDISTRICT	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
COMPANY	Text
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
SHAPE.STArea()	Double
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.34 swDischargePoint

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
DISCHRGTYP	Text
FLOWELEV	Double
INSTALLDATE	Date
ROTATION	Double
WIDTH	Double
HEIGHT	Double
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
SHAPE	Geometry
Enabled	Short Integer
AncillaryRole	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text
MATERIAL	Text
UFID	Text

13.2.02.C
continued

Table 13.35 swEasement

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
TYPE	Text
WIDTH	Double
OWNEDBY	Text
MAINTBY	Text
COUNCILDISTRICT	Text
COMPANY	Text
UFID	Text
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
SHAPE.STArea()	Double
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.36 - swFitting

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
FITTINGTYPE	Text
INSTALLDATE	Date
LOCDESC	Text
ROTATION	Double
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
UFID	Long Integer
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date

13.2.02.C
continued

Table 13.37 - swGravityMain

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
MATERIAL	Text
WIDTH	Double
HEIGHT	Double
MAINSHAPE	Text
PIPETYPE	Text
DOWNELEV	Double
UPELEV	Double
SLOPE	Double
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
DRAINAGEAREA	Text
LENGTH	Double
PLANNUMBER	Text
COMPANY	Text
UFID	Long Integer
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
UPSTMNODE	Text
DOWNSTMNODE	Text
UPDEPTH	Double
DOWNDEPTH	Double
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.38 - swInlet

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
RIMELEV	Double
INVERTELEV	Double
ACCESSMAT	Text
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
UFID	Long Integer
ROTATION	Double
SHAPE	Geometry
Enabled	Short Integer
AncillaryRole	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text
DEPTH	Double

13.2.02.C
continued

Table 13.39 - swManhole

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
INVERTELEV	Double
DEPTH	Double
RIMELEV	Double
WALLMAT	Text
MHTYPE	Text
ACTIVEFLAG	Short Integer
OWNEDBY	Short Integer
MAINTBY	Short Integer
ROTATION	Double
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
UFID	Long Integer
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text

13.2.02.C
continued

Table 13.40 - swNetworkStructure

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
NAME	Text
INSTALLDATE	Date
REHABDATE	Date
STRUCTTYPE	Text
OWNEDBY	Short Integer
MAINTBY	Short Integer
ROTATION	Double
COUNCILDISTRICT	Text
DATASOURCETYPE	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
UFID	Text
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text

13.2.02.C
continued

Table 13.41 - swOpenDrain

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
INSTALLDATE	Date
REHABDATE	Date
LINETYPE	Text
WIDTH	Double
DEPTH	Double
BEDMATERIAL	Text
SIDEMATERIAL	Text
OWNEDBY	Text
MAINTBY	Text
COUNCILDISTRICT	Text
UFID	Text
ADDRESS	Text
CHANNELNAME	Text
COMPANY	Text
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
SHAPE.STLength()	Double

13.2.02.C
continued

Table 13.42 - swUnderPa

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
CROSSINGTYPE	Text
INSTALLDATE	Date
LOCDESC	Text
NAME	Text
ROTATION	Double
OWNEDBY	Short Integer
MAINTBY	Short Integer
NUMBEROFCROSSINGS	Short Integer
PUMPSTATION	Text
SCADA	Text
RAINGAUGE	Text
FLOODWARNINGLIGHT	Text
COUNCILDISTRICT	Text
FUNDINGNUMBER	Text
FUNDINGTYPE	Text
PLANNUMBER	Text
COMPANY	Text
SHAPE	Geometry
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
ADDRESS	Text

13.2.02.C
continued

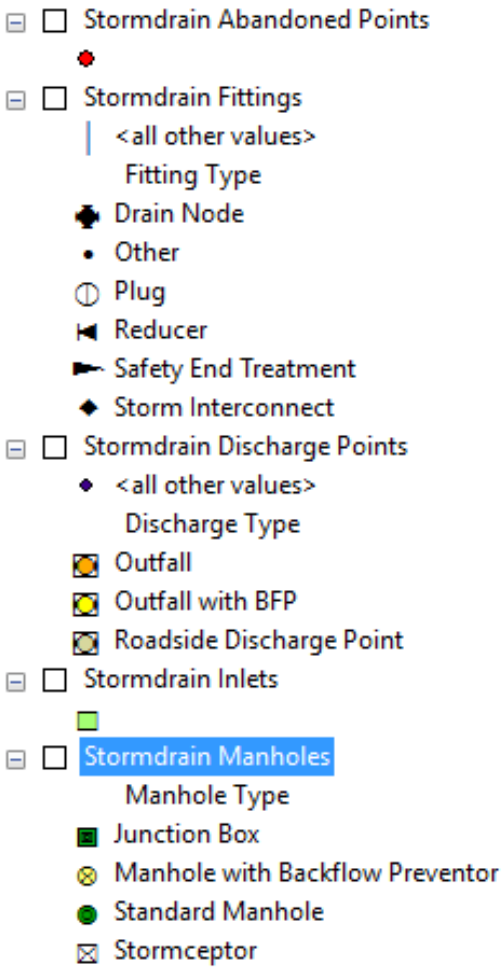
Table 13.43 - swVirtualDrainline

Field Name	Data Type
OBJECTID	Object ID
FACILITYID	Text
LINETYPE	Text
COMPANY	Text
SHAPE	Geometry
Enabled	Short Integer
GlobalID	Global ID
created_user	Text
created_date	Date
last_edited_user	Text
last_edited_date	Date
SHAPE.STLength()	Double

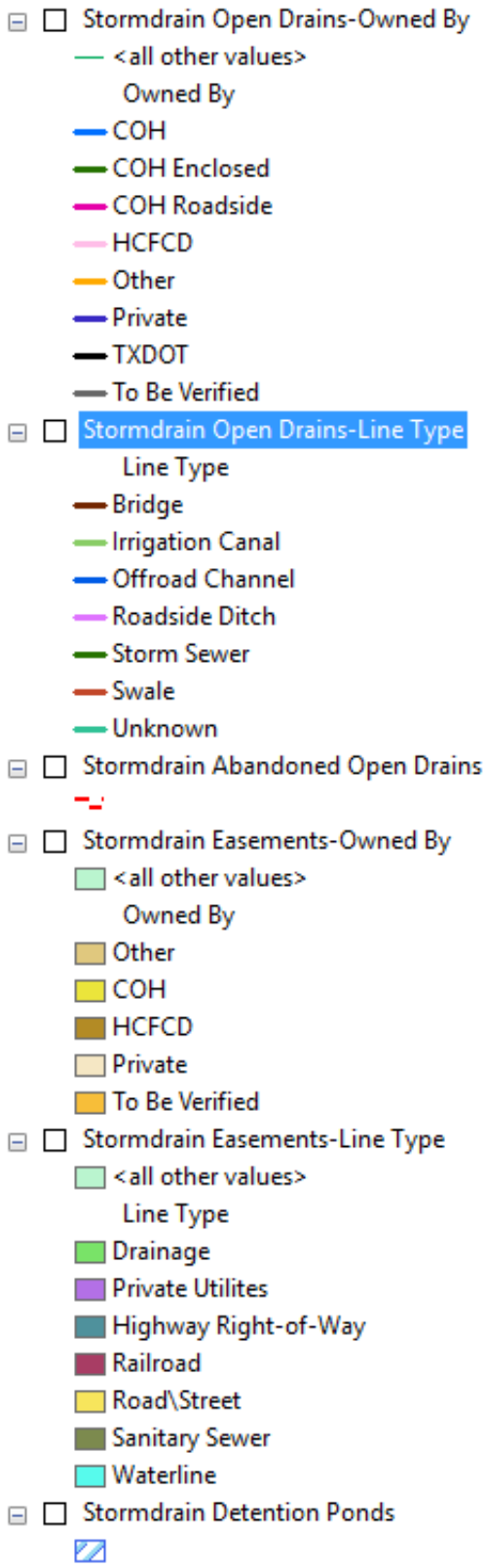
13.2.03 STORM WATER FEATURE SYMBOLOGIES

13.2.03.A Standard Symbologies

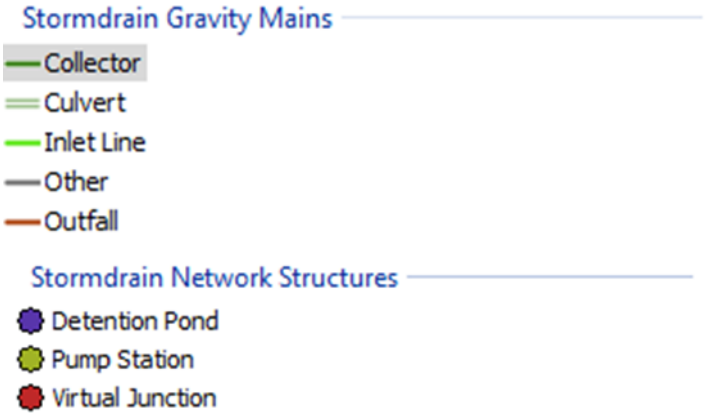
For each storm water feature class, a symbology file has been created respectively, which is called layer file with extension.lyr in ArcGIS. The figure below shows symbols for each storm water feature class.



13.2.03.A
continued



13.2.03.A
continued



13.2.03.B Feature Class Specifics

Additional information over some storm water feature classes is provided in the section.

1. Manhole

The storm manhole feature class has four types: manhole, junction box, stormceptor, and manhole with backflow preventer.

a. Standard Manhole and Junction Box

Figures 1 and 2 show the two common types in a Plan Set. Junction Boxes are made from reinforced concrete.

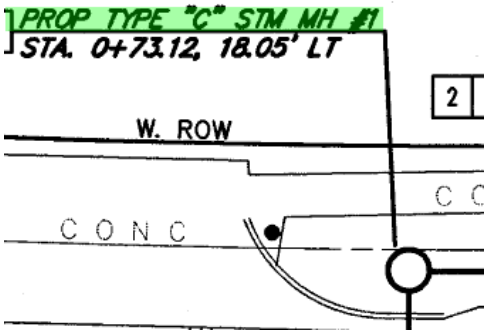


Figure 13.1 - Manhole

13.2.03.B.1.a
continued

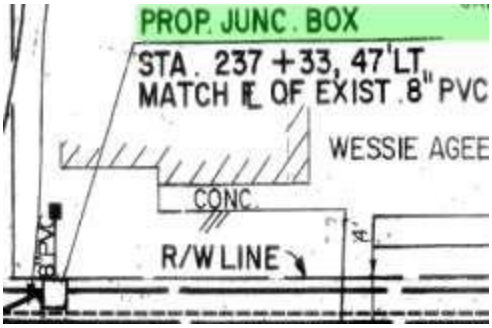


Figure 13.2 - Junction Box

b. Stormceptor is a special kind of manhole utilized for storm water pollution prevention. It would be identified in the Plan Set.

c. Manhole with backflow preventer will have a gate valve, check valve or equivalent device. If the gravity main has a Tideflex valve or similar device this information would still be identified on the upstream manhole as a manhole with backflow preventer.

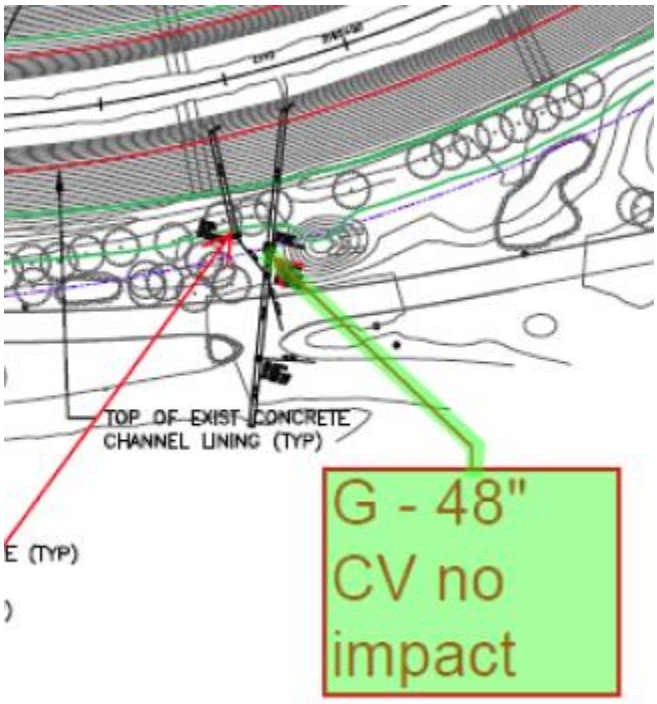


Figure 13.3 - Check Valve

13.2.03.B continued

2. Inlet

The storm inlet feature class has ten types. Nine of the types are considered standard. If any inlet is encountered that is not the standard nine, it will be identified as Other. Also, of note is the C Inlet; C1 is a C with one extension, a C2 is a C with two extensions. Inlets are typically made from concrete.

Figure 13.4 - C and C1 Inlets

Figure 13.5 - C2 Inlet

13.2.03.B continued

3. Network Structure

The network structure feature class has only three types: pump station, detention pond, and virtual junction.

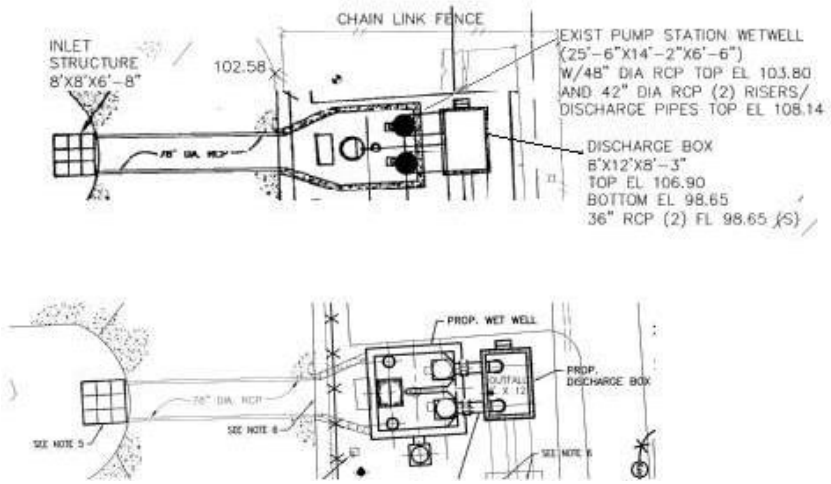


Figure 13.6 - Pump Station

In Figure 13.7, two low flow pilot channels are connected to another low flow pilot channel at a Detention Pond Network Structure.

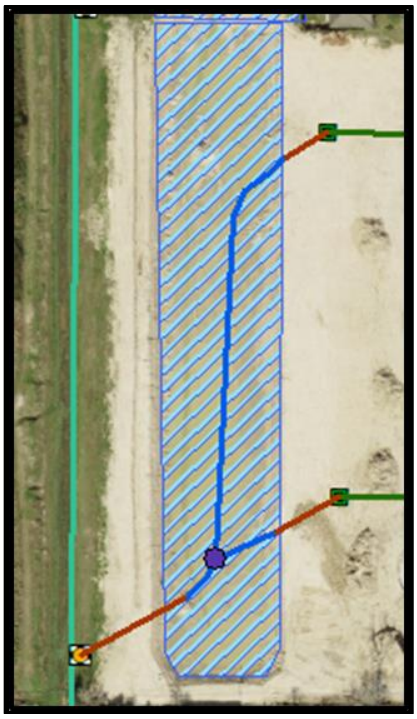


Figure 13.7 - Detention Pond

13.2.03.B.3 continued

Virtual Junctions are utilized to connect features where no other physical structure such as detention pond or pump station exits and serves to maintain system connectivity.

4. Fitting

The fitting feature class has six types. If any fitting is encountered that is not the standard six it will be identified as Other. Drain nodes are also used when the outfall of the system does not connect to another system.

Figure 13.8 - Drain Node

Figure 13.9 - Plug

Figure 13.10 - Plug (Aerial)

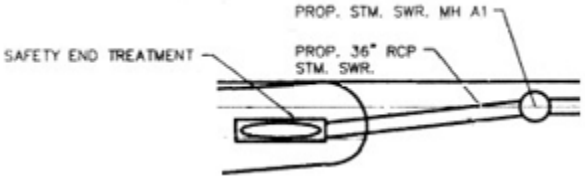


Figure 13.11 - Safety End Treatment

13.2.03.B.4
continued

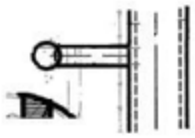


Figure 13.12 - Storm Interconnect

5. Discharge Point

   The fitting feature class has three types. Headwalls with Structure and Headwalls without Structure are identified as Outfall with BFP (Backflow Preventer) and Outfall, respectively. An Outfall may have riprap. Locations where a roadside ditch drains into off-road channel or other storm water feature are identified as Roadside Discharge Point.

Figure 13.13 - Outfall with BFP and Outfall

6. Storm Sewer (Gravity Main)

   The gravity main feature class has seven types. The following figures illustrate each type as found in a Plan Set.

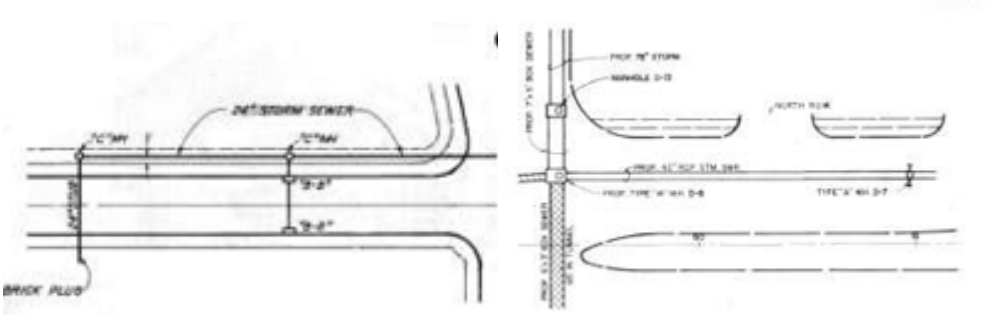


Figure 13.14 - Collector

13.2.03.B.6
continued

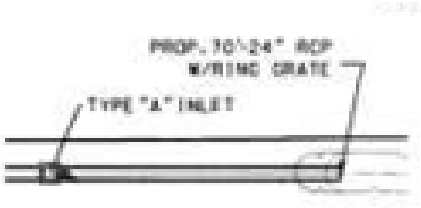


Figure 13.15 - Culvert

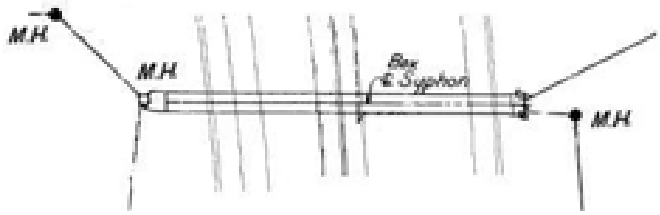


Figure 13.16 - Siphon

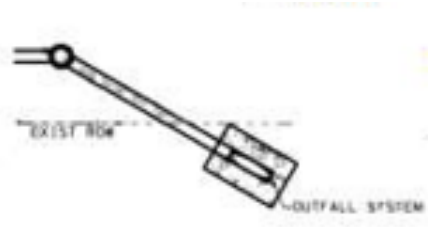


Figure 13.17 - Outfall

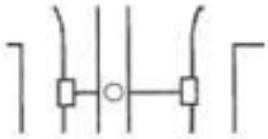


Figure 13.18 - Inlet Line

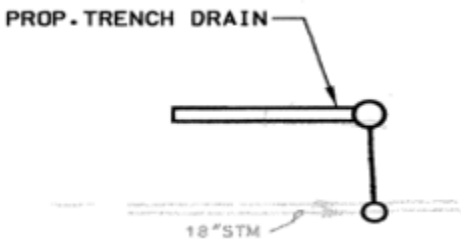


Figure 13.19 - Trench Drain

13.2.03.B continued

7. Open Drain

The open drain feature has seven types. The two major types are **roadside ditch** and **off-road channel**. The bridge type is used to maintain connectivity in the system when the off-road ditch passes under a bridge. Storm sewer is used when the off-road ditch enters a storm sewer system which has no Plan Set. It serves as a place holder until additional information is collected over storm sewer. Once additional information is collected the storm sewer is removed from the open drain and added to the gravity main feature class. Swale is used when an off-road channel is converted to a storm sewer, but a very shallow ditch is left to collect water into inlets above the storm sewer. Irrigation canals are not maintained by City of Houston but are identified to maintain connectivity in the system. Any off-road channels which need additional field verification and research are identified as Unknown.

Figure 13.20 - Roadside Ditch

Figure 13.21 - Earth and Concrete Off-road Channels

13.2.03.B continued

8. Polygon Storm Sewer Feature Classes

   Detention ponds and storm sewer easements are polygon features which do not participate in the geometric network but are assets tracked by SWMB. Easements not maintained by SWMB are also digitized for historical information.

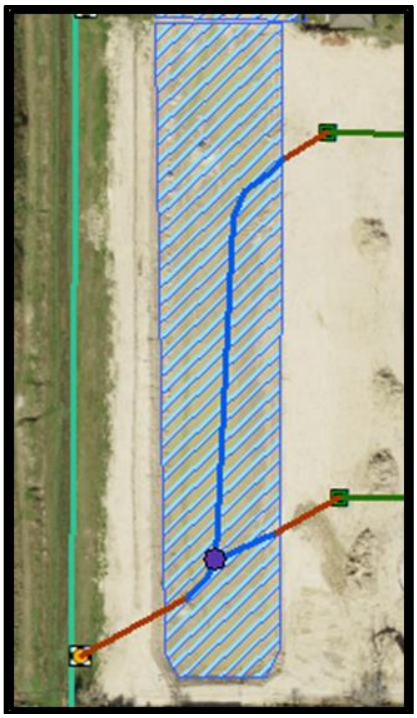


Figure 13.22 - Detention Pond

9. Abandoned and Removed Features

   When a feature is abandoned or removed (will be stated in Plan Set); the feature is copied and pasted into the appropriate abandoned feature class and given the appropriate status in the ABANDONSTATUS Field. For example, when a manhole is found in gravity line which requires splitting the line, the original line is removed (it is moved to the swAbandonedGravityMain with the status removed), then two new lines are created.

13.2.03.B continued

10. Underpasses

Underpasses are point features that do not participate in the geometric network but are critical assets tracked by SWMB. The underpass fields are used to track various flood warning devices. Also, the number and type of crossings at an underpass as tracked.

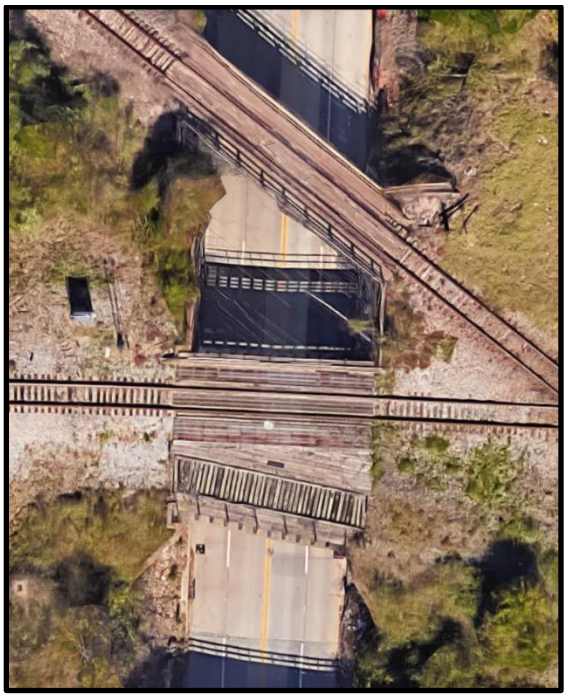


Figure 13.23 - Underpass with Three Railroad Crossings

13.2.04 STORM WATER DATA PROCESSING WORKFLOW

The figure below shows the workflow of storm water data processing procedure utilized by SWMB staff within Workflow Manager. While the use of Workflow Manager is not required, the steps utilized to create the GIS deliverable should be similar. Staff are assigned Jobs in Workflow Manager. The Staff checks the Job out and starts the workflow.

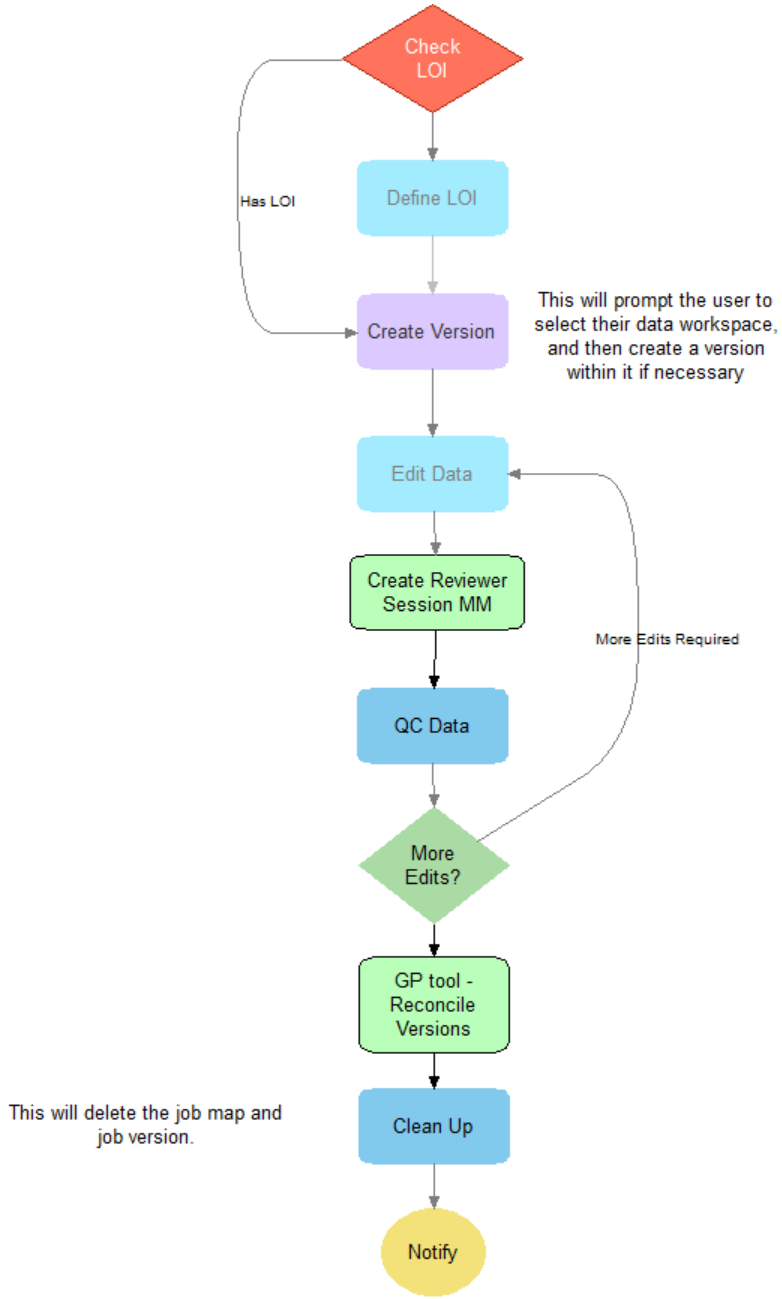


Figure 13.24 - Workflow for Editing, Data Quality Control, and Job Cleanup

13.2.04.A Check Location of Interest

Executing a Define Location of Interest (LOI) step in the workflow will open a workflow LOI map based on the map template defined for the job type. The layers marked as selectable in the LOI map template will appear as selectable in the workflow LOI map.

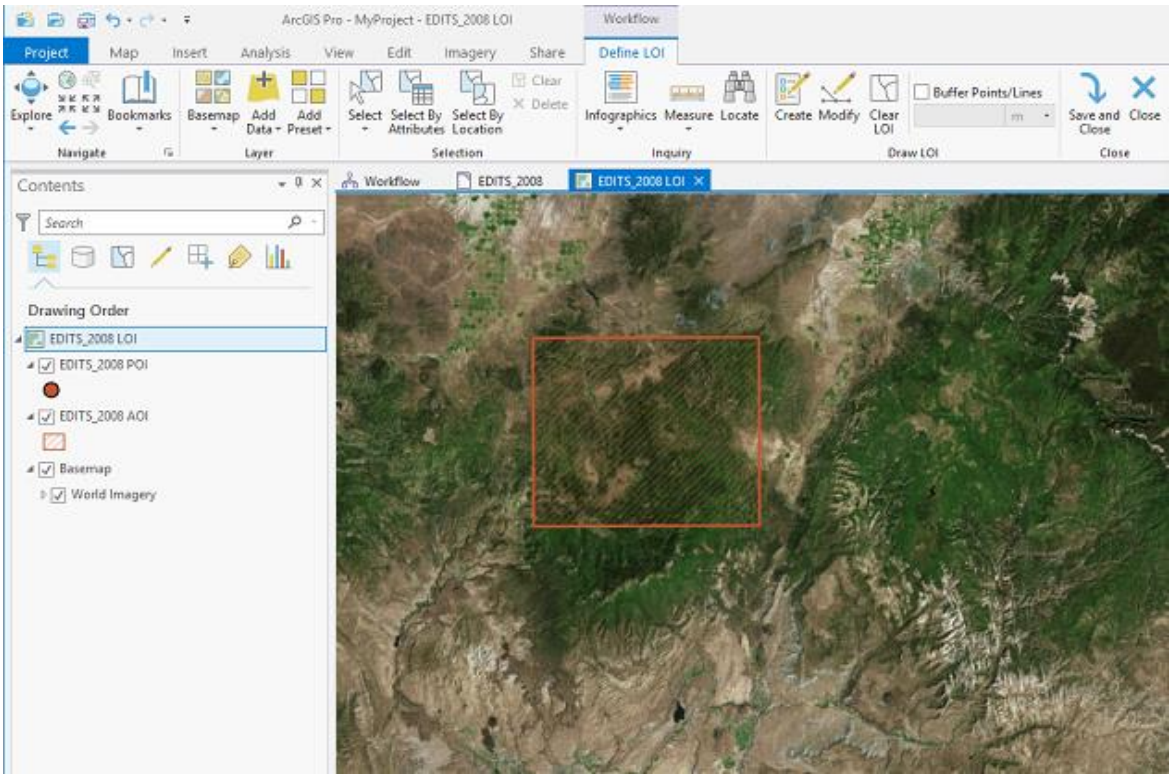


Figure 13.25 - Location of Interest (LOI)

13.2.04.B Define Location of Interest

Define provides common tools to navigate the map and add supplementary base map or feature layers, and it provides the tools required to define an LOI by selecting one or more features in the map.

13.2.04.C Create Version

This will prompt the user to select the data workspace and creates the version.

13.2.04.D Edit Data

User can start making edits in the Workflow Manager versioned database.

13.2.04.E Create Data Reviewer Session

This will initiate the Data Reviewer Session (See paragraph 13.2.05.B for more information).

13.2.04.F QC Data

See paragraph 13.2.05.A for QA/QC steps to check for system connectivity and flow direction.

13.2.04.G Run More Edits (If Required)

User makes additional edits if error were found using previous steps.

13.2.04.H Geoprocessing Tool – Reconcile Versions

In this step the job version is reconciled against the target version.

13.2.04.I Clean Up

This will delete the job map and job version.

13.2.05 STORM WATER QA/QC PROCEDURES

13.2.05.A Data Quality

1. Appropriate QA/QC standards will be utilized to ensure that the data is topologically correct, accurate, and complete. This would include:

    a. No erroneous overshoots, undershoots, dangles or intersection in the line work.

    b. Point and line features will be snapped together where appropriate to support networks.

    c. Linear features will not be broken for labeling or aesthetic purposes.

    d. Line features should be continuous and drawn from upstream to downstream.

    e. Point features should be digitized as points, using attribute block symbols with insertion points in the center of the block/feature.

    f. No sliver polygons (noncoincident).

    g. Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer.

    h. No duplicate features.

2. ESRI's Utility Network Analyst and Water Utility Network Analyst are used to check for connectivity and correct flow direction while Data Reviewer is used run batch checks for several issues such as duplications, reversed flow values, and null values in required fields.

13.2.05.B Utility Network Analyst and Water Utility Network Analyst

1. Both Utility Network Analyst and Water Utility Network Analyst are used to check flow direction and connectivity of the storm water drainage system.

2. The Water Utility Network Tools can be downloaded from the ESRI website. Once installed, right click in ArcMap to activate both Utility Network Analyst and Water Utility Network Analyst.

13.2.05.B
continued

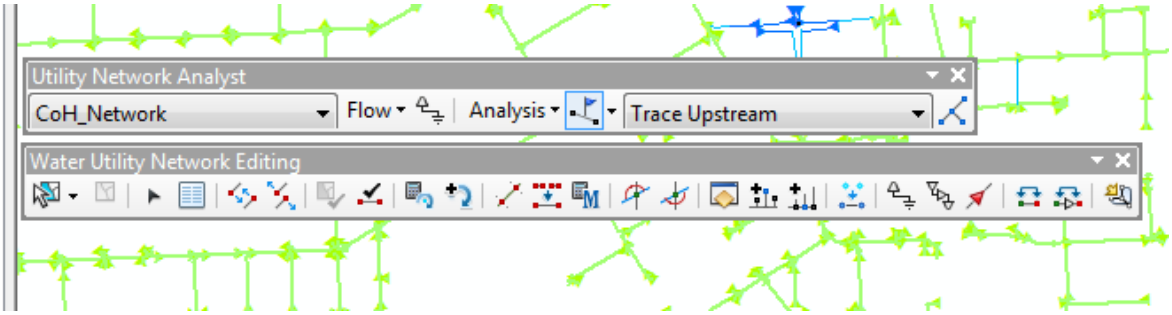


Figure 13.26

3. Add the entire network from the Geodatabase.

4. Right click and start editing any of the shapefiles in the Geodatabase from the table of contents.

5. Place a flag to start doing your traces.

    a. There are two types of flags; Edge Flag and Junction Flag. Junction Flags can only be set at junction points while Edge Flags can bet set anywhere in the network (this is the option often used).

    b. Once the flag is set, need to run the established digitalized flow direction on the water utility network editing toolbar.

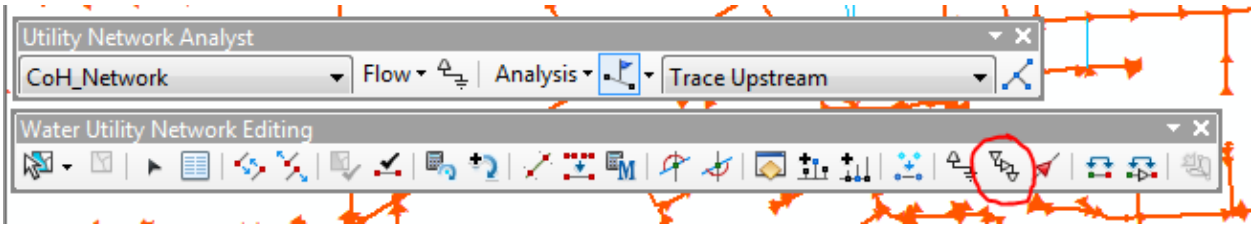


Figure 13.27

    c. Simply hit the solve button on Utility network analyst

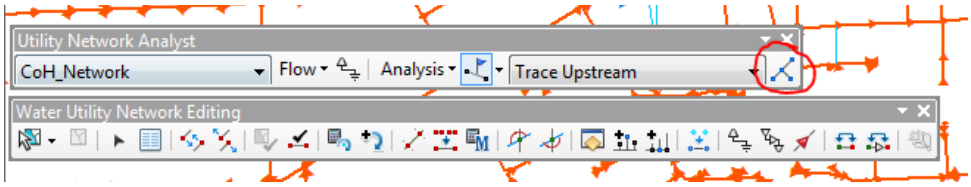


Figure 13.28

13.2.05.B
continued

6. Upstream Trace

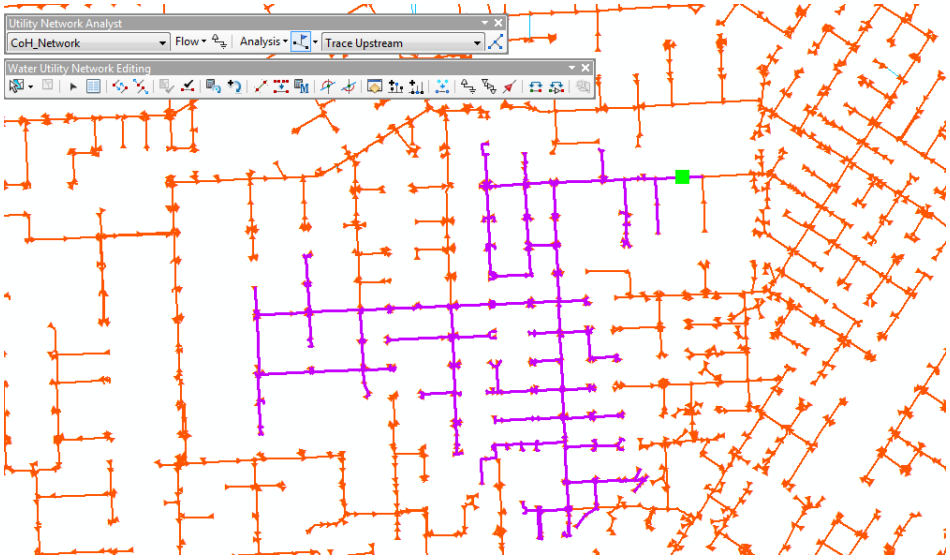


Figure 13.29

13.2.05.B
continued

7. Downstream Trace

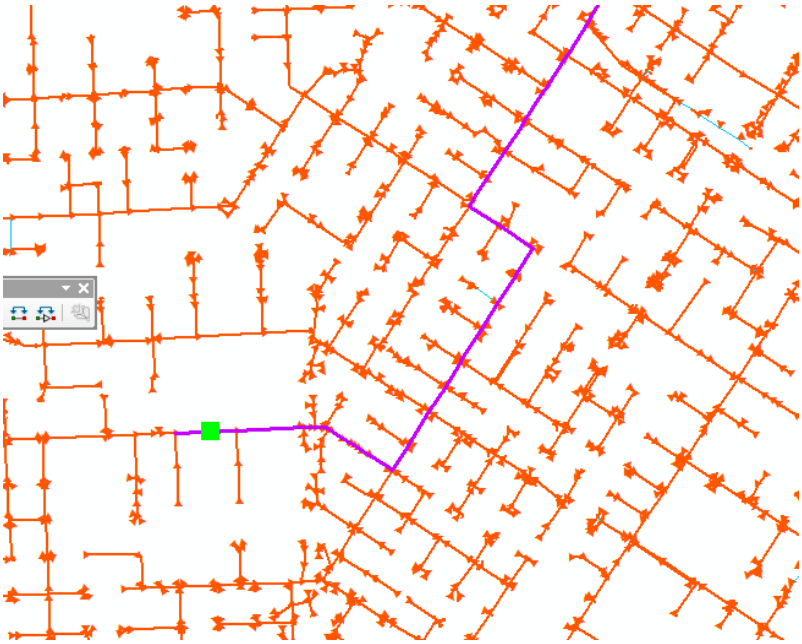


Figure 13.30

The trace is performed by choosing Selection under Options within the Analysis tab in Utility Network Analyst. Run the formal Trace again after changing this output. That way you can export to a separate shapefile or look at any line data you want.

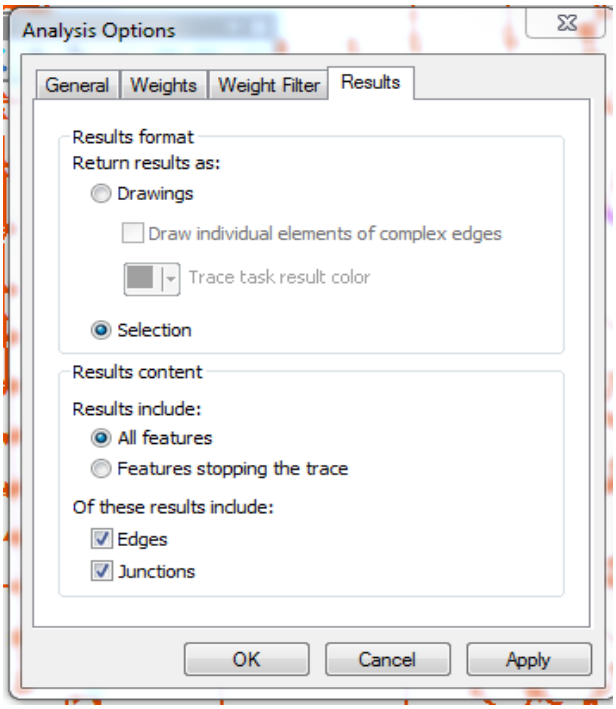


Figure 13.31

13.2.05.B.7
continued

After any trace to clear the results/flags so the line is no longer highlighted. You do this by selecting clear results/flags under analysis on the Utility Network Analyst.

Features are connected to the geometric network by using the Connect Geometric Network Feature Icon.

If flows are found to be incorrect, the Flip Selected Line Icon is used.

These procedures are rerun until all feature classes are connected and the flow direction is correct.

13.2.05.C Data Reviewer

Data Reviewer uses a Reviewer Btach Job file (.rbj) to check the data for errors. This file will be provided. The Data Reviewer session organizes the records in the Reviewer table.

1. On the main menu, click Customize > Toolbars > Data Reviewer.

2. Click the Reviewer Session Manager Button on the Data Reviewer toolbar. The Reviewer Session Manager Dialog Box appears.

3. Click Browse in the Reviewer Workspace area. The Reviewer Workspace dialog box appears.

4. Navigate to the Reviewer workspace and click Add.

   a. The Reviewer workspace is in the Data Reviewer directory where the sample data was copied. Reviewer.gdb appears in the Reviewer Workspace area in the Reviewer Session Manager Dialog box.

   b. The User Name value is automatically populated with the Windows login name.

5. Click New. The Reviewer Workspace Properties dialog box appears.

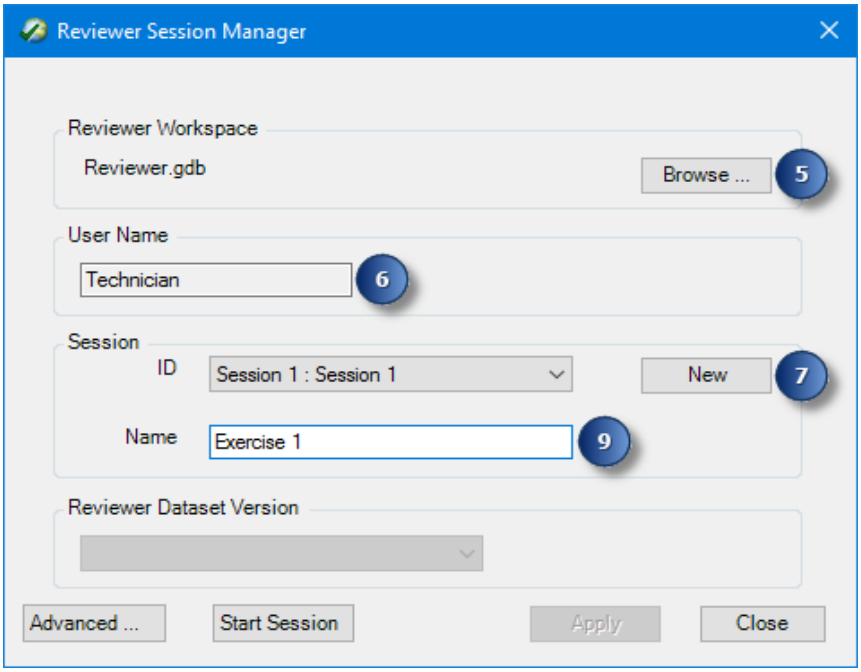


Figure 13.32 - Review Session Manager

13.2.05.C
continued

6. Ensure that the Use Active Data Frame Spatial Reference option is selected and click OK. The Reviewer Session Manager Dialog Box appears with the session information populated.

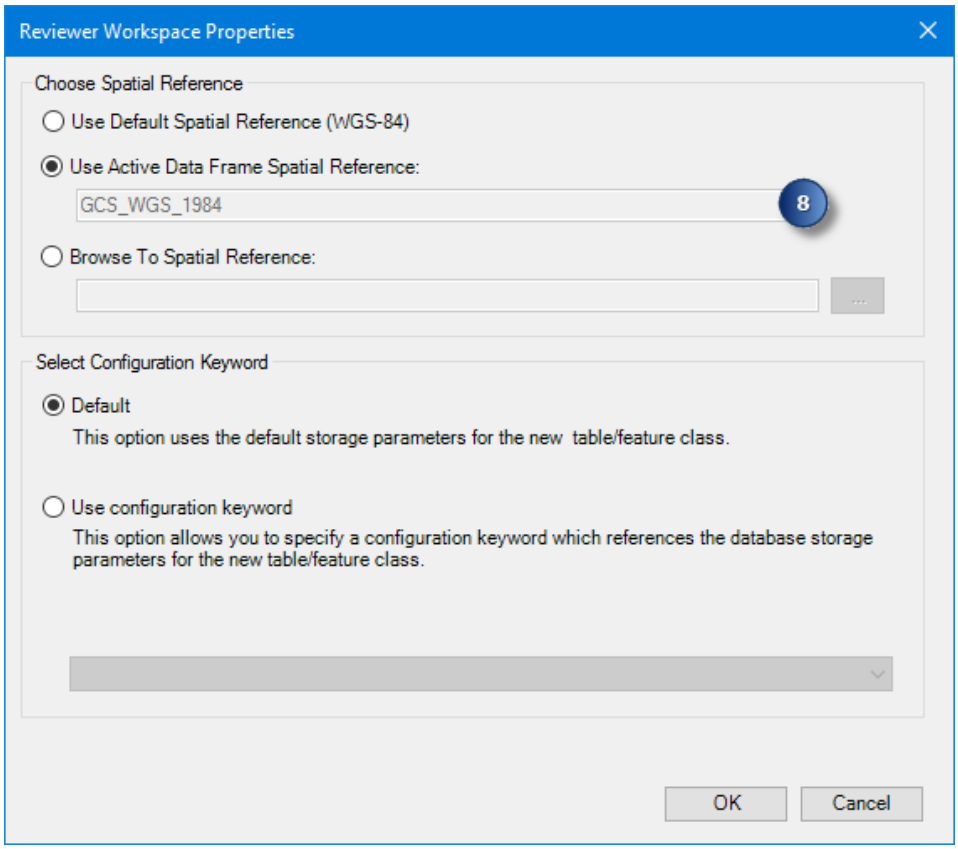


Figure 13.33 - Reviewer Workspace Properties

13.2.05.C
continued

7. Commit Records to Reviewer Table

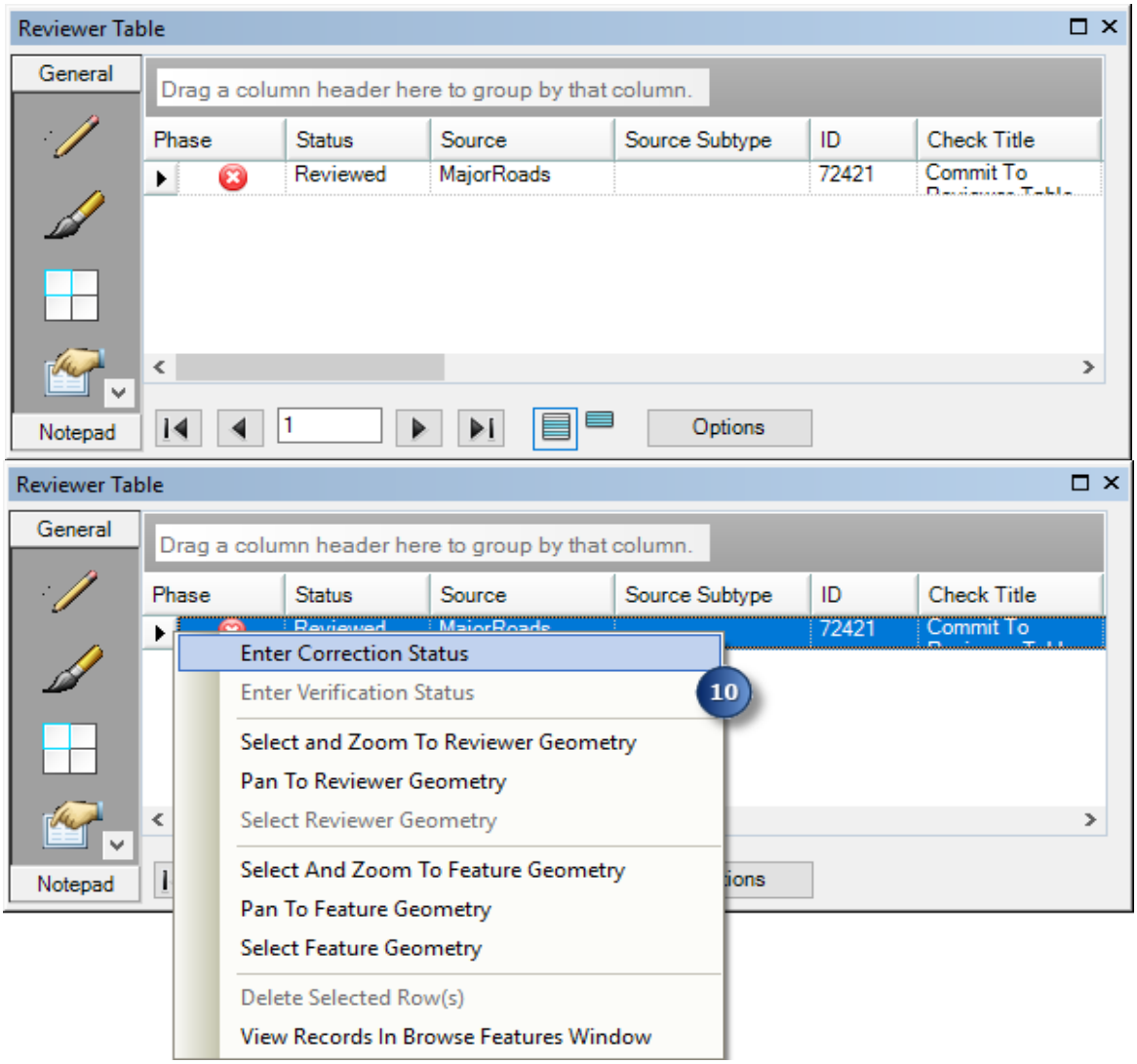


Figure 13.34 - Reviewer Table and Correction

8. End Review Session

   a. Click the Reviewer Session Manager Button on the Data Reviewer toolbar. Click End Session.

   b. The Reviewer session ends, and the button name changes to Start Session. Click Close and the Reviewer Session Manager Dialog Box closes

13.2.06 GIS DATA COLLECTION METHODS

GIS digital data collection may be captured using two approaches; field data collection with office processes or only office processes. The appropriate method should be determined by the Contractor, City Project Manager, and Service Line GIS Project Manager.

13.2.06.A Field Data Collection and With Office Processes

The Contractor shall utilize conventional or other methods to gain the highest accuracies possible, preferably by utilizing Global Navigation Satellite System (GNSS) devices/receivers. The Contractor shall use the appropriate software currently provided by vendors such as ESRI, Trimble, CartoPac, and MapText to collect data in the field. No matter the software used the correct domains shall be used to populate drop down menus to minimize data entry errors. For this method the Contractor would collect the spatial location of all manholes, inlets, and outfalls. The flow lines and elevations would be determined from the post construction as-built or CAD drawings. The line and polygon features would be done in the office. The GNSS information (e.g. number of satellites) recorded as part of the collected feature shall be provided as a table with the GIS deliverable.

13.2.06.B Office Processes

In the office data from the post construction as-built and CAD drawings can be converted through various methods to digital features. When digitizing features from maps/ drawings, the source, scale, date, and methods (i.e., process steps) shall be provided by the Contractor in a Descriptive Document.

SECTION 3 - WASTEWATER GIS DIGITAL SUBMISSION REQUIREMENTS

13.3.01 WASTEWATER FEATURE CLASSES (FEATURE CLASS NAME; FEATURE TYPE; SUBTYPE(S))

13.3.01.A Abandoned Wastewater Line/Point (sAbandonedLine; Line / sAbandonedPoint; Point) – Any wastewater infrastructure that was installed, used, and maintained, and is no longer in use but was not removed.

13.3.01.B Casing (sCasing; Line) – A pipe, typically made of steel, which is not designed to convey wastewater, but instead surrounds and protects a sewer line.

1. Casing (Subtype Value: 1)

13.3.01.C Cleanout (sCleanOut; Point) – A device designed to allow access to the line for the diagnosing and resolving of structural or other issues with that line. Typically, these are installed on service leads, though they are rarely used on main lines.

1. Cleanout (Subtype Value: 22) – do not digitize cleanouts that are installed on service leads.

13.3.01.D Fitting (sFitting; Point) – An appurtenance that is structurally required at the terminus of a line or at the connection point of two or more lines. Excepted from this feature class are cleanouts, manholes, network structures, and valves.

1. Interconnect (Subtype Value: 4)
2. Plug (3)
3. Stack (10)
4. Star Tap (2)
5. Wye (7)

13.3.01.E Force Main (sForceMain; Line) – A sewer line which conveys wastewater under pressure.

1. Force (Subtype Value: 1)
2. Sludge (2)

13.3.01.F Gravity Main (sGravityMain; Line) – A sewer line which, due to its slope, conveys wastewater using only gravity.

1. Small Diameter Main (Subtype Value: 3) – Defined as a non-siphon main having a diameter of less than or equal to 24-inch.
2. Large Diameter Main (8) – Defined as a non-siphon main having a diameter greater than 24-inch.
3. Siphon (5)
4. LS Pump Line (9)

13.3.01.G Manhole (sManhole; Point) – A device which, for pipe length restrictions, change of flow direction, and/or junction with another main, is placed at the end of a gravity main to allow equipment to diagnose and resolve issues while also providing enough clearance for a person to access.

1. Junction Box (Subtype Value: 13)
2. Manhole (12)

13.3.01.H Network Structure (sNetworkStructure; Point) – A facility which contains infrastructure elements that directly pump and/or treat wastewater.

1. Lift Station (Subtype Value: 30)
2. Private Pump Station (31)
3. Treatment Plants (33)
4. Wet Weather Facility (29)

13.3.01.I Service Lead (sServiceLine; Line) – Also called service line, a sewer pipe that connects a private property to a public sewer line.

1. Service Lead (Subtype Value: 0)

13.3.01.J Valve (sControlValve / sSystemValve; Point) – An appurtenance installed on force mains that controls flow.

1. Air Valve (Subtype Value: 26)
2. Air Valve in Manhole (27)

13.3.02 WASTEWATER GIS SUBMISSION REQUIREMENTS

13.3.02.A Projected Coordinate System

1. NAD_1983_StatePlane_Texas_South_Central_FIPS_4204_Feet

13.3.02.B Required Feature Classes

1. For Reference
    a. Right of Way (both current and proposed, if applicable)
    b. Easements
    c. Property Lines (both current and proposed, if applicable)
    d. Edges of Pavement and Sidewalk (both current and proposed, if applicable)
2. Include all existing utility infrastructure as required for plan and profile submission.
3. As applicable, all new wastewater lines and points shall be included in their respective feature classes, with required fields for each feature class as depicted in Table 13.44.

13.3.02.C Field Requirements

1. BURIEDDEPTH: Depth, in feet, of cleanout or manhole, as measured from flow elevation to rim elevation.
2. CREATIONSOURCE: Indicator of assets that were built as part of a Capital Projects contract or DPC agreement.
3. DATASOURCETYPE: If submission includes revisions that are or will be included on final as built deliverable to the file room, all features should be tagged with As Built; otherwise, select Plan and Profile.
4. DATUM, DATUM_YEAR: Horizontal benchmark information, including datum source for survey control points in the DATUM field and year of the datum reference (adjusted year, if applicable) in the DATUM_YEAR field.
5. DIAMETER: In inches, the nominal diameter.
6. DISTANCETODOWNSTREAMMANHOLE: Distance, in feet, from where the feature connects to the gravity main to the nearest downstream manhole.

13.3.02.C continued

7. DOWNSTREAMDIRECTION: Relative to the point where the feature connects to a sewer main, the closest cardinal direction of downstream flow.

8. DOWNSTREAMINVERT: In feet and rounded to the nearest hundredth, the elevation of the downstream terminus of the line.

9. FISCALYEAR: Based on the In-Service Date, the fiscal year is defined as July 1st of the previous year to June 30th of the current year. For example, FY21 is delimited by July 1, 2020 and June 30, 2021. Format is "FY" followed by the 2-digit year.

10. FLOWELEVATION: In feet and rounded to the nearest hundredth, the elevation of the flow line for the pipe that is conveying wastewater away from that manhole.

11. GFSORWBS, GFSWBSNUMBER: As assigned by the Capital Projects Service Line, this number is defined as a 1-character utility code, a 6-character project type code, a 4-character project number code, and a 1-digit phase code. Only required for Capital Improvement Projects.

12. ILMSNUMBER: Sometimes called project number, the integrated land management number is always 8 digits, starting with a 2-digit year followed by an assigned 6-digit number.

13. INLETELEVATION, INLETELEVATION2, INLETELEVATION3: In feet and rounded to the nearest hundredth, the elevation of the flow line for each pipe that is conveying wastewater into that manhole (or network structure). Only flow lines for gravity mains or force mains shall be included. In the event of more than one line entering the manhole, the lowest elevation shall be in INLETELEVATION, the next lowest elevation shall be in INLETELEVATION2, and, if necessary, the next lowest elevation shall be in INLETELEVATION3. In the event that there are more than 3 pipes flowing into a manhole, additional elevations should be identified in the NOTES field.

14. INSERVICEDATE: As applicable, the date of final acceptance by the city or the effective date of a substantial completion inspection. Only one date shall be used for the entirety of a project.

15. LENGTH: In feet, the length of a line feature defined as follows:

    a. Casing: Total distance from start point to end point

    b. Force Main: Distance from network structure (or fitting or valve, as applicable) to the next manhole (or fitting or valve, as applicable)

13.3.02.C.15 continued

c. Gravity Main: The whole stretch of pipe from upstream manhole to downstream manhole.

d. Service Lead: Measured from property line (typically also a Right-of-Way or easement line) to connection with gravity main.

16. LIFECYCLESTATUS: Each feature shall be tagged with its post-construction use status; Abandoned (still in the ground, but no longer in use), Existing (being used and maintained), or Rehabilitated.

17. MATERIAL: Manholes are required to have one of the materials listed from the sJunction Material domain, while all line features shall have one of the materials listed on the sWater Line Material domain. If a gravity main has more than one material in between the two manholes it connects, the material with the longer total length should be listed in this field. The material with the shorter overall length should be noted, with its length, in the NOTES field.

18. NOTES: Including, but not limited to, the specific use of this field as listed in this section, this field is to be used to communicate any discrepancies between the standards outlined in this section and the final digital deliverable. The explanations will receive consideration but will not guarantee acceptance of the feature(s) involved.

19. OWNER: Tag each feature as publicly owned or privately owned. If responsibility for maintenance is not with the owner, that detail should be indicated by selecting the appropriate option in the domain.

20. PERCENTSLOPE: In percentage form, the slope of the line. If there is a significant deviation from the minimum required slope or the slope as it will be depicted on the plan and profile drawings, indicate as such in the NOTES field.

21. PLANDATE: The date the city granted approval to the most recent revision of the plans used for construction. This is typically the date the director, or the director’s designee, signed off on the plan set.

22. PLANNUMBER: The drawing number assigned to the plan set by the file room.

23. PLANTYPE: If the city assigned a plan set a THD number (at present, a 3-digit number), then PLANTYPE shall be Texas Highway Department (THD). Otherwise, Plan and Profile (P) shall be selected.

13.3.02.C continued

24. PROJECTNUMBER: Sometimes called receipt number or permit number, this is a 7-digit number assigned by the city engineer's office. In the case of a TxDOT job, the number follows the format ####-##-###.

25. PROJECTTYPE: If a project number is assigned by the city engineer's office, the project type is Permit Number (PN). If the project number is assigned by TxDOT, the project type is Control Section Job (CSJ).

26. RIMELEVATION: The elevation, in feet, of the top of the cover of the manhole. It can also be calculated as Flow Elevation plus Depth.

27. SIZEOFCOVER: In inches, the diameter of the cover of the manhole.

28. SUBTYPECD: The specific type of feature within each feature class. The integer value for each subtype is listed in section 13.3.01.

29. TYPE: If a specific kind of manhole was installed, it should be indicated here. Otherwise, standard manhole should be selected.

30. UPSTREAMIVERT: In feet and rounded to the nearest hundredth, the elevation of the upstream terminus of the line.

13.3.03 WASTEWATER FIELDS (FIELD NAME; FIELD TYPE; LENGTH; DOMAIN NAME, IF APPLICABLE)

13.3.03.A BURIEDDEPTH; Double; 38

13.3.03.B CREATIONSOURCE; String; 20; sCreation Source

13.3.03.C DATASOURCETYPE; String; 20; sData Source Type LINE

13.3.03.D DATUM; String; 10; sDatum

13.3.03.E DATUM_YEAR; String; 4

13.3.03.F DIAMETER; Double; 10

13.3.03.G DISTANCETODOWNSTREAMMANHOLE; Double; 38

13.3.03.H DOWNSTREAMDIRECTION; String; 5; sDownstream Direction

13.3.03.I DOWNSTREAMINVERT; Double; 38

13.3.03.J FISCALYEAR; String; 10

13.3.03.K FLOWELEVATION; Double; 38

13.3.03.L GFSORWBS; String; 5; sProject Type2

13.3.03.M GFSWBSNUMBER; String; 24

13.3.03.N ILMSNUMBER; String; 15

13.3.03.O INLETELEVATION; Double; 38

13.3.03.P INLETELEVATION2; Double; 38

13.3.03.Q INLETELEVATION3; Double; 38

13.3.03.R INSERVICEDATE; Date; 8

13.3.03.S LENGTH; Double; 10

13.3.03.T LIFECYCLESTATUS; String; 5; sLifecycle Status

13.3.03.U MATERIAL; String; 5; sWater Line Material / sJunction Material

13.3.03.V NOTES; String; 255

13.3.03.W OWNER; String; 10; sOwner

13.3.03.X PERCENTSLOPE; Double; 38

13.3.03.Y PLANDATE; Date; 8

13.3.03.Z PLANNUMBER; String; 10

13.3.03.AA PLANTYPE; String; 20; sPlan Type

13.3.03.BB PROJECTNUMBER; String; 24

13.3.03.CC PROJECTTYPE; String; 30; sProject Type_2

13.3.03.DD RIMELEVATION; String; 38

13.3.03.EE SIZEOFCOVER; String; 5

13.3.03.FF SUBTYPECD; Integer; 10; Various

13.3.03.GG TYPE; String; 25; sType of Manhole

13.3.03.HH UPSTREAMINVERT; Double; 38

13.3.04 WASTEWATER DOMAINS (DOMAIN NAME; VALID CODES; CODE DESCRIPTIONS)

13.3.04.A sCreation Source

1. CIP; Capital Improvement Project
2. DPC; Developer Participation Contract

13.3.04.B sData Source Type LINE

1. AB; As Built
2. P; Plan and Profile

13.3.04.C. sDatum

1. HCFnnnn; Harris County Flood Control
2. COHnnnn; City of Houston
3. THDnnnn; Texas Highway Dept
4. USGSnnnn; U.S. Geological Survey
5. CORPnnnn; U.S. Army Corps of Engrs
6. UCGSnnnn; U.S. Coastal and Geodetic Survey
7. NGSnnnn; National Geodetic Survey

13.3.04.D. sDownstream Direction

1. S; South
2. E; East
3. W; West
4. N; North

13.3.04.E sJunction Material

1. FBGL; Fiberglass
2. CONC; Concrete

13.3.04.F sLifecycle Status

1. A; Abandoned
2. E; Features Being Used and Maintained
3. R; Rehabilitated

13.3.04.G sOwner

1. C; City Owned & Maintained
2. CP; City Owned & Privately Maintained
3. P; Privately Owned & Maintained
4. PC; Privately Owned & City Maintained

13.3.04.H sPlan Type

1. P; Plan and Profile
2. THD; Texas Highway Department

13.3.04.I sProject Type_2

1. CSJ; Control Section Job
2. PN; Permit Number

13.3.04.J sProject Type2

1. WBS; Work Business Structure

13.3.04.K SType of Manhole

1. CR; Corrosion Resistant
2. FMD; Force Main Discharge
3. SMRT; Smart
4. STAN; Standard

13.3.04.L sWater Line Material

1. DIP; Ductile Iron

2. ESC; Extra Strength Clay
3. FRP; Fiberglass Reinforced Pipe
4. PEP; Polyethylene Pipe (includes High Density)
5. PLP; Plastic-Lined Concrete Pipe
6. PVC; Polyvinyl Chloride
7. RCP; Reinforced Concrete Pipe

13.3.05 WASTEWATER QA/QC PROCEDURES

13.3.05.A Field Checks

1. Every feature should have each attribute, as applicable per Table 13.44, filled with accurate and consistent information as is expected for any submission.

2. All fields will be checked against the submitted, stamped, and approved plan and profile set for extraneous and erroneous entries.

13.3.05.B Visual Checks

1. All features must be placed in their correct location relative to all other features and with respect to the parcel and right-of-way layers.

2. All line features shall be digitized in the direction of flow (i.e. from source to sink). Flow direction will be checked for each line using symbology with arrows that point in the direction of digitized flow.

13.3.05.C Logic Checks

1. Each feature must have proper connection to the features around it. The following circumstances are prohibited and will be verified using a valence tool:

    a. Hanging Features

    b. Overshoots

    c. Points snapped to points

2. In the instances where two points are constructed on top of each other (i.e. a double wye), digitize one point in the actual location and offset the second point a small enough difference so it looks correct visually, but the points are technically adjacent.

13.3.05.C.2
continued

Table 13.44 - Fields Required per Feature Class (Wastewater)

FIELD / Feature Class	Casing	Cleanout	Fitting	Force Main	Gravity Main	Manhole	Network Structure	Service Lead	Valve
BURIEDDEPTH		x				x			
CREATIONSOURCE	*	*	*	*	*	*	*	*	*
DATASOURCETYPE	X	X	X	X	X	X	X	X	X
DATUM	X	X	X	X	X	X	X	X	X
DATUM_YEAR	X	X	X	X	X	X	X	X	X
DIAMETER	X		X	X	X	X		X	X
DISTTODSMH (abbr.)		X	*			X		X	
DOWNSTREAMDIRECTION		X	*			X			
DOWNSTREAMINVERT					X				
FISCALYEAR	X	X	X	X	X	X	X	X	X
FLOWELEVATION		X				X			
GFSORWBS	*	*	*	*	*	*	*	*	*
GFSWBSNUMBER	*	*	*	*	*	*	*	*	*
ILMSNUMBER	*	*	*	*	*	*	*	*	*
INLETELEVATION						*	X		
INLETELEVATION2						*			
INLETELEVATION3						*			
INSERVICEDATE	X	X	X	X	X	X	X	X	X
LENGTH	X			X	X			X	
LIFECYCLESTATUS	X	X	X	X	X	X	X	X	X
MATERIAL	X		X	X	X	X		X	
NOTES	*	*	*	*	*	*	*	*	*
OWNER	X	X	X	X	X	X	X	X	X
PERCENTSLOPE					X			X	
PLANDATE	X	X	X	X	X	X	X	X	X
PLANNUMBER	X	X	X	X	X	X	X	X	X
PLANTYPE	X	X	X	X	X	X	X	X	X
PROJECTNUMBER	*	*	*	*	*	*	*	*	*
PROJECTTYPE	*	*	*	*	*	*	*	*	*
RIMELEVATION						X			
SIZEOFCOVER		X				X			
SUBTYPECD	X	X	X	X	X	X	X	X	X
TYPE						X			
UPSTREAMINVERT					X			X	

*If applicable

SECTION 4 – WATER GIS DIGITAL SUBMISSION REQUIREMENTS

13.4.01 WATER FEATURE CLASSES (FEATURE CLASS NAME; FEATURE TYPE; SUBTYPE(S))

13.4.01.A Abandoned Water Line/Point (wAbandonedLine; Line / wAbandonedPoint; Point) – Any water infrastructure that was installed, used, and maintained, and is no longer in use but was not removed.

13.4.01.B Casing (wCasing; Line) – A pipe, typically made of steel, which is not designed to carry water, but instead surrounds and protects a water line.

1. Casing (Subtype Value: 7)

13.4.01.C Control Valve (wControlValve; Point) – An appurtenance usually placed at the dead-end of a smaller diameter distribution line or at the high point(s) of a large diameter transmission main typically to allow for the release of trapped air in the system.

1. Air Valve (Subtype Value: 26)
2. Blow Off (27)
3. Air Release Valve Inside Manhole (28)
4. Air Release Valve Inside Vault (29)
5. Drain Valve in Manhole (30)

13.4.01.D Fitting (wFitting; Point) – An appurtenance that is structurally required at the terminus of a line or at the connection point of two or more lines. Excepted from this feature class are control valves, hydrants, meters, pressure reducing stations, sampling stations, and system valves.

1. Line Interconnect (Subtype Value: 4)
2. Plug (1)
3. Reducer (2)
4. Tap Sleeve (3)
5. Water Logical Node (5)

13.4.01.E Hydrant (wHydrant; Point) – A structurally independent device used primarily for fire or water quality events.

1. Fire Hydrant (Subtype Value: 8)

13.4.01.F Lateral Service (wLateralService; Line) – Also called service line, a water pipe that connects a public water line to a fire service and/or private property.

1. Hydrant Lead (Subtype Value: 5) – Includes all lines that establish a connection from the main line to a fire hydrant.

2. Fire Line (6) – All publicly owned, typically via easement, lines that serve a property for the purpose of fire protection. Also included are lines that establish a connection from the main line to a meter that serves a private property.

13.4.01.G Meter (wMeter; Point) – A device that measures water passing through a point. This also serves as a demarcation between a public ownership from private ownership.

1. Meter (Subtype Value: 10) – Used to indicate the location of any physical meter.

2. Unmetered Sprinkler (11) – Used to indicate the transition point between public and private ownership on an unmetered fire line, typically at the limits of the applicable right of way or easement.

13.4.01.H Pressure Reducing Station (wPressureReducingStation; Point) – A facility which contains infrastructure elements that drastically and intentionally reduce water pressure to allow a large diameter main to be tapped by a small diameter main.

1. Pressure Reducing Station in Vault (Subtype Value: 31)

13.4.01.I Pump Pressure Main (wPumpPressureMain; Line) – A water line which collects raw water from a source to a water treatment facility or distributes treated water from a water treatment facility to end users.

1. Distribution Main (Subtype Value: 1) – Defined as a non-well collection main having a diameter of less than 24-inch.

2. Transmission Main (2) – Defined as a non-well collection main having a diameter greater than or equal to 24-inch.

3. Well Collection (8)

13.4.01.J Sampling Station (wSamplingStation; Point) – A point at which a sample of water for testing and quality control purposes can be taken directly.

1. Test Station (Subtype Value: 9)

13.4.01.K System Valve (wSystemValve; Point) – An appurtenance installed on mains that control flow of water.

1. Butterfly (Subtype Value: 19)
2. Butterfly Valve in Manhole (22)
3. Gate (21)
4. Hydrant Gate Valve (33)
5. Valve from Tapping Sleeve (20)

13.4.02 WATER GIS SUBMISSION REQUIREMENTS

13.4.02.A Projected Coordinate System:

NAD_1983_StatePlane_Texas_South_Central_FIPS_4204_Feet

13.4.02.B Required Feature Classes

1. For Reference
    a. Right of Way (both current and proposed, if applicable)
    b. Easements
    c. Property Lines (both current and proposed, if applicable)
    d. Edges of Pavement and Sidewalk (both current and proposed, if applicable)
2. Include all existing utility infrastructure as required for plan and profile submission.
3. As applicable, all new water lines and points shall be included in their respective feature classes, with required fields for each feature class as depicted in Table 13.45.

13.4.02.C Field Requirements

1. CREATIONSOURCE: Indicator of assets that were built as part of a Capital Projects contract or DPC agreement.

2. DATASOURCETYPE: If submission includes revisions that are or will be included on final as built deliverable to the file room, all features should be tagged with As Built; otherwise, select Plan and Profile.
3. DIAMETER: In inches, the nominal diameter.

4. FISCAL_YEAR: Based on the In-Service Date, the fiscal year is defined as July 1st of the previous year to June 30th of the current year. For example, FY21 is delimited by July 1, 2020 and June 30, 2021. Format is "FY" followed by the 2-digit year.

5. GFSORWBS, GFSWBSNUMBER: As assigned by the Capital Projects Service Line, this number is defined as a 1-character utility code, a 6-character project type code, a 4-character project number code, and a 1-digit phase code. Only required for Capital Improvement Projects.

6. GROUNDCOVER: In feet, the minimum cover for the water main.

7. HYDRANTLEADDIAMETER: In inches, the diameter of the lead line that connects a fire hydrant to the main

8. (could change) ILMSNUMBER: Sometimes called project number, the integrated land management number is always 8 digits, starting with a 2-digit year followed by an assigned 6-digit number.

9. INSERVICEDATE: As applicable, the date of final acceptance by the city or the effective date of a substantial completion inspection. Only one date shall be used for the entirety of a project.

10. LARGEMAINDIAMETER: In inches, the diameter of the main as follows:

    a. Fitting (Reducer): The larger end of the fitting

    b. Fitting (Tap Sleeve): The line being tapped

    c. Pressure Reducing Station: The line from which the water pressure needs to be reduced.

11. LENGTH: In linear feet, the length of a line feature defined as follows:

    a. Casing: Total distance from start point to end point

13.4.02.C.11 continued

b. Pump Pressure Main: Distance from one digitized appurtenance to the next.

c. Lateral Service: Total distance from fitting to hydrant (or meter)

12. LIFECYCLESTATUS: Each feature shall be tagged with its post-construction use status; Abandoned (still in the ground, but no longer in use) or Existing (being used and maintained).

13. MATERIAL: All line features shall have one of the materials listed on the wWater Line Material domain. If a water main has more than one material in between the fitting(s) and/or valve(s) it connects, water logical nodes shall be used to delineate material changes, and each pipe shall be attributed appropriately.

14. MAINDIAMETER: In inches, the diameter of the main line to which a meter or hydrant is tied.

15. NOTES: Including, but not limited to, the specific use of this field as listed in this section, this field is to be used to communicate any discrepancies between the standards outlined in this section and the final digital deliverable. The explanations will receive consideration but will not guarantee acceptance of the feature(s) involved.

16. OWNER: Tag each feature as publicly owned or privately owned. If responsibility for maintenance is not with the owner, that detail should be indicated by selecting the appropriate option in the domain.

17. PLANDATE: The date the city granted approval to the most recent revision of the plans used for construction. This is typically the date the director, or the director's designee, signed off on the plan set.

18. PLANNUMBER: The drawing number assigned to the plan set by the file room.

19. PLANTYPE: If the city assigned a plan set a THD number (at present, a 3-digit number), then PLANTYPE shall be Texas Highway Department (THD). Otherwise, Plan and Profile (P) shall be selected.

20. PROJECTNUMBER: Sometimes called job number, this is currently a 5-digit number assigned by city engineer's office. In the case of a TxDOT job, the number follows the format ####-##-###.

13.4.02.C continued

21. PROJECTTYPE: If a project number is assigned by the city engineer's office, the project type is City Job (J). If the project number is assigned by TxDOT, the project type is Control Section Job (CSJ).

22. SERVICEADDRESS: On meters, the address of the property being served. This includes the address number and, in all caps, street name.

23. SMALLMAINDIAMETER: In inches, the diameter of the main as follows:

    a. Fitting (Reducer): The smaller end of the fitting.

    b. Fitting (Tap Sleeve): The line coming from the tap sleeve.

    c. Pressure Reducing Station: The line leaving the pressure reducing station.

24. SUBTYPECD: The specific type of feature within each feature class. The integer value for each subtype is listed in 13.4.01.

13.4.03 WATER FIELDS (FIELD NAME; FIELD TYPE; LENGTH; DOMAIN NAME, IF APPLICABLE)

13.4.03.A CREATIONSOURCE; String; 20; wCreation Source

13.4.03.B DATASOURCETYPE; String; 20; wData Source Type

13.4.03.C DIAMETER; Double; 10

13.4.03.D FISCAL_YEAR; String; 10

13.4.03.E GFSORWBS; String; 5; wProject Type2

13.4.03.F GFSWBSNUMBER; String; 24

13.4.03.G GROUNDCOVER; Double; 7

13.4.03.H HYDRANTLEADDIAMETER; Double; 38

13.4.03.I ILMSNUMBER; String; 15

13.4.03.J INSERVICEDATE; Date; 8

13.4.03.K LARGEMAINDIAMETER; Double; 7

13.4.03.L LENGTH; Double; 10

13.4.03.M LIFECYCLESTATUS; String; 5; wLifecycle Status

13.4.03.N MATERIAL; String; 5; wWater Line Material

13.4.03.O MAINDIAMETER; Double; 10

13.4.03.P NOTES; String; 255

13.4.03.Q OWNER; String; 10; wOwner

13.4.03.R PLANDATE; Date; 8

13.4.03.S PLANNUMBER; String; 10

13.4.03.T PLANTYPE; String; 30; wPlan Type

13.4.03.U PROJECTNUMBER; String; 24

13.4.03.V PROJECTTYPE; String; 30; wProject Type

13.4.03.W SERVICEADDRESS; String; 50

13.4.03.X SMALLMAINDIAMETER; Double; 7

13.4.03.Y SUBTYPECD; Integer; 10; Various

13.4.04 WATER DOMAINS (DOMAIN NAME; VALID CODES; CODE DESCRIPTIONS)

13.4.04.A wCreation Source

1. CIP; Capital Improvement Project
2. DPC; Developer Participation Contract

13.4.04.B wData Source Type

1. AB; As Built
2. P; Plan and Profile

13.4.04.C wLifecycle Status

1. A; Abandoned
2. E; Features Being Used and Maintained

13.4.04.D wOwner

1. C; City Owned & Maintained
2. CP; City Owned & Privately Maintained
3. P; Privately Owned & Maintained
4. PC; Privately Owned & City Maintained

13.4.04.E wPlan Type

1. P; Plan and Profile
2. THD; Texas Highway Department

13.4.04.F wProject Type

1. CSJ; Control Section Job
2. JOB; City Job

13.4.04.G wProject Type2

1. WBS; Work Business Structure

13.4.04.H wWater Line Material

1. DI; Ductile Iron

2. FRP; Fiberglass Reinforced Pipe

3. PVC; Polyvinyl Chloride

4. STL; Steel

13.4.05 WATER QA/QC PROCEDURES

13.4.05.A Field Checks

1. Every feature should have each attribute, as applicable per Table 13.45, filled with accurate and consistent information as is expected for any submission.

2. All fields will be checked against the submitted, stamped, and approved plan and profile set for extraneous and erroneous entries.

13.4.05.B Visual Checks

1. All features must be placed in their correct location relative to all other features and with respect to the parcel and right-of-way layers.

2. All line features shall be digitized in the direction of flow (ie from larger line to smaller line). Looped systems of uniform size are exempted from this check. Flow direction will be checked for each line using symbology with arrows that point in the direction of digitized flow. Lateral Service features should always be drawn towards the meter or hydrant they are serving.

13.4.05.C Logic Checks

1. Each feature must have proper connection to the features around it. The following circumstances are prohibited and will be verified using a valence tool:

    a. Hanging Features

    b. Overshoots

    c. Points snapped to points

2. In the instances where two points are constructed on top of each other (ie a Tap Sleeve and Valve), digitize one point in the actual location and offset the second point a small enough difference so it looks correct visually, but the points are technically adjacent.

13.4.05.C.2
continued

Table 13.45 - Fields Required per Feature Class (Water)

FIELD / Feature Class	Casing	Control Valve	Fitting	Hydrant	Lateral Service	Meter	Pressure Reducing Station	Pump Pressure Main	Sampling Station	System Valve
CREATIONSOURCE	*	*	*	*	*	*	*	*	*	
DATASOURCETYPE	X	X	X	X	X	X	X	X	X	X
DIAMETER	X				X	X		X		X
FISCAL_YEAR	X	X	X	X	X	X	X	X	X	X
GFSORWBS	*	*	*	*	*	*	*	*	*	*
GFSWBSNUMBER	*	*	*	*	*	*	*	*	*	*
GROUNDCOVER								X		
HYDRANTLEADDIAMETER				X						
ILMSNUMBER	*	*	*	*	*	*	*	*	*	*
INSERVICEDATE	X	X	X	X	X	X	X	X	X	X
LARGEMAINDIAMETER			*				*			
LENGTH	X				X			X		
LIFECYCLESTATUS	X	X	X	X	X	X	X	X	X	X
MATERIAL	X				X			X		
MAINDIAMETER				X		X				
NOTES	*	*	*	*	*	*	*	*	*	
OWNER	X	X	X	X	X	X	X	X	X	X
PLANDATE	X	X	X	X	X	X	X	X	X	X
PLANNUMBER	X	X	X	X	X	X	X	X	X	X
PLANTYPE	X	X	X	X	X	X	X	X	X	X
PROJECTNUMBER	*	*	*	*	*	*	*	*	*	*
PROJECTTYPE	*	*	*	*	*	*	*	*	*	*
SERVICEADDRESS						X				
SMALLMAINDIAMETER			*				*			
SUBTYPECD	X	X	X	X	X	X	X	X	X	X

SECTION 5 – GEOTECHNICAL AND ENVIRONMENTAL GIS DIGITAL SUBMISSION REQUIREMENTS

The following state the minimum technical specifications required for geotechnical and environmental digital data. All data delivered will conform to the below stated requirements.

13.5.01 SPATIAL REFERENCES

13.5.01.A Coordinate System: State Plane Texas South Central Zone (4204) Feet

13.5.01.B Horizontal Datum: North American Datum of 1983 (NAD83)

13.5.01.C Vertical Datum: North American Vertical Datum of 1988 (NAVD88)

13.5.01.D Units: Feet

13.5.02 ACCURACY

The horizontal accuracy of the boring points shall meet or exceed submeter accuracies of 2 feet horizontal RMS.

13.5.03 BORING POINT LOCATIONS AND BORING LOG TEST RESULTS TABLE

There are two required data submissions for geotechnical and environmental reports: soil boring location points and the associated boring log test results.

The preference is to deliver this data in a file geodatabase. However, data may be delivered in a comma delimited (.CSV) text file, or Excel spreadsheet. The file geodatabase, text file, or excel spreadsheet will be named: BoringData_WBS_Number. The WBS number is a unique identifier for each project as assigned by the City.

13.5.03.A geoBoring (Point) – Soil boring location. Soil borings are drilled to evaluate the soil conditions of a site or project location and to obtain soil samples.

13.5.03.B geoBoringTestResults (Table) – Boring log test results stored in a tabular format.

13.5.03.C Geodatabase Feature Class and Table

The following tables contain all fields found in the boring point features and associated boring test result table with corresponding description, alias name, and domain value names. For purposes of this deliverable the boring point features are connected to the associated boring test results record through the PROJECTID field. The PROJECTID field is a unique identifier generated by the Consultant through the concatenation of the Report Type, Report Year, the WBS Number and BoreID.

13.5.03.C
continued

The relationship between the geoBoring point and the geoBoring Test Results are a one to one (1:1) relationship with one point being related directly back to one test result where the geoBoring point is the parent and the geoBoring Test Results are the child table. This data will be appended into a larger enterprise dataset maintained by the City where bore ids are recurring between different reports. The City will create a separate unique identifier for the dataset during the city's internal quality control process, and prior to publishing to the production database.

To ensure that the data is distinct, the Consultant will deliver a project id which will serve as the interim unique identifier delivered with the data. The PROJECT ID field needs to be formatted as follows:

PROJECT ID Format:

ReportTypeReportYear_WBSNumber_BoreID

- Sample Environmental Report: E2020_S-000035-0100-3_EB1
  where by:
  - E = Environmental
  - 2020 = Report Year in a four digit (YYYY) year format
  - Underscore = separator character
  - S-000035-0100-3 = WBS Number in alphanumeric format
  - EB1 = Bore ID in alphanumeric format

- Sample Geotechnical Report: G2021_ S-000035-0100-3_B1
  where by:
  - G = Geotechnical
  - 2021 = Report Year in a four digit (YYYY) year format
  - Underscore = separator character
  - S-000035-0100-3 = WBS Number in alphanumeric format
  - B1 = Bore ID in alphanumeric format

Table 13.46 - geoBoring Feature Class Attribute Fields for Geotechnical Borings

FieldName	Type	Length	Description	AliasName	DomainName
PROJECTID	Text	50	Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_ BoreID	Project ID	
WBSNUMBER	Text	25	City of Houston assigned number for the project	WBS Number	

FieldName	Type	Length	Description	AliasName	DomainName
PROJECTNAME	Text	250	City of Houston assigned project name	Project Name	
REPORTTYPE	Text	5	The report classification content either geotechnical or environmental	Report Type	geoReportType
REPORTSIGNEDDATE	Date		Date the report was signed	Report Signed Date	
CONSULTANTNAME	Text	250	Name of the firm who produced the report	Consultant Name	
BOREID	Text	25	Alphanumeric unique identification number assigned to the boring location	Bore ID	
X*	Double		Horizontal coordinate	X	
Y*	Double		Vertical coordinate	Y	
LATITUDE**	Double		Geographic coordinate in decimal degrees format measured North and South of the equator.	Latitude	
LONGITUDE**	Double		Geographic coordinate in decimal degrees format measured East and West of the prime meridian.	Longitude	
SURFACEELEV	Double		Vertical measurement of the height of the land surface (Feet)	Surface Elevation	
DEPTH	Double		Total distance from the top of the surface elevation to the bottom of the boring (Feet)	Depth	
WATERENCOUNTERED	Text	50	Measurement in Feet at which water was first encountered at the time of drilling	Water Encountered	
WATERLEVEL	Text	50	Measurement in Feet of the water level 15-20 minutes after water was first encountered	Water Level	
READINGDATE	Date		Date at which the water level measurement in Feet was read 24 hours or more after drilling completed	Reading Date	
WATERLEVELREADING	Text	50	The water level measurement in Feet read 24 hours or more after drilling completed	Water Level Reading	
CONTAMINATION	Short		Yes/No Field to flag whether or not contamination was detected	Contamination	dYesNo
DRILLEDDATE	Date		Date the boring was drilled	Drilled Date	

*The field is only required for geotechnical borings and is not a requirement for environmental borings.
**The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

Table 13.47 - geoBoringTestResults Table Attribute Fields for Geotechnical Borings

FieldName	Type	Length	Description	AliasName	DomainName
PROJECTID	Text	50	Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID	Project ID	
WBSNUMBER	Text	25	City of Houston assigned number for the project	WBS Number	
PROJECTNAME	Text	250	City of Houston assigned project name	Project Name	
CONSULTANTPROJECTNO	Text	50	Consultant assigned number for the project	Consultant Project Number	
REPORTSIGNEDDATE	Date		Date the report was signed	Report Signed Date	
BOREID	Text	25	Alphanumeric unique identification number assigned to the boring location	Bore ID	
SAMPLENO	Text	25	The unique identification number for the sample	Sample Number	
SAMPLEDEPTHTOP	Double		Top depth of the boring in Feet	Sample Depth Top	
SAMPLEDEPTHBTM	Double		Bottom depth of the boring in Feet	Sample Depth Bottom	
SAMPLETYPE	Text	5	Type of sample taken	Sample Type	geoSampleType
SPT	Double		Standard penetration test (SPT) measurement in blows/Feet	SPT	
WATERCONTENT	Double		Percent water content in sample	Water Content	
DRYDENSITY	Double		Dry density of sample measured in pounds per cubic foot (pcf)	Dry Density	
ATTERBERGLIMITSLL	Double		Atterberg limits – Liquid Limit (%)	Atterberg Limits LL	
ATTERBERGLIMITSPL	Double		Atterberg limits – Plastic Limit (%)	Atterberg Limits PL	
ATTERBERGLIMITSPI	Double		Atterberg limits – Plasticity Index (%)	Atterberg Limits PI	
PERPASSSIEVE200	Double		Percent passing sieve 200 (%)	Percent Passing Sieve 200	
TSFUNCONFCOMPTEST	Double		Shear strength (TSF) unconfined compression test	TSF UC Test	
TSFUUTEST	Double		Shear strength (TSF) triaxial compression (UU) test	TSF UU Test	

FieldName	Type	Length	Description	AliasName	DomainName
TSFCONFININGPRESS	Double		Shear strength (TSF) Confining pressure TSF	TSF Confining Pressure	
TSFTORVANE	Double		Shear strength (TSF) torvane	TSF Torvane	
TSFPOCKETPENETROMETER	Double		Shear strength (TSF) pocket penetrometer	TSF Pocket Penetrometer	
TYPEOFMATERIAL	Text	250	Type of soil material. For geotechnical borings refer to ASTM D2487. For environmental borings refer to ASTM D2488.	Type of Material	
PID*	Double		Photoionization Detector (PID) value (ppm)	PID	

*The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

13.5.03.C.1 Domain Codes and Values

The tables below contain all the domain values for the geotechnical and environmental boring point feature class and the associated boring log test results table.

Table 13.48 - geoYesNo Domain

Code	Description
0	No
1	Yes

Table 13.49 - geoSampleType Domain

Code	Description
UD	Undisturbed Sample
SS	Split Spoon Sample
AG	Auger Cuttings
SPT	Standard Penetration Test

Table 13.50 - geoReportType Domain

Code	Description
GEO	Geotechnical
ENV	Environmental

13.5.03.D Tabular Data

If a file geodatabase cannot be delivered, the following tables contain all fields found in the boring point and test result tabular data which may be delivered in comma delimited or Excel spreadsheet format.

Table 13.51 - geoBoring Tabular Attribute Fields

Field Name	Type	Description	List Values
PROJECTID	Text	Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID	
WBSNUMBER	Text	City of Houston assigned number for the project	
PROJECTNAME	Text	City of Houston assigned project name	
REPORTTYPE	Text	The report classification content either geotechnical or environmental	geoReportType
REPORTSIGNEDDATE	Date	Date the report was signed	
CONSULTANTNAME	Text	Name of the firm who produced the report	
BOREID	Text	Alphanumeric unique identification number assigned to the boring location	
X*	Numeric	Horizontal coordinate	
Y*	Numeric	Vertical coordinate	
LATITUDE**	Numeric	Geographic coordinate in decimal degrees format measured North and South of the equator.	
LONGITUDE**	Numeric	Geographic coordinate in decimal degrees format measured East and West of the prime meridian.	
SURFACEELEV	Numeric	Vertical measurement of the height of the land surface (Feet)	
DEPTH	Numeric	Total distance from the top of the surface elevation to the bottom of the boring (Feet)	
WATERENCOUNTERED	Text	Measurement in Feet at which water was first encountered at the time of drilling	
WATERLEVEL	Text	Measurement in Feet of the water level 15-20 minutes after water was first encountered	
READINGDATE	Date	Date at which the water level measurement in Feet was read 24 hours or more after drilling completed	
WATERLEVELREADING	Text	The water level measurement in Feet read 24 hours or more after drilling completed	
CONTAMINATION	Numeric	Yes/No Field to flag whether or not contamination was detected	dYesNo
DRILLEDDATE	Date	Date the boring was drilled	

*The field is only required for geotechnical borings and is not a requirement for environmental borings.
**The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

WBS Number	
Project Name	
Report Type (Geo or Env)	
Report Signed Date	
Consultant Name	

Bore ID	X	Y	Depth	Water First Encountered at Time of Drilling	Water Level 15-20 minutes after Water was First Encountered	Water Level Measured 24 hours or more After Drilling Completed		Contamination (Y/N)	Drilled Date
						Reading Date	Water Level Reading		

Figure 13.35 - Sample Heading and Format for geoBoring Excel Data

Table 13.52 - geoBoringTestResults Table Attribute Fields

Field Name	Type	Description	List Values
PROJECTID	Text	Unique ID for the project populated by the consultant based on report type, year, the project WBS number, and bore ID. Format is: ReportTypeYear_WBSNumber_BoreID	
WBSNUMBER	Text	City of Houston assigned number for the project	
PROJECTNAME	Text	City of Houston assigned project name	
CONSULTANTPROJECTNO	Text	Consultant assigned number for the project	
REPORTSIGNEDDATE	Date	Date the report was signed	
BOREID	Text	Alphanumeric unique identification number assigned to the boring location	
SAMPLENO	Text	The unique identification number for the sample	
SAMPLEDEPTHTOP	Numeric	Top depth of the boring in Feet	
SAMPLEDEPTHBTM	Numeric	Bottom depth of the boring in Feet	
SAMPLETYPE	Text	Type of sample taken	geoSampleType
SPT	Numeric	Standard penetration test (SPT) measurement in blows/Feet	
WATERCONTENT	Numeric	Percent water content in sample	
DRYDENSITY	Numeric	Dry density of sample measured in pounds per cubic foot (pcf)	
ATTERBERGLIMITSLL	Numeric	Atterberg limits – Liquid Limit (%)	
ATTERBERGLIMITSPL	Numeric	Atterberg limits – Plastic Limit (%)	
ATTERBERGLIMITSPI	Numeric	Atterberg limits – Plasticity Index (%)	
PERPASSSIEVE200	Numeric	Percent passing sieve 200 (%)	
TSFUNCONFCOMPTEST	Numeric	Shear strength (TSF) unconfined compression test	
TSFUUTEST	Numeric	Shear strength (TSF) triaxial compression (UU) test	

Field Name	Type	Description	List Values
TSFCONFININGPRESS	Numeric	Shear strength (TSF) Confining pressure TSF	
TSFTORVANE	Numeric	Shear strength (TSF) torvane	
TSFPOCKETPENETROMETER	Numeric	Shear strength (TSF) pocket penetrometer	
TYPEOFMATERIAL	Text	Type of soil material. For geotechnical borings refer to ASTM D2487. For environmental borings refer to ASTM D2488.	
PID*	Numeric	Photoionization Detector (PID) value (ppm)	

*The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

SUMMARY OF LABORATORY TEST RESULTS

Geotechnical Consultant's Name

PROJECT NAME:

COH WBS NUMBER:

CONSULTANT PROJECT NUMBER:

BORING NO.	SAMPLE NO.	DEPTH (FT) Top	DEPTH (FT) Bottom	SAMPLE TYPE	SPT (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PL (%)	ATTERBERG LIMITS PI (%)	PERCENT PASSING SIEVE 200 (%)	SHEAR STRENGTH (TSF) UNCONFINED COMPRESSION TEST	SHEAR STRENGTH (TSF) UU TEST (CONFINING PRESSURE, TSF)	SHEAR STRENGTH (TSF) TORVANE	SHEAR STRENGTH (TSF) POCKET PENETR-OMETER	TYPE OF MATERIAL
B-1	1	0.0	0.5	AG		25										Fat Clay
	2	0.5	2.0	UD		23	100	68	24	44	95	1.5		2.0	2.0	Fat Clay
	3	2.0	4.0	UD		22							1.25 (0.4)	1.5	1.5	Fat Clay
	4	4.0	5.5	SS	22	12					35					Silty Sand
B-2	1															

LEGEND

UD = UNDISTURBED SAMPLE, EXTRUDED IN FIELD
SS = SPLIT SPOON SAMPLE
AG = AUGER CUTTINGS
SPT = STANDARD PENETRATION TEST

LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTICITY INDEX
UU = TRIAXIAL COMPRESSION

NOTES:

FIGURE

Figure 13.36 - Sample Test Results for geoBoringTestResults Excel Data

13.5.03.D.1 List Values

The tables below contain all the list values for the geotechnical and environmental boring point and boring log test results tables.

Table 13.53 - geoYesNo List

Value	Description
0	No
1	Yes

Table 13.54 - geoSampleType List

Value	Description
UD	Undisturbed Sample
SS	Split Spoon Sample
AG	Auger Cuttings
SPT	Standard Penetration Test

Table 13.55 - geoReportType List

Value	Description
GEO	Geotechnical
ENV	Environmental

13.5.03.E Required Attributes

The following table summarizes the required attribute fields that are to be populated, if relevant, for the boring point feature class or tabular data and the associated boring log test results table.

Table 13.56 - Fields Required Feature Class and Table

FIELD / FEATURECLASS	geoBoring	geoBoringTestResults
PROJECTID	X	X
WBSNUMBER	X	
PROJECTNAME	X	
REPORTTYPE	X	
CONSULTANTPROJECTNO		X
REPORTSIGNEDDATE	X	
CONSULTANTNAME	X	
BOREID	X	
X*	X	
Y*	X	

FIELD / FEATURECLASS	geoBoring	geoBoringTestResults
LATITUDE**	X	
LONGITUDE**	X	
SURFACEELEV	X	
DEPTH	X	
WATERENCOUNTERED	X	
WATERLEVEL	X	
READINGDATE	X	
WATERLEVELREADING	X	
CONTAMINATION	X	
DRILLEDDATE	X	
SAMPLENO		X
SAMPLEDEPTHTOP		X
SAMPLEDEPTHBTM		X
SAMPLETYPE		X
SPT		X
WATERCONTENT		X
DRYDENSITY		X
ATTERBERGLIMITSLL		X
ATTERBERGLIMITSPL		X
ATTERBERGLIMITSPI		X
PERPASSSIEVE200		X
TSFUNCONFCOMPTEST		X
TSFUUTEST		X
TSFCONFININGPRESS		X
TSFTORVANE		X
TSFPOCKETPENETROMETER		X
TYPEOFMATERIAL		X
PID**		X

*The field is only required for geotechnical borings and is not a requirement for environmental borings.
**The field is only required for environmental borings and/or test results and is not a requirement for geotechnical borings.

13.5.04 DELIVERABLE FORMATS

13.5.04.A The geotechnical and environmental data products may be delivered in one of the following formats:

1. Boring Locations (geoBoring) - file geodatabase feature class, comma delimited text file (.CSV), or Excel Spreadsheet; and

2. Boring Log Test Results (geoBoringTestResults) - file geodatabase table, comma delimited text file (.CSV), or Excel Spreadsheet.

13.5.04.B The preferred delivery format is to submit both the boring locations and the test results within one file geodatabase. Shapefiles will not be accepted as a submission format.

13.5.04.C The City will specify the delivery method during project planning.

END OF CHAPTER