916 Drainage Structures Sheet

916.1 General

The signed and sealed Building Information Model (BIM) files contain the complete drainage system information for the project. The Drainage Structures sheet provides supplemental data and information for proposed drainage structures, including:

(1) Drainage Plan View

(2) Drainage Profiles

(3) Drainage Tabular Information

(4) Drainage Special Details and Notes

(5) Optional Materials Tabulation

The Drainage Structures sheet is produced as a contract document and placed within the Roadway Plans. This sheet may be produced on a standard-format sheet (11”x17”) or a large-format sheet (36”x48” or 36”x72”). Use landscape orientation regardless of sheet size selected. Sheet size selection should be based on size and extent of drainage network(s). The Drainage Structures sheet should display the complete extents of individual drainage network(s).

Use the following horizontal scales:

	Standard	Optional
Curbed Roadways	1” = 40’	1” = 50’
Flush-shoulder Roadways	1” = 50’	1” = 100’

Provide a legend for all abbreviations included in the drainage tabular information. See ***Exhibit 916-1*** for an illustration of the Drainage Structures sheet.

916.2 Drainage Plan View

The drainage plan view is typically shown in the upper half of the sheet. The purpose of this view is to highlight the drainage network(s) that will be shown in the profile views and included in the tabular data. The display limits of the drainage plan view should contain the entire proposed drainage network. If multiple drainage networks are shown or overlap, clearly indicate which network the profile and tabular information is associated with.

916.2.1 Required Information

Provide the following information in the plan view:

- Display the view such that the centerline of construction or baseline of survey stationing is increasing from left to right. Display station numbers close to station ticks. Include a north arrow and scale above and near the drainage plan view.
- Display proposed limits of pavement, curbs, traffic separators, sidewalks, curb ramps, and driveways. Show proposed bridges and approach slabs by simple outline and indicate the bridge structure number. The intent is to show an outline of the proposed roadway to give context to the location of the drainage structures. The elements of the proposed roadway should be gray scaled.
- Display and label existing and proposed underground utilities only where a conflict exists. Identify the underground utility as a conflict node.
- Display the proposed drainage system by depicting drainpipes with a single pipeline style indicating direction of flow, and the outline of inlets, manholes, junction boxes, and outfall features (e.g., MES, endwall).
- Display and label existing structures that are to be filled, plugged, and remain in place.

Do not display existing topography, except to the extent those elements are to be incorporated into, affected by, or accommodated by the proposed drainage system. Existing topography elements may include roads, streets, driveways, buildings, underground and overhead utilities, walls, curbs, pavements, fences, railroads, bridges, drainage structures and similar items, as well as streams, ponds, lakes, wooded areas, ditches, existing gasoline storage tanks within limits of topographical survey, and other physical features. When shown, display existing topography elements as gray scaled.

916.2.2 Structure and Pipe Numbers

Provide drainage structure numbers, and a pipe number between structures. Include the bridge number for proposed bridge culverts. Established the structure and pipe numbers using the convention shown in ***Exhibit 916-1*** and described as follows:

(1) Storm drain networks: Assign structure numbers in ascending order along the centerline of construction or baseline of construction. Assign pipe numbers to correlate with the structure at the hydraulically upper end of pipe.

(2) Cross drains: Assign structure number in ascending order along the direction of flow (hydraulic upper end to lower end). Intermediate structure numbers along the same cross drain typically use the same beginning structure number with suffix letter. Assign pipe numbers to correlate with the structure at the hydraulically upper end of pipe.

916.3 Drainage Profile

Drainage profiles are typically shown in the lower left portion of the sheet as illustrated in ***Exhibit 916-1***. Stack or space the profiles to avoid overlapping of structures or notes. Display drainage profiles from left to right, beginning with the structure at the hydraulically upper end of the system run to the outfall or structure at the hydraulically lower end. All storm drain networks, cross drains and side drains are to be shown in profile view.

Each drainage profile must include a background grid at the appropriate scale. Use the same horizontal scale for the profile portion that is used for the plan portion. The vertical scale is typically 10% of the horizontal scale (e.g., 1” = 50’ horizontal scale would typically use a 1” = 5’ vertical scale).

916.3.1 Required Information

Drainage profiles depict vertical relationships of the drainage network or cross drain along the centerline of the pipes. Provide the following information for each drainage profile:

- Display drainage structures (typically depicted as rectangles) and connecting pipes. Place the outside edge of the first structure at the first vertical grid line as shown in ***Exhibit 916-1***. Assign the value of zero to the first vertical grid line; subsequent vertical grid lines reflect the true distance along the pipe system.
- Label drainage pipes and structure numbers.
- Display and label existing and proposed surfaces along centerline of pipe. Displaying surfaces past the limits of the first and last pipes is not required.
- Provide horizontal grid line elevations along the left side of the background grid.
- Display and label existing and proposed underground utilities. When appropriate, identify underground utility as a conflict node.

916.4 Drainage Tabular Information

The Drainage Tabular Information is typically shown on the lower right portion of the sheet and consists of four tables:

(1) Pipe Data

(2) Structures Data

(3) Endwall and MES Data

(4) Optional Materials

If there is insufficient space on the Drainage Structures sheet, the Drainage Tabular Information may be placed on a separate sheet titled “Drainage Structures Data”.

916.4.1 Pipe Data

The Pipe Data table contains the following information:

- Pipe number, length, and size
- Hydraulic upper end structure number with invert elevation
- Hydraulic lower end structure number with elevation
- Optional materials group number

916.4.2 Structures Data

The Structure Data table contains the following information for each structure:

- Structure number
- Baseline feature
- Structure location (baseline station and offset)
- Structure type and bottom dimensions
- FDOT Standard Plans (Index 400 series) Notes
- Reference point elevation
- Pipe label for each pipe entering or exiting the structure

916.4.3 Endwall and MES Data

The Endwall and MES Data table contains the following information:

- Structure number
- Baseline feature
- Structure location (baseline station and offset)
- Structure type
- Pipe invert elevation
- Structure notes

916.4.4 Optional Materials

Modification for Non-Conventional Projects:
Delete ***FDM 916.6*** and see ***Chapter 6*** of the ***Drainage Manual*** for Optional Material requirements.

Consider optional materials for all pipes; however, match pipe extensions and end section replacements to the existing pipe material. See the Department's ***Drainage Design Guide*** (Optional Pipe Material Chapter) for more information.

Conduct an Optional Pipe Materials Analysis and place an Optional Materials table with the Drainage Tabular Information. The Optional Materials table shows all materials allowed and indicates which material is plotted in the plans and used as the basis for pay item quantities. The Optional Materials table is to include:

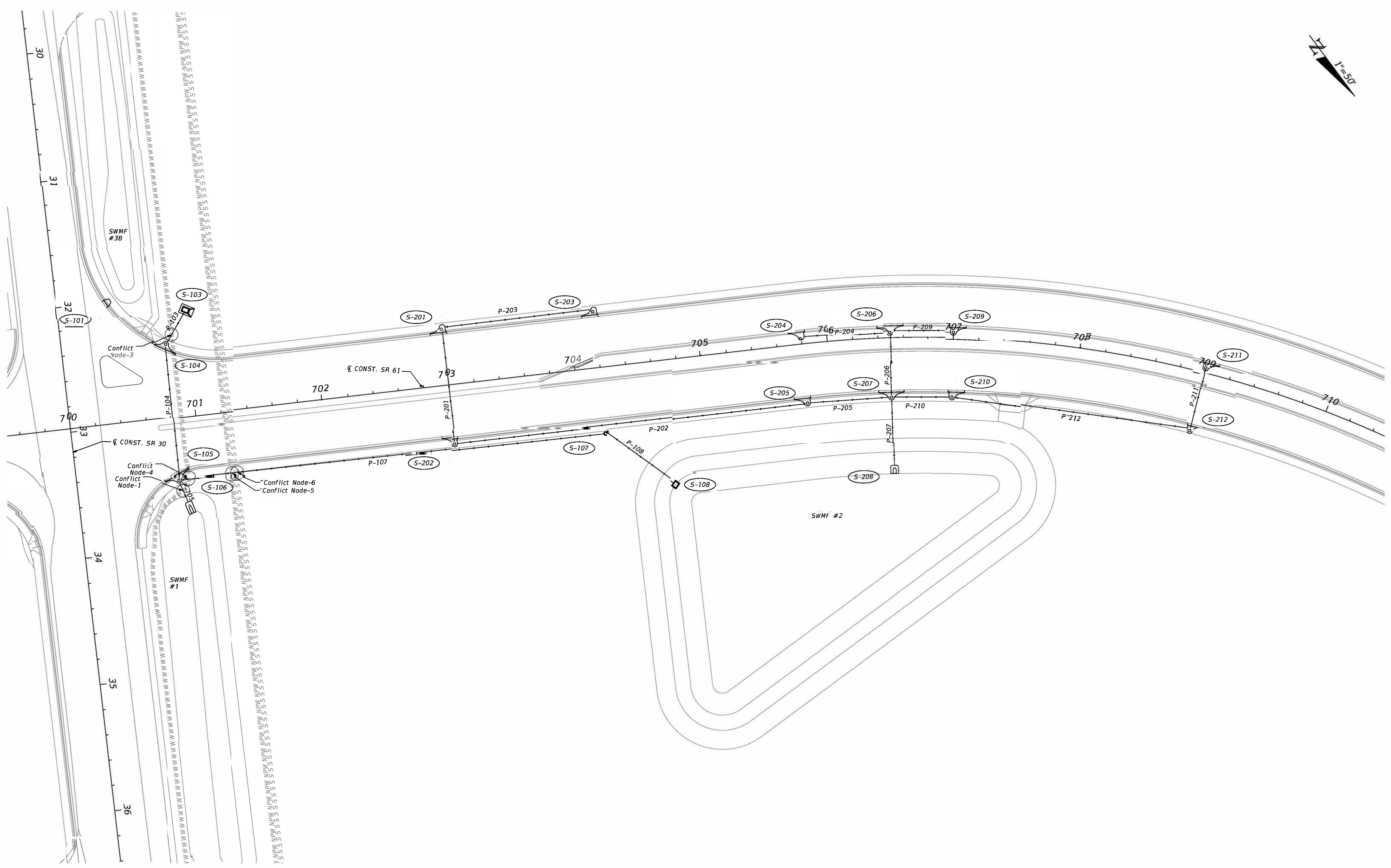
- Optional Pipe Group Number
- Size(s)
- Material, thickness or class, corrugation requirements, and protective coating
- Plotted and as-built notations, and construction remarks

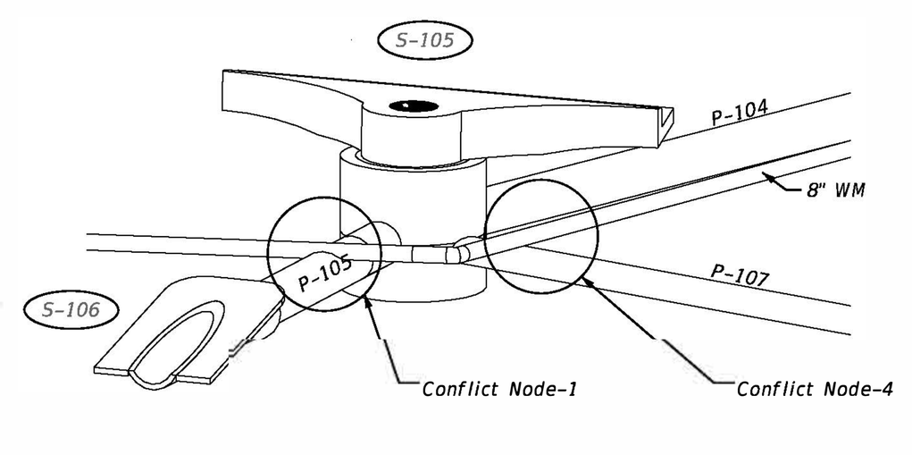
916.5 Drainage Special Details

Showing special horizontal or vertical details in the plans is typically not necessary. However, if it is determined that providing a special drainage detail is beneficial to show the design intent, the detail is typically placed in the upper right portion of the sheet but may be shown anywhere within available space on the sheet. Any scale may be used.

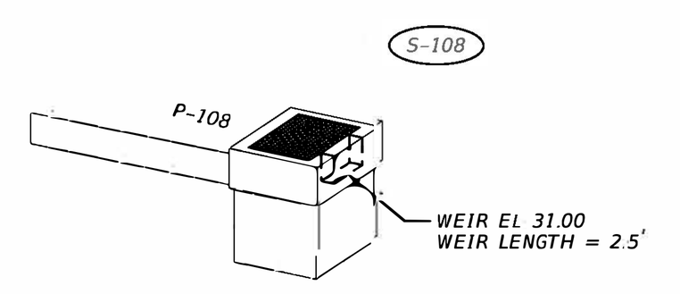
The following are examples of information that may be depicted:

- Clash detection results and utility clearances
- Drainage structure details (non-standard structures, pond outfall structures multiple or off-centered pipe connections to a structure wall)
- Isometric and 3D views with identifying labels



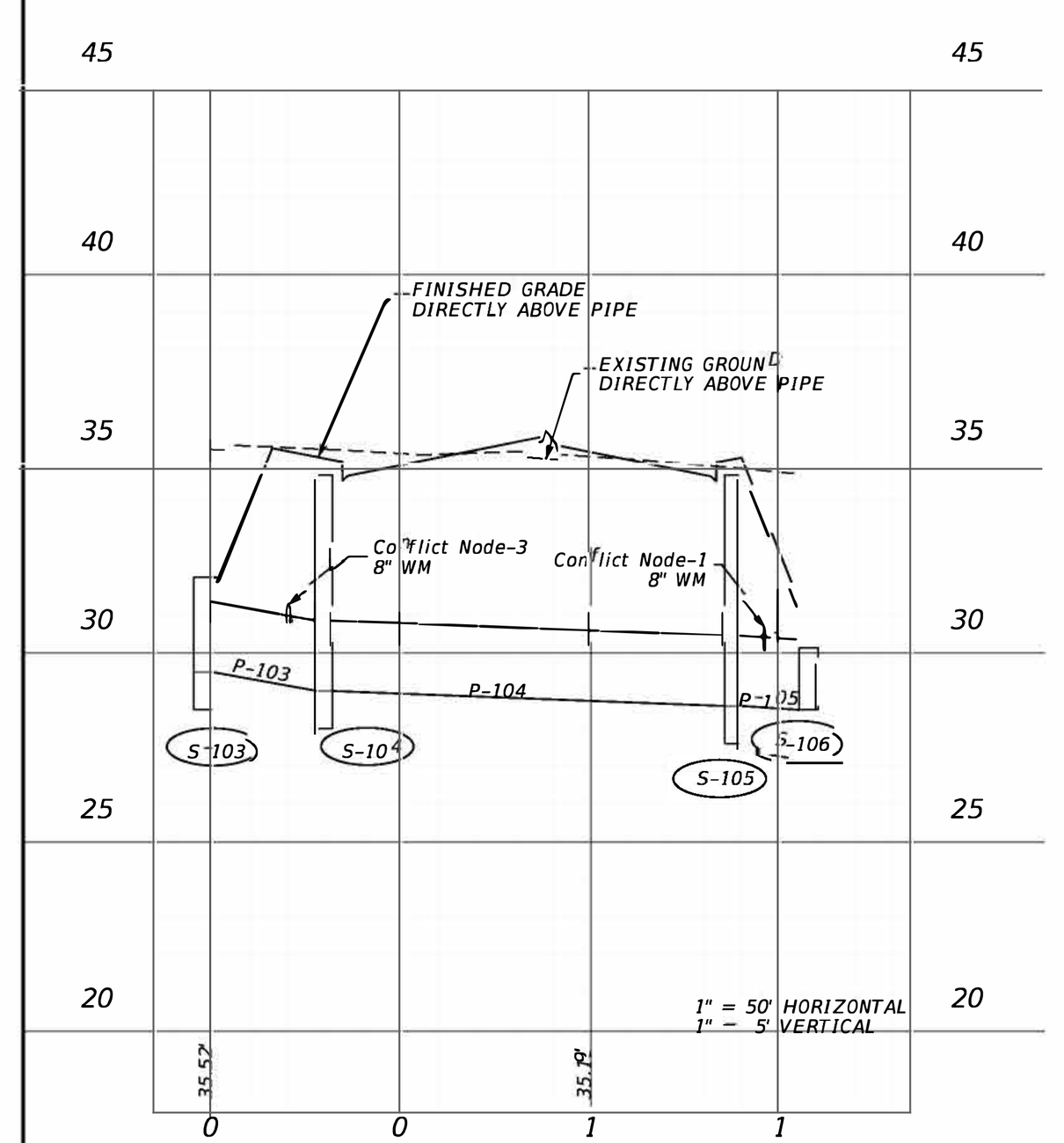


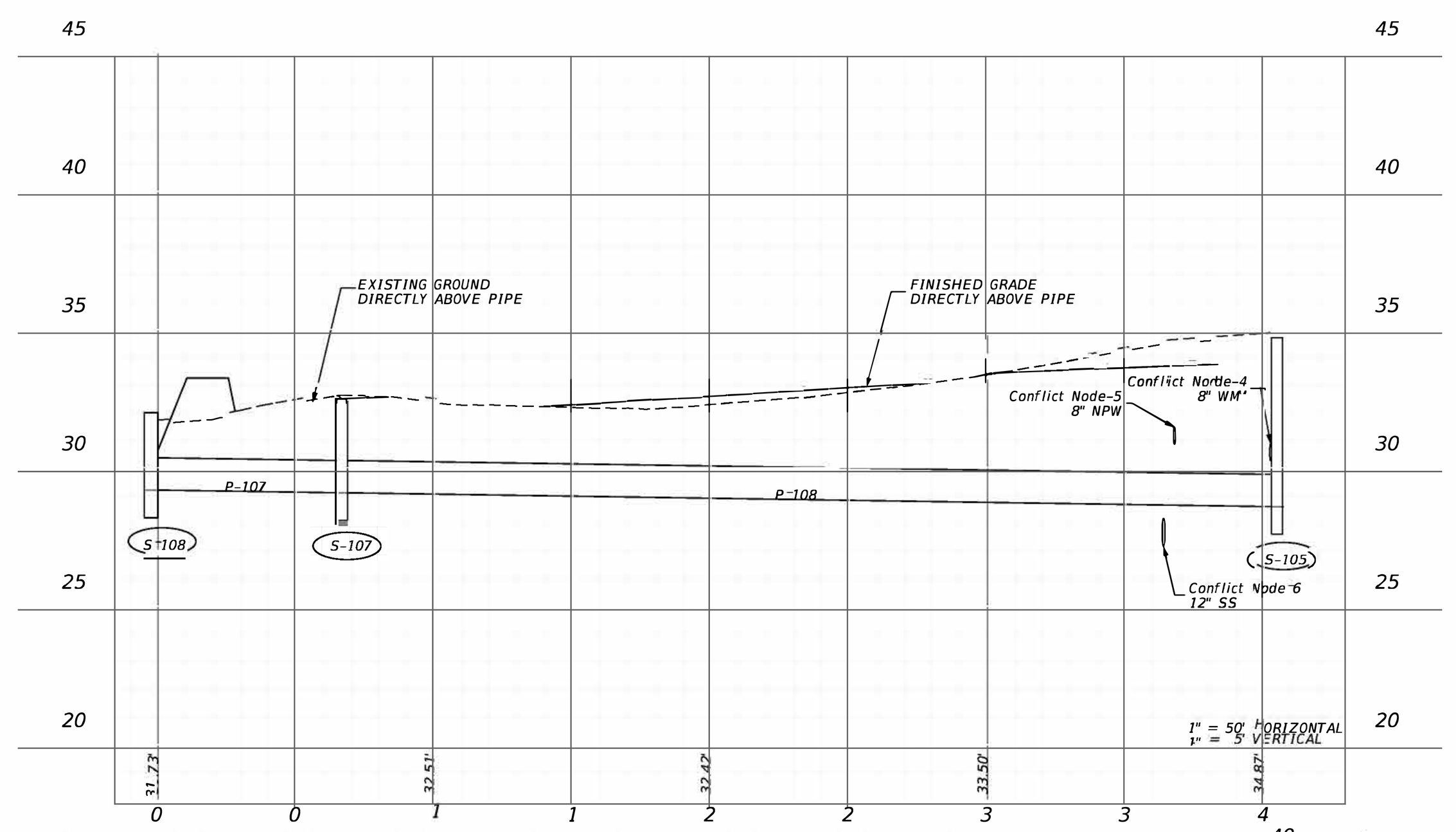
S-105 DETAIL

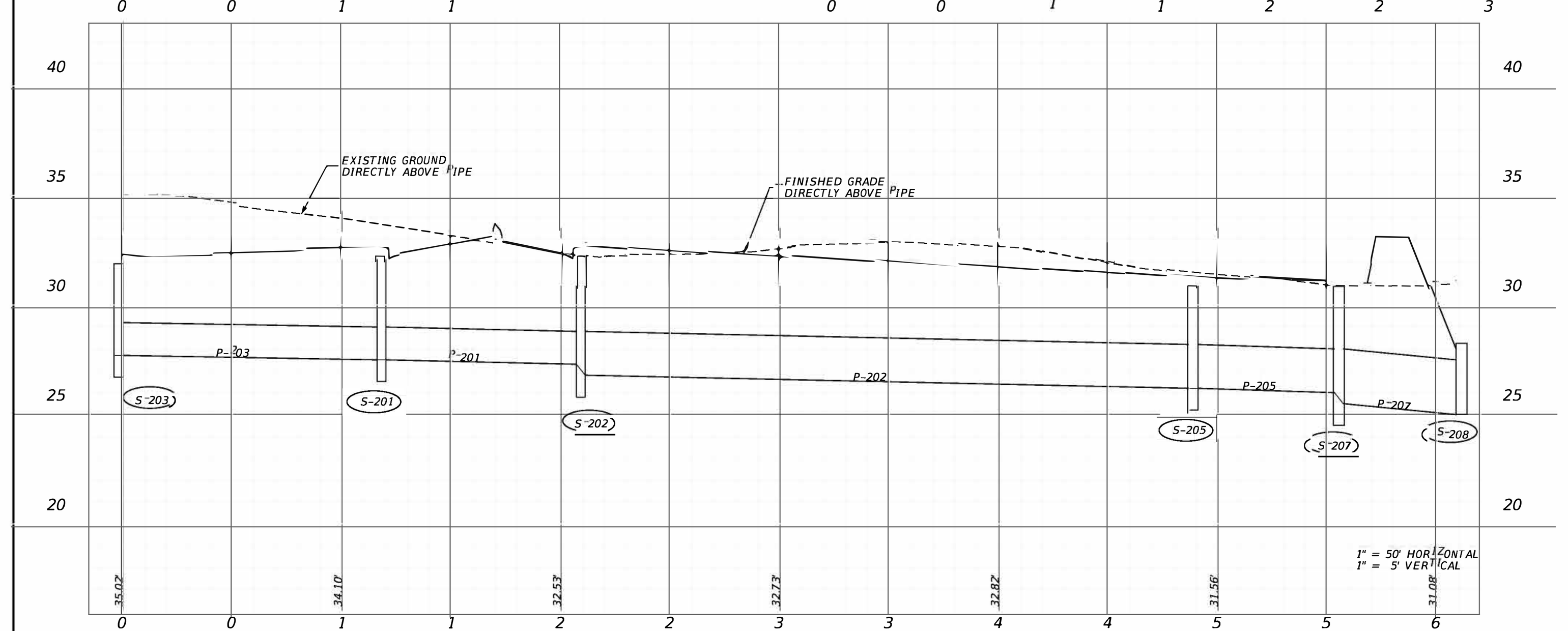


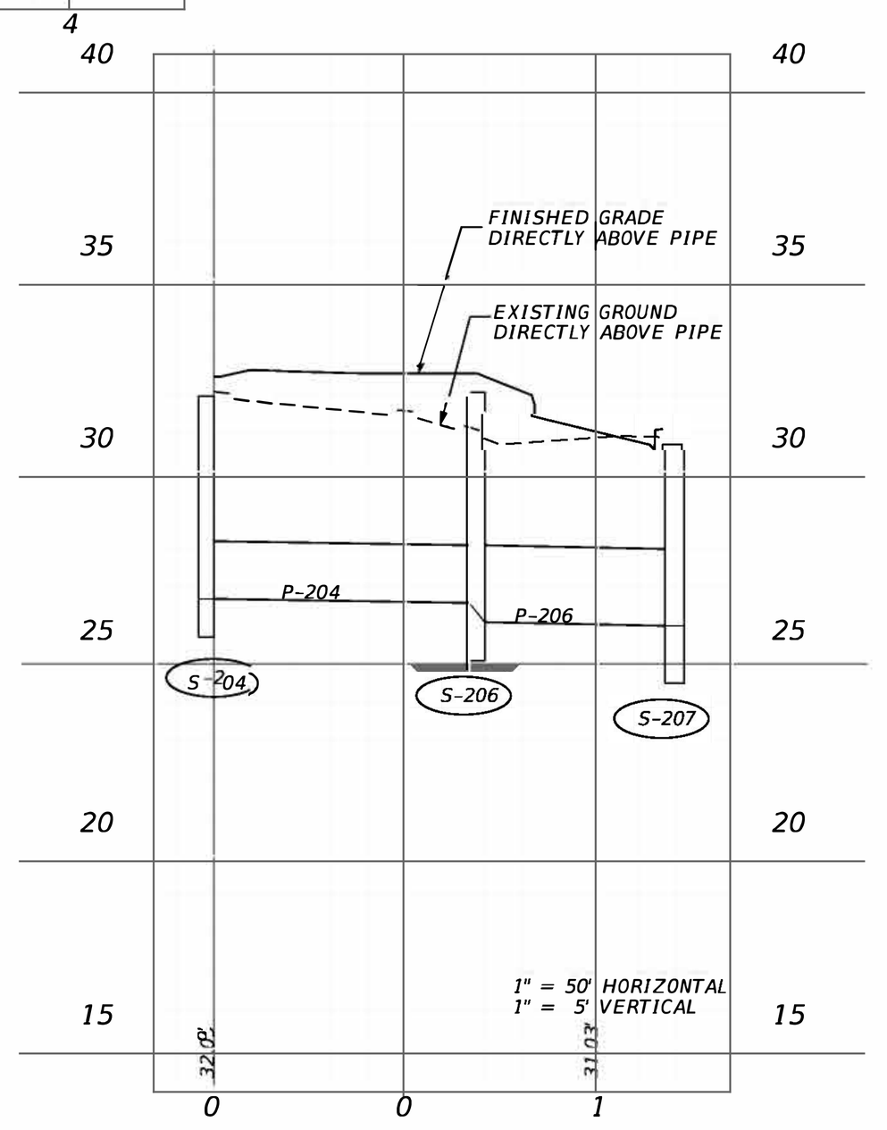
S-108 DETAIL

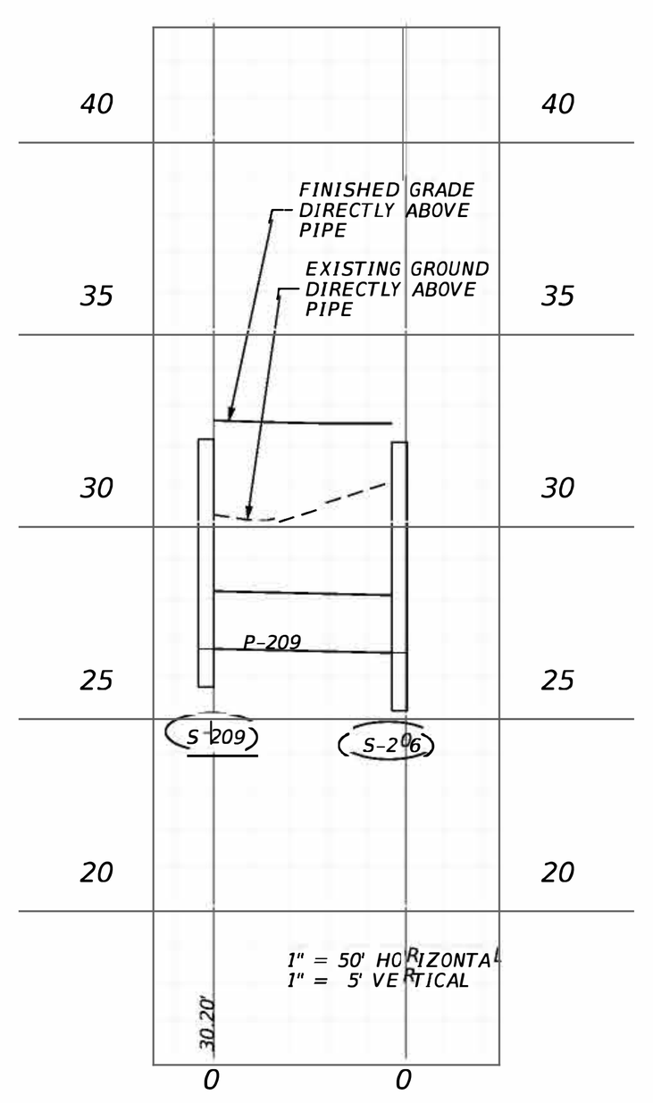
Utility Conflicts								
Label	Conflictee	Conflicter	Baseline Feature	Baseline Station (ft)	Baseline Offset (ft)	X (ft)	Y (ft)	Notes
Conflict Node-1	P-105	8" WM	CL_SR61	700+83.58	57.63	2006796.65	402739.60	SEE S-105 DETAIL
Conflict Node-2	P-102	8" WM	CL_SR61	700+88.60	-92.35	2006717.29	402612.23	
Conflict Node-3	P-103	8" WM	CL_SR61	700+88.60	-65.88	2006730.53	402635.15	
Conflict Node-4	P-107	8" WM	CL_SR61	700+88.55	49.05	2006788.05	402734.65	SEE S-105 DETAIL
Conflict Node-5	P-107	8" NPW	CL_SR61	701+22.58	49.27	2006758.69	402751.86	
Conflict Node-6	P-107	12" SS	CL_SR61	701+26.58	49.28	2006755.23	402753.87	

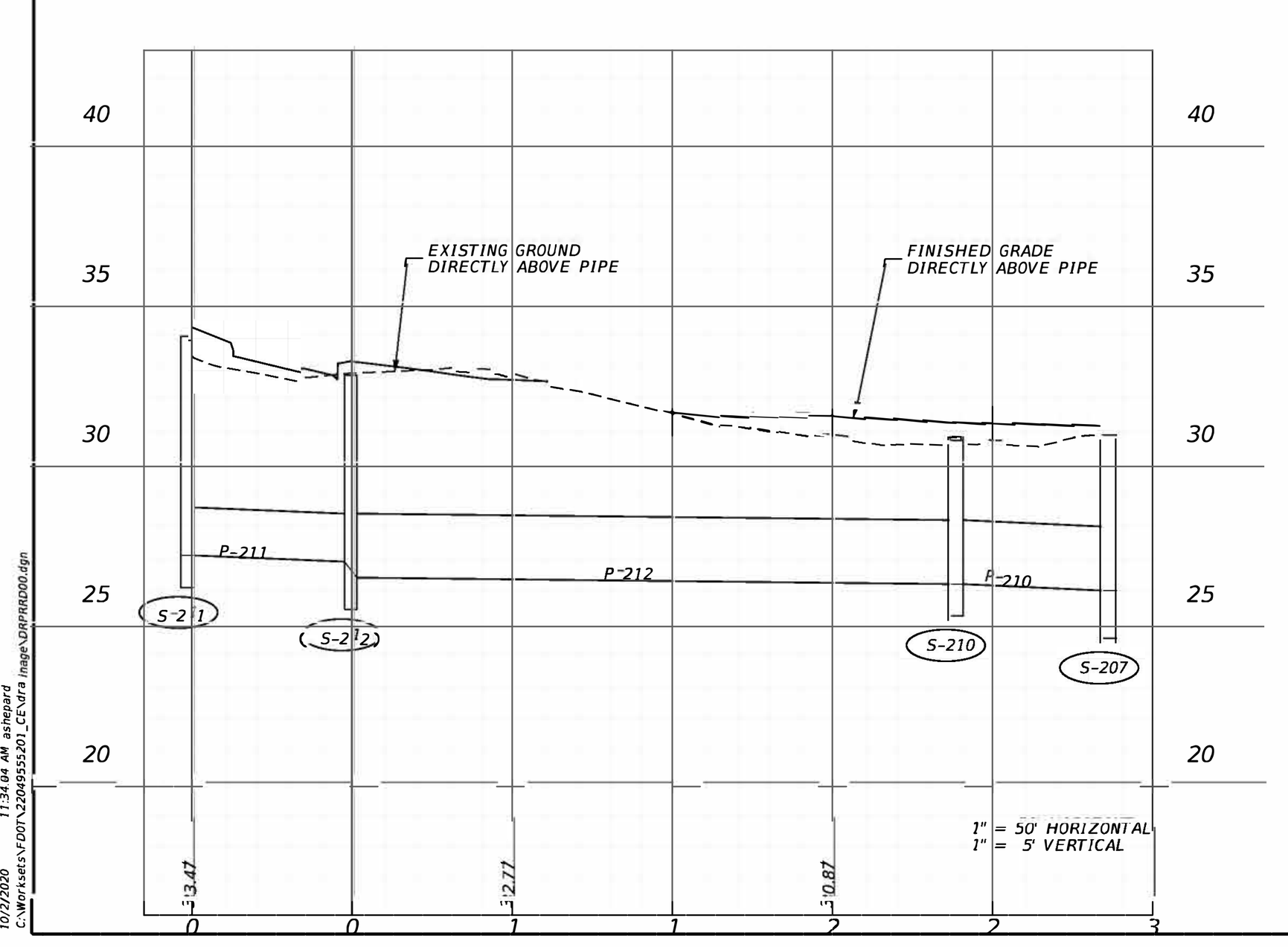












Pipe Data									
Label	Barrels	Length (Construction) (ft)	Size	Start Node (Upper)	Start Invert (ft)	Stop Node (Lower)	Stop Invert (ft)	Optional Pipe
P-103	1	28	24 inch	S-103	29.50	S-104	29.00	Group 1
P-104	1	103	24 inch	S-104	29.00	S-105	28.60	Group 1
P-105	1	15	24 inch	S-105	28.60	S-106	28.50	Group 1
P-107	1	334	14x23 inch	S-107	29.10	S-105	28.60	Group 4
P-108	1	70	14x23 inch	S-108	29.20	S-107	29.10	Group 4
P-201	1	87	18 inch	S-201	27.50	S-202	27.30	Group 1
P-202	1	276	24 inch	S-202	26.80	S-205	26.20	Group 1
P-203	1	116	18 inch	S-203	27.70	S-201	27.50	Group 1
P-204	1	66	18 inch	S-204	26.70	S-206	26.60	Group 1
P-205	1	62	24 inch	S-205	26.20	S-207	26.00	Group 1
P-206	1	47	24 inch	S-206	26.10	S-207	26.00	Group 1
P-207	1	42	30 inch	S-207	25.50	S-208	25.00	Group 2
P-209	1	46	18 inch	S-209	26.70	S-206	26.60	Group 1
P-210	1	43	24 inch	S-210	26.20	S-207	26.00	Group 1
P-211	1	47	18 inch	S-211	27.10	S-212	26.90	Group 3
P-212	1	185	24 inch	S-212	26.40	S-210	26.20	Group 1

Optional Materials Tabulation					
Group Number	Size(s)	Material	Plotted	As Built	Remarks
Group 1	18 - 24	RCP CLASS II	X		
		SRAP, 16 GA.			
		SRSP, 14 GA.			
		SRASP, 16 GA.			
Group 2	30	RCP CLASS II			
		SRAP, 14 GA.			
		SRASP, 14 GA.			
Group 3	18	RCP CLASS I	X		
		HDPE CL II			
		PVC ASTM F-949			
		PP			
Group 4	14x23	ERCP, CLASS II	X		

Structure Data									
Label	Baseline Feature	Baseline Station (ft)	Baseline Offset (ft)	Structure Type	Bottom Dimensions	FDOT Standard Plans (400 index series) Notes	Reference Point Elevation (ft)	Sump Elevation (Structure Invert) (ft)	-Pipe- Label
S-101	US98	32+02	-38.55	CLOSED FLUME			34.76	33.26	
S-103	CL_SR61	701+02	-83.90	DBI TYPE E		TRAVERSABLE INLET WITH SLOT EL 31.42	32.00	28.50	
									(Out) P-103
S-104	CL_SR61	700+80	-54.04	CURB INLET TYPE 2	4' DIA.		34.71	28.00	
									(In) P-103
									(Out) P-104
S-105	CL_SR61	700+79	43.76	CURB INLET TYPE 2	4' DIA.		34.71	27.60	
									(In) P-104
									(In) P-107
									(Out) P-105
S-107	CL_SR61	704+19	51.15	MANHOLE TYPE 8	3.5' DIA.		32.63	28.10	
									(In) P-108
									(Out) P-107
S-108	CL_SR61	704+69	97.32	DBI TYPE D		NON-TRAVERSABLE INLET	32.00	28.20	
									(Out) P-108
S-201	CL_SR61	703+00	-40.00	CURB INLET TYPE 1	4' DIA.		32.40	26.50	
									(In) P-203
									(Out) P-201
S-202	CL_SR61	703+00	40.00	CURB INLET TYPE 1	4' DIA.		32.40	25.80	
									(In) P-201
									(Out) P-202
S-203	CL_SR61	704+20	-40.00	CURB INLET TYPE 1	4' DIA.		31.90	26.70	
									(Out) P-203
S-204	CL_SR61	705+80	-11.00	CURB INLET TYPE 1	4' DIA.		31.98	25.70	
									(Out) P-204
S-205	CL_SR61	705+80	40.00	CURB INLET TYPE 1	4' DIA.		31.00	25.20	
									(In) P-202
									(Out) P-205
S-206	CL_SR61	706+50	-11.00	CURB INLET TYPE 2	4' DIA.		32.07	25.10	
									(In) P-204
									(In) P-209
									(Out) P-206
S-207	CL_SR61	706+50	40.00	CURB INLET TYPE 2	4' x 4'		30.85	24.50	
									(In) P-205
									(In) P-206
									(In) P-210
									(Out) P-207
S-209	CL_SR61	707+00	-11.00	CURB INLET TYPE 1	4' DIA.		32.15	25.70	
									(Out) P-209
S-210	CL_SR61	707+00	40.00	CURB INLET TYPE 1	4' DIA.		30.93	25.20	
									(In) P-212
									(Out) P-210
S-211	CL_SR61	709+00	-11.00	CURB INLET TYPE 1	4' DIA.		33.94	26.10	
									(Out) P-211
S-212	CL_SR61	709+00	40.00	CURB INLET TYPE 1	4' DIA.		32.72	25.40	
									(In) P-211
									(Out) P-212

Endwall and MES Data						
Label	Baseline Feature	Baseline Station (ft)	Baseline Offset (ft)	Structure Type	Elevation (Invert) (ft)	FDOT Standard Plans (400 index series) Notes
S-106	CL_SR61	700+87	69.15	CD MES 1:4	28.50	
S-208	CL_SR61	706+50	102.50	CD MES 1:2	25.00	

Exhibit 916-1

Date: 1/1/21

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004 F.A.C.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION				
ROAD NO.	COUNTY	FINANCIAL PROJECT ID	DRAINAGE STRUCTURES	SHEET NO.
SR 61	WAKULLA	220495-5-52-01		PLAN 1