

Pipeline Inspection Report



T.D. Williamson
Pipeline Performance™

Company Name

Hiland Crude, LLC

Project Name

Dore Loop Launch to Receive

Pipe Size

10"

Inspection Date(s)

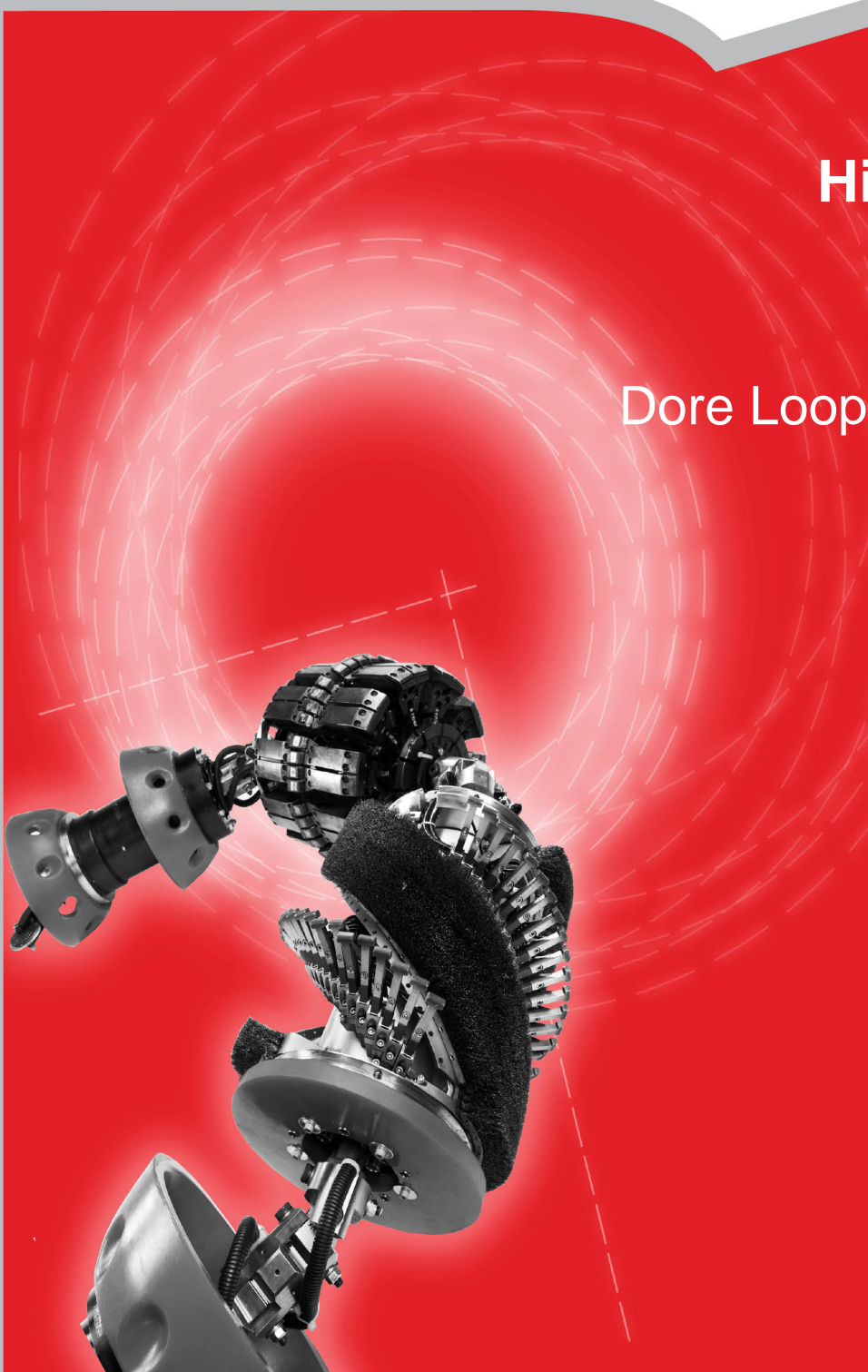
Sep 23, 2013

Report Date(s)

Dec 2, 2013

TDW Regional Office

TDW Services, Inc.





Executive Summary - GMFL Inspection

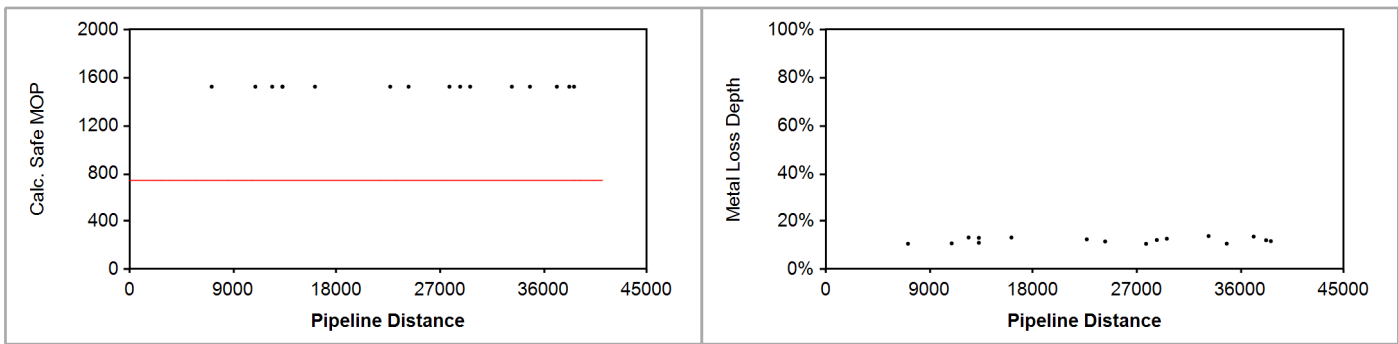
Executive Summary - GMFL Inspection

RUN INFORMATION

<i>Hiland Crude, LLC</i>	<i>Dore Loop Launch to Receive</i>	
<i>Heber Briceno</i>	<i>10" Crude</i>	
	Launcher	Receiver
Location:	Dore Loop Launch	Receive
Date/Time:	9/23/2013 2:13:53 PM	9/23/2013 4:55:20 PM
Stationing:	0+00	410+99
GPS - LAT:	47.92029061	47.92407086
GPS - LONG:	-103.6267702	-103.7836949
Duration of run - Hours: 2.69	Average Velocity: 4.24 ft/sec	Tool Tracking By: Cherokee Pipeline Services
Pipeline Length: 41,118.00 ft	Maximum Velocity: 4.61 ft/sec	
On-site Representative: Jesse Child	Data Analyst: Ben Stehling	
Contact: Heber Briceno		

INSPECTION FINDINGS

Current Established Maximum	Criteria Used: ASME B31G: Modified			
Operating Pressure of Pipeline: 750 psi	Defect Interaction Rule: 1 inch between pits			
Welds Detected: 926	Valves Detected: 2	Fittings Detected: 2	Markers Detected: 9	Gains Detected: 0
Casings Detected: 0	Tees Detected: 3	Flanges Detected: 6	Repairs Detected: 0	Deformations Detected: 1
P' < P*: 0	M/L pits: 16	M/L grouping: 16		
Internal groups: 2	External groups: 14			



* The number of anomalies where P' (calculated safe max. pressure for an anomaly) is less than P (current established maximum pressure of pipeline) - see ASME B31G

INSPECTION DETAILS

A total of 16 metal loss groups (2 Internal/14 External) were detected on the inspection survey, of which the deepest is reported at 14%. Using an established maximum operating pressure of 750 psi, 0 of the metal loss features appear to be pressure reducing.

Inspection data was obtained for the full length (41,118 feet / 7.79 miles) of the survey. The quality of the inspection data is satisfactory for a comprehensive assessment of this pipeline segment.

The inspection tool for this project included TDW XYZ Mapping module consisting of a high resolution Inertial Measurement Unit (IMU). The precision navigation data recorded by the IMU along with survey data supplied for specified control points and AGM locations provides a calculation of X, Y and Z coordinates for all objects and features listed in this report. The reported Latitude and Longitude are in NAD83 datum format. Z coordinates are Orthometric heights reported in feet. The final accuracy of reported coordinates is dependent upon the accuracy of the survey points and distance between these points, as well as uniform tool speed; however, the Survey Data Provided for AGM/Control Points is not at the required Sub-Centimeter accuracy level as specified in the document: XYZ Survey Data Requirements (D1902 Rev D).



Executive Summary - Deformation

RUN INFORMATION

Hiland Crude, LLC
 Heber Briceno

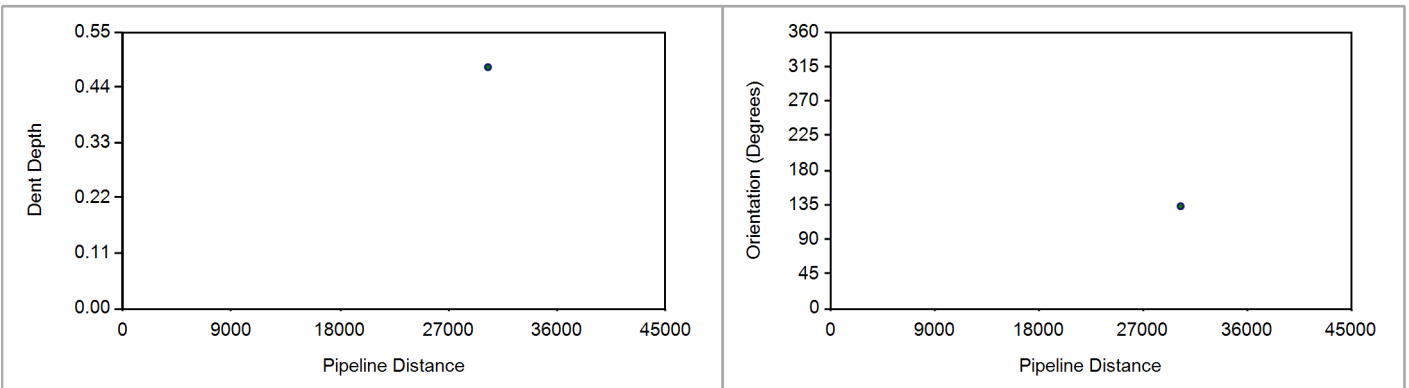
Dore Loop Launch to Receive
 10" Crude

	Launcher	Receiver
Location:	Dore Loop Launch	Receive
Date/Time:	9/22/2013 1:13:28 PM	9/22/2013 4:04:21 PM
Stationing:	0+00	410+99
GPS - LAT:	47.92029061	47.92407086
GPS - LONG:	-103.6267702	-103.7836949

Duration of run - Hours: 2.85 **Average Velocity:** 4.01 ft/sec **Tool Tracking By:** Cherokee Pipeline Services
Pipeline Length: 41,102.00 ft **Maximum Velocity:** 4.35 ft/sec
On-site Representative: Jesse Child **Data Analyst:** Ben Stehling

INSPECTION FINDINGS

Deformations Detected: 1 **Ovalities Detected:** 0 **Expansions Detected:** 0 **Heavy Weld Detected:** 0 **Valves Detected:** 2



INSPECTION DETAILS

Inspection data was obtained for the full length (41,102 feet / 7.78 miles) of the survey. The quality of the inspection data is satisfactory for a comprehensive assessment of this pipeline segment.

A total of 1 deformation (1 dent) was detected on the inspection survey which is reported at 0.48 inch.



Metal Loss - Immediate Prioritized Repairs

ID#	Distance (ft)	Depth	Length	Width	Orientation	PSI (P')	% of Est. psi (P'/P)	Latitude	Longitude	Altitude
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Nothing found in this pipeline inspection meets the criteria for Immediate Repair conditions relating to METAL LOSS.

Metal Loss - Immediate Prioritized Repairs



Metal Loss - 180 Day Prioritized Repairs

ID#	Distance (ft)	Depth	Length	Width	Orientation	PSI (P')	% of Est. psi (P'/P)	Latitude	Longitude	Altitude
-----	---------------	-------	--------	-------	-------------	----------	-------------------------	----------	-----------	----------

Nothing in the inspection meets the criteria for 180 Day Repair conditions relating to METAL LOSS.



Dent - Immediate Prioritized Repairs

ID#	Distance (ft)	Depth (in)	Depth (%)	Orientation	Metal Loss	On a Weld	Ovality	Description
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Nothing found in the pipeline inspection meets the criteria for Immediate Repair conditions relating to DENTS.

Dent - Immediate Prioritized Repairs



Dent - 60 Day Prioritized Repairs

ID#	Distance (ft)	Depth (in)	Depth (%)	Orientation	Metal Loss	On a Weld	Ovality	Description
-----	---------------	------------	-----------	-------------	------------	-----------	---------	-------------

Nothing in the inspection meets of the criteria for 60 Day Repair conditions relating to DENTS.

Dent - 60 Day Prioritized Repairs



Dent - 180 Day Prioritized Repairs

ID#	Distance (ft)	Depth (in)	Depth (%)	Orientation	Metal Loss	On a Weld	Ovality	Description
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Nothing in the inspection meets of the criteria for 180 Day Repair conditions relating to DENTS.

Dent - 180 Day Prioritized Repairs



Metal Loss Summary

DEFINITIONS

This Metal Loss Summary Report provides information regarding indicated anomalies found in this inspection. Anomalies detected during the inspection are sized and assigned a length, width, and depth. The specified formula for determining remaining-strength of the anomaly is then applied to the predicted sizes. The predicted size accuracy is described in the contract specifications.

The Metal Loss Summary Report is a listing of metal loss indications in the pipeline, sorted first by the calculated safe maximum operating pressure (P') ascending, then by depth descending. As an aid in locating these anomalies, the upstream and downstream references are included, as well as distances from the defect to the reference.

ID#	Each location is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Dist.	Given in either feet or meters, based on contractual agreements, this is the absolute distance from launch.
Depth	Predicted depth of the defect as a percentage of nominal wall.
Length	Predicted length of the defect, reported in either inches or millimeters.
Width	Predicted width of the defect, reported in either inches or millimeters.
ID/OD	Determination whether the defect exists on the inside (INT) or outside (EXT) surface of the pipe.
Orientation: Deg / O'Clock	Orientation is reported in degrees and o'clock (0 degrees/12:00 at top of pipe) as viewed looking downstream.
P'	Based on the specified formula for determining remaining-strength, it is the predicted safe maximum allowable pressure for the defect (P').
% Est. Press. (P'/P)	Percent of maximum established pressure, this is calculated by dividing the calculated safe pressure of the defect (P') by the current established maximum operating pressure of the pipeline (P). For TDW reporting, P is either established MOP provided by the customer or the calculated pressure rating for the pipe (P). Percentages less than 100% are considered pressure reducing.
Aboveground References	The name of the closest upstream and downstream references, usually either an AGM or a Valve.
Distance from Defect	The distance to the upstream and downstream reference listed in the previous column. Used for locating defects in the field.

See Appendix C for Dig Sheet Preparation



Metal Loss Summary

Metal Loss Summary

ID#	Dist (ft)	Depth	Length	Width	ID/OD	Orientation Deg O'clock	P'	% Est. Press. (P'/P)	Above-Ground References	Distance from Defect	
40000011	33,241.8	13.9%	0.64	0.66	EXT	155	5:00	1525.5	100.0	U/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	5537.91
										D/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	197.65
40000013	37,159.2	13.7%	1.66	1.68	INT	33	1:00	1525.5	100.0	U/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	3719.76
										D/S: AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	2096.13
40000002	12,392.0	13.3%	1.24	2.06	INT	13	12:15	1525.5	100.0	U/S: AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	1761.20
										D/S: AGM 030, Sta. 159+98, ROW -- Han #8456	3610.85
40000005	16,112.5	13.3%	0.95	0.79	EXT	233	7:45	1525.5	100.0	U/S: AGM 030, Sta. 159+98, ROW -- Han #8456	109.64
										D/S: AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	5669.31
40000004	13,285.4	13.2%	0.95	1.19	EXT	149	4:45	1525.5	100.0	U/S: AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	2654.60
										D/S: AGM 030, Sta. 159+98, ROW -- Han #8456	2717.45
40000010	29,616.9	12.8%	0.60	1.08	EXT	96	3:00	1525.5	100.0	U/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	1913.05
										D/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	3822.51
40000006	22,660.8	12.5%	0.63	0.50	EXT	166	5:30	1525.5	100.0	U/S: AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	879.00
										D/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	5043.10
40000009	28,744.1	12.3%	0.63	1.54	EXT	33	1:00	1525.5	100.0	U/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	1040.20
										D/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	4695.35
40000014	38,238.4	12.2%	1.01	0.91	EXT	262	8:30	1525.5	100.0	U/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	4798.94
										D/S: AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	1016.94
40000015	38,651.8	11.8%	0.82	0.92	EXT	28	12:45	1525.5	100.0	U/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	5212.34
										D/S: AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	603.54



Metal Loss Summary

Metal Loss Summary

ID#	Dist (ft)	Depth	Length	Width	ID/OD	Orientation Deg O'clock	P'	% Est. Press. (P'/P)	Above-Ground References	Distance from Defect	
40000007	24,256.2	11.6%	1.48	2.28	EXT	186	6:00	1525.5	100.0	U/S: AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	2474.35
										D/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	3447.75
40000003	13,285.2	11.1%	1.39	0.55	EXT	175	5:45	1525.5	100.0	U/S: AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	2654.42
										D/S: AGM 030, Sta. 159+98, ROW -- Han #8456	2717.62
40000001	10,926.1	10.8%	0.64	0.46	EXT	343	11:15	1525.5	100.0	U/S: AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	295.34
										D/S: AGM 030, Sta. 159+98, ROW -- Han #8456	5076.70
40000012	34,817.8	10.7%	0.95	0.56	EXT	287	9:30	1525.5	100.0	U/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	1378.38
										D/S: AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	4437.51
40000000	7,128.5	10.7%	0.75	0.95	EXT	299	9:45	1525.5	100.0	U/S: AGM 010, Sta. 52+24, Hwy 85 -- Han #8456	1871.89
										D/S: AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	3502.25
40000008	27,815.1	10.7%	1.12	0.91	EXT	70	2:15	1525.5	100.0	U/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	111.22
										D/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	5624.33

This report shows a maximum of 100 metal loss groups.

Type	Number
Metal Loss	16



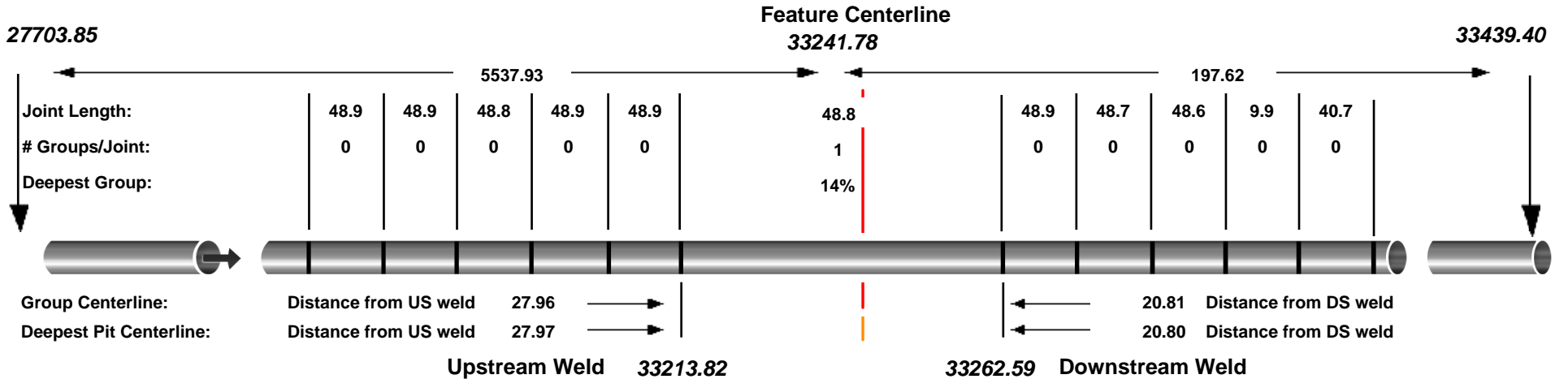
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456

DOWNSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

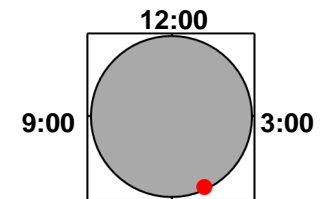


Feature Information

ID:	40000011	Distance from Launcher:	33241.78	<u>Feature Description</u>
Time:	13658.87	Orientation on Pipe Wall:	5:00	Metal Loss - EXTERNAL
Latitude:	47.92773700	Longitude:	-103.75364206	Wall Thickness: 0.219
				Altitude: 2269.998

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: 14%
 Length: 0.644
 Width: 0.657
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
2894.19	Bend left - 36 deg., 3D	2093.19	Bend right - 24 deg., 1.5D
2956.42	Bend left - 18 deg., 81D	7692.87	Bend left - 82 deg., 3D
7023.32	Bend left - 34 deg., 3D	7850.12	Bend up - 45 deg., 3D
7944.29	Bend right - 24 deg., 1.5D	7868.96	Bend down - 45 deg., 3D
8371.73	Bend left - 42 deg., 3D	7871.31	Flange

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in
 2. All numbers in italics are Distance from Launch



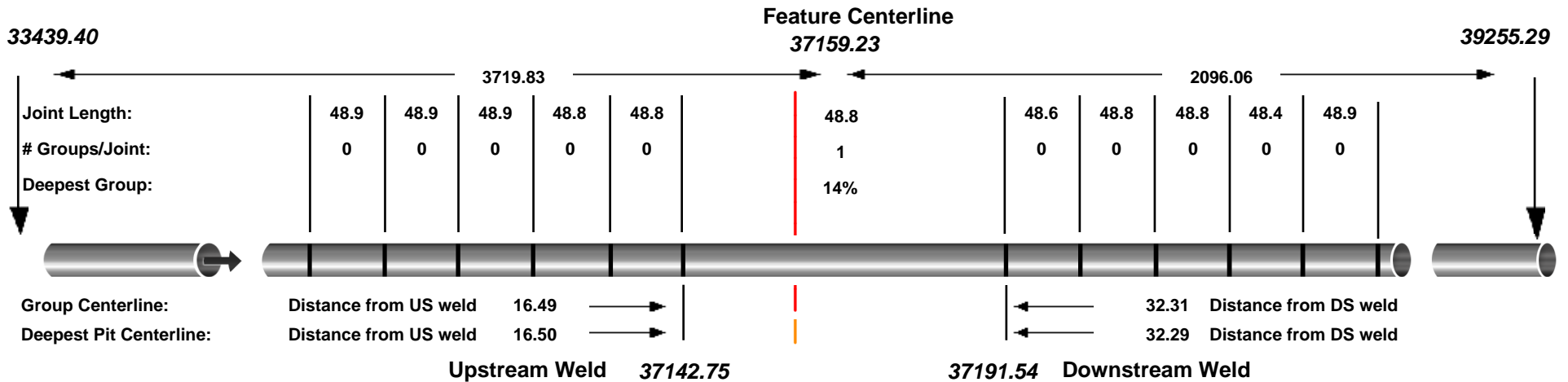
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

DOWNSTREAM REFERENCE

AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456

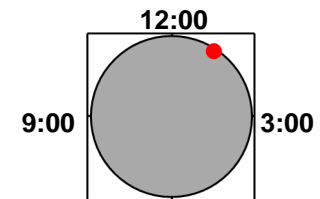


Feature Information

ID:	40000013	Distance from Launcher:	37159.23	<u>Feature Description</u>
Time:	14589.67	Orientation on Pipe Wall:	1:00	Metal Loss - INTERNAL
Latitude:	47.92464806	Longitude:	-103.76824651	Wall Thickness: 0.219
				Altitude: 2241.588

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: 14%
 Length: 1.662
 Width: 1.680
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
1824.26	Bend right - 24 deg., 1.5D	3775.42	Bend left - 82 deg., 3D
6811.64	Bend left - 36 deg., 3D	3932.67	Bend up - 45 deg., 3D
6873.87	Bend left - 18 deg., 81D	3951.51	Bend down - 45 deg., 3D
10940.77	Bend left - 34 deg., 3D	3953.86	Flange
11861.74	Bend right - 24 deg., 1.5D	3954.60	Tee at 90 deg.

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



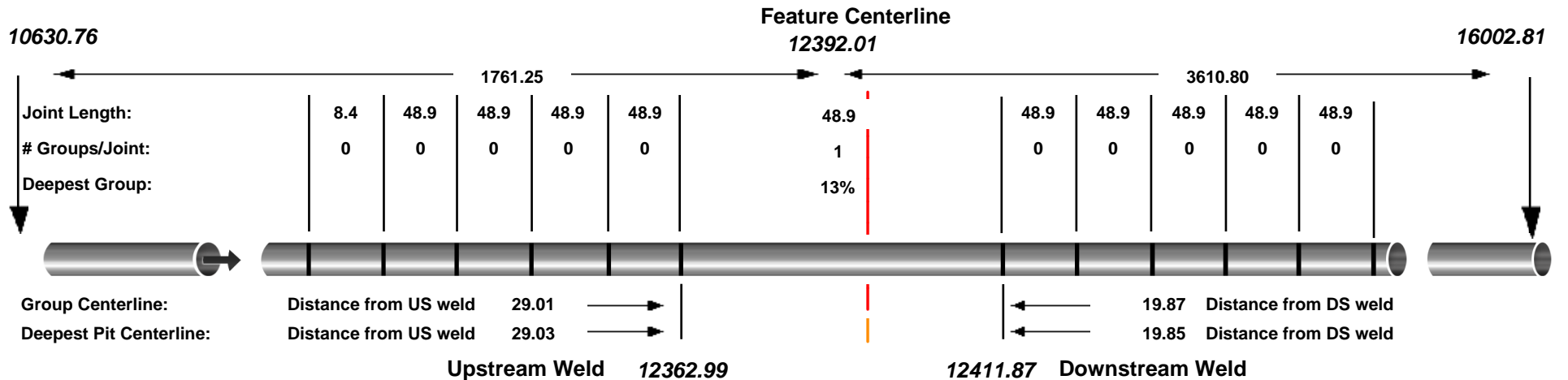
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802

DOWNSTREAM REFERENCE

AGM 030, Sta. 159+98, ROW -- Han #8456

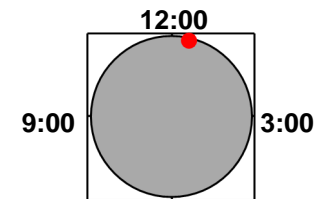


Feature Information

ID:	40000002	Distance from Launcher:	12392.01	<u>Feature Description</u>
Time:	8738.26	Orientation on Pipe Wall:	12:15	Metal Loss - INTERNAL
Latitude:	47.91634184	Longitude:	-103.67545519	Wall Thickness: 0.219
				Altitude: 2027.380

Feature Orientation

as looking downstream



6:00
 12:00 is top of pipe

GROUP

Depth: 13%
 Length: 1.241
 Width: 2.058
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
1785.59	Tee on top of pipe	3570.57	Bend right - 12 deg., 65D
4053.20	Bend right - 34 deg., 3D	12478.04	Bend left - 42 deg., 3D
5570.08	Bend left - 26 deg., 1.5D	12905.48	Bend right - 24 deg., 1.5D
8695.76	Bend left - 30 deg., 3D	13826.45	Bend left - 34 deg., 3D
8849.07	Bend right - 20 deg., 3D	17893.35	Bend left - 18 deg., 81D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



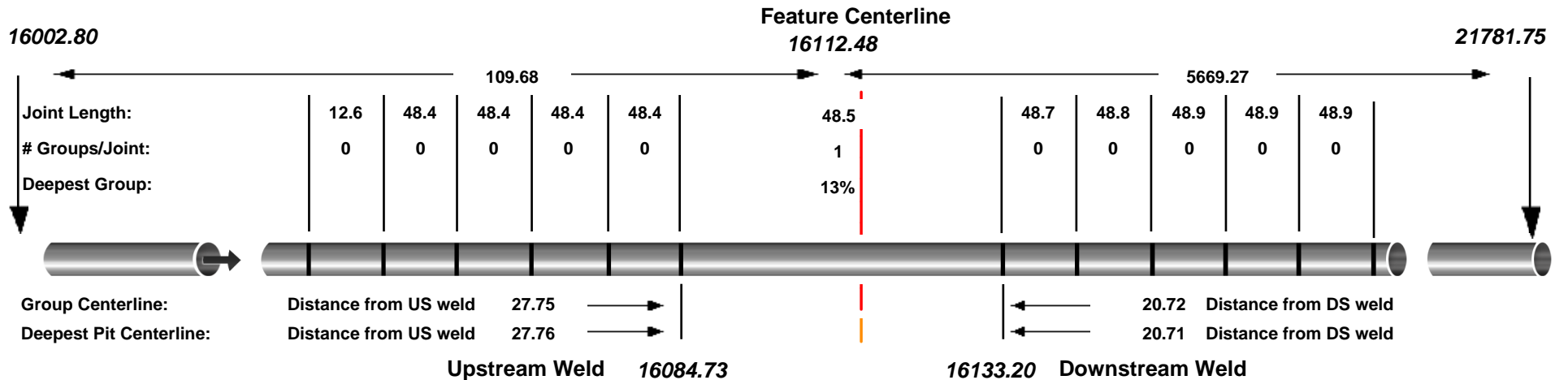
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 030, Sta. 159+98, ROW -- Han #8456

DOWNSTREAM REFERENCE

AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836

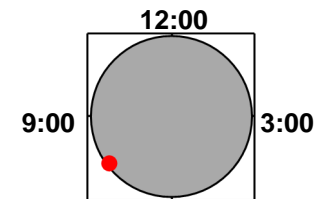


Feature Information

ID:	40000005	Distance from Launcher:	16112.48	<u>Feature Description</u>
Time:	9613.34	Orientation on Pipe Wall:	7:45	Metal Loss - EXTERNAL
Latitude:	47.91653253	Longitude:	-103.69062361	Wall Thickness: 0.219
				Altitude: 2054.784

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: 13%
 Length: 0.951
 Width: 0.790
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
149.90	Bend right - 12 deg., 65D	8757.57	Bend left - 42 deg., 3D
5506.06	Tee on top of pipe	9185.01	Bend right - 24 deg., 1.5D
7773.67	Bend right - 34 deg., 3D	10105.98	Bend left - 34 deg., 3D
9290.55	Bend left - 26 deg., 1.5D	14172.88	Bend left - 18 deg., 81D
12416.23	Bend left - 30 deg., 3D	14235.11	Bend left - 36 deg., 3D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



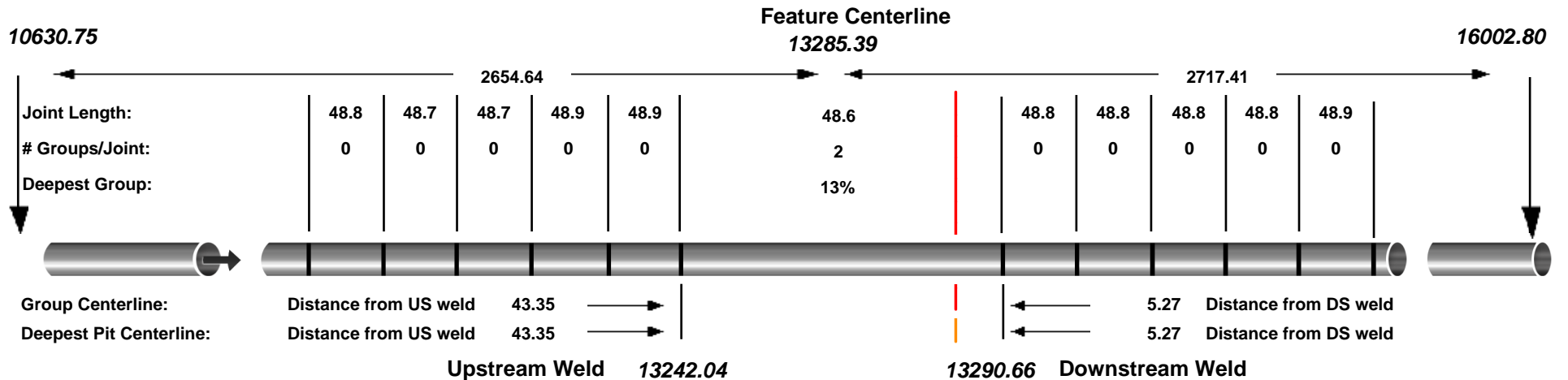
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802

DOWNSTREAM REFERENCE

AGM 030, Sta. 159+98, ROW -- Han #8456

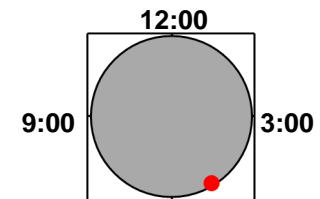


Feature Information

ID:	40000004	Distance from Launcher:	13285.39	<u>Feature Description</u>
Time:	8948.30	Orientation on Pipe Wall:	4:45	Metal Loss - EXTERNAL
Latitude:	47.91633944	Longitude:	-103.67911448	Wall Thickness: 0.219
				Altitude: 2035.431

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: 13%
 Length: 0.946
 Width: 1.191
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
2678.97	Tee on top of pipe	2677.19	Bend right - 12 deg., 65D
4946.58	Bend right - 34 deg., 3D	11584.66	Bend left - 42 deg., 3D
6463.46	Bend left - 26 deg., 1.5D	12012.10	Bend right - 24 deg., 1.5D
9589.14	Bend left - 30 deg., 3D	12933.07	Bend left - 34 deg., 3D
9742.45	Bend right - 20 deg., 3D	16999.97	Bend left - 18 deg., 81D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



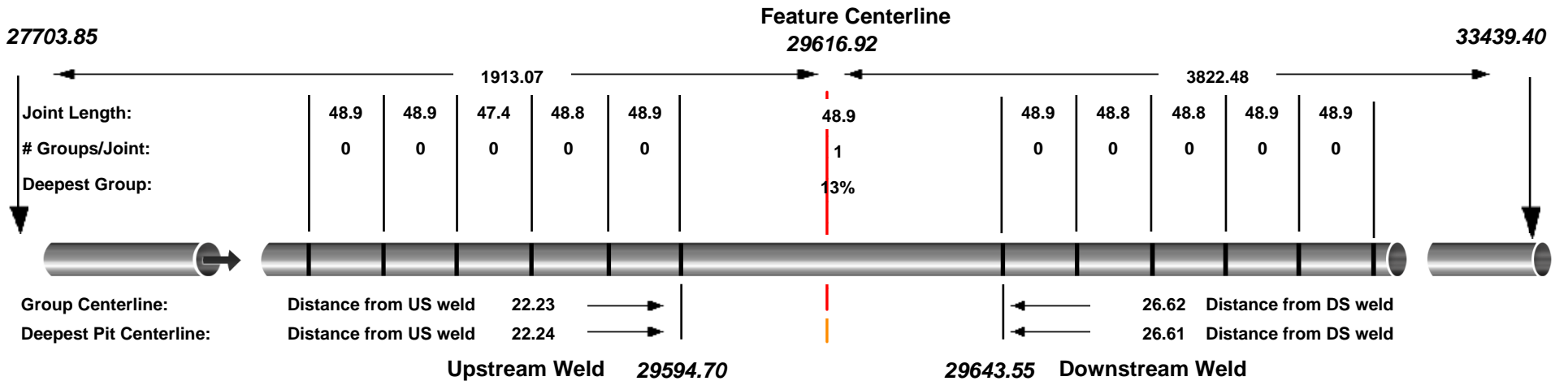
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456

DOWNSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

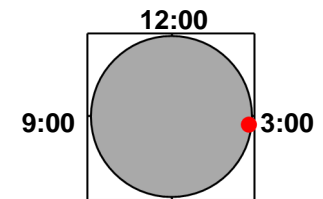


Feature Information

ID:	40000010	Distance from Launcher: 29616.92	<u>Feature Description</u>
Time:	12793.91	Orientation on Pipe Wall: 3:00	Metal Loss - EXTERNAL
Latitude:	47.93066282	Longitude: -103.74072622	Wall Thickness: 0.219
			Altitude: 2245.791

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: **13%**
 Length: **0.595**
 Width: **1.076**
 ERF: **0.492**

Safe Operating Pressure: **1525 psi**

Upstream Locations		Downstream Locations	
3398.46	Bend left - 34 deg., 3D	668.44	Bend left - 18 deg., 81D
4319.43	Bend right - 24 deg., 1.5D	730.67	Bend left - 36 deg., 3D
4746.87	Bend left - 42 deg., 3D	5718.05	Bend right - 24 deg., 1.5D
13654.34	Bend right - 12 deg., 65D	11317.73	Bend left - 82 deg., 3D
19010.50	Tee on top of pipe	11474.98	Bend up - 45 deg., 3D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



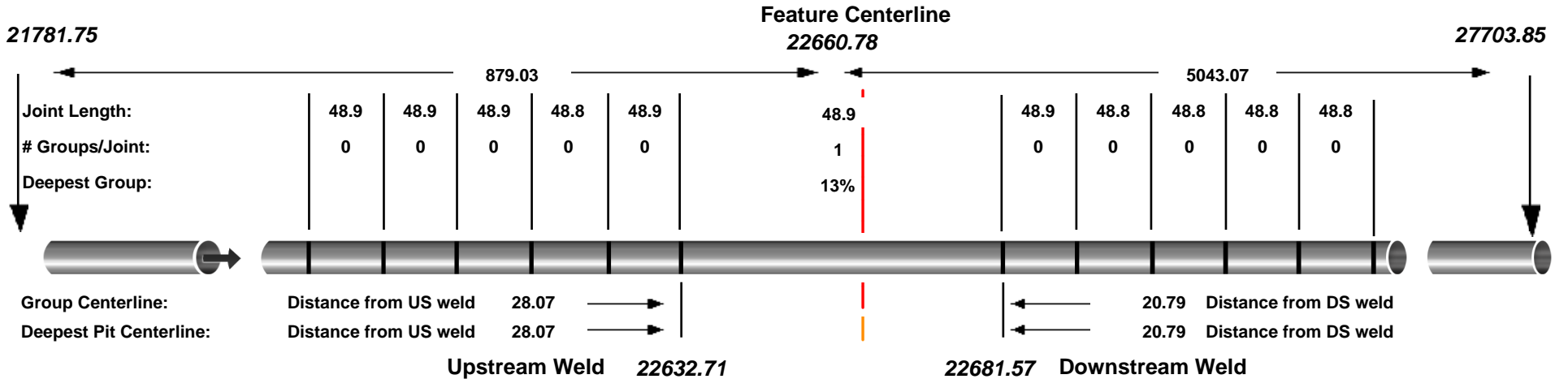
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836

DOWNSTREAM REFERENCE

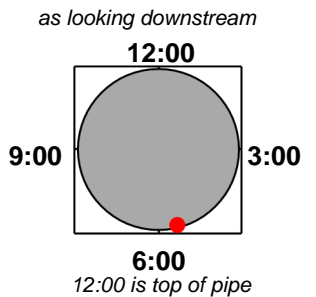
AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456



Feature Information

ID:	40000006	Distance from Launcher:	22660.78	<u>Feature Description</u>
Time:	11155.20	Orientation on Pipe Wall:	5:30	Metal Loss - EXTERNAL
Latitude:	47.92265528	Longitude:	-103.71569758	Wall Thickness: 0.219
				Altitude: 2108.083

Feature Orientation



GROUP

Depth: 13%
 Length: 0.632
 Width: 0.495
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
6698.20	Bend right - 12 deg., 65D	2209.27	Bend left - 42 deg., 3D
12054.36	Tee on top of pipe	2636.71	Bend right - 24 deg., 1.5D
14321.97	Bend right - 34 deg., 3D	3557.68	Bend left - 34 deg., 3D
15838.85	Bend left - 26 deg., 1.5D	7624.58	Bend left - 18 deg., 81D
18964.53	Bend left - 30 deg., 3D	7686.81	Bend left - 36 deg., 3D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in 2. All numbers in italics are Distance from Launch



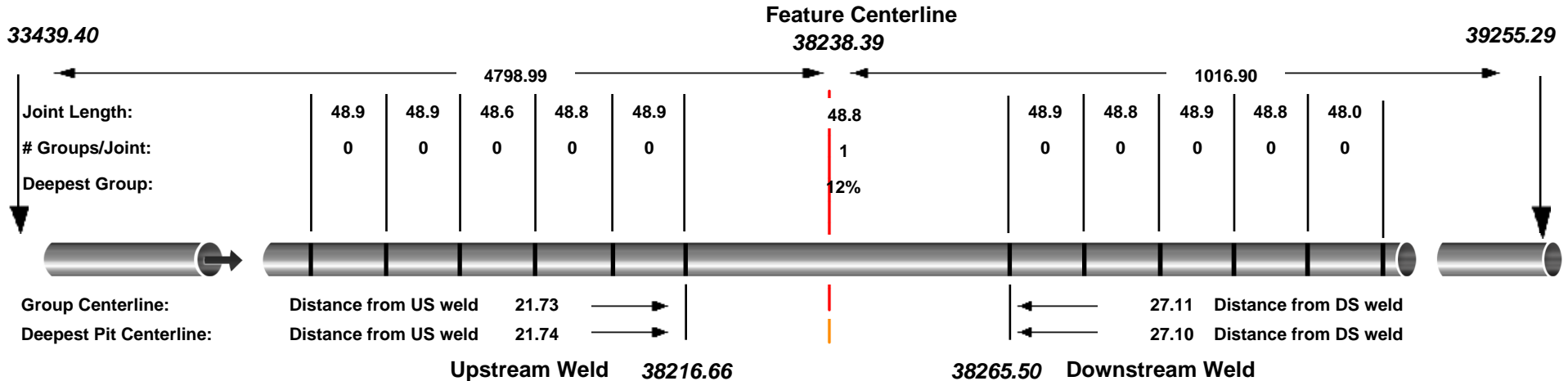
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

DOWNSTREAM REFERENCE

AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456

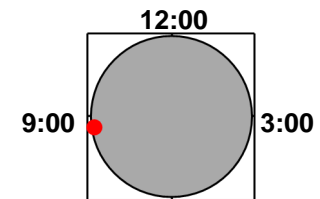


Feature Information

ID:	40000014	Distance from Launcher:	38238.39	<u>Feature Description</u>	
Time:	14842.54	Orientation on Pipe Wall:	8:30	Metal Loss - EXTERNAL	
		Wall Thickness:	0.219		
Latitude:	47.92467175	Longitude:	-103.77266250	Altitude:	2262.784

Feature Orientation

as looking downstream



12:00 is top of pipe

GROUP

Depth: 12%
 Length: 1.006
 Width: 0.908
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
2903.42	Bend right - 24 deg., 1.5D	2696.26	Bend left - 82 deg., 3D
7890.80	Bend left - 36 deg., 3D	2853.51	Bend up - 45 deg., 3D
7953.03	Bend left - 18 deg., 81D	2872.35	Bend down - 45 deg., 3D
12019.93	Bend left - 34 deg., 3D	2874.70	Flange
12940.90	Bend right - 24 deg., 1.5D	2875.44	Tee at 90 deg.

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in 2. All numbers in italics are Distance from Launch



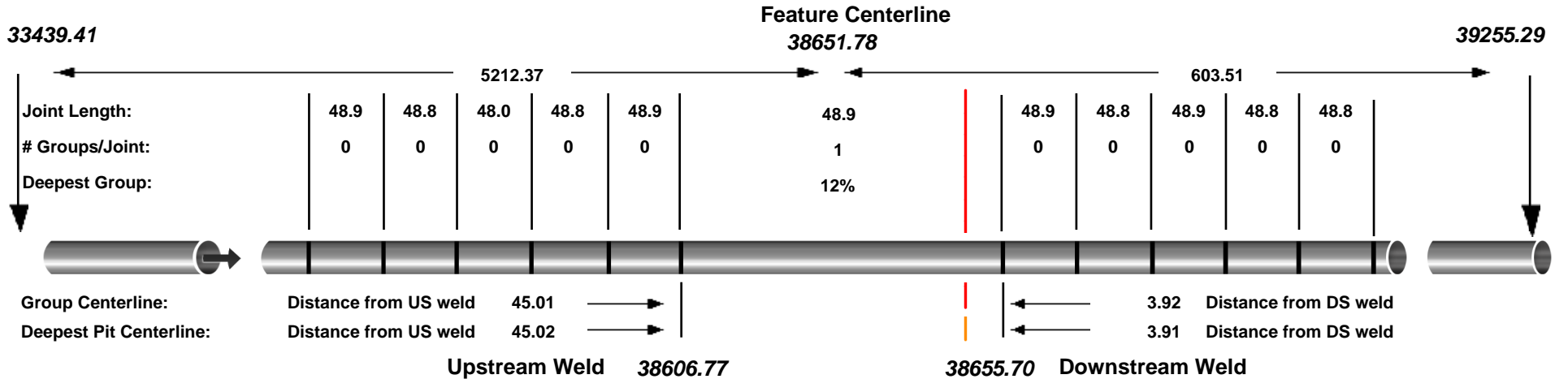
GROUP - Dig Site Information Report

UPSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

DOWNSTREAM REFERENCE

AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456

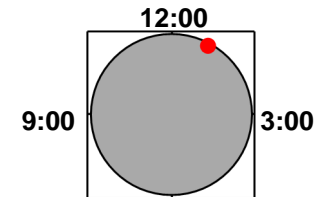


Feature Information

ID:	40000015	Distance from Launcher:	38651.78	Feature Description
Time:	14940.44	Orientation on Pipe Wall:	12:45	Metal Loss - EXTERNAL
Latitude:	47.92468140	Longitude:	-103.77435506	Wall Thickness: 0.219
				Altitude: 2258.466

Feature Orientation

as looking downstream



6:00
12:00 is top of pipe

GROUP

Depth: 12%
 Length: 0.819
 Width: 0.921
 ERF: 0.492

Safe Operating Pressure: 1525 psi

Upstream Locations		Downstream Locations	
3316.81	Bend right - 24 deg., 1.5D	2282.87	Bend left - 82 deg., 3D
8304.19	Bend left - 36 deg., 3D	2440.12	Bend up - 45 deg., 3D
8366.42	Bend left - 18 deg., 81D	2458.96	Bend down - 45 deg., 3D
12433.32	Bend left - 34 deg., 3D	2461.31	Flange
13354.29	Bend right - 24 deg., 1.5D	2462.05	Tee at 90 deg.

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



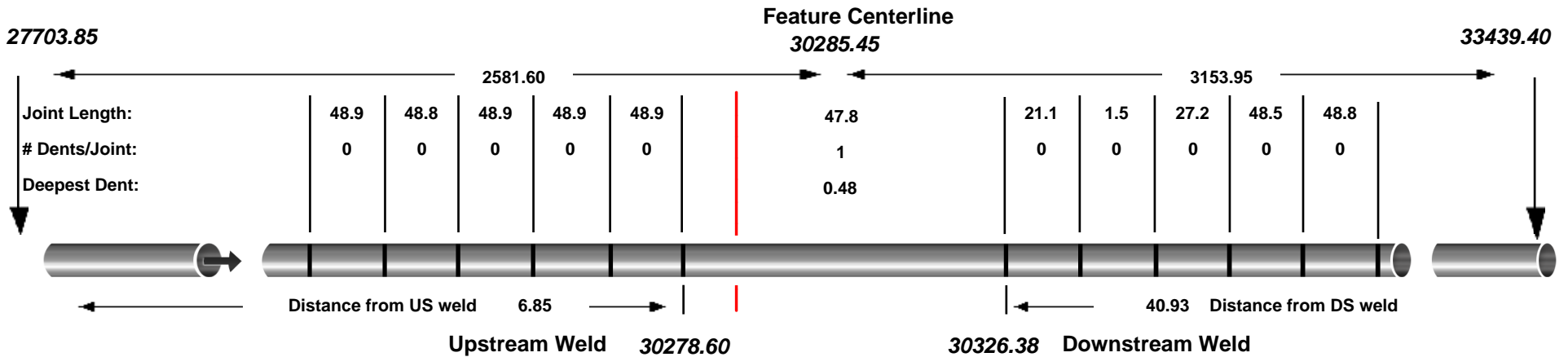
DENT - Dig Site Information Report

UPSTREAM REFERENCE

AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456

DOWNSTREAM REFERENCE

AGM 060, Sta. 334+75, CR 16 -- Han #8836

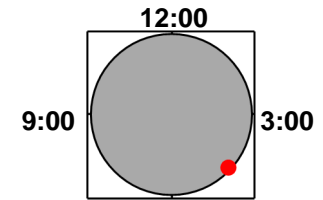


Feature Information

ID:	14000000	Distance from Launcher:	30285.45	<u>Feature Description</u>
Time:	12950.95	Orientation on Pipe Wall:	4:15	DENT
Latitude:	47.93155600	Longitude:	-103.74312159	Wall Thickness: 0.219
				Altitude: 2234.129

Feature Orientation

as looking downstream



6:00
 12:00 is top of pipe

DENT
 Depth: **0.48**

Upstream Locations

0.09	Bend left - 18 deg., 81D
4066.99	Bend left - 34 deg., 3D
4987.96	Bend right - 24 deg., 1.5D
5415.40	Bend left - 42 deg., 3D
14322.87	Bend right - 12 deg., 65D

Downstream Locations

62.14	Bend left - 36 deg., 3D
5049.52	Bend right - 24 deg., 1.5D
10649.20	Bend left - 82 deg., 3D
10806.45	Bend up - 45 deg., 3D
10825.29	Bend down - 45 deg., 3D

(relative distance from Feature Centerline)

1. Measurements on this sheet are in ft / in

2. All numbers in italics are Distance from Launch



Charts

CHARTS

The Pipeline Summary report provides an overview of the pipeline condition.

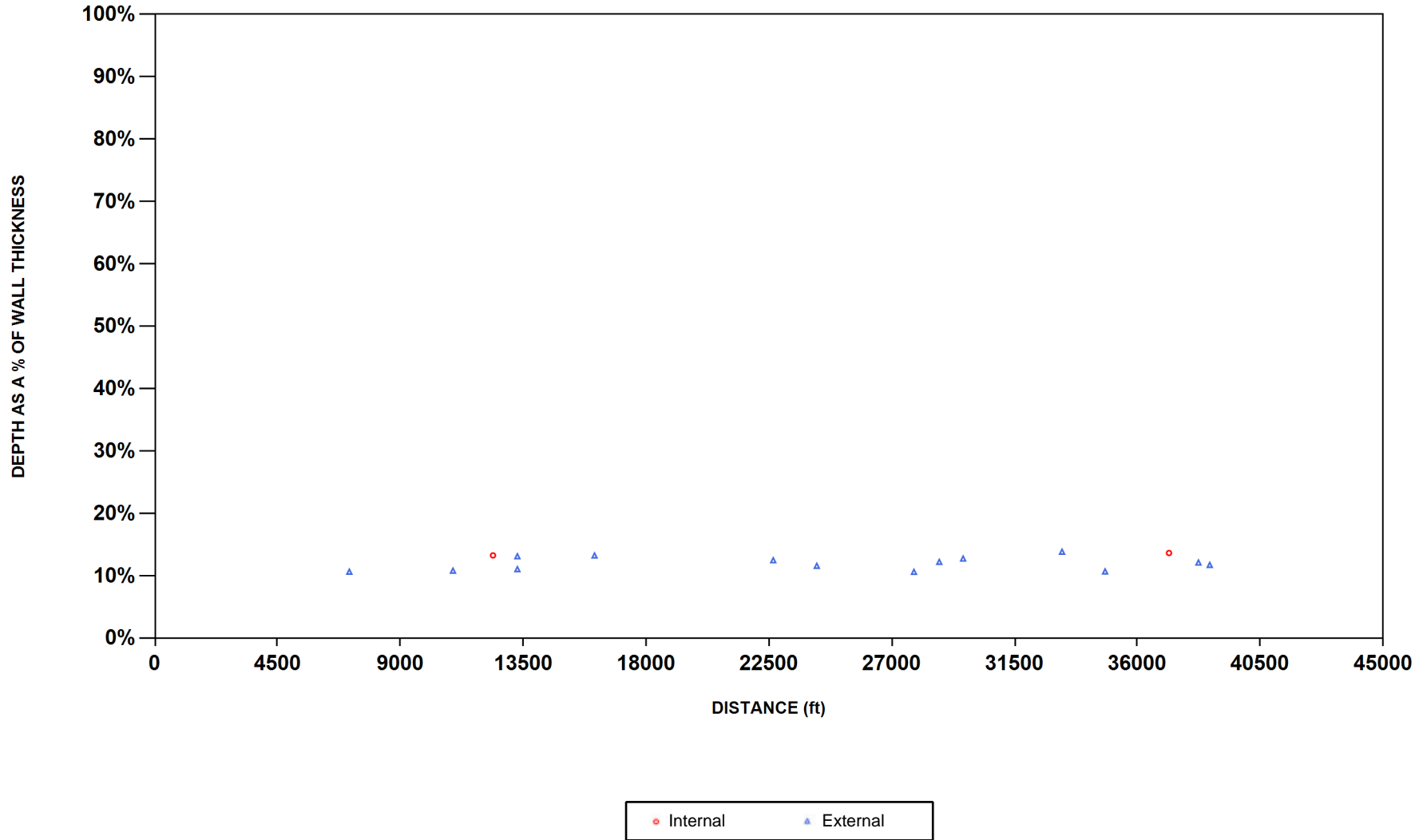
The following charts are utilized in this report:

Metal Loss Depth	This chart highlights the predicted depths of defects as a percentage of wall thickness compared to distance. Areas of concentrated metal loss are easily detected as defects group.
Metal Loss Orientation	The distance from launch is plotted against the orientation of the defect. Orientation is based on 360° in a circle, with 0° or 360° marking the top of the pipe (180° the bottom). Displaying the orientation of defects around the circumference of the pipeline may aid in determining the type of corrosion mechanism present. For example, the majority of defects along the bottom of the pipe might indicate internal channel corrosion.
Metal Loss - Calculated Safe Max. Operating Pressure	The calculated safe maximum operating pressure of each defect is plotted compared to distance.
Velocity - MFL	Displays the speed of the tool relative to distance during the inspection. The specified contractual velocity of the inspection tool is 10 feet per second. If the tool exceeds this speed, the data collected by the tool may be degraded.
Defect Depth Histogram	Displays the total number of defects (pressure reducing groups/defects and non-pressure reducing groups /defects (where $P' < P$)) by predicted depth of the defect as a percentage of nominal wall.
Dent Depth	This chart highlights the predicted depths of deformations in inches or mm compared to distance.
Dent Orientation	The distance from launch is plotted against the orientation of the deformation indications. Orientation is based on 360° in a circle, with 0° or 360° marking the top of the pipe (180° the bottom).
Velocity - DEF	Displays the speed of the tool relative to distance during the inspection. The specified contractual velocity of the inspection tool is 10 feet per second. If the tool exceeds this speed, the data collected by the tool may be degraded.



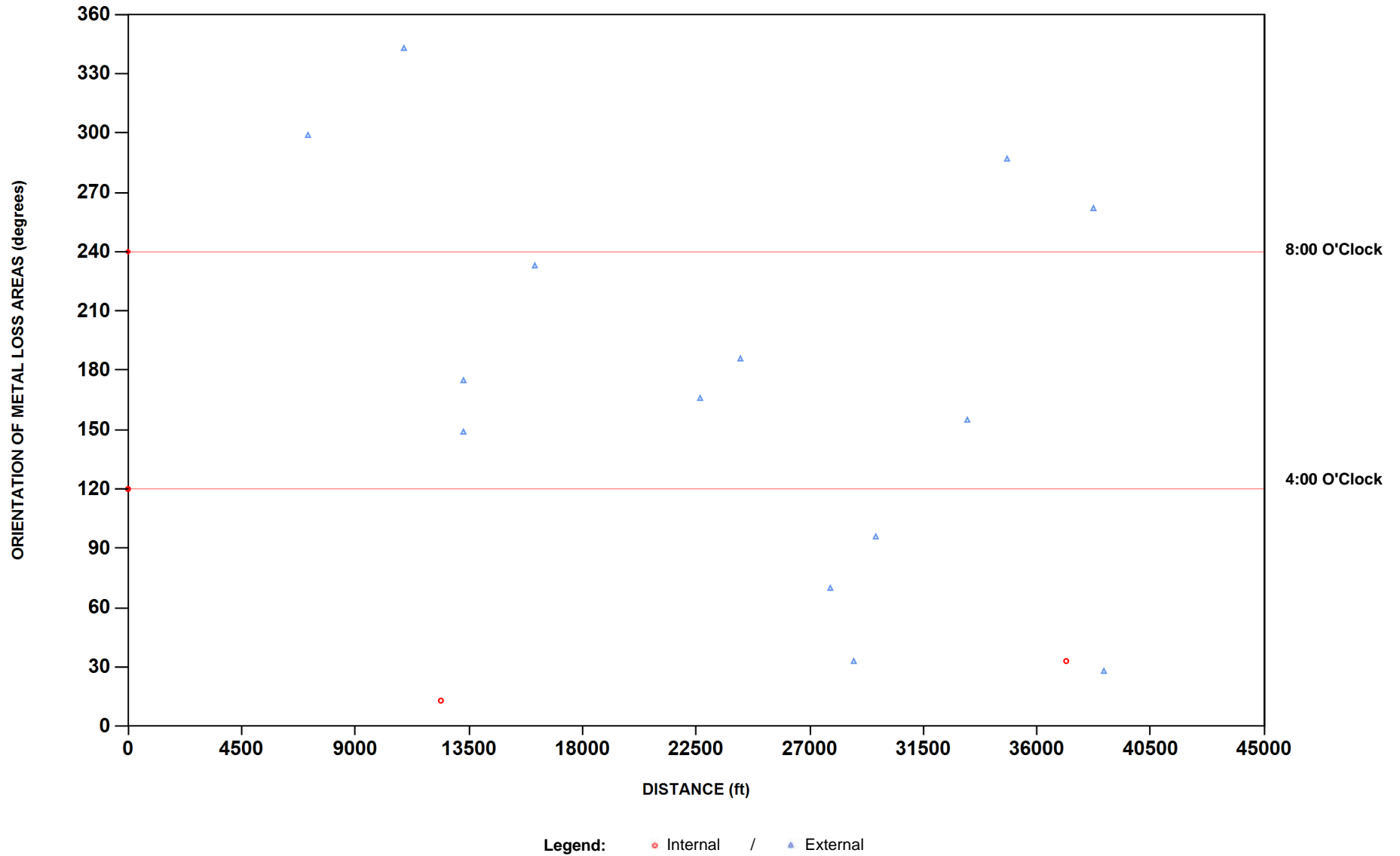
Metal Loss Depth Graph

Metal Loss Depth Graph





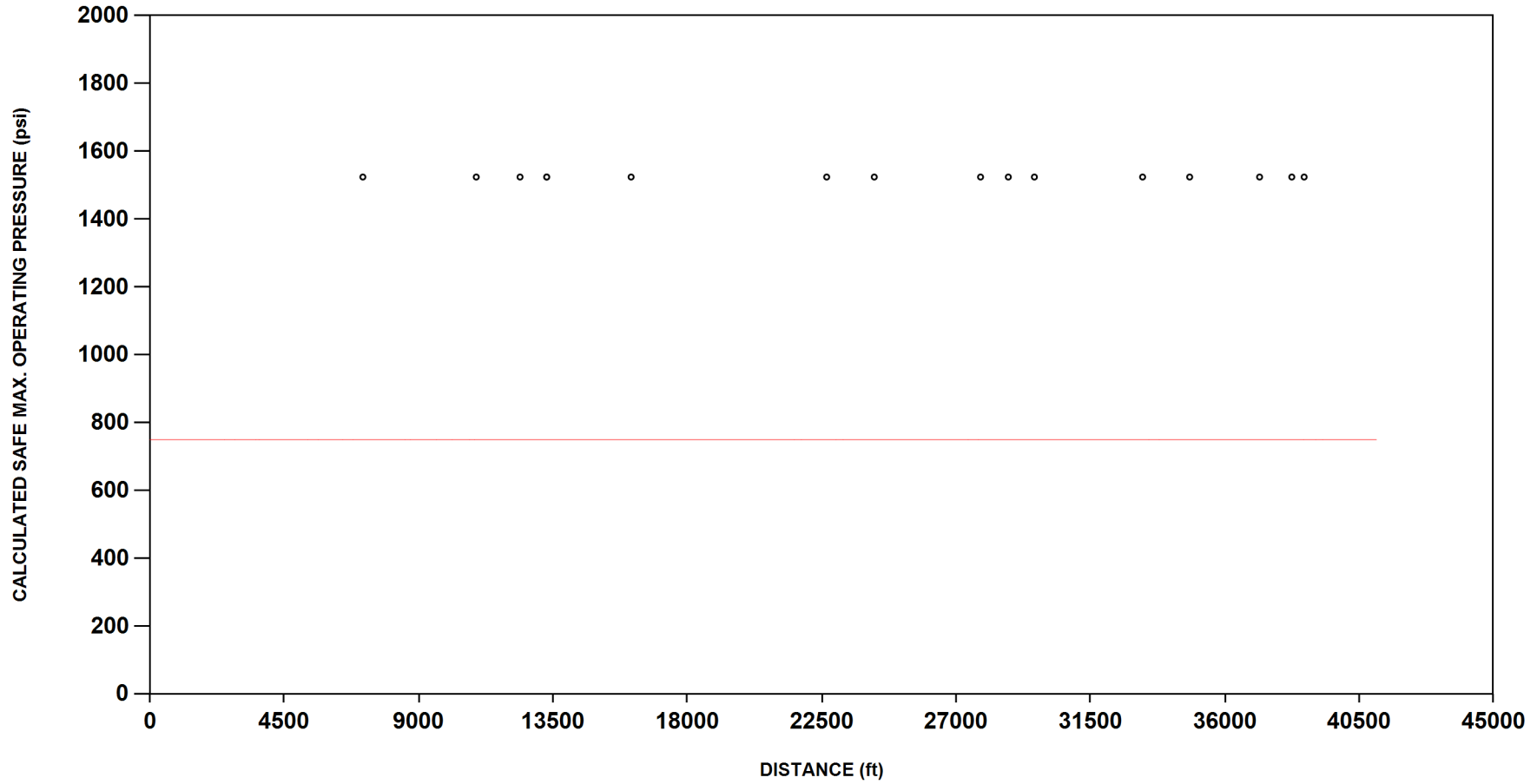
Metal Loss Orientation Graph



Metal Loss Orientation Graph



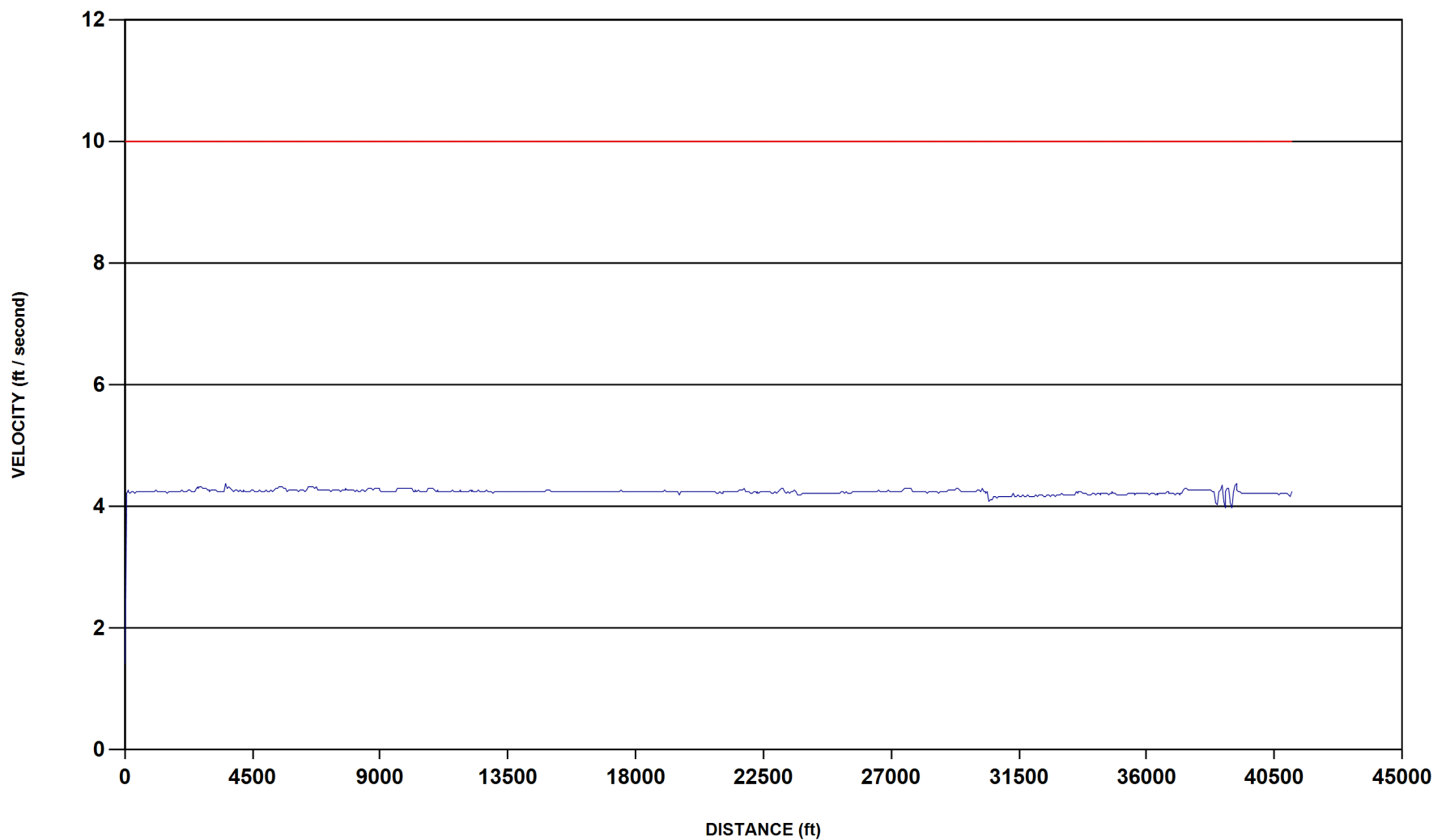
Metal Loss - Calculated Safe Max. Operating Pressure Graph



Metal Loss - Calculated Safe Max. Operating Pressure Graph



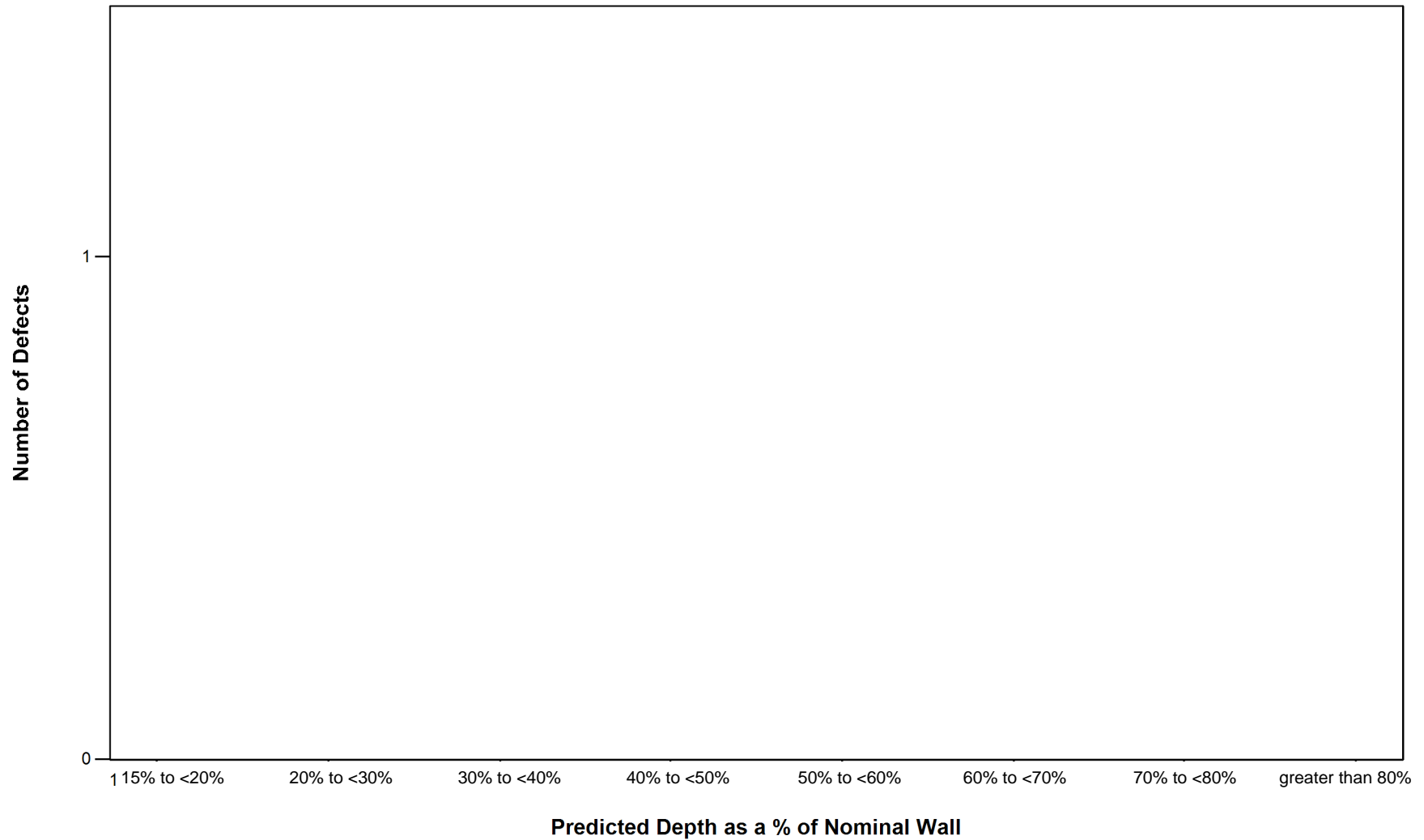
Velocity Graph - MFL



Velocity Graph - MFL



Defect Depth Histogram



Defect Depth Histogram

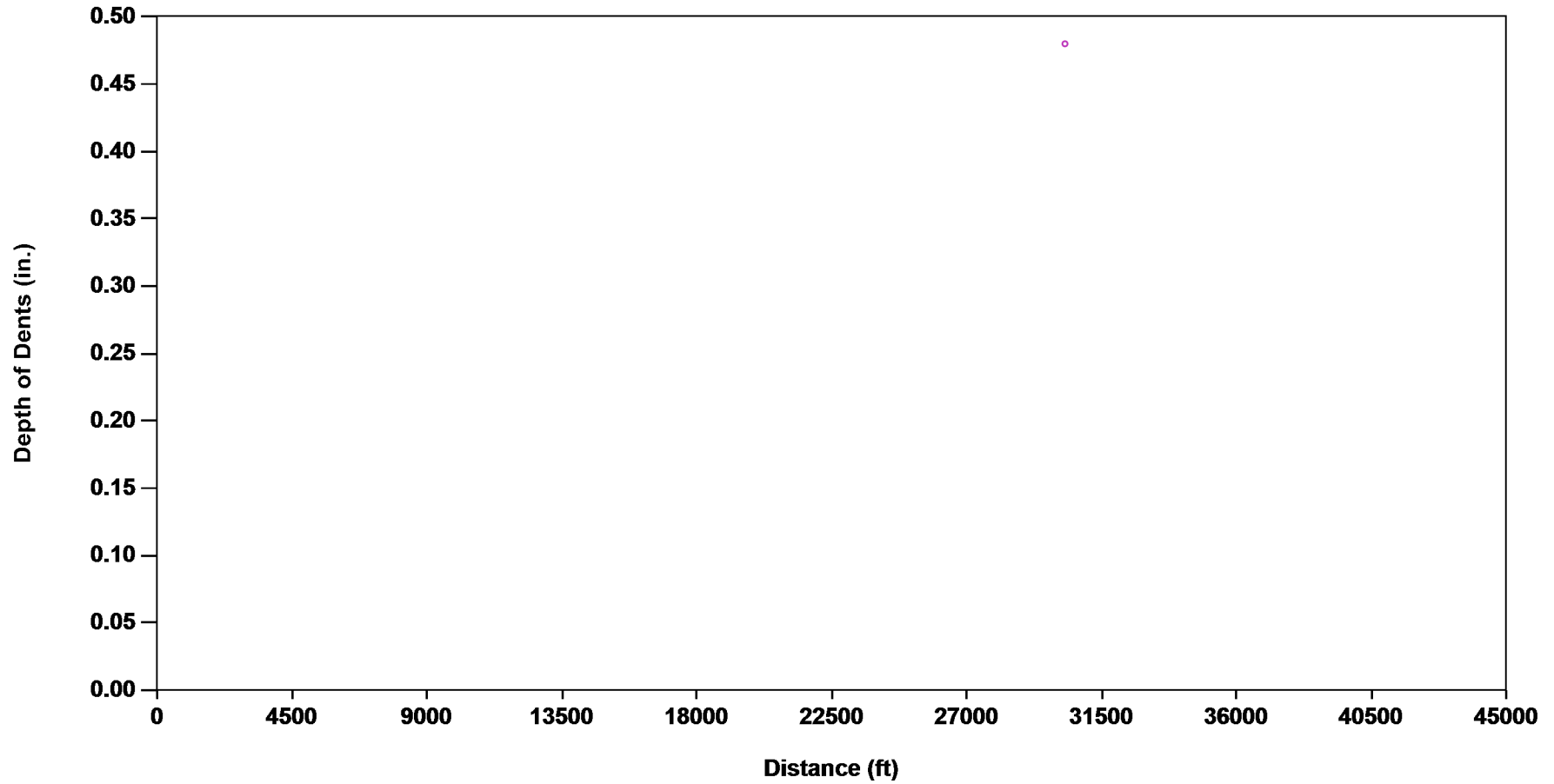
Total Defects: **16**

■ Non-Pressure-Reducing Groups

■ Pressure-Reducing Groups (where $P' < P$)



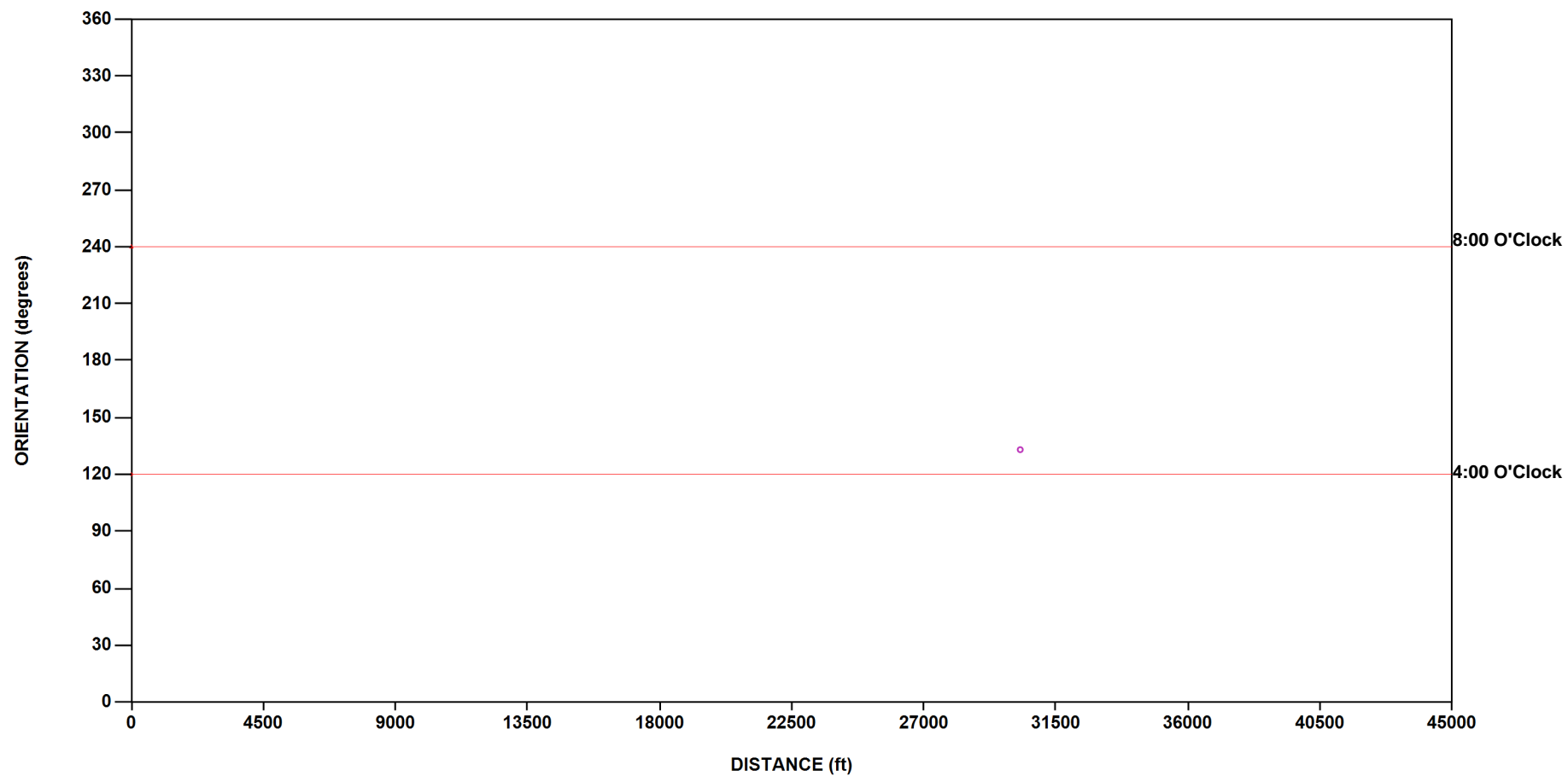
Dent Depth Graph



Dent Depth Graph



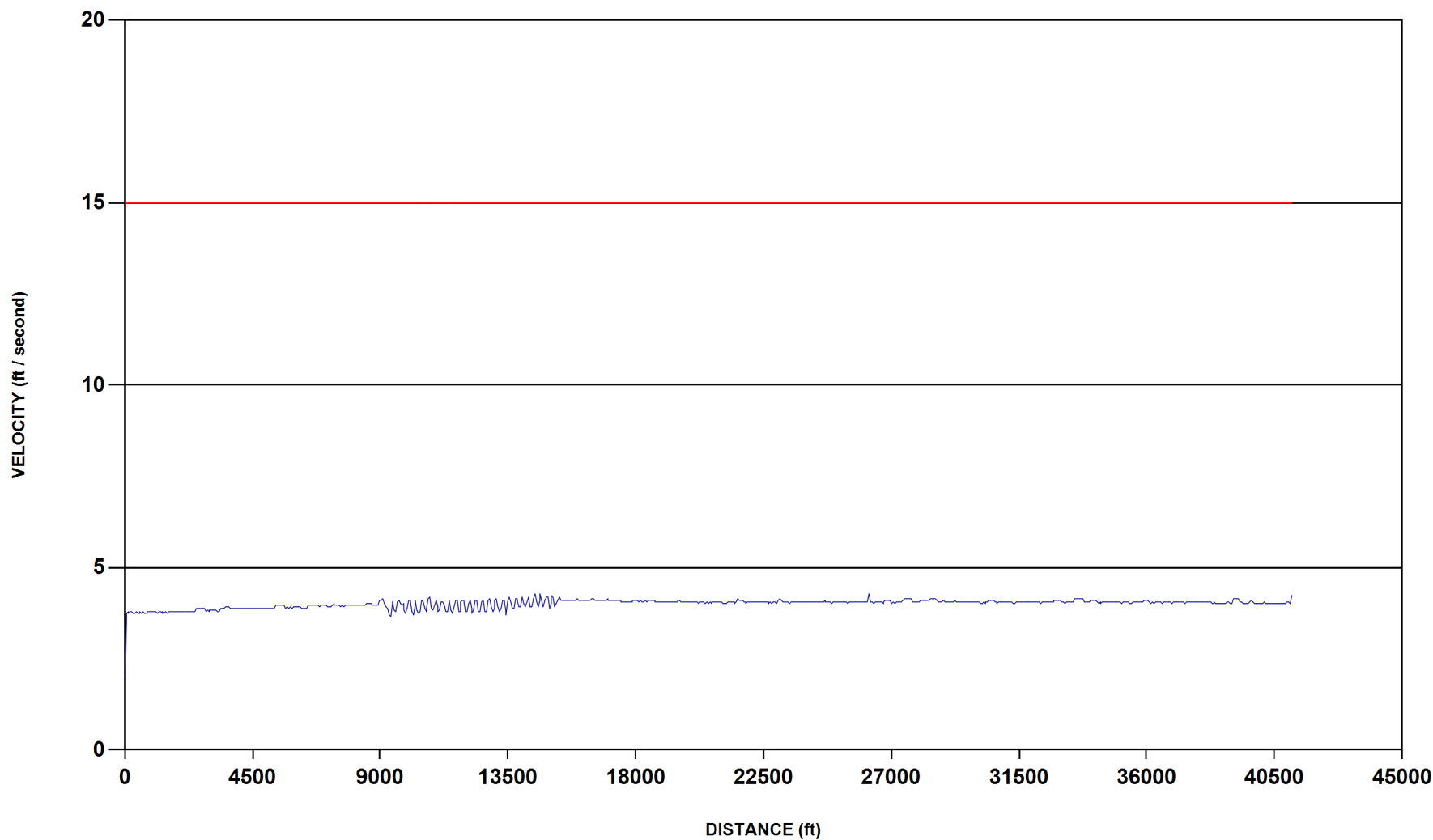
Dent Orientation Graph



Dent Orientation Graph



Velocity Graph - DEF



Velocity Graph - DEF



Locations Summary

DEFINITIONS

A location is a feature in the pipeline that can be used to correlate the inspection tool data to above ground references. Common location features include valves, fittings, flanges, tees, casings, repairs and aboveground markers (AGMs).

For example, a metal loss area could be referenced as being 200 feet down stream from a valve. Not all locations can be easily found from above ground. Some locations might not be useful if they are not above ground.

ID#	Each location is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Time	A reference time from the inspection tool. May also be used to locate features in the PIGTRAP software.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Joint #	This unique number identifies the girth weld number.
U/S Weld Dist.	The distance to the upstream (U/S) weld (in feet or meters).
D/S Weld Dist.	The distance to the downstream (D/S) weld (in feet or meters).
Description	Describes the location in greater detail. Possible entries include valves, flanges, fittings, tees, markers, etc.
Latitude	This shows the north/south position of the Location as supplied by the customer or recorded by an AGM box. For XYZ mapping runs, these values are the supplied survey points or were calculated by the tool.
Longitude	This shows the east/west position of the Location as supplied by the customer or recorded by an AGM box. For XYZ mapping runs, these values are the supplied survey points or were calculated by the tool.
Altitude	For XYZ mapping runs, this shows the elevation above sea level of the location as supplied by the customer or calculated by the tool.

Zeros in Latitude and Longitude mean that no data was supplied by the customer. Calculated or estimated values can be viewed in the Pipe Listing report.



Locations Summary

ID#	Time	Dist (ft)	Joint #	U/S Weld	D/S Weld	Description	Latitude	Longitude	Altitude
				Dist.	Dist.				
10000001	5,834.45	0.0	110	1.9	1.8	Valve (Launcher), Sta. 0+00, Dore Junction Loop	47.92029061	-103.62677020	2012.150
10000002	5,835.35	1.2	110	3.1	0.5	Flange	47.92029053	-103.62677439	2012.329
10000003	5,835.76	2.0	120	0.2	1.4	Fitting on top of pipe	47.92029051	-103.62677707	2012.451
10000004	5,835.86	2.5	120	0.6	0.9	Pipe Support	47.92029049	-103.62677844	2012.513
10000005	5,836.23	4.0	130	0.2	1.2	Tee at 270 deg.	47.92029043	-103.62678369	2012.760
10000006	5,836.51	5.2	140	0.5	0.5	Flange	47.92029039	-103.62678795	2012.964
10000007	5,836.86	6.8	150	0.1	1.9	Bend down - 45 deg., 3D	47.92029036	-103.62679292	2012.994
10000039	5,838.97	16.2	160	8.5	2.7	Pipe Entering the Ground, Dore Loop Launch Site - - Han #8683	47.92029019	-103.62681600	2008.178
10000008	5,839.79	19.9	170	0.1	1.8	Bend up - 45 deg., 3D	47.92029015	-103.62682717	2005.608
10000009	6,354.35	2,206.7	650	0.1	0.9	Bend left - 24 deg., 1.5D	47.92025924	-103.63571139	2054.206
10000010	6,667.13	3,543.3	980	0.1	0.8	Bend right - 20 deg., 3D	47.91844354	-103.64037924	2082.056
10000011	6,702.69	3,696.8	1,040	0.1	1.2	Bend left - 30 deg., 3D	47.91857766	-103.64097325	2074.149
10000012	7,068.48	5,256.6	1,380	14.9	33.8	AGM 010, Sta. 52+24, Hwy 85 -- Han #8456	47.91746169	-103.64715110	2052.476
10000013	7,433.66	6,822.3	1,740	0.1	0.9	Bend left - 26 deg., 1.5D	47.91767690	-103.65346031	1999.429
10000014	7,788.78	8,339.4	2,080	0.1	1.2	Bend right - 34 deg., 3D	47.91593678	-103.65902214	2045.371
10000015	8,319.46	10,606.8	2,630	0.2	1.1	Tee on top of pipe	47.91625396	-103.66815836	2022.628
10000016	8,325.07	10,630.8	2,650	20.2	16.6	AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	47.91627025	-103.66825370	2022.917
10000017	9,579.39	15,968.3	3,780	23.0	25.4	Bend right - 12 deg., 65D	47.91635817	-103.69009574	2056.247
10000018	9,587.51	16,002.8	3,790	14.8	33.5	AGM 030, Sta. 159+98, ROW -- Han #8456	47.91639157	-103.69022770	2054.892
10000019	10,947.95	21,781.8	5,020	12.2	29.7	AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	47.92198823	-103.71223430	2116.816
10000020	11,677.32	24,870.8	5,690	0.1	1.6	Bend left - 42 deg., 3D	47.92440347	-103.72434266	2196.290
10000021	11,778.28	25,297.9	5,800	0.1	0.9	Bend right - 24 deg., 1.5D	47.92434293	-103.72607805	2202.860
10000022	11,995.46	26,219.0	6,020	0.0	1.2	Bend left - 34 deg., 3D	47.92633279	-103.72840203	2215.989
10000023	12,343.77	27,703.9	6,350	8.9	33.0	AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	47.92821082	-103.73379940	2228.258
10000024	12,953.52	30,296.3	6,890	6.8	41.0	Bend left - 18 deg., 81D	47.93156986	-103.74316090	2234.035
10000025	12,965.78	30,348.2	6,910	0.1	1.3	Bend left - 36 deg., 3D	47.93160109	-103.74336768	2233.964
10000026	13,705.94	33,439.4	7,570	20.8	19.9	AGM 060, Sta. 334+75, CR 16 -- Han #8836	47.92756677	-103.75440780	2278.234
10000027	14,156.23	35,335.4	7,990	0.1	0.9	Bend right - 24 deg., 1.5D	47.92459751	-103.76077443	2227.345
10000028	15,083.70	39,255.3	8,820	39.3	2.6	AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	47.92466592	-103.77682160	2259.238
10000029	15,482.38	40,936.4	9,220	0.2	3.7	Bend left - 82 deg., 3D	47.92454979	-103.78370346	2221.399
10000030	15,519.45	41,092.7	9,280	0.1	1.7	Bend up - 45 deg., 3D	47.92412005	-103.78369590	2223.025

Locations Summary



Locations Summary

ID#	Time	Dist (ft)	Joint #	U/S Weld Dist.	D/S Weld Dist.	Description	Latitude	Longitude	Altitude
10000040	15,521.84	41,102.7	9,300	1.8	7.8	Pipe Exiting the Ground, Dore Junction Loop Trap - - Han #8683	47.92409988	-103.78369550	2229.906
10000031	15,523.91	41,111.6	9,310	0.2	1.8	Bend down - 45 deg., 3D	47.92408584	-103.78369530	2234.064
10000032	15,524.26	41,113.1	9,320	0.5	0.5	Flange	47.92408280	-103.78369520	2234.059
10000033	15,524.53	41,114.3	9,330	0.2	1.2	Tee at 90 deg.	47.92408002	-103.78369510	2233.791
10000034	15,524.87	41,115.7	9,340	0.6	0.9	Pipe Support	47.92407666	-103.78369508	2233.445
10000035	15,524.98	41,116.2	9,340	1.1	0.4	Fitting on top of pipe	47.92407549	-103.78369502	2233.321
10000036	15,525.16	41,117.0	9,350	0.5	3.2	Flange	47.92407395	-103.78369500	2233.163
10000037	15,525.46	41,118.4	9,350	1.9	1.8	Valve (Receiver), Sta. 410+99, Dore Junction Loop Trap	47.92407086	-103.78369490	2232.845

Locations Summary

Locations	Number
Bend	17
Casing	0
Flange	6
Fitting	2
Marker	9
Repair	0
Tee	3
Valve	2
Pipe Support	2



Casings Summary

DEFINITIONS

A casing is a section of larger diameter pipe through which the pipeline passes. Usually installed to protect a pipeline from excessive external loading, casings can also shield pipelines from protective cathodic protection currents. Therefore, the condition of a pipeline inside a casing can provide valuable information.

TDW MFL tools detect when a casing is not centered around the pipeline. These casings are referred to as being eccentric. The closer the casing is to the pipeline, the stronger the signal seen by the inspection tool. The tool will not detect if the casing is shorted to the pipe wall. The tool might see evidence of a short, such as metal loss.

This information may be useful in updating pipeline databases and alignment sheets.

Sometimes spacers are identified inside casings. These are mechanical devices used to center the pipeline inside the casing and are not considered harmful.

ID#	Each location is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Time	A reference time from the inspection tool. May also be used to locate features in the PIGTRAP software.
Distance Start, End	Given in either feet or meters, this is the absolute distance measured by the tool from launch to the beginning and ending of the casing.
Casing Length	The total predicted casing length (in feet or meters).
Eccentric (side)	Identifies one of four conditions associated with the casing: 1- no eccentricity (blank); 2- eccentric on upstream side (upstream); 3- eccentric on downstream side (downstream); 4- eccentric on both ends (both)
# of Metal Loss in Casing	Provides the number of metal loss groups identified inside the casing.
Max. Depth of Metal Loss	If metal loss is identified inside the casing, this column provides the maximum predicted depth of all metal loss features.
Above Ground References	The name of the closest upstream and downstream references, usually an Aboveground Marker or a Valve.
Distance from Start/Upstream Side of Casing	The distance from the Aboveground Reference (AGM or Valve) to the start (upstream) side of the casing.



Casings Summary

ID#	Time	Distance (ft) Start	End	Casing Length (ft)	Eccentric (side)	# of Metal Loss in Casing	Max. Depth of Metal Loss	Above Ground References	Distance from Start/Upstream Side of Casing
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No Casings appear in this pipeline inspection

Casings Summary



Deformation Summary

DEFINITIONS

The Deformation Summary Report lists all the deformations and dents detected during the inspection, sorted by depth of deformation (descending)

Dents may affect the integrity of the pipeline and are considered harmful. A dent with associated metal loss is potentially more significant than a dent alone.

ID#	Each Deformation is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Depth	Depth of the indication in inches or mm.
Orientation	The orientation of the deformation indication in degrees (top of pipe = 0) and clock position, as viewed facing downstream.
Sub Type	The sub type of deformation if other than dent (i.e. Heavy Weld, Ovality, Buckle, Expansion).
Min X Sec Dia	The minimum measured Cross-Section (ID) measured within the scope of the deformation.
Description	Text describing a deformation in greater detail. Any special conditions are noted.
On Weld	Determination whether the indication crosses a girth (or seam) weld.
Metal Loss	"Yes" is listed if there is any metal loss associated with a dent.
Above-Ground References	The name of the closest upstream and downstream references, usually either an AGM or a valve.
Distance from Defect	The distance to the upstream and downstream reference listed in the previous column. Used for locating defects in the field.



Deformation Summary

ID#	Distance (ft)	Depth (in)	Depth %	Orientation (Deg / O'Clock)	Sub Type	Min X Sec Dia	Description	On Metal Weld Loss	Above-Ground References	Distance from Defect
14000000	30,285.5	0.48	4.8%	133 4:15		9.63			U/S: AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456 D/S: AGM 060, Sta. 334+75, CR 16 -- Han #8836	2581.26 3154.30

Type	Number
DENT	1

Deformation Summary



Gains (Metal in Close Proximity)

DEFINITIONS

The inspection tool may detect ferrous metal objects located close to or touching the pipeline. They appear as additional metal added to the pipe, and are referred to as gains. This table identifies gains detected during the inspection.

Clamps or anchors around the pipeline are considered gains. Some metal objects can be potentially harmful to the pipeline. They can damage the pipeline's protective coating, or over time may dent or cause damage to the pipeline.

ID#	Each location is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Length	The measured length of the gain measured in feet or meters.
Width	The measured width of the gain measured in inches or millimeters. When full circumference, this is usually typical of a clamp or banding around the circumference of the pipeline.
Depth in Gauss	The difference in gauss reading (magnetic strength) at the gain. The greater the number, the greater the mass of the object, or the closer the proximity to the pipeline, or both. This table is sorted with highest depth in gauss listed in a descending order.
Orientation: Degrees / O'Clock	The distance from launch is plotted against the orientation of the defect. Orientation is based on 360 degrees in a circle, with 0 / 360 degrees marking the top of the pipe (180 degrees the bottom).
Joint #	This unique number identifies the girth weld number.
U/S Weld Dist.	The distance to the upstream (U/S) weld (in feet or meters).
D/S Weld Dist.	The distance to the downstream (D/S) weld (in feet or meters).

Gains (Metal in Close Proximity)



Gains (Metal in Close Proximity)

ID#	Distance (ft)	Length (in)	Width (in)	Depth in Gauss	Orientation Degrees	Orientation / O'Clock	Joint #	U/S Weld Dist.	D/S Weld Dist.
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No Gains have been detected on this pipeline inspection

Gains (Metal in Close Proximity)



Nominal Wall Thickness

DEFINITIONS

The following list provides locations along the pipeline where changes in wall thickness or pipe type occur. While the TDW inspection tool can easily detect changes in wall thickness, it cannot take direct thickness measurements. Therefore, where wall thicknesses are known, the tool can identify the locations where the thickness changes. Where wall thicknesses are not known, best efforts will be made to estimate thicknesses based on best available data.

ID#	Each wall thickness change ID is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Wall Thickness	The predicted wall thickness in inches or millimeters.
Pipetype	Type of pipe construction. Electric Resistance Weld (ERW), Seamless (SMLS), Lap Weld (LW), etc.
Yield Strength (SMYS)	Specified Minimum Yield Strength – A required strength level that measured yield stress of a pipe material must exceed, which is a function of pipe grade. The measured yield stress is the tensile stress required to produce a total elongation of 0.5 percent of a gage length as determined by an extensometer during a tensile test.
Safety Factor	(or design factor) Typically 0.72 per ASME B31.4 In setting the safety factor, due consideration has been given to and allowances made for the manufacturing tolerance and maximum allowable depth of imperfections provided for in the specifications.
Length of Segment	The length of the pipe for the specified wall thickness, measured in feet or meters.

Nominal Wall Thickness



Nominal Wall Thickness

ID#	Distance (ft)	Wall Thickness (in)	Pipetype	Yield Strength (SMYS)	Safety Factor	Length of Segment (ft)
11000000	-1.89	0.365	SEAMLESS	52000	0.72	22.68
11000001	20.78	0.219	ERW	52000	0.72	2469.65
11000002	2490.43	0.250	ERW	52000	0.72	367.31
11000003	2857.74	0.219	ERW	52000	0.72	685.95
11000004	3543.69	0.250	ERW	52000	0.72	144.36
11000005	3688.04	0.219	ERW	52000	0.72	1602.32
11000006	5290.36	0.250	ERW	52000	0.72	371.89
11000007	5662.25	0.219	ERW	52000	0.72	775.34
11000008	6437.58	0.250	ERW	52000	0.72	335.54
11000009	6773.13	0.219	ERW	52000	0.72	1746.24
11000010	8519.37	0.250	ERW	52000	0.72	209.32
11000011	8728.69	0.219	ERW	52000	0.72	864
11000012	9592.69	0.250	ERW	52000	0.72	545.16
11000013	10137.85	0.219	ERW	52000	0.72	552.44
11000014	10690.29	0.250	ERW	52000	0.72	190.68
11000015	10880.97	0.219	ERW	52000	0.72	10721.03
11000016	21602.00	0.250	ERW	52000	0.72	209.4
11000017	21811.40	0.219	ERW	52000	0.72	1191.65
11000018	23003.05	0.250	ERW	52000	0.72	204
11000019	23207.04	0.219	ERW	52000	0.72	4195.55
11000020	27402.59	0.250	ERW	52000	0.72	334.17
11000021	27736.76	0.219	ERW	52000	0.72	5722.48
11000022	33459.24	0.250	ERW	52000	0.72	335.5
11000023	33794.74	0.219	ERW	52000	0.72	5253.61
11000024	39048.35	0.250	ERW	52000	0.72	251.49
11000025	39299.84	0.219	ERW	52000	0.72	1788.17
11000026	41088.02	0.365	SEAMLESS	52000	0.72	5.58
11000027	41093.59	0.250	ERW	52000	0.72	7.28
11000028	41100.88	0.365	SEAMLESS	52000	0.72	17.52

Nominal Wall Thickness

Wall Thickness	Pipetype	Total Length (ft)	Total Length (miles)	Percent of Total Distance
0.219	ERW	37,568	7.115	91.4%
0.250	ERW	3,506	0.664	8.5%
0.365	SEAMLESS	46	0.009	0.1%



Repair Report

DEFINITIONS

This table lists all the repairs to the pipeline detected during the inspection.

Pipeline repairs that are typically detected include:

- Sleeves
- Half sole
- Patches
- Stopples
- Clamps
- Weld + End
- Clock Spring

ID# Each repair is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.

Distance Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.

Length Gives the linear length of the repair.

Type of Repair Describes the type of repair detected during the inspection.



Repair Report

Repair Report

ID#

Distance (ft)

Length (ft)

Type of Repair

No Repairs have been detected on this pipeline inspection



AGM Information Summary

DEFINITIONS

This table includes all values and above ground marker sites in the inspection run.

ID#	Each location is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Time	A reference time from the inspection tool. May also be used to locate features in the PIGTRAP software.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Description	Describes the AGM in greater detail. Generally includes only valves and markers.
Latitude	This shows the north/south position of the Location as supplied by the customer or recorded by an AGM box. For XYZ mapping runs, these values are the supplied survey points or were calculated by the tool.
Longitude	This shows the east/west position of the Location as supplied by the customer or recorded by an AGM box. For XYZ mapping runs, these values are the supplied survey points or were calculated by the tool.
Altitude	For XYZ mapping runs, this shows the elevation above sea level of the location as supplied by the customer or calculated by the tool.

Zeroes in Latitude and Longitude mean that no data was supplied by the customer. Calculated or estimated values can be viewed in the Pipe Listing report.



AGM Information Summary

AGM Information Summary

ID#	Time	Distance(ft)	Description	Latitude	Longitude	Altitude
10000001	5834.45	0.00	Valve (Launcher), Sta. 0+00, Dore Junction Loop	47.92029061	-103.62677020	2012.150
10000039	5838.97	16.20	Pipe Entering the Ground, Dore Loop Launch Site -- Han #8683	47.92029019	-103.62681600	2008.178
10000012	7068.48	5256.62	AGM 010, Sta. 52+24, Hwy 85 -- Han #8456	47.91746169	-103.64715110	2052.476
10000016	8325.07	10630.76	AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	47.91627025	-103.66825370	2022.917
10000018	9587.51	16002.80	AGM 030, Sta. 159+98, ROW -- Han #8456	47.91639157	-103.69022770	2054.892
10000019	10947.95	21781.75	AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	47.92198823	-103.71223430	2116.816
10000023	12343.77	27703.85	AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	47.92821082	-103.73379940	2228.258
10000026	13705.94	33439.41	AGM 060, Sta. 334+75, CR 16 -- Han #8836	47.92756677	-103.75440780	2278.234
10000028	15083.70	39255.29	AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	47.92466592	-103.77682160	2259.238
10000040	15521.84	41102.73	Pipe Exiting the Ground, Dore Junction Loop Trap -- Han #8683	47.92409988	-103.78369550	2229.906
10000037	15525.46	41118.40	Valve (Receiver), Sta. 410+99, Dore Junction Loop Trap	47.92407086	-103.78369490	2232.845

TYPE	NUMBER
Valves	2
Markers	9



Miscellaneous

DEFINITIONS

There are occasions when special notations or circumstances require the addition of a note. These notes are included in this table for your reference.

ID#	Each miscellaneous note is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Time	A reference time from the inspection tool. May also be used to locate features in the PIGTRAP software.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance measured by the tool from launch.
Memo	A description of the entry.

MEMO EXAMPLES

Gap or dent in casing	When the casing is not welded, or when a gap occurs in the weld, this signature is detected by the tool, and identified with a Misc. remark.
Inclusion	An anomaly in the cross section of the pipeline. Inclusions may be detrimental if they protrude through the pipe wall.
Mill anomaly	The process of manufacturing pipe can often leave indications in the pipe wall. Typically these anomalies are not detrimental, and are identified for the benefit of the client.
Sensor problems	Noting locations where anomalous sensor readings occurred.
Tool stops/starts	All tools are setup on a time-based system. When the tool stops, it continues to record, although not moving. When the tool moves very slowly, it is possible that its movement is not detected, and therefore, reported distances may appear shorter than actual. Many stops and starts may affect the overall distance accuracy of the tool.



Miscellaneous

Miscellaneous

ID#	Time	Distance (ft)	Memo
12000000	203.90	-12.00	Begin Run Tickle
12000001	22,223.74	41,156.76	End Run Tickle

Total	Number
Misc listings	2

DEFINITIONS

The Pipeline Listing Report presents all detected pipeline data in sequential order, beginning at launcher and ending at the receiver. The table includes welds, locations, metal loss defects, AGMs, wall thickness changes, etc.

ID#	Each item is automatically assigned a number in the software. This number is provided to assist the user of PIGTRAP software to more easily find any given defect.
Description	Describes the event at the particular location. Identifies the type of the descriptive, being a weld, location, pipe thickness change, etc.
Distance	Given in either feet or meters, based on contractual agreements, this is the absolute distance from launch.
Joint #	This unique number identifies the girth weld number.
U/S Weld	The distance to the upstream (U/S) weld (in feet or meters).
D/S Weld	The distance to the downstream (D/S) weld (in feet or meters).
Latitude	If GPS coordinates were provided for launch, receive and AGMs, this provides the predicted Latitude reading of the location from the first GPS reading based on INS readings obtained by the tool during the inspection.
Longitude	If GPS coordinates were provided for launch, receive and AGMs, this provides the predicted Longitude reading of the location from the first GPS reading based on INS readings obtained by the tool during the inspection.
Altitude	If GPS coordinates were provided for launch, receive and AGMs, this provides the predicted Altitude reading of the location from the first GPS reading based on INS readings obtained by the tool during the inspection.
Orientation: Deg. / O'Clock	Orientation is reported in degrees or o'clock (0 degrees/12:00 at top of pipe) as viewed looking downstream.
% Depth	Predicted depth of the defect as a percentage of nominal wall.
Length or WT (Pipe Thickness)	Predicted length of the defect, reported in either inches or millimeters – or if a wall thickness change, the new wall thickness begins at this point.
Width or YS (Yield Strength)	Predicted width of the defect, reported in either inches or millimeters – or if a wall thickness change, the new SMYS begins at this point.
P' (Calc. Safe Max. Operating Pressure) or SF (Safety Factor)	Calculated safe maximum operating pressure for the pipeline segment as calculated based on information provided by the Customer. TDW software uses either ASME B31G, MODIFIED ASME B31G or Z662-99 to calculate the calculated safe maximum allowable operating pressure (P') of the pipeline at a metal loss area.
(P'/P)	Percent of maximum established pressure, this is calculated by dividing the calculated safe pressure of the defect (P') by the current established maximum operating pressure of the pipeline (P). For TDW reporting, P is either established MOP provided by the customer or the calculated pressure rating for the pipe (P). Percentages less than 100% are considered pressure reducing.



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
12000000	Begin Run Tickle	-12.0	0	-	10.1	47.92029056	-103.62677006	2012.134						
11000000	WT CHANGE	-1.9	0	0.0	0.0	47.92029056	-103.62677006	2012.134			0.365	52000	0.72	
	110 WELD	-1.9	110	0.0	3.6	47.92029056	-103.62677006	2012.134						
10000000	Flange	-1.3	110	0.5	3.1	47.92029056	-103.62677006	2012.134	0	12:00				
10000001	Valve (Launcher), Sta. 0+00, Dore Junction Loop	0.0	110	1.9	1.8	47.92029061	-103.62677020	2012.150						
10000002	Flange	1.2	110	3.1	0.5	47.92029053	-103.62677439	2012.329	0	12:00				
	120 WELD	1.8	120	0.0	1.6	47.92029051	-103.62677615	2012.409						
10000003	Fitting on top of pipe	2.0	120	0.2	1.4	47.92029051	-103.62677707	2012.451	3	12:00				
10000004	Pipe Support	2.5	120	0.6	0.9	47.92029049	-103.62677844	2012.513						
	130 WELD	3.3	130	0.0	1.4	47.92029045	-103.62678124	2012.642						
10000005	Tee at 270 deg.	4.0	130	0.2	1.2	47.92029043	-103.62678369	2012.760	273	9:00				
	140 WELD	4.7	140	0.0	1.0	47.92029041	-103.62678626	2012.887						
10000006	Flange	5.2	140	0.5	0.5	47.92029039	-103.62678795	2012.964	0	12:00				
	150 WELD	5.7	150	0.0	2.0	47.92029038	-103.62678959	2013.033						
10000007	Bend down - 45 deg., 3D	6.8	150	0.1	1.9	47.92029036	-103.62679292	2012.994	0	12:00				
	160 WELD	7.7	160	0.0	11.2	47.92029033	-103.62679572	2012.690						
10000039	Pipe Entering the Ground, Dore Loop Launch Site -- Han #8683	16.2	160	8.5	2.7	47.92029019	-103.62681600	2008.178						
	170 WELD	18.9	170	0.0	1.9	47.92029016	-103.62682405	2006.175						
10000008	Bend up - 45 deg., 3D	19.9	170	0.1	1.8	47.92029015	-103.62682717	2005.608	0	12:00				
11000001	WT CHANGE	20.8	170	0.0	0.0	47.92029012	-103.62683095	2005.344			0.219	52000	0.72	
	180 WELD	20.8	180	0.0	10.1	47.92029011	-103.62683111	2005.341						
	190 WELD	30.9	190	0.0	48.8	47.92028986	-103.62687229	2005.576						
	200 WELD	79.6	200	0.0	48.9	47.92028757	-103.62707087	2007.469						
	210 WELD	128.5	210	0.0	48.8	47.92028520	-103.62726958	2010.121						
	220 WELD	177.3	220	0.0	48.9	47.92028336	-103.62746800	2013.564						
	230 WELD	226.2	230	0.0	48.9	47.92028249	-103.62766680	2015.058						
	240 WELD	275.2	240	0.0	48.7	47.92028185	-103.62786599	2015.971						
	250 WELD	323.9	250	0.0	48.9	47.92028241	-103.62806435	2014.519						
	260 WELD	372.8	260	0.0	48.8	47.92028348	-103.62826310	2012.493						
	270 WELD	421.6	270	0.0	48.9	47.92028418	-103.62846201	2011.774						
	280 WELD	470.5	280	0.0	48.9	47.92028472	-103.62866085	2013.648						
	290 WELD	519.5	290	0.0	49.0	47.92028431	-103.62885968	2016.629						
	300 WELD	568.5	300	0.0	48.9	47.92028162	-103.62905879	2019.044						
	310 WELD	617.4	310	0.0	49.0	47.92027756	-103.62925718	2022.523						
	320 WELD	666.3	320	0.0	48.9	47.92027331	-103.62945522	2027.529						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
330	WELD	715.2	330	0.0	48.6	47.92026968	-103.62965296	2032.821						
340	WELD	763.8	340	0.0	48.8	47.92027015	-103.62985029	2032.169						
350	WELD	812.7	350	0.0	48.9	47.92027230	-103.63004764	2026.641						
360	WELD	861.6	360	0.0	49.0	47.92027301	-103.63024580	2021.539						
370	WELD	910.5	370	0.0	48.9	47.92027147	-103.63044415	2017.895						
380	WELD	959.4	380	0.0	48.9	47.92026850	-103.63064329	2017.651						
390	WELD	1,008.3	390	0.0	48.9	47.92026524	-103.63084238	2018.636						
400	WELD	1,057.2	400	0.0	46.1	47.92026301	-103.63104130	2021.058						
410	WELD	1,103.3	410	0.0	48.9	47.92026121	-103.63122835	2024.671						
420	WELD	1,152.2	420	0.0	48.9	47.92025973	-103.63142705	2028.881						
430	WELD	1,201.0	430	0.0	48.9	47.92025874	-103.63162588	2031.614						
440	WELD	1,249.9	440	0.0	48.9	47.92025752	-103.63182479	2030.086						
450	WELD	1,298.8	450	0.0	48.9	47.92025542	-103.63202340	2027.403						
460	WELD	1,347.8	460	0.0	48.9	47.92025372	-103.63222270	2026.868						
470	WELD	1,396.7	470	0.0	48.7	47.92025326	-103.63242183	2028.062						
480	WELD	1,445.3	480	0.0	48.9	47.92025250	-103.63261994	2030.392						
490	WELD	1,494.2	490	0.0	48.9	47.92025175	-103.63281898	2033.416						
500	WELD	1,543.1	500	0.0	48.9	47.92025095	-103.63301808	2036.657						
510	WELD	1,592.1	510	0.0	48.9	47.92024978	-103.63321681	2040.826						
520	WELD	1,641.0	520	0.0	49.0	47.92024886	-103.63341538	2045.960						
530	WELD	1,690.0	530	0.0	48.9	47.92024826	-103.63361306	2052.055						
540	WELD	1,738.9	540	0.0	48.9	47.92024675	-103.63381073	2057.692						
550	WELD	1,787.8	550	0.0	48.9	47.92024533	-103.63400948	2060.304						
560	WELD	1,836.7	560	0.0	46.6	47.92024618	-103.63420859	2059.270						
570	WELD	1,883.4	570	0.0	48.1	47.92024751	-103.63439821	2059.477						
580	WELD	1,931.5	580	0.0	48.4	47.92024886	-103.63459377	2060.927						
590	WELD	1,979.9	590	0.0	49.0	47.92025023	-103.63479131	2062.363						
600	WELD	2,028.9	600	0.0	48.9	47.92025215	-103.63499006	2064.337						
610	WELD	2,077.8	610	0.0	49.0	47.92025429	-103.63518926	2064.580						
620	WELD	2,126.7	620	0.0	48.9	47.92025627	-103.63538799	2061.767						
630	WELD	2,175.7	630	0.0	15.8	47.92025881	-103.63558615	2057.598						
640	WELD	2,191.4	640	0.0	14.8	47.92025921	-103.63564994	2055.996						
650	WELD	2,206.2	650	0.0	0.9	47.92025941	-103.63570950	2054.243						
10000009	Bend left - 24 deg., 1.5D	2,206.7	650	0.1	0.9	47.92025924	-103.63571139	2054.206	0	12:00				
660	WELD	2,207.1	660	0.0	14.5	47.92025896	-103.63571326	2054.177						
670	WELD	2,221.7	670	0.0	27.4	47.92024322	-103.63576742	2054.257						
680	WELD	2,249.1	680	0.0	48.9	47.92021160	-103.63586855	2055.276						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
690 WELD		2,298.0	690	0.0	48.9	47.92015226	-103.63604634	2058.845						
700 WELD		2,346.9	700	0.0	49.0	47.92008898	-103.63622009	2064.296						
710 WELD		2,395.9	710	0.0	48.9	47.92002051	-103.63638885	2070.657						
720 WELD		2,444.8	720	0.0	45.7	47.91994487	-103.63655120	2075.298						
11000002 WT CHANGE		2,490.4	720	0.0	0.0	47.91987128	-103.63670042	2075.345			0.250	52000	0.72	
730 WELD		2,490.5	730	0.0	41.8	47.91987120	-103.63670058	2075.343						
740 WELD		2,532.3	740	0.0	42.0	47.91980643	-103.63683989	2070.385						
750 WELD		2,574.3	750	0.0	42.0	47.91974235	-103.63698140	2065.983						
760 WELD		2,616.3	760	0.0	42.0	47.91968039	-103.63712555	2066.512						
770 WELD		2,658.3	770	0.0	42.0	47.91961798	-103.63726907	2068.550						
780 WELD		2,700.3	780	0.0	42.0	47.91955341	-103.63741044	2070.723						
790 WELD		2,742.4	790	0.0	42.0	47.91948693	-103.63754980	2074.073						
800 WELD		2,784.3	800	0.0	41.9	47.91941968	-103.63768739	2079.013						
810 WELD		2,826.3	810	0.0	19.1	47.91935363	-103.63782669	2083.602						
820 WELD		2,845.4	820	0.0	12.4	47.91932367	-103.63789028	2085.347						
11000003 WT CHANGE		2,857.7	820	0.0	0.1	47.91930443	-103.63793178	2086.130			0.219	52000	0.72	
830 WELD		2,857.8	830	0.0	48.5	47.91930434	-103.63793198	2086.133						
840 WELD		2,906.3	840	0.0	48.9	47.91922778	-103.63809449	2086.801						
850 WELD		2,955.2	850	0.0	48.9	47.91915010	-103.63825766	2086.537						
860 WELD		3,004.1	860	0.0	48.9	47.91907252	-103.63842146	2085.922						
870 WELD		3,053.0	870	0.0	48.9	47.91899529	-103.63858506	2085.059						
880 WELD		3,101.9	880	0.0	48.9	47.91891802	-103.63874909	2085.154						
890 WELD		3,150.8	890	0.0	48.9	47.91884004	-103.63891203	2085.381						
900 WELD		3,199.7	900	0.0	48.9	47.91876289	-103.63907596	2085.606						
910 WELD		3,248.5	910	0.0	48.9	47.91868898	-103.63924306	2085.026						
920 WELD		3,297.5	920	0.0	48.9	47.91862061	-103.63941543	2084.588						
930 WELD		3,346.3	930	0.0	48.9	47.91856167	-103.63959527	2084.379						
940 WELD		3,395.2	940	0.0	48.8	47.91851428	-103.63978294	2083.968						
950 WELD		3,444.1	950	0.0	48.2	47.91847850	-103.63997624	2083.023						
960 WELD		3,492.3	960	0.0	44.6	47.91845309	-103.64017020	2082.143						
970 WELD		3,536.9	970	0.0	5.9	47.91844435	-103.64035322	2081.944						
980 WELD		3,542.9	980	0.0	0.9	47.91844348	-103.64037771	2082.066						
10000010 Bend right - 20 deg., 3D		3,543.3	980	0.1	0.8	47.91844354	-103.64037924	2082.056	0	12:00				
11000004 WT CHANGE		3,543.7	980	0.0	0.0	47.91844364	-103.64038072	2082.039			0.250	52000	0.72	
990 WELD		3,543.7	990	0.0	41.8	47.91844366	-103.64038089	2082.035						
1000 WELD		3,585.6	1000	0.0	42.0	47.91847616	-103.64054417	2076.714						
1010 WELD		3,627.6	1010	0.0	42.0	47.91851600	-103.64070494	2073.247						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
1020 WELD		3,669.5	1020	0.0	18.6	47.91855483	-103.64086722	2072.694						
11000005 WT CHANGE		3,688.0	1020	0.0	0.1	47.91857065	-103.64093922	2073.731			0.219	52000	0.72	
1030 WELD		3,688.1	1030	0.0	8.1	47.91857070	-103.64093945	2073.733						
1040 WELD		3,696.2	1040	0.0	1.3	47.91857736	-103.64097055	2074.104						
10000011 Bend left - 30 deg., 3D		3,696.8	1040	0.1	1.2	47.91857766	-103.64097325	2074.149	0 12:00					
1050 WELD		3,697.5	1050	0.0	42.3	47.91857761	-103.64097601	2074.206						
1060 WELD		3,739.8	1060	0.0	16.1	47.91854712	-103.64114346	2079.035						
1070 WELD		3,755.9	1070	0.0	48.9	47.91853506	-103.64120667	2080.612						
1080 WELD		3,804.7	1080	0.0	48.9	47.91849860	-103.64139959	2081.565						
1090 WELD		3,853.6	1090	0.0	48.9	47.91846315	-103.64159336	2080.996						
1100 WELD		3,902.5	1100	0.0	48.9	47.91842994	-103.64178790	2079.190						
1110 WELD		3,951.4	1110	0.0	48.9	47.91839669	-103.64198234	2077.214						
1120 WELD		4,000.3	1120	0.0	48.9	47.91836318	-103.64217681	2075.014						
1130 WELD		4,049.2	1130	0.0	48.9	47.91832893	-103.64237093	2073.503						
1140 WELD		4,098.1	1140	0.0	48.9	47.91829423	-103.64256493	2071.212						
1150 WELD		4,147.0	1150	0.0	48.8	47.91825906	-103.64275891	2068.909						
1160 WELD		4,195.8	1160	0.0	48.9	47.91822439	-103.64295277	2066.611						
1170 WELD		4,244.8	1170	0.0	48.9	47.91818797	-103.64314578	2063.958						
1180 WELD		4,293.6	1180	0.0	48.9	47.91815056	-103.64333860	2061.194						
1190 WELD		4,342.5	1190	0.0	48.8	47.91811423	-103.64353205	2060.358						
1200 WELD		4,391.3	1200	0.0	48.9	47.91807873	-103.64372549	2062.463						
1210 WELD		4,440.2	1210	0.0	48.9	47.91804314	-103.64391833	2067.011						
1220 WELD		4,489.1	1220	0.0	49.0	47.91800788	-103.64411151	2070.962						
1230 WELD		4,538.1	1230	0.0	48.9	47.91797248	-103.64430506	2072.431						
1240 WELD		4,587.0	1240	0.0	48.9	47.91793771	-103.64449870	2072.547						
1250 WELD		4,635.9	1250	0.0	48.9	47.91790307	-103.64469207	2071.213						
1260 WELD		4,684.8	1260	0.0	48.9	47.91786857	-103.64488590	2069.349						
1270 WELD		4,733.7	1270	0.0	48.5	47.91783392	-103.64507973	2066.620						
1280 WELD		4,782.2	1280	0.0	48.6	47.91779924	-103.64527191	2064.392						
1290 WELD		4,830.8	1290	0.0	48.9	47.91776264	-103.64546354	2060.688						
1300 WELD		4,879.7	1300	0.0	48.9	47.91772744	-103.64565692	2058.026						
1310 WELD		4,928.6	1310	0.0	48.9	47.91769189	-103.64584993	2054.522						
1320 WELD		4,977.5	1320	0.0	48.9	47.91765442	-103.64604248	2052.472						
1330 WELD		5,026.4	1330	0.0	46.6	47.91761694	-103.64623522	2053.836						
1340 WELD		5,073.0	1340	0.0	22.3	47.91758275	-103.64641958	2054.150						
1350 WELD		5,095.3	1350	0.0	48.7	47.91756708	-103.64650800	2054.039						
1360 WELD		5,144.0	1360	0.0	48.9	47.91753276	-103.64670122	2053.269						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
1370	WELD	5,192.9	1370	0.0	48.8	47.91749911	-103.64689551	2051.977						
1380	WELD	5,241.7	1380	0.0	48.7	47.91746962	-103.64709120	2052.318						
10000012	AGM 010, Sta. 52+24, Hwy 85 -- Han #8456	5,256.6	1380	14.9	33.8	47.91746169	-103.64715110	2052.476						
11000006	WT CHANGE	5,290.4	1380	0.0	0.0	47.91744630	-103.64728748	2052.062			0.250	52000	0.72	
1390	WELD	5,290.4	1390	0.0	41.8	47.91744628	-103.64728768	2052.060						
1400	WELD	5,332.2	1400	0.0	41.9	47.91743153	-103.64745632	2047.025						
1410	WELD	5,374.1	1410	0.0	42.0	47.91741873	-103.64762663	2044.006						
1420	WELD	5,416.1	1420	0.0	42.0	47.91740842	-103.64779789	2042.452						
1430	WELD	5,458.0	1430	0.0	42.0	47.91739940	-103.64796924	2041.703						
1440	WELD	5,500.0	1440	0.0	42.0	47.91739000	-103.64814037	2042.019						
1450	WELD	5,542.0	1450	0.0	40.2	47.91737993	-103.64831128	2042.488						
1460	WELD	5,582.2	1460	0.0	42.0	47.91736905	-103.64847505	2042.142						
1470	WELD	5,624.2	1470	0.0	38.1	47.91736276	-103.64864502	2046.905						
11000007	WT CHANGE	5,662.2	1470	0.0	0.0	47.91735836	-103.64879984	2049.880			0.219	52000	0.72	
1480	WELD	5,662.3	1480	0.0	44.4	47.91735835	-103.64880004	2049.882						
1490	WELD	5,706.7	1490	0.0	48.8	47.91735216	-103.64898178	2049.231						
1500	WELD	5,755.5	1500	0.0	48.9	47.91734551	-103.64918175	2046.408						
1510	WELD	5,804.4	1510	0.0	48.9	47.91733966	-103.64938160	2043.291						
1520	WELD	5,853.3	1520	0.0	48.9	47.91733424	-103.64958190	2040.362						
1530	WELD	5,902.3	1530	0.0	47.8	47.91732952	-103.64978193	2037.830						
1540	WELD	5,950.1	1540	0.0	45.2	47.91732476	-103.64997713	2034.386						
1550	WELD	5,995.3	1550	0.0	10.0	47.91732089	-103.65016141	2029.779						
1560	WELD	6,005.2	1560	0.0	45.3	47.91732019	-103.65020207	2028.856						
1570	WELD	6,050.6	1570	0.0	48.9	47.91731671	-103.65038797	2026.698						
1580	WELD	6,099.5	1580	0.0	48.9	47.91731310	-103.65058824	2028.204						
1590	WELD	6,148.4	1590	0.0	49.0	47.91731000	-103.65078692	2034.352						
1600	WELD	6,197.4	1600	0.0	48.9	47.91730869	-103.65098609	2039.453						
1610	WELD	6,246.3	1610	0.0	48.9	47.91731113	-103.65118636	2040.267						
1620	WELD	6,295.2	1620	0.0	48.8	47.91732127	-103.65138600	2037.686						
1630	WELD	6,344.0	1630	0.0	48.9	47.91733850	-103.65158307	2031.523						
1640	WELD	6,392.9	1640	0.0	44.7	47.91736087	-103.65177802	2023.569						
11000008	WT CHANGE	6,437.6	1640	0.0	0.1	47.91738399	-103.65195536	2016.478			0.250	52000	0.72	
1650	WELD	6,437.6	1650	0.0	41.8	47.91738402	-103.65195560	2016.468						
1660	WELD	6,479.4	1660	0.0	41.9	47.91740640	-103.65211886	2007.170						
1670	WELD	6,521.3	1670	0.0	41.9	47.91743303	-103.65228419	2001.779						
1680	WELD	6,563.2	1680	0.0	42.0	47.91746222	-103.65245042	2002.064						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
1690	WELD	6,605.2	1690	0.0	42.0	47.91749060	-103.65261667	2002.805						
1700	WELD	6,647.3	1700	0.0	42.0	47.91752214	-103.65278204	2001.459						
1710	WELD	6,689.3	1710	0.0	41.9	47.91755879	-103.65294480	1999.607						
1720	WELD	6,731.2	1720	0.0	42.0	47.91759664	-103.65310746	1999.767						
11000009	WT CHANGE	6,773.1	1720	0.0	0.1	47.91763524	-103.65326853	1999.543			0.219	52000	0.72	
1730	WELD	6,773.2	1730	0.0	48.6	47.91763530	-103.65326880	1999.542						
1740	WELD	6,821.8	1740	0.0	1.0	47.91767657	-103.65345821	1999.431						
10000013	Bend left - 26 deg., 1.5D	6,822.3	1740	0.1	0.9	47.91767690	-103.65346031	1999.429	0	12:00				
1750	WELD	6,822.8	1750	0.0	36.6	47.91767699	-103.65346237	1999.429						
1760	WELD	6,859.4	1760	0.0	47.2	47.91766879	-103.65361211	1999.396						
1770	WELD	6,906.6	1770	0.0	48.9	47.91765428	-103.65380400	2000.905						
1780	WELD	6,955.5	1780	0.0	48.9	47.91763147	-103.65399988	2007.495						
1790	WELD	7,004.4	1790	0.0	48.9	47.91760510	-103.65419305	2016.296						
1800	WELD	7,053.4	1800	0.0	49.0	47.91757573	-103.65438726	2021.818						
1810	WELD	7,102.3	1810	0.0	47.9	47.91754190	-103.65458018	2027.118						
40000000	Metal Loss - EXTERNAL	7,128.5	1810	26.2	21.8	47.91752213	-103.65468260	2030.190	299	9:45	11%	0.75	0.95	1640 100%
1820	WELD	7,150.3	1820	0.0	48.9	47.91750482	-103.65476723	2032.629						
1830	WELD	7,199.2	1830	0.0	48.9	47.91746185	-103.65495687	2035.788						
1840	WELD	7,248.0	1840	0.0	48.9	47.91741336	-103.65514376	2035.794						
1850	WELD	7,296.9	1850	0.0	48.9	47.91735895	-103.65532711	2034.247						
1860	WELD	7,345.8	1860	0.0	49.0	47.91729977	-103.65550659	2031.081						
1870	WELD	7,394.8	1870	0.0	49.0	47.91723817	-103.65568491	2029.014						
1880	WELD	7,443.7	1880	0.0	48.9	47.91717605	-103.65586301	2029.000						
1890	WELD	7,492.6	1890	0.0	48.9	47.91711375	-103.65604063	2030.093						
1900	WELD	7,541.5	1900	0.0	48.9	47.91705183	-103.65621814	2032.837						
1910	WELD	7,590.4	1910	0.0	48.9	47.91698982	-103.65639539	2036.359						
1920	WELD	7,639.3	1920	0.0	48.9	47.91692776	-103.65657272	2040.152						
1930	WELD	7,688.3	1930	0.0	48.9	47.91686626	-103.65675027	2043.575						
1940	WELD	7,737.2	1940	0.0	48.9	47.91680542	-103.65692873	2044.711						
1950	WELD	7,786.1	1950	0.0	49.0	47.91674411	-103.65710753	2045.486						
1960	WELD	7,835.0	1960	0.0	48.9	47.91668150	-103.65728488	2046.476						
1970	WELD	7,883.9	1970	0.0	48.9	47.91661641	-103.65746041	2046.977						
1980	WELD	7,932.8	1980	0.0	48.8	47.91654820	-103.65763258	2045.769						
1990	WELD	7,981.6	1990	0.0	48.9	47.91647658	-103.65780180	2042.983						
2000	WELD	8,030.5	2000	0.0	21.1	47.91640342	-103.65796916	2039.269						
2010	WELD	8,051.6	2010	0.0	26.9	47.91637078	-103.65804064	2037.529						
2020	WELD	8,078.5	2020	0.0	48.5	47.91632840	-103.65813119	2035.773						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
2030	WELD	8,127.1	2030	0.0	24.8	47.91625213	-103.65829400	2032.134						
2040	WELD	8,151.9	2040	0.0	48.9	47.91621218	-103.65837652	2031.926						
2050	WELD	8,200.8	2050	0.0	48.9	47.91613440	-103.65853964	2034.626						
2060	WELD	8,249.7	2060	0.0	48.9	47.91605949	-103.65870436	2040.662						
2070	WELD	8,298.5	2070	0.0	40.2	47.91599115	-103.65887601	2044.778						
2080	WELD	8,338.7	2080	0.0	1.3	47.91593742	-103.65901969	2045.376						
10000014	Bend right - 34 deg., 3D	8,339.4	2080	0.1	1.2	47.91593678	-103.65902214	2045.371	0 12:00					
2090	WELD	8,340.0	2090	0.0	48.9	47.91593637	-103.65902487	2045.349						
2100	WELD	8,389.0	2100	0.0	48.9	47.91593795	-103.65922439	2040.893						
2110	WELD	8,437.8	2110	0.0	48.8	47.91593891	-103.65942449	2038.290						
2120	WELD	8,486.7	2120	0.0	32.8	47.91594898	-103.65962387	2035.311						
11000010	WT CHANGE	8,519.4	2120	0.0	0.1	47.91596044	-103.65975490	2030.528			0.250	52000	0.72	
2130	WELD	8,519.4	2130	0.0	41.8	47.91596047	-103.65975517	2030.514						
2140	WELD	8,561.3	2140	0.0	41.8	47.91597664	-103.65991966	2020.253						
2150	WELD	8,603.1	2150	0.0	42.0	47.91599025	-103.66008818	2014.556						
2160	WELD	8,645.1	2160	0.0	42.0	47.91600452	-103.66025807	2017.381						
2170	WELD	8,687.1	2170	0.0	41.7	47.91600634	-103.66042737	2024.108						
11000011	WT CHANGE	8,728.7	2170	0.0	0.1	47.91600485	-103.66059279	2033.357			0.219	52000	0.72	
2180	WELD	8,728.7	2180	0.0	28.3	47.91600485	-103.66059302	2033.367						
2190	WELD	8,757.1	2190	0.0	48.5	47.91600672	-103.66070775	2037.476						
2200	WELD	8,805.6	2200	0.0	48.9	47.91601281	-103.66090537	2041.347						
2210	WELD	8,854.5	2210	0.0	48.9	47.91601958	-103.66110541	2042.080						
2220	WELD	8,903.3	2220	0.0	48.9	47.91602744	-103.66130538	2041.083						
2230	WELD	8,952.2	2230	0.0	48.8	47.91603440	-103.66150535	2038.673						
2240	WELD	9,001.0	2240	0.0	48.8	47.91604031	-103.66170383	2033.320						
2250	WELD	9,049.8	2250	0.0	48.8	47.91604578	-103.66190133	2025.620						
2260	WELD	9,098.6	2260	0.0	48.8	47.91605071	-103.66209968	2019.100						
2270	WELD	9,147.4	2270	0.0	47.5	47.91605544	-103.66229991	2017.345						
2280	WELD	9,194.9	2280	0.0	48.8	47.91605942	-103.66249474	2016.108						
2290	WELD	9,243.7	2290	0.0	48.9	47.91606278	-103.66269440	2014.204						
2300	WELD	9,292.5	2300	0.0	48.8	47.91606739	-103.66289441	2013.097						
2310	WELD	9,341.3	2310	0.0	48.8	47.91607265	-103.66309431	2014.078						
2320	WELD	9,390.2	2320	0.0	48.9	47.91607724	-103.66329462	2015.078						
2330	WELD	9,439.1	2330	0.0	48.8	47.91607950	-103.66349504	2014.787						
2340	WELD	9,487.9	2340	0.0	48.8	47.91607881	-103.66369525	2014.746						
2350	WELD	9,536.7	2350	0.0	48.9	47.91607443	-103.66389554	2014.741						
2360	WELD	9,585.6	2360	0.0	7.1	47.91606193	-103.66409482	2012.840						



Pipeline Listing

TDW Services, Inc.

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Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
11000012	WT CHANGE	9,592.7	2360	0.0	0.1	47.91605938	-103.66412298	2012.287			0.250	52000	0.72	
	2370 WELD	9,592.8	2370	0.0	34.9	47.91605935	-103.66412325	2012.281						
	2380 WELD	9,627.7	2380	0.0	41.9	47.91604427	-103.66426320	2007.558						
	2390 WELD	9,669.6	2390	0.0	41.9	47.91602535	-103.66442823	1998.397						
	2400 WELD	9,711.5	2400	0.0	42.0	47.91600076	-103.66459624	1997.006						
	2410 WELD	9,753.4	2410	0.0	42.0	47.91597292	-103.66476254	2000.573						
	2420 WELD	9,795.4	2420	0.0	42.0	47.91594367	-103.66492810	2003.676						
	2430 WELD	9,837.4	2430	0.0	42.0	47.91591412	-103.66509387	2004.138						
	2440 WELD	9,879.3	2440	0.0	41.9	47.91588800	-103.66526092	2002.537						
	2450 WELD	9,921.2	2450	0.0	41.9	47.91586891	-103.66542987	1999.861						
	2460 WELD	9,963.1	2460	0.0	41.9	47.91585912	-103.66560071	1999.732						
	2470 WELD	10,005.1	2470	0.0	41.9	47.91585600	-103.66577190	2002.068						
	2480 WELD	10,047.0	2480	0.0	41.9	47.91585976	-103.66594305	2004.318						
	2490 WELD	10,088.9	2490	0.0	42.0	47.91587730	-103.66611201	2007.172						
	2500 WELD	10,130.9	2500	0.0	7.1	47.91590858	-103.66627595	2011.708						
11000013	WT CHANGE	10,137.9	2500	0.0	0.1	47.91591410	-103.66630317	2012.160			0.219	52000	0.72	
	2510 WELD	10,137.9	2510	0.0	22.1	47.91591416	-103.66630344	2012.164						
	2520 WELD	10,160.0	2520	0.0	48.6	47.91593254	-103.66638970	2013.291						
	2530 WELD	10,208.6	2530	0.0	48.7	47.91597108	-103.66658044	2015.312						
	2540 WELD	10,257.3	2540	0.0	48.8	47.91600311	-103.66677413	2017.297						
	2550 WELD	10,306.1	2550	0.0	48.8	47.91603625	-103.66696811	2018.477						
	2560 WELD	10,354.9	2560	0.0	48.8	47.91607146	-103.66716134	2019.362						
	2570 WELD	10,403.8	2570	0.0	48.4	47.91610674	-103.66735459	2019.947						
	2580 WELD	10,452.1	2580	0.0	48.8	47.91614127	-103.66754624	2020.444						
	2590 WELD	10,500.9	2590	0.0	48.8	47.91617599	-103.66773956	2021.348						
	2600 WELD	10,549.7	2600	0.0	48.8	47.91621099	-103.66793302	2021.707						
	2610 WELD	10,598.5	2610	0.0	4.7	47.91624803	-103.66812560	2022.501						
	2620 WELD	10,603.2	2620	0.0	3.0	47.91625135	-103.66814380	2022.579						
	2630 WELD	10,606.2	2630	0.0	1.4	47.91625348	-103.66815565	2022.620						
10000015	Tee on top of pipe	10,606.8	2630	0.2	1.1	47.91625396	-103.66815836	2022.628	7	12:00				
	2640 WELD	10,607.6	2640	0.0	3.0	47.91625450	-103.66816139	2022.633						
	2650 WELD	10,610.5	2650	0.0	36.8	47.91625665	-103.66817315	2022.643						
10000016	AGM 020, Sta. 106+13, Gravel Rd. -- Han #8802	10,630.8	2650	20.2	16.6	47.91627025	-103.66825370	2022.917						
	2660 WELD	10,647.3	2660	0.0	43.0	47.91627925	-103.66832034	2022.992						
11000014	WT CHANGE	10,690.3	2660	0.0	0.1	47.91629189	-103.66849469	2021.553			0.250	52000	0.72	
	2670 WELD	10,690.3	2670	0.0	41.8	47.91629190	-103.66849493	2021.551						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
2680	WELD	10,732.1	2680	0.0	41.9	47.91630058	-103.66866388	2016.401						
2690	WELD	10,774.1	2690	0.0	41.5	47.91630875	-103.66883375	2011.661						
2700	WELD	10,815.6	2700	0.0	41.9	47.91631450	-103.66900343	2012.243						
2710	WELD	10,857.5	2710	0.0	23.5	47.91632495	-103.66917373	2014.016						
11000015	WT CHANGE	10,881.0	2710	0.0	0.1	47.91633079	-103.66926927	2013.990			0.219	52000	0.72	
2720	WELD	10,881.0	2720	0.0	24.3	47.91633080	-103.66926951	2013.990						
2730	WELD	10,905.4	2730	0.0	48.0	47.91633553	-103.66936889	2014.297						
40000001	Metal Loss - EXTERNAL	10,926.1	2730	20.7	27.3	47.91633811	-103.66945387	2014.516	343	11:15	11%	0.64	0.46	1640 100%
2740	WELD	10,953.4	2740	0.0	48.6	47.91633911	-103.66956556	2015.124						
2750	WELD	11,002.0	2750	0.0	48.9	47.91633879	-103.66976487	2016.819						
2760	WELD	11,050.9	2760	0.0	48.9	47.91633889	-103.66996341	2018.443						
2770	WELD	11,099.8	2770	0.0	48.7	47.91633978	-103.67016512	2019.065						
2780	WELD	11,148.5	2780	0.0	48.9	47.91634068	-103.67036482	2018.658						
2790	WELD	11,197.4	2790	0.0	48.8	47.91634123	-103.67056508	2019.217						
2800	WELD	11,246.2	2800	0.0	48.2	47.91634152	-103.67076499	2019.914						
2810	WELD	11,294.4	2810	0.0	48.9	47.91634130	-103.67096226	2020.013						
2820	WELD	11,343.3	2820	0.0	48.8	47.91634061	-103.67116238	2020.201						
2830	WELD	11,392.0	2830	0.0	48.9	47.91633993	-103.67136230	2020.759						
2840	WELD	11,440.9	2840	0.0	48.9	47.91634024	-103.67156208	2021.479						
2850	WELD	11,489.8	2850	0.0	48.9	47.91634188	-103.67176198	2022.237						
2860	WELD	11,538.7	2860	0.0	48.8	47.91634207	-103.67196231	2023.040						
2870	WELD	11,587.5	2870	0.0	48.3	47.91634096	-103.67216231	2022.893						
2880	WELD	11,635.8	2880	0.0	47.9	47.91634051	-103.67236011	2022.354						
2890	WELD	11,683.8	2890	0.0	48.1	47.91634019	-103.67255602	2019.914						
2900	WELD	11,731.9	2900	0.0	48.2	47.91634075	-103.67275270	2017.774						
2910	WELD	11,780.1	2910	0.0	48.0	47.91634184	-103.67295050	2017.479						
2920	WELD	11,828.1	2920	0.0	47.2	47.91634167	-103.67314707	2018.600						
2930	WELD	11,875.3	2930	0.0	48.9	47.91634113	-103.67334036	2018.731						
2940	WELD	11,924.2	2940	0.0	48.9	47.91634038	-103.67354039	2018.688						
2950	WELD	11,973.1	2950	0.0	48.9	47.91633952	-103.67374064	2017.470						
2960	WELD	12,022.0	2960	0.0	48.9	47.91633915	-103.67394085	2017.741						
2970	WELD	12,070.8	2970	0.0	49.0	47.91633914	-103.67414087	2019.916						
2980	WELD	12,119.8	2980	0.0	39.2	47.91633993	-103.67434092	2022.319						
2990	WELD	12,159.0	2990	0.0	8.4	47.91634135	-103.67450144	2023.556						
3000	WELD	12,167.4	3000	0.0	48.9	47.91634158	-103.67453593	2023.906						
3010	WELD	12,216.3	3010	0.0	48.9	47.91634301	-103.67473579	2025.633						
3020	WELD	12,265.3	3020	0.0	48.9	47.91634477	-103.67493599	2026.313						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
3030 WELD		12,314.1	3030	0.0	48.9	47.91634513	-103.67513624	2026.043						
3040 WELD		12,363.0	3040	0.0	48.9	47.91634306	-103.67533641	2026.192						
40000002 Metal Loss - INTERNAL		12,392.0	3040	29.0	19.9	47.91634184	-103.67545519	2027.380	13	12:15	13%	1.24	2.06	1640 100%
3050 WELD		12,411.9	3050	0.0	48.9	47.91634117	-103.67553651	2028.296						
3060 WELD		12,460.8	3060	0.0	48.9	47.91634053	-103.67573668	2028.774						
3070 WELD		12,509.6	3070	0.0	48.9	47.91634041	-103.67593665	2029.466						
3080 WELD		12,558.5	3080	0.0	48.9	47.91634063	-103.67613657	2029.987						
3090 WELD		12,607.4	3090	0.0	48.9	47.91634082	-103.67633709	2030.668						
3100 WELD		12,656.2	3100	0.0	48.9	47.91634043	-103.67653687	2031.326						
3110 WELD		12,705.1	3110	0.0	48.8	47.91633978	-103.67673666	2032.460						
3120 WELD		12,754.0	3120	0.0	48.9	47.91633942	-103.67693679	2033.155						
3130 WELD		12,802.9	3130	0.0	48.9	47.91634014	-103.67713705	2033.196						
3140 WELD		12,851.8	3140	0.0	48.6	47.91634041	-103.67733729	2033.319						
3150 WELD		12,900.4	3150	0.0	48.8	47.91634044	-103.67753632	2033.692						
3160 WELD		12,949.3	3160	0.0	48.7	47.91634027	-103.67773640	2034.388						
3170 WELD		12,998.0	3170	0.0	48.8	47.91634008	-103.67793647	2035.459						
3180 WELD		13,046.8	3180	0.0	48.7	47.91633997	-103.67813644	2036.517						
3190 WELD		13,095.5	3190	0.0	48.7	47.91634039	-103.67833616	2036.767						
3200 WELD		13,144.2	3200	0.0	48.9	47.91634044	-103.67853603	2036.604						
3210 WELD		13,193.2	3210	0.0	48.9	47.91633962	-103.67873667	2036.383						
3220 WELD		13,242.0	3220	0.0	48.6	47.91633976	-103.67893682	2035.729						
40000003 Metal Loss - EXTERNAL		13,285.2	3220	43.1	5.5	47.91633944	-103.67911384	2035.430	175	5:45	11%	1.39	0.55	1640 100%
40000004 Metal Loss - EXTERNAL		13,285.4	3220	43.3	5.3	47.91633944	-103.67911448	2035.431	149	4:45	13%	0.95	1.19	1640 100%
3230 WELD		13,290.7	3230	0.0	48.8	47.91633937	-103.67913615	2035.467						
3240 WELD		13,339.4	3240	0.0	48.8	47.91633791	-103.67933579	2034.432						
3250 WELD		13,388.3	3250	0.0	48.8	47.91633701	-103.67953584	2031.819						
3260 WELD		13,437.1	3260	0.0	48.8	47.91633721	-103.67973546	2028.495						
3270 WELD		13,485.9	3270	0.0	48.9	47.91633849	-103.67993542	2026.252						
3280 WELD		13,534.8	3280	0.0	48.9	47.91633966	-103.68013565	2025.368						
3290 WELD		13,583.6	3290	0.0	48.8	47.91633996	-103.68033590	2025.023						
3300 WELD		13,632.5	3300	0.0	48.9	47.91634011	-103.68053605	2025.180						
3310 WELD		13,681.3	3310	0.0	48.8	47.91634050	-103.68073626	2025.260						
3320 WELD		13,730.2	3320	0.0	48.8	47.91634053	-103.68093610	2025.303						
3330 WELD		13,779.0	3330	0.0	48.9	47.91634054	-103.68113646	2025.479						
3340 WELD		13,827.9	3340	0.0	48.9	47.91634046	-103.68133649	2025.642						
3350 WELD		13,876.8	3350	0.0	48.8	47.91634064	-103.68153693	2025.903						
3360 WELD		13,925.6	3360	0.0	48.9	47.91634092	-103.68173682	2026.099						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
3370	WELD	13,974.5	3370	0.0	48.7	47.91634129	-103.68193705	2026.251						
3380	WELD	14,023.2	3380	0.0	48.8	47.91634138	-103.68213671	2026.495						
3390	WELD	14,072.0	3390	0.0	48.9	47.91634139	-103.68233669	2026.673						
3400	WELD	14,121.0	3400	0.0	48.9	47.91634173	-103.68253679	2026.905						
3410	WELD	14,169.8	3410	0.0	48.9	47.91634190	-103.68273701	2027.222						
3420	WELD	14,218.7	3420	0.0	48.9	47.91634191	-103.68293713	2027.520						
3430	WELD	14,267.5	3430	0.0	48.9	47.91634191	-103.68313731	2027.950						
3440	WELD	14,316.4	3440	0.0	48.8	47.91634197	-103.68333732	2028.208						
3450	WELD	14,365.3	3450	0.0	48.5	47.91634150	-103.68353740	2028.713						
3460	WELD	14,413.8	3460	0.0	48.9	47.91634143	-103.68373637	2029.219						
3470	WELD	14,462.7	3470	0.0	47.5	47.91634197	-103.68393626	2030.471						
3480	WELD	14,510.1	3480	0.0	48.9	47.91634259	-103.68413038	2030.738						
3490	WELD	14,559.0	3490	0.0	48.9	47.91634300	-103.68433079	2031.331						
3500	WELD	14,607.9	3500	0.0	48.9	47.91634408	-103.68453092	2032.485						
3510	WELD	14,656.9	3510	0.0	48.9	47.91634501	-103.68473105	2033.039						
3520	WELD	14,705.7	3520	0.0	48.9	47.91634587	-103.68493095	2034.510						
3530	WELD	14,754.7	3530	0.0	48.9	47.91634648	-103.68513083	2037.203						
3540	WELD	14,803.5	3540	0.0	48.9	47.91634670	-103.68533078	2039.302						
3550	WELD	14,852.5	3550	0.0	48.9	47.91634584	-103.68553081	2040.855						
3560	WELD	14,901.4	3560	0.0	48.9	47.91634466	-103.68573092	2042.075						
3570	WELD	14,950.3	3570	0.0	48.9	47.91634362	-103.68593087	2042.888						
3580	WELD	14,999.2	3580	0.0	48.9	47.91634370	-103.68613082	2043.243						
3590	WELD	15,048.1	3590	0.0	48.9	47.91634476	-103.68633087	2042.316						
3600	WELD	15,097.0	3600	0.0	48.9	47.91634563	-103.68653074	2040.254						
3610	WELD	15,145.9	3610	0.0	48.9	47.91634602	-103.68673076	2039.467						
3620	WELD	15,194.7	3620	0.0	48.9	47.91634609	-103.68693089	2040.181						
3630	WELD	15,243.7	3630	0.0	48.9	47.91634595	-103.68713097	2041.429						
3640	WELD	15,292.6	3640	0.0	48.9	47.91634544	-103.68733105	2042.496						
3650	WELD	15,341.5	3650	0.0	48.9	47.91634543	-103.68753099	2043.586						
3660	WELD	15,390.5	3660	0.0	48.9	47.91634542	-103.68773126	2045.065						
3670	WELD	15,439.3	3670	0.0	48.6	47.91634593	-103.68793136	2047.111						
3680	WELD	15,487.9	3680	0.0	48.9	47.91634633	-103.68813027	2048.938						
3690	WELD	15,536.8	3690	0.0	48.9	47.91634610	-103.68833060	2050.523						
3700	WELD	15,585.7	3700	0.0	48.9	47.91634573	-103.68853071	2051.697						
3710	WELD	15,634.6	3710	0.0	48.9	47.91634598	-103.68873075	2052.014						
3720	WELD	15,683.5	3720	0.0	48.9	47.91634694	-103.68893089	2051.595						
3730	WELD	15,732.4	3730	0.0	48.9	47.91634738	-103.68913107	2051.537						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
3740	WELD	15,781.3	3740	0.0	48.9	47.91634777	-103.68933108	2052.526						
3750	WELD	15,830.1	3750	0.0	48.5	47.91634833	-103.68953113	2054.693						
3760	WELD	15,878.6	3760	0.0	12.6	47.91634818	-103.68972923	2056.119						
3770	WELD	15,891.2	3770	0.0	48.4	47.91634843	-103.68978061	2056.147						
3780	WELD	15,939.5	3780	0.0	48.4	47.91635163	-103.68997879	2056.533						
10000017	Bend right - 12 deg., 65D	15,968.3	3780	23.0	25.4	47.91635817	-103.69009574	2056.247	0	12:00				
3790	WELD	15,988.0	3790	0.0	48.4	47.91637574	-103.69017166	2055.430						
10000018	AGM 030, Sta. 159+98, ROW -- Han #8456	16,002.8	3790	14.8	33.5	47.91639157	-103.69022770	2054.892						
3800	WELD	16,036.3	3800	0.0	48.4	47.91643113	-103.69035164	2053.976						
3810	WELD	16,084.7	3810	0.0	48.5	47.91649419	-103.69052565	2053.351						
40000005	Metal Loss - EXTERNAL	16,112.5	3810	27.7	20.8	47.91653253	-103.69062361	2054.784	233	7:45	13%	0.95	0.79	1640 100%
3820	WELD	16,133.2	3820	0.0	48.7	47.91656138	-103.69069650	2056.377						
3830	WELD	16,181.9	3830	0.0	48.8	47.91663050	-103.69086704	2059.112						
3840	WELD	16,230.7	3840	0.0	48.9	47.91670068	-103.69103764	2060.372						
3850	WELD	16,279.6	3850	0.0	48.9	47.91677019	-103.69120883	2061.979						
3860	WELD	16,328.5	3860	0.0	48.9	47.91683977	-103.69138014	2061.912						
3870	WELD	16,377.4	3870	0.0	48.3	47.91691003	-103.69155092	2062.202						
3880	WELD	16,425.7	3880	0.0	48.9	47.91697958	-103.69171894	2063.234						
3890	WELD	16,474.6	3890	0.0	48.9	47.91704969	-103.69188954	2064.547						
3900	WELD	16,523.5	3900	0.0	48.9	47.91711945	-103.69206073	2065.851						
3910	WELD	16,572.4	3910	0.0	48.9	47.91718881	-103.69223219	2067.307						
3920	WELD	16,621.3	3920	0.0	48.9	47.91725811	-103.69240360	2068.459						
3930	WELD	16,670.2	3930	0.0	48.9	47.91732784	-103.69257454	2069.583						
3940	WELD	16,719.1	3940	0.0	48.9	47.91739808	-103.69274513	2070.993						
3950	WELD	16,768.0	3950	0.0	48.9	47.91746862	-103.69291554	2072.135						
3960	WELD	16,816.9	3960	0.0	48.9	47.91753843	-103.69308614	2074.329						
3970	WELD	16,865.8	3970	0.0	48.7	47.91760866	-103.69325650	2076.545						
3980	WELD	16,914.6	3980	0.0	3.6	47.91767735	-103.69342771	2077.216						
3990	WELD	16,918.2	3990	0.0	48.6	47.91768228	-103.69344064	2077.191						
4000	WELD	16,966.8	4000	0.0	48.5	47.91774464	-103.69361668	2077.535						
4010	WELD	17,015.3	4010	0.0	48.7	47.91780031	-103.69379669	2080.165						
4020	WELD	17,064.0	4020	0.0	48.7	47.91784487	-103.69398436	2083.806						
4030	WELD	17,112.7	4030	0.0	47.9	47.91788131	-103.69417563	2086.387						
4040	WELD	17,160.6	4040	0.0	48.5	47.91791436	-103.69436529	2085.214						
4050	WELD	17,209.1	4050	0.0	47.4	47.91794984	-103.69455582	2081.397						
4060	WELD	17,256.4	4060	0.0	6.0	47.91798474	-103.69474152	2076.722						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC

Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
4070 WELD		17,262.4	4070	0.0	45.8	47.91798908	-103.69476507	2076.211						
4080 WELD		17,308.2	4080	0.0	47.0	47.91802292	-103.69494549	2075.150						
4090 WELD		17,355.3	4090	0.0	48.9	47.91805622	-103.69513127	2076.719						
4100 WELD		17,404.2	4100	0.0	48.9	47.91809153	-103.69532454	2077.723						
4110 WELD		17,453.1	4110	0.0	48.9	47.91812683	-103.69551734	2078.775						
4120 WELD		17,502.0	4120	0.0	48.9	47.91816192	-103.69571038	2081.549						
4130 WELD		17,550.9	4130	0.0	48.9	47.91819729	-103.69590214	2086.696						
4140 WELD		17,599.8	4140	0.0	48.9	47.91823462	-103.69609377	2089.851						
4150 WELD		17,648.7	4150	0.0	48.9	47.91827451	-103.69628478	2091.535						
4160 WELD		17,697.6	4160	0.0	48.9	47.91831667	-103.69647456	2094.064						
4170 WELD		17,746.5	4170	0.0	48.9	47.91836047	-103.69666361	2096.103						
4180 WELD		17,795.4	4180	0.0	48.9	47.91840508	-103.69685220	2097.910						
4190 WELD		17,844.3	4190	0.0	48.9	47.91844920	-103.69704109	2100.170						
4200 WELD		17,893.2	4200	0.0	48.9	47.91849352	-103.69722961	2102.732						
4210 WELD		17,942.1	4210	0.0	48.9	47.91853846	-103.69741793	2105.450						
4220 WELD		17,991.0	4220	0.0	48.9	47.91858714	-103.69760432	2107.386						
4230 WELD		18,039.8	4230	0.0	48.9	47.91863995	-103.69778798	2108.600						
4240 WELD		18,088.8	4240	0.0	48.9	47.91869480	-103.69797068	2109.277						
4250 WELD		18,137.6	4250	0.0	48.9	47.91874981	-103.69815320	2110.194						
4260 WELD		18,186.5	4260	0.0	48.9	47.91880468	-103.69833565	2111.323						
4270 WELD		18,235.4	4270	0.0	48.9	47.91886010	-103.69851805	2111.836						
4280 WELD		18,284.4	4280	0.0	48.9	47.91891579	-103.69870015	2112.094						
4290 WELD		18,333.3	4290	0.0	48.8	47.91897062	-103.69888317	2112.712						
4300 WELD		18,382.0	4300	0.0	48.9	47.91902497	-103.69906565	2114.123						
4310 WELD		18,430.9	4310	0.0	48.9	47.91907962	-103.69924840	2115.239						
4320 WELD		18,479.8	4320	0.0	48.9	47.91913465	-103.69943080	2114.676						
4330 WELD		18,528.7	4330	0.0	49.0	47.91918971	-103.69961360	2113.848						
4340 WELD		18,577.7	4340	0.0	48.9	47.91924422	-103.69979631	2114.692						
4350 WELD		18,626.6	4350	0.0	48.9	47.91929911	-103.69997915	2115.588						
4360 WELD		18,675.5	4360	0.0	48.6	47.91935464	-103.70016135	2115.796						
4370 WELD		18,724.1	4370	0.0	48.9	47.91940880	-103.70034314	2116.767						
4380 WELD		18,773.0	4380	0.0	48.9	47.91946317	-103.70052611	2117.933						
4390 WELD		18,821.9	4390	0.0	48.9	47.91951790	-103.70070894	2118.250						
4400 WELD		18,870.7	4400	0.0	48.9	47.91957280	-103.70089166	2119.735						
4410 WELD		18,919.6	4410	0.0	48.9	47.91962735	-103.70107430	2121.153						
4420 WELD		18,968.5	4420	0.0	48.8	47.91968163	-103.70125715	2123.351						
4430 WELD		19,017.3	4430	0.0	48.8	47.91973642	-103.70144007	2124.483						



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4440	WELD	19,066.2	4440	0.0	48.8	47.91979112	-103.70162244	2126.804						
4450	WELD	19,115.0	4450	0.0	48.9	47.91984580	-103.70180520	2128.866						
4460	WELD	19,163.8	4460	0.0	48.9	47.91990063	-103.70198773	2129.556						
4470	WELD	19,212.7	4470	0.0	47.6	47.91995778	-103.70216873	2129.810						
4480	WELD	19,260.3	4480	0.0	41.8	47.92001862	-103.70234132	2129.629						
4490	WELD	19,302.1	4490	0.0	35.5	47.92006887	-103.70249508	2131.177						
4500	WELD	19,337.6	4500	0.0	44.6	47.92010853	-103.70262773	2133.048						
4510	WELD	19,382.1	4510	0.0	48.6	47.92014971	-103.70279902	2135.637						
4520	WELD	19,430.8	4520	0.0	48.3	47.92018675	-103.70299010	2137.763						
4530	WELD	19,479.1	4530	0.0	48.7	47.92022337	-103.70318021	2140.077						
4540	WELD	19,527.8	4540	0.0	48.9	47.92026095	-103.70337157	2142.171						
4550	WELD	19,576.6	4550	0.0	48.8	47.92029853	-103.70356384	2143.621						
4560	WELD	19,625.5	4560	0.0	48.9	47.92033580	-103.70375603	2145.242						
4570	WELD	19,674.4	4570	0.0	48.8	47.92037325	-103.70394809	2145.919						
4580	WELD	19,723.2	4580	0.0	48.9	47.92041177	-103.70413993	2146.684						
4590	WELD	19,772.1	4590	0.0	48.9	47.92044998	-103.70433140	2149.154						
4600	WELD	19,821.0	4600	0.0	48.9	47.92048773	-103.70452356	2150.282						
4610	WELD	19,869.9	4610	0.0	37.1	47.92052599	-103.70471546	2149.181						
4620	WELD	19,907.1	4620	0.0	15.8	47.92055509	-103.70486145	2148.902						
4630	WELD	19,922.9	4630	0.0	44.2	47.92056737	-103.70492351	2149.396						
4640	WELD	19,967.0	4640	0.0	48.8	47.92060111	-103.70509703	2151.664						
4650	WELD	20,015.9	4650	0.0	48.9	47.92063755	-103.70528952	2152.514						
4660	WELD	20,064.7	4660	0.0	48.9	47.92067472	-103.70548216	2152.482						
4670	WELD	20,113.7	4670	0.0	48.9	47.92071107	-103.70567502	2152.564						
4680	WELD	20,162.5	4680	0.0	48.8	47.92074736	-103.70586797	2152.118						
4690	WELD	20,211.3	4690	0.0	48.8	47.92078433	-103.70606039	2151.742						
4700	WELD	20,260.2	4700	0.0	48.9	47.92082198	-103.70625255	2151.132						
4710	WELD	20,309.0	4710	0.0	48.8	47.92085920	-103.70644500	2150.901						
4720	WELD	20,357.9	4720	0.0	48.9	47.92089552	-103.70663772	2150.246						
4730	WELD	20,406.7	4730	0.0	48.8	47.92093234	-103.70683016	2148.478						
4740	WELD	20,455.5	4740	0.0	48.9	47.92096984	-103.70702201	2145.444						
4750	WELD	20,504.4	4750	0.0	48.9	47.92100821	-103.70721346	2142.115						
4760	WELD	20,553.3	4760	0.0	48.9	47.92104675	-103.70740471	2138.955						
4770	WELD	20,602.2	4770	0.0	48.9	47.92108392	-103.70759660	2135.290						
4780	WELD	20,651.1	4780	0.0	48.9	47.92112113	-103.70778874	2132.399						
4790	WELD	20,699.9	4790	0.0	48.8	47.92115873	-103.70798015	2128.899						
4800	WELD	20,748.7	4800	0.0	48.9	47.92119700	-103.70817184	2126.238						

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
4810	WELD	20,797.6	4810	0.0	48.8	47.92123451	-103.70836401	2125.689						
4820	WELD	20,846.4	4820	0.0	48.9	47.92127124	-103.70855673	2126.031						
4830	WELD	20,895.3	4830	0.0	48.9	47.92130742	-103.70874942	2127.579						
4840	WELD	20,944.1	4840	0.0	48.9	47.92134386	-103.70894190	2128.618						
4850	WELD	20,993.0	4850	0.0	48.9	47.92138081	-103.70913416	2129.141						
4860	WELD	21,041.9	4860	0.0	48.8	47.92141792	-103.70932672	2129.568						
4870	WELD	21,090.8	4870	0.0	48.8	47.92145485	-103.70951925	2129.011						
4880	WELD	21,139.6	4880	0.0	48.8	47.92149186	-103.70971126	2126.020						
4890	WELD	21,188.4	4890	0.0	48.9	47.92152834	-103.70990355	2123.279						
4900	WELD	21,237.3	4900	0.0	48.8	47.92156503	-103.71009630	2121.646						
4910	WELD	21,286.0	4910	0.0	48.8	47.92160280	-103.71028804	2120.029						
4920	WELD	21,334.9	4920	0.0	48.8	47.92164089	-103.71047982	2118.378						
4930	WELD	21,383.7	4930	0.0	48.9	47.92167858	-103.71067200	2117.783						
4940	WELD	21,432.5	4940	0.0	48.9	47.92171574	-103.71086437	2118.200						
4950	WELD	21,481.4	4950	0.0	47.6	47.92175308	-103.71105642	2119.109						
4960	WELD	21,529.0	4960	0.0	46.8	47.92179041	-103.71124366	2118.881						
4970	WELD	21,575.8	4970	0.0	26.3	47.92182860	-103.71142694	2118.279						
11000016	WT CHANGE	21,602.0	4970	0.0	0.1	47.92184952	-103.71152983	2117.873			0.250	52000	0.72	
4980	WELD	21,602.1	4980	0.0	41.7	47.92184957	-103.71153010	2117.872						
4990	WELD	21,643.7	4990	0.0	42.0	47.92187944	-103.71169395	2114.317						
5000	WELD	21,685.7	5000	0.0	41.9	47.92191100	-103.71185927	2113.054						
5010	WELD	21,727.6	5010	0.0	41.9	47.92194159	-103.71202433	2114.631						
5020	WELD	21,769.6	5020	0.0	41.9	47.92197877	-103.71218652	2116.700						
10000019	AGM 040, Sta. 217+54, 146th Ave. NW -- Han #8836	21,781.8	5020	12.2	29.7	47.92198823	-103.71223430	2116.816						
11000017	WT CHANGE	21,811.4	5020	0.0	0.1	47.92201044	-103.71235132	2116.159			0.219	52000	0.72	
5030	WELD	21,811.5	5030	0.0	40.3	47.92201049	-103.71235155	2116.157						
5040	WELD	21,851.8	5040	0.0	48.8	47.92204059	-103.71251090	2114.943						
5050	WELD	21,900.6	5050	0.0	48.8	47.92207766	-103.71270315	2113.153						
5060	WELD	21,949.4	5060	0.0	48.9	47.92211519	-103.71289505	2111.670						
5070	WELD	21,998.3	5070	0.0	48.8	47.92215202	-103.71308764	2110.287						
5080	WELD	22,047.1	5080	0.0	48.8	47.92218878	-103.71327994	2111.324						
5090	WELD	22,095.9	5090	0.0	48.5	47.92222533	-103.71347257	2111.949						
5100	WELD	22,144.4	5100	0.0	48.7	47.92226164	-103.71366392	2112.084						
5110	WELD	22,193.1	5110	0.0	48.8	47.92229892	-103.71385606	2112.018						
5120	WELD	22,242.0	5120	0.0	48.8	47.92233614	-103.71404839	2111.699						



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5130	WELD	22,290.8	5130	0.0	48.8	47.92237308	-103.71424089	2111.472							
5140	WELD	22,339.6	5140	0.0	48.8	47.92241045	-103.71443309	2111.415							
5150	WELD	22,388.4	5150	0.0	48.9	47.92244802	-103.71462516	2110.912							
5160	WELD	22,437.3	5160	0.0	48.9	47.92248606	-103.71481707	2110.509							
5170	WELD	22,486.2	5170	0.0	48.9	47.92252344	-103.71500943	2110.491							
5180	WELD	22,535.0	5180	0.0	48.8	47.92256018	-103.71520209	2110.495							
5190	WELD	22,583.8	5190	0.0	48.9	47.92259746	-103.71539423	2109.834							
5200	WELD	22,632.7	5200	0.0	48.9	47.92263411	-103.71558688	2108.331							
40000006	Metal Loss - EXTERNAL	22,660.8	5200	28.0	20.8	47.92265528	-103.71569758	2108.083	166	5:30	13%	0.63	0.50	1640	100%
5210	WELD	22,681.6	5210	0.0	48.9	47.92267104	-103.71577957	2108.084							
5220	WELD	22,730.4	5220	0.0	48.8	47.92270886	-103.71597160	2108.606							
5230	WELD	22,779.3	5230	0.0	48.8	47.92274646	-103.71616373	2107.515							
5240	WELD	22,828.1	5240	0.0	48.8	47.92278338	-103.71635618	2107.444							
5250	WELD	22,876.9	5250	0.0	48.8	47.92282024	-103.71654837	2109.096							
5260	WELD	22,925.7	5260	0.0	44.1	47.92285759	-103.71674060	2110.101							
5270	WELD	22,969.8	5270	0.0	33.3	47.92289361	-103.71691297	2110.816							
11000018	WT CHANGE	23,003.0	5270	0.0	0.1	47.92292144	-103.71704262	2111.935			0.250	52000	0.72		
5280	WELD	23,003.1	5280	0.0	41.8	47.92292149	-103.71704285	2111.937							
5290	WELD	23,044.9	5290	0.0	41.9	47.92295659	-103.71720593	2111.531							
5300	WELD	23,086.8	5300	0.0	42.0	47.92299259	-103.71736792	2107.260							
5310	WELD	23,128.8	5310	0.0	42.0	47.92302952	-103.71753037	2107.208							
5320	WELD	23,170.7	5320	0.0	36.4	47.92307106	-103.71768997	2109.557							
11000019	WT CHANGE	23,207.0	5320	0.0	0.0	47.92310850	-103.71782781	2109.721			0.219	52000	0.72		
5330	WELD	23,207.1	5330	0.0	6.0	47.92310855	-103.71782799	2109.721							
5340	WELD	23,213.1	5340	0.0	48.6	47.92311440	-103.71785108	2109.766							
5350	WELD	23,261.7	5350	0.0	48.7	47.92316210	-103.71803777	2110.647							
5360	WELD	23,310.4	5360	0.0	48.8	47.92320931	-103.71822520	2111.831							
5370	WELD	23,359.2	5370	0.0	48.9	47.92325332	-103.71841416	2113.314							
5380	WELD	23,408.1	5380	0.0	48.8	47.92329419	-103.71860480	2114.930							
5390	WELD	23,456.9	5390	0.0	48.9	47.92333138	-103.71879705	2116.016							
5400	WELD	23,505.7	5400	0.0	48.8	47.92336620	-103.71899049	2116.581							
5410	WELD	23,554.5	5410	0.0	48.7	47.92339890	-103.71918495	2116.871							
5420	WELD	23,603.3	5420	0.0	48.8	47.92343061	-103.71937933	2118.062							
5430	WELD	23,652.0	5430	0.0	48.7	47.92346216	-103.71957380	2119.743							
5440	WELD	23,700.8	5440	0.0	48.7	47.92349492	-103.71976777	2121.162							
5450	WELD	23,749.5	5450	0.0	48.6	47.92352723	-103.71996196	2122.443							
5460	WELD	23,798.1	5460	0.0	48.9	47.92355864	-103.72015618	2123.703							



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5470	WELD	23,846.9	5470	0.0	48.6	47.92359076	-103.72035057	2125.687						
5480	WELD	23,895.5	5480	0.0	43.8	47.92362093	-103.72054421	2127.440						
5490	WELD	23,939.3	5490	0.0	48.6	47.92364553	-103.72071959	2129.836						
5500	WELD	23,987.9	5500	0.0	48.8	47.92367456	-103.72091378	2132.100						
5510	WELD	24,036.7	5510	0.0	48.9	47.92370907	-103.72110668	2135.450						
5520	WELD	24,085.6	5520	0.0	47.6	47.92374549	-103.72129855	2139.123						
5530	WELD	24,133.1	5530	0.0	6.0	47.92378245	-103.72148558	2140.652						
5540	WELD	24,139.1	5540	0.0	48.1	47.92378694	-103.72150917	2140.844						
5550	WELD	24,187.2	5550	0.0	48.1	47.92382191	-103.72169943	2142.786						
5560	WELD	24,235.4	5560	0.0	48.8	47.92385563	-103.72189052	2143.521						
40000007	Metal Loss - EXTERNAL	24,256.2	5560	20.7	28.1	47.92387019	-103.72197275	2143.740	186	6:00	12%	1.48	2.28	1640 100%
5570	WELD	24,284.2	5570	0.0	48.8	47.92389119	-103.72208342	2143.256						
5580	WELD	24,333.0	5580	0.0	48.9	47.92392746	-103.72227630	2143.149						
5590	WELD	24,381.9	5590	0.0	48.9	47.92396402	-103.72246859	2146.569						
5600	WELD	24,430.8	5600	0.0	48.8	47.92400022	-103.72266084	2150.592						
5610	WELD	24,479.6	5610	0.0	48.8	47.92403576	-103.72285346	2154.069						
5620	WELD	24,528.4	5620	0.0	48.8	47.92407139	-103.72304587	2157.918						
5630	WELD	24,577.2	5630	0.0	48.8	47.92410787	-103.72323715	2163.120						
5640	WELD	24,626.0	5640	0.0	48.8	47.92414521	-103.72342805	2168.995						
5650	WELD	24,674.8	5650	0.0	48.8	47.92418174	-103.72361917	2175.524						
5660	WELD	24,723.6	5660	0.0	48.9	47.92422143	-103.72380862	2181.221						
5670	WELD	24,772.5	5670	0.0	48.7	47.92427667	-103.72398998	2184.835						
5680	WELD	24,821.2	5680	0.0	48.7	47.92433874	-103.72416606	2190.839						
5690	WELD	24,869.9	5690	0.0	1.7	47.92440270	-103.72433950	2196.190						
10000020	Bend left - 42 deg., 3D	24,870.8	5690	0.1	1.6	47.92440347	-103.72434266	2196.290	0	12:00				
5700	WELD	24,871.6	5700	0.0	43.5	47.92440367	-103.72434598	2196.367						
5710	WELD	24,915.1	5710	0.0	48.3	47.92437811	-103.72452040	2198.424						
5720	WELD	24,963.4	5720	0.0	48.7	47.92435046	-103.72471415	2199.624						
5730	WELD	25,012.2	5730	0.0	48.8	47.92432608	-103.72491076	2199.600						
5740	WELD	25,061.0	5740	0.0	48.8	47.92431739	-103.72510971	2199.950						
5750	WELD	25,109.8	5750	0.0	48.8	47.92431676	-103.72530994	2200.285						
5760	WELD	25,158.5	5760	0.0	48.8	47.92431658	-103.72550974	2201.145						
5770	WELD	25,207.3	5770	0.0	48.6	47.92431972	-103.72570984	2202.264						
5780	WELD	25,256.0	5780	0.0	32.9	47.92432588	-103.72590874	2203.247						
5790	WELD	25,288.9	5790	0.0	8.5	47.92433830	-103.72604183	2202.976						
5800	WELD	25,297.4	5800	0.0	0.9	47.92434258	-103.72607628	2202.866						
10000021	Bend right - 24 deg., 1.5D	25,297.9	5800	0.1	0.9	47.92434293	-103.72607805	2202.860	0	12:00				



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
5810	WELD	25,298.4	5810	0.0	15.1	47.92434336	-103.72607991	2202.852						
5820	WELD	25,313.4	5820	0.0	9.2	47.92436605	-103.72613138	2202.266						
5830	WELD	25,322.7	5830	0.0	48.6	47.92438144	-103.72616175	2201.881						
5840	WELD	25,371.2	5840	0.0	48.7	47.92447193	-103.72630815	2199.372						
5850	WELD	25,419.9	5850	0.0	48.8	47.92457717	-103.72643171	2198.451						
5860	WELD	25,468.7	5860	0.0	48.8	47.92468486	-103.72655189	2197.429						
5870	WELD	25,517.5	5870	0.0	48.9	47.92479099	-103.72667469	2197.723						
5880	WELD	25,566.4	5880	0.0	48.8	47.92489671	-103.72679829	2200.378						
5890	WELD	25,615.2	5890	0.0	48.8	47.92500192	-103.72692244	2203.634						
5900	WELD	25,664.0	5900	0.0	48.9	47.92510725	-103.72704646	2205.768						
5910	WELD	25,712.9	5910	0.0	48.9	47.92521293	-103.72717024	2206.717						
5920	WELD	25,761.7	5920	0.0	48.9	47.92531893	-103.72729374	2207.434						
5930	WELD	25,810.6	5930	0.0	48.9	47.92542472	-103.72741706	2208.404						
5940	WELD	25,859.5	5940	0.0	48.8	47.92553109	-103.72753978	2208.406						
5950	WELD	25,908.2	5950	0.0	48.8	47.92563720	-103.72766292	2207.529						
5960	WELD	25,957.0	5960	0.0	47.7	47.92574326	-103.72778584	2206.057						
5970	WELD	26,004.8	5970	0.0	24.2	47.92584722	-103.72790540	2204.079						
5980	WELD	26,029.0	5980	0.0	44.5	47.92590050	-103.72796535	2203.517						
5990	WELD	26,073.5	5990	0.0	48.4	47.92599888	-103.72807350	2206.685						
6000	WELD	26,121.9	6000	0.0	48.2	47.92610934	-103.72818411	2210.318						
6010	WELD	26,170.1	6010	0.0	48.3	47.92622074	-103.72829196	2212.767						
6020	WELD	26,218.4	6020	0.0	1.2	47.92633144	-103.72840033	2215.956						
1000022	Bend left - 34 deg., 3D	26,219.0	6020	0.0	1.2	47.92633279	-103.72840203	2215.989	0	12:00				
6030	WELD	26,219.7	6030	0.0	45.1	47.92633397	-103.72840404	2216.005						
6040	WELD	26,264.8	6040	0.0	48.2	47.92638705	-103.72857107	2215.688						
6050	WELD	26,312.9	6050	0.0	46.3	47.92644093	-103.72875145	2213.057						
6060	WELD	26,359.3	6060	0.0	48.4	47.92649288	-103.72892496	2211.290						
6070	WELD	26,407.6	6070	0.0	48.6	47.92654856	-103.72910515	2211.669						
6080	WELD	26,456.2	6080	0.0	48.6	47.92660801	-103.72928299	2207.828						
6090	WELD	26,504.8	6090	0.0	48.7	47.92667006	-103.72945903	2204.311						
6100	WELD	26,553.5	6100	0.0	48.5	47.92673086	-103.72963700	2202.362						
6110	WELD	26,602.0	6110	0.0	48.8	47.92679001	-103.72981520	2199.671						
6120	WELD	26,650.8	6120	0.0	48.6	47.92685164	-103.72999297	2201.406						
6130	WELD	26,699.4	6130	0.0	26.9	47.92691514	-103.73016703	2206.865						
6140	WELD	26,726.4	6140	0.0	48.8	47.92695073	-103.73026373	2208.888						
6150	WELD	26,775.1	6150	0.0	48.8	47.92701467	-103.73043942	2210.736						
6160	WELD	26,824.0	6160	0.0	48.8	47.92707763	-103.73061648	2212.193						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
6170	WELD	26,872.8	6170	0.0	48.9	47.92714031	-103.73079356	2212.432						
6180	WELD	26,921.6	6180	0.0	48.8	47.92720298	-103.73097059	2212.799						
6190	WELD	26,970.4	6190	0.0	48.8	47.92726531	-103.73114802	2212.518						
6200	WELD	27,019.2	6200	0.0	48.8	47.92732735	-103.73132557	2212.068						
6210	WELD	27,068.0	6210	0.0	48.9	47.92738884	-103.73150340	2211.821						
6220	WELD	27,116.9	6220	0.0	47.0	47.92745088	-103.73168086	2212.359						
6230	WELD	27,163.9	6230	0.0	46.3	47.92751063	-103.73185199	2212.135						
6240	WELD	27,210.2	6240	0.0	48.7	47.92756874	-103.73202102	2209.995						
6250	WELD	27,258.9	6250	0.0	48.9	47.92763099	-103.73219799	2210.264						
6260	WELD	27,307.8	6260	0.0	48.8	47.92769523	-103.73237349	2212.748						
6270	WELD	27,356.6	6270	0.0	46.1	47.92776145	-103.73254781	2213.544						
11000020	WT CHANGE	27,402.6	6270	0.0	0.1	47.92782316	-103.73271234	2214.738			0.250	52000	0.72	
6280	WELD	27,402.6	6280	0.0	41.5	47.92782324	-103.73271255	2214.740						
6290	WELD	27,444.2	6290	0.0	41.9	47.92787762	-103.73286235	2213.477						
6300	WELD	27,486.1	6300	0.0	41.9	47.92793018	-103.73301502	2213.608						
6310	WELD	27,528.0	6310	0.0	41.9	47.92798184	-103.73316844	2214.784						
6320	WELD	27,569.9	6320	0.0	41.9	47.92803530	-103.73332021	2216.055						
6330	WELD	27,611.8	6330	0.0	41.9	47.92809165	-103.73346926	2218.313						
6340	WELD	27,653.7	6340	0.0	41.3	47.92814806	-103.73361724	2223.655						
6350	WELD	27,695.0	6350	0.0	41.9	47.92820021	-103.73376679	2227.415						
10000023	AGM 050, Sta. 277+22, 147th Ave. NW -- Han #8456	27,703.9	6350	8.9	33.0	47.92821082	-103.73379940	2228.258						
11000021	WT CHANGE	27,736.8	6350	0.0	0.1	47.92824995	-103.73392051	2231.236			0.219	52000	0.72	
6360	WELD	27,736.8	6360	0.0	7.0	47.92825002	-103.73392073	2231.241						
6370	WELD	27,743.8	6370	0.0	47.0	47.92825847	-103.73394625	2231.833						
6380	WELD	27,790.8	6380	0.0	48.8	47.92831741	-103.73411721	2233.681						
40000008	Metal Loss - EXTERNAL	27,815.1	6380	24.3	24.5	47.92834845	-103.73420529	2233.528	70	2:15	11%	1.12	0.91	1640 100%
6390	WELD	27,839.6	6390	0.0	48.8	47.92838020	-103.73429360	2232.623						
6400	WELD	27,888.4	6400	0.0	48.9	47.92844409	-103.73446867	2227.253						
6410	WELD	27,937.3	6410	0.0	48.8	47.92850661	-103.73464484	2222.800						
6420	WELD	27,986.1	6420	0.0	48.8	47.92856517	-103.73482501	2223.527						
6430	WELD	28,034.9	6430	0.0	48.7	47.92862599	-103.73500339	2224.564						
6440	WELD	28,083.6	6440	0.0	48.9	47.92869026	-103.73517843	2227.072						
6450	WELD	28,132.4	6450	0.0	48.9	47.92875356	-103.73535354	2233.056						
6460	WELD	28,181.3	6460	0.0	48.8	47.92881600	-103.73552938	2237.860						
6470	WELD	28,230.1	6470	0.0	48.8	47.92887895	-103.73570575	2239.874						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
6480	WELD	28,278.9	6480	0.0	48.8	47.92894194	-103.73588243	2240.488						
6490	WELD	28,327.7	6490	0.0	48.9	47.92900481	-103.73605918	2241.984						
6500	WELD	28,376.6	6500	0.0	48.8	47.92906742	-103.73623588	2244.381						
6510	WELD	28,425.4	6510	0.0	48.9	47.92913039	-103.73641248	2247.153						
6520	WELD	28,474.4	6520	0.0	48.9	47.92919336	-103.73658934	2248.833						
6530	WELD	28,523.2	6530	0.0	48.9	47.92925613	-103.73676597	2250.482						
6540	WELD	28,572.1	6540	0.0	48.9	47.92931920	-103.73694253	2252.018						
6550	WELD	28,621.0	6550	0.0	48.8	47.92938224	-103.73711940	2252.185						
6560	WELD	28,669.8	6560	0.0	48.9	47.92944543	-103.73729609	2252.267						
6570	WELD	28,718.7	6570	0.0	48.9	47.92950811	-103.73747288	2251.258						
40000009	Metal Loss - EXTERNAL	28,744.1	6570	25.4	23.5	47.92954069	-103.73756498	2251.140	33	1:00	12%	0.63	1.54	1640 100%
6580	WELD	28,767.6	6580	0.0	48.9	47.92957101	-103.73764998	2251.737						
6590	WELD	28,816.5	6590	0.0	48.9	47.92963323	-103.73782740	2252.876						
6600	WELD	28,865.3	6600	0.0	47.1	47.92969627	-103.73800421	2252.809						
6610	WELD	28,912.4	6610	0.0	48.9	47.92975777	-103.73817396	2252.544						
6620	WELD	28,961.2	6620	0.0	48.8	47.92982058	-103.73835107	2252.495						
6630	WELD	29,010.1	6630	0.0	48.9	47.92988250	-103.73852896	2252.392						
6640	WELD	29,058.9	6640	0.0	48.9	47.92994432	-103.73870677	2252.104						
6650	WELD	29,107.8	6650	0.0	48.9	47.93000753	-103.73888355	2250.887						
6660	WELD	29,156.7	6660	0.0	48.9	47.93007137	-103.73905965	2249.521						
6670	WELD	29,205.6	6670	0.0	48.5	47.93013489	-103.73923606	2248.101						
6680	WELD	29,254.1	6680	0.0	48.9	47.93019671	-103.73941202	2246.528						
6690	WELD	29,303.0	6690	0.0	48.8	47.93025828	-103.73959021	2245.221						
6700	WELD	29,351.8	6700	0.0	48.9	47.93032056	-103.73976756	2243.778						
6710	WELD	29,400.7	6710	0.0	48.9	47.93038434	-103.73994356	2241.601						
6720	WELD	29,449.6	6720	0.0	47.4	47.93044888	-103.74011933	2239.973						
6730	WELD	29,497.0	6730	0.0	48.8	47.93051051	-103.74029042	2241.880						
6740	WELD	29,545.8	6740	0.0	48.9	47.93057230	-103.74046815	2243.859						
6750	WELD	29,594.7	6750	0.0	48.9	47.93063435	-103.74064572	2245.534						
40000010	Metal Loss - EXTERNAL	29,616.9	6750	22.2	26.6	47.93066282	-103.74072622	2245.791	96	3:00	13%	0.60	1.08	1640 100%
6760	WELD	29,643.5	6760	0.0	48.9	47.93069689	-103.74082275	2245.555						
6770	WELD	29,692.4	6770	0.0	48.8	47.93075969	-103.74100005	2244.450						
6780	WELD	29,741.2	6780	0.0	48.8	47.93082252	-103.74117700	2243.232						
6790	WELD	29,790.0	6790	0.0	48.9	47.93088555	-103.74135385	2242.219						
6800	WELD	29,838.9	6800	0.0	48.9	47.93094822	-103.74153094	2241.366						
6810	WELD	29,887.8	6810	0.0	48.8	47.93101069	-103.74170836	2240.031						
6820	WELD	29,936.6	6820	0.0	48.8	47.93107383	-103.74188531	2238.819						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
6830	WELD	29,985.4	6830	0.0	48.8	47.93113842	-103.74206075	2237.741						
6840	WELD	30,034.2	6840	0.0	48.9	47.93120462	-103.74223504	2236.944						
6850	WELD	30,083.1	6850	0.0	48.8	47.93127274	-103.74240769	2236.237						
6860	WELD	30,131.9	6860	0.0	48.9	47.93134110	-103.74257951	2235.873						
6870	WELD	30,180.9	6870	0.0	48.9	47.93140986	-103.74275228	2235.652						
6880	WELD	30,229.7	6880	0.0	48.9	47.93147816	-103.74292491	2235.225						
6890	WELD	30,278.6	6890	0.0	47.8	47.93154648	-103.74309740	2234.179						
14000000	DENT	30,285.5	6890	6.5	41.3	47.93155600	-103.74312159	2234.129	133	4:15	4.8%			
10000024	Bend left - 18 deg., 81D	30,296.3	6890	6.8	41.0	47.93156986	-103.74316090	2234.035	0	12:00				
6900	WELD	30,326.4	6900	0.0	21.1	47.93159132	-103.74327951	2234.373						
6910	WELD	30,347.5	6910	0.0	1.5	47.93160105	-103.74336461	2233.992						
10000025	Bend left - 36 deg., 3D	30,348.2	6910	0.1	1.3	47.93160109	-103.74336768	2233.964	0	12:00				
6920	WELD	30,348.9	6920	0.0	27.2	47.93160068	-103.74337051	2233.907						
6930	WELD	30,376.1	6930	0.0	48.5	47.93156743	-103.74346938	2230.599						
6940	WELD	30,424.6	6940	0.0	48.8	47.93151053	-103.74364687	2222.719						
6950	WELD	30,473.4	6950	0.0	48.8	47.93145418	-103.74382679	2216.016						
6960	WELD	30,522.3	6960	0.0	48.9	47.93139839	-103.74400696	2209.471						
6970	WELD	30,571.2	6970	0.0	48.9	47.93134147	-103.74418691	2203.405						
6980	WELD	30,620.1	6980	0.0	48.8	47.93128438	-103.74437030	2203.100						
6990	WELD	30,668.8	6990	0.0	48.8	47.93122739	-103.74455126	2208.292						
7000	WELD	30,717.7	7000	0.0	48.8	47.93117108	-103.74472790	2215.029						
7010	WELD	30,766.5	7010	0.0	46.9	47.93111373	-103.74490726	2220.279						
7020	WELD	30,813.3	7020	0.0	48.9	47.93105910	-103.74508119	2221.886						
7030	WELD	30,862.2	7030	0.0	48.9	47.93100270	-103.74526238	2221.168						
7040	WELD	30,911.1	7040	0.0	48.8	47.93094519	-103.74544321	2222.356						
7050	WELD	30,959.9	7050	0.0	48.9	47.93088792	-103.74562435	2222.556						
7060	WELD	31,008.8	7060	0.0	48.9	47.93083001	-103.74580546	2222.123						
7070	WELD	31,057.7	7070	0.0	48.9	47.93077308	-103.74598669	2222.264						
7080	WELD	31,106.6	7080	0.0	48.8	47.93071737	-103.74616908	2222.251						
7090	WELD	31,155.4	7090	0.0	48.8	47.93066560	-103.74635372	2222.104						
7100	WELD	31,204.2	7100	0.0	48.8	47.93061934	-103.74654151	2222.246						
7110	WELD	31,253.0	7110	0.0	48.9	47.93057740	-103.74673154	2223.188						
7120	WELD	31,301.8	7120	0.0	48.9	47.93053920	-103.74692373	2222.228						
7130	WELD	31,350.7	7130	0.0	45.4	47.93050425	-103.74711642	2218.592						
7140	WELD	31,396.1	7140	0.0	20.0	47.93047179	-103.74729345	2210.947						
7150	WELD	31,416.2	7150	0.0	48.0	47.93045540	-103.74737021	2206.936						
7160	WELD	31,464.2	7160	0.0	48.0	47.93040506	-103.74755096	2204.107						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)	
7170	WELD	31,512.1	7170	0.0	48.5	47.93034217	-103.74772287	2208.851							
7180	WELD	31,560.7	7180	0.0	48.0	47.93027379	-103.74789359	2209.272							
7190	WELD	31,608.6	7190	0.0	48.0	47.93020475	-103.74806044	2205.982							
7200	WELD	31,656.6	7200	0.0	48.0	47.93013653	-103.74822884	2203.488							
7210	WELD	31,704.6	7210	0.0	47.8	47.93006657	-103.74839468	2206.934							
7220	WELD	31,752.4	7220	0.0	44.8	47.92999732	-103.74855845	2214.786							
7230	WELD	31,797.1	7230	0.0	48.7	47.92993228	-103.74871272	2219.993							
7240	WELD	31,845.8	7240	0.0	48.9	47.92986013	-103.74888079	2222.812							
7250	WELD	31,894.7	7250	0.0	48.9	47.92978716	-103.74904909	2223.396							
7260	WELD	31,943.5	7260	0.0	48.9	47.92971407	-103.74921740	2224.237							
7270	WELD	31,992.5	7270	0.0	48.9	47.92964109	-103.74938571	2225.534							
7280	WELD	32,041.3	7280	0.0	48.9	47.92956828	-103.74955416	2227.834							
7290	WELD	32,090.2	7290	0.0	48.9	47.92949613	-103.74972291	2230.783							
7300	WELD	32,139.1	7300	0.0	48.9	47.92942357	-103.74989108	2233.634							
7310	WELD	32,188.0	7310	0.0	48.4	47.92934976	-103.75005822	2236.524							
7320	WELD	32,236.5	7320	0.0	48.9	47.92927651	-103.75022372	2238.736							
7330	WELD	32,285.4	7330	0.0	48.9	47.92920264	-103.75039107	2238.749							
7340	WELD	32,334.2	7340	0.0	48.9	47.92912899	-103.75055890	2239.121							
7350	WELD	32,383.1	7350	0.0	48.9	47.92905572	-103.75072641	2241.983							
7360	WELD	32,432.0	7360	0.0	48.8	47.92898127	-103.75089305	2244.061							
7370	WELD	32,480.8	7370	0.0	48.8	47.92890606	-103.75105907	2243.656							
7380	WELD	32,529.7	7380	0.0	48.9	47.92883152	-103.75122582	2242.304							
7390	WELD	32,578.6	7390	0.0	48.9	47.92875731	-103.75139273	2241.579							
7400	WELD	32,627.4	7400	0.0	48.9	47.92868182	-103.75155838	2242.305							
7410	WELD	32,676.3	7410	0.0	48.9	47.92860542	-103.75172314	2244.174							
7420	WELD	32,725.2	7420	0.0	48.8	47.92852801	-103.75188714	2245.975							
7430	WELD	32,774.0	7430	0.0	48.8	47.92845013	-103.75205006	2248.500							
7440	WELD	32,822.9	7440	0.0	48.8	47.92837413	-103.75221456	2252.228							
7450	WELD	32,871.7	7450	0.0	48.9	47.92830021	-103.75238135	2254.479							
7460	WELD	32,920.6	7460	0.0	48.9	47.92822659	-103.75254904	2255.626							
7470	WELD	32,969.5	7470	0.0	48.9	47.92815087	-103.75271478	2255.831							
7480	WELD	33,018.4	7480	0.0	48.9	47.92807338	-103.75287847	2256.146							
7490	WELD	33,067.2	7490	0.0	48.8	47.92799584	-103.75304199	2258.276							
7500	WELD	33,116.1	7500	0.0	48.9	47.92791990	-103.75320660	2261.735							
7510	WELD	33,165.0	7510	0.0	48.9	47.92784547	-103.75337291	2265.257							
7520	WELD	33,213.8	7520	0.0	48.8	47.92777444	-103.75354233	2268.145							
40000011	Metal Loss - EXTERNAL	33,241.8	7520	27.9	20.8	47.92773700	-103.75364206	2269.998	155	5:00	14%	0.64	0.66	1640	100%



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
7530	WELD	33,262.6	7530	0.0	48.9	47.92771107	-103.75371795	2270.874						
7540	WELD	33,311.5	7540	0.0	48.7	47.92765985	-103.75390258	2272.834						
7550	WELD	33,360.1	7550	0.0	48.6	47.92762201	-103.75409374	2274.811						
7560	WELD	33,408.7	7560	0.0	9.9	47.92758963	-103.75428674	2277.153						
7570	WELD	33,418.6	7570	0.0	40.7	47.92758282	-103.75432613	2277.635						
10000026	AGM 060, Sta. 334+75, CR 16 -- Han #8836	33,439.4	7570	20.8	19.9	47.92756677	-103.75440780	2278.234						
11000022	WT CHANGE	33,459.2	7570	0.0	0.1	47.92754948	-103.75448477	2278.080			0.250	52000	0.72	
7580	WELD	33,459.3	7580	0.0	41.7	47.92754942	-103.75448501	2278.079						
7590	WELD	33,501.0	7590	0.0	42.0	47.92750145	-103.75463939	2275.138						
7600	WELD	33,543.0	7600	0.0	42.0	47.92743717	-103.75478133	2271.731						
7610	WELD	33,585.0	7610	0.0	42.0	47.92736851	-103.75491933	2271.371						
7620	WELD	33,627.0	7620	0.0	41.9	47.92730156	-103.75505928	2272.408						
7630	WELD	33,668.9	7630	0.0	41.9	47.92723198	-103.75519594	2273.301						
7640	WELD	33,710.9	7640	0.0	42.0	47.92716134	-103.75533127	2271.133						
7650	WELD	33,752.8	7650	0.0	42.0	47.92709543	-103.75547107	2267.399						
11000023	WT CHANGE	33,794.7	7650	0.0	0.1	47.92703160	-103.75561286	2263.667			0.219	52000	0.72	
7660	WELD	33,794.8	7660	0.0	48.3	47.92703151	-103.75561306	2263.662						
7670	WELD	33,843.1	7670	0.0	48.9	47.92695824	-103.75577793	2260.005						
7680	WELD	33,892.0	7680	0.0	48.9	47.92688292	-103.75594312	2256.260						
7690	WELD	33,940.9	7690	0.0	48.8	47.92680651	-103.75610781	2254.305						
7700	WELD	33,989.7	7700	0.0	8.1	47.92672883	-103.75627122	2253.197						
7710	WELD	33,997.8	7710	0.0	26.5	47.92671574	-103.75629815	2253.229						
7720	WELD	34,024.2	7720	0.0	48.9	47.92667321	-103.75638656	2253.684						
7730	WELD	34,073.1	7730	0.0	48.8	47.92659477	-103.75654950	2255.019						
7740	WELD	34,121.9	7740	0.0	48.9	47.92651578	-103.75671164	2254.886						
7750	WELD	34,170.8	7750	0.0	48.8	47.92643655	-103.75687345	2254.549						
7760	WELD	34,219.6	7760	0.0	48.9	47.92635700	-103.75703523	2254.912						
7770	WELD	34,268.5	7770	0.0	48.9	47.92627751	-103.75719683	2253.801						
7780	WELD	34,317.4	7780	0.0	47.7	47.92619757	-103.75735761	2253.587						
7790	WELD	34,365.1	7790	0.0	47.7	47.92611939	-103.75751481	2252.887						
7800	WELD	34,412.7	7800	0.0	48.8	47.92604205	-103.75767292	2251.049						
7810	WELD	34,461.5	7810	0.0	48.9	47.92596425	-103.75783579	2248.708						
7820	WELD	34,510.3	7820	0.0	48.8	47.92588754	-103.75799975	2247.076						
7830	WELD	34,559.1	7830	0.0	48.9	47.92580922	-103.75816185	2244.539						
7840	WELD	34,608.0	7840	0.0	48.4	47.92572952	-103.75832300	2241.820						
7850	WELD	34,656.4	7850	0.0	48.9	47.92565158	-103.75848389	2238.879						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
7860	WELD	34,705.3	7860	0.0	48.8	47.92557304	-103.75864619	2235.360						
7870	WELD	34,754.1	7870	0.0	48.8	47.92549448	-103.75880797	2232.028						
7880	WELD	34,802.9	7880	0.0	48.9	47.92541581	-103.75897022	2229.589						
40000012	Metal Loss - EXTERNAL	34,817.8	7880	14.9	34.0	47.92539192	-103.75901973	2228.941	287 9:30	11%	0.95	0.56	1640	100%
7890	WELD	34,851.8	7890	0.0	48.8	47.92533730	-103.75913228	2227.010						
7900	WELD	34,900.6	7900	0.0	48.7	47.92525916	-103.75929530	2226.211						
7910	WELD	34,949.3	7910	0.0	48.8	47.92518033	-103.75945723	2225.485						
7920	WELD	34,998.1	7920	0.0	48.8	47.92510057	-103.75961838	2225.889						
7930	WELD	35,046.9	7930	0.0	48.8	47.92502177	-103.75978073	2226.289						
7940	WELD	35,095.6	7940	0.0	48.8	47.92494238	-103.75994206	2226.092						
7950	WELD	35,144.5	7950	0.0	48.8	47.92486231	-103.76010288	2224.545						
7960	WELD	35,193.2	7960	0.0	48.8	47.92478320	-103.76026401	2223.822						
7970	WELD	35,242.0	7970	0.0	48.5	47.92470796	-103.76043005	2224.331						
7980	WELD	35,290.6	7980	0.0	44.3	47.92464477	-103.76060479	2225.725						
7990	WELD	35,334.9	7990	0.0	0.9	47.92459784	-103.76077272	2227.322						
10000027	Bend right - 24 deg., 1.5D	35,335.4	7990	0.1	0.9	47.92459751	-103.76077443	2227.345	0 12:00					
8000	WELD	35,335.8	8000	0.0	48.9	47.92459730	-103.76077616	2227.370						
8010	WELD	35,384.7	8010	0.0	48.9	47.92459893	-103.76097625	2229.347						
8020	WELD	35,433.6	8020	0.0	48.8	47.92460119	-103.76117628	2229.610						
8030	WELD	35,482.4	8030	0.0	48.9	47.92460408	-103.76137618	2227.422						
8040	WELD	35,531.3	8040	0.0	48.7	47.92460707	-103.76157610	2224.196						
8050	WELD	35,579.9	8050	0.0	48.8	47.92460879	-103.76177611	2224.362						
8060	WELD	35,628.8	8060	0.0	48.8	47.92460904	-103.76197581	2227.583						
8070	WELD	35,677.6	8070	0.0	48.9	47.92461019	-103.76217520	2231.851						
8080	WELD	35,726.5	8080	0.0	48.8	47.92461034	-103.76237478	2235.968						
8090	WELD	35,775.3	8090	0.0	48.9	47.92461044	-103.76257491	2236.664						
8100	WELD	35,824.2	8100	0.0	48.8	47.92461157	-103.76277530	2236.362						
8110	WELD	35,873.0	8110	0.0	48.9	47.92461341	-103.76297564	2236.916						
8120	WELD	35,921.9	8120	0.0	48.9	47.92461424	-103.76317570	2237.464						
8130	WELD	35,970.7	8130	0.0	48.8	47.92461474	-103.76337584	2236.375						
8140	WELD	36,019.5	8140	0.0	48.9	47.92461575	-103.76357587	2235.102						
8150	WELD	36,068.4	8150	0.0	48.8	47.92461760	-103.76377612	2234.197						
8160	WELD	36,117.2	8160	0.0	48.8	47.92461876	-103.76397614	2234.449						
8170	WELD	36,166.0	8170	0.0	48.8	47.92461900	-103.76417666	2234.226						
8180	WELD	36,214.9	8180	0.0	48.8	47.92461945	-103.76437690	2234.153						
8190	WELD	36,263.7	8190	0.0	48.8	47.92462063	-103.76457706	2233.075						
8200	WELD	36,312.5	8200	0.0	48.8	47.92462157	-103.76477703	2232.873						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
8210	WELD	36,361.3	8210	0.0	48.8	47.92462245	-103.76497725	2235.032						
8220	WELD	36,410.1	8220	0.0	48.9	47.92462295	-103.76517714	2237.662						
8230	WELD	36,459.0	8230	0.0	48.8	47.92462505	-103.76537714	2239.121						
8240	WELD	36,507.8	8240	0.0	48.8	47.92462824	-103.76557721	2240.102						
8250	WELD	36,556.6	8250	0.0	48.8	47.92462911	-103.76577754	2240.180						
8260	WELD	36,605.4	8260	0.0	48.8	47.92462903	-103.76597738	2239.394						
8270	WELD	36,654.2	8270	0.0	48.9	47.92463069	-103.76617764	2239.185						
8280	WELD	36,703.1	8280	0.0	48.9	47.92463334	-103.76637778	2241.228						
8290	WELD	36,752.0	8290	0.0	48.9	47.92463485	-103.76657785	2243.569						
8300	WELD	36,800.8	8300	0.0	48.7	47.92463551	-103.76677805	2244.955						
8310	WELD	36,849.6	8310	0.0	48.8	47.92463550	-103.76697758	2245.679						
8320	WELD	36,898.4	8320	0.0	48.9	47.92463563	-103.76717792	2245.320						
8330	WELD	36,947.4	8330	0.0	48.9	47.92463667	-103.76737806	2245.371						
8340	WELD	36,996.2	8340	0.0	48.9	47.92463830	-103.76757851	2245.610						
8350	WELD	37,045.1	8350	0.0	48.8	47.92464088	-103.76777866	2244.978						
8360	WELD	37,093.9	8360	0.0	48.8	47.92464432	-103.76797851	2241.713						
8370	WELD	37,142.7	8370	0.0	48.8	47.92464728	-103.76817889	2241.211						
40000013	Metal Loss - INTERNAL	37,159.2	8370	16.4	32.4	47.92464806	-103.76824651	2241.588	33	1:00	14%	1.66	1.68	1640 100%
8380	WELD	37,191.5	8380	0.0	48.6	47.92464936	-103.76837906	2242.443						
8390	WELD	37,240.1	8390	0.0	48.8	47.92465007	-103.76857826	2244.430						
8400	WELD	37,289.0	8400	0.0	48.8	47.92464909	-103.76877808	2248.043						
8410	WELD	37,337.8	8410	0.0	48.4	47.92464913	-103.76897760	2250.706						
8420	WELD	37,386.2	8420	0.0	48.9	47.92465076	-103.76917560	2250.168						
8430	WELD	37,435.0	8430	0.0	48.9	47.92465305	-103.76937535	2246.137						
8440	WELD	37,484.0	8440	0.0	48.8	47.92465591	-103.76957478	2242.092						
8450	WELD	37,532.8	8450	0.0	6.1	47.92465777	-103.76977411	2237.385						
8460	WELD	37,538.9	8460	0.0	42.6	47.92465789	-103.76979889	2236.793						
8470	WELD	37,581.5	8470	0.0	48.9	47.92465850	-103.76997366	2234.318						
8480	WELD	37,630.4	8480	0.0	48.9	47.92465921	-103.77017407	2235.038						
8490	WELD	37,679.3	8490	0.0	48.9	47.92465946	-103.77037405	2237.744						
8500	WELD	37,728.2	8500	0.0	48.8	47.92465966	-103.77057406	2240.859						
8510	WELD	37,777.0	8510	0.0	48.9	47.92466312	-103.77077381	2243.510						
8520	WELD	37,825.9	8520	0.0	48.9	47.92466358	-103.77097360	2247.549						
8530	WELD	37,874.8	8530	0.0	48.9	47.92466398	-103.77117330	2251.262						
8540	WELD	37,923.6	8540	0.0	48.9	47.92466437	-103.77137342	2253.273						
8550	WELD	37,972.5	8550	0.0	48.9	47.92466544	-103.77157351	2255.124						
8560	WELD	38,021.4	8560	0.0	48.9	47.92466633	-103.77177387	2256.885						



Pipeline Listing

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Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
8570	WELD	38,070.3	8570	0.0	48.6	47.92466744	-103.77197390	2257.256						
8580	WELD	38,118.9	8580	0.0	48.8	47.92466892	-103.77217317	2258.456						
8590	WELD	38,167.7	8590	0.0	48.9	47.92467036	-103.77237321	2260.221						
8600	WELD	38,216.7	8600	0.0	48.8	47.92467138	-103.77257335	2262.057						
40000014	Metal Loss - EXTERNAL	38,238.4	8600	21.7	27.2	47.92467175	-103.77266250	2262.784	262	8:30	12%	1.01	0.91	1640 100%
8610	WELD	38,265.5	8610	0.0	48.9	47.92467206	-103.77277359	2263.673						
8620	WELD	38,314.4	8620	0.0	48.8	47.92467259	-103.77297361	2265.448						
8630	WELD	38,363.2	8630	0.0	48.9	47.92467358	-103.77317389	2265.163						
8640	WELD	38,412.1	8640	0.0	48.8	47.92467470	-103.77337390	2263.920						
8650	WELD	38,461.0	8650	0.0	48.0	47.92467636	-103.77357428	2262.803						
8660	WELD	38,509.0	8660	0.0	48.8	47.92467805	-103.77377105	2262.831						
8670	WELD	38,557.9	8670	0.0	48.9	47.92467930	-103.77397118	2262.134						
8680	WELD	38,606.8	8680	0.0	48.9	47.92467998	-103.77417103	2260.494						
40000015	Metal Loss - EXTERNAL	38,651.8	8680	45.0	4.0	47.92468140	-103.77435506	2258.466	28	12:45	12%	0.82	0.92	1640 100%
8690	WELD	38,655.7	8690	0.0	48.9	47.92468157	-103.77437112	2258.380						
8700	WELD	38,704.6	8700	0.0	48.8	47.92468336	-103.77457125	2258.528						
8710	WELD	38,753.4	8710	0.0	48.9	47.92468529	-103.77477101	2260.220						
8720	WELD	38,802.3	8720	0.0	48.8	47.92468537	-103.77497104	2262.190						
8730	WELD	38,851.1	8730	0.0	48.8	47.92468367	-103.77517108	2262.154						
8740	WELD	38,899.9	8740	0.0	48.7	47.92468221	-103.77537107	2260.621						
8750	WELD	38,948.6	8750	0.0	48.5	47.92468355	-103.77556998	2257.410						
8760	WELD	38,997.1	8760	0.0	43.5	47.92468502	-103.77576859	2254.482						
8770	WELD	39,040.6	8770	0.0	7.8	47.92468312	-103.77594703	2252.288						
11000024	WT CHANGE	39,048.3	8770	0.0	0.1	47.92468233	-103.77597835	2251.837				0.250	52000	0.72
8780	WELD	39,048.4	8780	0.0	41.7	47.92468232	-103.77597859	2251.834						
8790	WELD	39,090.1	8790	0.0	41.9	47.92467504	-103.77614858	2248.495						
8800	WELD	39,132.1	8800	0.0	42.0	47.92467078	-103.77631931	2251.577						
8810	WELD	39,174.0	8810	0.0	41.9	47.92466931	-103.77648997	2255.489						
8820	WELD	39,216.0	8820	0.0	42.0	47.92466724	-103.77666096	2258.032						
10000028	AGM 070, Sta. 392+83, 149th Ave. NW -- Han #8456	39,255.3	8820	39.3	2.6	47.92466592	-103.77682160	2259.238						
8830	WELD	39,257.9	8830	0.0	42.0	47.92466577	-103.77683243	2259.220						
11000025	WT CHANGE	39,299.8	8830	0.0	0.0	47.92466338	-103.77700404	2259.016				0.219	52000	0.72
8840	WELD	39,299.9	8840	0.0	30.1	47.92466337	-103.77700420	2259.015						
8850	WELD	39,330.0	8850	0.0	48.6	47.92465964	-103.77712743	2258.395						
8860	WELD	39,378.5	8860	0.0	48.7	47.92464669	-103.77732564	2257.814						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
8870	WELD	39,427.2	8870	0.0	48.8	47.92462490	-103.77752271	2258.074						
8880	WELD	39,476.0	8880	0.0	48.9	47.92460174	-103.77771989	2257.900						
8890	WELD	39,524.9	8890	0.0	48.8	47.92458536	-103.77791881	2258.046						
8900	WELD	39,573.7	8900	0.0	48.8	47.92457828	-103.77811859	2257.529						
8910	WELD	39,622.5	8910	0.0	48.8	47.92457566	-103.77831859	2256.541						
8920	WELD	39,671.3	8920	0.0	48.8	47.92457460	-103.77851880	2256.007						
8930	WELD	39,720.1	8930	0.0	48.8	47.92457472	-103.77871912	2255.426						
8940	WELD	39,768.9	8940	0.0	48.8	47.92457468	-103.77891958	2255.542						
8950	WELD	39,817.7	8950	0.0	48.8	47.92457363	-103.77911979	2255.093						
8960	WELD	39,866.6	8960	0.0	48.9	47.92457238	-103.77931976	2254.779						
8970	WELD	39,915.4	8970	0.0	48.8	47.92457129	-103.77951999	2252.904						
8980	WELD	39,964.2	8980	0.0	48.8	47.92457080	-103.77971978	2249.565						
8990	WELD	40,013.1	8990	0.0	48.8	47.92457051	-103.77991950	2246.147						
9000	WELD	40,061.9	9000	0.0	48.4	47.92456966	-103.78011871	2241.260						
9010	WELD	40,110.3	9010	0.0	48.9	47.92456942	-103.78031693	2238.379						
9020	WELD	40,159.1	9020	0.0	48.8	47.92456984	-103.78051751	2237.774						
9030	WELD	40,208.0	9030	0.0	8.7	47.92456881	-103.78071795	2238.199						
9040	WELD	40,216.6	9040	0.0	38.8	47.92456843	-103.78075310	2238.267						
9050	WELD	40,255.4	9050	0.0	48.8	47.92456649	-103.78091201	2238.530						
9060	WELD	40,304.2	9060	0.0	48.8	47.92456386	-103.78111222	2238.050						
9070	WELD	40,353.0	9070	0.0	48.8	47.92456030	-103.78131215	2236.794						
9080	WELD	40,401.9	9080	0.0	48.8	47.92455652	-103.78151212	2234.008						
9090	WELD	40,450.6	9090	0.0	48.8	47.92455440	-103.78171246	2233.687						
9100	WELD	40,499.4	9100	0.0	41.6	47.92455264	-103.78191291	2233.575						
9110	WELD	40,541.1	9110	0.0	6.9	47.92455181	-103.78208353	2231.438						
9120	WELD	40,548.0	9120	0.0	48.8	47.92455189	-103.78211210	2231.203						
9130	WELD	40,596.8	9130	0.0	36.0	47.92455252	-103.78231209	2231.112						
9140	WELD	40,632.8	9140	0.0	7.0	47.92455250	-103.78245983	2231.041						
9150	WELD	40,639.8	9150	0.0	48.8	47.92455260	-103.78248852	2230.751						
9160	WELD	40,688.6	9160	0.0	48.8	47.92455297	-103.78268817	2226.837						
9170	WELD	40,737.4	9170	0.0	48.9	47.92455263	-103.78288814	2222.929						
9180	WELD	40,786.2	9180	0.0	48.8	47.92455314	-103.78308861	2221.582						
9190	WELD	40,835.1	9190	0.0	48.9	47.92455370	-103.78328897	2221.322						
9200	WELD	40,884.0	9200	0.0	47.5	47.92455297	-103.78348923	2220.878						
9210	WELD	40,931.5	9210	0.0	3.0	47.92455176	-103.78368378	2221.331						
9220	WELD	40,934.5	9220	0.0	3.8	47.92455169	-103.78369598	2221.384						
10000029	Bend left - 82 deg., 3D	40,936.4	9220	0.2	3.7	47.92454979	-103.78370346	2221.399	0	12:00				



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
9230	WELD	40,938.3	9230	0.0	4.3	47.92454509	-103.78370706	2221.357						
9240	WELD	40,942.6	9240	0.0	47.9	47.92453277	-103.78370710	2221.142						
9250	WELD	40,990.5	9250	0.0	48.8	47.92440173	-103.78370550	2219.916						
9260	WELD	41,039.3	9260	0.0	48.8	47.92426697	-103.78370144	2220.822						
11000026	WT CHANGE	41,088.0	9260	0.0	0.1	47.92413317	-103.78369630	2222.883			0.365	52000	0.72	
9270	WELD	41,088.1	9270	0.0	3.7	47.92413298	-103.78369630	2222.883						
9280	WELD	41,091.8	9280	0.0	1.8	47.92412261	-103.78369596	2222.881						
10000030	Bend up - 45 deg., 3D	41,092.7	9280	0.1	1.7	47.92412005	-103.78369590	2223.025	0	12:00				
11000027	WT CHANGE	41,093.6	9280	0.0	0.1	47.92411777	-103.78369590	2223.428			0.250	52000	0.72	
9290	WELD	41,093.7	9290	0.0	7.3	47.92411763	-103.78369590	2223.461						
11000028	WT CHANGE	41,100.9	9290	0.0	0.1	47.92410357	-103.78369560	2228.554			0.365	52000	0.72	
9300	WELD	41,101.0	9300	0.0	9.6	47.92410340	-103.78369560	2228.617						
10000040	Pipe Exiting the Ground, Dore Junction Loop Trap -- Han #8683	41,102.7	9300	1.8	7.8	47.92409988	-103.78369550	2229.906						
9310	WELD	41,110.6	9310	0.0	2.0	47.92408751	-103.78369530	2233.760						
10000031	Bend down - 45 deg., 3D	41,111.6	9310	0.2	1.8	47.92408584	-103.78369530	2234.064	0	12:00				
9320	WELD	41,112.6	9320	0.0	1.0	47.92408394	-103.78369523	2234.121						
10000032	Flange	41,113.1	9320	0.5	0.5	47.92408280	-103.78369520	2234.059	0	12:00				
9330	WELD	41,113.6	9330	0.0	1.4	47.92408160	-103.78369520	2233.954						
10000033	Tee at 90 deg.	41,114.3	9330	0.2	1.2	47.92408002	-103.78369510	2233.791	90	3:00				
9340	WELD	41,115.0	9340	0.0	1.5	47.92407840	-103.78369510	2233.624						
10000034	Pipe Support	41,115.7	9340	0.6	0.9	47.92407666	-103.78369508	2233.445						
10000035	Fitting on top of pipe	41,116.2	9340	1.1	0.4	47.92407549	-103.78369502	2233.321	358	11:45				
9350	WELD	41,116.5	9350	0.0	3.7	47.92407481	-103.78369500	2233.251						
10000036	Flange	41,117.0	9350	0.5	3.2	47.92407395	-103.78369500	2233.163	0	12:00				
10000037	Valve (Receiver), Sta. 410+99, Dore Junction Loop Trap	41,118.4	9350	1.9	1.8	47.92407086	-103.78369490	2232.845						
10000038	Flange	41,119.7	9350	3.2	0.5	47.92407172	-103.78369490	2232.930	0	12:00				
9360	WELD	41,120.2	9360	0.0	-	47.92407172	-103.78369490	2232.930						



Pipeline Listing

TDW Services, Inc.

Hiland Crude, LLC
Dore Loop Launch to Receive

ID#	Description	Distance (ft)	Joint #	U/S Weld	D/S Weld	Latitude	Longitude	Altitude	Orientation (Deg / O'Clock)	Depth (%)	Length or WT	Width or YS	P' or SF	(P'/P)
12000001	End Run Tickle	41,156.8	9360	36.5	-	47.92407172	-103.78369490	2232.930						

Type	Number
DEFORMATION	1
GAINS	0
GROUPED PITS	16
LOCATIONS	41
MISC	2
WT CHANGES	29
WELDS	926



General Inline Inspection Terms

GLOSSARY

AGM (Aboveground Marker)	A portable device placed at an above ground reference point that both detects and records the passage of an in-line inspection tool. AGMs are typically reported using a marker number followed by the aboveground reference point description of the location device (box) placement.
ABOVE-GROUND REFERENCE POINTS	The above ground reference point is a permanent reference on or above the pipeline, which can be used to locate features in the pipeline. Reference points can be valves, fences, test stations, markers posts, or other permanent features.
ACCELEROMETERS	Part of the INS package of the in-line inspection tool. Each TDW tool contains 3 axis-aligned accelerometers measuring orientation and shock.
ANCHOR, WEIGHT OR HANGAR	Non-welded full encirclement pipeline features typically evenly spaced across water crossings. These are usually not detrimental unless associated metal loss is detected.
ANOMALY	Any kind of imperfection or defect that may be present in the wall of the pipe. This includes coating or welding.
APPURTENANCE	A component that is attached to the pipeline; e.g., valve, tee, casing, instrument connection.
ASME B31G, MODIFIED ASME B31G, or DNV RP-F101	Commonly used analysis criterion for metal loss anomalies in a pipeline. TDW software may use ASME B31G, MODIFIED ASME B31G, or DNV RP-F101 to calculate the safe maximum allowable operating pressure or failure pressure at an area of metal loss. These formulas utilize only length and depth - they do not take into consideration the width of the anomaly. The MODIFIED ASME B31G more closely approximates the values obtained via the RSTRENG calculations, which is less conservative than the standard ASME B31G calculation. See also DNV RP-F101.
BEND	A physical pipe configuration that changes pipeline direction.
BEND RADIUS	The radius of the bend in the pipe as related to the pipe diameter (D). Example: A 3-D bend would have a radius of 3 times the diameter of the pipe measured to the centerline of the pipe.
BORE RESTRICTION	Any reduction of the cross-section of the pipe that may restrict the passage of an ILI pig.
BUCKLE	A condition where the pipeline has undergone sufficient plastic deformation to cause permanent wrinkling or deformation of the pipe wall or the pipe's cross section.
BURST PRESSURE	The pressure at which the nominal hoop stress in the wall of a pipe equals the specified minimum yield stress of the pipe grade. It is calculated by $2st/D$ where s = SMYS, t = nominal wall thickness, D = nominal outside diameter of pipe.
CALIBRATION DIG	An exploratory excavation to compare findings of an in-line inspection system to actual conditions with the purpose of improving data analysis.
CASING ANOMALY	When the casing is not welded, or when a gap occurs in the weld, this signature is detected by the tool, and identified with a miscellaneous remark.
CHARACTERIZATION	The process of quantifying the size, shape, orientation, and location of an anomaly, defect, or critical defect after it has been detected.
CHECK VALVE	A valve that prevents reverse flow.
CLAMP	Non-welded full encirclement pipeline feature not located at a bridge or water crossing, in some cases a type of temporary repair.
COMPONENT	Any physical part of the pipeline, other than line pipe, including but not limited to valves, welds, tees, flanges, fitting, taps, branch connections, outlets, supports and anchors.



General Inline Inspection Terms

GLOSSARY PART 2

CONTROL POINT	Control points are know locations used to provide coordinate updates to aid the final processing of the inertial data gathered from the instruments onboard the inspection vehicle.
CORROSION (External)	Metal loss due to electrochemical, galvanic, microbiological, or other attack on the pipe due to environmental conditions surrounding the pipe.
CORROSION (Internal)	Metal loss due to chemical or other attack on the steel from liquids on the inside of the pipe. Electrochemical attack can also occur in local cells, but this is less frequent.
DATA ANALYSIS	The process through which indications are evaluated to classify, characterize and size them as non-relevant conditions, pipeline components, anomalies, imperfections, or defects.
DATUM	A datum is a set of reference points on the earth's surface against which position measurements are made. Horizontal datums are used for describing a point on the earth's surface, in latitude and longitude or another coordinate system. While hundreds of reference datums exists some examples of horizontal datums include, NAD27, NAD83, and WGS84. Vertical datums are tidal, based on sea levels referencing geodetic datums such as NAVD88, or geodetic, based on the same ellipsoid models of the earth used for computing horizontal datums.
DNV RP-F101	An analysis procedure that differs from the commonly used ASME B31G criterion. Developed by the Norwegian company Det Norske Veritas, this method is employed for European and Asian pipelines. The DNV algorithm is generally considered to be more conservative than ASME B31G.
DEFECT	An anomaly for which an analysis, such as ASME B31G, would indicate that the pipe is approaching failure as the nominal hoop stress approaches the specified minimum yield stress (SMYS).
DEFORMATION PIG	A pig designed to record conditions such as dents, wrinkles, ovalities, bend radius and angle by making measurements of the inside surface of the pipeline.
DENTS	Dents are depressions in the pipeline that may be detected by the inline inspection tool. MFL tools may be able to detect dents, but may not be able to accurately size them.
DETECTION THRESHOLD	A characteristic dimension or dimensions of an anomaly that must be exceeded to achieve a stated probability of detection.
DOT192	Part 192 of the Code for Federal Regulations (CFR) Title 49 that addresses Gas Transmission Pipelines.
DOT195	Part 195 of the Code for Federal Regulations (CFR) Title 49 that addresses Transportation of Hazardous Liquids by Pipeline.
ECCENTRIC CASINGS	TDW tools detect when a casing is not centered on the pipeline. These casings are referred to as being eccentric. The closer the casing is to the pipeline, the stronger the signal seen by the inspection tool. The tool may not detect if the casing is shorted to the pipe wall. The tool might see evidence of a short, such as metal loss.
ESTIMATED REPAIR FACTOR (ERF)	The ratio of pipeline design pressure or in some cases MOP to the safe maximum operating pressure (P').
ERW (Electric Resistance Weld)	Describes a process used to form steel from a sheet into tubular form (pipe). Welds are formed by resistance heating of two edges of a metal sheet and then forcing them together to create a solid-state weld.
EXPANSION	Local increase of pipe diameter during service which indicates the yield stress of the pipe at that location has been surpassed.



General Inline Inspection Terms

GLOSSARY PART 3

General Inline Inspection Terms

FAILURE PRESSURE RATIO (FPR)	The ratio of the predicted failure pressure calculated by an analysis criterion (e.g. ASME B31G, RSTRENG, etc.) to the MAOP
FEATURE	Any physical object detected by an in-line inspection system. Features may be anomalies, components, or some other item.
FITTING	A branch connection attached to the pipeline which is smaller than the nominal pipe size that alters flow or diverts product (e.g. tap, offtake, split-tee, weld-o-let, thread-o-let).
GAIN (Metal in Close Proximity)	The inspection tool may detect ferrous metal objects located close to or touching the pipeline. They appear as additional metal added to the pipe and are referred to as gains. Clamps or anchors are considered gains as well as features such as puddle welds or CP connections. Generally, repairs such as patches or sleeves are called out as repairs even though they show appear in the data as gains.
GIRTH WELD	A circumferential weld joining two joints of pipe.
GIS	Geographic Information System is any system that captures, stores, analyzes, manages, and presents data that are linked to location. GIS is the merging of cartography and database technology.
GOUGE	Elongated grooves or cavities caused by mechanical removal of metal.
GPS (Global Positioning System)	The navigational system utilizing satellite technology to provide a user an exact position on the earth's surface. When coupled with known surface locations such as valves and AGMs, an ILI tool's INS or IMU can approximate or calculate the centerline of a pipeline.
GYROSCOPES (Gyros)	Electronic sensors used to measure change in direction of in-line inspection tool during inspection process. Displayed as pitch and yaw in PIGTRAP.
GROUP	A group is several pits that are grouped together using specific interaction rules. If a pit is a mountain peak, then a group is a mountain range. The reason for groups is so that the overall extent of the metal loss area can be evaluated. Most formulas for calculating the strength of the pipe wall around metal loss look at the overall length of metal loss after interaction rules have been applied to pits.
HALF SOLE	A device used to repair a pipeline by welding a small section over half the circumference of the pipe over the defect, literally half of a sleeve.
HALL SENSORS	A sensor that directly measures the remaining magnetic field strength not absorbed by the pipe.
HCA (High Consequence Area)	A criterion for pipelines designed by the Code of Federal Regulations which define what program and practices operators must use to manage pipeline integrity if the pipeline is located near a commercially navigable waterway, a high population area, or an unusually sensitive area.
HEAT AFFECTED ZONE (HAZ)	The region around a weld which has been metallurgically affected during the welding process.
HEAVY WELD	A girth weld in which the root pass or a portion of the root pass intrudes further than normal into the ID of the pipe. Not usually considered detrimental.
HIGH RESOLUTION	A term used to describe the function of TDW tools for use in MFL or Deformation analysis schemes. Both MFL and Deformation tools are considered high resolution.
IMPERFECTION	An anomaly with dimension and characteristics that do not exceed acceptable limits.



General Inline Inspection Terms

GLOSSARY PART 4

IMU (Inertial Measurement Unit)	Inertial measurement unit, or IMU, is the main component of inertial guidance systems. An IMU works by sensing motion including the type, rate, and direction of that motion using a combination of accelerometers and gyroscopes.
INCLUSION	An anomaly in the cross section of the pipeline caused by manufacturing processes. Inclusions may be detrimental if they protrude through the pipe wall. Refer to mill anomaly.
INDICATION	Any measured signal or response from an inspection of a pipe different than the normal baseline signal.
INS (Inertial Navigation System)	Refers to a system of accelerometers and gyroscopes to track the movement and orientation of the inspection tool through bends, turns, etc.
INTERACTION RULES	Specifications that establish spacing criteria between anomalies or defects (pits). If the indications or defects are proximate to one another within the criteria, the anomaly or defect is treated as a single larger unit or group for engineering analysis purposes.
INSPECTION	The use of a non-destructive inspection technique.
JOINT	A single section of pipe that is welded to others to make up a pipeline.
LACK OF FUSION (LOF)	In a weld, any area or zone that lacks complete melting and coalescence of a portion of the weld.
LAUNCHER	Refers to the beginning of the inspection; an oversize section of pipe equipped with sealing door through which the inspection tool is loaded into the pipeline.
LOCATION	A location is a feature in the pipeline that can be used to correlate the inspection tool data to above ground references. Common location features include valves, fitting, flanges, tees, casings, repairs and AGMs. For example, a metal loss area could be referenced as being 200 feet downstream from a valve. Not all locations can be easily found from aboveground.
LATITUDE & LONGITUDE	Latitude is the angular distance north or south from the earth's equator measured through 90 degrees. Longitude is the arc or portion of the earth's equator intersected between the meridian of a given place and the prime meridian and is expressed either in degrees or in time. Latitude and longitude are reported as GPS coordinates. Predicted GPS for features are provided in the Pipeline Listing section.
MAOP (Maximum Allowable Operating Pressure)	(or Design Pressure) The maximum internal pressure permitted in the operation of a pipeline as defined by the Code of Federal Regulations.
MAPPING PIG	An ILI tool that uses an IMU to collect data that can be analyzed to produce an elevation and plan view of the pipeline route.
MEASUREMENT THRESHOLD	A characteristic's dimension or dimensions above which anomaly measurements can be made.
MECHANICAL DAMAGE	A generic term used to describe combinations of dents gouges, and/or cold work caused by the application of external force. Damage includes coating, movement of metal and high residual stress.
METAL LOSS	Any of a number of types of anomalies in pipe in which metal has been removed from the pipe surface, usually due to corrosion or gouging.
MFL (Magnetic Flux Leakage)	An inspection technique in which a magnetic field is applied to a pipe section and measurements are taken of a magnetic flux density at the pipe surface. Changes in measured flux density indicate the presence of a possible defect.



General Inline Inspection Terms

GLOSSARY PART 5

MILL ANOMALY	The process of manufacturing pipe can often leave indications in the pipe wall. Typically these anomalies are not detrimental, and are identified for the benefit of the client.
MINIMUM BORE	The minimum measured Internal Diameter of the pipe at any particular point. Also referred to as minimum cross-section.
MISALIGNMENT	A girth weld anomaly where the two joints of pipe were not aligned properly prior to welding. Sometimes referred to as a hi-lo.
MOP (Maximum Operating Pressure)	The established maximum internal pressure expected during the operation of a pipeline, which cannot normally exceed the maximum allowable operating pressure (MAOP).
ODOMETER	Wheels on in-line inspection tool, which rotate along the pipe to measure the distance the tool has traveled.
ORIENTATION	The location of the reference around the circumference of the pipe, as viewed in the direction of flow (downstream). The value is represented in degrees 0-360° rotating clockwise around pipe. (0° = top of pipe, 90° = 3:00)
OVALITY	A condition in which a circular pipe forms into an ellipse, usually as the result of external forces.
P	Calculated pressure rating for the pipe. Per ASME B31G, it is the greater of either the established MOP for liquid lines (MAOP for gas lines), or $2stFT/D$, where S = SMYS, F = appropriate design factor from ASME B31G, T = Temperature derating factor, D = nominal outside diameter of pipe, and t = nominal wall thickness. See ASME B31G. In application, this variable is identical per DNV RP-F101, however it is calculated using different formulas and factors.
P' (Calculated safe maximum operating pressure)	Calculated safe maximum operating pressure for the pipeline segment as calculated based on information provided by the Customer. TDW software uses ASME B31G, MODIFIED ASME B31G, or DNV RP-F101 to calculate the safe maximum allowable operating pressure (P') of the pipeline at a metal loss area for liquid lines. The calculation also takes into consideration a temperature factor, for use when the line is at elevated temperature, and a safety factor. The default values used in calculations are a temperature factor of 1, and a safety factor of 72% (80% for Canada).
P_{fail} (Calculated failure pressure)	Calculated maximum operating pressure for the pipeline segment as calculated based on information provided by the Customer. TDW software uses ASME B31G, MODIFIED ASME B31G, or DNV RP-F101 to calculate the failure pressure (P _{fail}) of the pipeline at a metal loss area for gas lines. The calculation also takes into consideration a temperature factor, for use when the line is at elevated temperature, and a safety factor. The default values used in calculations are a temperature factor of 1, and a safety factor of 100%.
P'/P	Percent of maximum established pressure, this is calculated by dividing the calculated safe pressure of the defect (P') by the current established maximum operating pressure of the pipeline (P). For TDW reporting, P is either established MOP provided by the customer or the calculated pressure rating for the pipe (P). Percentages less than 100% are considered pressure-reducing.
P_{fail}/MAOP	Percent of MAOP, this is calculated by dividing the calculated failure pressure of the defect (P _{fail}) by the current MAOP of the pipeline (P). For TDW reporting, P is either established MAOP provided by the customer or the calculated pressure rating for the pipe (P).
PATCH	A device used to repair a pipeline by welding a small section of pipe on top of the defect.
PIG	A generic term signifying any independent, self-contained device, tool or vehicle that moves through the interior of the pipeline for purposes of inspecting, batching, dimensioning, or cleaning.



General Inline Inspection Terms

GLOSSARY PART 6

PIGTRAP	Pipeline Inspection Graphical Test Reporting and Analysis Program (PIGTRAP). Proprietary software developed by TDW Inc. for viewing data collected by the inspection tool.
PIPE SUPPORT	Any device used to support an aboveground pipeline.
PIT	Localized concentrated-cell corrosion on the external or internal surfaces that results from generation of a potential (voltage) difference set up by variations in oxygen concentrations within and outside the pit. The oxygen-starved pit acts as anode and the pipe surface acts as the cathode. If several pits are in close proximity to each other, they may be grouped together using interaction rules as one group.
PLANAR	An NDT term indicating a feature has two-dimensional characteristics like a fissure. Sometimes referred to as crack-like.
RSTRENG	A computer program designed to calculate the calculated safe maximum operating pressure (P') of corroded pipe. RSTRENG results are approximated when Modified B31G criteria is used.
REBOUNDING	The process of changing the dent depth and shape by internal pressure in the pipe. Generally, dents due to third-party contact will re-round, while dents due to rocks will not unless the rock causing the dent is removed.
RECEIVER	Refers to the ending of the inspection; an oversize section of pipe equipped with sealing door through which the inspection tool is retrieved from the pipeline.
REPORTING THRESHOLD	A parameter that defines whether or not an anomaly will be reported. The parameter may be a limiting value on the depth, width, or length of the anomaly or feature.
RESIDUAL DENT DEPTH	The dent depth measured under a particular set of conditions, e.g., in pressurized or un-pressurized pipeline. While maximum dent depth does not change, the residual or measured dent depth changes with pressure and loading. Also referred to as the measured dent depth.
RUPTURE PRESSURE RATIO (RPR)	The ratio of the predicted failure pressure calculated by an analysis criterion (e.g. ASME B31G, RSTRENG, etc.) to the pressure at specified minimum yield strength (SMYS)
SAFETY FACTOR	(or Design Factor) Typically 0.72 for liquid lines per ASME B31G (0.80 in Canada) . In setting the safety factor, due consideration has been given to and allowances made for the manufacturing tolerance and maximum allowable depth of imperfections provided for in the specifications. DNV RP-F101 uses a slightly different Total Usage Factor, which is entered as the Safety Factor in PIGTRAP. The typical 0.72 factor becomes 0.648 when applying the DNV modeling factor of 0.9.
SEAMLESS	Pipe that is manufactured by means of extrusion. This process typically creates significantly more variation in pipe wall thickness than ERW pipe.
SEAM VARIATION	Non-detrimental irregularity due to the manufacturing of the seam weld. An example is excess or variance in trim.
SEAM WELD (or SEAM)	The longitudinal or spirally-oriented weld in pipe connecting two edges of a formed plate which was created at the pipe mill.
SLEEVE	A device used to repair a pipeline by welding a small section of pipe over the full circumference of the pipe over the top of the defect.
SpirALL™ Magnetic Flux Leakage	A tool system that unites a conventional axial MFL and a unique spiral MFL tool section into one tool combining the benefits of each for enhanced defect characterization and sizing.



General Inline Inspection Terms

GLOSSARY PART 7

Spiral MFL (SMFL)	A unique type of MFL tool section that creates an oblique, near-45 degree magnetic field within the pipe wall. This allows detection and characterization of long and narrow metal loss or seam features on par with circumferential or transverse MFL tools.
SPACER	A device used to maintain space between a casing and a pipeline.
SMYS (Specified Minimum Yield Strength)	A required strength level that measured yield stress of a pipe material must exceed, which is reported as pipe grade. The measured yield stress is the tensile stress required to produce a total elongation of 0.5 percent of a gage length as determined by an extensometer during a tensile test.
STITCHING	Intermittent or repeating lack of fusion in a seam weld.
TEMPERATURE FACTOR	Typically 1.0 unless the metal temperature is expected to exceed a normal temperature range of -20°F (-30°C) to 250°F (120°C).
THIRD PARTY DAMAGE	Damage to a pipeline system by an outside party. See mechanical damage.
TRACKING	The process used to monitor the progress of the inspection tool through the pipeline. AGM boxes are placed at aboveground marker reference locations to record the passage of the inspection tool.
TRAP	Pipeline facility for launching and receiving tools and pigs.
VOLUMETRIC	A term indicating a feature has three-dimensional characteristic similar to a typical corrosion pit.
WELD ANOMALY	Any area or zone in a weld that lacks complete melting and fusion of a portion of the weld which could have occurred during the welding process or caused by corrosion.
WRINKLE	A smooth and localized bulge visible on the outside wall of the pipe.
WRINKLE BEND	A field bend that contains smooth and localized bulges on the inner radius of the bend, sometimes formed when pipe is cold bent.



Appendix A

Database and Reporting Details

1. The Graphs, Dig Sheets, and Tables used in this report were generated using a standalone reporting engine from data contained in a Microsoft Access™ database.
2. If the end user has Microsoft™ Access on their computer, they have complete access to the inspection database. The database file which has an extension of *.mdb (Microsoft™ database) is stored in the same directory as the tool data. Although the printed reports and report spreadsheet were generated by a standalone reporting engine, using Access the user can customize some basic graphs or tables contained in the database. Alternatively, the data can be exported to a spreadsheet if preferred.
3. The PigTrap™ software, included with this report, provides the user with an easy way to view the data collected by the TDW in-line inspection tool and can also be helpful when trying to locate certain features or specific sections of pipe. The software can be run off various media or installed onto a network or hard drive. Please refer to Appendix B for installation requirements and instructions.
4. For dig sheet creation, please refer to Appendix C.
5. TDW inspection tools are designed to detect various features and anomalies within a pipeline. These various features and anomalies are added to the database using PigTrap™ software by qualified Data Analysts.
6. Database Numbering System: All entries in the database have a unique number assigned to them. The table below lists the number range of each category of database records.

7. All records are numbered sequentially from the beginning of the pipeline section to the end of the pipeline section. By default Welds begin at 110 and are incremented by 10 from one weld to the next. This can be altered to match customer weld or joint numbering by request.

Welds	110	to	9,999,999
Locations	10,000,000	to	10,999,999
Pipe	11,000,000	to	11,999,999
Misc	12,000,000	to	12,999,999
Gains	13,000,000	to	13,999,999
Deformations	14,000,000	to	14,999,999
Bore Restrictions	15,000,000	to	15,999,999
Pits or Other Defects	20,000,000	to	39,999,999
Groups (of Pits)	40,000,000	to	49,999,999
Seam Welds	51,000,000	to	51,999,999

8. All other records are incremented by 1 from one record to the next. For example, the first Location record would be numbered 10,000,000, the second record would be 10,000,001, and the third record would be 10,000,002, etc. Depending on information sent out previous to the final report, numbering may change during analysis of the run.



Appendix B

Installation Instructions for PigTrap™ Pipeline Inspection Graphical Test/Report Analysis Program

The PigTrap™ software allows the user to view all of the data collected during the Magpie/TDW inline inspection survey. Installation requires the disk(s) or external drive that accompany the inspection report.

System Requirements

Before you install and run PigTrap™ please verify that the computer you are installing to meets the minimum requirements needed to successfully open and operate PigTrap™.

Windows OS

- Microsoft® Windows 7, Vista®; Windows® XP Professional, Home Edition
 - o Administrator rights required
- 2.0 GHz Intel® Core™ 2 Duo Processor or higher
- 2 GB RAM or more
- 1 GB available hard drive space plus additional necessary for the run size.
- Qualified hardware-accelerated OpenGL graphics card, 32-bit color, and 256MB of VRAM (latest manufacturer drivers strongly recommended also).
- Microsoft® Access 2003 or higher
- Microsoft® .NET Framework 3.5 Service pack 1
- Microsoft® Visual C++ 2008 SP1 Redistributable Package (x86)
- Microsoft® Report Viewer 2008 SP1

What electronic data accompanied the inspection report

The CD, DVD, or external drive supplied by T.D. Williamson, Inc. for this PigTrap™ inspection of your pipeline contains the following types of files. For CD or DVDs the first disk will contain these files while accompanying disks (if any) contain raw tool data only. External drives will contain this information in the Final Report folder on the external drive under the run name folder.

- Database – .MBD (Microsoft Data Base) Files of this type may be viewed through Microsoft Access. This file contains the analysis of the inspection.
- .rsf – This is a PigTrap™ reference file which holds specific settings for the run to be viewed.
- Spreadsheet – .XLS (Microsoft Excel) A Pipeline Listing is generated for your run in an Excel spreadsheet format. Each event at a particular location is identified and described. You may use Copy and Paste techniques to build your own custom formatted report.
- Setup.exe file – This file executes the installation of the data for the specific run contained on the disk(s) or external drive.

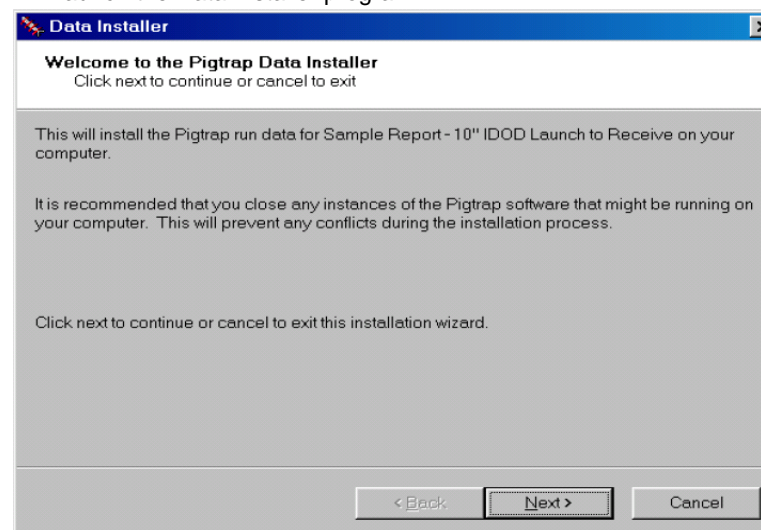
- h*.nnn, c*.nnn, i*.nnn, p*.nnn, t*.nnn, l*.nnn & o*.nnn – The raw tool data created on-board the inspection tool. These files are necessary for PigTrap™ to function properly. CD and DVDs have the option to install these files onto your computer, if chosen not to install them to your computer the disks must be used to view the run.

Run Data and PigTrap™ Installation

The inspection report will be accompanied by either CDs, DVDs, or an external drive containing all files necessary for installation. Installation for CDs and DVDs differs from external drives, if an external drive accompanied your final report please skip to PigTrap™ Installation.

CDs and DVDs

1. Insert Disk 1 from the report binder into your computer's CD/DVD drive.
2. Access the Setup.exe program located on the CD or DVD. This can be done by browsing to your computer's CD/DVD drive and double clicking Setup.exe. This will launch the Data Installer program.



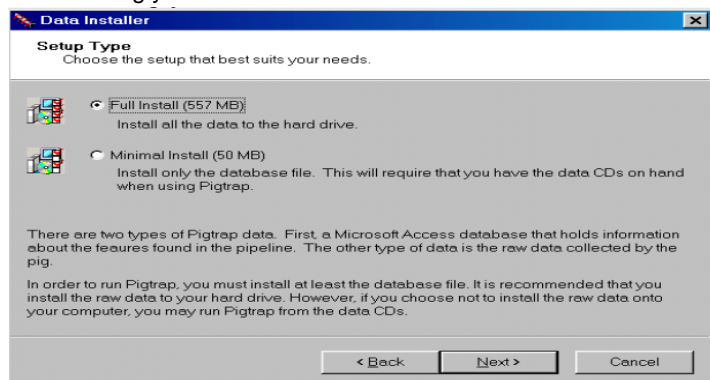
Note: If you want to install only the Pigtrap™ software and not the run data (advanced users only), choose Cancel and go to the Pigtrap™ Installation steps on page 3.

3. Click Next to continue installing the run data.

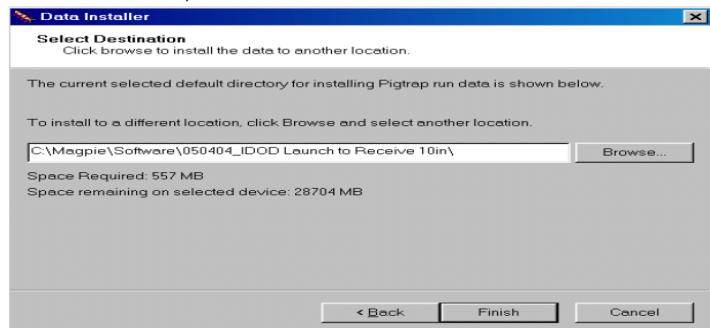


Appendix B

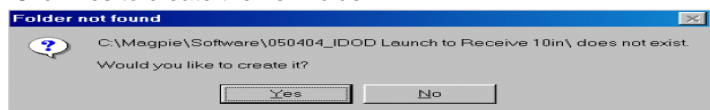
4. Choose the type of install you would like to perform: Full Install (recommended) or Minimal Install. The size of the installation is shown next to each type of installation. The database file must be installed for PigTrap™ to operate properly, but you may choose to not install the raw data. If you choose to not install all the data, you may need to change disks while viewing the data in PigTrap™. Click Next to continue after making your choice.



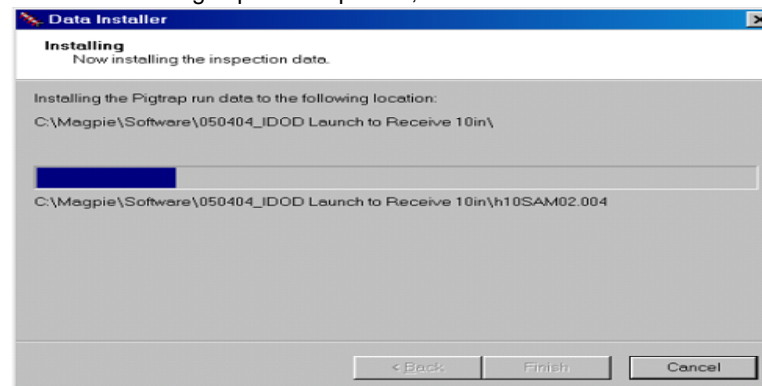
5. Choose the installation location on your computer for the data files. The default and recommended location is C:\Magpie\Software. The location inside this folder is based on the trap date, name, and size of the run. If you would like to specify another location, click the Browse... button. Click Finish to continue.



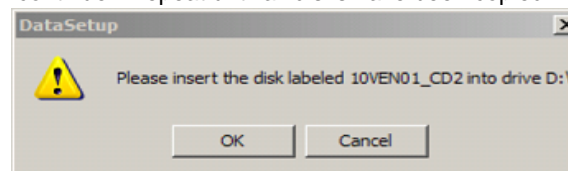
6. If the installation folder does not already exist, then you will be prompted to create it. Click Yes to create the new folder.



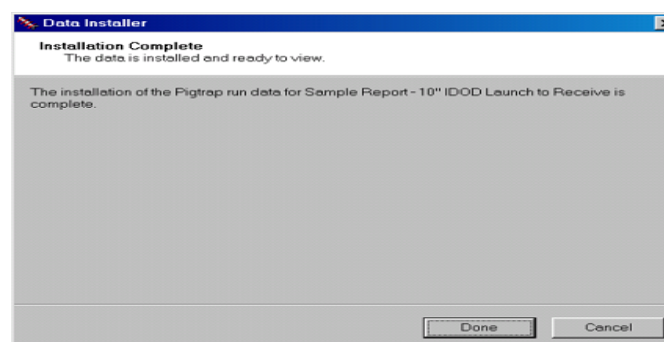
7. The following progress bar will appear. There may be a short delay while the database is being copied. Be patient, this is normal.



8. You may be prompted to insert other disks from the run distribution if data was supplied on more than one disk. Insert the required disk and click OK to continue. Repeat until all disks have been copied.



9. Click Done to complete the run data installation.



10. After clicking Done in the Data Installer PigTrap™ Installation will automatically launch.

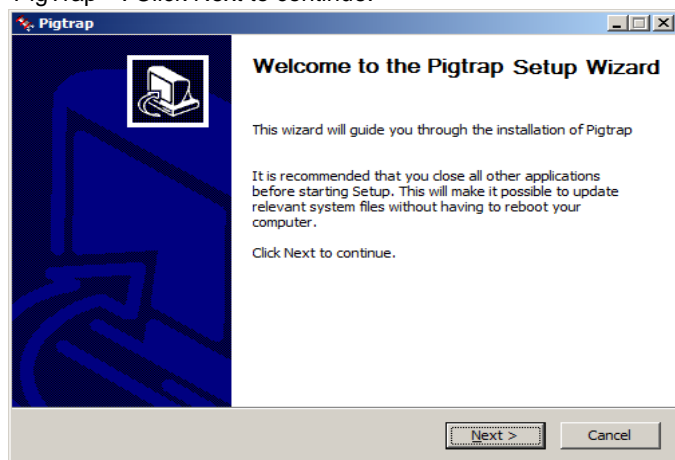


Appendix B

PigTrap™ Installation

Note: CD and DVDs follow a slightly different installation process. Steps 1 and 2 are for external drives, if you are installing from CDs or DVDs please skip to step 3.

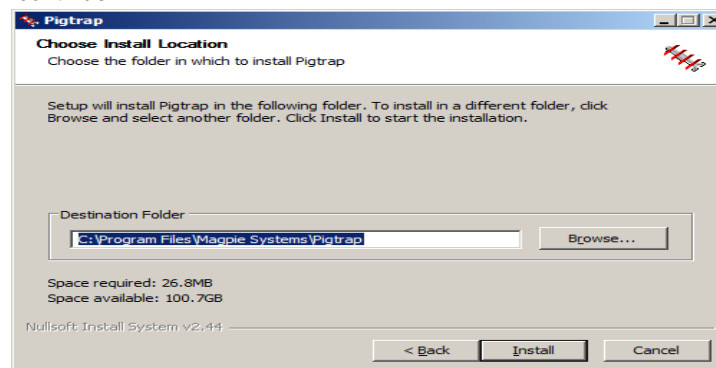
1. Plug the external drive into your computer.
2. Access the PigTrap™ setup.exe located on the external drive. This can be done by browsing to external drive and double clicking PigTrap™ setup.exe.
3. PigTrap™ Setup Wizard will launch. This will guide you through the installation of PigTrap™. Click Next to continue.



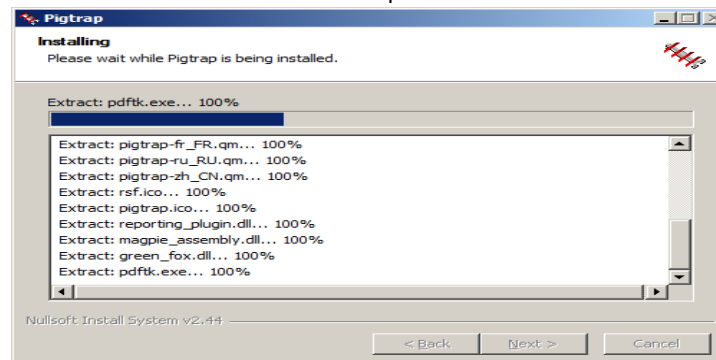
4. The Software License Agreement will appear. Read the agreement select I Agree to continue. You must accept the agreement to install PigTrap™.



5. Choose the installation location on your computer for the PigTrap™ software. The default and recommended location is C:\Magpie\Software. Click Install to continue.



6. The following progress bar will appear while PigTrap™ installs all the necessary files. Once the installation has completed click Finish to close the wizard.



7. When prompted whether you would like to view the run data, click Yes to launch PigTrap™. Shortcuts are now on the desktop to the run and to PigTrap™. Once PigTrap™ opens with the data, choose save in the upper left of the data view.





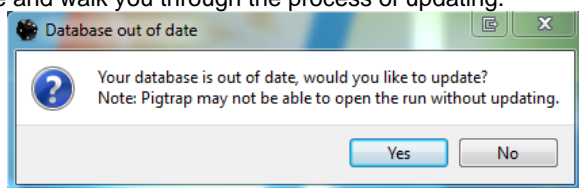
Appendix B

Opening and Viewing the Inspection Data

Viewing the inspection data in PigTrap™ can be done by using one of three different methods.

1. Double click on PigTrap™ .exe icon. Click on the Open Folder icon, then browse to the installed inspection data folder and select the desired .rsf or .mrsf file.
2. Double click on a run settings file (.rsf or .mrsf) that is associated with PigTrap™.
3. Drag and drop a run settings file (.rsf or .mrsf) on top of the PigTrap™ .exe file.

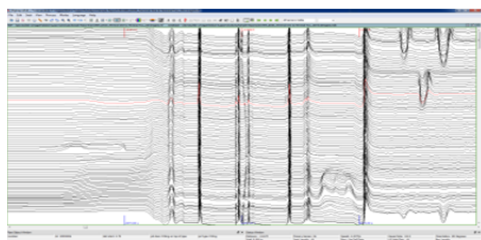
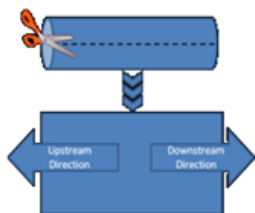
PigTrap™ was designed so you would have the ability to review previous TDW/Magpie inspection data when needed. However, you may need to acquire an updated Microsoft Access Data-base from one of our TDW representatives. When opening previous data in PigTrap™ you may encounter the message, "Your database is very old. You may need to update it." If this happens, don't panic. Chances are you will be able to view the data without any problems. If you can't, just contact your TDW representative and we can send you a newer database and walk you through the process of updating.



We packed so much into the new PigTrap™ the older reference files just couldn't hold it all so a new one may need to be created. Once the new reference file finishes, you will be able to freely navigate around in PigTrap™.

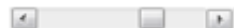
What am I looking at?

The data viewed in PigTrap™ is a 360 degree snapshot of the inside of the inspected pipe. This captured data is sliced down the middle and laid flat in the PigTrap™ main display. The horizontal lines represent sensor data collected from the pigging tool. Each line is one sensor. The left side of the screen is "upstream" while the right side of the screen is "downstream". So, as you scroll from left to right you are moving downstream from the launch valve.



Basic Navigation

The horizontal scrollbar at the bottom of the main view moves the view upstream or downstream. Clicking on the left arrow moves upstream while clicking on the right arrow moves downstream.

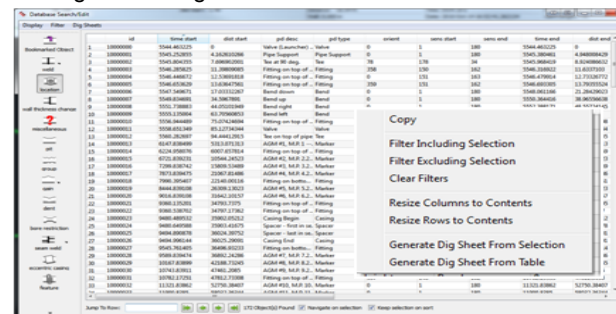


The vertical scrollbar at the right side of the main view rolls the data vertically to a desired orientation of the view.

Zooming IN/OUT on the data is easily performed by clicking on the Zoom buttons.

Select the "Jump to Distance" icon from the run toolbar to enter a desired distance point to navigate in the inspection data. The option "View Width" sets how much viewable area to display (time based).

Click on the binoculars to open the Database/Search Edit (DSE). This displays a table of the pipe objects marked by the Data Analysis personnel. The buttons in the DSE allow for a high level filtering of specific types of marked pipe objects in the table. Right click on any pipe object to display a context menu of filtering, resize columns/rows and generate dig/feature sheets.



For example: Launch and Receive Valves can be found under "location" button, you'll also find Bends, Tees, Markers, etc.

For additional information regarding dig/feature sheet creation, see Appendix C.

Training

For detailed Pigtrap training, contact your TDW representative.

Appendix B



Appendix B

Trouble Shooting

Issue	Possible Cause	Possible Solution
"Data files missing" message displayed on the Main view.	PigTrap™ is not able to load the necessary data file(s) because they are missing, not installed correctly, media/hardware damage (Dirty or scratched CD/DVD, drive failure).	Please reinstall the inspection data, check the run setting has the correct path to the files (Run Settings>Files>Data File Directory), clean the CD/DVD.
"Generate Dig Sheet" is not available from the DSE.	PigTrap™ is not installed correctly.	Please reinstall PigTrap™.
Main window title bar is not visible.	Full screen is enabled.	Press "F11" on the keyboard.
Not able to highlight pipe objects.	The color bit depth is not set correctly.	PigTrap™ requires a 32 bit color depth, please contact IT to assist in changing to the correct setting.
	One of the task specific modes is enabled.	Press the "Done" or "Cancel" buttons from the bottom left.
REF error message.	If this is the first time opening a run with PigTrap™, it may attempt to create a reference file (.ref2). This message appears because a .ref2 file does not exist or it is corrupt.	Select OK to create a new ref2 file.
Can't see the sensor data.	Zoomed in very close.	Click on the Zoom OUT button.
	Sensors are not enabled.	Turn on the sensors from the Run Toolbar.
Can't find the Status/Database Window.	The Status/Database windows are not enabled	Go to View>Status Window and toggle the option ON
Crashes while opening.	The video card drivers are out of date.	Update the graphic card drivers. Note: Before installing the latest driver, you may need to uninstall the current drivers while in Windows safe mode. Can also turn off shaders.
	The .rsf is corrupt and needs replacing.	Reinstall the inspection data.
	Microsoft Visual C++2010 redistributable is corrupt or not installed.	This is typically installed the TDW Inspection data. It is possible to have a corrupt install and additional help may be required to correct the issue. Please contact your local IT department to assist with the prerequisite install.



Appendix B

Tool Bar Layouts and Functions

Run Toolbar

The run toolbar will contain button that will toggle different views, traces and features on and off. Some of the features will be technology specific, such as IDOD as proximity sensors are only present on MFL tools. The arrows next to some buttons will provide additional options related to the specific button. Each window can be undocked by clicking and dragging the dotted left side of the toolbar.



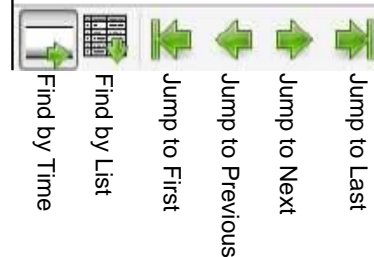
Main

The main toolbar contains navigation buttons that will aid in viewing run data and seeking to specific distances or locations.



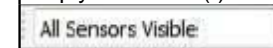
Database Navigation

These buttons navigate to features listed in the DSE.



Sensor Visibility

PigTrap™ allows user to zoom in on specific set of sensors, this dialog will display what sensors are currently being viewed. To return to viewing all sensors simply zoom out (-).



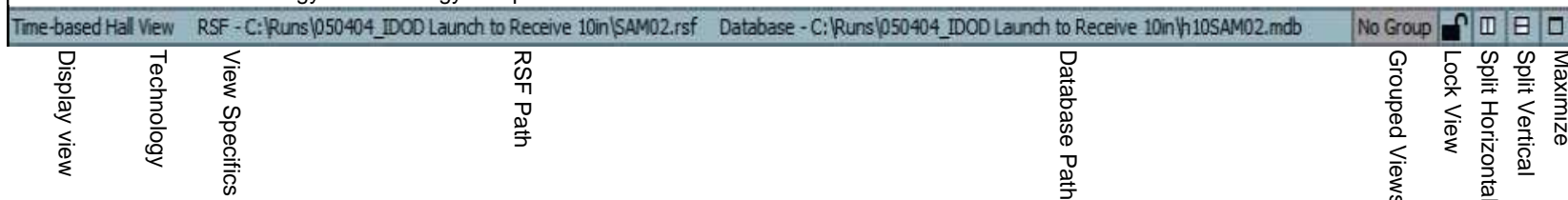
Quick Search

The quick search allows users to quickly search for features by typing in a certain criteria, such as '+valve' this will jump to the next downstream valve.



Run Details Status Bar

The run details status bar displays information regarding the view-type (time or distance), the location of the RSF and database and allows for the splitting of multiple views. Additional views can be split vertically or horizontally and even un-docked into a separate window using the button that appears after a view has been split. Locking a view will keep the current view in place. This feature will allow for multiple runs to be open in the same PigTrap™ for easier run to run or technology to technology comparison.





Appendix B

Displayed Information and Shortcuts

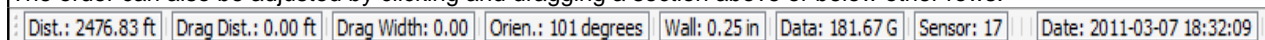
Pipe Object and Status Windows

The Pipe Object and Status Windows will be defaulted to the right side of PigTrap™. Both windows can be docked and undocked by double clicking the title bar, left clicking and dragging or clicking the undock button located in the top right corner. As PigTrap™ has the ability to display multiple datasets the Status Window will update each section depending on which tool technology is selected (refer to the Run Details Status Bar on the Tool Bar Layout and Functions page). The information contained in each section of the Status Window can also be customized by right clicking on the desired section and selecting what data to display.

	<p>The pipe object window will display information about a highlighted feature, such as a weld, providing the weld ID and Distance. Features are highlighted when the cursor is placed upstream of an object and the object becomes highlighted with a teal color.</p>	
	<p>The General section of the Status Window will display information pertaining to all datasets. The information is dependent on the cursor location, displaying the current distance, orientation, wall thickness, joint length, up stream weld and date and time. The drag distance and drag width is populated when a box is drawn and can be useful when manually measuring lengths and widths.</p>	
	<p>The MFL window will display information for the current highlighted sensor. The highlighted sensor will be a red line over the entire sensor. These sensors can be turned on and off using the Esc key.</p>	
	<p>The IDOD window will display information for the current highlighted IDOD sensor. The IDOD sensors can be turned on by pressing the tilde (~) key.</p>	
	<p>The odometer section displays information about the speed for the current cursor location.</p>	

Status Bar

The Status Bar is located at the bottom left of PigTrap™ and contains much of the same information as the General section of the Status Window. It can also be customized by right clicking and selecting what information to display. The order can also be adjusted by clicking and dragging a section above or below other rows.



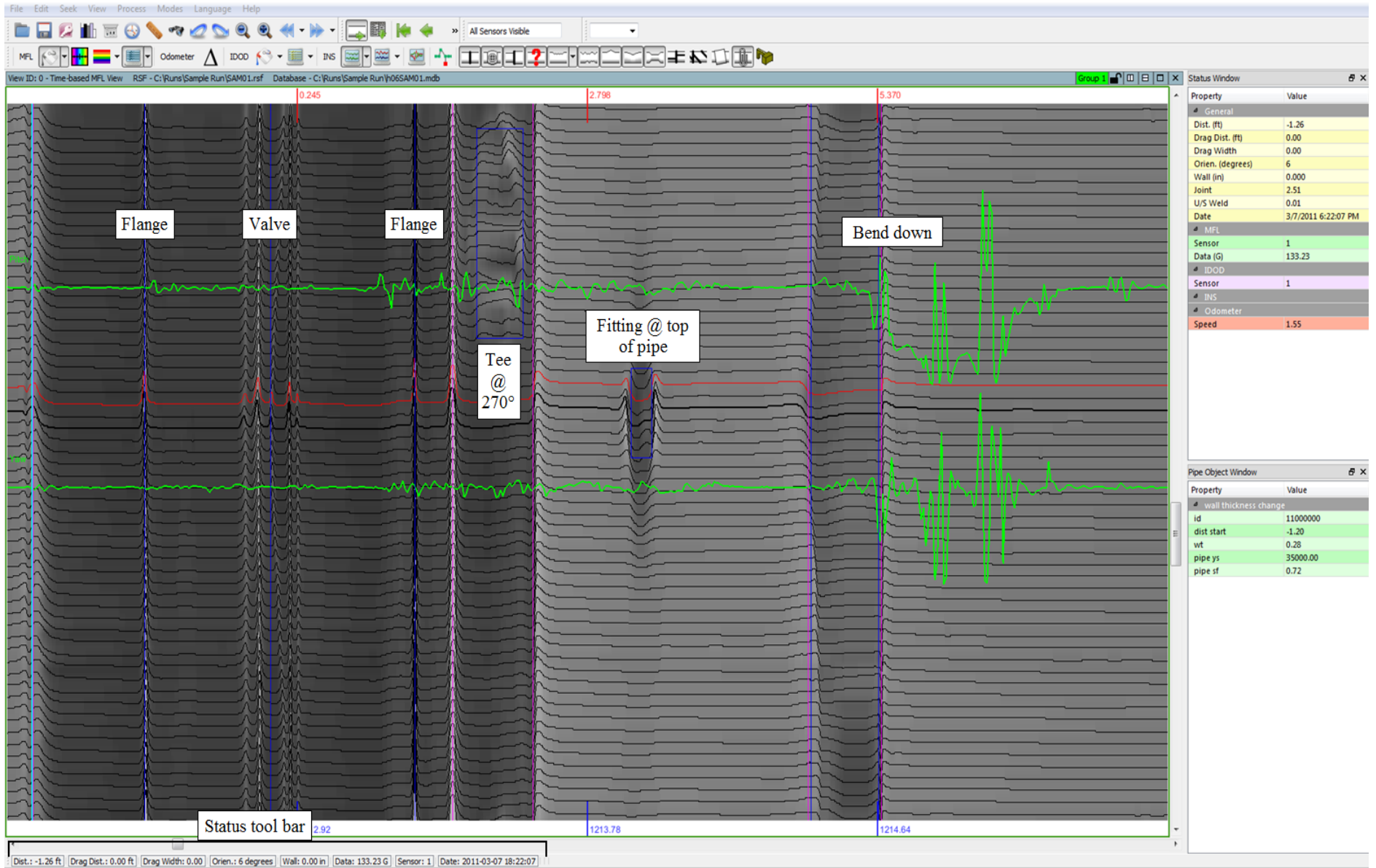
Keyboard Shortcuts

Ôd ÆÁ	Jump to Launch Valve
Ôd ÆÁ	Jump to Receive Valve
	Move Half Screen Downstream
	Move Half Screen Upstream
Page Down	Move Full Screen Downstream
Page Up	Move Full Screen Upstream
	Rotate Orientation Up
	Rotate Orientation Down
Mouse Wheel	Rotate Orientation
Ctrl + F	Open Database Search Edit (DSE)
Spacebar	Repeat Last DSE Find
Ctrl + Z	Undo Last View
Ctrl + Shift + Z	Redo Last View
Ctrl + D	Jump to Distance
Ctrl + T	Jump to Time
Ctrl + H	Open Deformation Cross Section
Ôd ÆÁ	Jump to Downstream Marker Trip
Ôd ÆÁ	Jump to Upstream Marker Trip
Alt + Double Click	Hide Status Windows
Esc	Turn Hall sensors on/off
Tilde (~)	Turn IDOD sensors on/off
M	Measure dragged box



Appendix B

PigTrap™ MFL Runs

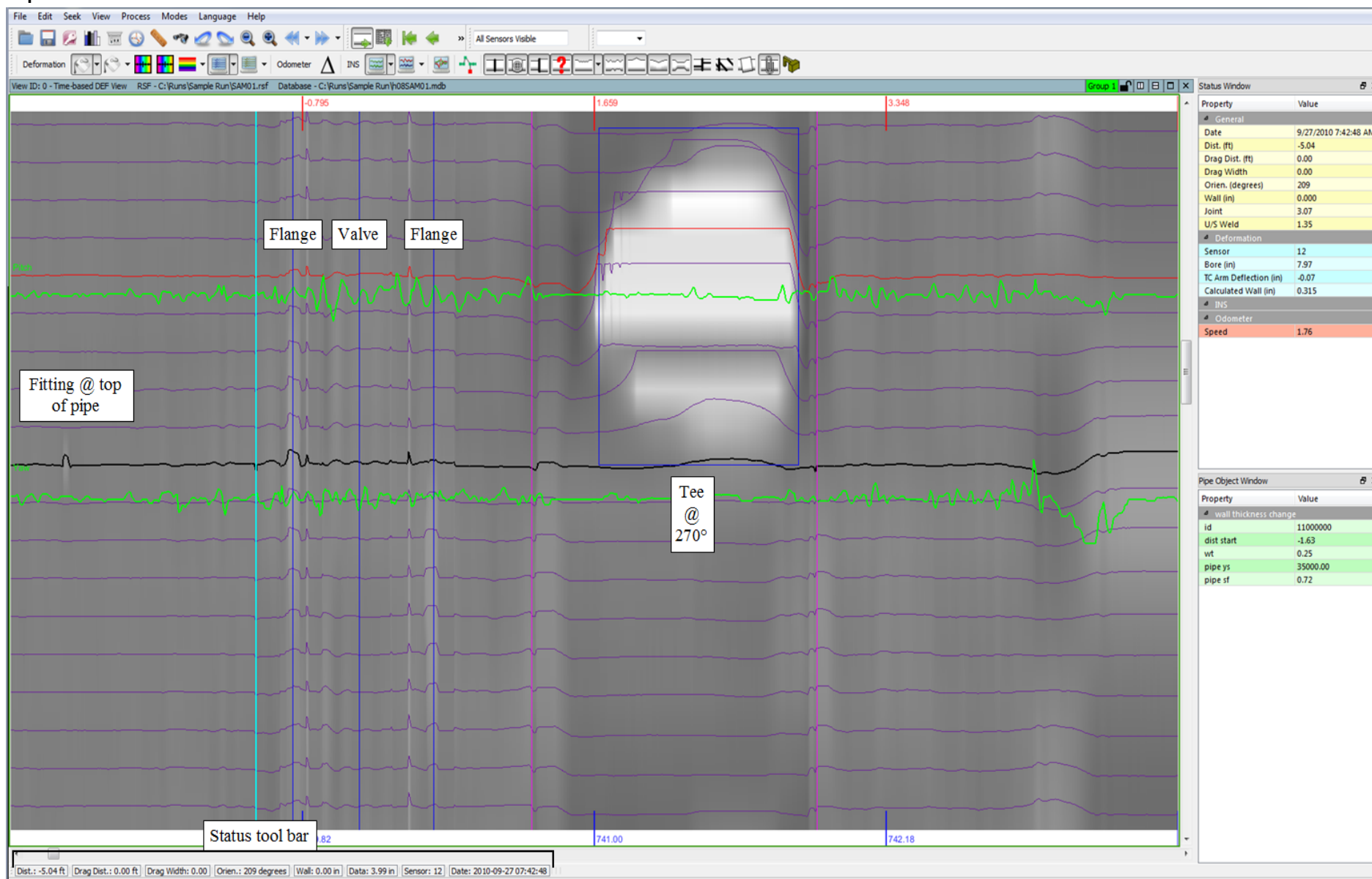


Appendix B



Appendix B

PigTrap™ DEF Runs



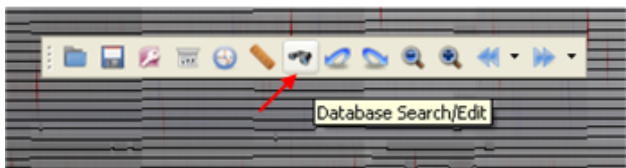
Appendix B



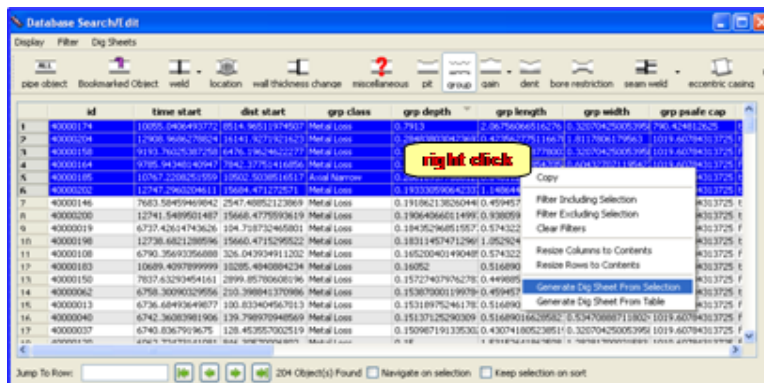
Appendix C

The user can view and print dig sheets for any anomaly or feature detected in the pipeline including Metal Loss (Groups or Pits), Dents, Locations, Gains, Wall Thickness changes, Welds, Miscellaneous notes, etc.

1. Open PigTrap™ to view the inspection data for the run. Please consult Appendix B if you need instructions on installing and viewing the raw data.
2. Click on the Database Search/Edit option either by clicking on the small binoculars icon in the toolbar or choosing the option under the Seek toolbar.



a. This will bring up the Database Search/Edit (DSE) window.



3. You can choose what type of feature you want to list in the window by clicking on the icon in the margin.

4. Once the list populates with that type of object, you can filter or sort the data to find the object(s) for which you want to create dig sheets.

- a. Clicking on the header of the column will sort either ascending or descending. Click again to reverse the order.
- b. You may also use or create various filters by clicking on one of the two Filters buttons.
- c. There is also a Displayed Columns button which allows you to hide or show the various columns of data.

5. Right clicking in the table or choosing the Dig Sheets option in the top toolbar will allow you to create dig sheets one of two ways:

- a. Generate Dig Sheet From Selection – This will create a separate dig sheet for each of the highlighted rows in the list. Using the Ctrl key or the Shift key and clicking rows will allow for multiple row selection.
- b. Generate Dig Sheet From Table – This will create a separate dig sheet for every item in the list whether highlighted or not. Note that if the list contains a lot of features, this could lead to numerous dig sheets being created and may impact the short term performance of your computer while they are being generated.

6. The dig sheets you requested will automatically be previewed for easier printing as well as saved to a directory as a pdf file for printing later.

- a. To choose which directory the dig sheets are saved into, choose Report Creation Settings under the Dig Sheets option in the top toolbar.

7. Also under the Dig Sheets toolbar in the DSE window, you may change various dig sheet formatting preferences by clicking on Dig Sheet Settings option.