APPENDIX 7D

Data Formats

List of Tables

1. INTRODUCTION

The following tables list data types and naming convention of each component of a computer model of a study area:

1. Data requirements for building the network of a hydraulic model (Table 1)
2. Data requirements for storage facilities and pumps (Table 2)
3. Data requirements for weirs, orifices, valves, sluice gates, and flap gates (Table 3)

Reference field names corresponding to each type of information in GIS can be found in DSG section 7.5.2, Hydraulic Conveyance System Model Data.

Table 7D-1
Data Requirements for Building the Network of a Hydraulic Model

Description	Units, Field ID, or Data Type	Sample Data	Data Source
Pipes and Forcemains			
Upstream Node ID	S_ENDPT_ID or D_ENDPT_ID	046E-090	GIS
Downstream Node ID	S_IMSID or D_ENDPT_ID	059-072	GIS
System Type		Combined	GIS
Asset ID	[U/S node ID]_[D/S node ID]	046E-090_059-072	GIS
(Pipe) Length	Ft	325.0	GIS
(Pipe) Shape		CIRC	GIS
(Pipe) Width	In	8.0	GIS
(Pipe) Height	In	8.0	GIS
(Pipe) Material		Conc	GIS or as-builts
(Pipe) Roughness (Manning's n, Chezy's C, Hazen-Williams' C, or Darcy-Weisbach's f)		0.013	Tabulated values based upon pipe material, and/or field observation
Upstream Invert Level[3]	ft AD[1]	87.800	GIS
Downstream Invert Level[3]	ft AD[1]	86.600	GIS
Type of pipes	Gravity or Forcemain	Gravity	GIS
Flap Gate (one-way valve)		Yes	GIS, As-builts
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS

Description	Units, Field ID, or Data Type	Sample Data	Data Source
	Nodes		
Node ID	S_ENDPT_ID or D_ENDPT_ID	046E-090	GIS
Node Type		Manhole	GIS
System Type		Combined	GIS
X-coordinate	ft NAD83[2]	1282611.9	GIS
Y-coordinate	ft NAD83[2]	213245.8	GIS
Ground Level	ft AD[1]	96.000	GIS
Invert Elevation[3]	ft AD[1]	87.8	GIS, or As-builts
Diameter of network element (e.g. manhole)	ft	4	GIS, As-builts, Field Observation, or SPU Standard Plans
Cover Type	SEALED (Pressurized) or UNSEALED	UNSEALED	Field observation, or As-builts
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS

Notes

[1] ft AD = feet above NAVD88-North American Vertical Datum of 1988 datum

[2] ft NAD83 = NAD_1983_HARN_StatePlane_Washington_North_FIPS_4601_Feet

[3] Use the minimum of ELEV1, ELEV2, ELEV3, ELEV4 or CINVERT – DEPTH unless information shown on As-builts drawings indicates otherwise. Please note that the node invert can also be calculated from the lowest pipe invert connected to the node.

Table 7D-2
Data Requirements for Storage Facilities and Pumps

Description	Units, Field ID, or Data Type	Sample Data	Data Source
	Wet Wells or Other Storage Facilities		
Node ID	S_ENDPT_ID or D_ENDPT_ID	059-453	GIS
Node/Link Type		Storage	GIS
System Type		Combined	GIS
Asset ID	ST[S_ENDPT_ID], or other City's distinct identifier	ST059-453	GIS
X-coordinate (if storage facilities are modeled as nodes)	ft NAD83[2]	1282611.9	GIS
Y-coordinate (if storage facilities are modeled as nodes)	ft NAD83[2]	213245.8	GIS
Invert Elevation	ft AD[1]	16.3	GIS, As-builts, or Field measurement

Description	Units, Field ID, or Data Type	Sample Data	Data Source
Ground Level	ft AD[1]	96.000	GIS
Depth- Surface Area relationship of facilities	ft AD[1] - Sq.ft	Tabulated data of depth[3] and corresponding surface area[4]	Field measurement or As-builts
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS
	PUMPS		
Upstream Node ID	S_ENDPT_ID or D_ENDPT_ID	059-453	GIS
Downstream Node ID	F[S_ENDPT_ID] or F[D_ENDPT_ID]	F059-453	Dummy node connecting the end of the pump element to the beginning of the downstream link (forcemain link, or the gravity main if the forcemain is not modeled)
Type (Pump type)		TYPE 2	Field observation, SPU SOPA, or as-builts
System Type		Combined	GIS
Asset ID	PS_[U/S node ID]_#	PS_059-453_1	
Switch On Level	ft AD[1]	16.57	Field measurement, SPU SOPA, or SCADA
Switch Off Level	ft AD[1]	11.7	Field measurement, SPU SOPA, or SCADA
Pump Discharge Information	gpm, or gpm-ft	Fixed discharge value, or tabulated Head Discharge data[5]	Field measurement, or SPU SOPA
Operation Sequence and Logics	Set point driven or RTC	Real Time Control (RTC) Input	Field Information, or SPU SOPA
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS

Notes

[1] ft AD = feet above NAVD88-North American Vertical Datum of 1988 datum

[2] ft NAD83 = NAD_1983_HARN_StatePlane_Washington_North_FIPS_4601_Feet

[3]Depth data used by the H/H software can be either accumulative or relative. Please verify and use the correct type of depth data.

[4]If only stage-storage curve is available, surface area at each depth can be back calculated from the stage-storage curve.

[5]Depending on whether the forcemain is modeled, the head-discharge (pump) curves provided by pump manufacturers or created by draw-down tests might need to be modified before being used by a H/H model. Please verify and use the right head-discharge (pump curve) depending on how the pumping facility is modeled.

Table 7D-3
Data Requirements for Weirs, Orifices, Valves, Sluice Gates, and Flap Gates

Description	Units, Field ID, or Data Type	Sample Data	Data Source
Upstream Node Name	S_ENDPT_ID or D_ENDPT_ID	059-456	GIS
Downstream Node Name	For a *Weir*: W[S_ENDPT_ID] or W[D_ENDPT_ID] For an *Orifice*: R[S_ENDPT_ID] or R[D_ENDPT_ID] For a *Valve* not modeled as an imbedded feature in a pipe: V[S_ENDPT_ID] or V[D_ENDPT_ID] For a *Sluice or Flap Gate*: G[S_ENDPT_ID] or G[D_ENDPT_ID]	W059-456	Dummy node connecting the end of the structure to the beginning of the downstream link
Link/node Type	The type of Weir, Orifice, Valve, Sluice gate, or flap gate	TRANSVERSE	Field measurement
System Type	Combined, Storm, or Sanitary	Combined	GIS
Asset ID	For a *Weir*: WR_[S_ENDPT_ID] or WR_[D_ENDPT_ID] For an *Orifice*: OR_[S_ENDPT_ID] or OR_[D_ENDPT_ID] For a *Valve* not modeled as an imbedded feature in a pipe link: VV_[S_ENDPT_ID] or VV_[D_ENDPT_ID] For a *Sluice Gate*: SG_[S_ENDPT_ID] or SG_[D_ENDPT_ID] For a *Flap Gate*: FG_[S_ENDPT_ID] or FG_D_ENDPT_ID]	WR_059-456	
Crest Elevation	ft AD[1]	18.8	Field measurement, or SPU SOPA
Geometry (under both *free flow* and *submerged* condition)	Structure dependent	Essential geometric properties of the structures (under both free flow and submerged condition)	Field measurement, or As-builts
Primary (free flow) and Secondary (submerged) discharge coefficients[2,3]		0.6	As-builts, Manufacturers' values, or typical values
Flap Gate (one-way valve)	Yes/No (checked / unchecked)	Yes (checked)	GIS, As-builts
Operation Sequence and Logics	Static or RTC	Real Time Control (RTC) Input	Field Information, or SPU SOPA

Description	Units, Field ID, or Data Type	Sample Data	Data Source
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS

Notes

[1] ft AD = feet above NAVD88-North American Vertical Datum of 1988 datum

[2]. It should be noted that the default weir coefficients in modeling platform may be too high or too low. Please verify, document, and use appropriate values and do not default to default values in model

[3]Discharge coefficient are unit and equation dependent. Please verify and use the correct unit and value as specified by H/H software.

Table 7D-4
Data Requirements for Hydrobrakes or Leaping Weirs

Description	Units, Field ID, or Data Type	Sample Data	Data Source
Upstream Node ID	S_ENDPT_ID or D_ENDPT_ID	059-453	GIS
Downstream Node ID	For a Hydrobrake: HB[S_ENDPT_ID] or HB[D_ENDPT_ID] For a Leaping Weir: L[[S_ENDPT_ID]] or L[D_ENDPT_ID]	HB059-453	Dummy node connecting the end of the structure to the beginning of the downstream link
System Type		Combined	GIS
Asset ID	For a Hydrobrake: HB_[S_ENDPT_ID] or HB_[D_ENDPT_ID] For a Leaping Weir: LW[[S_ENDPT_ID]] or LW[D_ENDPT_ID]	HB_059-453	
Upstream Invert Level[2]	ft AD[1]	87.800	GIS
Downstream Invert Level[2]	ft AD[1]	86.600	GIS
Q-H relation		Tabulated head vs flow relationship; might also need to use Real Time Control	Field measurement and SVM simulation results
Owner		SPU	GIS
Status	Active or abandoned	Active	GIS

Notes

[1] ft AD = feet above NAVD88-North American Vertical Datum of 1988 datum

[2] Use the minimum of ELEV1, ELEV2, ELEV3, ELEV4 or CINVERT – DEPTH unless information shown on As-builts drawings indicates otherwise. Please note that the node invert can also be calculated from the lowest pipe invert connected to the node.