Line 5 2018 Mackinac Straits Close Interval Survey Including 2019 Shore Approach Surveys

Mears Job #: 9141883310

Prepared for:

Enbridge Energy, Limited Partnership

December 9, 2019

ENBDNR0009793

Enbridge Energy, Limited Partnership – Line 5

2018 Close Interval Survey

Mears Job Number: 9141883310

Executive Summary

The following is the complete Close Interval survey (CIS) report completed by Mears Group, Inc. on the Enbridge Energy, Limited Partnership (Enbridge) Line 5 dual pipeline crossing of the Straits of Mackinac. The scope of the project was to perform an interrupted[1] CIS survey of both the east and west crossings from station fence to station fence. The East line (from station fence to station fence) included approximately 4.02 miles of survey and the West Line included approximately 4.07 miles of survey (from station fence to station fence). During the 2018 survey season, weather conditions on the water permitted completing approximately 75% of the survey on the East line and 80% of the survey on the West Line. All onshore portions and all deep-water portions were surveyed. During the summer of 2019, the remaining shallow water surveys were completed. The survey began in September 2018 and continued into November 2018 until weather conditions on the lake deteriorated, causing the remaining shallow water surveys to be completed in July of 2019.

Some of the key points as related to the surveys are as follows:

- In 2018, 100% of the deep-water portions of the pipelines were successfully surveyed (Clamps W1 to W8 and Clamps E1 to E7). No off-potentials more positive than -0.850V $Cu/CuSO_4$ were recorded indicating that the pipeline is meeting industry accepted criteria for adequate protection over these segments.

- In 2018, 100% of the onshore portions of the pipelines were successfully surveyed from the station fences to the shoreline. No off-potentials more positive than -0.850V $Cu/CuSO_4$ were recorded indicating that the pipeline is meeting industry accepted criteria for adequate protection over these segments.

- In 2019, 100% of the shallow-water shore approaches were successfully surveyed. No off-potentials more positive than -0.850V $Cu/CuSO_4$ were recorded indicating that the pipeline is meeting industry accepted criteria for adequate protection over these segments.

[1] Interrupted Close-Interval Potential Survey (On/Off Survey): A series of structure-to-electrolyte potentials taken along a pipeline, with influencing CP current sources switched using equipment designed to interrupt the CP current briefly to obtain an IR-free pipe-to-electrolyte potential.

Introduction

The Close Interval Survey (CIS) of this pipeline was completed in accordance with Mears Proposal CP5386 dated February 22, 2018; and Standing Agreement LCW2163 between Mears Group, Inc. (Mears) and Enbridge Energy, Limited Partnership (Enbridge), dated April 27, 2017 and applicable NACE International Standards. Any deviations from the above referenced documents are noted herein.

Enbridge's Line 5 is a 645-mile, 30-inch-diameter pipeline that travels through Michigan's Upper and Lower Peninsulas, originating in Superior, Wisconsin, and terminating in Sarnia, Ontario, Canada. As it travels under the Straits of Mackinac, Line 5 splits into two 20-inch-diameter, parallel pipelines approximately 1,300 feet apart that are buried onshore and into the lake and rest partially exposed on the lake floor for the balance of the crossings. Figure 1 shows the approximate location of the crossing. CIS survey of the crossing posed many significant challenges due to the length (~4 miles) and depth (to over 200 feet) of the crossing and the fact that the Strait is a navigable waterway.

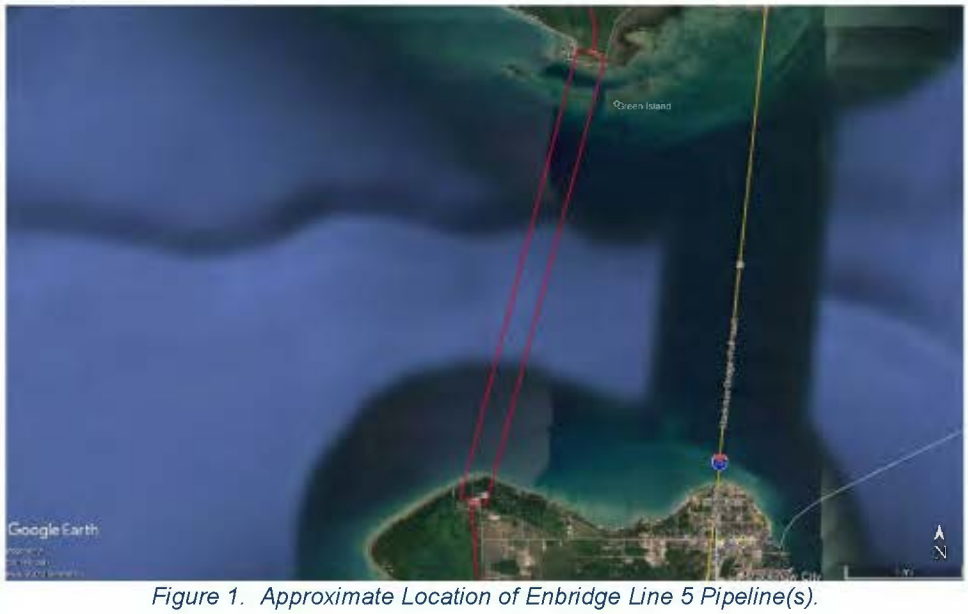


Figure 1. Approximate Location of Enbridge Line 5 Pipeline(s).

The proposed scope of work included two specific Tasks: Task 1 – Technical Support for close interval pipe-to-electrolyte survey (CIS) of the Straits and Task 2 – Execution Support for completion of the survey(s). These Tasks are summarized below.

Task 1 – Technical Support for the Straits CIS Survey

During this task, Mears worked with technology providers to assist in the development of procedures for conducting the CIS of the dual pipelines at the lake approaches and across the submerged strait.

Task 2 – CIS Survey Execution Support

The purpose of this task was to assist Enbridge in the execution and reporting of the CIS of the Line 5 crossings. Mears anticipated that the completion of the survey will require the customary support such as establishing influencing current sources, establishing and maintaining the prescribed interruption, establish and maintain pipe-to-soil data loggers on either side of the crossings, and customary CIS and testing of the on-shore segments between the shore and the station fence(s).

Deep Water Close Interval Survey

A previously completed report[2] outlining the State-of-the-Art describing available survey technologies to assess coating damage on in-situ pipelines identified the CIS survey as a reliable tool for assessing the levels of cathodic protection and the ability to locate medium-to-large defects in their protective coatings (isolated or continuous and typically >600 mm^2 [1 in^2]). For this survey a procedure was developed and implemented for conducting a remotely operated vehicle (ROV) assisted survey over the lines. The ROV assisted trailing wire survey is the most widely used method for monitoring CP levels along offshore and submerged pipelines. The deep-water surveys were performed using an ROV to carry the reference electrode(s) and a direct connection to the pipeline(s) in this case provided by installed test points. All measurements were recorded onboard a surface vessel.

For this survey pipe connections were installed prior to the survey to obtain direct electrical contact to the pipe. Figure 2 shows the location of these connection points. Seven test point clamps were installed on the East line (E1 through E7) and eight clamps were installed on the West line (W1 through W8). Underwater clamps designed for this application and utilized around the world for similar applications with waterproof wire and connectors that are water mateable were utilized to insure watertight electrically isolated connections. The location of the clamps was determined by the physical features along the pipeline routes (pipe exposure, water depth, and pipe accessibility) and by a reasonable survey distance between the test points (typically less than 2,000 feet). This spacing was deemed reasonable to permit the survey to be completed from point-to-point while accommodating the challenges of the navigable water way.

[2] "Straits of Mackinac Line 5 Coating Assessment Technologies State of the Art", June 14, 2018

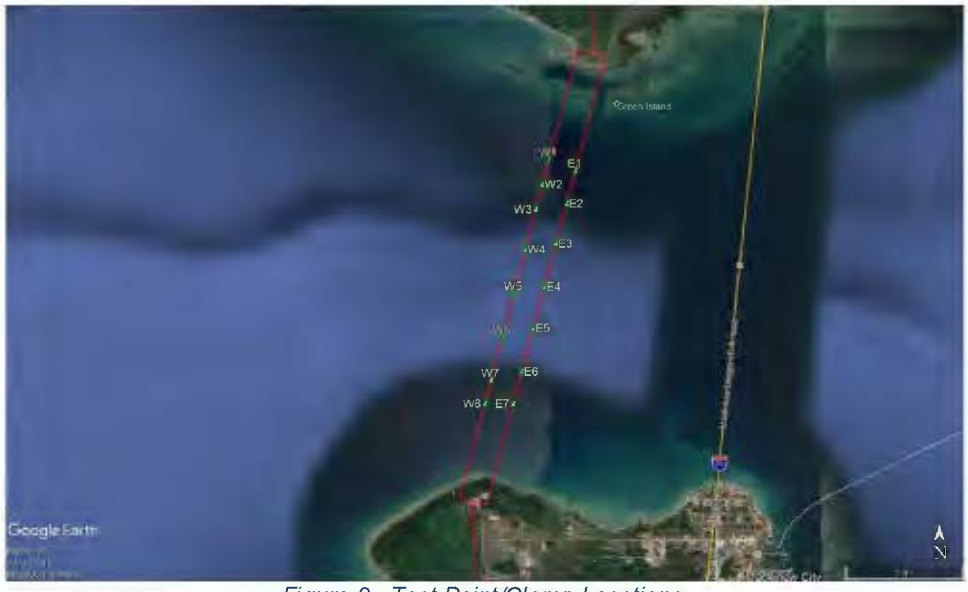


Figure 2. Test Point/Clamp Locations.

The clamps utilized for the making the pipe connections were commercially available from Deepwater Corrosion Services. Appropriate submersible and under water mateable electrical connections were utilized for establishing the electrical connection between the pipe and the surface vessel. Figure 3 shows a clamp prior to installation.

Procedures for installation of the clamps are provided in Appendix A.


Figure 3. Pipe Test Point Clamp.

To complete the submersed portions of the survey, two reference electrodes were mounted on an ROV and were carried above the pipeline while the connection to the pipeline is maintained by spooling out a light gauge insulated wire from a wire supply apparatus aboard the survey support vessel. The reference cells were fully enclosed and sealed half-cells designed for the water

pressure at the maximum depth of the CIS.

Potential measurements were recorded onboard the surface vessel. The pipe-to-electrolyte potential was measured using both reference electrodes so as to provide redundancy in the data collection and to permit subsequent analyses of voltage gradients. The reference electrodes are referred to as the Bow and Aft electrodes. Figure 4 shows the ROV and the Reference Cell locations. Reference cells were checked daily for calibration purposes and testing was conducted to assure that the operation of the ROV electronics had no influence on the measured potentials.

The deep water capable ROV is equipped with a lighted camera and powerful vectored thrusters for control in all directions. It is a stable platform that was capable of carrying the reference electrodes as well as dragging its own umbilical and the reference electrode leads through the survey.

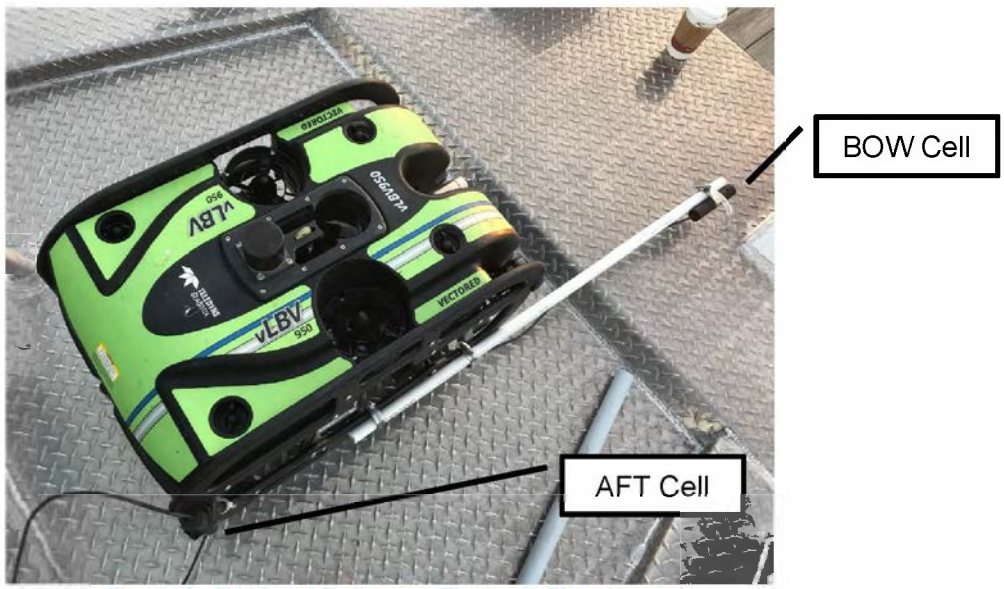


Figure 4. ROV and Reference Electrode Placements.

The survey required a water proof trailing wire connected to the pipeline connections. Marine rated water proof 16-gauge wire was utilized. The connector on one end of the trailing wire was mated to the pipe clamp test point(s) connector brought above water from the clamp to support vessel. The wire was spooled on a reel that allows continuous connection to the CIS meters at all times.

Survey data (pipe On- and Off-potentials) was collected as the ROV traveled the pipeline. Upon reaching the next clamp (test point) the test wire was retrieved and brought to the surface to permit the measurement of metallic IR-drop. Near potentials (on- and off-potentials while connected to the Near test point) and Far potentials (on- and off- potentials while connected to the Far test point) were also recorded.

The ROV position over the line was determined by a camera feed to the support vessel. The ROV was navigated to travel approximately three to five feet over the pipeline. The ROV's GPS position was referenced via ultra-short baseline acoustic positioning (USBL) which was in turn referenced to the support vessel GPS location. This permitted the calculation of the ROV's location in standard GPS terms and the survey data was aligned to the position over the line by aligning the time stamps of the ROV GPS position with the survey data point time stamps. Both the GPS time stamps and the data collection time stamps are synchronized to GPS satellite time.

The ROV in some cases became entangled on obstructions requiring the ROV to stray from the

pipeline and double back to free itself. Currents also occasionally pulled the ROV off course. To eliminate these excursions from the survey data file, the ROV GPS data was reviewed with respect to the known pipeline GPS location, permitting removal of any spurious or repeated data and assuring that the data collected was as reasonably close to over the line being surveyed as conditions would permit.

The survey data collection equipment collected both on- and off-potentials every four seconds. This equated to a data point every 2 to 5 feet along the pipelines, except when conditions such as currents or surface vessel positioning caused the ROV to accelerate or decelerate. On average, a structure potential measurement was recorded and plotted every 4.4 feet over the East line (excluding skips[3]) and every 4.3 Feet over the West line (excluding skips).

In addition to the survey components, data loggers and reference electrodes were in place continuously on each on-shore leg (North and South) of both pipelines (East and West). These loggers were utilized to verify and monitor the current interruption and to provide additional support to the survey data. Daily data logs were utilized to confirm rectifier operation, to confirm rectifier interruption prior to any survey, and to evaluate if any interference (stray current, telluric currents etc.) were impacting the surveys.

The detailed deep-water Survey Procedure is provided in Appendix B.

On-shore portions of the lines (from the shore to the station fences on both the North and South sides of the crossing) were located and also surveyed using the following Procedures:

- MLDC-01 Rev3 Location and Depth of Cover Survey
- MCIS-01-Rev7, Close Interval Survey Procedure
- MQA-01-Rev17, Quality Assurance Program

Deteriorating weather conditions at the end of the 2018 survey activities prevented completion of the survey of the final shallow water shore approaches. Completion of the shallow water surveys (survey from the nearest-to-shore installed clamp to the shore) were undertaken in July 2019. These surveys were completed in 2019 by utilizing the ROV to retrieve the previously installed (2018) test wire from the nearest installed clamp and placing the reference electrode over the line within 3 feet of the lake bed by suspending the reference cell on a weighted line supporting a submersible camera (to assist in navigating areas where the pipeline is exposed and where overburden is easily identified). Dual data loggers were again employed on board the survey vessel to assure redundant data streams in the event of any survey errors.

The survey boat then navigated the shore approaches utilizing GPS navigation. When the shore approach became too shallow for the survey boat (<3 feet), the cell was walked to shore to complete the survey. Figure 5 below shows the survey boat as it meets the shallow water at the shore. GPS data and associated time-stamps were matched to data collected GPS time-stamps for appropriate data alignment.

[3] "Skips" are pauses in the data collection while the ROV was not properly positioned over the pipelines or while electrical connections to the pipeline were being made.



Figure 5. Survey boat approaching shore during 2019 shore approach surveys.

Prior to the surveys, all cathodic protection current sources known to influence the survey area were identified and current interruption was initiated and verified. Figure 6 shows the location of the influencing current sources for both the 2018 and 2019 surveys. Table 1 shows the rectifier outputs from the 2018 and 2019 shore approach surveys. The total current interrupted during the 2018 survey was 124.55A and the total current interrupted during the 2019 shore approach surveys was 134.24A. The 9.7A difference between the 2018 and 2019 surveys was due to an increase in the output of the rectifier providing CP to the ATC electric cables (and slight seasonal variations in the current output of the Enbridge and TransCanada sources). The ATC electric cables cross the Straits to the west of the Line 5 crossings and the associated impressed current CP ground bed is located on the North shore of the Straits just west of the Line 5 west crossing. This current source (ATC) is independent of the Line 5 sources (electrically isolated), and as such it does not influence the polarized potential of Line 5. Due to its proximity to the North Shore Line 5 approaches, it does it does however have an impact on the measured On-Potentials of the lines due to its contribution to IR-drop in the proximity of the ground bed.

These sources cover approximately 30 miles upstream of the crossing and 21 miles downstream of the crossing, and include Enbridge, TransCanada and ATC impressed current sources.

The current interruption was verified daily and waveprints of the interruption waveform were collected at the start of the survey day, midday and at the end of the survey day. A three second On-cycle, one second Off-cycle was utilized. Figure 7 shows a typical waveprint of the interruption cycle.

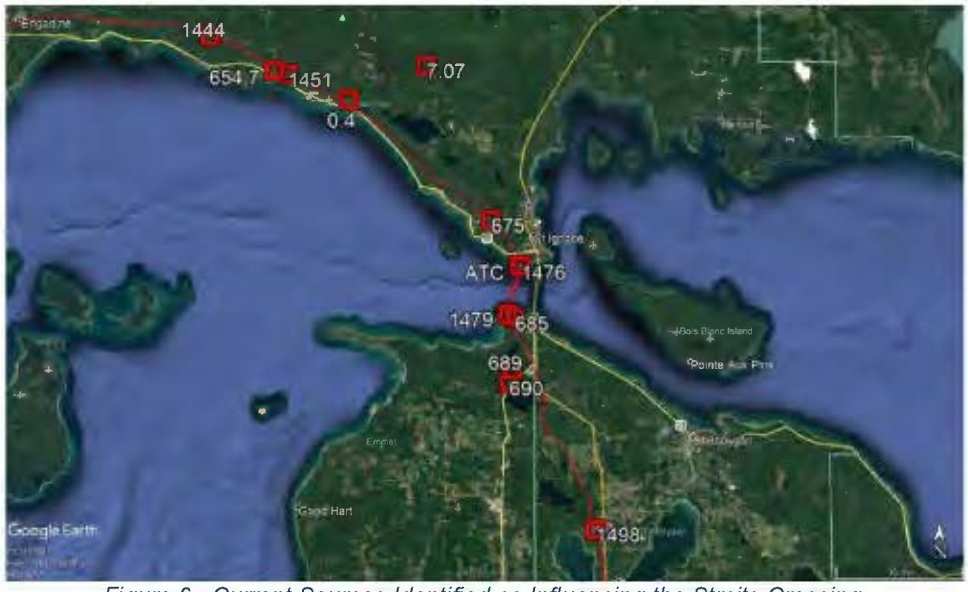


Figure 6. Current Sources Identified as Influencing the Straits Crossing.

Table 1. Current Source Identification and Outputs during the 2018 and 2019 Surveys.

Operator	Latitude	Longitude	Rectifier ID	Location Description	Date	Volts	Amps		Date	Volts	Amps	Amps (Off)	Comments
TransCanada	46.028200	-85.033968	0.4	MP 0.4	09/09/18	34.90	13.00		07/09/19	34.50	13.89	0.00	manually set due to interruption issues
TransCanada	46.067275	-84.907716	7.07	MP 7.07	09/09/18	16.60	4.40		07/09/19	16.90	3.88	0.00	manually set due to interruption issues, breaker issue and large ants nest, need waders
TransCanada	46.061317	-85.155413	654.7	MP 654.7	09/08/18	48.87	7.50		07/08/19	48.80	7.60	0.00	
TransCanada	45.892656	-84.801769	675	MP 675.0	09/08/18	19.54	17.10		07/08/19	19.59	15.70	0.00	
TransCanada	45.781850	-84.762900	685	MP 685.0	09/11/18	42.00	12.70		07/08/19	42.20	10.50	0.00	
TransCanada	45.723641	-84.766998	689	MP 689.0	09/11/18	22.48	11.10		07/08/19	22.36	10.30	0.00	
TransCanada	45.708524	-84.771938	690	MP 690.0	09/11/18	30.65	8.30		07/08/19	31.30	11.70	0.00	
Enbridge	46.099652	-85.260805	1444	Hog Island	09/08/18	25.90	5.10		07/08/19	25.90	4.85	0.30	Solar Unit
Enbridge	46.057000	-85.133800	1451	Cut River	09/08/18	35.77	3.40		07/08/19	36.00	2.96	0.00	Surge Protection damaged, call EI when survey completed (Brody Carlson 906.280.6559
Enbridge	45.841155	-84.753158	1476	Straights station	09/07/18	6.30	6.00		07/08/19	6.57	5.62	0.00	
Enbridge	45.786316	-84.774429	1479	Mackinaw station	09/07/18	29.96	14.40		07/08/19	15.60	13.20	0.00	
Enbridge	45.542683	-84.632614	1498	Topinabee	09/08/18	10.79	10.90		07/08/19	10.90	11.45	0.00	
ATC	45.840952	-84.756881	ATC	ATC Substation	09/10/18	26.50	10.65		07/10/19	53.90	22.59	0.00	

2018 Total Current Interrupted 9/12/2019: 124.55 **2019 Total Current Interrupted 7/9/2019: 134.24**

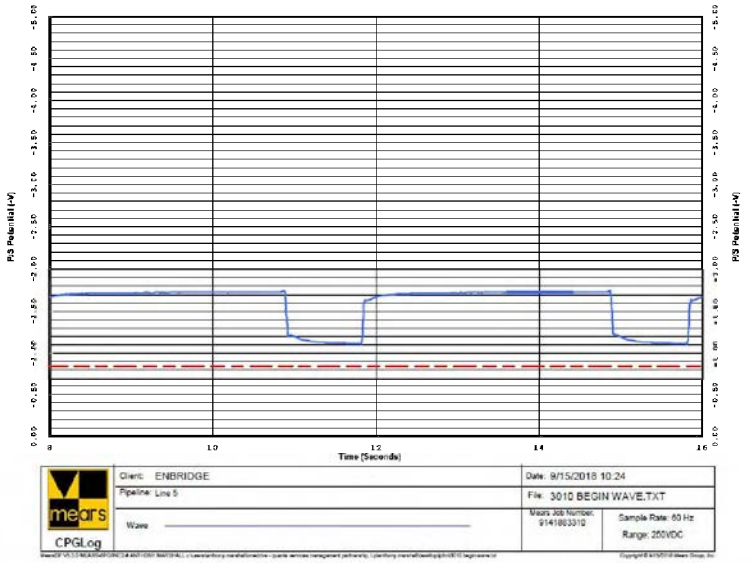


Figure 7. Typical Interruption Waveprint Showing interruption Cycle (3 seconds on, 1 second off)

RESULTS

This CIS Report is the culmination of review and evaluation of the data collected. The CIS data has been plotted for each pipeline (East and West) and for both reference electrodes (Bow and Aft). These plots are provided in the following Appendices:

Appendix C – East Pipeline BOW Cell

Appendix D – East Pipeline AFT Cell

Appendix E – West Pipeline BOW Cell

Appendix F – West Pipeline AFT Cell

Appended to the plots is also the 2019 shallow water shore approach survey data.

Some of the key points as related to the surveys are as follows:

- In 2018, 100% of the deep-water portions of the pipelines were successfully surveyed (Clamps W1 to W8 and Clamps E1 to E7). No off-potentials more positive than -0.850V Cu/$CuSO_4$ were recorded indicating that the pipeline is meeting industry accepted criteria for adequate protection over these segments.

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- In 2019, 100% of the shallow-water shore approaches were successfully surveyed. No off-potentials more positive than -0.850V Cu/$CuSO_4$ were recorded indicating that the pipeline is meeting industry accepted criteria for adequate protection over these segments.

DATA PRESENTATION

The survey data provided displays an On-potential line shown in blue, an off-potential line shown in green and a reference line indicating the –0.850 Volts polarized potential criteria displayed on the graph as a dashed red line. Relevant survey comments are also aligned with the data. These comments were entered into the data stream while surveying as well as additional comments (anchor locations provided by Enbridge) referenced by GPS to the survey.

The following items are included within each Appendix for each line:

1) CIS Profile Graph Referenced to Enbridge Stationing (Bow and Aft duplicate surveys) plotted in 1,000 foot intervals,
2) RAPSheets,
3) Exceptions Off-Potentials Less Negative than -0.850 volt CSE,
4) Exceptions Off-Potentials More Negative than -1.200 volt CSE, and
5) CIS Skip Report.

A CD containing all information in PDF format is provided for additional reference and analysis.

Limitations on Data Interpretation

Pipe-to-Soil Potentials:

Local conditions can impact the collection and analysis of structure potentials. The presence of static or dynamic stray currents can influence the potentials collected and should be considered in their analysis and interpretation. Some of the sources include foreign cathodic protection systems, some industrial operations, welding, DC transit operations, telluric currents.

All foreign CP sources known to influence the Line 5 system in the vicinity of the Straits crossing were accounted for and interrupted during the survey. No industrial or transit sources of stray current were identified or deemed to be influencing the pipelines. Telluric currents impacting pipe-to-soil (or water) potentials are usually associated with disturbances in the earths magnetic field due to its interaction with the flow of charged particles from sun activity. These disturbances are related to sunspot activity and can vary greatly especially on pipelines located closer to the magnetic poles of the earth. Telluric activity can have long cycle effects (slow gradual changes in measured potentials) or more rapid (short term) effects. Telluric activity has been reported to influence Line 5 and as such the continuous data recorders placed during the survey were monitored to assess if telluric activity was occurring and if so, the possible magnitude of its effects. In cases of significant telluric activity, procedures can be utilized to compensate for this activity by analysis of the stationary data logs (time-based deviation from average applied to time-based survey potentials).

Detailed review of the daily stationery data logs showed no evidence of long-cycle telluric influence. Minimum short cycle influence was observed in some of the data files (typically less than 50 mV).

Some of these locations for reference electrode earth contact may include sources of measurement error in pipe-to-soil potentials.

Watering to improve reference contact will reduce errors associated with the resistances of measurement circuits. Measurement errors associated with voltage (IR) drops in the earth will be minimized through the use of the interrupted CIS.

One factor, which is likely to cause difficulty in data interpretation, is the measurement of pipe-to-soil potentials through contact over concrete. The alkalinity of the concrete often skews the apparent potentials measured. This is further complicated by the fact that the properties of concrete may vary substantially from one location to another. The effect of the concrete may be influenced by the presence of unknown contaminants, differences in batch preparation, local porosity, and alkalinity depletion with age. The presence of reinforcing steel between the reference electrode and the pipe could influence these potential measurements.

Sidewalks often contain a thin-gage wire mesh, and concrete roadways may contain rebar to satisfy loading requirements.

Global Position Satellite Survey (GPS) and UBSL:

Several factors may affect the acquisition and accuracy of GPS coordinates collected in the field. Field conditions that affect satellite coverage and/or geometry, such as, overhead canopies or large buildings, may result in poor or no data collection. Real-time differential correction will be utilized with an integrated GPS Beacon where accessible. While these factors typically do not impact GPS collection on open water, several factors impact the positioning of the ROV with respect to the vessel and can produce brief gaps in the ROV positioning data stream. Because the USBL is line of site and much of the survey was conducted in deep water, there are moments when the data stream is interrupted. These reasons include top side weather conditions, lake bottom features blocking communication, software lag, and aeration caused by boat motors.

If real-time correction is not available, data files will be post-processed from base station providers. Errors may occur in post-processed data if insufficient base station data is available. Every effort is made to minimize measurement errors to the extent possible by data acquisition techniques. Data analysis considered identifiable factors to avoid misinterpretation.

GPS Navigation:

It is important to note that navigation of a post-processed and differentially corrected GPS coordinate may contain real-time errors in the field. Essentially, there are three (3) modes of real time data collection and navigation. The first mode uses the US Coast Guard Beacon system with real-time differential correction (DGPS). FAA published specifications for DGPS are typical positional errors of one (1) to three (3) meters. The second mode of operation, the US Coast Guard Beacon system with no real-time DGPS, has a published specification of 10 meters. The third mode, Wide Area Augmentation System (WAAS), has a published specification of seven (7) meters.

Due to the fact that DGPS may not always be available in the field, it is important to always triangulate a GPS position by using at least two (2) other known GPS sites. The location of these coordinates and the distance measured to the navigated site is confirmed using this technique to insure proper relocation of the data.

ENBDNR0009805

Appendix A – Clamp Installation Procedure

ENBDNR0009806

1.0 PURPOSE

The purpose of this document is to define the requirements to install Deepwater's RetroClamp.

2.0 APPLICATION

This work instruction applies to all personnel that will be installing Deepwater's RetroClamp CP retrofit system with rectified cathodic protection systems. The RetroClamp consists the RetroClamp frame and contact screw.

3.0 PR0CEDURES

3.1 Required Equipment

- Polatrak ROV II™ Diver Handheld Probe (or equivalent).
- Wrench or sockets in sizes: 3/4" and 1"

Hydraulic Impact (Possibly)

3.2 Subsea Placement and Attachment

3.2.1 Determine where the RetroClamp should be installed per the placement sketch.

3.2.2 Clean marine growth from an 8-inch-wide band on the member wherethe RetroClamp will be installed

3.2.3 Deploy the RetroClamp into location using rigging.

3.2.4 Ensure the contact screws are backed out to allow the frame to rest onthe member.

3.2.5 Push the RetroClamp onto the pipeline or member, ensuring both Flapper Plates engage. Pull back on the clamp to confirm the flapper plates are securely engaging the member (clamp should not come off the member).





3.2.6 Contact the probe with the top plate of the RetroClamp (be sure to break through the coating to reach bare metal and use a file if necessary topside prior to deployment). Read and record this potential. This potential measurement should be close to a native potential as the clamp has not made contact with the pipe yet.



3.2.7 Turn the contact screw clockwise to fully engage the pipeline. Typically, when installed properly the contact screw and two flapper plates are the only parts of the RetroClamp in contact with the pipeline. Once the contact screw is fully engaged the floating pate should separate from the rest of the frame by approximately ½ of an inch (indicated below)



3.2.6 Once again contact the probe with the top plate of the RetroClamp (be sure to break through the coating to reach bare metal and use a file if necessary topside prior to deployment). Read and record this potential(s). It is recommended that the cathodic protection rectifiers are interrupting during this step and that the ON and OFF readings are recorded.



3.2.9 This potential readings in step 3.2.8 should show a protected criteria and a potential change between the ON and OFF cycles. If the readings are low or there is no shift, confirm that all connection are firm metal-to-metal.:

- RetroClamp contact screw to pipeline or member
- Probe to RetroClamp
- Probe to pipeline (optional)

3.2.10 Repeat both measurements until this criterion is achieved.

3.2.11 Tighten locking nut on clamp contact screw, use 1-1/16" wrench (if diver installed). RetroClamps that are installed by ROVs will not have a locking nut.



3.2.12 When practical, the wire attached to the clamp can be have a pigtail attached with the end of the copper wire showing. The probe can touch the end of this wire and the results seen in step 3.2.8 should be similar. These readings should be no more than 10 mV difference from the probe to clamp potential readings. If they are different, check all connections to clamp and connectors of the wire and repeat the readings until this criteria is met.



Test lead wire connected to clamp



Wire relief connections



Male connecter at top with cover and other end of its wire is connected to clamp. Female connector at the bottom.



Male connector on top without cap and female connector below that plugs into male connector and other end of its wire connects to the trailing wire above water surface.

4.0 APPLICABLE FORMS

All readings and drawings shall be recorded on the provided survey sheets for each report.

Revision Log

Revision No.	Description of Change	Revised By	Date
000	Original		2018-08-22

Appendix B – Close Interval Survey Procedure

Mears Group, Inc.
Close Interval Surveys of Underwater Pipelines
Enbridge Straits of Mackinac CIS

Pre-Survey Requirements

Pipe Connections – A sufficient number of pipe connections will be installed prior to the survey (see table 1, below). This will occur 1 – 2 weeks or greater before the survey is to commence. Underwater clamps with water proof wire and connectors that are water mateable will be utilized to insure watertight electrically isolated connections.

Action – Verify Number of Clamps and Exact Stationing _ (Mears/Ballard)

Underwater Clamp Installation – Before installing any underwater clamps to the pipeline, water proof wire will be directly connected to the clamp with a short length of wire (e.g. 1 – 4 feet) with a male water mateable connector. This will then be connected to another length of wire sufficiently long enough for the wire to come to the surface for the execution of the survey. The wire coming to the surface will connect to the clamp wire with a female connector and will have a male connector and dead-end cap connected on the other end of the wire that will be staged underwater and eventually come to the surface. This wire length will be approximately pipe depth plus 50 feet.

The clamps will be clearly labeled as follows with the wire length stated being 50 feet longer than the clamp depth. Clamps with pig tails are being shipped directly to Ballard's yard. The wire lengths for connection to each clamp pigtail are being assembled in Rosebush with the proper connections and will be sent for connection above the water surface before installation.

Clamp installation to proceed after clamps and connecting wire extensions are landed in Mackinac – coordinated by BMC/MEARS. Earliest start of clamp installation is July 8-10 – but material delivery and resource availability may push this a bit later. Anticipated duration of clamp installation is 5-6 working days.

East pipeline				
Clamp Name	Length of wire	water depth	GPS N/E	Pipe Chain
E1	120 feet			
E2	270 feet			
E3	200 feet			
E4	165 feet			
E5	170 feet			
E6	135 feet			
E7	120 feet			

West pipeline	
Clamp Name	Length of wire
W1	125 feet
W2	145 feet
W3	275 feet
W4	230 feet
W5	175 feet

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W6	175 feet
W7	125 feet
W8	130 feet

All clamps should be checked for proper wire length and wire continuity out of the water before installation (tested by MEARS).

Once the clamp is installed and verification has been made of the clamp connection to the pipe, the electrical continuity between the pipe clamp and wire will be confirmed by the diver using a Polatrak CP Gun to check the potential of the pipe, and then checking the potential at the end termination of the wire. MEARS will prepare a end-connector adapter (female mate-able connector to a contact surface for the Polatrak gun).

After continuity is confirmed, the diver will re-install the end protector cap and stage the wire underwater in a secure manner that will allow for retrieval by an ROV during the CIS. BMC will record the GPS positioning of underwater staging areas for wire retrieval.

Resources needed for clamp installation include dive barge, divers, winch, ROV, Polatrak CP gun, half-cell, volt meter, 25 foot piece of wire with female water mateable connector for connection to the clamp wire and banana plug at the opposite end for the connection to the volt meter, water proof cell with 25 feet of water proof wire with banana plug at the end of the wire and CP tech to verify/troubleshoot electrical connections or make necessary repairs.

CIS SURVEY – COMMON REQUIREMENTS:

Trailing wire – A waterproof wire will be utilized for the trailing wire connected to the pipeline connections. Marine rated waterproof 16-gauge wire will be utilized. The connector on one end of the trailing wire will be a female connector that attaches to the male connector brought above water from the clamp to surface wire. The wire must be spooled on a suitable spool (Hykon, Hubble or other as accepted by BMC) that allows continuous connection to the CIS meter at all times. Two spools will be prepared prior to survey. One spool will have 2500 feet of trailing wire on it. The other spool will have 5000 feet.

An extension cable from the trailing wire spool (located at the aft of the CIS boat) will be routed to the data recorders located in the cabin of the boat. This cable will have connectors suitable to the trailing wire spool (at one end) and the datalogging equipment (at the other end). Note that the survey datalogger end will require a splitter to permit connection to both dataloggers used during the survey.

The ROV will utilize two half-cells mounted to the ROV with one placed in front of the ROV and one placed behind the ROV at a sufficient length to not be interfered with by any ROV or ROV umbilical generated DC signals. MEARS/BMC will conduct interference testing at least 1 week prior to anticipated start of the CIS. For this survey this will be approximately 2 feet in front of the ROV and 2 feet in back of the ROV. A channel or rack attached to the ROV with the submersible half-cells attached to the ends of the rack opposite of each other should be sufficient.

Half Cells – fully enclosed and sealed half-cells will be utilized for the underwater survey. The half-cells must be rated to the water pressure at the maximum depth of the CIS.

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Wire Connections to half cells – A waterproof and sealed wire connection to each half cell must be utilized for the survey. The half cells are being mounted onto an ROV and the wires from both half cells will be attached to the ROV umbilical cord. This will help ensure that the wires do not get tangled up and no unnecessary strain is put on the half-cell wire connection. The reference cell lead wires will be 500 feet (each) for this survey.

UDL-1 data loggers

Interruption will be verified and monitored via UDL-1 or UDL-2 data loggers with half cells attached to the nearest land test stations on both sides of the water crossings with 2 data loggers upstream and two data loggers downstream of the survey area on the pipeline being surveyed. This will occur 1 -2 days before the CIS survey is to commence. Action will be taken to properly secure the half cells and data loggers from any disturbance. Any interruption irregularities will be addressed immediately. Interruption will be monitored via waveprints at both shore approaches (north and south) to assure proper interruption scheme is maintained.

The Underwater Survey

Two CP technicians will be aboard the boat to operate the two Allegro meters. Due to space limitations on the CIS boat, management of the trailing wire and connection of the wire and half-cell leads to the meter will be shared between the CP technicians and the boats Dive Tender. The boat will also have a captain and ROV pilot (totaling 5 persons on board).

MEARS will supply two other CP technicians (one each side of the Straits) be on shore to assist in case of wire problems, interruption problems or any other unforeseen technical issues that might occur onshore during the survey.

MEARS personnel will also frequently record and monitor waveprints to assure that all current sources are actively being interrupted. Should changes in the interruption cycle be noted (loss of synchronization, loss of current source(s), loss of interruption, etc.), survey operations will cease until the changes can be identified and addressed.

Pipeline buried under soil below water and not visible

The shallow water survey presents unique challenges that may require one or more of the following activities to ensure the CIS reference cell tracks the position of the underwater/buried pipelines:

- Use of known GPS location of the pipelines: In this scenario, the GPS stationing of the pipeline will be used to guide the surveyor (diver or ROV).
- Pre-locating and marking of the pipe location: In this scenario, a line locator (or GPS stationing of the pipeline) will be used to place marker buoys, stakes or submerged flagging to set visual waypoints to guide the surveyor.
- Live locating of the pipe location: in this scenario, a locator (person or team) will live locate the pipeline using a line location device, staying in visual contact with the surveyor (who will follow the locator/team).

The best line location regime will be determined by MEARS/BMC for each discrete segment on a 'best for purpose' basis.

Only a single reference cell (carried by a diver) will be used for this portion of the survey.

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The negative connection for this portion of the survey will be the nearest land based test station (where the stationary datalogger is located). The CIS will begin at the edge of the water with a waterproof trailing wire connected to the nearest test station of the pipeline that is not submerged. This trailing wire will be connected to the CIS meter on the dive boat. The reference cell wire is attached to the divers umbilical – terminating at the reference cell carried by the diver. The trailing wire on the boat will need to be secured such that it can easily be dispensed from the boat and into the water while the boat is in motion and the diver moves along the water bottom.

The diver will carry a submersible half-cell that will be connected to a waterproof wire that comes to the surface and is connected to the volt meter on the dive boat along with the trailing wire. A second reference electrode/datalogger will not be required for this portion of the survey.

Caution will need to be taken to insure no tangling of the trailing wire and ROV or Diver umbilical cord/half-cell wires occur as everything will be in very close proximity to each other. A sub-meter GPS position of the diver will be required during the survey to locate the position of the pipeline and the CIS data. The CP technician at the surface on the boat will be recording the data. The diver will walk over the pipeline placing the half-cell on the bottom of the water in the dirt/mud every three to five feet and over the pipeline until the diver reaches the first underwater connection point.

The diver survey will continue until the first underwater negative connection is reached. (Refer to generalized trailing wire reconnection procedure)

Resources: As/ Required - Dive boat, Diver, pipe locator connected to pipeline on land, sub-meter GPS, underwater locator, marking buoys, locate technician in boat.

Generalized Trailing Wire Reconnection:
The wire at the underwater connection point will need to be brought to the surface to allow for a near ground and metal IR measurement.

In the case of the Diver/ROV survey transition (first underwater clamp encountered), the ROV that is observing the divers progress will seek the pre-staged negative connection wires and will recover this to the diver/ROV support boat. The diver (and the divers reference cell) will remain on bottom until the electrical continuity of the Near Ground pipe connection is validated. (After the cable to pipe connection is validated, the Diver can be recovered to surface).

The on-boat MEARS technologist/Diver Tender will facilitate the necessary cable manipulation to collect the following measurements:

- ON/OFF Far Ground potentials (using divers bottom side reference cell) (this will already have been obtained with the CIS)
- ON/OFF PS potentials with the ROV at the boat (as verification of cable connections and functioning of both ROV reference cells) – using the Far Ground negative connection point
- ON/OFF PS potentials with the ROV at the boat (as verification of cable connections and functioning of both ROV reference cells) – using the Near Ground negative connection point
- Cell to Cell potentials with the ROV at the boat.
- ON/OFF IR readings (using the existing trailing wire to the preceding negative connection point and the just recovered Near Ground pipe connection wire)
  After this, the ROV will fly down to the clamp location.

- ON/OFF PS potential with the ROV at the clamp, using the Near Ground negative connection point

The survey will need to be paused while the wire is brought to the surface. The diver half-cell will need to be utilized for the near ground and metal IR readings at pipe depth. Once these measurements are taken, the pipe connection to the furthest pipe connection can be disconnected and dropped in the water for retrieval by a diver or ROV. If the pipe is visible, an ROV can now be utilized for the remaining sections of underwater pipeline. We will check the ROV half-cell measurements to the Diver half-cell measurements to insure that are within 5 mV of each other. The ROV measurements will need to be with the ROV hovered above the pipe 3 – 5 feet.

At this point in the survey, the diver will come out of the water. The ROV will be deployed (if not already) and the wires from the two half-cells on the ROV will be connected to two Allegro meters at the boat surface. One half-cell wire and the trailing wire at the first clamp will be connected to one CIS meter and the other meter will have both half-cell connections connected to it. The second meter will be collecting voltage gradient differences between to the two half-cells. This will require a splitter cable that will be provided by Mears so that one half-cell wire can go to both meters.

The ROV while traveling down the pipeline should be positioned at approximately 3 – 5 feet above the exposed underwater pipeline.

The ROV position will be recorded by the ship's GPS and sonar system for the entire survey. This position will be matched, linked or synchronized with the CIS meter for data collection. This will allow for the CIS data to be correctly aligned with the position of the rover above the pipeline. A second GPS will be utilized by the CIS meter and/or second Allegro meter to allow the GPS time stamps to be matched to the Boat GPS that is tracking the ROV position to align the data to the ROV and pipeline positions.

The technician recording the data will setup automatic collection of the CIS data from the meter to collect data at approximately 2 – 5 feet intervals along the entire length of the survey section. The recommended speed of the ROV is approximately 1 foot per second.

As the ROV is traveling along the pipeline, the CP technicians at the boat surface will insure the data being collected is valid and inform the boat operator to stop at any point there is a question in the data stream. When the ROV and half cells get to the next underwater connection point and clamp, the survey will need to be paused while the ROV retrieves the nearest ground wire and brings it to the surface. Once the wire is secured on board the boat and ready for connection to the meter, the ROV will return to the pipeline and hold in place at this nearest clamp while the technician collects near ground and Metal IR measurements. Caution will need to be taken to insure no tangling of the trailing wire and ROV umbilical cord/half-cell wires occur as everything will be in very close proximity to each other. Once complete the far ground trailing wire can be disconnected and left for retrieval by the ROV or diver while the survey continues. The survey now continues in the automatic collection mode with the nearest connection point wire connected to the CIS meter repeating these steps each time there is a new underwater connection point until the required length of the survey is complete for the visible pipeline section.

At the last clamp in the survey section, the ROV will come out of the water and the diver will enter the water to complete the remaining section of the survey up to the shore line. All requirements as mentioned previously for the buried non-visible pipeline sections will be applicable.

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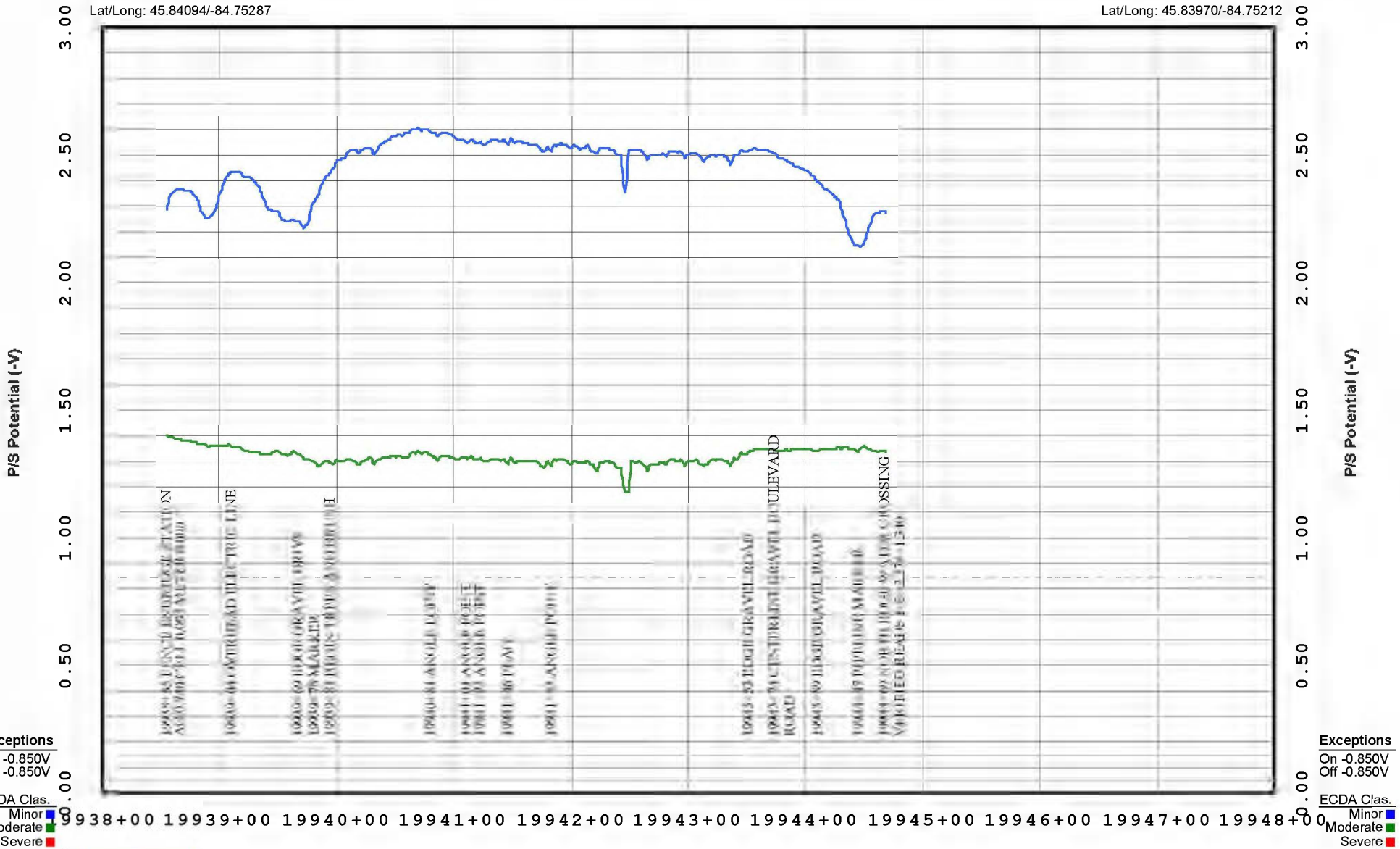
Post Survey

After the survey is complete, Mears will process the CIS and voltage gradient data with the collected GPS and time stamp data and align accordingly for the length of the survey sections. Ballard will provide Mears with the appropriate GPS coordinates and time stamps of the diver and rover positions of the survey. Mears can then align the CIS and voltage gradient data to the diver and rover positioning data for final alignment of data.

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Appendix C – 2018 Close Interval Survey Results – East Pipeline Bow Cell and 2019 Shore Approach Survey

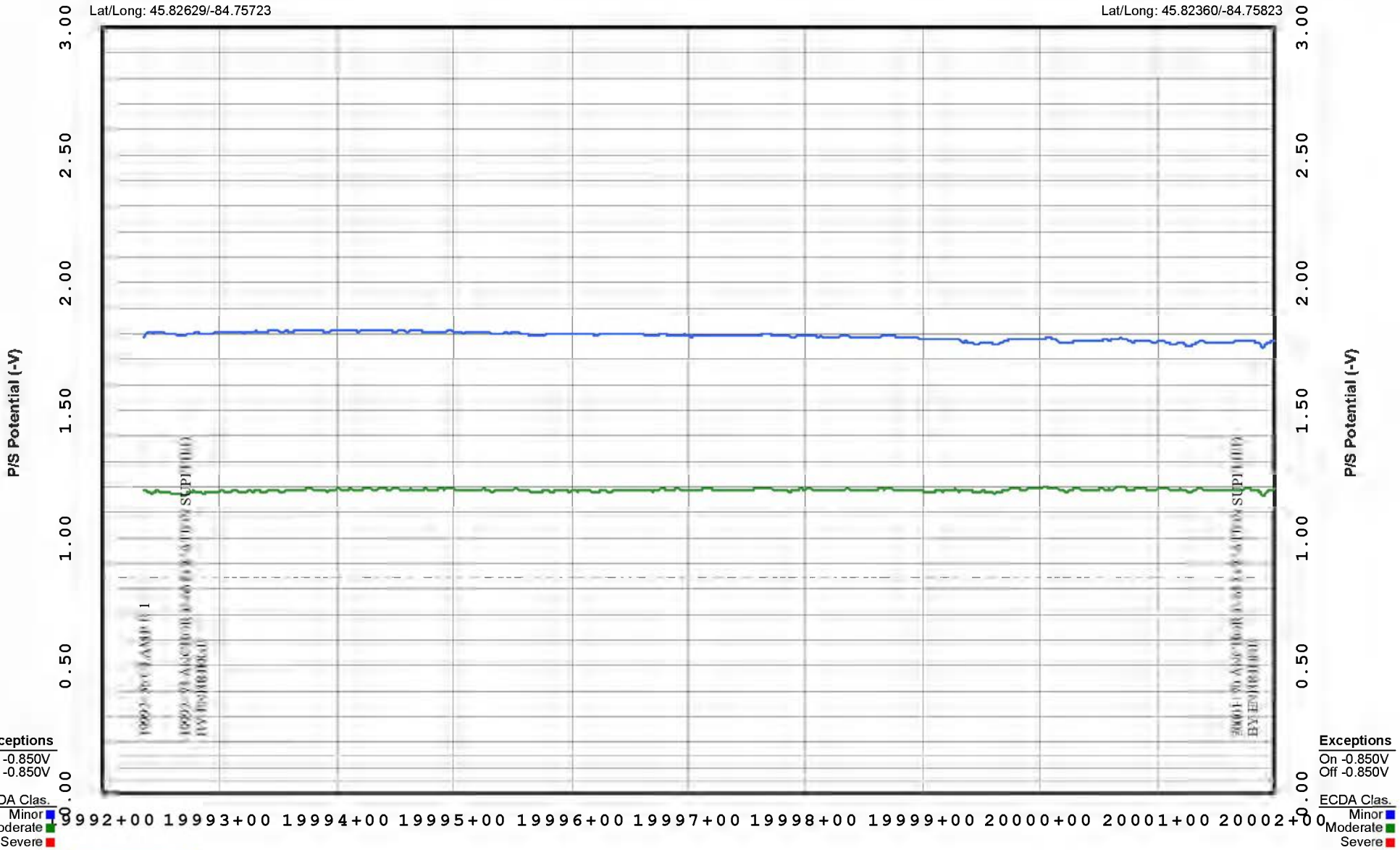
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File: 1000 EAST BOW

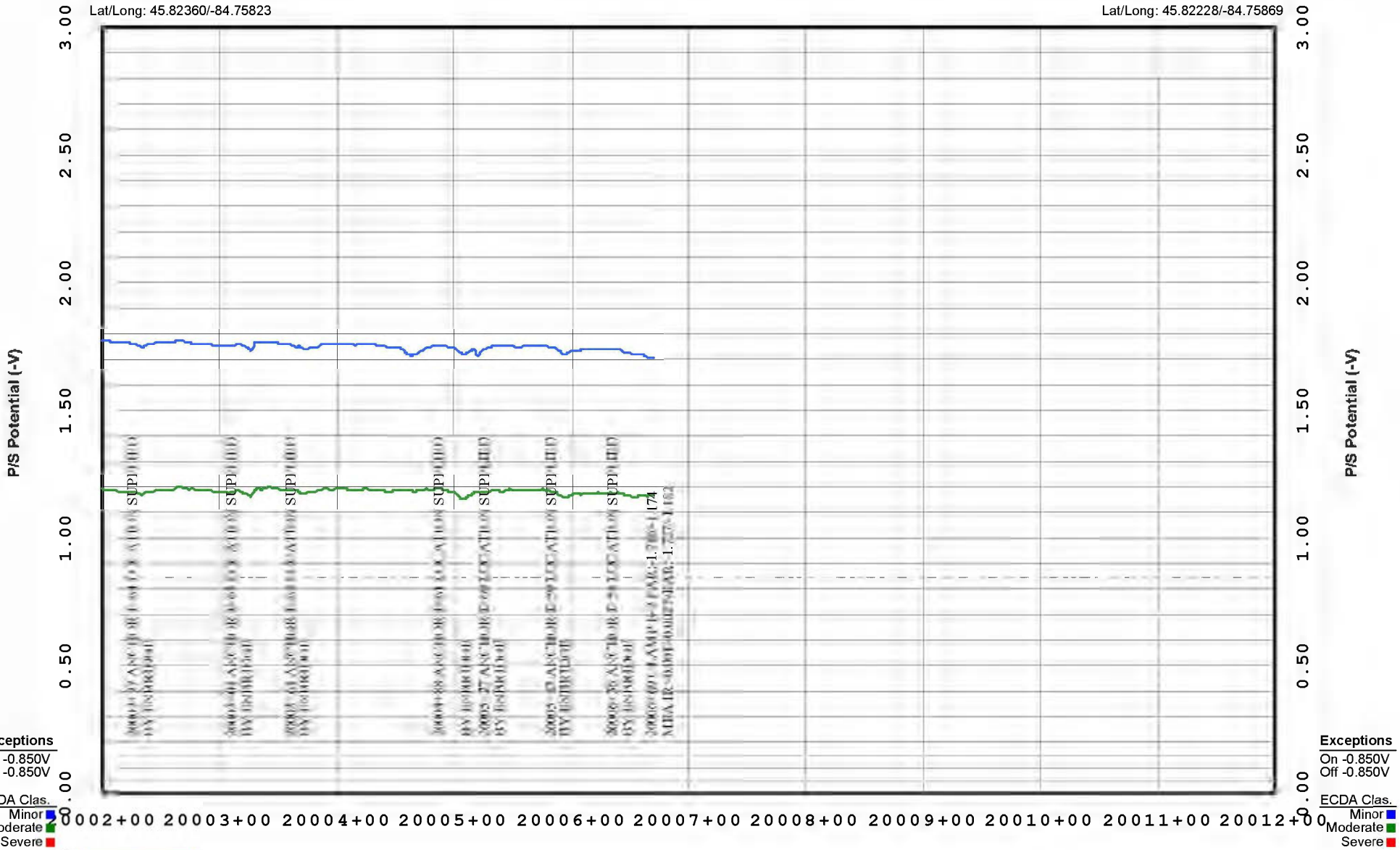
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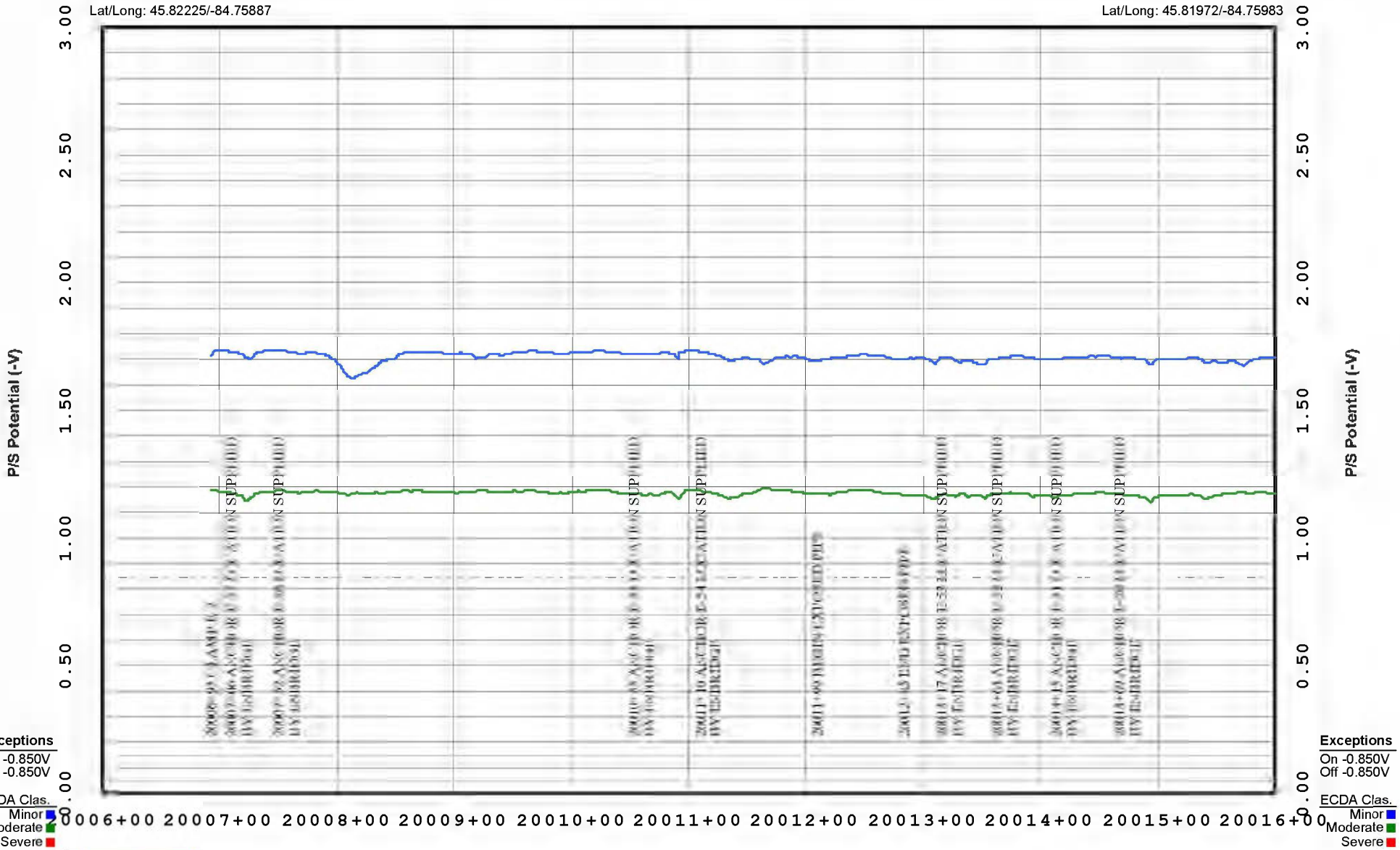
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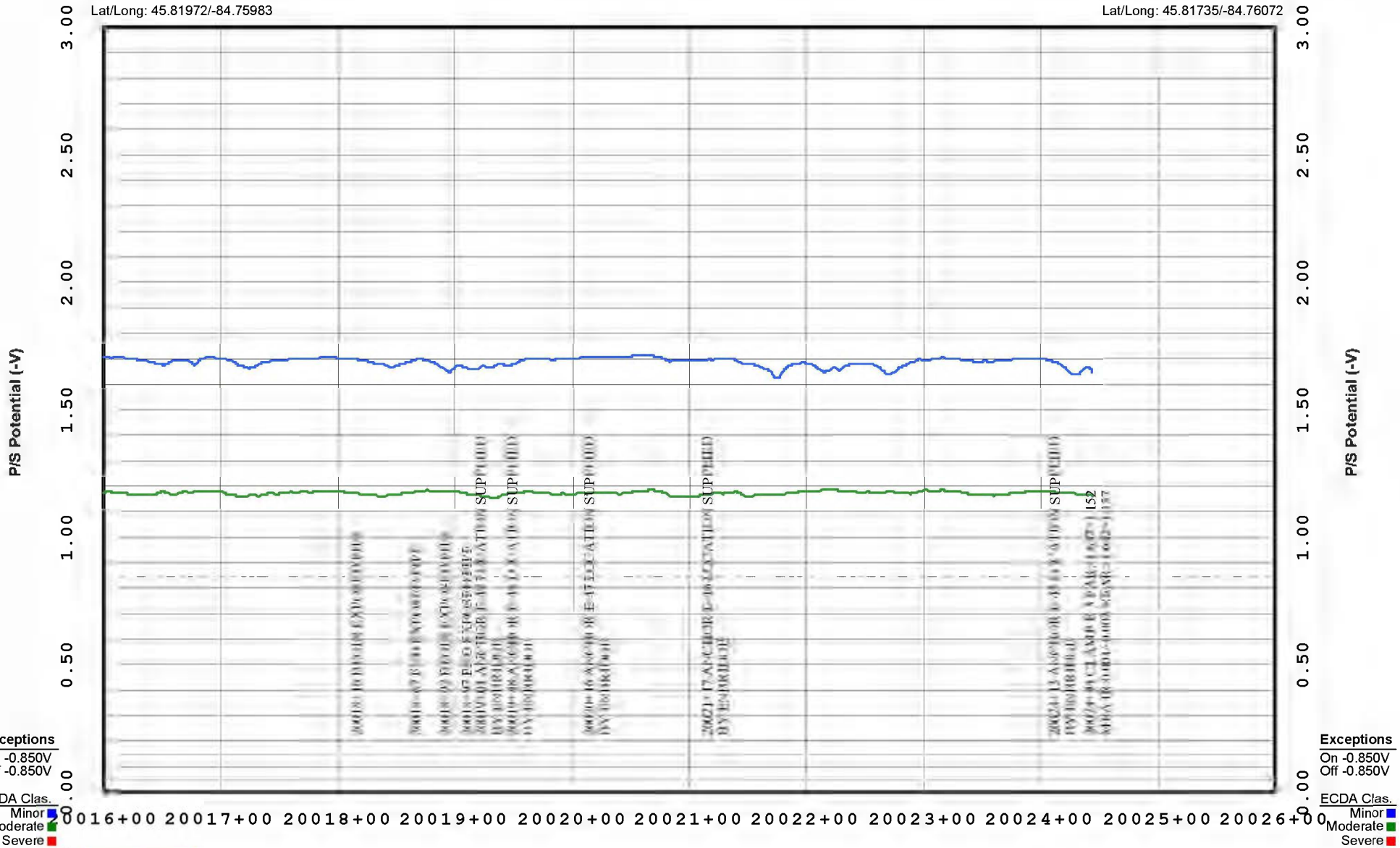
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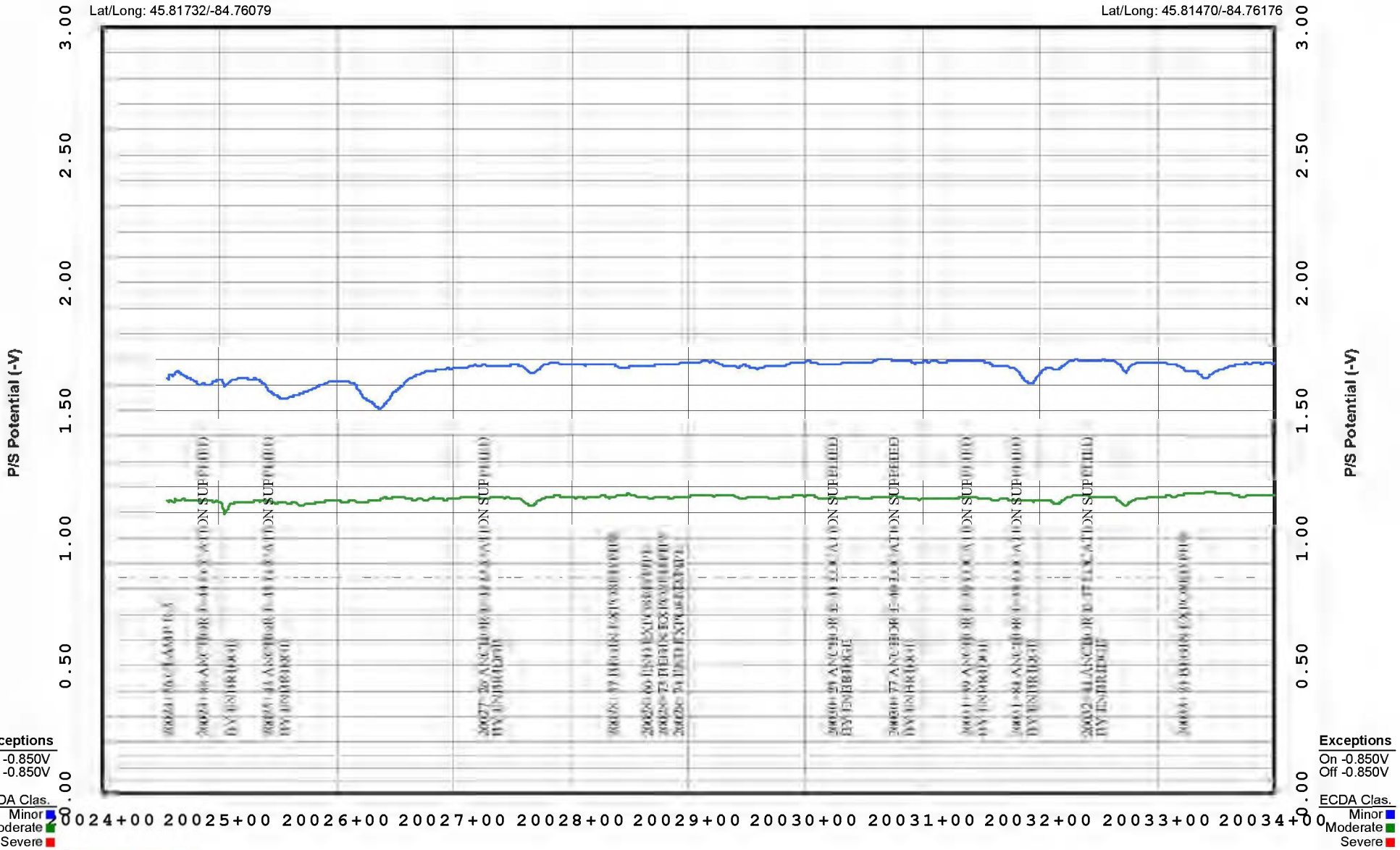
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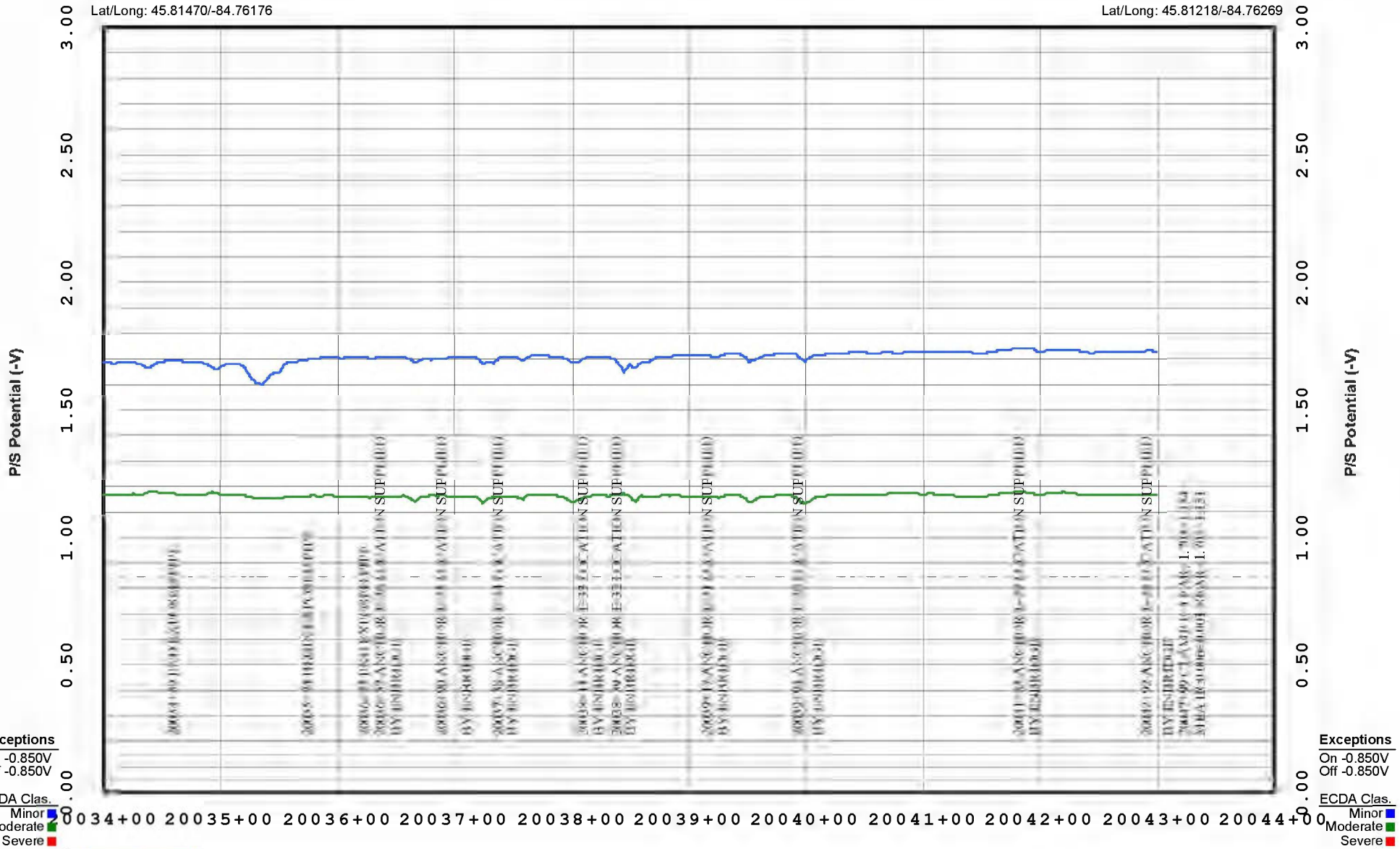
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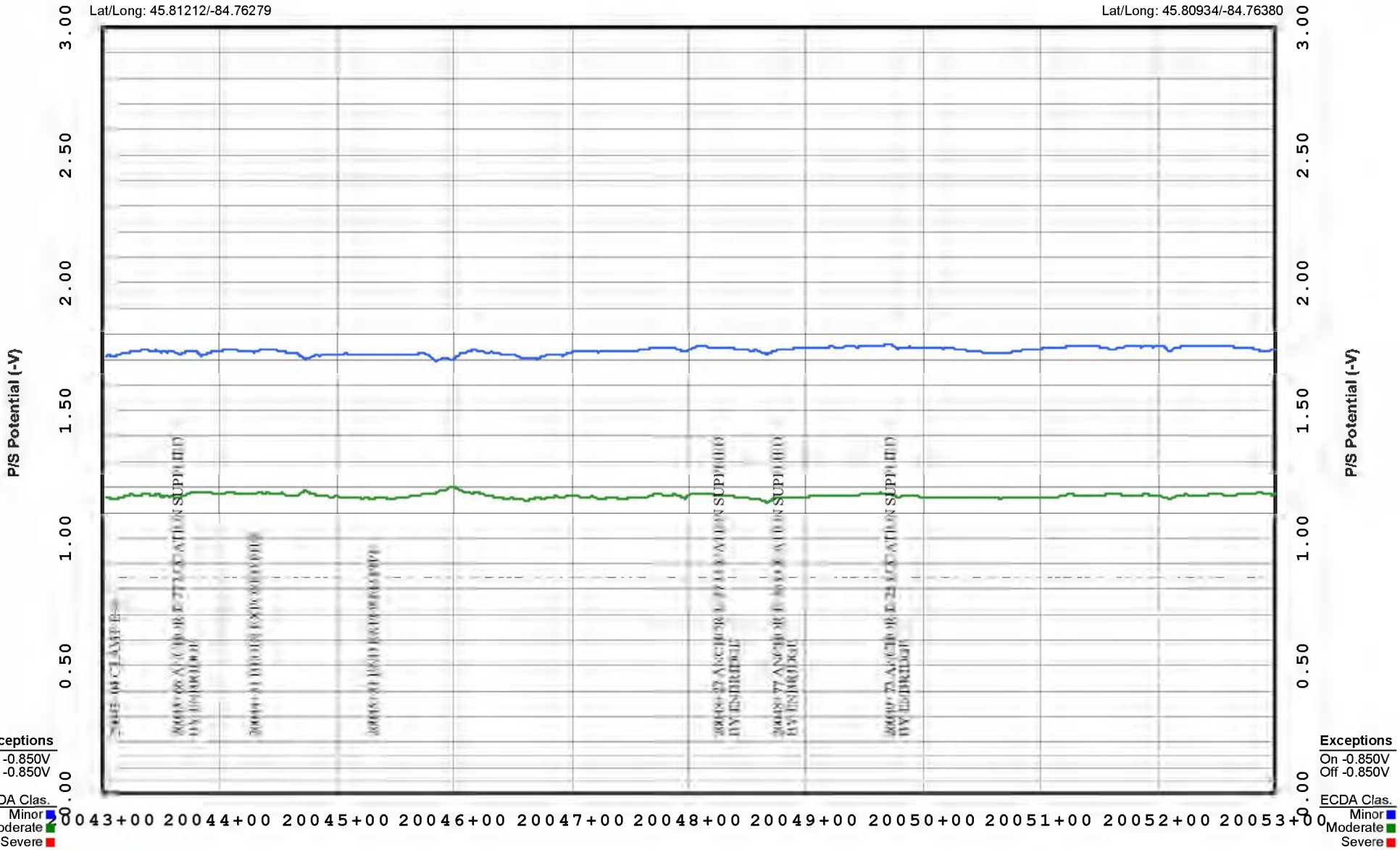
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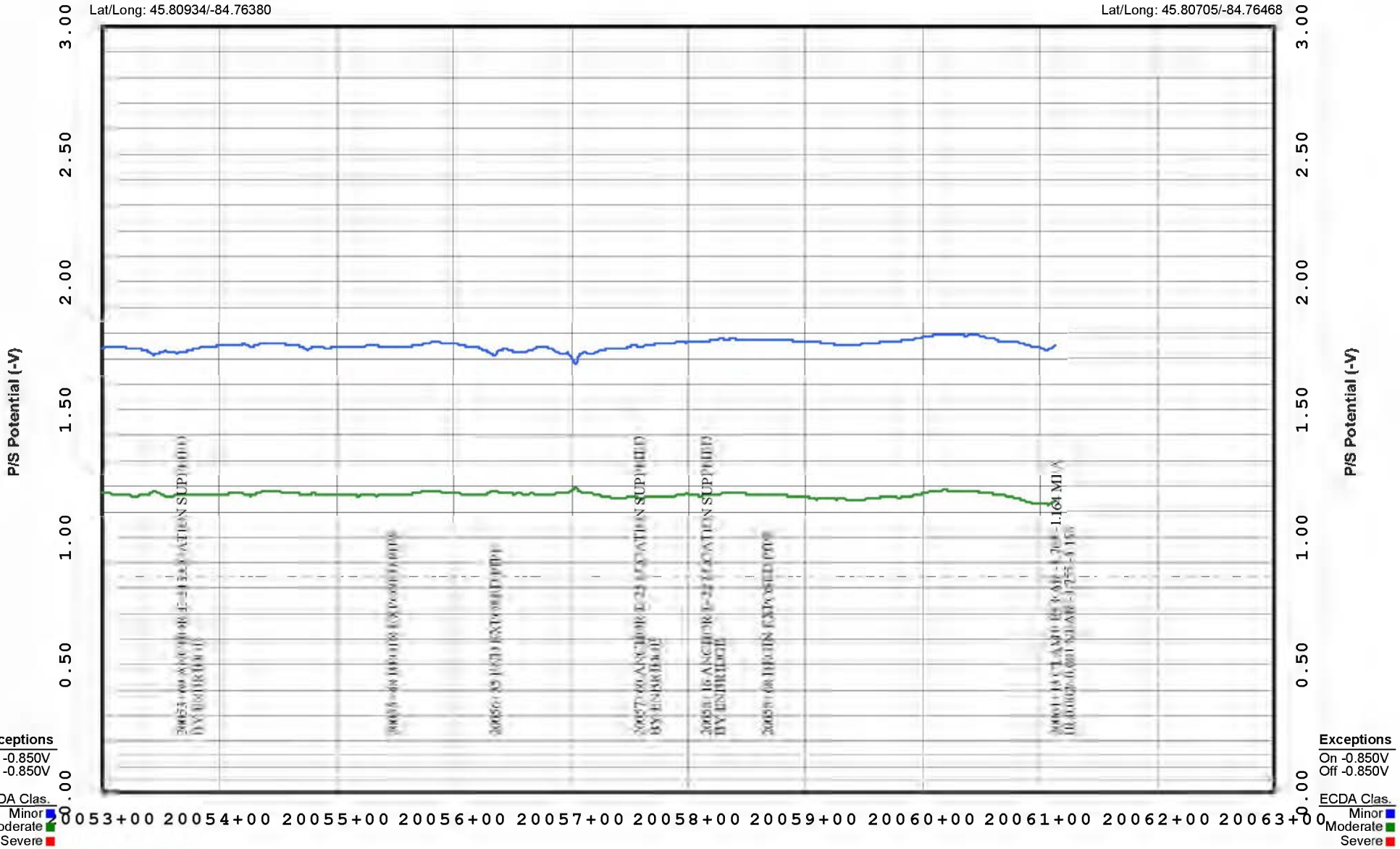
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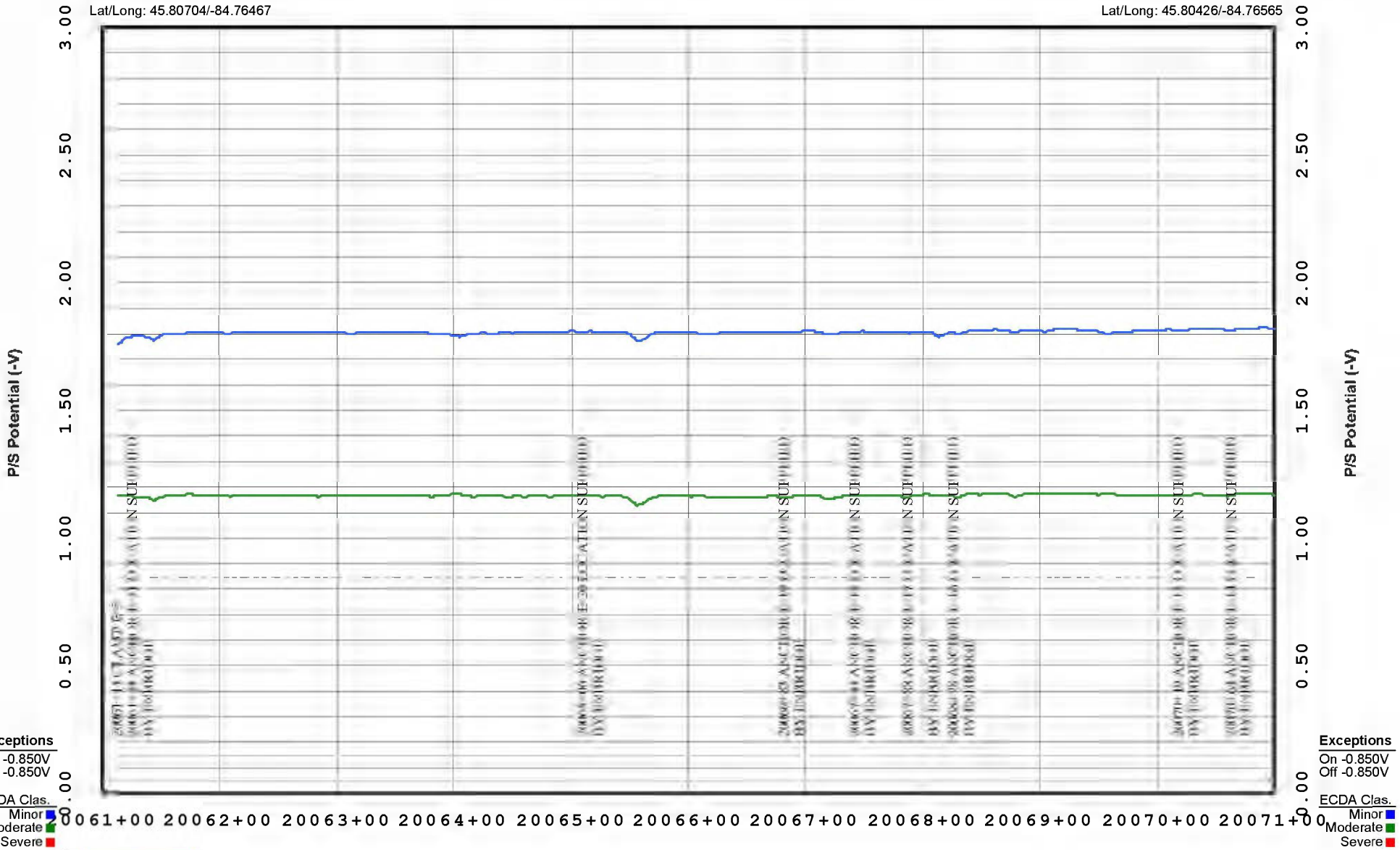
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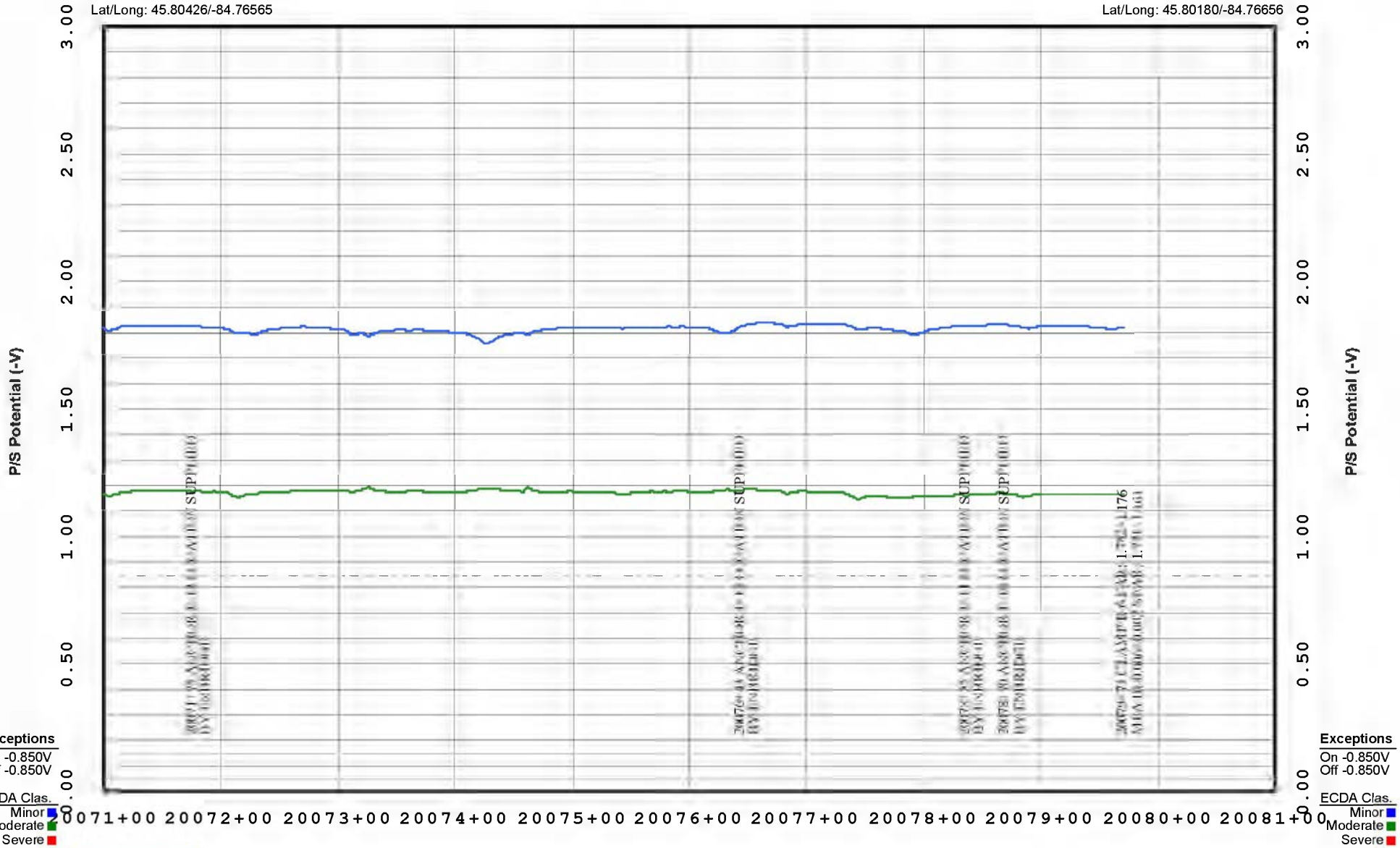
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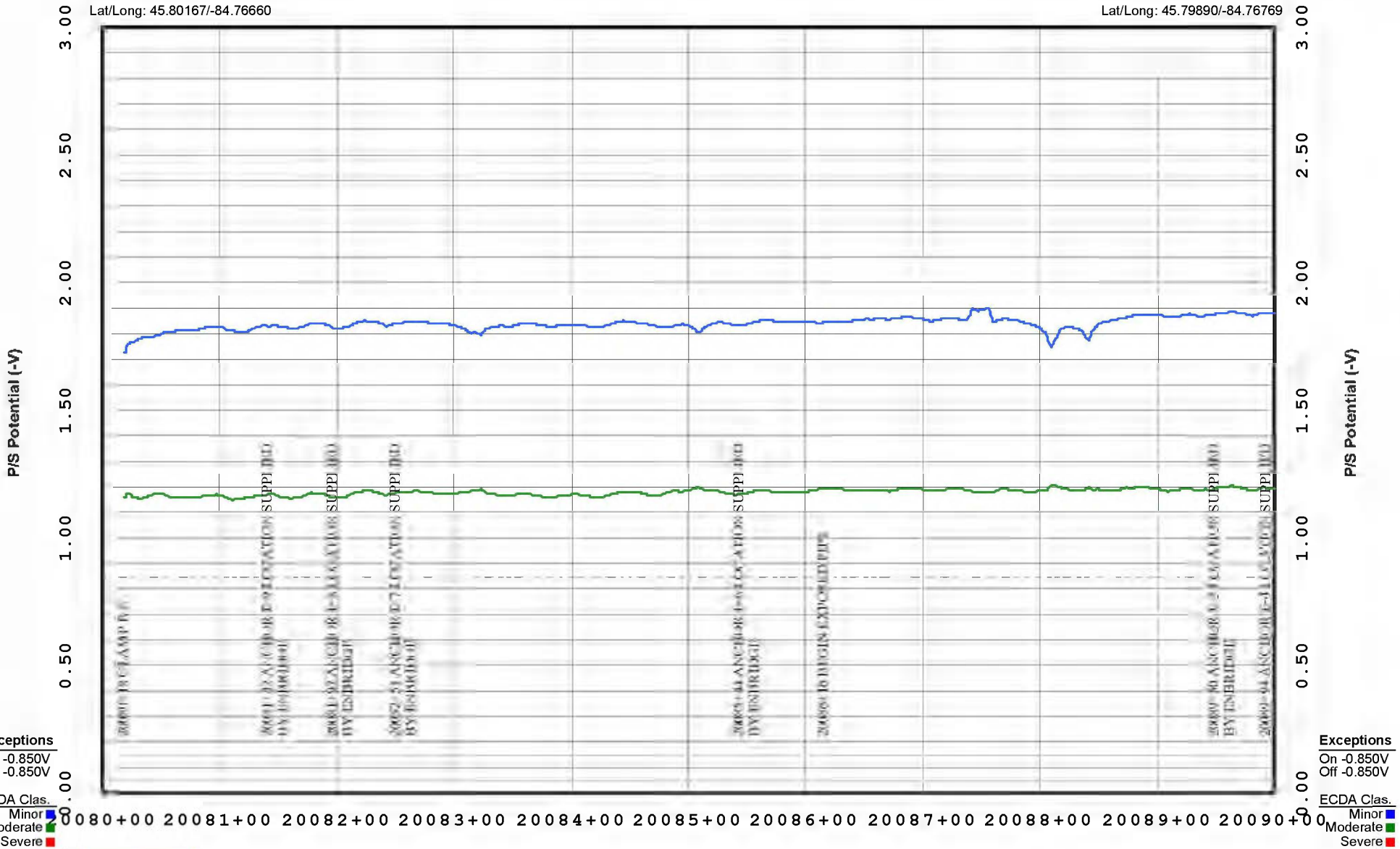
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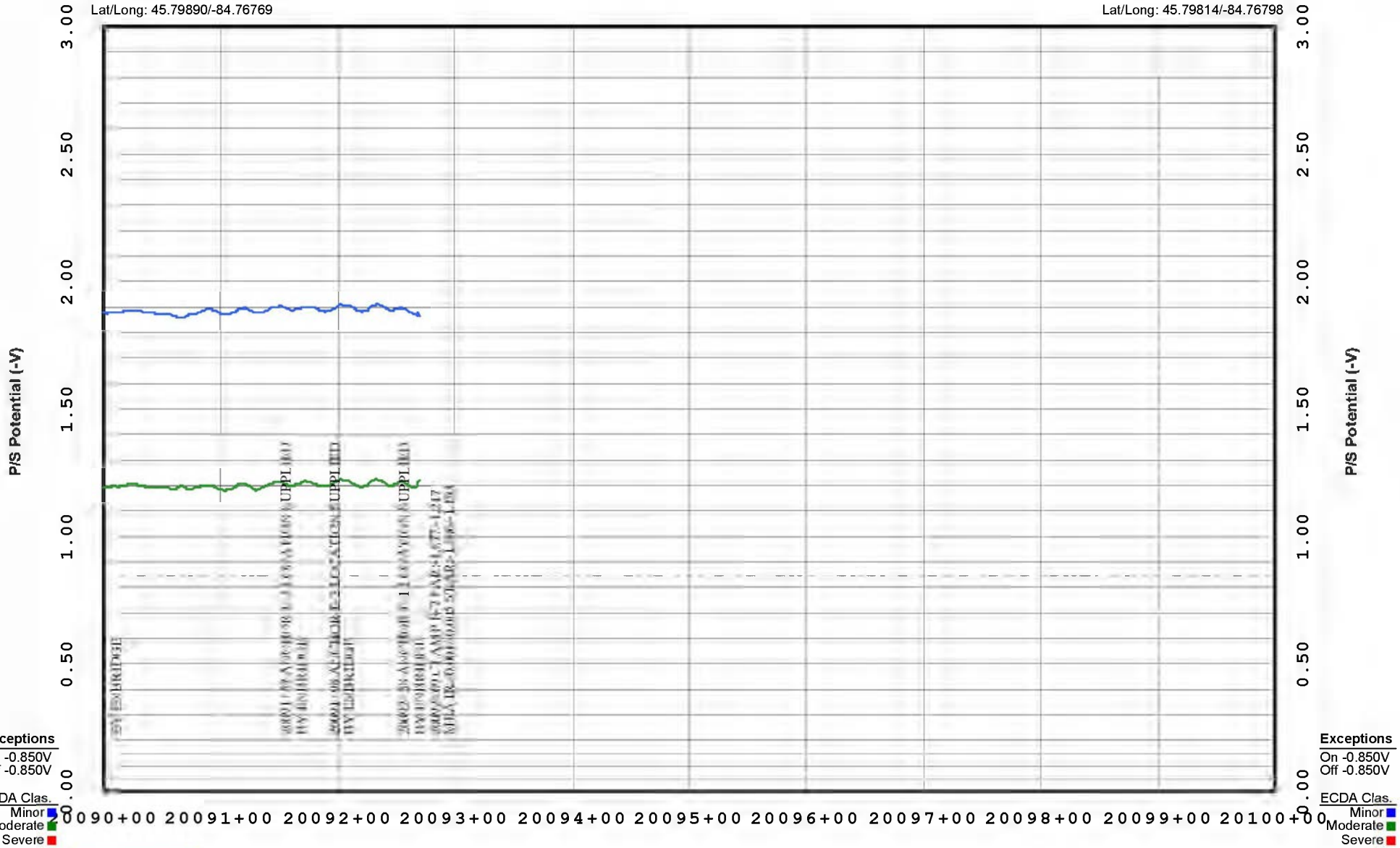
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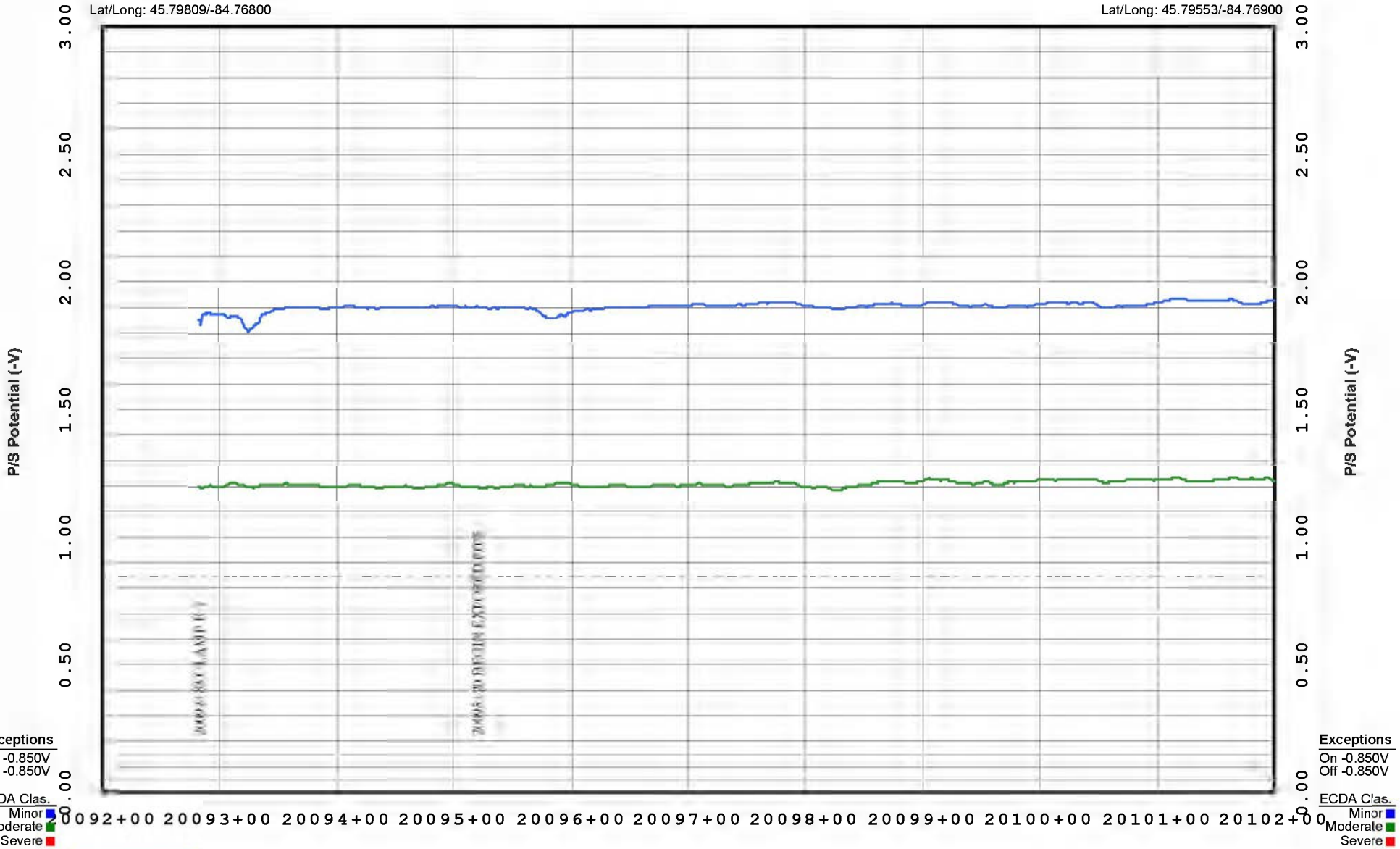
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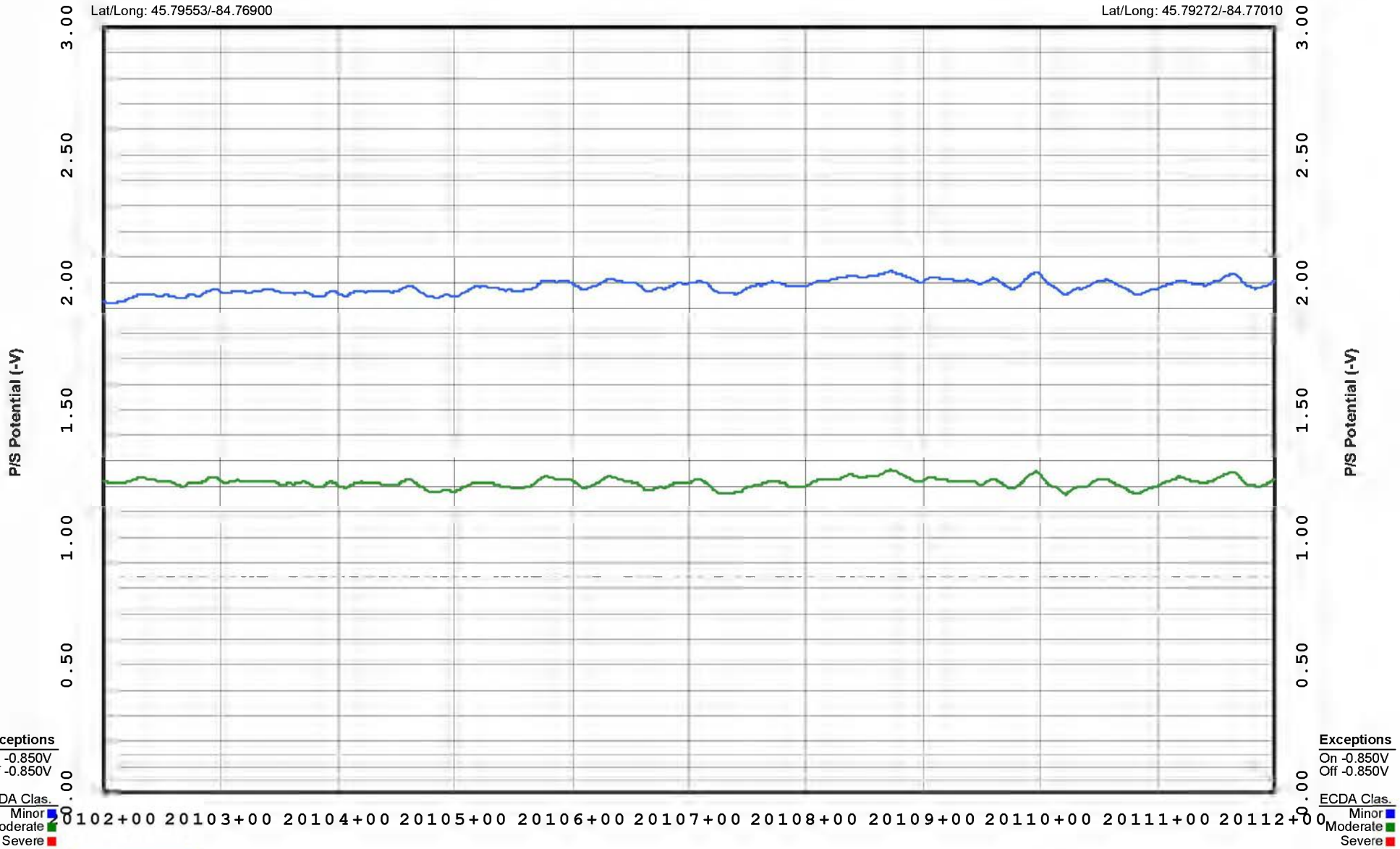
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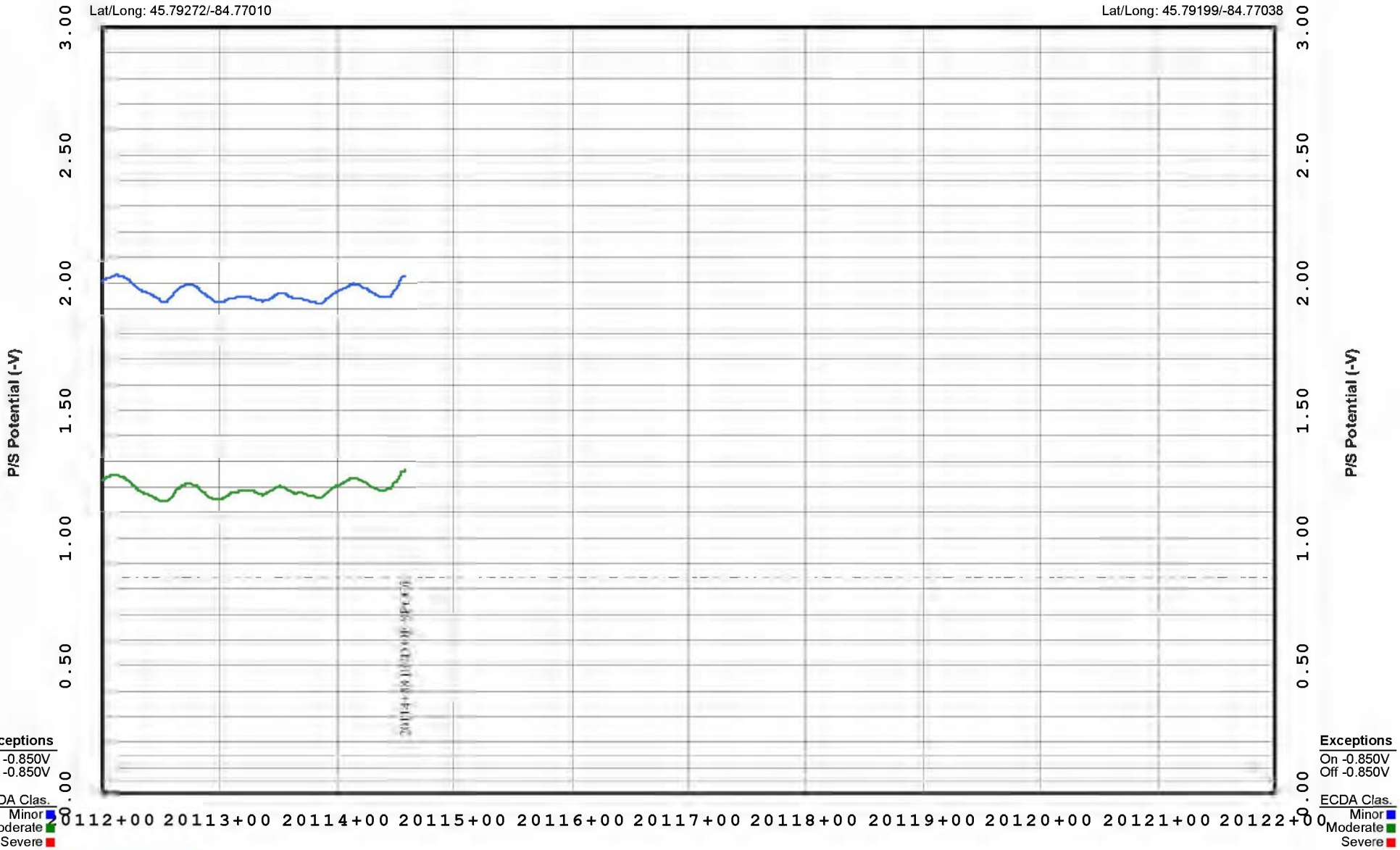
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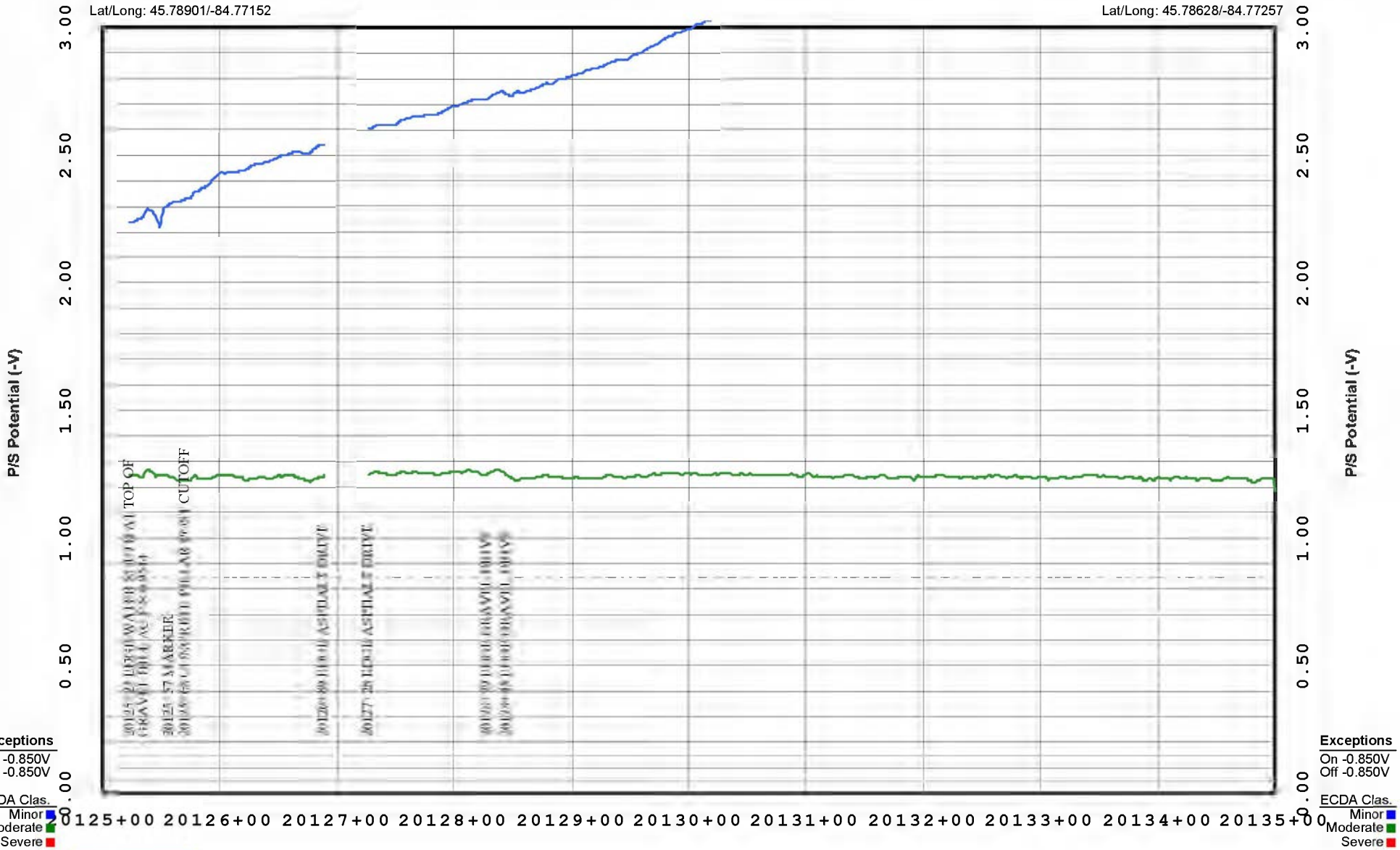
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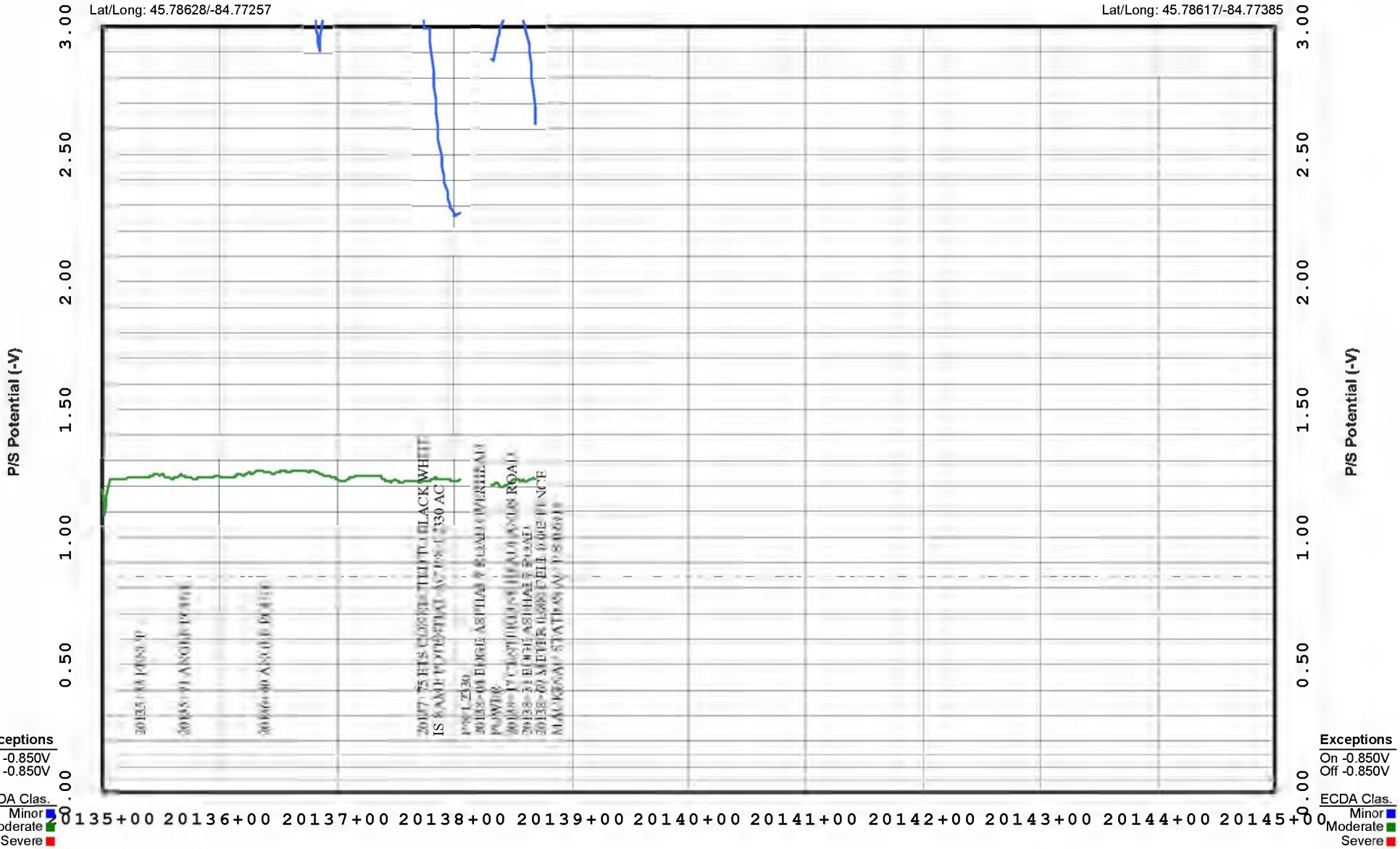
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19939+04 OVERHEAD ELECTRIC LINE

19939+69 EDGE GRAVEL DRIVE
19939+78 MARKER
19939+81 BEGIN TREES AND BRUSH

19940+81 ANGLE POINT
19941+01 ANGLE POINT
19941+23 ANGLE POINT
19941+46 FLAG

19941+83 ANGLE POINT

19943+53 EDGE GRAVEL ROAD
19943+74 CENTERLINE GRAVEL [illegible] ROAD
19943+89 EDGE GRAVEL ROAD

19944+47 PIPELINE MARKER
19944+69 NORTH EDGE WATER [illegible] VERIFIED READS P/S:-2.278/-1.3[illegible]

377+50
19942+80

377+75
19943+30

MILEAGE CALCULATED FROM SURVEY STATIONING

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19943+80

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-0.500
-0.850
-1.000
-1.500
-2.000
-2.500

CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE

ENBRIDGE
BOW FILE
East Line Bow

Length of RAPSheet: 1960 FEET (600 METERS)
Page(s): 1 OF 8
Drawn By: HART SMALLEY
Date Drawn: 03/21/19
Project Number: 9141883310
Project Manager: KURT LAWSON

ENBDNR0009837

378.00
1925 +40

375.25
1897 +60

375.00
1893 +40

MILEAGE CALCULATED
FROM SURVEY STATIONING

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CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

ON/OFF SURVEY DIRECTION

Project Number
914188331O

Project Manager
KURT LAWSON

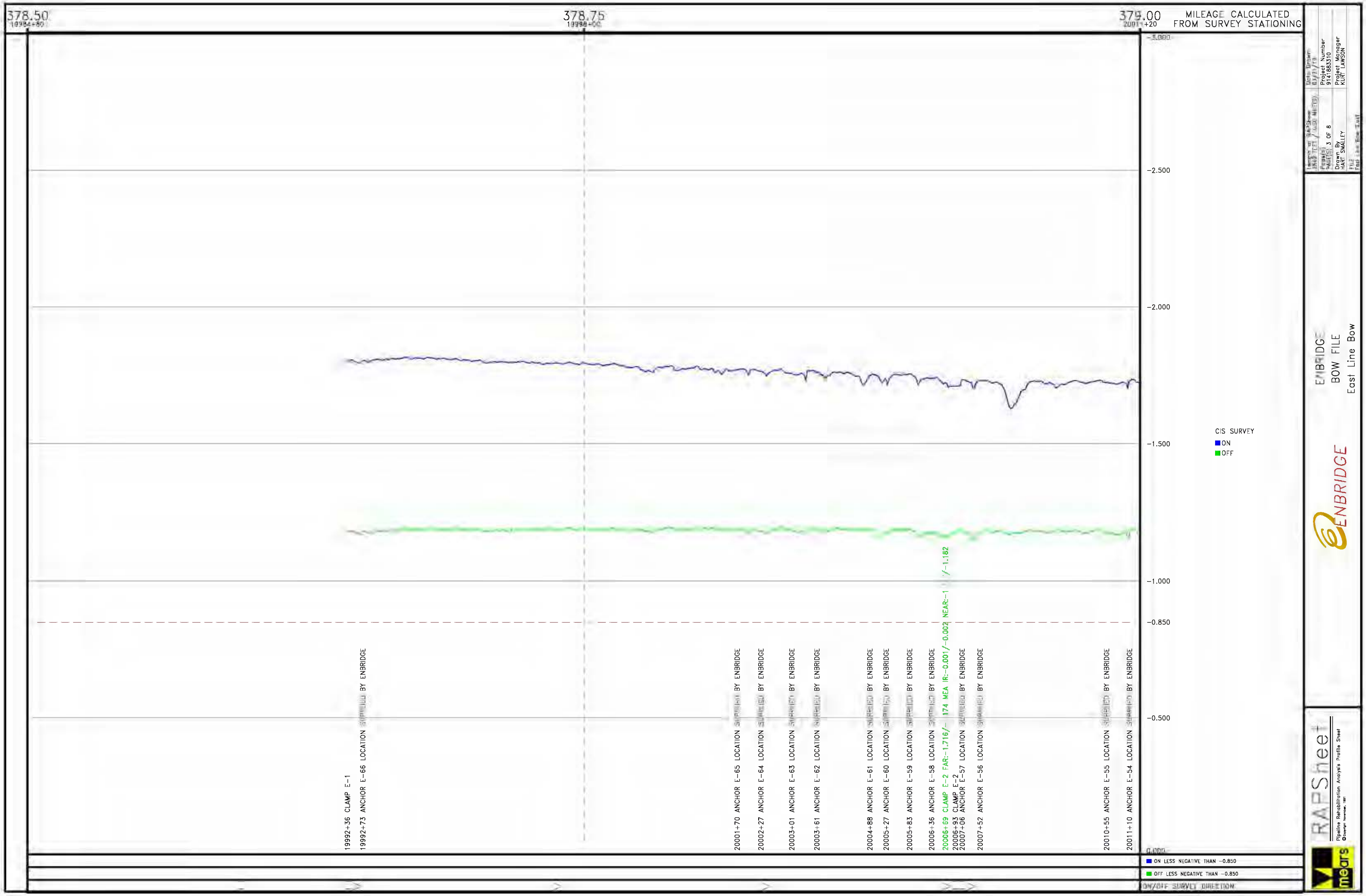
Drawn By
HART SMALLEY

2 OF 8

E B IDG
BOW FILE
East Line Bow

ENBRIDGE

Pipeline Rehabilitation Analysis Profile Sheet
© Enbridge November, 1991


378.50
19984+80
378.75
19988+00
379.00
20011+20
MILEAGE CALCULATED FROM SURVEY STATIONING
-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000
CIS SURVEY
ON
OFF
/-1.182
19992+36 CLAMP E-1
19992+73 ANCHOR E-66 LOCATION SURVEYED BY ENBRIDGE
20001+70 ANCHOR E-65 LOCATION SURVEYED BY ENBRIDGE
20002+27 ANCHOR E-64 LOCATION SURVEYED BY ENBRIDGE
20003+01 ANCHOR E-63 LOCATION SURVEYED BY ENBRIDGE
20003+61 ANCHOR E-62 LOCATION SURVEYED BY ENBRIDGE
20004+88 ANCHOR E-61 LOCATION SURVEYED BY ENBRIDGE
20005+27 ANCHOR E-60 LOCATION SURVEYED BY ENBRIDGE
20005+83 ANCHOR E-59 LOCATION SURVEYED BY ENBRIDGE
20006+36 ANCHOR E-58 LOCATION SURVEYED BY ENBRIDGE
20006+69 CLAMP E-2 FAR:-1.716/- 174 MEA IR:-0.001/-0.002 NEAR:-1
20006+93 CLAMP E-2
20007+06 ANCHOR E-57 LOCATION SURVEYED BY ENBRIDGE
20007+52 ANCHOR E-56 LOCATION SURVEYED BY ENBRIDGE
20010+55 ANCHOR E-55 LOCATION SURVEYED BY ENBRIDGE
20011+10 ANCHOR E-54 LOCATION SURVEYED BY ENBRIDGE
ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION
Date Drawn 8/31/19
Project Number 914883310
Project Manager KURT LAWSON
Length of Survey (KM/MILES) 9.423KM / 5.85 MILES
Page(s) 3 OF 8
Drawn By HART SMALLEY
FILE East Line Bow
ENBRIDGE
BOW FILE
East Line Bow
ENBRIDGE
RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stoneyer Newman, 1991
Mears

379.00
20011+20

379.25
20024+40

379.50
20037+60

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20011+99 BEGIN EXPOSED PIPE
20012+85 END EXPOSED PIPE
20013+17 ANCHOR E-53 LOCATION SUPPLIED BY ENBRIDGE
20013+64 ANCHOR E-52 LOCATION SUPPLIED BY ENBRIDGE
20014+15 ANCHOR E-51 LOCATION SUPPLIED BY ENBRIDGE
20014+69 ANCHOR E-50 LOCATION SUPPLIED BY ENBRIDGE
20018+16 BEGIN EXPOSED PIPE
20018+67 END EXPOSED PIPE
20018+92 BEGIN EXPOSED PIPE
20018+97 END EXPOSED PIPE
20019+01 ANCHOR E-49 LOCATION SUPPLIED BY ENBRIDGE
20019+48 ANCHOR E-48 LOCATION SUPPLIED BY ENBRIDGE
20020+16 ANCHOR E-47 LOCATION SUPPLIED BY ENBRIDGE
20021+17 ANCHOR E-46 LOCATION SUPPLIED BY ENBRIDGE
20024+13 ANCHOR E-45 LOCATION SUPPLIED BY ENBRIDGE
20024+88 ANCHOR E-44 LOCATION SUPPLIED BY ENBRIDGE
20025+43 ANCHOR E-43 LOCATION SUPPLIED BY ENBRIDGE
20027+26 ANCHOR E-42 LOCATION SUPPLIED BY ENBRIDGE
20028+37 BEGIN EXPOSED PIPE
20028+66 END EXPOSED PIPE
20028+73 BEGIN EXPOSED PIPE
20028+74 END EXPOSED PIPE
20030+24 ANCHOR E-41 LOCATION SUPPLIED BY ENBRIDGE
20030+77 ANCHOR E-40 LOCATION SUPPLIED BY ENBRIDGE
20031+39 ANCHOR E-39 LOCATION SUPPLIED BY ENBRIDGE
20031+81 ANCHOR E-38 LOCATION SUPPLIED BY ENBRIDGE
20032+41 ANCHOR E-37 LOCATION SUPPLIED BY ENBRIDGE
20033+24 BEGIN EXPOSED PIPE
20034+59 END EXPOSED PIPE
20035+74 BEGIN EXPOSED PIPE
20036+23 END EXPOSED PIPE
20036+32 ANCHOR E-36 LOCATION SUPPLIED BY ENBRIDGE
20036+90 ANCHOR E-35 LOCATION SUPPLIED BY ENBRIDGE
20037+38 ANCHOR E-34 LOCATION SUPPLIED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (Not TEXT / 4.30 INCHES)
Page(s) 4 OF 8
Drawn By HART SMALLEY
Date Drawn 03/31/16
Project Number 9141883310
Project Manager KURT LAWSON
FILE East Line Bow

ENBRIDGE
BOW FILE
East Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stantec Version: 1991

Mears

379.50
20037+60

379.75
20050+80

380.00
20064+00

MILEAGE CALCULATED FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20038+11 ANCHOR E-33 LOCATION SURVEYED BY ENBRIDGE
20038+39 ANCHOR E-32 LOCATION SURVEYED BY ENBRIDGE
20039+17 ANCHOR E-31 LOCATION SURVEYED BY ENBRIDGE
20039+94 ANCHOR E-30 LOCATION SURVEYED BY ENBRIDGE
20041+83 ANCHOR E-29 LOCATION SURVEYED BY ENBRIDGE
20042+92 ANCHOR E-28 LOCATION SURVEYED BY ENBRIDGE .151
20042+99 CLAMP E-4 FAR:-1.703/-0.001 NEAR:-1 IR:0.006/-0.001
20043+04 CLAMP E-4
20043+66 ANCHOR E-27 LOCATION SURVEYED BY ENBRIDGE
20044+31 BEGIN EXPOSED PIPE
20045+31 END EXPOSED PIPE
20048+27 ANCHOR E-27 LOCATION SURVEYED BY ENBRIDGE
20048+77 ANCHOR E-26 LOCATION SURVEYED BY ENBRIDGE
20049+73 ANCHOR E-25 LOCATION SURVEYED BY ENBRIDGE
20053+69 ANCHOR E-24 LOCATION SURVEYED BY ENBRIDGE
20055+48 BEGIN EXPOSED PIPE
20056+35 END EXPOSED PIPE
20057+60 ANCHOR E-23 LOCATION SURVEYED BY ENBRIDGE
20058+16 ANCHOR E-22 LOCATION SURVEYED BY ENBRIDGE
20058+68 BEGIN EXPOSED PIPE
20061+13 CLAMP E5 FAR:-1.763/-1.[illegible] NEA IR:0.002/-0.001 NEAR:-1 1.158
20061+14 CLAMP E-5
20061+24 ANCHOR E-21 LOCATION SURVEYED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (Both Text / Main Sheet): Page(s) 5 OF 8
Drawn By: HART SMALLEY
Date Drawn: 03/31/19
Project Number: 914883310
Project Manager: KURT LAWSON
FILE: East Line Bow

ENBRIDGE
BOW FILE
East Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stantec Version: 1991

Mears

380.00
20064+00

380.25
20077+20

380.50
20090+40

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20065+06 ANCHOR E-20 LOCATION SUPPLIED BY ENBRIDGE
20066+83 ANCHOR E-19 LOCATION SUPPLIED BY ENBRIDGE
20067+43 ANCHOR E-18 LOCATION SUPPLIED BY ENBRIDGE
20067+88 ANCHOR E-17 LOCATION SUPPLIED BY ENBRIDGE
20068+28 ANCHOR E-16 LOCATION SUPPLIED BY ENBRIDGE
20070+19 ANCHOR E-15 LOCATION SUPPLIED BY ENBRIDGE
20070+64 ANCHOR E-14 LOCATION SUPPLIED BY ENBRIDGE
20071+75 ANCHOR E-13 LOCATION SUPPLIED BY ENBRIDGE
20076+43 ANCHOR E-12 LOCATION SUPPLIED BY ENBRIDGE
20078+35 ANCHOR E-11 LOCATION SUPPLIED BY ENBRIDGE
20078+70 ANCHOR E-10 LOCATION SUPPLIED BY ENBRIDGE
20079+71 CLAMP E-6 FAR:-1.782/-.161 MEA IR:0.006/-0.002 NEAR:-1
20080+18 CLAMP E-6
20081+42 ANCHOR E-9 LOCATION SUPPLIED BY ENBRIDGE
20081+97 ANCHOR E-8 LOCATION SUPPLIED BY ENBRIDGE
20082+51 ANCHOR E-7 LOCATION SUPPLIED BY ENBRIDGE
20085+44 ANCHOR E-6 LOCATION SUPPLIED BY ENBRIDGE
20086+16 BEGIN EXPOSED PIPE
20089+50 ANCHOR E-5 LOCATION SUPPLIED BY ENBRIDGE
20089+94 ANCHOR E-4 LOCATION SUPPLIED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (Not TET / 4.30 METS)
Page(s) 6 OF 8
Drawn By HART SMALLEY
FILE East Line Bow

Date Drawn 03/31/15
Project Number 9141883310
Project Manager KURT LAWSON

ENBRIDGE
BOW FILE
East Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stantec Version: 1911

Years

380.50
20090+40

380.75
20105+60

381.00
20115+80

MILEAGE CALCULATED FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20091+57 ANCHOR E-3 LOCATION SUPPLIED BY ENBRIDGE

20091+98 ANCHOR E-2 LOCATION SUPPLIED BY ENBRIDGE

20092+58 ANCHOR E-1 LOCATION SUPPLIED BY ENBRIDGE
20092+69 CLAMP E-7 FAR:-1.877 MEA IR:-0.001 +/-0.005 NEAR:-1.193
20092+83 CLAMP E-7

20095+20 BEGIN EXPOSED PIPE

20114+58 END OF SPOOL

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3540 FEET / 1.30 MILES)
Page(s): 7 OF 8
Drawn By: HART SMALLEY
FILE: East Line Bow.rsf
Date Drawn: 03/31/19
Project Number: 914883310
Project Manager: KURT LAWSON

ENBRIDGE
BOW FILE
East Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Years

ENBDNR0009843

381.00
20115+80

381.25
20130+00

381.50
20145+20

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20125+23 EDGE WATER SOUTH AT [illegible] OF GRAVEL HILL AC P/S:0.9514
20125+57 MARKER
20125+68 CONCRETE PILLAR POST [illegible]
20126+89 EDGE ASPHALT DRIVE
20127+28 EDGE ASPHALT DRIVE
20128+29 EDGE GRAVEL DRIVE
20128+45 EDGE GRAVEL DRIVE
20135+71 ANGLE POINT
20136+40 ANGLE POINT
20137+75 ETS CONNECTED TO BLACK WHIP IS SAME POTENTIAL AC P/S:1 [illegible] AC P/S: .2338
20138+04 20m ASPHALT ROAD OVERHEAD POWER
20138+17 CENTERLINE HIGHLAND ROAD
20138+31 EDGE ASPHALT ROAD
20138+69 METER 0.000 CELL 0.003 [illegible] MACKINAC STATION AC P/S:0.6715

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Date Drawn: 03/31/15
Project Number: 914183310
Project Manager: KURT LAWSON
Drawn By: HART SMALLEY
Sheet(s): 8 OF 8
Scale: 1" = 50' (11x17) 1" = 100' (ANSI D)
TILE

ENBRIDGE
EAST LINE
BOW FILE
East Line Bow

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stoneyer Hammer, 1991

mears

ENBDNR0009844

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials Less Negative than -0.850 Volt

Enbridge

East Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
			NO OFF READS LESS NEGATIVE -0.850 V					
	Total Feet	**0**						

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

East Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19938+55	19942+46	391	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.840942282	-84.752874709	45.8403282790	-84.7518677799
19942+50	19944+70	220	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8403171642	-84.7518724799	45.8396996845	-84.7521196198
20045+97	20045+99	2	OFF READS MORE NEGATIVE -1.200 V	10/01/18	45.81133959	-84.76304641	45.8113332900	-84.7630485800
20088+08	20088+16	8	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7994429050	-84.7674795875	45.7994207500	-84.7674883050
20089+61	20089+68	7	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7990132700	-84.7676491350	45.79899436	-84.76765658
20090+19	20090+32	13	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7988493000	-84.7677137950	45.7988126660	-84.7677282880
20090+66	20090+67	1	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79871679	-84.76776608	45.7987142760	-84.7677670740
20090+87	20090+91	4	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7986588140	-84.7677889760	45.7986478900	-84.7677932800
20091+14	20091+24	10	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7985821800	-84.7678192150	45.7985537175	-84.7678304625
20091+40	20091+84	44	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7985095850	-84.7678478825	45.79838455	-84.76789719
20091+91	20092+17	26	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7983656200	-84.7679046800	45.7982926600	-84.7679325850
20092+24	20092+42	18	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7982729560	-84.7679389420	45.79822168	-84.76795547
20092+47	20092+61	14	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7982068275	-84.7679602800	45.79816584	-84.76797350
20092+68	20092+82	14	OFF READS MORE NEGATIVE -1.200 V	/ /	45.79814643	-84.76798027	45.7980932771	-84.7679990179
20092+90	20092+98	8	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79807216	-84.76801318	45.79806072	-84.76803894
20092+99	20093+24	25	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7980584300	-84.7680421750	45.7979872133	-84.7680561367
20093+33	20093+94	61	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79796096	-84.76806215	45.79779816	-84.76812117
20093+97	20093+98	1	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79778844	-84.76811863	45.7977859667	-84.7681200383
20094+08	20094+23	15	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7977564550	-84.7681279150	45.79771339	-84.76812838
20094+44	20094+62	18	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7976553200	-84.7681531500	45.7976052100	-84.7681745075
20094+83	20095+09	26	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7975469350	-84.7681993500	45.7974749400	-84.7682300600
20095+44	20095+69	25	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7973757250	-84.7682723575	45.7973064275	-84.7683018975
20095+78	20096+10	32	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7972807533	-84.7683128533	45.79719286	-84.76835035
20096+28	20096+49	21	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7971406425	-84.7683725825	45.7970838	-84.76839682
20096+50	20098+04	154	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7970805200	-84.7683982200	45.7966465900	-84.7685709475
20098+43	20103+80	537	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7965369925	-84.7686135525	45.79502466	-84.76920142
20103+86	20104+02	16	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7950092775	-84.7692073925	45.79496309	-84.76922529

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\bow\east bowfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

East Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
20104+10	20104+72	62	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7949415875	-84.7692336475	45.7947668760	-84.7693014020
20105+09	20105+43	34	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7946617380	-84.7693421640	45.79456592	-84.76937932
20105+64	20106+08	44	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7945076100	-84.7694019575	45.7943840880	-84.7694498560
20106+16	20106+60	44	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7943612450	-84.7694587050	45.7942374800	-84.7695067040
20106+83	20107+19	36	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79417146	-84.76953231	45.79407117	-84.76957119
20107+51	20107+85	34	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7939808340	-84.7696062360	45.79388552	-84.76964322
20107+91	20107+96	5	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7938683320	-84.7696498680	45.7938548200	-84.7696551150
20108+00	20109+71	171	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7938437700	-84.7696593960	45.7933625200	-84.7698460250
20109+80	20110+11	31	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7933367100	-84.7698560480	45.7932495850	-84.7698898300
20110+40	20110+70	30	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7931670740	-84.7699218140	45.79308366	-84.76995420
20110+99	20112+28	129	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7930007800	-84.7699863150	45.79263785	-84.77012708
20112+67	20112+82	15	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7925298340	-84.7701689740	45.7924873725	-84.7701854025
20113+50	20113+54	4	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7922965580	-84.7702594040	45.7922849225	-84.7702639275
20113+98	20114+30	32	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7921590750	-84.7703069400	45.7920688040	-84.7703375300
20114+46	20114+59	13	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7920241000	-84.7703574275	45.7919891365	-84.7703783222
20125+23	20126+90	167	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.789006190	-84.771519188	45.7885482053	-84.7716996183
20127+28	20135+00	772	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.7884395702	-84.7717324274	45.7862785128	-84.7725713542
20135+06	20138+05	299	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.7862620667	-84.7725796087	45.7861205626	-84.7735864860
20138+31	20138+69	38	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.786135279	-84.773700037	45.786166879	-84.773853917
	Total Feet	3671						

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\bow\east bowfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

CIS Skip Report with GPS

Report of any skips in the data with GPS

Enbridge

East Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Region	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19944+70	19992+35	4766	NORTH EDGE WATER CROSSING VERIFIED READS; CLAMP E-1		/ /	45.8396996845	-84.7521196198	45.8262888045	-84.7572317172
20114+59	20125+22	1064	END OF SPOOL; EDGE WATER SOUTH AT TOP OF GRAVEL HILL AC P/S:0.9514		/ /	45.7919891365	-84.7703783222	45.7890089935	-84.7715181158
20126+90	20127+27	38	EDGE ASPHALT DRIVE; EDGE ASPHALT DRIVE		09/27/18	45.7885482053	-84.7716996183	45.7884424322	-84.7717315692
20138+05	20138+30	26	EDGE ASPHALT ROAD OVERHEAD POWER; CENTERLINE HEADLANDS ROAD; EDGE ASPHALT ROAD		09/27/18	45.7861205626	-84.7735864860	45.7861347148	-84.7736956532

Total Feet 5894

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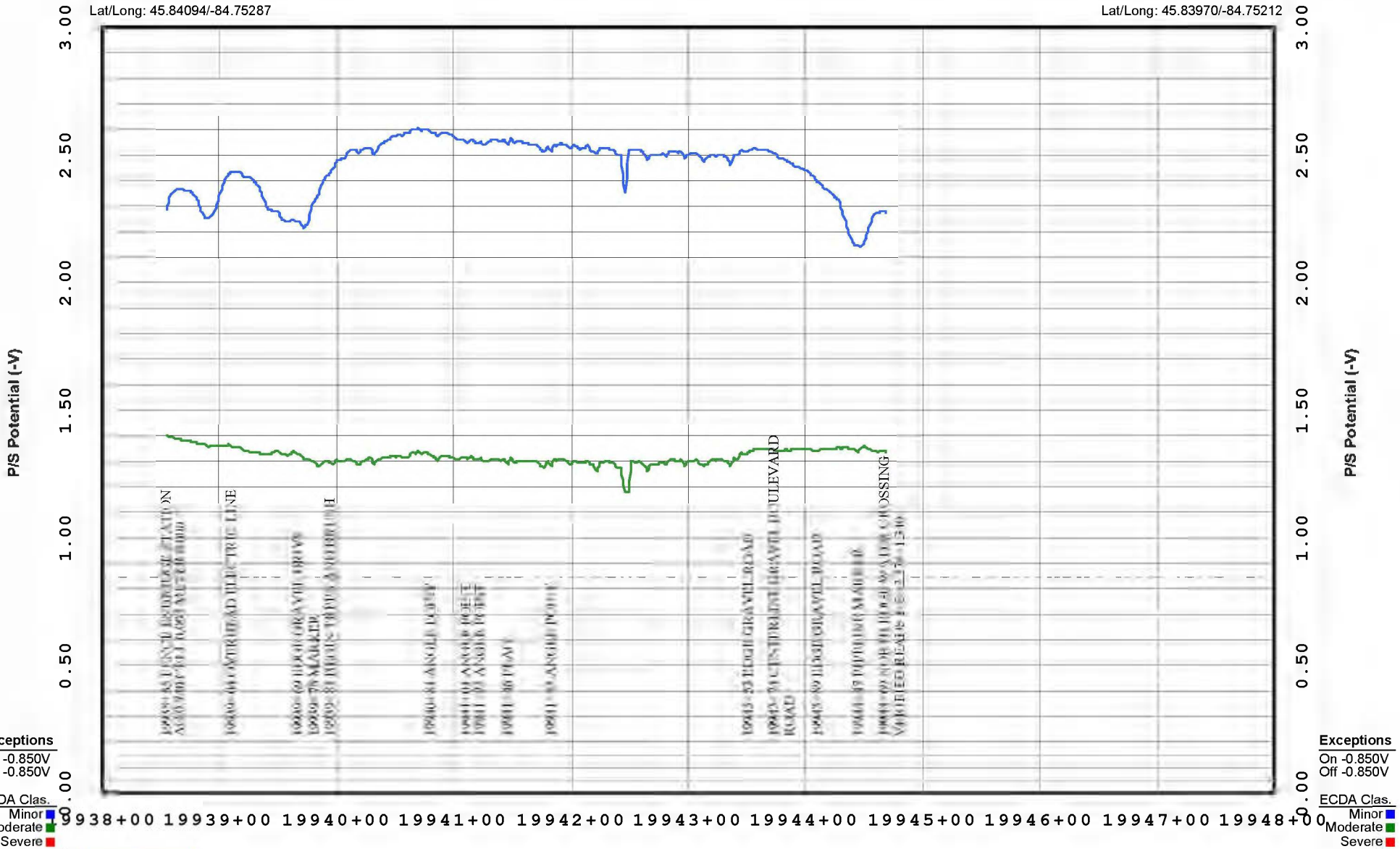
Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\bow\east bowfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

Appendix D – 2018 Close Interval Survey Results – East Pipeline Aft Cell and 2019 Shore Approach Survey

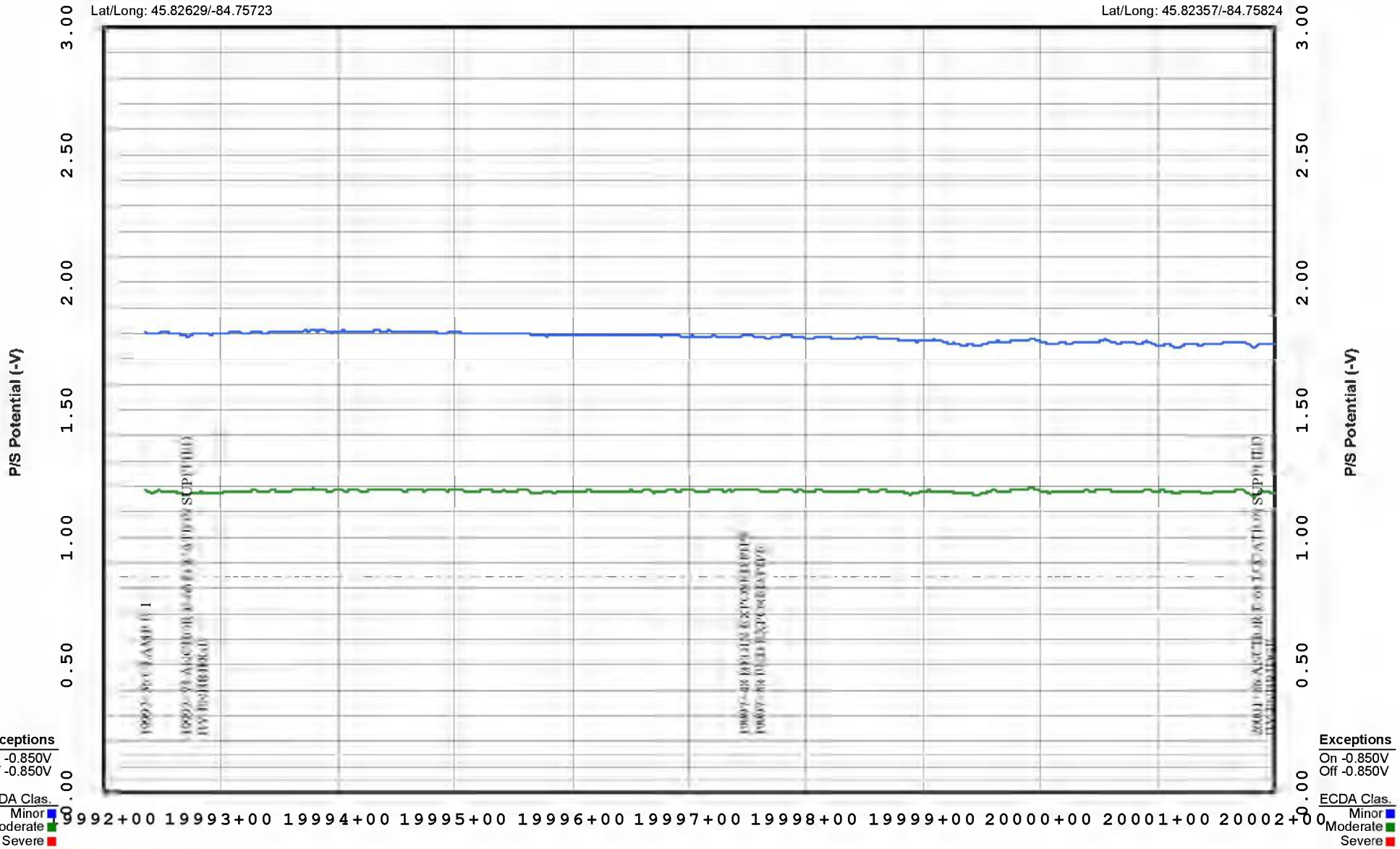
ENBDNR0009849



mears CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: EAST LINE AFT	File: 6000 N SHORE EAST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 1 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 09/18/18

File: 2000 EAST AFT

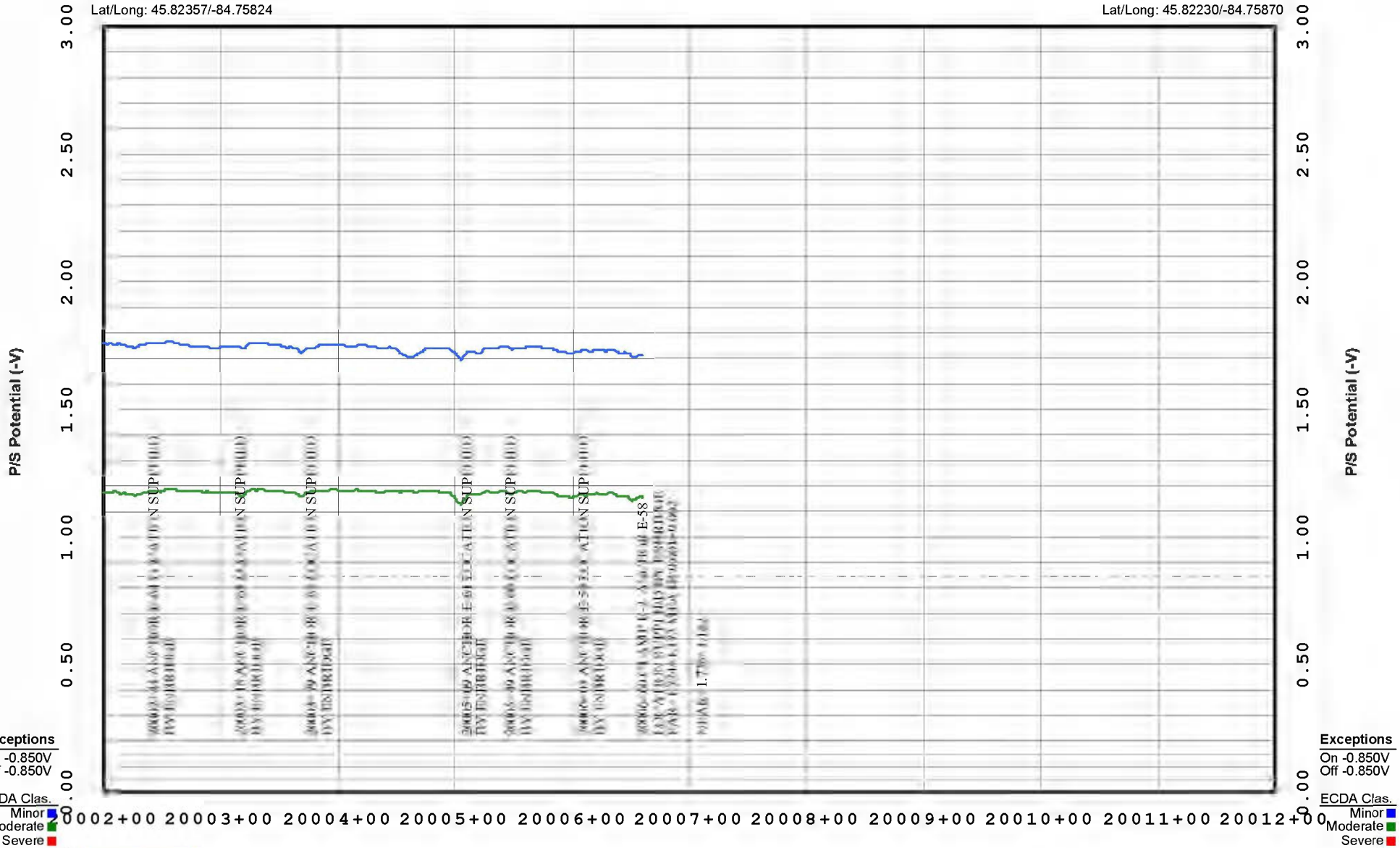
Mears Job Number. 9141883310

Page: 2 of 18

Survey Direction

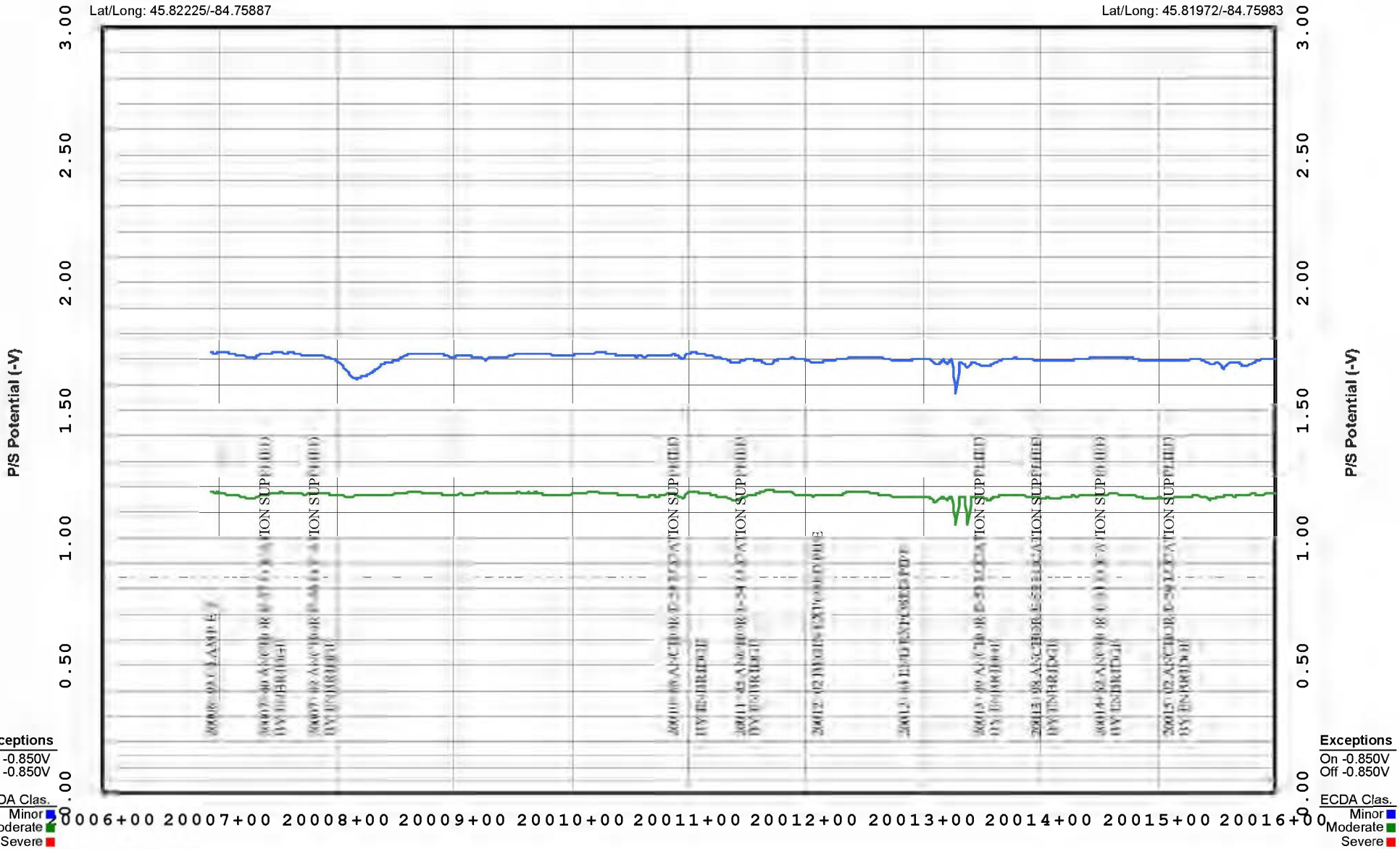
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 09/18/18	
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	On / Off	Mears Job Number. 9141883310 Page: 3 of 18	Survey Direction

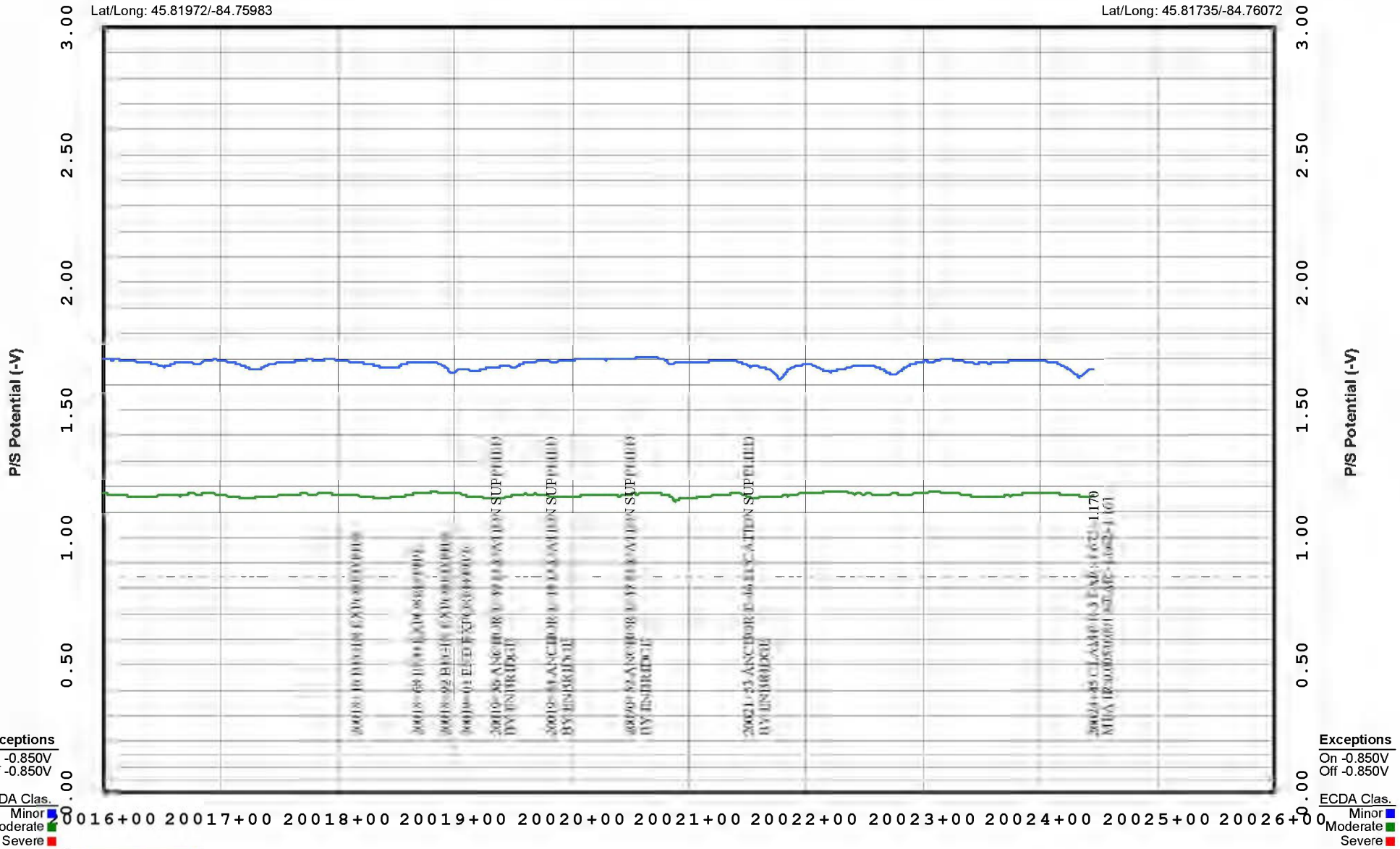
Copyright © 03/21/19 Mears Group, Inc.



mears CPGLog	Client: ENBRIDGE	Date: 09/19/18	
	Pipeline: EAST LINE AFT	File: 2010 EAST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 4 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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mears

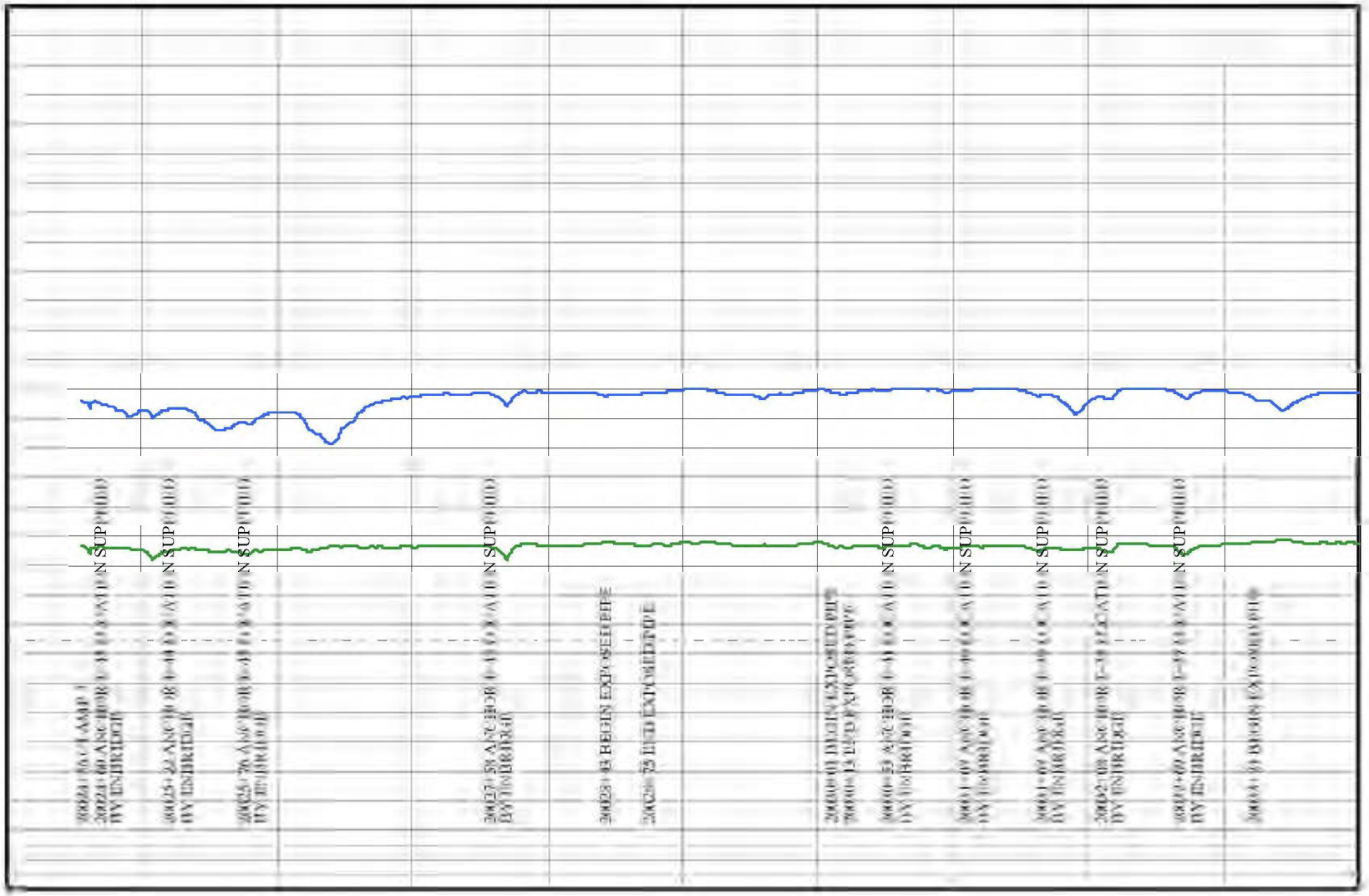
CPGLog

Client: ENBRIDGE		Date: 09/19/18	
Pipeline: EAST LINE AFT		File: 2010 EAST AFT	
On Off		Mears Job Number. 9141883310 Page: 5 of 18	Survey Direction

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Lat/Long: 45.81732/-84.76079

Lat/Long: 45.81468/-84.76176



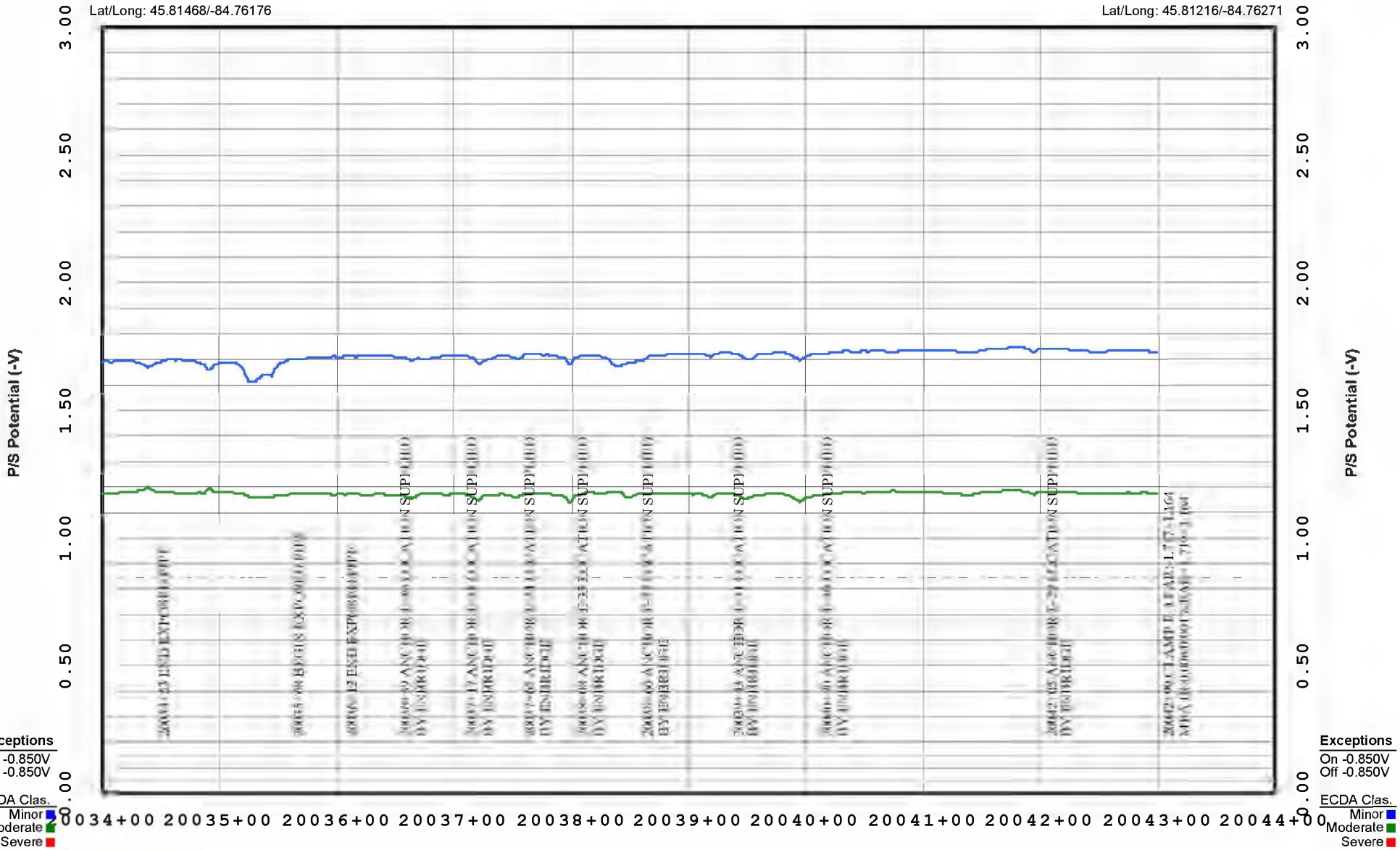
Exceptions
On -0.850V
Off -0.850V

ECDA Clas.
Minor
Moderate
Severe

mears CPGLog	Client: ENBRIDGE	Date: 10/01/18	
	Pipeline: EAST LINE AFT	File: 2020 EAST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 6 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

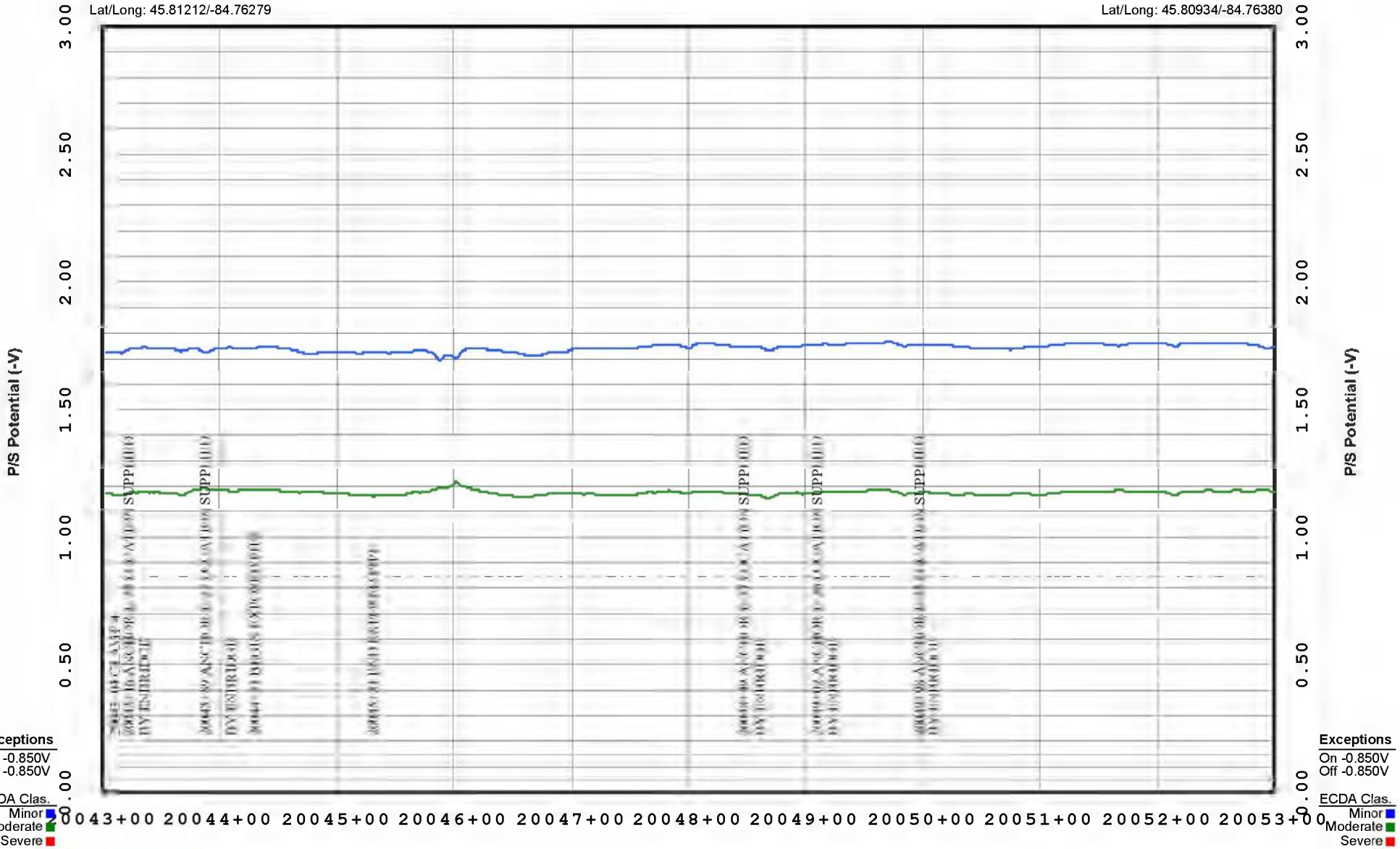
Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 10/01/18	
	Pipeline: EAST LINE AFT	File: 2020 EAST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 7 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

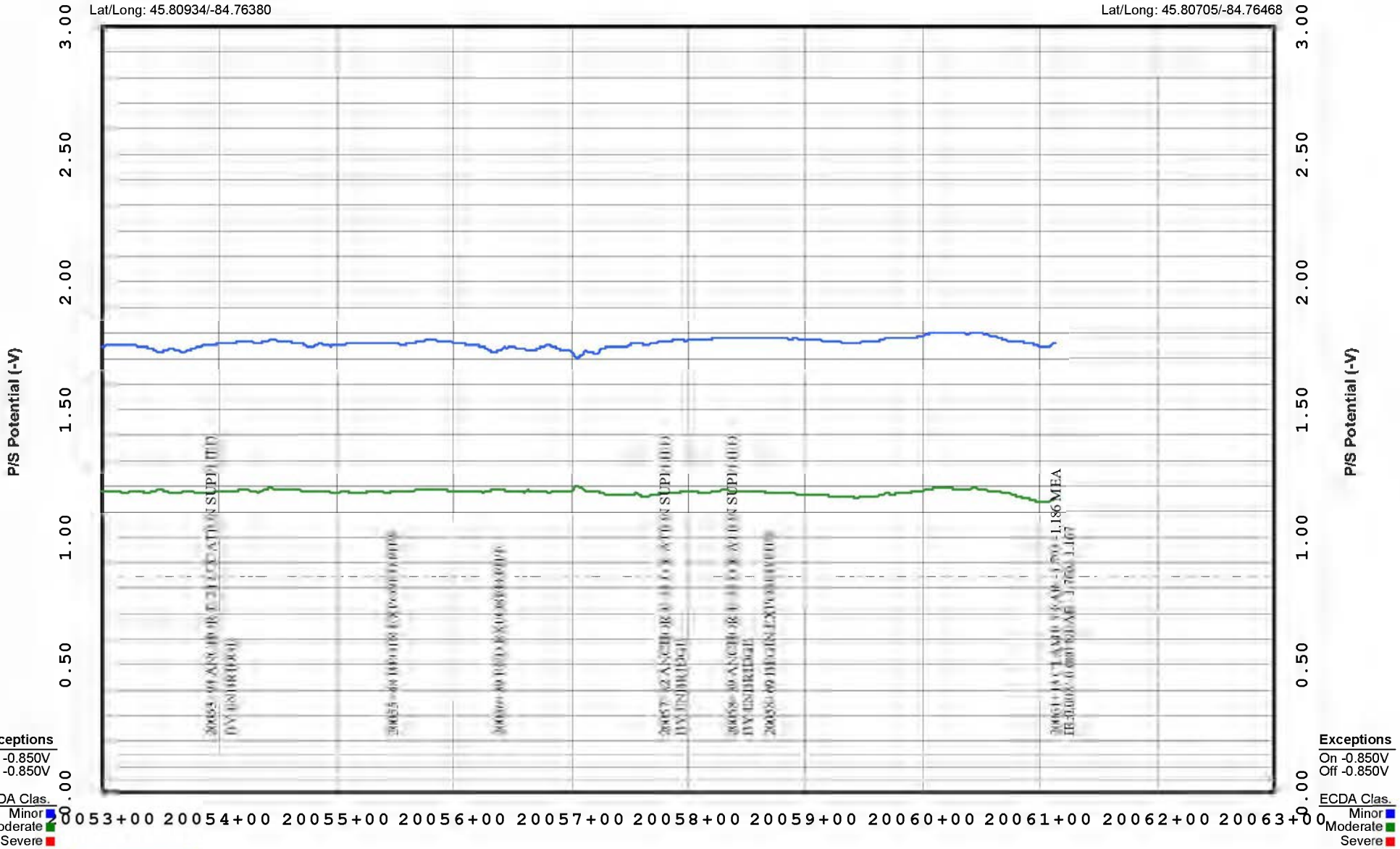
Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 10/01/18	
	Pipeline: EAST LINE AFT	File: 2030 EAST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 8 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

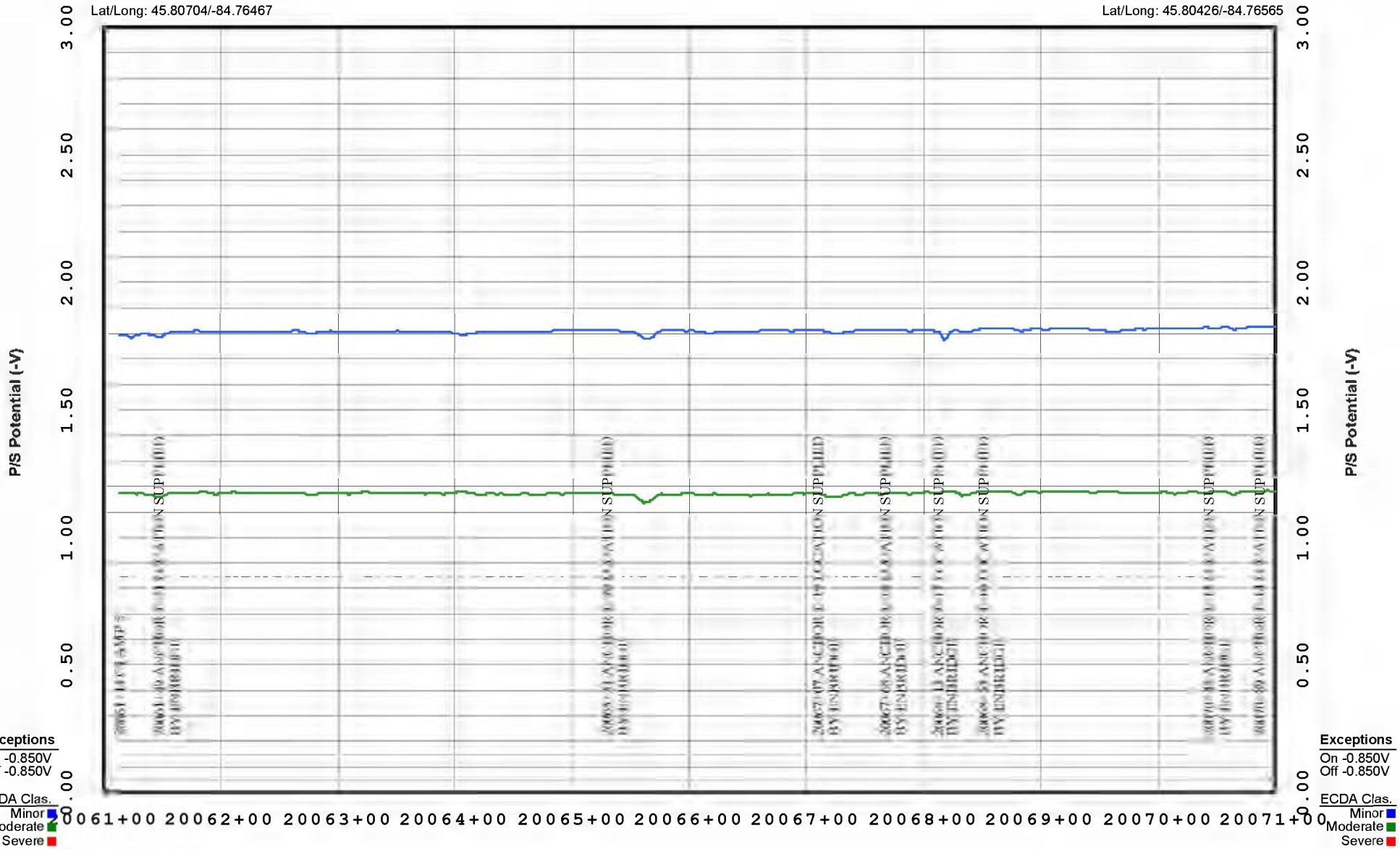
Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 10/01/18	
	Pipeline: EAST LINE AFT	File: 2030 EAST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 9 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 10/03/18

File: 2040 EAST AFT

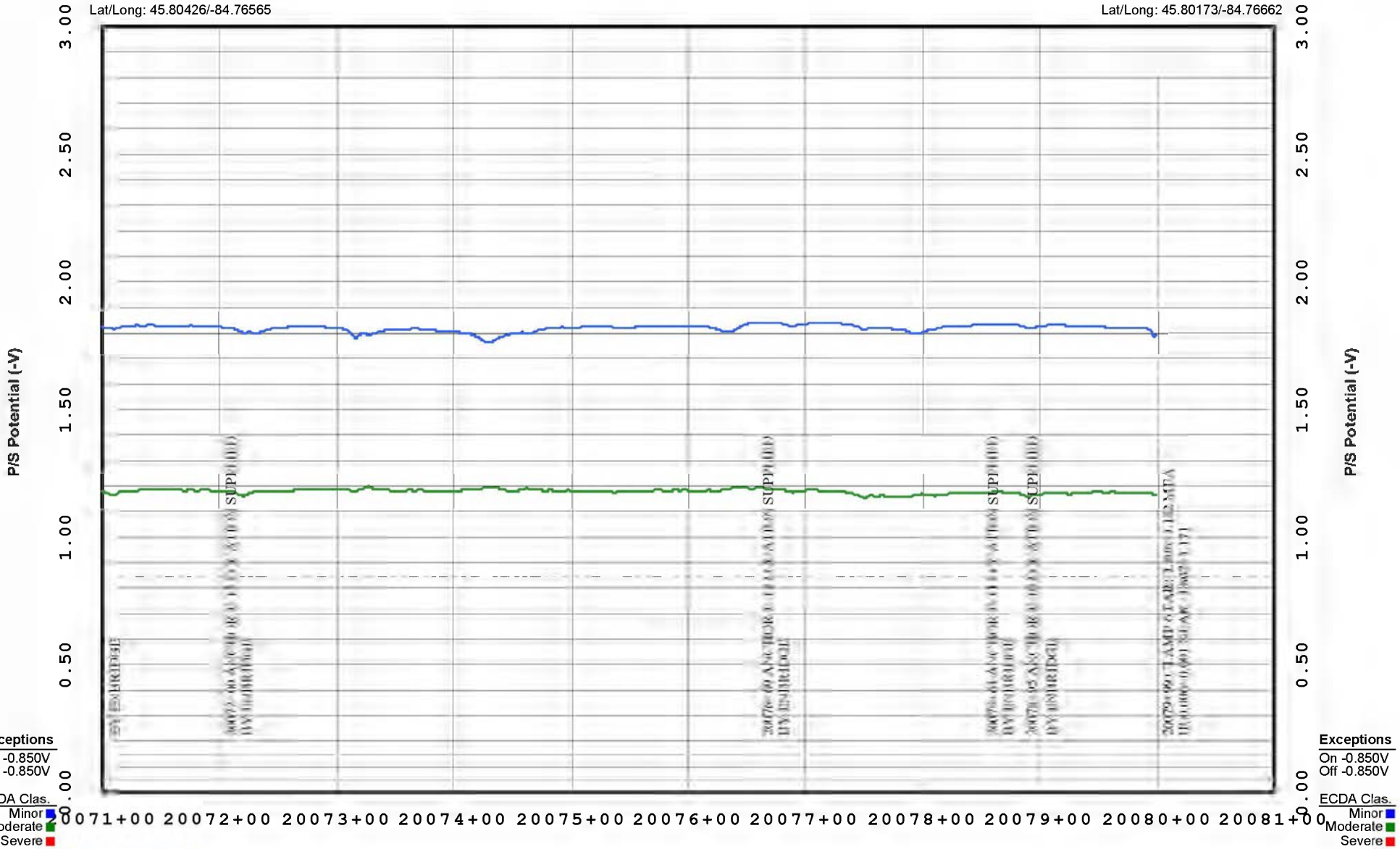
Mears Job Number. 9141883310

Page: 10 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

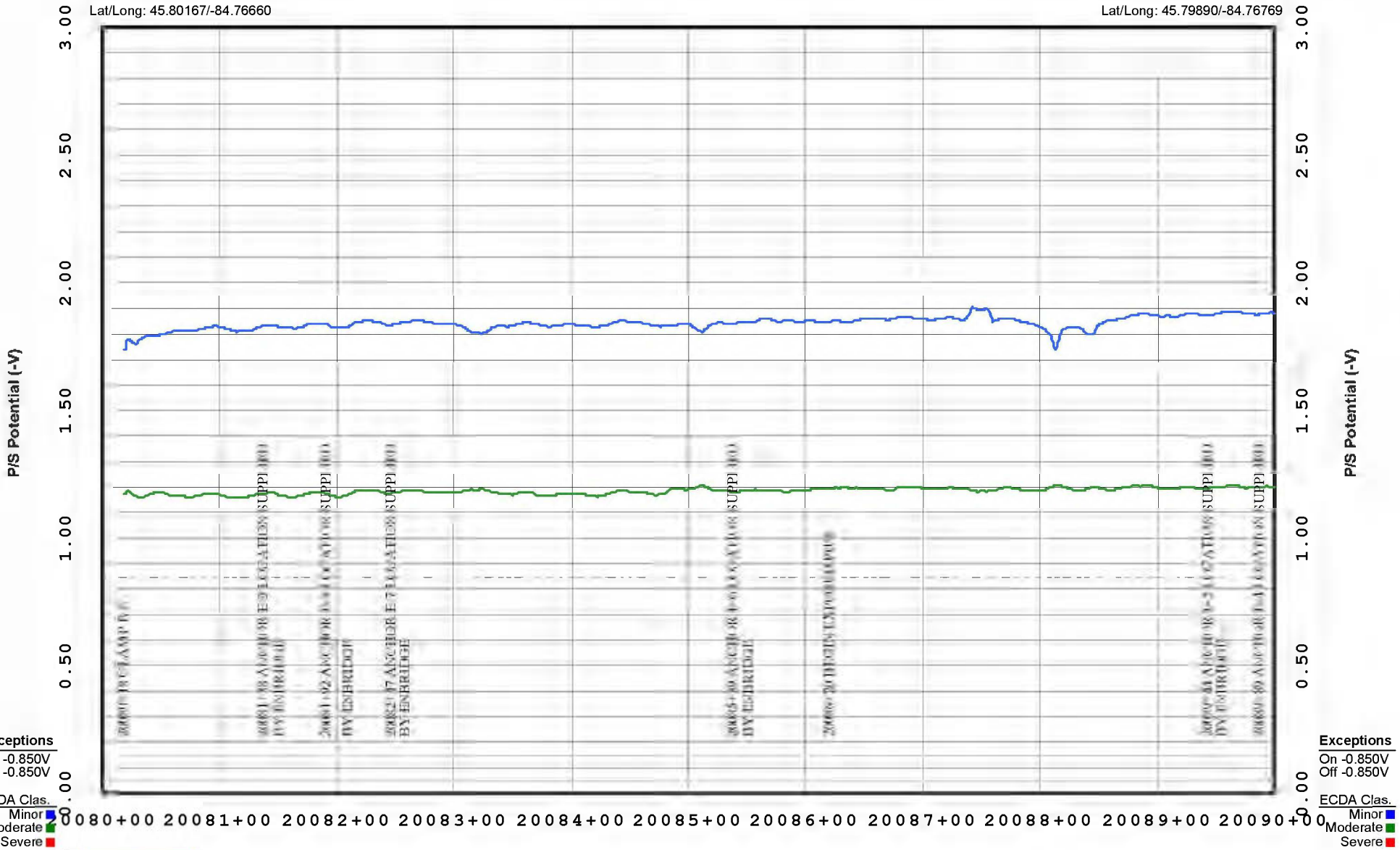
Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 10/03/18	
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	On / Off	Mears Job Number. 9141883310 Page: 11 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 10/09/18

File: 2050 EAST AFT

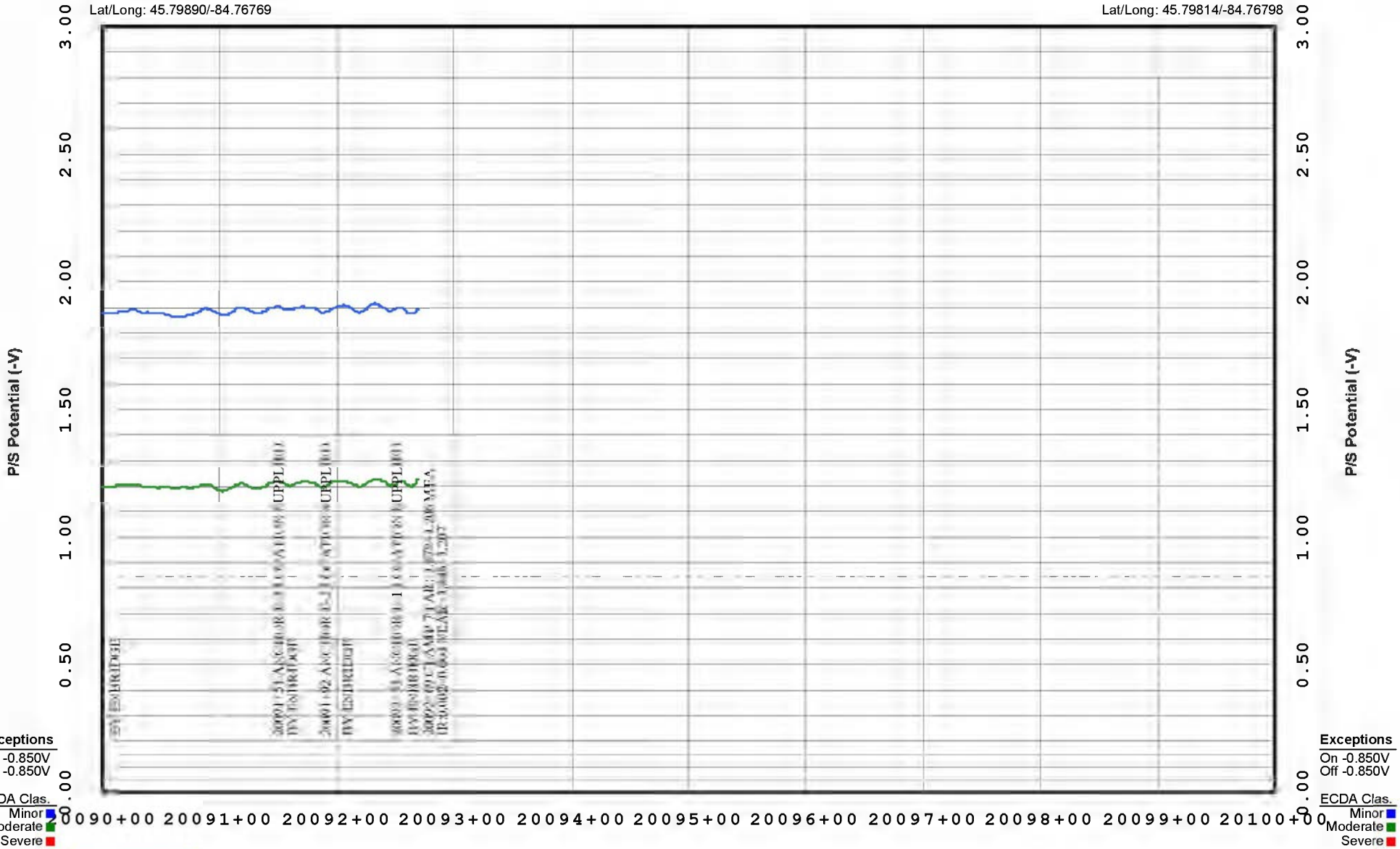
Mears Job Number. 9141883310

Page: 12 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 10/09/18

File: 2050 EAST AFT

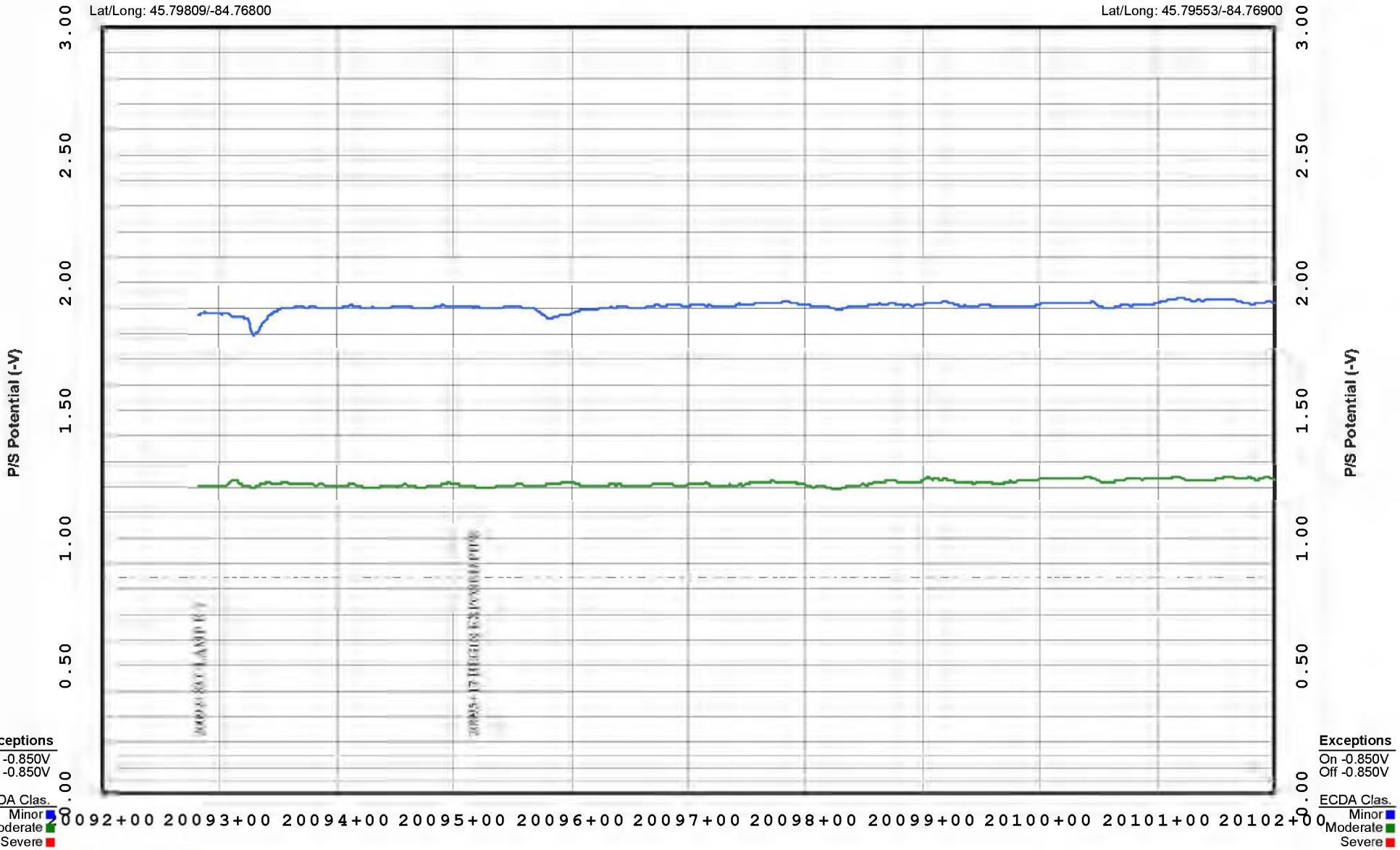
Mears Job Number. 9141883310

Page: 13 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

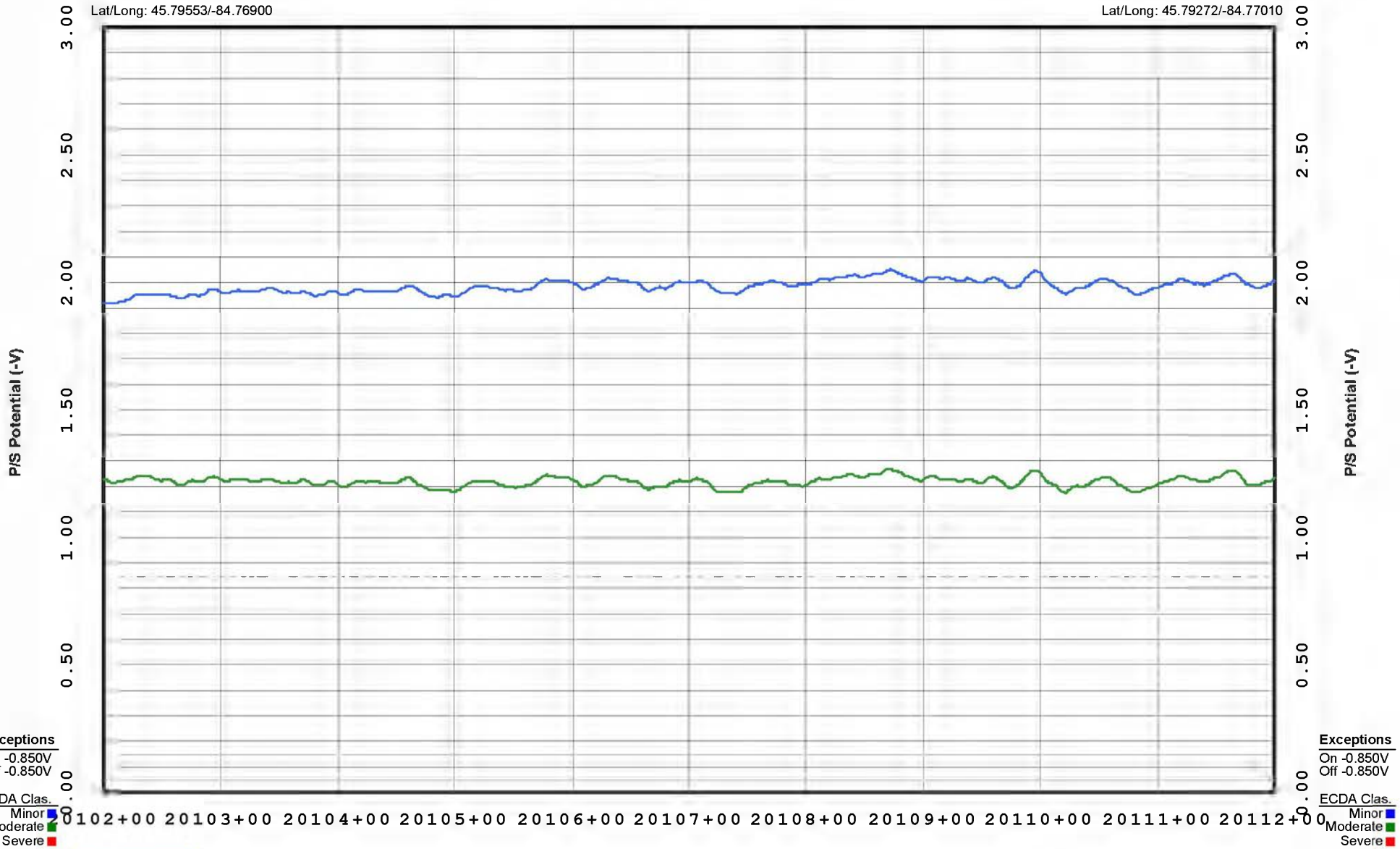
Copyright © 03/21/19 Mears Group, Inc.



CPGLog	Client: ENBRIDGE	Date: 10/09/18	
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	On / Off	Mears Job Number. 9141883310 Page: 14 of 18	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 10/09/18

File: 2060 EAST AFT

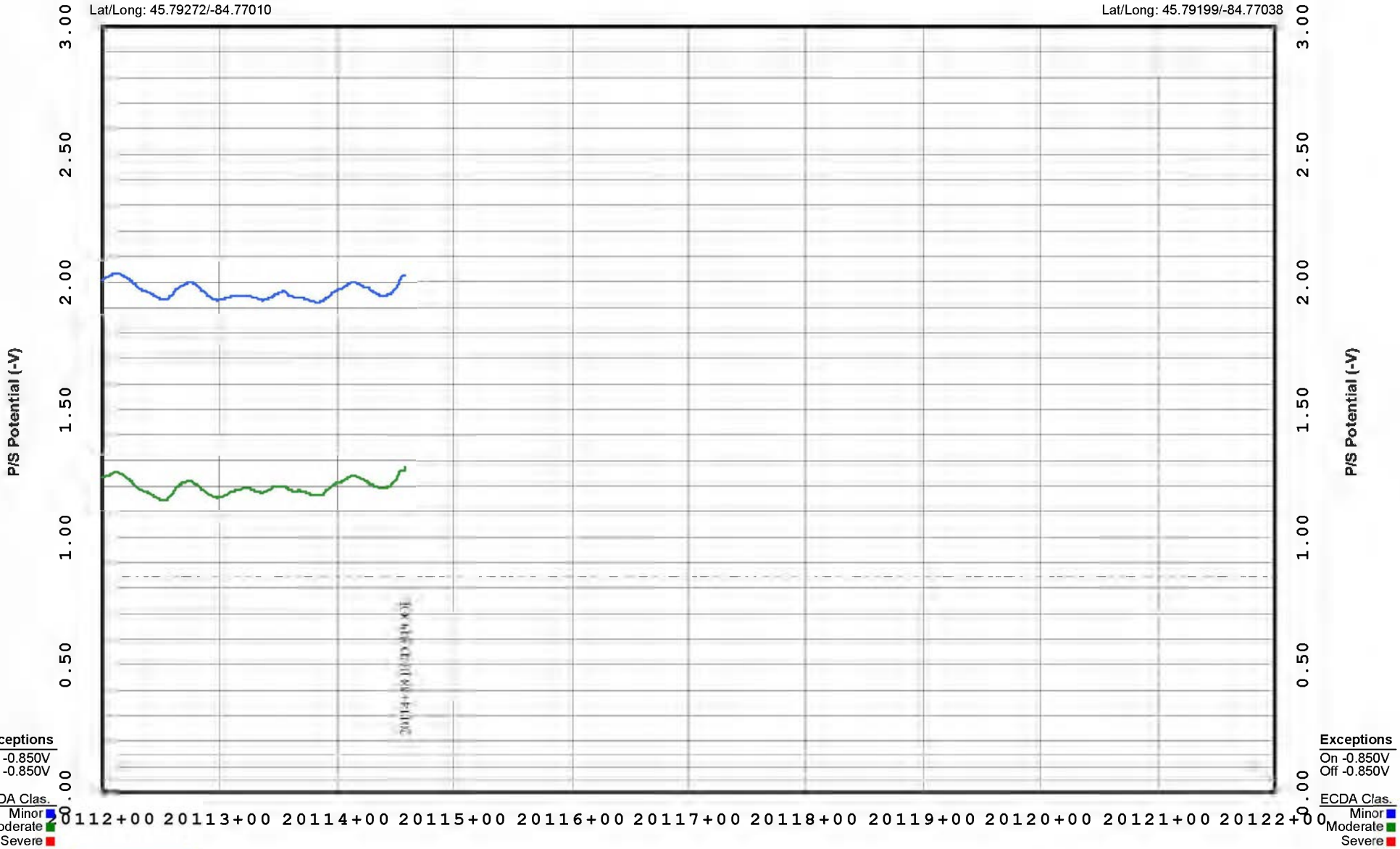
Mears Job Number. 9141883310

Page: 15 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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mears

CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 10/09/18

File: 2060 EAST AFT

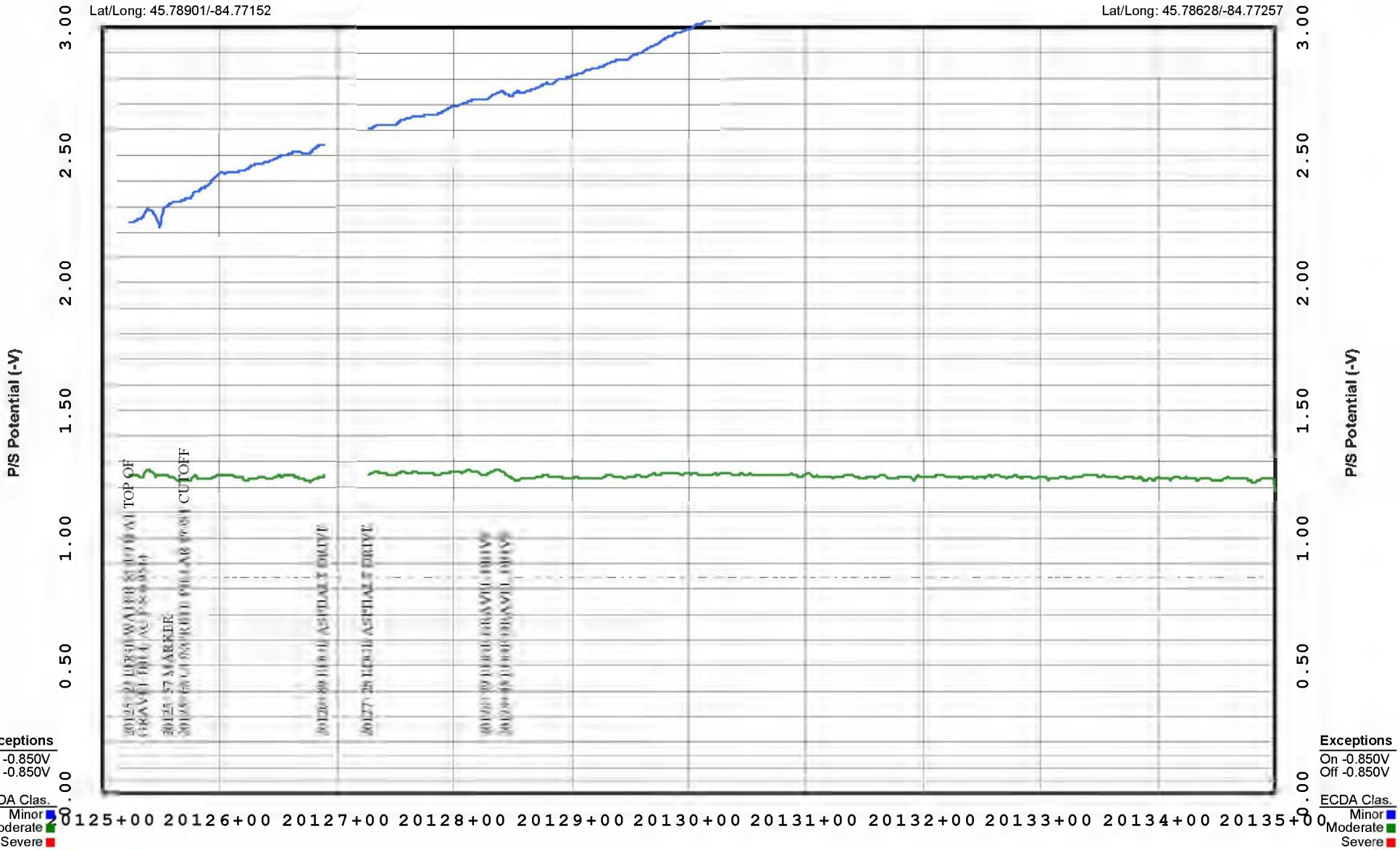
Mears Job Number. 9141883310

Page: 16 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: EAST LINE AFT

On

Off

Date: 09/27/18

File: 6050 S SHORE EAST LEG

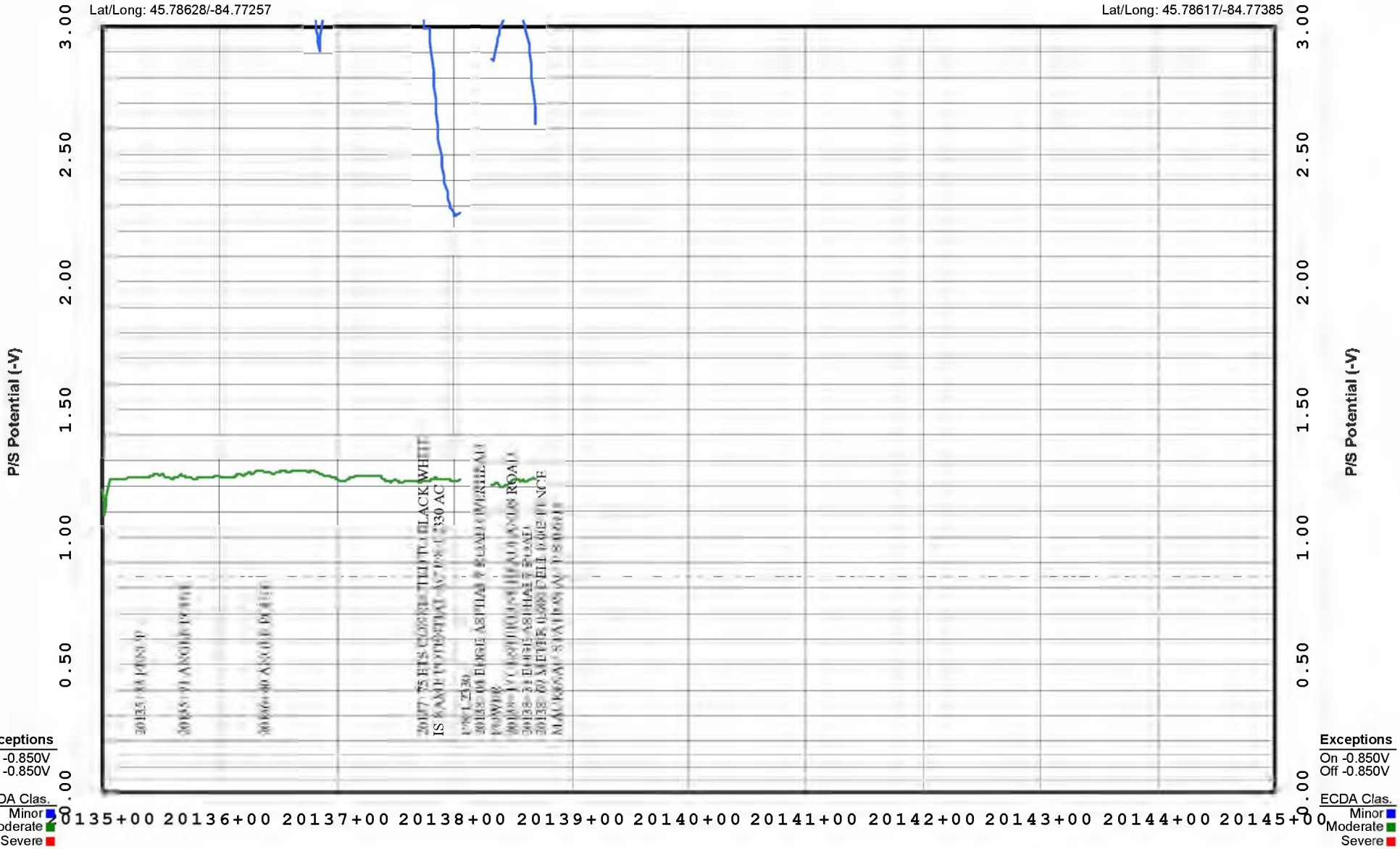
Mears Job Number. 9141883310

Page: 17 of 18

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\least aftfinal.cdb

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CPGLog	Client: ENBRIDGE	Date: 09/27/18	
	Pipeline: EAST LINE AFT	File: 6050 S SHORE EAST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 18 of 18	Survey Direction

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377.50
19932+00

377.75
19943+20

378.00
19956+40

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

1938+55 FENCE ENBRIDGE STATION 4"X6"X40 CELL 0.003 METER 0.000
1939+04 OVERHEAD ELECTRIC LINE
1939+69 EDGE GRAVEL DRIVE
1939+78 MARKER
1939+81 BEGIN TREES AND BRUSH
1940+81 ANGLE POINT
1941+01 ANGLE POINT
1941+23 ANGLE POINT
1941+46 FLAG
1941+83 ANGLE POINT
1943+53 EDGE GRAVEL ROAD
1943+74 CENTERLINE GRAVEL [illegible] ROAD
1943+89 EDGE GRAVEL ROAD
1944+47 PIPELINE MARKER
1944+69 NORTH EDGE WATER [illegible] VERIFIED READS P/S:-2,278/-1,145

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Units: Drawn: 03/31/15
Project Number: 914183310
Project Manager: KURT LAWSON
Drawn By: HART SMALLEY
SHEET 1 OF 8

ENBRIDGE
AFT [illegible]
East Line Aft

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stoneyer Newman, 1991

mears

ENBDNR0009868

378.00
1925 +40

375.25
1897 +60

375.00
1892 +00

MILEAGE CALCULATED
FROM SURVEY STATIONING

-2.500

-2.000

-1.500

-1.000

-0.850

-0.500

CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

ON/OFF SURVEY DIRECTION

Project Number
914188331O

Project Manager
KURT LAWSON

Drawn By
HART SMALLEY

2 OF 8

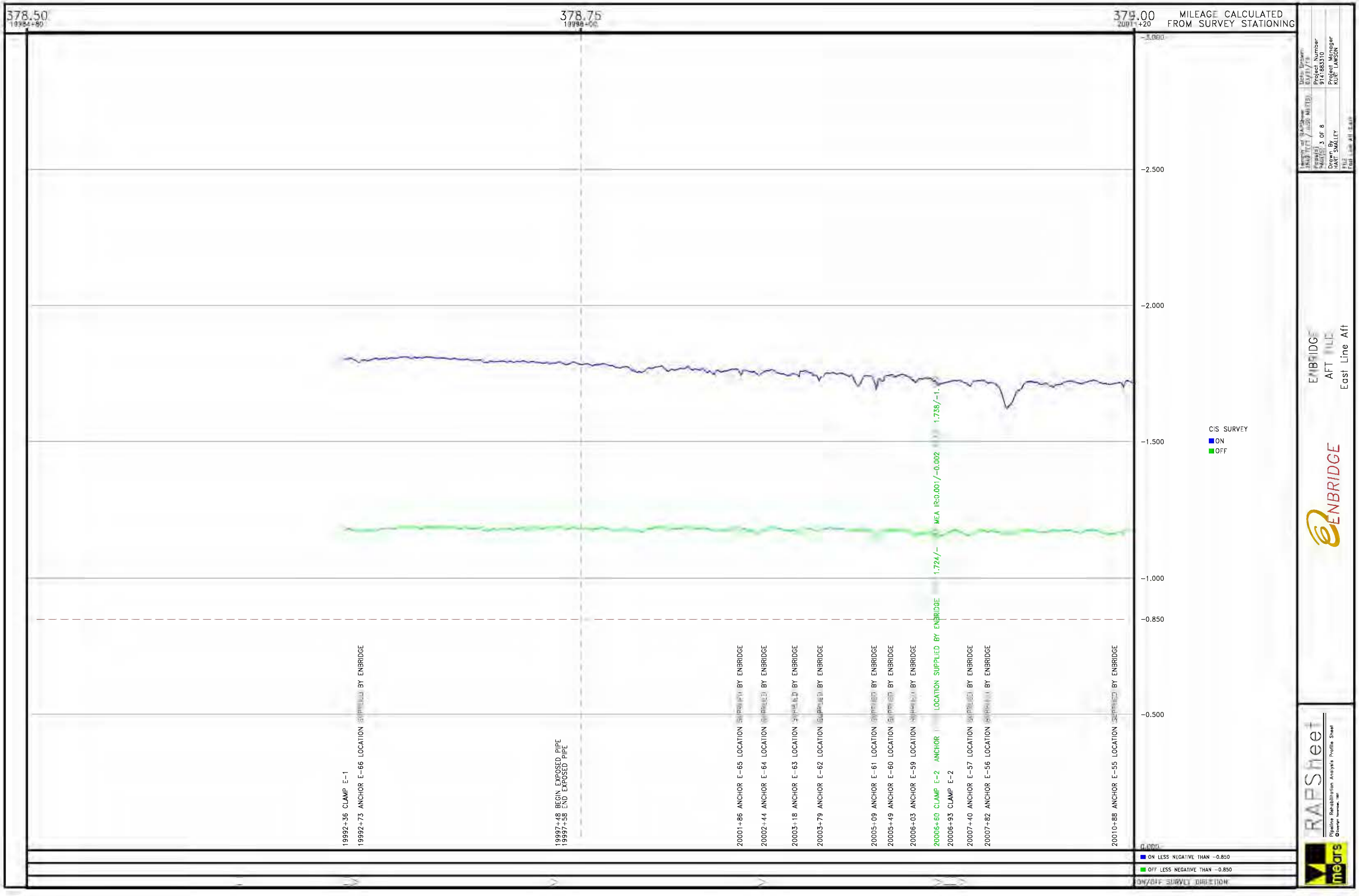
ENBRIDGE

AFT

East Line Aft

Pipeline Rehabilitation Analysis Profile Sheet

©Stoneyer November, 1991


378.50
19984+80
378.75
19988+00
379.00
20001+20
MILEAGE CALCULATED FROM SURVEY STATIONING
-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000
CIS SURVEY
ON
OFF
1.738/-1.
MEA IR:0.001/-0.002
1.724/-
19992+36 CLAMP E-1
19992+73 ANCHOR E-66 LOCATION SUPPLIED BY ENBRIDGE
19997+48 BEGIN EXPOSED PIPE
19997+58 END EXPOSED PIPE
20001+86 ANCHOR E-65 LOCATION SUPPLIED BY ENBRIDGE
20002+44 ANCHOR E-64 LOCATION SUPPLIED BY ENBRIDGE
20003+18 ANCHOR E-63 LOCATION SUPPLIED BY ENBRIDGE
20003+79 ANCHOR E-62 LOCATION SUPPLIED BY ENBRIDGE
20005+09 ANCHOR E-61 LOCATION SUPPLIED BY ENBRIDGE
20005+49 ANCHOR E-60 LOCATION SUPPLIED BY ENBRIDGE
20006+03 ANCHOR E-59 LOCATION SUPPLIED BY ENBRIDGE
20006+60 CLAMP E-2 ANCHOR LOCATION SUPPLIED BY ENBRIDGE
20006+93 CLAMP E-2
20007+40 ANCHOR E-57 LOCATION SUPPLIED BY ENBRIDGE
20007+82 ANCHOR E-56 LOCATION SUPPLIED BY ENBRIDGE
20010+88 ANCHOR E-55 LOCATION SUPPLIED BY ENBRIDGE
ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION
Date Drawn: 03/31/19
Project Number: 914183310
Project Manager: KURT LAWSON
Drawn By: HART SMALLEY
Sheet 3 OF 8
ENBRIDGE
AFT
East Line Aft
RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Deepwater Nevertheless, 1981
Mears

379.00
20011+20

379.25
20024+40

379.50
20037+60

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

.161

20011+45 ANCHOR E-54 LOCATION SUPPLIED BY ENBRIDGE
20012+02 BEGIN EXPOSED PIPE
20012+84 END EXPOSED PIPE
20013+49 ANCHOR E-53 LOCATION SUPPLIED BY ENBRIDGE
20013+98 ANCHOR E-52 LOCATION SUPPLIED BY ENBRIDGE
20014+52 ANCHOR E-51 LOCATION SUPPLIED BY ENBRIDGE
20015+02 ANCHOR E-50 LOCATION SUPPLIED BY ENBRIDGE
20018+16 BEGIN EXPOSED PIPE
20018+68 END EXPOSED PIPE
20018+92 BEGIN EXPOSED PIPE
20019+01 END EXPOSED PIPE
20019+36 ANCHOR E-49 LOCATION SUPPLIED BY ENBRIDGE
20019+84 ANCHOR E-48 LOCATION SUPPLIED BY ENBRIDGE
20020+52 ANCHOR E-47 LOCATION SUPPLIED BY ENBRIDGE
20021+53 ANCHOR E-46 LOCATION SUPPLIED BY ENBRIDGE
20024+56 CLAMP 1
20024+60 ANCHOR E-45 LOCATION SUPPLIED BY ENBRIDGE
20025+22 ANCHOR E-44 LOCATION SUPPLIED BY ENBRIDGE
20025+76 ANCHOR E-43 LOCATION SUPPLIED BY ENBRIDGE
20027+58 ANCHOR E-42 LOCATION SUPPLIED BY ENBRIDGE
20028+43 BEGIN EXPOSED PIPE
20028+75 END EXPOSED PIPE
20030+01 BEGIN EXPOSED PIPE
20030+13 END EXPOSED PIPE
20030+53 ANCHOR E-41 LOCATION SUPPLIED BY ENBRIDGE
20031+07 ANCHOR E-40 LOCATION SUPPLIED BY ENBRIDGE
20031+67 ANCHOR E-39 LOCATION SUPPLIED BY ENBRIDGE
20032+08 ANCHOR E-38 LOCATION SUPPLIED BY ENBRIDGE
20032+69 ANCHOR E-37 LOCATION SUPPLIED BY ENBRIDGE
20033+24 BEGIN EXPOSED PIPE
20034+53 END EXPOSED PIPE
20035+68 BEGIN EXPOSED PIPE
20036+12 END EXPOSED PIPE
20036+59 ANCHOR E-36 LOCATION SUPPLIED BY ENBRIDGE
20037+17 ANCHOR E-35 LOCATION SUPPLIED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (ONE TEXT / 6.30 METER)
Page(s) 4 OF 8
Drawn By HART SMALLEY
Date Drawn 01/31/19
Project Number 9141883310
Project Manager KURT LAWSON
FILE East Line Aft 4.dgn

ENBRIDGE
AFT FILE
East Line Aft

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stoneyer Inc., 1991

Mears

379.50
20037+60

379.75
20050+80

380.00
20064+00

MILEAGE CALCULATED FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20037+65 ANCHOR E-34 LOCATION SURVEYED BY ENBRIDGE
20038+08 ANCHOR E-33 LOCATION SURVEYED BY ENBRIDGE
20038+66 ANCHOR E-32 LOCATION SURVEYED BY ENBRIDGE
20039+43 ANCHOR E-31 LOCATION SURVEYED BY ENBRIDGE
20040+20 ANCHOR E-30 LOCATION SURVEYED BY ENBRIDGE
20042+05 ANCHOR E-29 LOCATION SURVEYED BY ENBRIDGE
20042+99 CLAMP 4 FAR:-1.717/-1.164 MEA IR:0.006/0.001 NEAR:-1.164
20043+04 CLAMP 4
20043+16 ANCHOR E-28 LOCATION SURVEYED BY ENBRIDGE
20043+89 ANCHOR E-27 LOCATION SURVEYED BY ENBRIDGE
20044+31 BEGIN EXPOSED PIPE
20045+31 END EXPOSED PIPE
20048+49 ANCHOR E-27 LOCATION SURVEYED BY ENBRIDGE
20049+02 ANCHOR E-26 LOCATION SURVEYED BY ENBRIDGE
20049+98 ANCHOR E-25 LOCATION SURVEYED BY ENBRIDGE
20053+94 ANCHOR E-24 LOCATION SURVEYED BY ENBRIDGE
20055+48 BEGIN EXPOSED PIPE
20056+39 END EXPOSED PIPE
20057+82 ANCHOR E-23 LOCATION SURVEYED BY ENBRIDGE
20058+39 ANCHOR E-22 LOCATION SURVEYED BY ENBRIDGE
20058+69 BEGIN EXPOSED PIPE
20061+13 CLAMP 5 FAR:-1.793/-1.167 MEA IR:0.003/-0.000 NEAR:-1.167
20061+14 CLAMP 5
20061+49 ANCHOR E-21 LOCATION SURVEYED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3840 FEET / 1.30 MILE(S)
Page(s): 5 OF 8
Drawn By: HART SMALLEY
Date Drawn: 03/31/19
Project Number: 9141883310
Project Manager: KURT LAWSON
FILE: East Line Aft.dgn

ENBRIDGE
AFT FILE
East Line Aft

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stress Engineering, 1991

Mears

ENBDNR0009872

380.00
20064+00

380.25
20077+20

380.50
20090+40

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20065+31 ANCHOR E-20 LOCATION SUPPLIED BY ENBRIDGE
20067+07 ANCHOR E-19 LOCATION SUPPLIED BY ENBRIDGE
20067+68 ANCHOR E-18 LOCATION SUPPLIED BY ENBRIDGE
20068+13 ANCHOR E-17 LOCATION SUPPLIED BY ENBRIDGE
20068+53 ANCHOR E-16 LOCATION SUPPLIED BY ENBRIDGE
20070+45 ANCHOR E-15 LOCATION SUPPLIED BY ENBRIDGE
20070+89 ANCHOR E-14 LOCATION SUPPLIED BY ENBRIDGE
20072+00 ANCHOR E-13 LOCATION SUPPLIED BY ENBRIDGE
20076+69 ANCHOR E-12 LOCATION SUPPLIED BY ENBRIDGE
20078+61 ANCHOR E-11 LOCATION SUPPLIED BY ENBRIDGE
20078+95 ANCHOR E-10 LOCATION SUPPLIED BY ENBRIDGE
20079+99 CLAMP 6 FAR:-1.806/-1.1 MEA IR:0.006/-0.001 NEAR:-1 1.171
20080+18 CLAMP E-6
20081+38 ANCHOR E-9 LOCATION SUPPLIED BY ENBRIDGE
20081+92 ANCHOR E-8 LOCATION SUPPLIED BY ENBRIDGE
20082+47 ANCHOR E-7 LOCATION SUPPLIED BY ENBRIDGE
20085+39 ANCHOR E-6 LOCATION SUPPLIED BY ENBRIDGE
20086+20 BEGIN EXPOSED PIPE
20089+44 ANCHOR E-5 LOCATION SUPPLIED BY ENBRIDGE
20089+89 ANCHOR E-4 LOCATION SUPPLIED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3960 FEET / 1.20 METERS
Page(s): 6 OF 8
Drawn By: HART SMALLEY
Date Drawn: 03/31/19
Project Number: 9141883310
Project Manager: KURT LAWSON
FILE: East Line Aft

ENBRIDGE
AFT FILE
East Line Aft

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Mears

380.50
20090+40

380.75
20105+60

381.00
20115+80

MILEAGE CALCULATED FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20091+51 ANCHOR E-3 LOCATION SUPPLIED BY ENBRIDGE
20091+92 ANCHOR E-2 LOCATION SUPPLIED BY ENBRIDGE
20092+53 ANCHOR E-1 LOCATION SUPPLIED BY ENBRIDGE IR:0.002/-0.004 NEAR:- 1.207
20092+69 CLAMP 7
20092+83 CLAMP E-
20095+17 BEGIN EXPOSED PIPE
20114+58 END SPOOL

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3840 FEET / 1.30 MILES
Page(s): 7 OF 8
Drawn By: HART SMALLEY
Date Drawn: 01/31/19
Project Number: 9421883310
Project Manager: KURT LAWSON
FILE: East Line Aft

ENBRIDGE
AFT FILE
East Line Aft

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Mears

ENBDNR0009874

381.00
20115+80

381.25
20130+00

381.50
20145+20

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20125+23 EDGE WATER SOUTH AT [illegible] OF GRAVEL HILL AC P/S:0.9514
20125+57 MARKER
20125+68 CONCRETE PILLAR POST [illegible]
20126+89 EDGE ASPHALT DRIVE
20127+28 EDGE ASPHALT DRIVE
20128+29 EDGE GRAVEL DRIVE
20128+45 EDGE GRAVEL DRIVE
20135+71 ANGLE POINT
20136+40 ANGLE POINT
20137+75 ETS CONNECTED TO BLACK WHIP IS SAME POTENTIAL AC P/S:1 [illegible] AC P/S: .2338
20138+04 20in ASPHALT ROAD OVERHEAD POWER
20138+17 CENTERLINE HEADINGS ROAD
20138+31 EDGE ASPHALT ROAD
20138+69 METER 0.000 CELL 0.003 [illegible] MACKINAC STATION AC P/S:0.6715

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Date Drawn: 03/31/15
Project Number: 914883310
Project Manager: KURT LAWSON
Drawn By: HART SMALLEY
Sheet No: 8 OF 8

ENBRIDGE
AFT [illegible]
East Line Aft

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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mears

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials Less Negative than -0.850 Volt

Enbridge

East Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
			NO OFF READS LESS NEGATIVE -0.850 V					
	Total Feet	0						

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

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Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

East Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19938+55	19942+46	391	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.840942282	-84.752874709	45.8403282790	-84.7518677799
19942+50	19944+70	220	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8403171642	-84.7518724799	45.8396996845	-84.7521196198
20045+98	20046+06	8	OFF READS MORE NEGATIVE -1.200 V	10/01/18	45.8113370700	-84.7630472780	45.81131433	-84.76305513
20057+05	20057+06	1	OFF READS MORE NEGATIVE -1.200 V	10/01/18	45.80819928	-84.76424211	45.8081958933	-84.7642433033
20085+09	20085+15	6	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.8002851675	-84.7671472125	45.8002681740	-84.7671539220
20086+89	20086+94	5	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7997770675	-84.7673477325	45.7997625580	-84.7673534480
20088+09	20088+21	12	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79943974	-84.76748084	45.7994049175	-84.7674945675
20088+73	20088+98	25	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7992583580	-84.7675524140	45.7991882700	-84.7675800675
20089+26	20089+27	1	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79910788	-84.76761179	45.7991053600	-84.7676127840
20089+49	20089+71	22	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79904478	-84.76763667	45.79898173	-84.76766155
20089+89	20089+97	8	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79893131	-84.76768147	45.7989092525	-84.7676901575
20090+07	20090+37	30	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7988809	-84.76770134	45.7987956125	-84.7677349900
20090+42	20090+44	2	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7987823860	-84.7677402060	45.7987767175	-84.7677424425
20090+52	20090+55	3	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79875463	-84.76775118	45.7987451575	-84.7677549075
20090+82	20090+95	13	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7986695300	-84.7677847575	45.7986327250	-84.7677992650
20091+12	20091+26	14	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7985853450	-84.7678179625	45.7985454960	-84.7678337120
20091+39	20091+86	47	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7985095850	-84.7678478825	45.7983769900	-84.7679001960
20091+90	20092+19	29	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7983656200	-84.7679046800	45.79828282	-84.76793575
20092+20	20093+29	109	OFF READS MORE NEGATIVE -1.200 V	/ /	45.7982803540	-84.7679365480	45.79797371	-84.76806016
20093+31	20094+33	102	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7979673350	-84.7680611550	45.7976871800	-84.7681395500
20094+36	20094+69	33	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7976786967	-84.7681431667	45.7975850033	-84.7681831133
20094+73	20095+23	50	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7975742725	-84.7681877100	45.7974352425	-84.7682469800
20095+30	20098+21	291	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7974154000	-84.7682554375	45.79659991	-84.76858909
20098+33	20104+73	640	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7965656300	-84.7686024250	45.79476443	-84.76930235
20105+08	20105+50	42	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7946642	-84.76934121	45.7945475050	-84.7693864850
20105+57	20106+09	52	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7945266360	-84.7693945560	45.79438171	-84.76945078
20106+11	20106+61	50	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7943759780	-84.7694529960	45.7942350300	-84.7695076520

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MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

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Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

East Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
20106+81	20107+20	39	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7941775350	-84.7695299550	45.7940680875	-84.7695723950
20107+50	20109+72	222	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7939832720	-84.7696052880	45.7933594450	-84.7698472175
20109+79	20110+14	35	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7933391700	-84.7698550920	45.7932409840	-84.7698931740
20110+30	20110+35	5	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7931965900	-84.7699103960	45.7931818	-84.76991612
20110+36	20110+71	35	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7931787325	-84.7699173050	45.7930805925	-84.7699553825
20110+98	20112+29	131	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7930038500	-84.7699851300	45.7926353840	-84.7701280340
20112+65	20112+83	18	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7925347420	-84.7701670620	45.7924842950	-84.7701865950
20113+48	20113+56	8	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7923014540	-84.7702575120	45.7922787150	-84.7702662350
20113+96	20114+33	37	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79216544	-84.77030479	45.7920605400	-84.7703403300
20114+45	20114+59	14	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79202672	-84.77035496	45.7919891365	-84.7703783222
20125+23	20126+90	167	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.789006190	-84.771519188	45.7885482053	-84.7716996183
20127+28	20135+00	772	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.7884395702	-84.7717324274	45.7862785128	-84.7725713542
20135+06	20138+05	299	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.7862620667	-84.7725796087	45.7861205626	-84.7735864860
20138+31	20138+69	38	OFF READS MORE NEGATIVE -1.200 V	09/27/18	45.786135279	-84.773700037	45.786166879	-84.773853917
	Total Feet	4026						

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

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CIS Skip Report with GPS

Report of any skips in the data with GPS

Enbridge

East Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Region	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19944+70	19992+35	4766	NORTH EDGE WATER CROSSING VERIFIED READS; CLAMP E-1		/ /	45.8396996845	-84.7521196198	45.8262888045	-84.7572317172
20114+59	20125+22	1064	END SPOOL; EDGE WATER SOUTH AT TOP OF GRAVEL HILL AC P/S:0.9514		/ /	45.7919891365	-84.7703783222	45.7890089935	-84.7715181158
20126+90	20127+27	38	EDGE ASPHALT DRIVE; EDGE ASPHALT DRIVE		09/27/18	45.7885482053	-84.7716996183	45.7884424322	-84.7717315692
20138+05	20138+30	26	EDGE ASPHALT ROAD OVERHEAD POWER; CENTERLINE HEADLANDS ROAD; EDGE ASPHALT ROAD		09/27/18	45.7861205626	-84.7735864860	45.7861347148	-84.7736956532

Total Feet 5894

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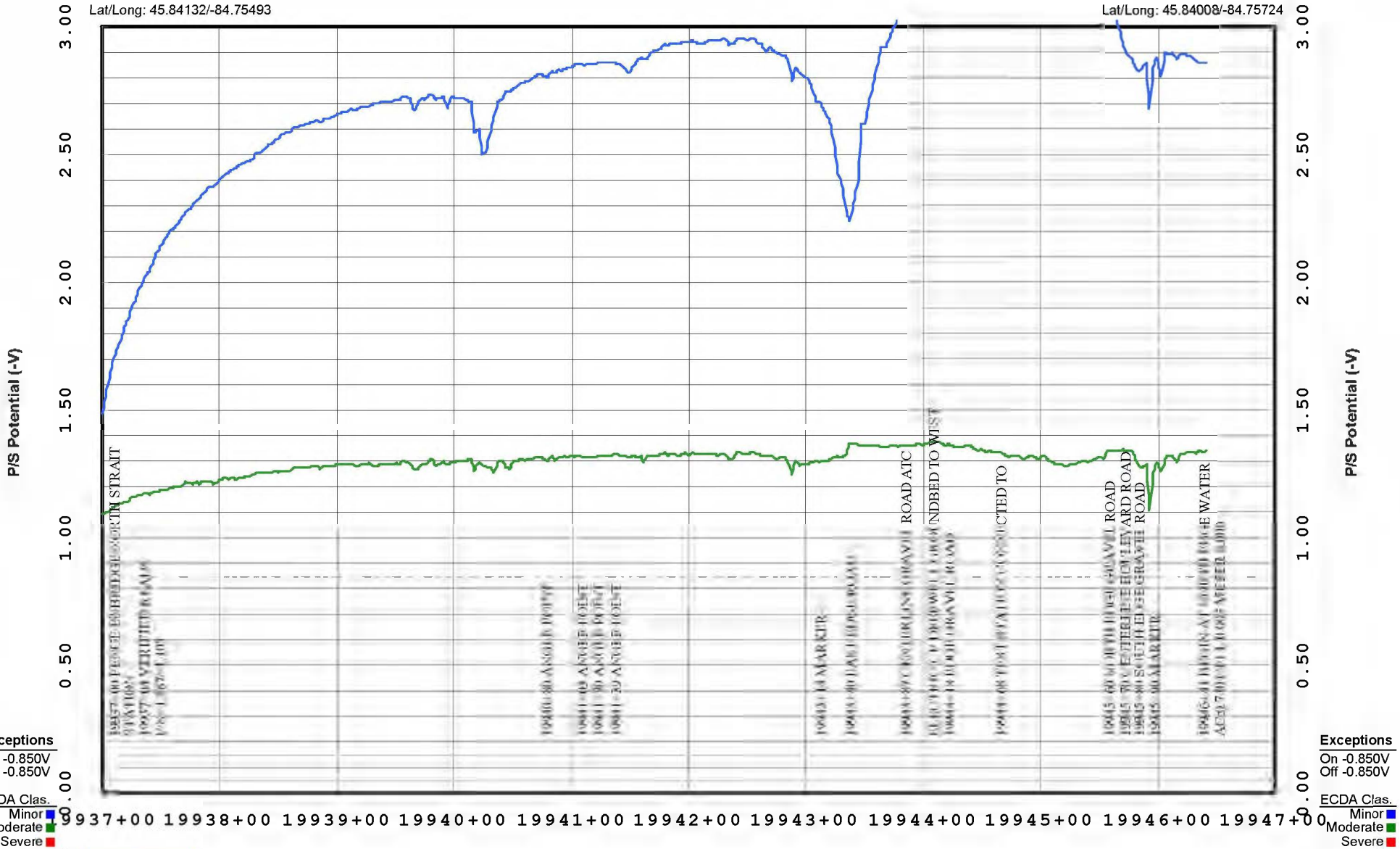
Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\east\aft\east aftfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

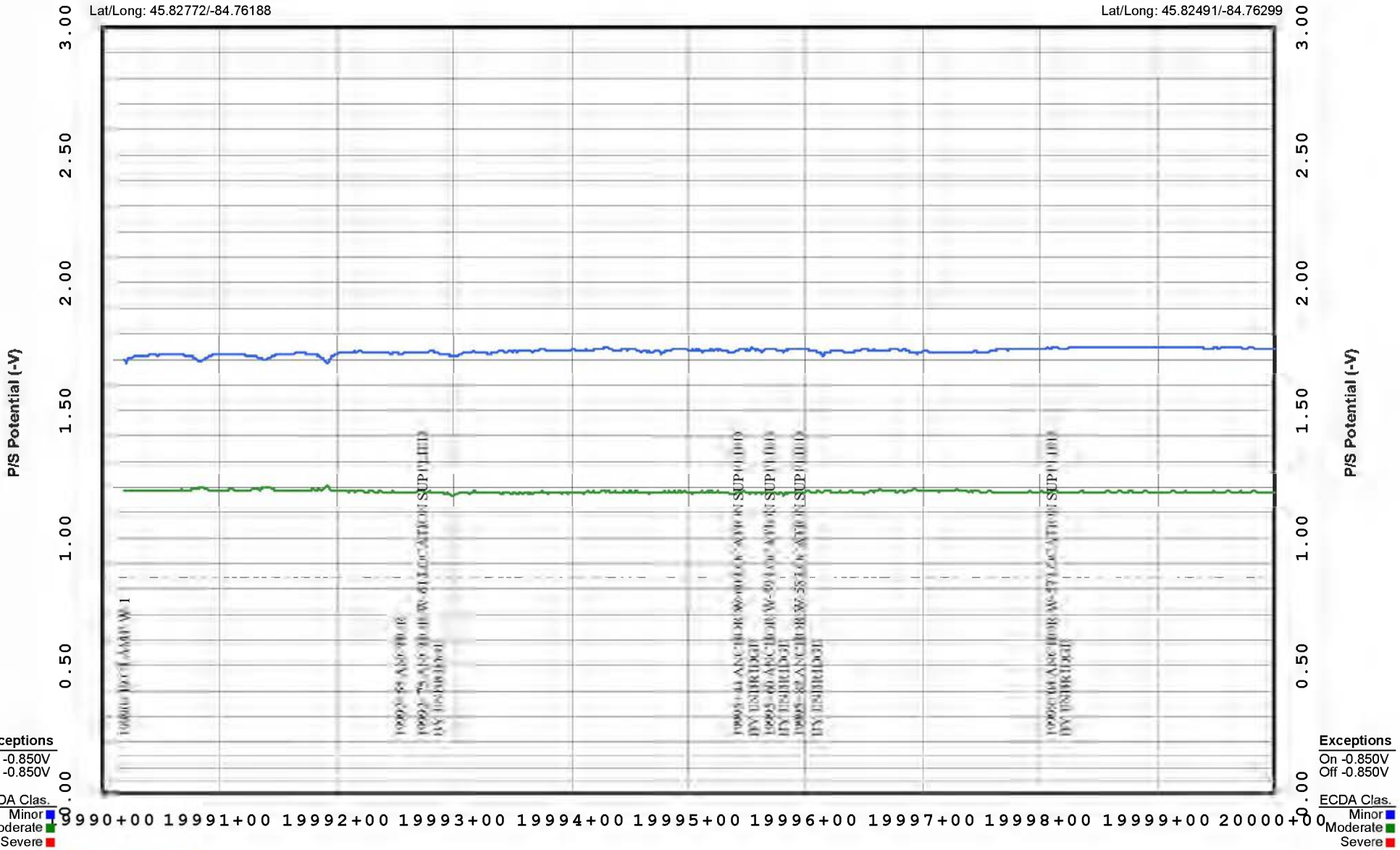
Appendix E – 2018 Close Interval Survey Results – West Pipeline Bow Cell and 2019 Shore Approach Survey

ENBDNR0009880



CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE BOW	File: 5000 N SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 1 of 20	Survey Direction

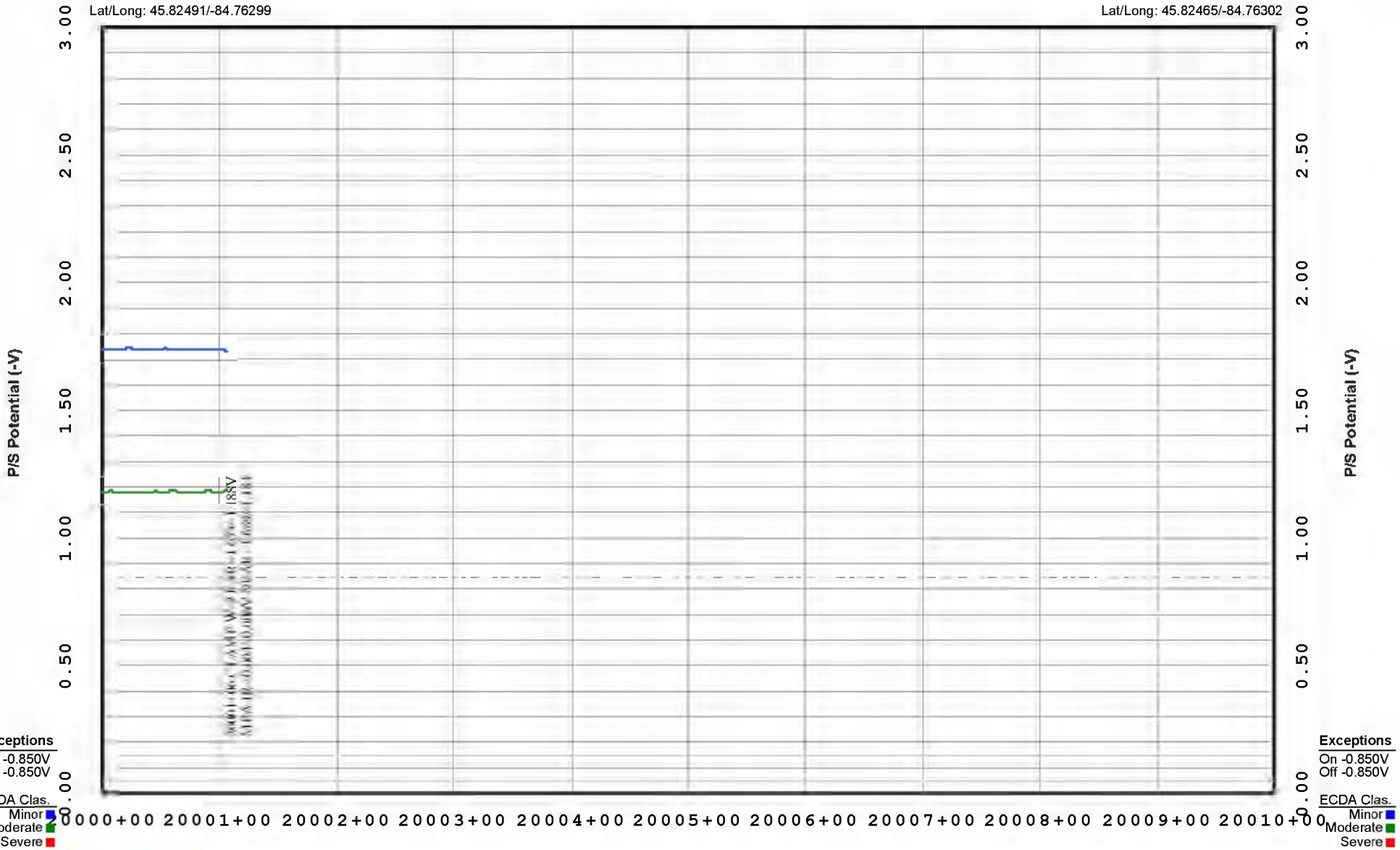
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CPGLog	Client: ENBRIDGE	Date: 09/14/18	
	Pipeline: WEST LINE BOW	File: 3000 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 2 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/14/18

File: 3000 WEST BOW

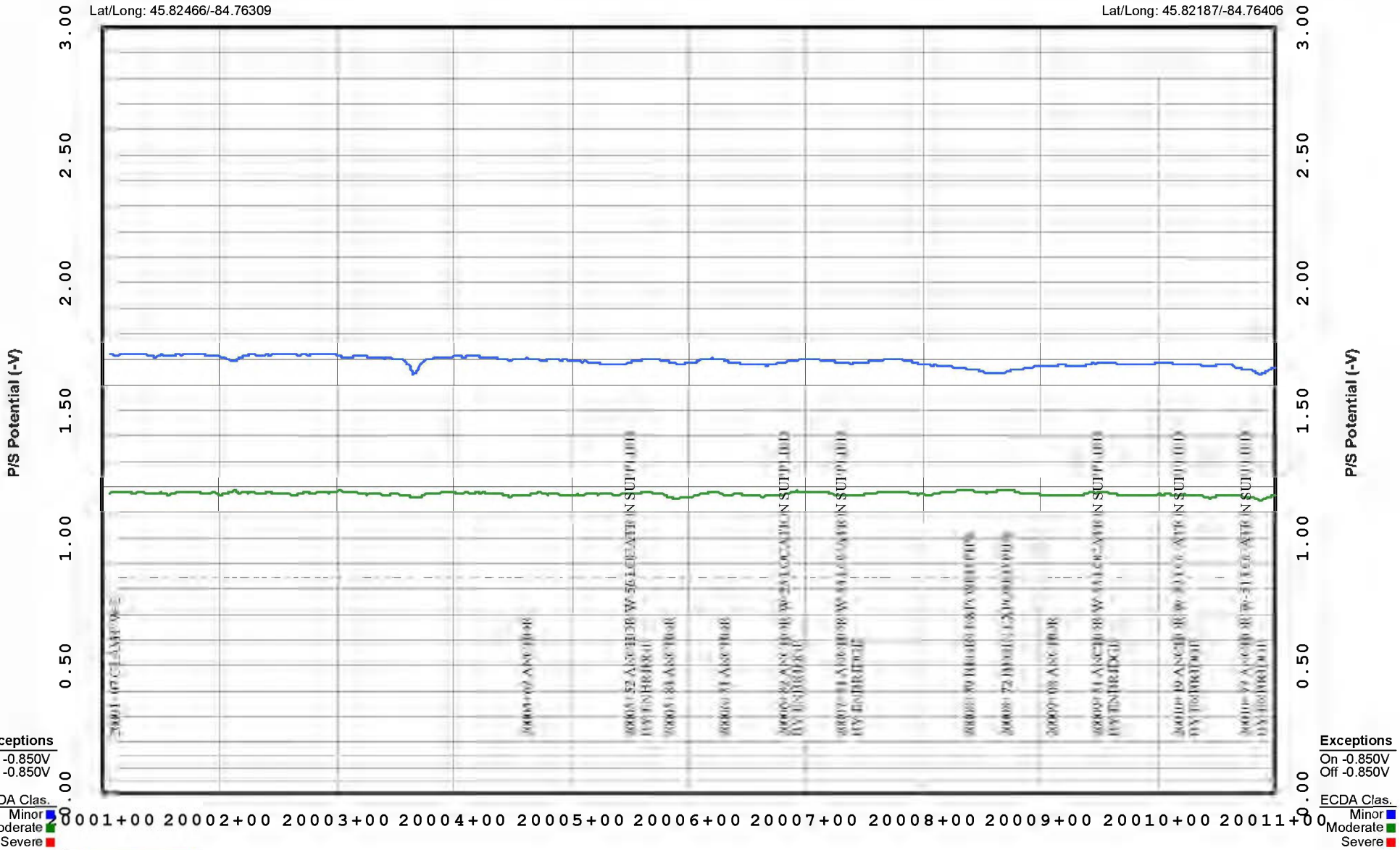
Mears Job Number. 9141883310

Page: 3 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

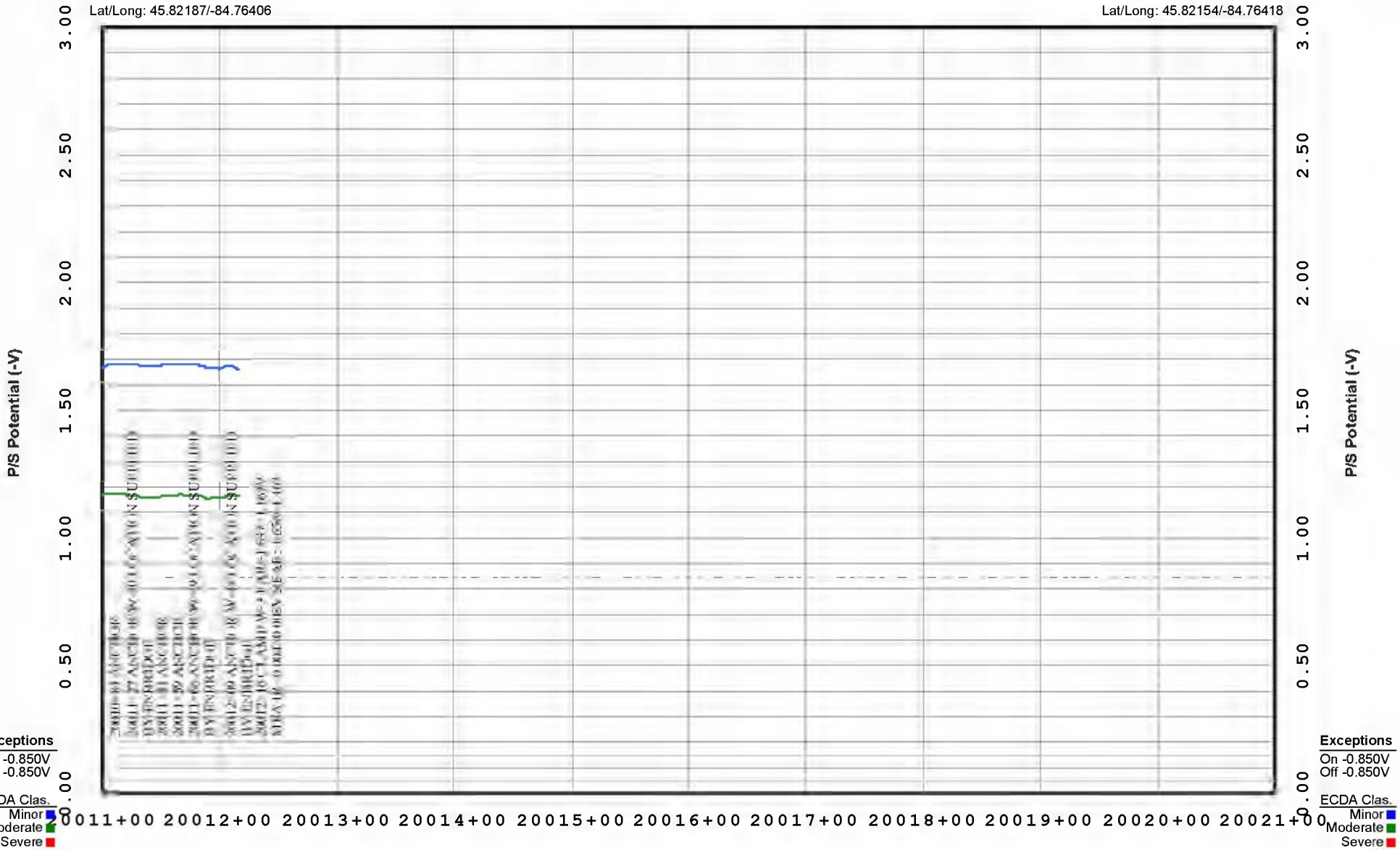
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mears CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE BOW	File: 3010 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 4 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/15/18

File: 3010 WEST BOW

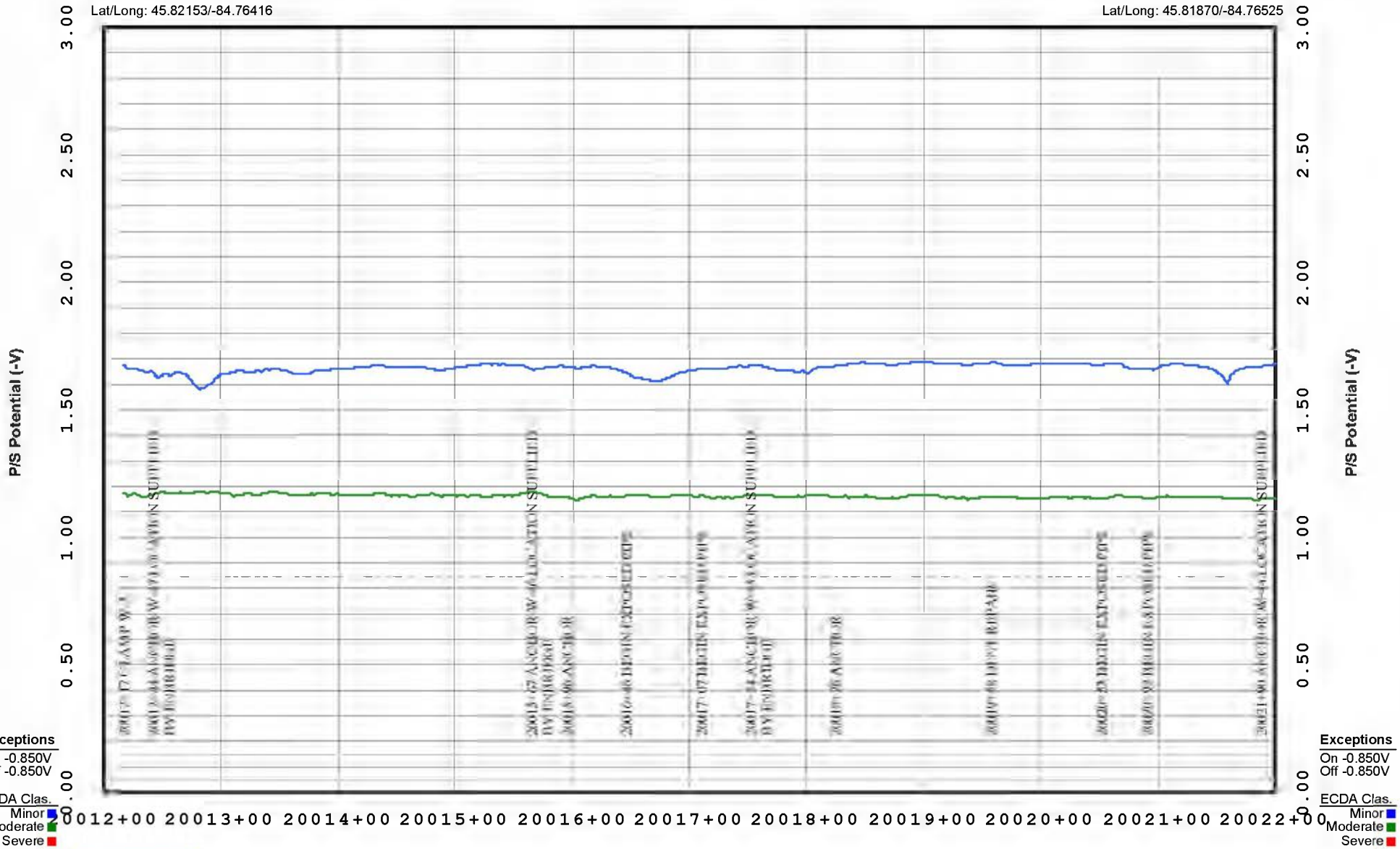
Mears Job Number. 9141883310

Page: 5 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

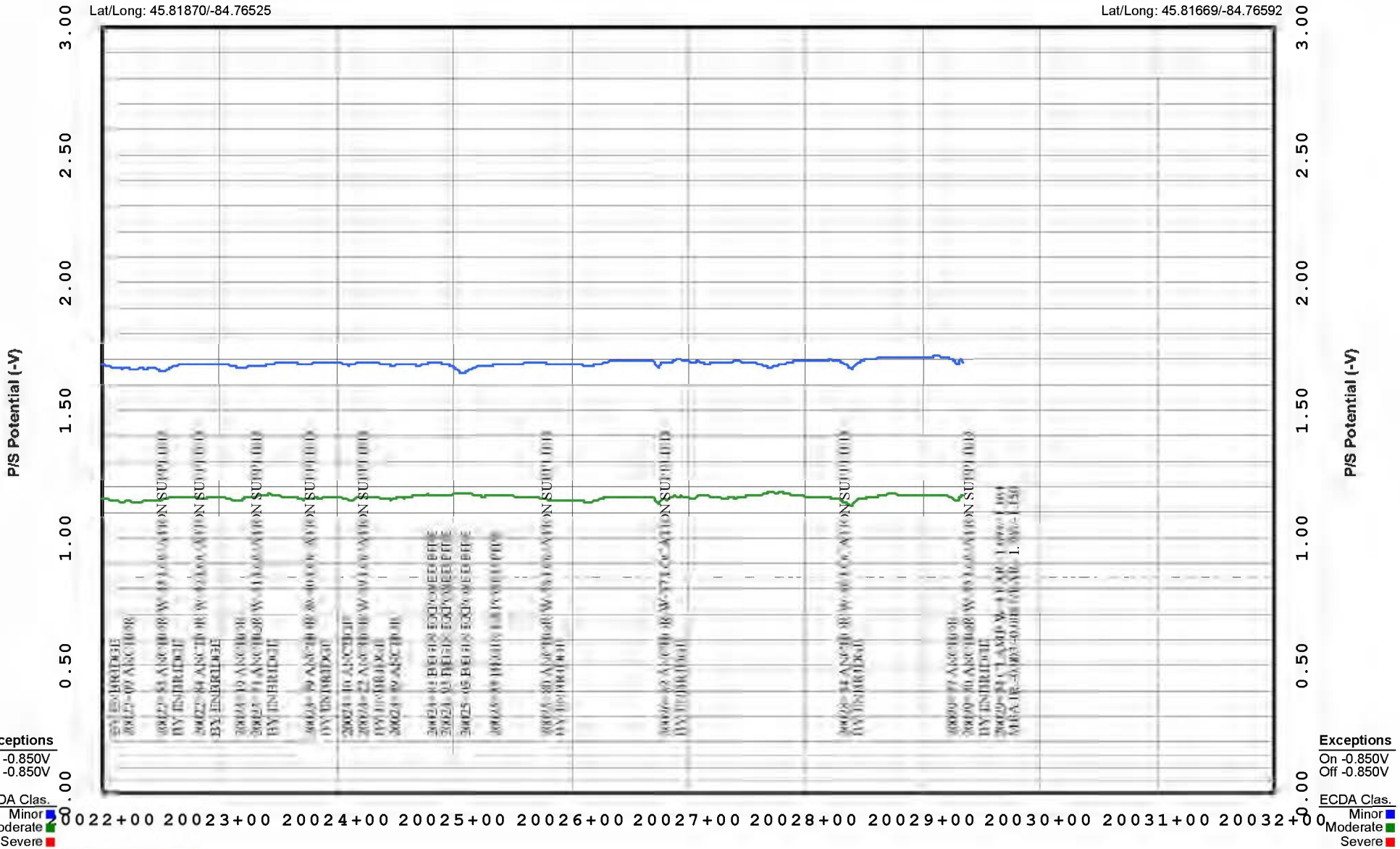
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mears CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE BOW	File: 3020 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 6 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/15/18

File: 3020 WEST BOW

Mears Job Number. 9141883310

Page: 7 of 20

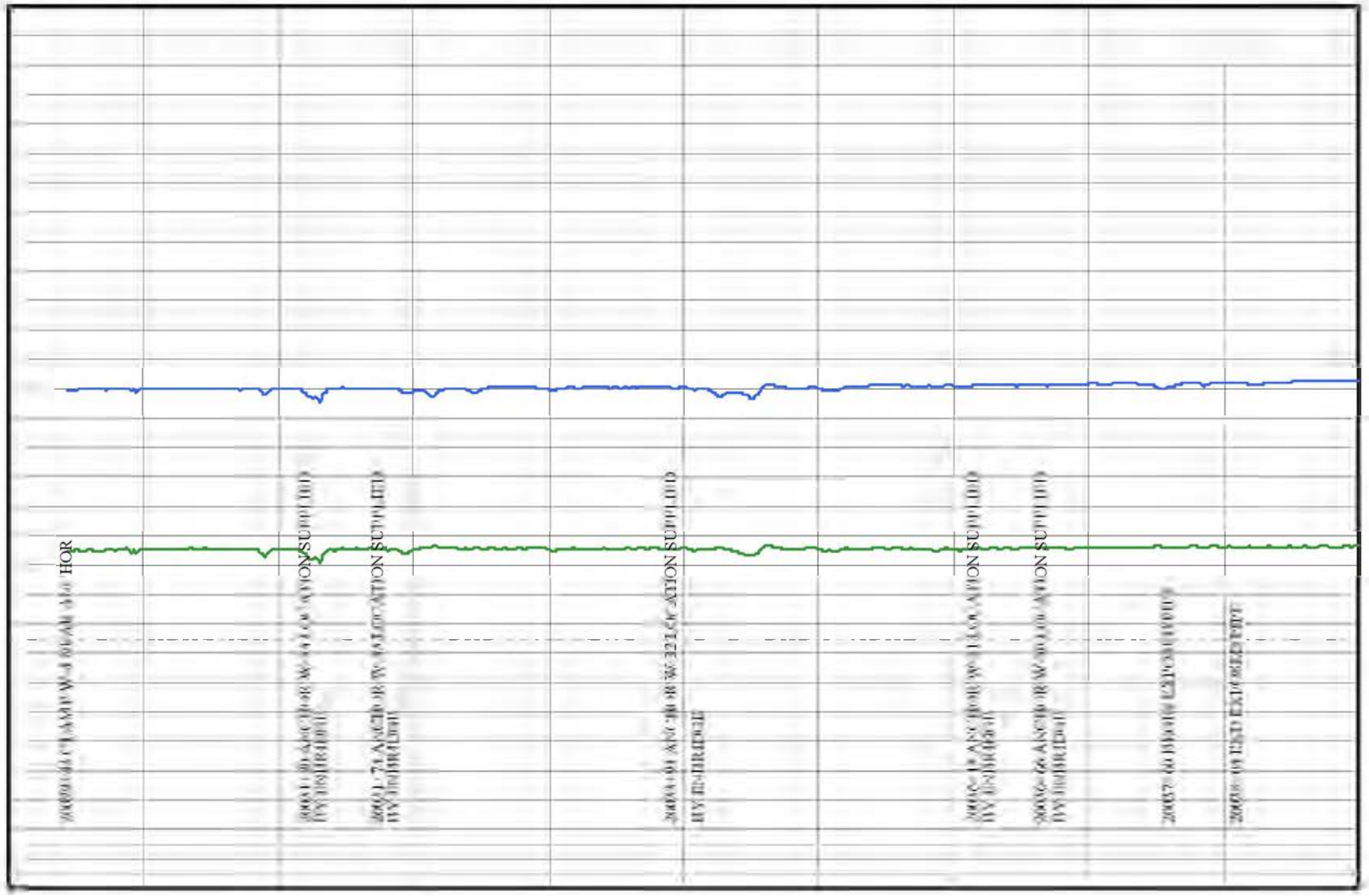
Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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Lat/Long: 45.81667/-84.76589

Lat/Long: 45.81400/-84.76697



Exceptions
On -0.850V
Off -0.850V

ECDA Clas.
Minor
Moderate
Severe

Exceptions
On -0.850V
Off -0.850V

ECDA Clas.
Minor
Moderate
Severe

CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/17/18

File: 3030 WEST BOW

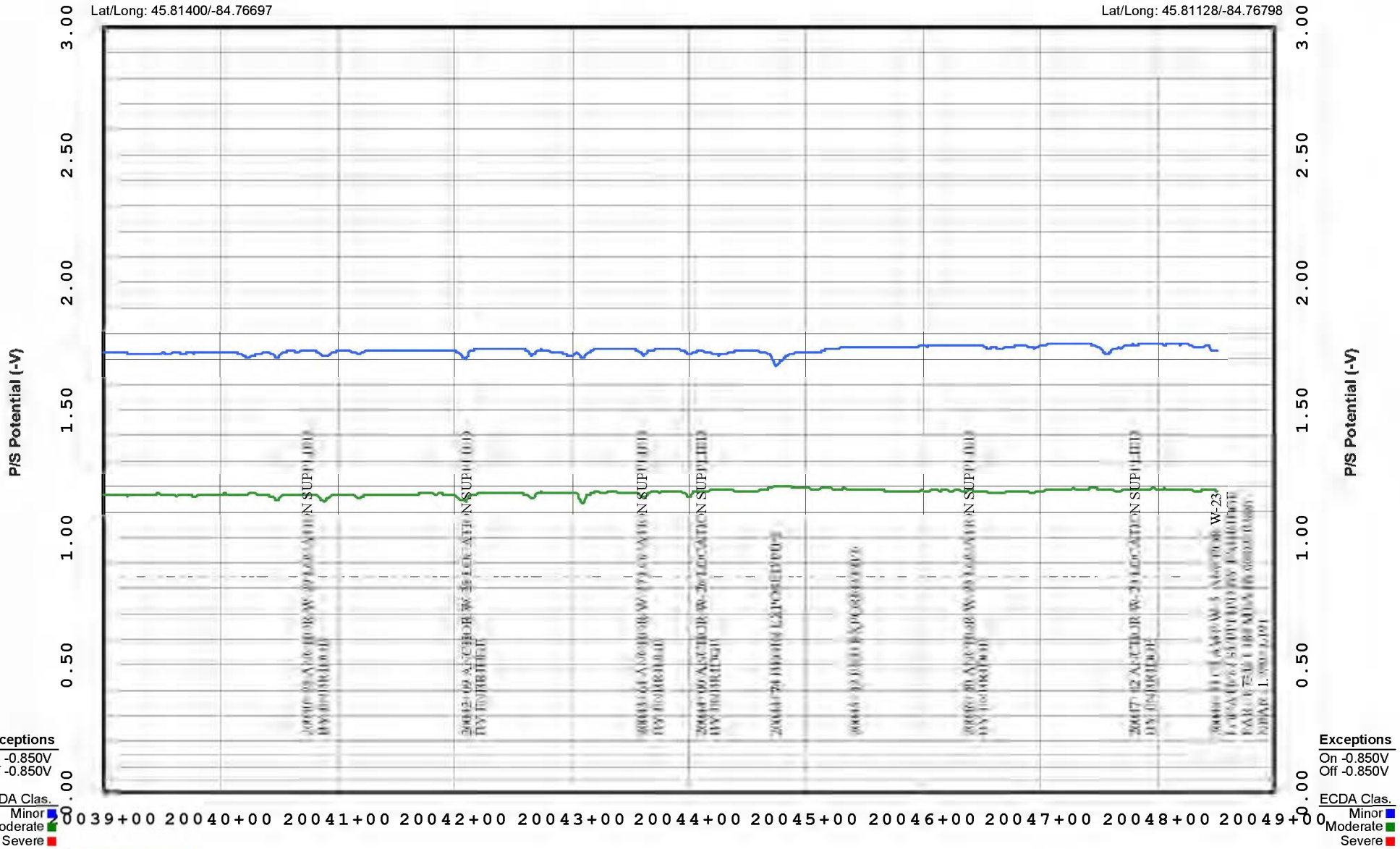
Mears Job Number.
9141883310

Page:
8 of 20

Survey Direction

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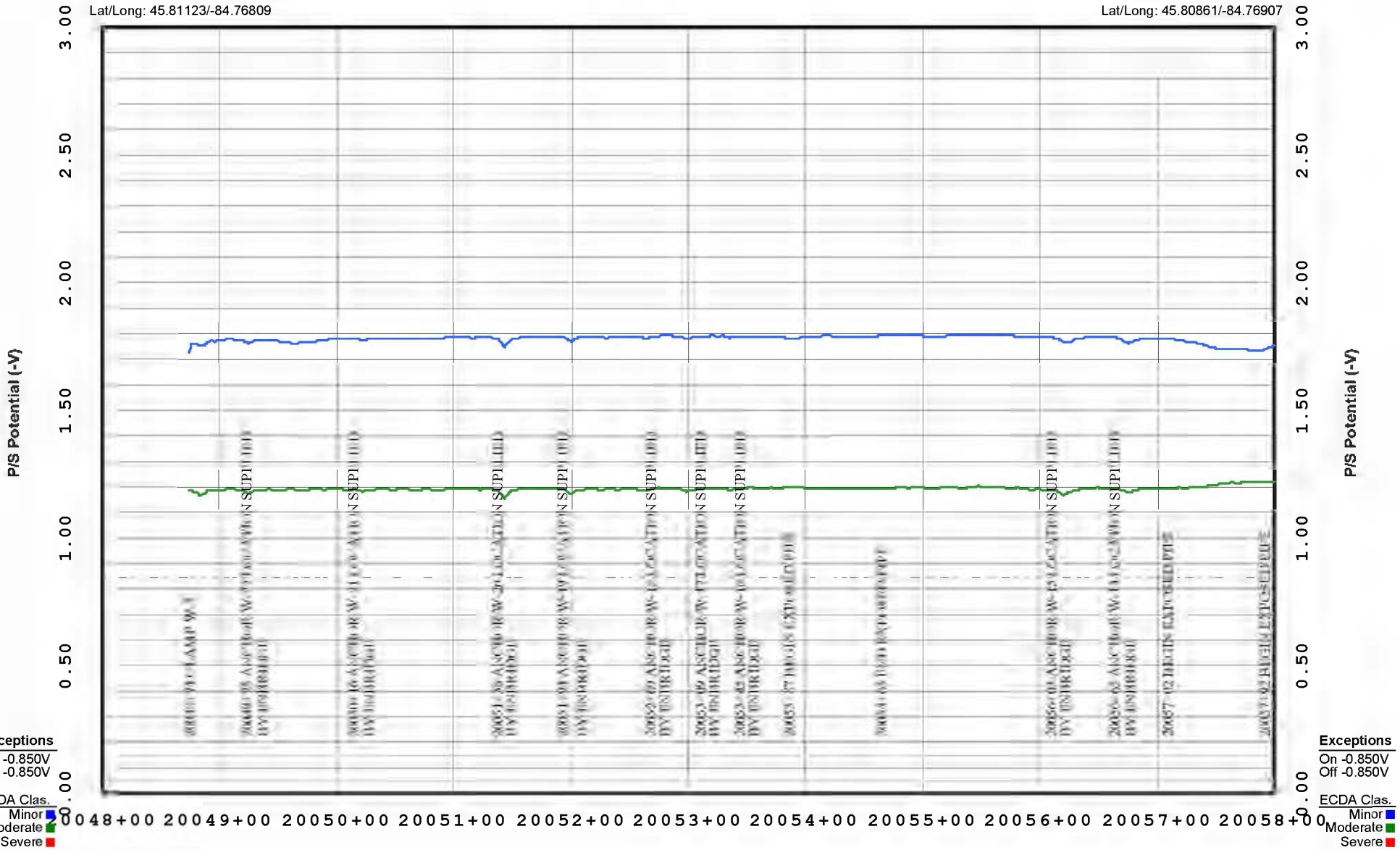
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CPGLog	Client: ENBRIDGE	Date: 09/17/18	
	Pipeline: WEST LINE BOW	File: 3030 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 9 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/18/18

File: 3040 WEST BOW

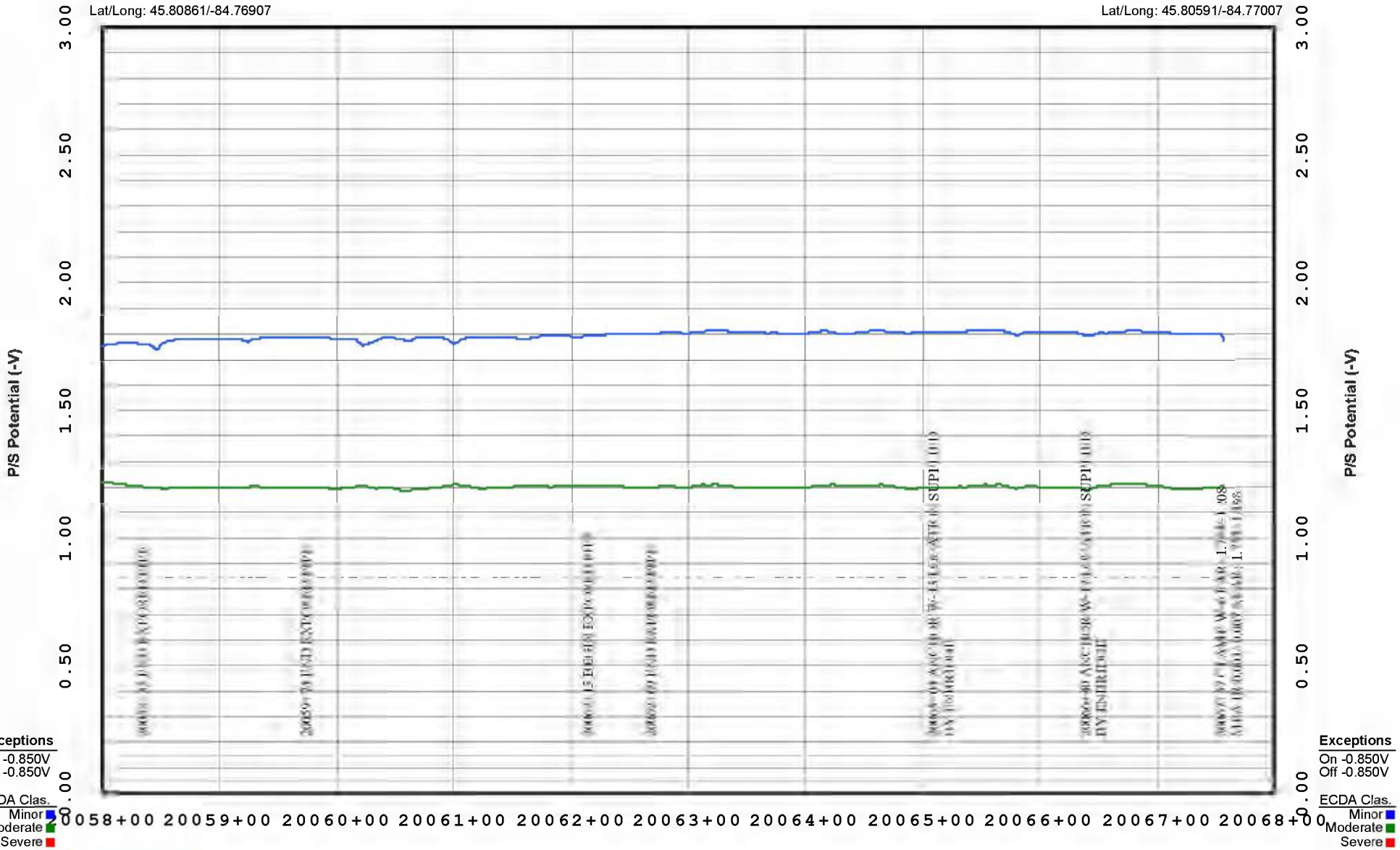
Mears Job Number. 9141883310

Page: 10 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 09/18/18

File: 3040 WEST BOW

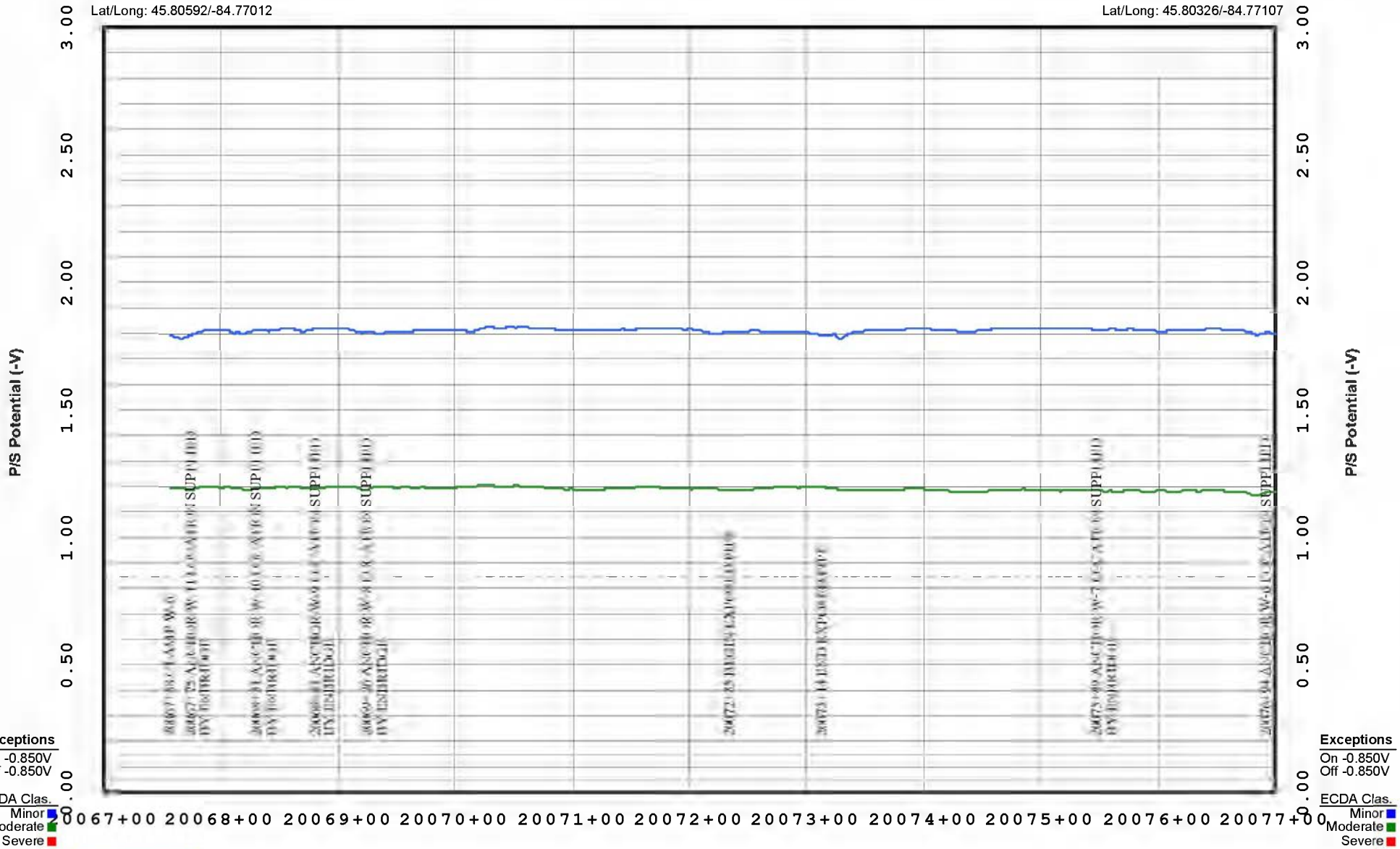
Mears Job Number. 9141883310

Page: 11 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

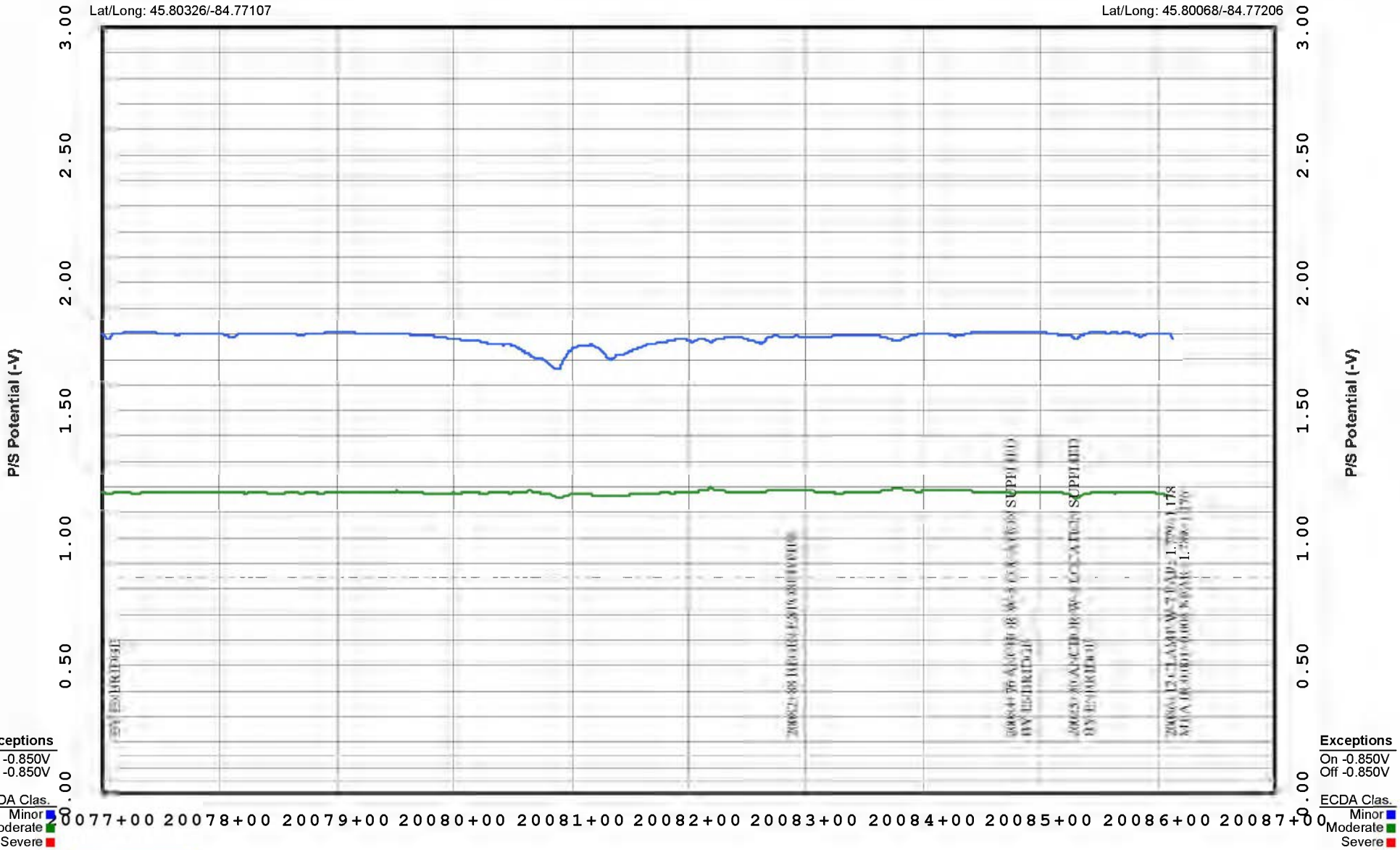
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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE BOW	File: 3050 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 12 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

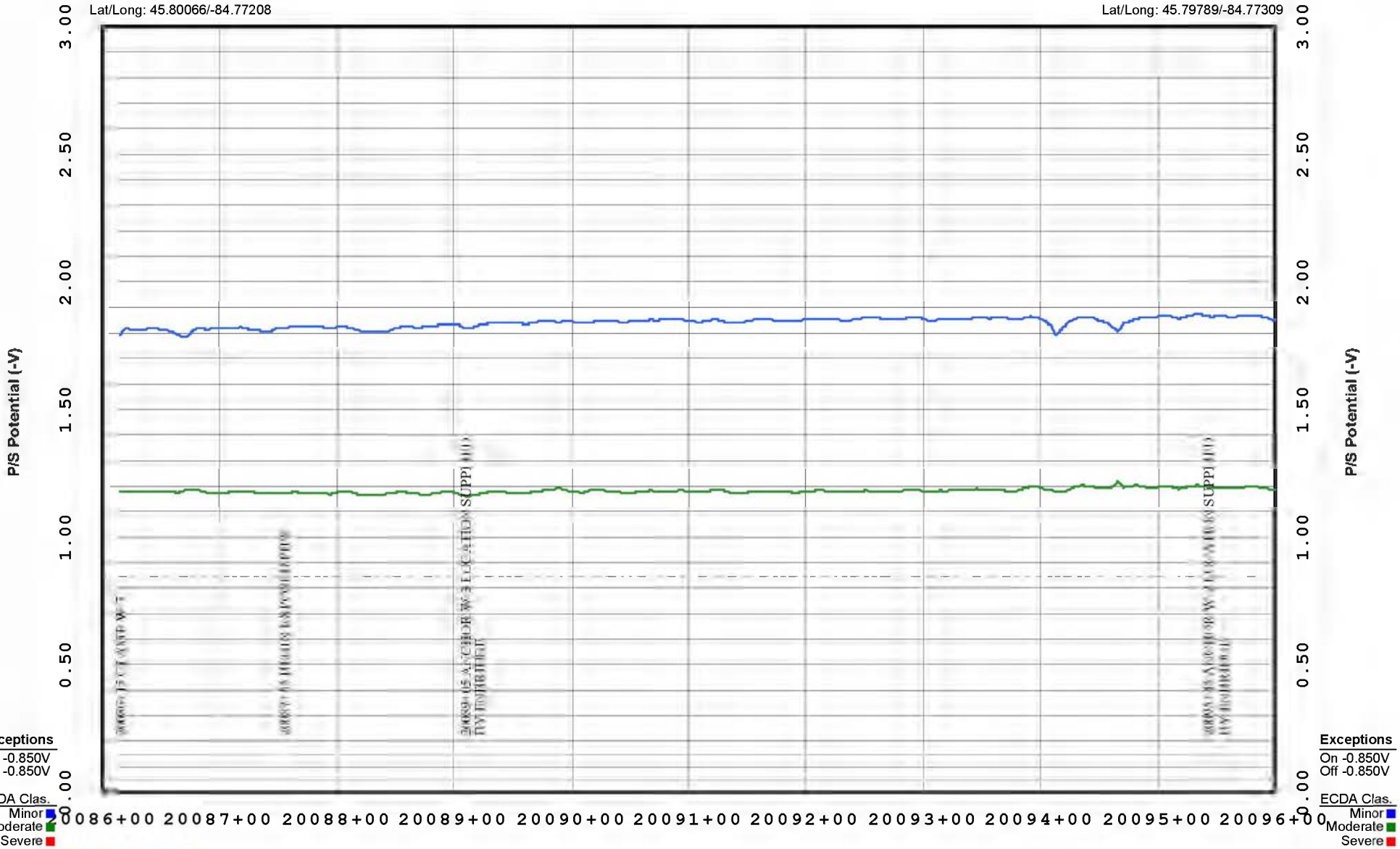
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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE BOW	File: 3050 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 13 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

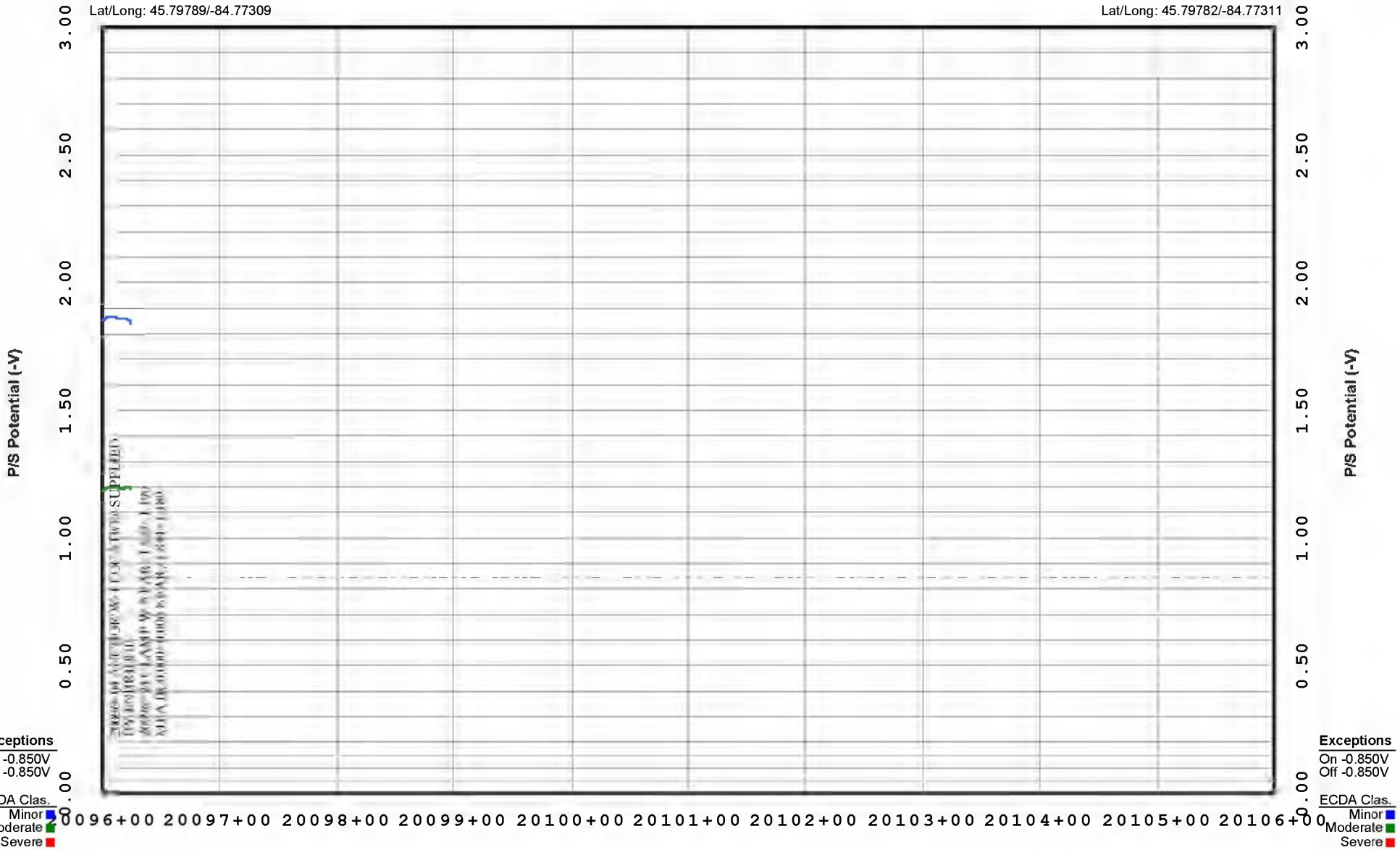
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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE BOW	File: 3060 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 14 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

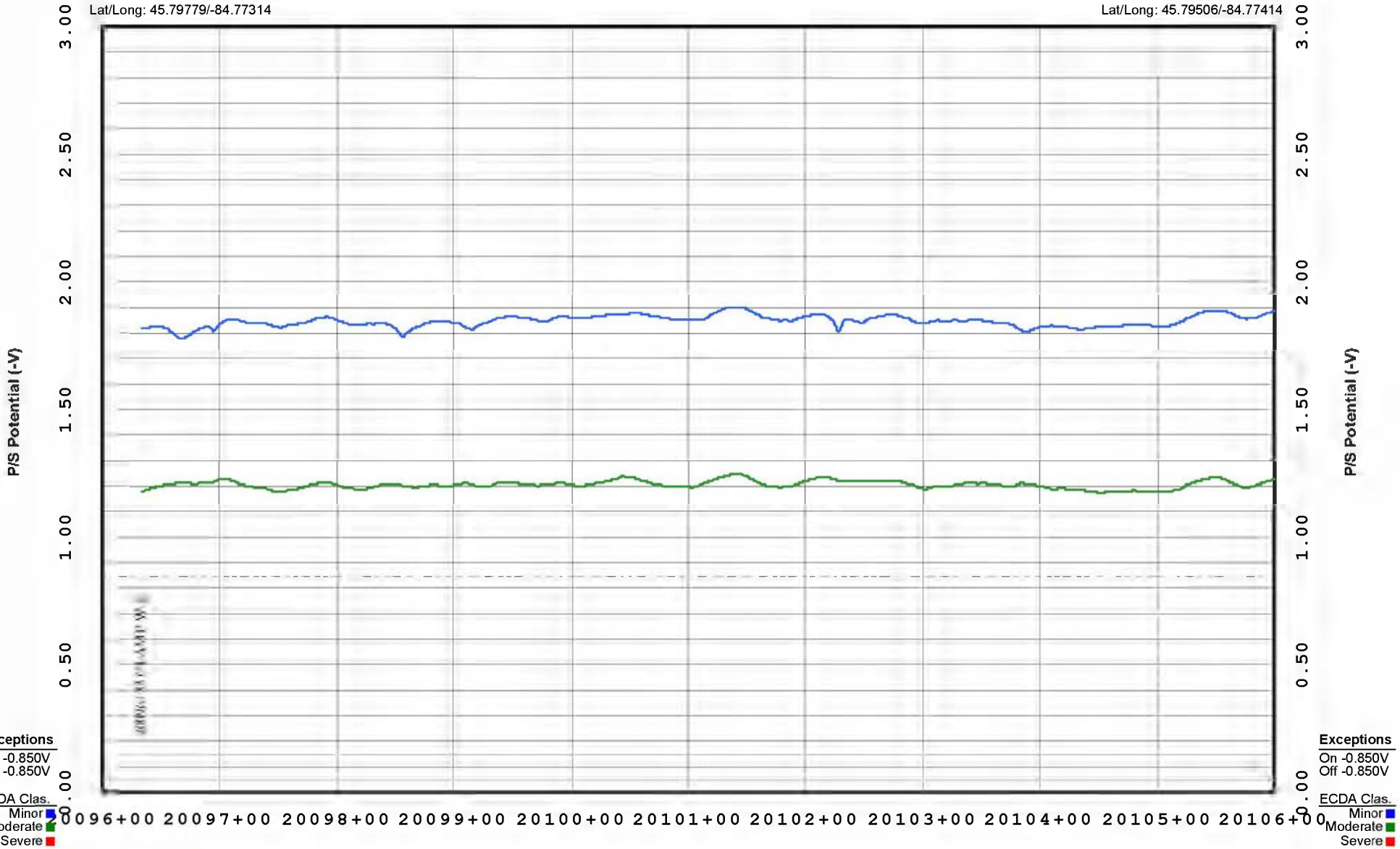
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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE BOW	File: 3060 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 15 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 10/09/18

File: 3070 WEST BOW

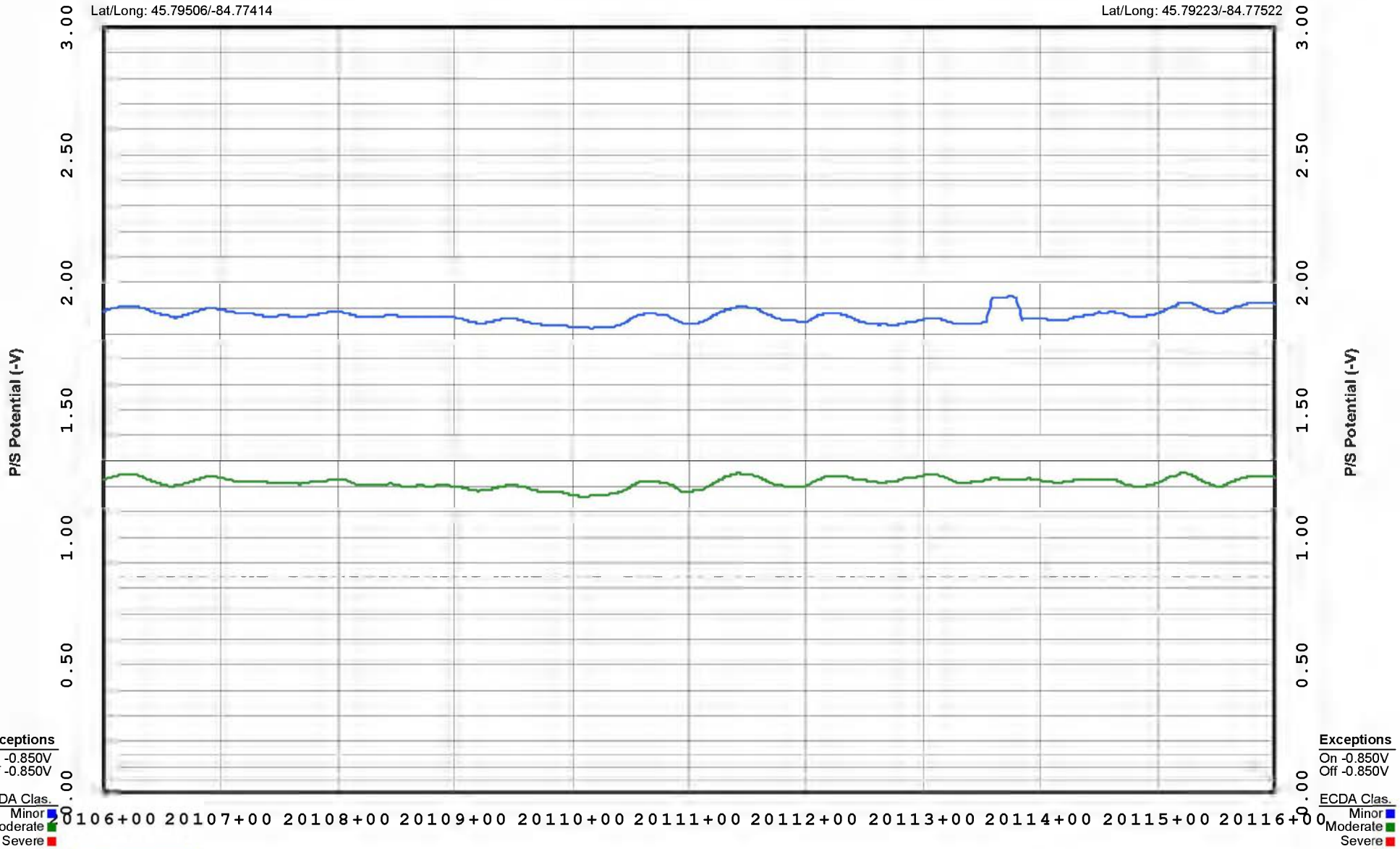
Mears Job Number. 9141883310

Page: 16 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE BOW

On

Off

Date: 10/09/18

File: 3070 WEST BOW

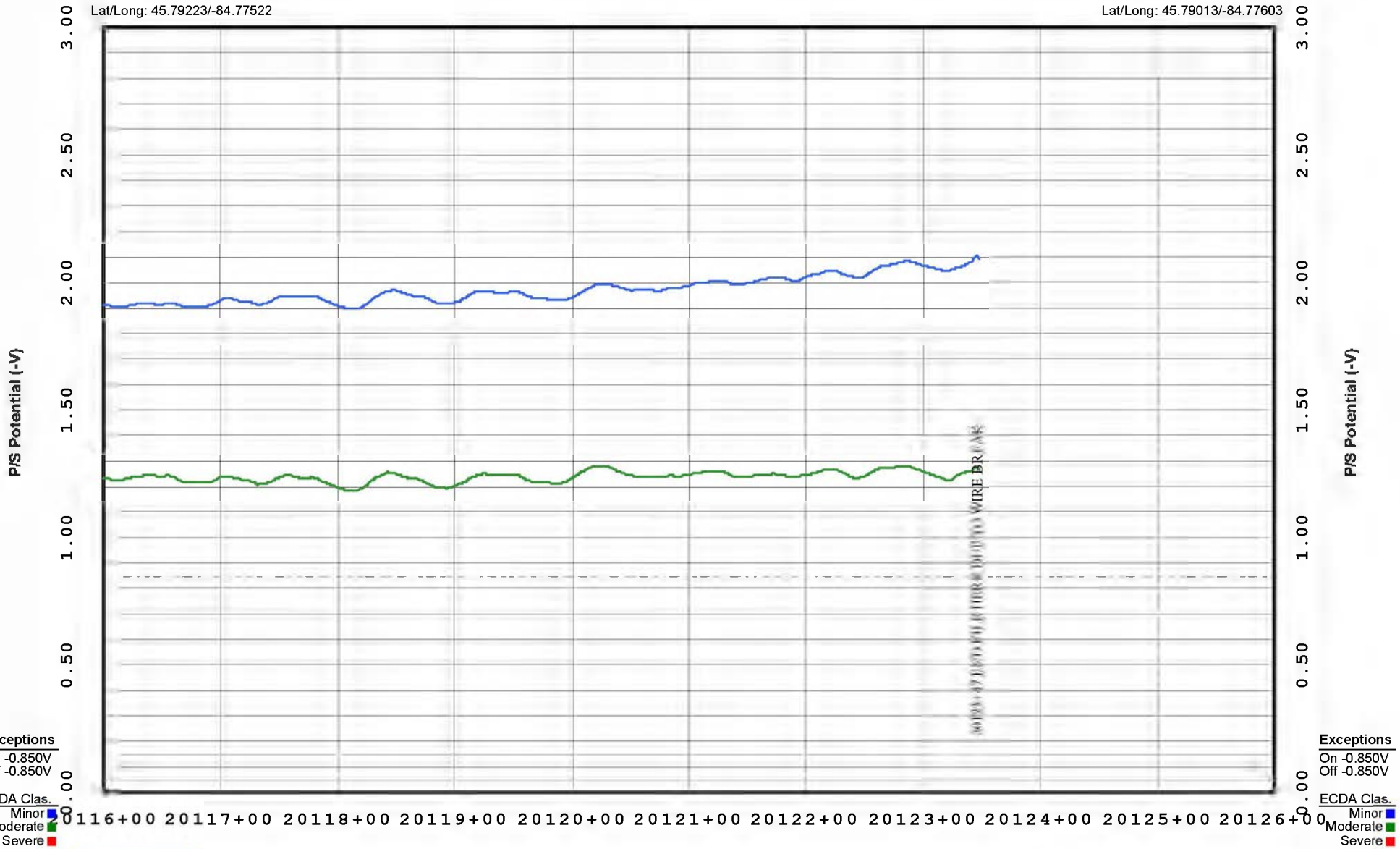
Mears Job Number. 9141883310

Page: 17 of 20

Survey Direction

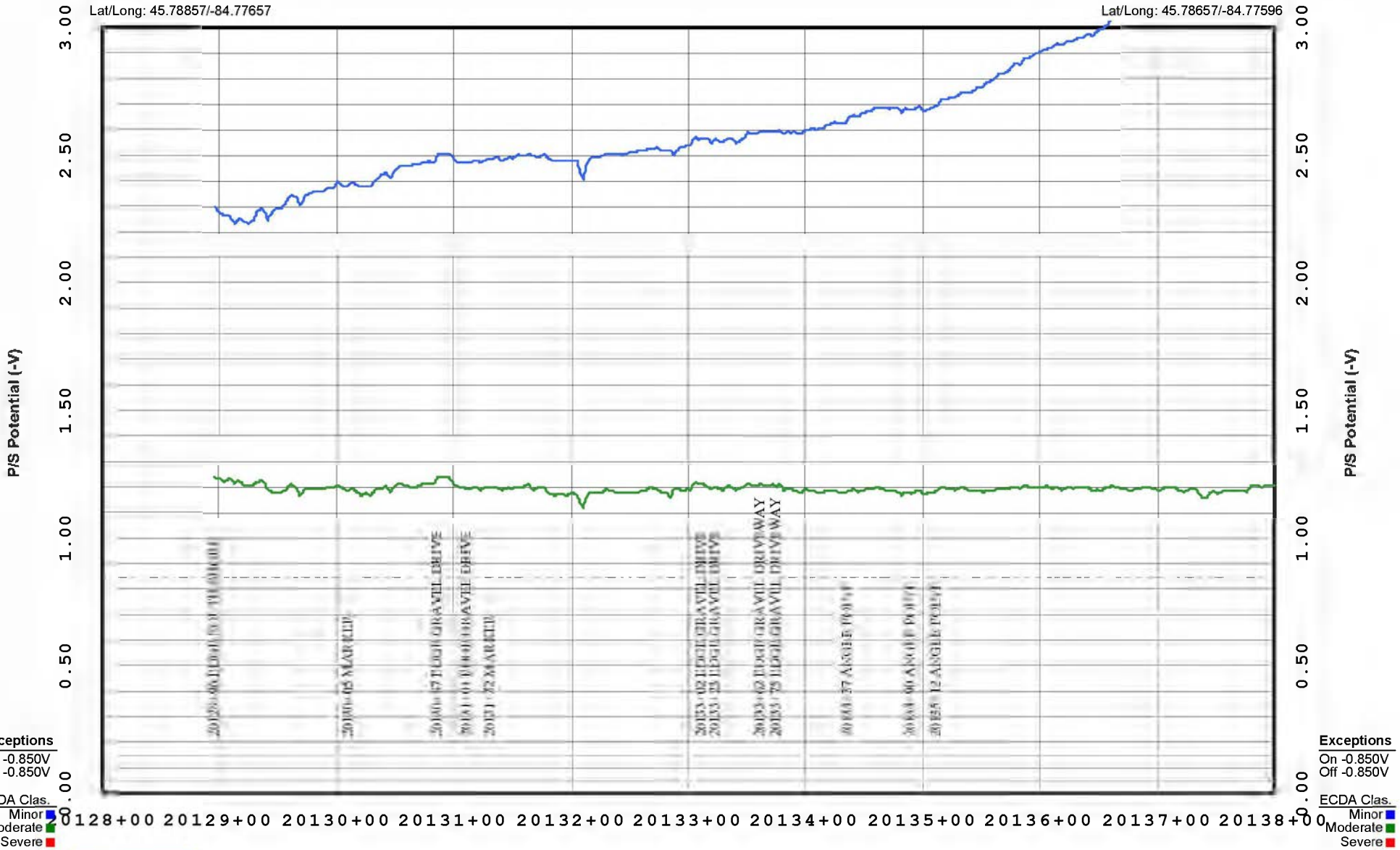
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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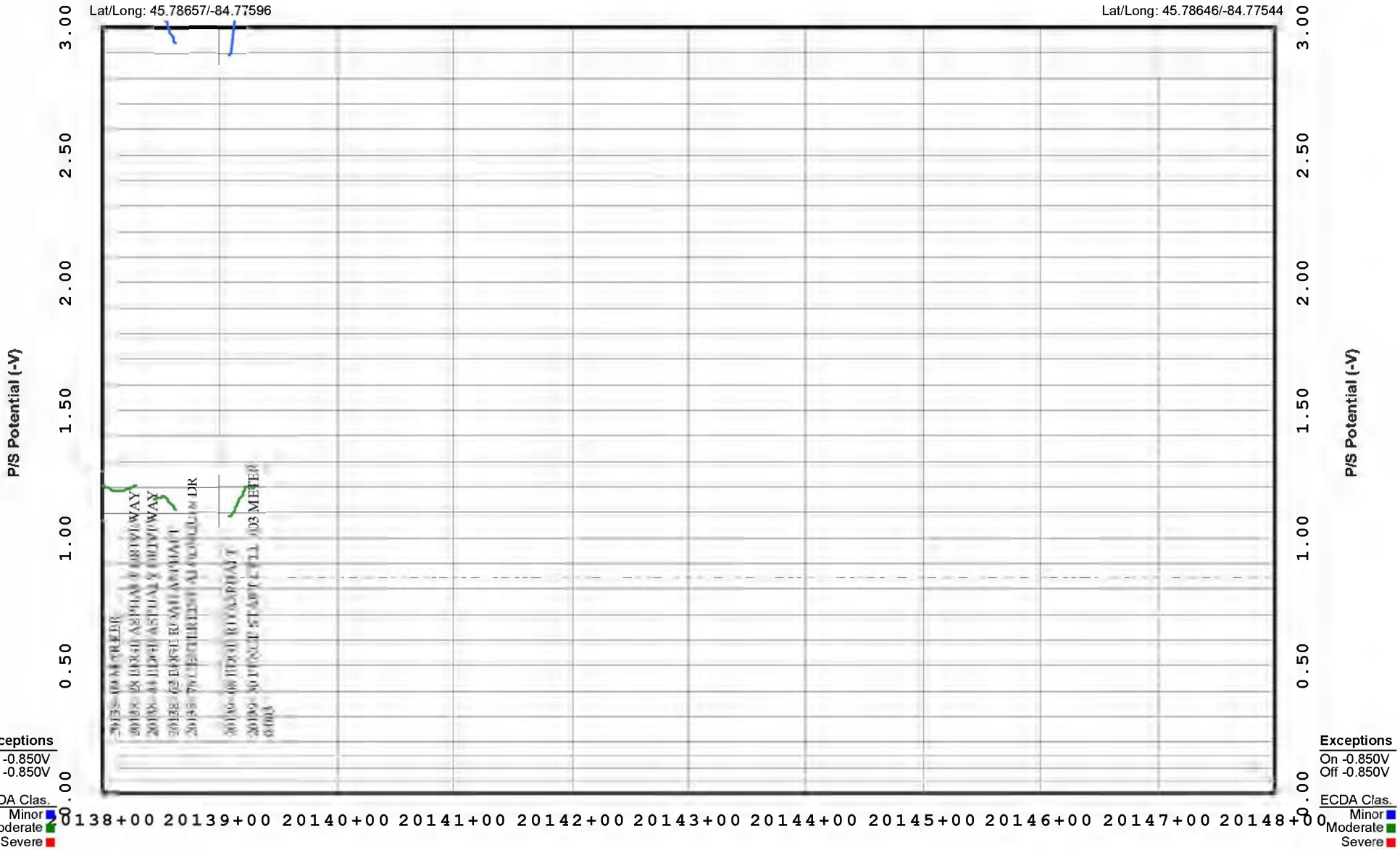
mears CPGLog	Client: ENBRIDGE	Date: 10/09/18	
	Pipeline: WEST LINE BOW	File: 3070 WEST BOW	
	On / Off	Mears Job Number. 9141883310 Page: 18 of 20	Survey Direction

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CPGLog	Client: ENBRIDGE	Date: 09/19/18	
	Pipeline: WEST LINE BOW	File: 5050 S SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 19 of 20	Survey Direction

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CPGLog	Client: ENBRIDGE	Date: 09/19/18	
	Pipeline: WEST LINE BOW	File: 5050 S SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 20 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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377+50
19950+00

19937+00 FENCE ENBRIDGE NORTH STRAIT STATION
19937+04 VERIFIED READS P/S:-1.587/-.105

19940+80 ANGLE POINT
19941+03 ANGLE POINT
19941+20 ANGLE POINT
19941+39 ANGLE POINT

19943+14 MARKER
19943+40 EAST EDGE ROAD

19943+87 CENTERLINE GRAVEL ROAD ELECTRIC CP DEEPWELL GROUNDBED TO WEST
19944+18 EDGE GRAVEL ROAD

19944+68 TEST STATION CONNECTED

19945+60
19945+70 CENTERLINE BOULEVARD ROAD
19945+80
19945+90 KANX

19946+41 BEGIN AT NORTH EDGE WATER AC:0.740 CELL 0.003 METER 0.000

377+75
19946+20

378+00
19950+40

MILEAGE CALCULATED FROM SURVEY STATIONING

-0.000
-0.500
-0.850
-1.000
-1.500
-2.000
-2.500
-3.000

CIS SURVEY
ON
OFF

DIRECTION OF SURVEY

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850

mears
RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE

ENBRIDGE
BOW FILE
West Line Bow

Length of RAPSheet: 3960 FEET / 0.750 MILE(S)	Date Drawn: 03/21/19
Page(s): PAGE(S) 1 OF 8	Project Number: 9141883310
Drawn By: HART SMALLEY	Project Manager: KURT LAWSON
FILE: West line Bow 1.dgn	

ENBDNR0009901

378.00
1925 +40

375.25
1897 +60

375.00
1893 +80

MILEAGE CALCULATED
FROM SURVEY STATIONING

-2.500

-2.000

-1.500

-1.000

-0.850

-0.500

CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

ON/OFF SURVEY DIRECTION

Project Number
914188331O

Project Manager
KURT LAWSON

Drawn By
HART SMALLEY

2 OF 8

ENBRIDGE

E B IDG
BOW FILE
West Line Bow

Pipeline Rehabilitation Analysis Profile Sheet
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378.50
1998+80

378.75
1999A+00

379.00
2001+20

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

19990+19 CLAMP W-1
19992+55 ANCHOR
19992+75 ANCHOR W-61 LOCATION [illegible] BY ENBRIDGE
19995+44 ANCHOR W-60 LOCATION [illegible] BY ENBRIDGE
19995+60 ANCHOR W-59 LOCATION [illegible] BY ENBRIDGE
19995+82 ANCHOR W-58 LOCATION [illegible] BY ENBRIDGE
19999+44 ANCHOR W-57 LOCATION [illegible] BY ENBRIDGE
20001+06 CLAMP W-2 FAR:-1.673/-1.188V MEA IR:-0.004/-0.066V NEAR:-1.184
20001+07 CLAMP W-2
20004+62 ANCHOR
20005+52 ANCHOR W-56 LOCATION [illegible] BY ENBRIDGE
20005+84 ANCHOR
20006+31 ANCHOR
20006+82 ANCHOR W-55 LOCATION [illegible] BY ENBRIDGE
20007+31 ANCHOR W-54 LOCATION [illegible] BY ENBRIDGE
20008+39 BEGIN EXPOSED PIPE
20008+72 BEGIN EXPOSED PIPE
20009+08 ANCHOR
20009+51 ANCHOR W-53 LOCATION [illegible] BY ENBRIDGE
20010+19 ANCHOR W-52 LOCATION [illegible] BY ENBRIDGE
20010+77 ANCHOR W-51 LOCATION [illegible] BY ENBRIDGE
20010+84 ANCHOR

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (Not TOT / ALSO NEXT): [illegible]
Page(s) Number: 3 OF 8
Drawn By: HART SMALLEY
File: [illegible]
Date Drawn: 03/31/19
Project Number: 9141883310
Project Manager: KURT LAWSON

ENBRIDGE
BOW FILE
West Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Mears

ENBDNR0009903

379.00
20011+20

379.25
20024+40

379.50
20037+60

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20011+27 ANCHOR W-50 LOCATION SUPPLIED BY ENBRIDGE
20011+41 ANCHOR
20011+54 ANCHOR
20011+68 ANCHOR W-49 LOCATION SUPPLIED BY ENBRIDGE
20012+09 ANCHOR W-48 LOCATION SUPPLIED BY ENBRIDGE
20012+16 CLAMP W-3 FAR:-1.637/-0.004 NEAR:-0.008V MEA IR:-0.004/-0.008V NEAR:-1.
20012+17 CLAMP W-3
20012+44 ANCHOR W-47 LOCATION SUPPLIED BY ENBRIDGE
20015+67 ANCHOR W-46 LOCATION SUPPLIED BY ENBRIDGE
20015+96 ANCHOR
20016+46 BEGIN EXPOSED PIPE
20017+07 BEGIN EXPOSED PIPE
20017+54 ANCHOR W-45 LOCATION SUPPLIED BY ENBRIDGE
20018+26 ANCHOR
20019+58 DENT REPAIR
20020+53 BEGIN EXPOSED PIPE
20020+92 BEGIN EXPOSED PIPE
20021+90 ANCHOR W-44 LOCATION SUPPLIED BY ENBRIDGE
20022+09 ANCHOR
20022+53 ANCHOR W-43 LOCATION SUPPLIED BY ENBRIDGE
20022+84 ANCHOR W-42 LOCATION SUPPLIED BY ENBRIDGE
20023+19 ANCHOR
20023+31 ANCHOR W-41 LOCATION SUPPLIED BY ENBRIDGE
20023+79 ANCHOR W-40 LOCATION SUPPLIED BY ENBRIDGE
20024+10 ANCHOR
20024+22 ANCHOR W-39 LOCATION SUPPLIED BY ENBRIDGE
20024+81 BEGIN EXPOSED PIPE
20025+05 BEGIN EXPOSED PIPE
20025+35 BEGIN EXPOSED PIPE
20025+80 ANCHOR W-38 LOCATION SUPPLIED BY ENBRIDGE
20026+82 ANCHOR W-37 LOCATION SUPPLIED BY ENBRIDGE
20028+34 ANCHOR W-36 LOCATION SUPPLIED BY ENBRIDGE
20029+27 ANCHOR
20029+30 ANCHOR W-35 LOCATION SUPPLIED BY ENBRIDGE
20029+34 CLAMP W-4 FAR:-1.893/-0.003/-0.008 NEAR:-1.150
20029+43 CLAMP W-4 NEAR ANCHOR
20031+20 ANCHOR W-34 LOCATION SUPPLIED BY ENBRIDGE
20031+74 ANCHOR W-33 LOCATION SUPPLIED BY ENBRIDGE
20033+91 ANCHOR W-32 LOCATION SUPPLIED BY ENBRIDGE
20036+15 ANCHOR W-31 LOCATION SUPPLIED BY ENBRIDGE
20036+66 ANCHOR W-30 LOCATION SUPPLIED BY ENBRIDGE
20037+60 BEGIN EXPOSED PIPE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Date Drawn: 03/31/16
Project Number: 914883310
Project Manager: KURT LAWSON
Length of RAPSheet: 3960 FEET / 1.50 MILE(S)
Page(s): 4 OF 8
Drawn By: HART SMALLEY
FILE: West Line Bow.dgn

ENBRIDGE
BOW FILE
West Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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20037+60 BEGIN EXPOSED PIPE

20038+04 END EXPOSED PIPE

20040+75 ANCHOR W-29 LOCATION SUPPLIED BY ENBRIDGE

20042+09 ANCHOR W-28 LOCATION SUPPLIED BY ENBRIDGE

20043+61 ANCHOR W-27 LOCATION SUPPLIED BY ENBRIDGE

20044+00 ANCHOR W-26 LOCATION SUPPLIED BY ENBRIDGE

20044+74 BEGIN EXPOSED PIPE

20045+42 END EXPOSED PIPE

20046+40 ANCHOR W-25 LOCATION SUPPLIED BY ENBRIDGE

20047+82 ANCHOR W-24 LOCATION SUPPLIED BY ENBRIDGE

20048+51 CLAMP W-5 ANCHOR LOCATION SUPPLIED BY ENBRIDGE 1.734/-1.1 MEA IR:0.002/-0.006 .739/-1.1

20048+74 CLAMP W-5

20049+25 ANCHOR W-22 LOCATION SUPPLIED BY ENBRIDGE

20050+16 ANCHOR W-21 LOCATION SUPPLIED BY ENBRIDGE

20051+38 ANCHOR W-20 LOCATION SUPPLIED BY ENBRIDGE

20051+94 ANCHOR W-19 LOCATION SUPPLIED BY ENBRIDGE

20052+69 ANCHOR W-18 LOCATION SUPPLIED BY ENBRIDGE

20053+09 ANCHOR W-17 LOCATION SUPPLIED BY ENBRIDGE

20053+45 ANCHOR W-16 LOCATION SUPPLIED BY ENBRIDGE

20053+87 BEGIN EXPOSED PIPE

20054+65 END EXPOSED PIPE

20056+03 ANCHOR W-15 LOCATION SUPPLIED BY ENBRIDGE

20056+65 ANCHOR W-14 LOCATION SUPPLIED BY ENBRIDGE

20057+02 BEGIN EXPOSED PIPE

20057+92 BEGIN EXPOSED PIPE

20058+35 END EXPOSED PIPE

20059+74 END EXPOSED PIPE

20062+15 BEGIN EXPOSED PIPE

20062+69 END EXPOSED PIPE

379.50
20037+60

379.75
20050+80

380.00
20064+00

MILEAGE CALCULATED FROM SURVEY STATIONING

0.000 -0.500 -0.850 -1.000 -1.500 -2.000 -2.500 -3.000

CIS SURVEY
ON
OFF

ON/OFF SURVEY DIRECTION

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

mears RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE
BOW FILE
West Line Bow

Length of RAPSheet: 3960 FEET / 0.50 MILE(S)	Date Drawn: 04/21/10
Page(s): PAGE(S) 5 OF 8	Project Number: 9141883310
Drawn By: HART SMALLEY	Project Manager: KURT LAWSON
FILE: West line Bow 3.cir	

ENBDNR0009905

380.00
20064+00

380.25
20077+20

380.50
20090+40

MILEAGE CALCULATED FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20065+04 ANCHOR W-13 LOCATION SURVEYED BY ENBRIDGE
20066+40 ANCHOR W-12 LOCATION SURVEYED BY ENBRIDGE
20067+57 CLAMP W-6 FAR:-1.784/-[illegible] MEA IR:0.001/-0.007 NEAR:-1 .198
20067+58 CLAMP W-6
20067+75 ANCHOR W-11 LOCATION SURVEYED BY ENBRIDGE
20068+31 ANCHOR W-10 LOCATION SURVEYED BY ENBRIDGE
20068+81 ANCHOR W-9 LOCATION SURVEYED BY ENBRIDGE
20069+26 ANCHOR W-8 LOCATION SURVEYED BY ENBRIDGE
20072+35 BEGIN EXPOSED PIPE
20073+14 END EXPOSED PIPE
20075+49 ANCHOR W-7 LOCATION SURVEYED BY ENBRIDGE
20076+94 ANCHOR W-6 LOCATION SURVEYED BY ENBRIDGE
20082+88 BEGIN EXPOSED PIPE
20084+76 ANCHOR W-5 LOCATION SURVEYED BY ENBRIDGE
20085+30 ANCHOR W-4 LOCATION SURVEYED BY ENBRIDGE
20086+12 CLAMP W-7 FAR:-1.779/-[illegible].178 MEA IR:0.001/-0.005 NEAR:-1 .176
20086+15 CLAMP W-7
20087+55 BEGIN EXPOSED PIPE
20089+05 ANCHOR W-3 LOCATION SURVEYED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3960 FEET / 1.20 METERS
Page(s): 6 OF 8
Drawn By: HART SMALLEY
File: West Line Bow.dgn

Date Drawn: 01/31/19
Project Number: 914883310
Project Manager: KURT LAWSON

ENBRIDGE
BOW FILE
West Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Means

380.50
20090+40

380.75
20103+60

381.00
20115+80

MILEAGE CALCULATED
FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20095+45 ANCHOR W-2 LOCATION SURVEYED BY ENBRIDGE

20096+04 ANCHOR W-1 LOCATION SURVEYED BY ENBRIDGE
20096+24 CLAMP W-8 FAR:-1.823/-1.190 MEA IR:0.000/-0.006 NEAR:-1 .189
20096+33 CLAMP W-8

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Date Drawn: 03/31/15
Project Number: 914183310
Project Manager: KURT LAWSON
Drawn By: HART SMALLEY
Sheet(s): 7 OF 8
Length of RAPSheet: 3540 FEET / 1.30 MILES
FILE: West Line Bow 7.cdr

ENBRIDGE
BOW FILE
West Line Bow

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE

381.00
20115+80

381.25
20130+00

381.50
20145+20

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20123+47 END FILE HERE DUE TO WWP BREAK
20128+96 EDGE SOUTH SHORE
20130+87 EDGE GRAVEL DRIVE
20131+01 EDGE GRAVEL DRIVE
20131+32 MARKER
20133+02 EDGE GRAVEL DRIVE
20133+23 EDGE GRAVEL DRIVE
20133+62 EDGE GRAVEL DRIVEWAY
20133+75 EDGE GRAVEL DRIVEWAY
20134+37 ANGLE POINT
20134+90 ANGLE POINT
20135+12 ANGLE POINT
20138+09 MARKER
20138+28 EDGE ASPHALT DRIVEWAY
20138+44 EDGE ASPHALT DRIVEWAY
20138+78 EDGE ROAD ASPHALT
20139+08 CENTERLINE ALGONQUIN DR
20139+30 EDGE RD ASPHALT
FENCE START CELL .003 WWP# .003

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (Not TOT / 4.30 INCHES)
Page(s) 8 OF 8
Drawn By HART SMALLEY
File West Line Bow.pdf

Date Drawn 03/31/19
Project Number 9141883310
Project Manager KURT LAWSON

ENBRIDGE
BOW FILE
West Line Bow

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Stantec Version: 1991

Mears

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials Less Negative than -0.850 Volt

Enbridge

West Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
			NO OFF READS LESS NEGATIVE -0.850 V					
	Total Feet	0						

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

West Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19937+66	19945+92	826	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8413581518	-84.7551946854	45.8402225571	-84.7571850036
19945+95	19946+42	47	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8402139427	-84.7571885421	45.8400819787	-84.7572428771
19990+84	19990+85	1	OFF READS MORE NEGATIVE -1.200 V	09/14/18	45.82753962	-84.76198721	45.8275360500	-84.7619887350
19991+91	19991+93	2	OFF READS MORE NEGATIVE -1.200 V	09/14/18	45.8272186100	-84.7621436500	45.82721201	-84.76214724
20044+76	20044+84	8	OFF READS MORE NEGATIVE -1.200 V	09/17/18	45.8123191250	-84.7674596000	45.8122948820	-84.7674665980
20055+41	20055+51	10	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8093486880	-84.7688045700	45.8093199360	-84.7688147800
20057+40	20058+48	108	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8087819540	-84.7690056020	45.8084754620	-84.7691143000
20058+67	20058+69	2	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8084201033	-84.7691339283	45.8084147767	-84.7691358117
20058+84	20058+93	9	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8083721217	-84.7691509517	45.8083470760	-84.7691598260
20059+24	20059+43	19	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.80825751	-84.76919157	45.8082042933	-84.7692104667
20059+51	20059+61	10	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8081808560	-84.7692187800	45.8081536500	-84.7692284267
20060+13	20060+29	16	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8080049600	-84.7692821560	45.8079585633	-84.7692997850
20060+83	20061+16	33	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8078065317	-84.7693575050	45.80771235	-84.76939325
20061+33	20061+36	3	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.80766544	-84.76941108	45.8076556075	-84.7694148000
20061+40	20062+50	110	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8076445350	-84.7694190050	45.8073322980	-84.7695375460
20062+55	20062+61	6	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8073182800	-84.7695428650	45.8073011480	-84.7695493720
20062+70	20063+40	70	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8072760760	-84.7695588960	45.80707798	-84.76963409
20063+47	20063+60	13	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8070570767	-84.7696420233	45.8070214520	-84.7696555720
20063+69	20063+81	12	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8069963460	-84.7696650740	45.8069619720	-84.7696781520
20063+95	20064+80	85	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.80692124	-84.76969360	45.8066815367	-84.7697846033
20065+18	20065+74	56	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8065728960	-84.7698258520	45.8064152100	-84.7698857250
20065+84	20066+02	18	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8063864800	-84.7698966233	45.80633421	-84.76991646
20066+17	20066+27	10	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8062923833	-84.7699323650	45.8062635467	-84.7699433000
20066+47	20067+09	62	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8062078780	-84.7699644140	45.8060310150	-84.7700305275
20067+42	20067+58	16	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8059356275	-84.7700401800	45.80592046	-84.77012498
20069+09	20069+13	4	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8054878040	-84.7702306960	45.8054763200	-84.7702336400
20069+33	20069+44	11	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8054189120	-84.7702483540	45.8053868520	-84.7702577440

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

West Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
20070+17	20070+40	23	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8051811467	-84.7703376333	45.8051160900	-84.7703629220
20070+44	20070+66	22	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8051054900	-84.7703670250	45.8050436120	-84.7703910600
20072+79	20072+86	7	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8044429100	-84.7706243480	45.8044243400	-84.7706315550
20094+31	20094+41	10	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.7983585500	-84.7728901400	45.7983308167	-84.7728998900
20094+62	20094+70	8	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.7982708000	-84.7729210067	45.7982487280	-84.7729287560
20094+76	20094+85	9	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.79823308	-84.77293428	45.7982059520	-84.7729437880
20095+28	20095+40	12	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.7980853850	-84.7729862250	45.7980506817	-84.7729984367
20096+49	20097+25	76	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79774571	-84.77314092	45.7975257940	-84.7731937780
20097+75	20098+04	29	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7973835640	-84.7732389740	45.7973015560	-84.7732650320
20098+35	20098+62	27	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7972136580	-84.7732981980	45.7971367120	-84.7733284000
20098+75	20098+90	15	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79709944	-84.77334302	45.79705704	-84.77335965
20098+93	20099+20	27	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7970485740	-84.7733629740	45.79697238	-84.77339288
20099+22	20100+05	83	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7969676567	-84.7733947400	45.79673481	-84.77348613
20100+08	20100+79	71	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7967263560	-84.7734894540	45.79652521	-84.77356840
20101+08	20101+71	63	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7964431880	-84.7736005920	45.7962648760	-84.7736706000
20101+89	20102+95	106	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7962163920	-84.7736896280	45.7959172900	-84.7738069950
20103+11	20103+17	6	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7958711080	-84.7738250820	45.7958538	-84.77383178
20103+19	20103+74	55	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7958489867	-84.7738336533	45.79569481	-84.77389328
20103+79	20103+99	20	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7956798520	-84.7738990560	45.79562496	-84.77392028
20105+24	20105+70	46	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7952715725	-84.7740569300	45.7951405820	-84.7741075920
20105+83	20108+63	280	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7951039380	-84.7741217580	45.7943137000	-84.7744265100
20108+65	20109+02	37	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7943079540	-84.7744286960	45.7942041320	-84.7744681680
20109+41	20109+59	18	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7940952420	-84.7745096020	45.7940435660	-84.7745292360
20110+51	20110+88	37	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7937831	-84.77462828	45.7936799240	-84.7746675340
20111+17	20111+87	70	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79359679	-84.77469915	45.79339867	-84.77477450
20111+99	20115+50	351	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7933642200	-84.7747876140	45.7923741000	-84.7751641580
20115+55	20118+00	245	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7923598400	-84.7751695620	45.7916670020	-84.7754330540

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Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

West Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
20118+23	20118+86	63	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79160154	-84.77545795	45.7914235160	-84.7755256260
20118+97	20123+48	451	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7913919620	-84.7755376480	45.7901282101	-84.7760314380
20128+96	20129+41	45	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.788571949	-84.776572886	45.7884426497	-84.7766196232
20129+60	20129+66	6	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7883880567	-84.7766393567	45.7883708168	-84.7766455883
20129+98	20130+05	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7882788460	-84.7766787952	45.7882585599	-84.7766858663
20130+41	20130+43	2	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7881542315	-84.7767222323	45.7881484355	-84.7767242527
20130+50	20130+65	15	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7881281494	-84.7767313238	45.7880846792	-84.7767464763
20130+68	20131+05	37	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7880759852	-84.7767495068	45.7879692194	-84.7767842609
20131+19	20131+20	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7879302065	-84.7767983848	45.7879274199	-84.7767993937
20131+28	20131+29	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7879051268	-84.7768074645	45.7879023401	-84.7768084733
20131+54	20131+59	5	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7878326743	-84.7768336947	45.7878187411	-84.7768387390
20131+60	20131+67	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7878159545	-84.7768397478	45.7877964480	-84.7768468098
20133+04	20133+18	14	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7874027181	-84.7769916981	45.7873623008	-84.7770060412
20133+23	20133+24	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7873478660	-84.7770111637	45.7873449790	-84.7770121883
20133+33	20133+37	4	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7873189964	-84.7770214088	45.7873074486	-84.7770255068
20133+47	20133+80	33	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7872785790	-84.7770357519	45.7871827027	-84.7770635519
20135+16	20135+17	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7868278786	-84.7770635101	45.7868264712	-84.7770607545
20135+85	20135+92	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867801856	-84.7767890206	45.7867760047	-84.7767600516
20135+94	20136+09	15	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867748102	-84.7767517747	45.7867658511	-84.7766896982
20136+58	20136+66	8	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867109565	-84.7764999800	45.7866993441	-84.7764703565
20136+89	20136+92	3	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7866659585	-84.7763851890	45.7866616038	-84.7763740802
20137+79	20138+04	25	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7865850640	-84.7760434503	45.7865695023	-84.7759473459
20138+26	20138+29	3	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7865497451	-84.7758603428	45.7865468077	-84.7758483812
20139+23	20139+27	4	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7864627376	-84.7754742007	45.7864597573	-84.7754573049
20139+29	20139+30	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7864582671	-84.7754488570	45.786457522	-84.775444633
	Total Feet	4079						

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MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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CIS Skip Report with GPS

Report of any skips in the data with GPS

Enbridge

West Line Bow

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Region	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19946+42	19990+18	4377	BEGIN AT NORTH EDGE WATER AC:0.740 CELL 0.003 METER 0.000; CLAMP W-1		/ /	45.8400819787	-84.7572428771	45.8277182653	-84.7618774309
20123+48	20128+95	548	END FILE HERE DUE TO WIRE BREAK; EDGE SOUTH SHORE		/ /	45.7901282101	-84.7760314380	45.7885747889	-84.7765718980
20138+29	20138+43	15	EDGE ASPHALT DRIVEWAY; EDGE ASPHALT DRIVEWAY		09/19/18	45.7865468077	-84.7758483812	45.7865331002	-84.7757925606
20138+63	20139+07	45	EDGE ROAD ASPHALT; CENTERLINE ALGONQUIN DR; EDGE RD ASPHALT		09/19/18	45.7865136148	-84.7757129074	45.7864747962	-84.7755414566

Total Feet 4985

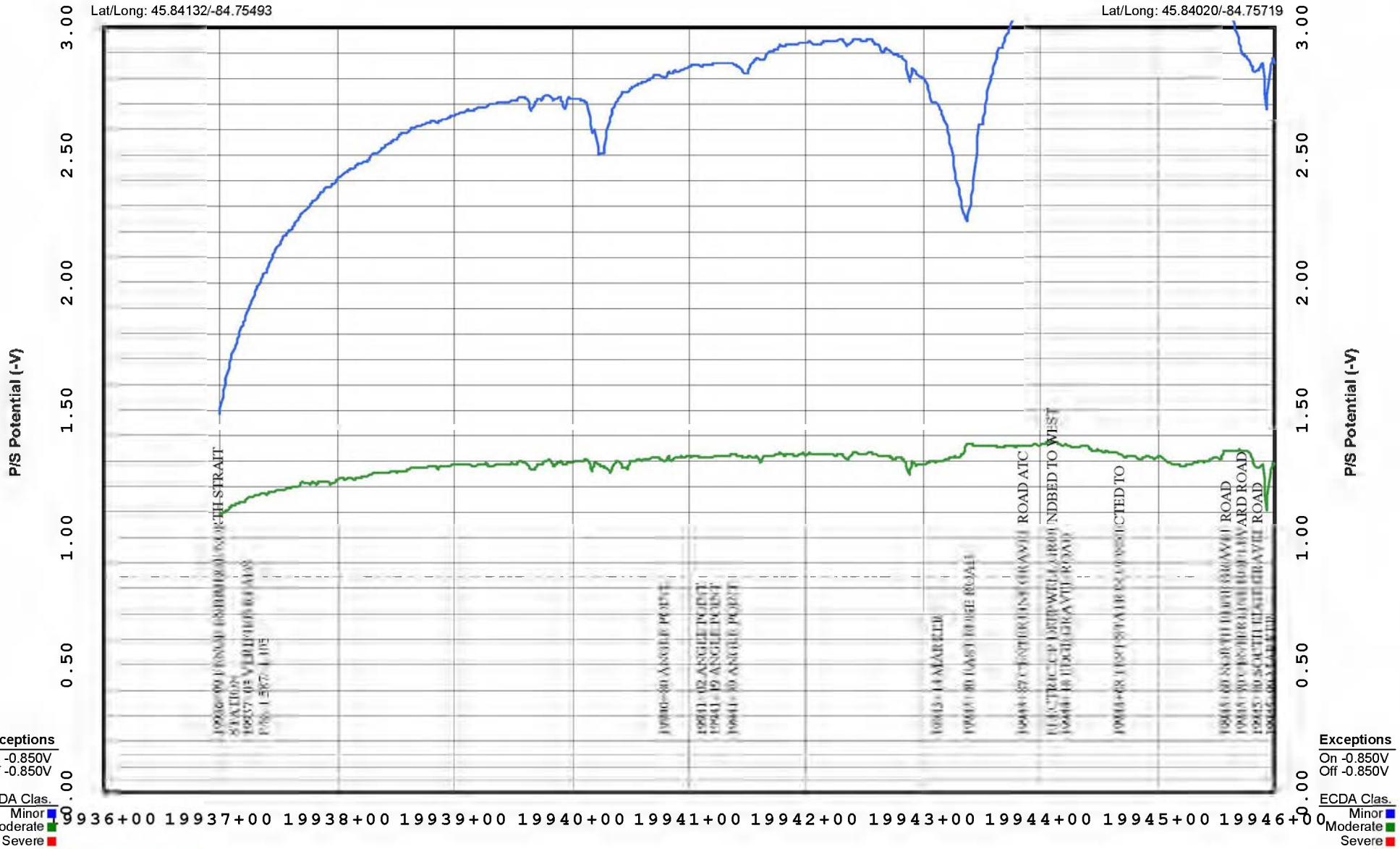
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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\bow\west bowfinal.cdb

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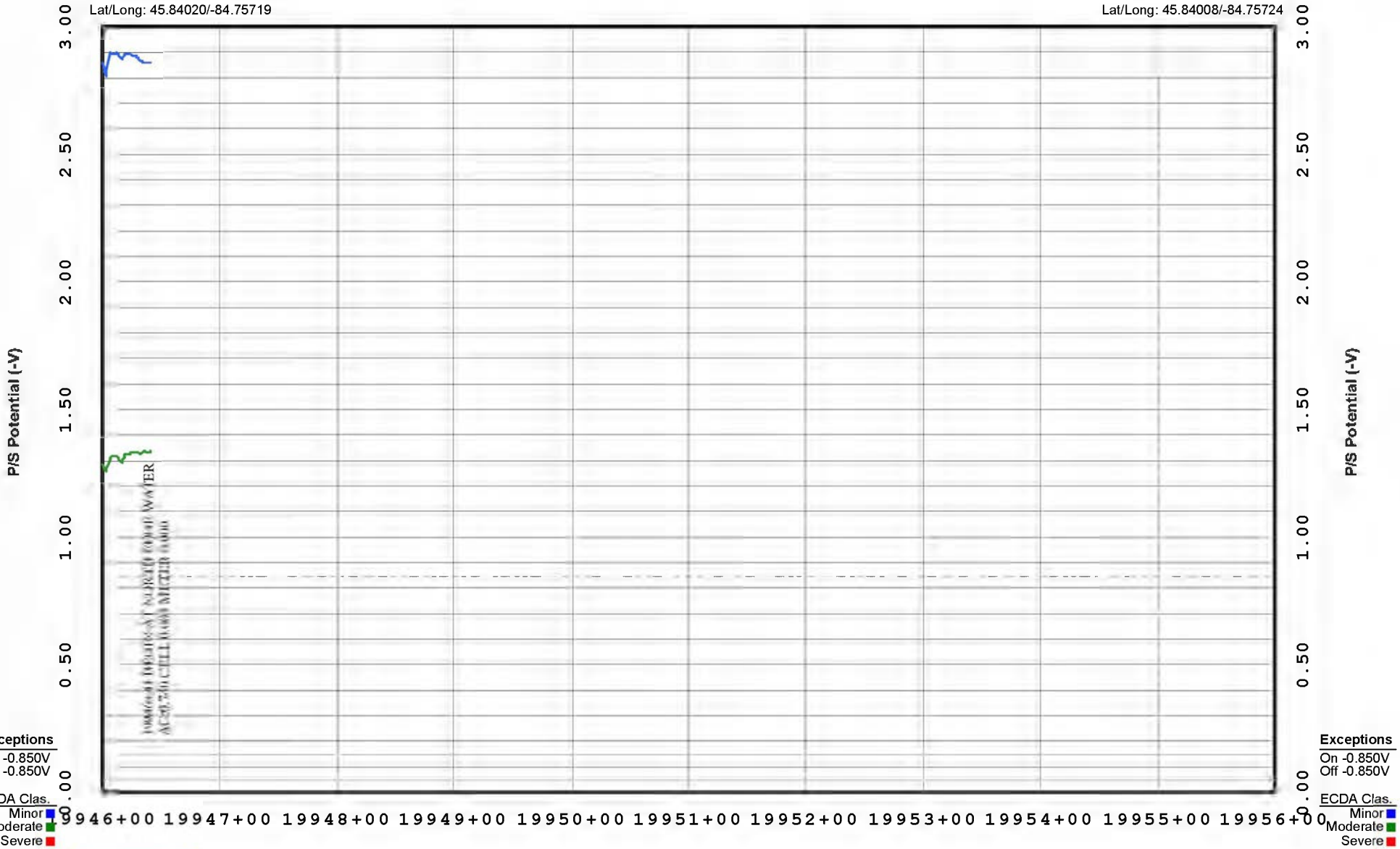
Appendix F – 2018 Close Interval Survey Results – West Pipeline Aft Cell and 2019 Shore Approach Survey



CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE AFT	File: 5000 N SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 1 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

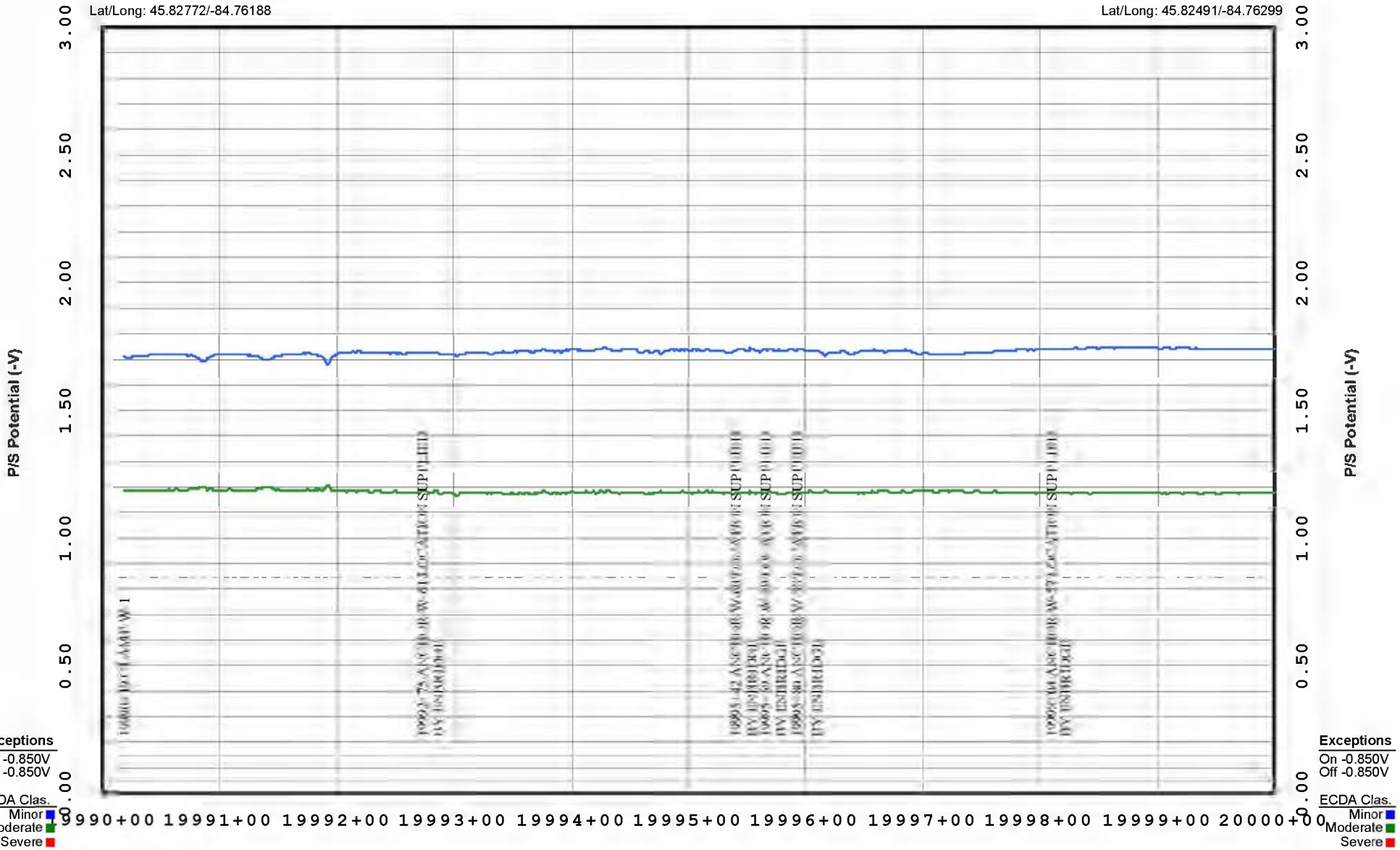
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CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE AFT	File: 5000 N SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 2 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

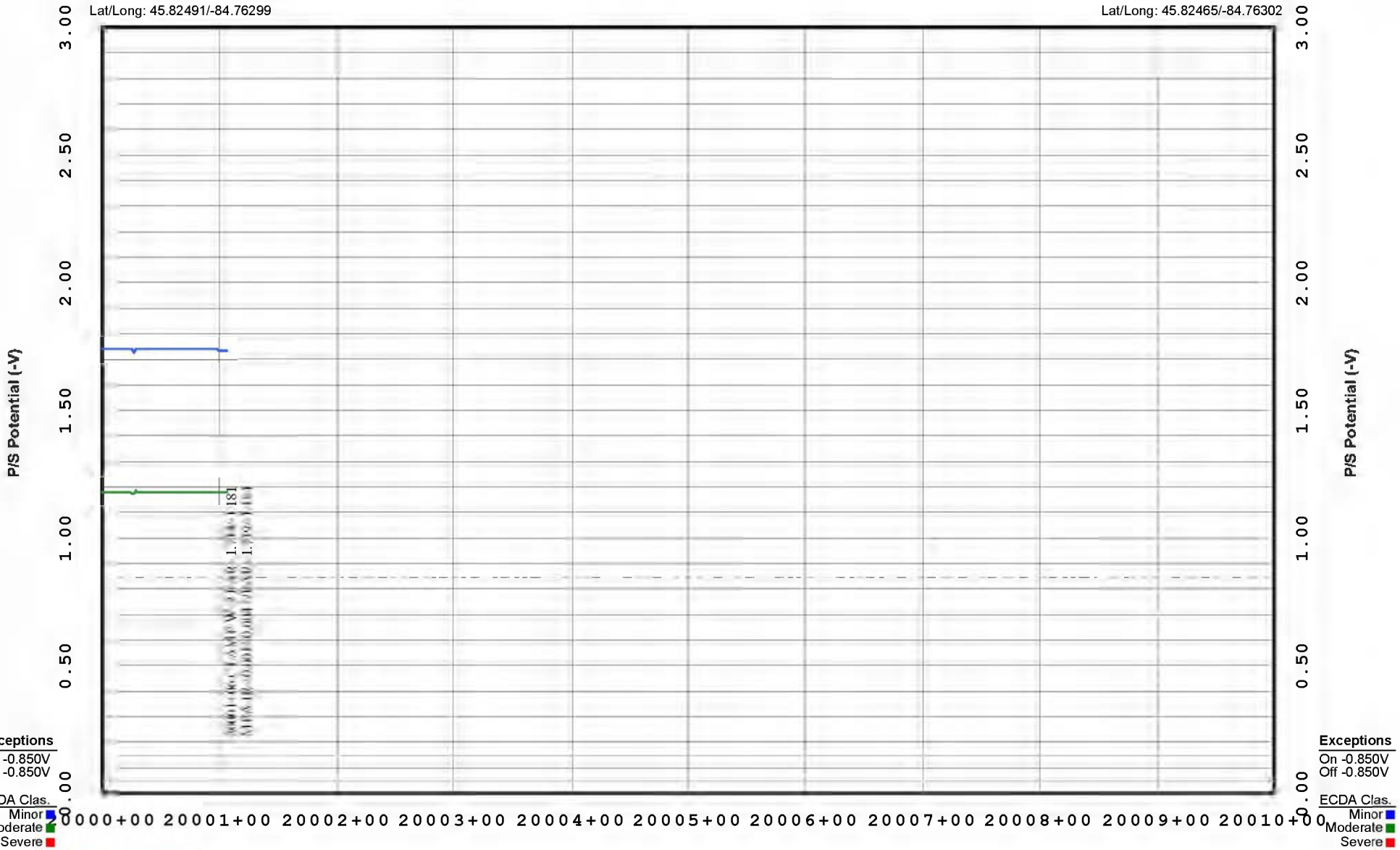
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CPGLog	Client: ENBRIDGE	Date: 09/14/18	
	Pipeline: WEST LINE AFT	File: 4000 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 3 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 09/14/18

File: 4000 WEST AFT

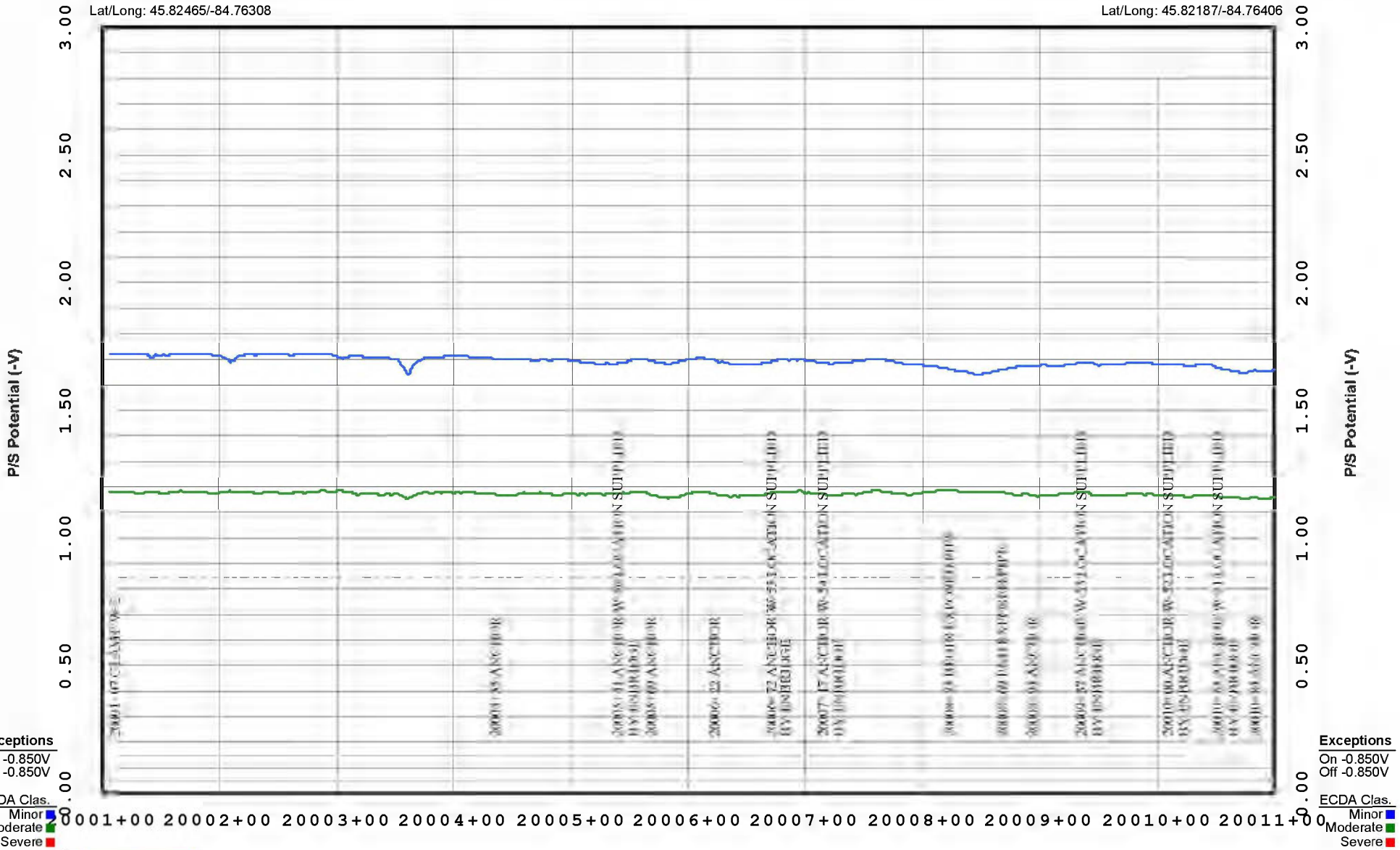
Mears Job Number. 9141883310

Page: 4 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 09/15/18

File: 4010 WEST AFT

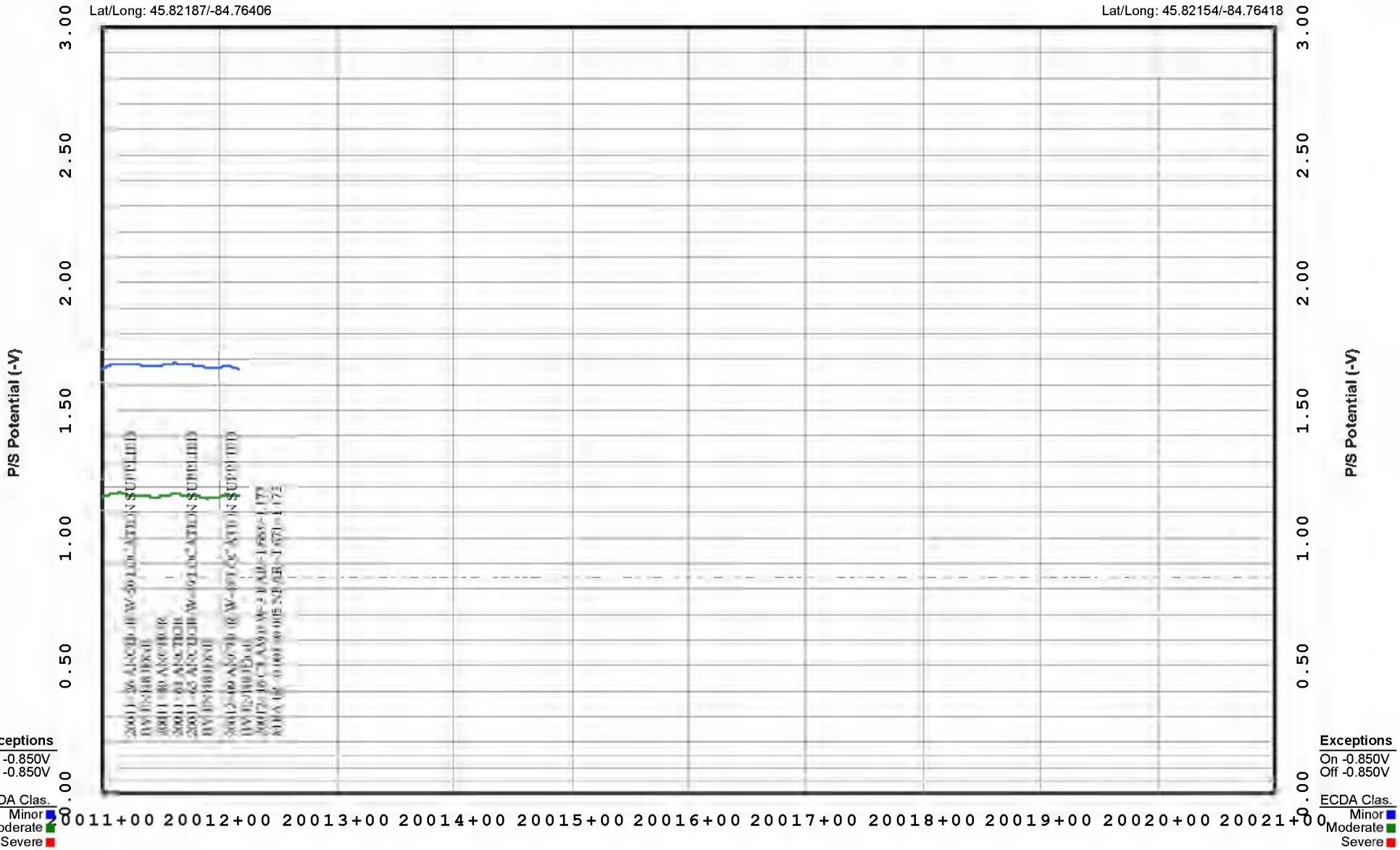
Mears Job Number. 9141883310

Page: 5 of 20

Survey Direction

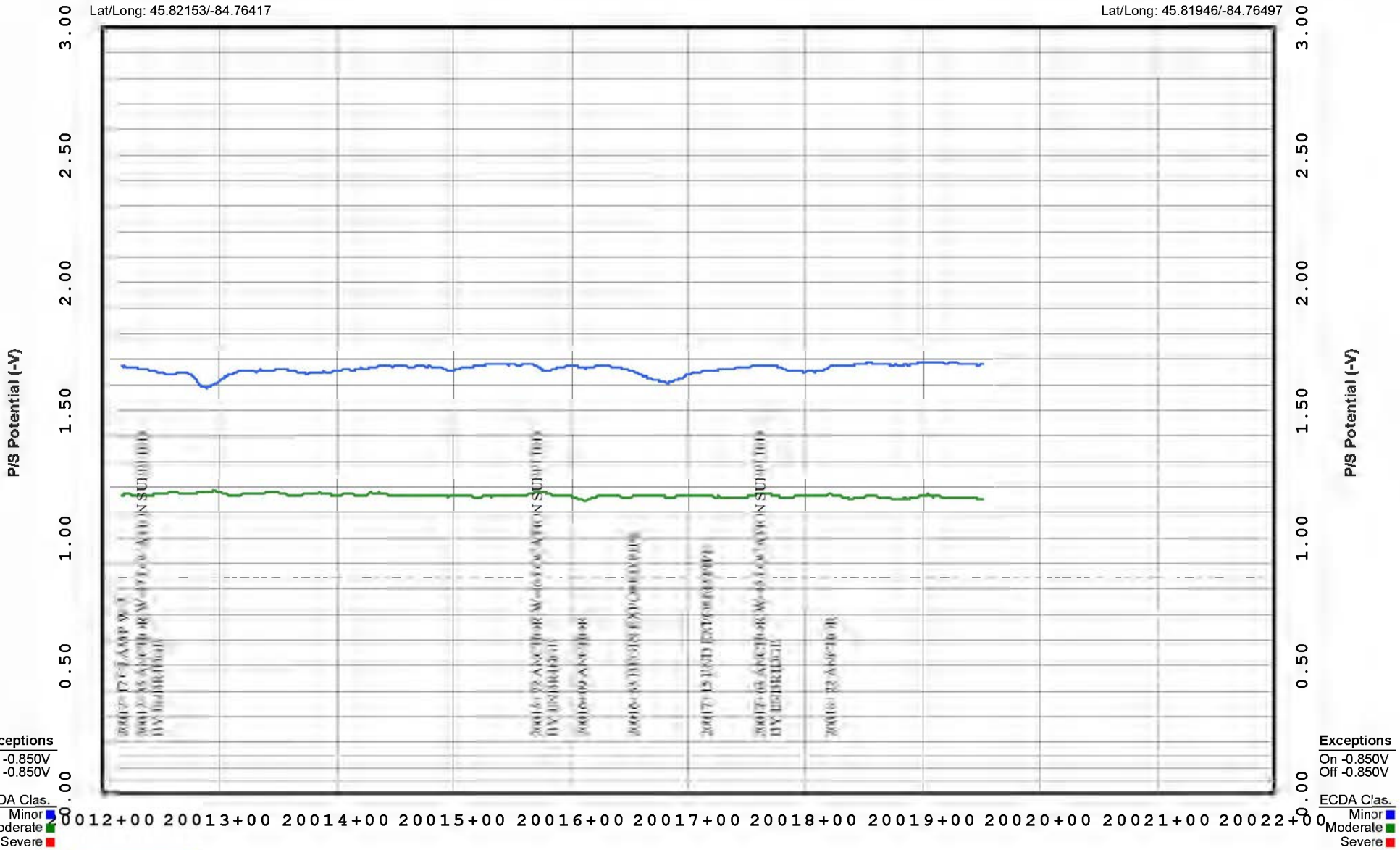
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE AFT	File: 4010 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 6 of 20	Survey Direction

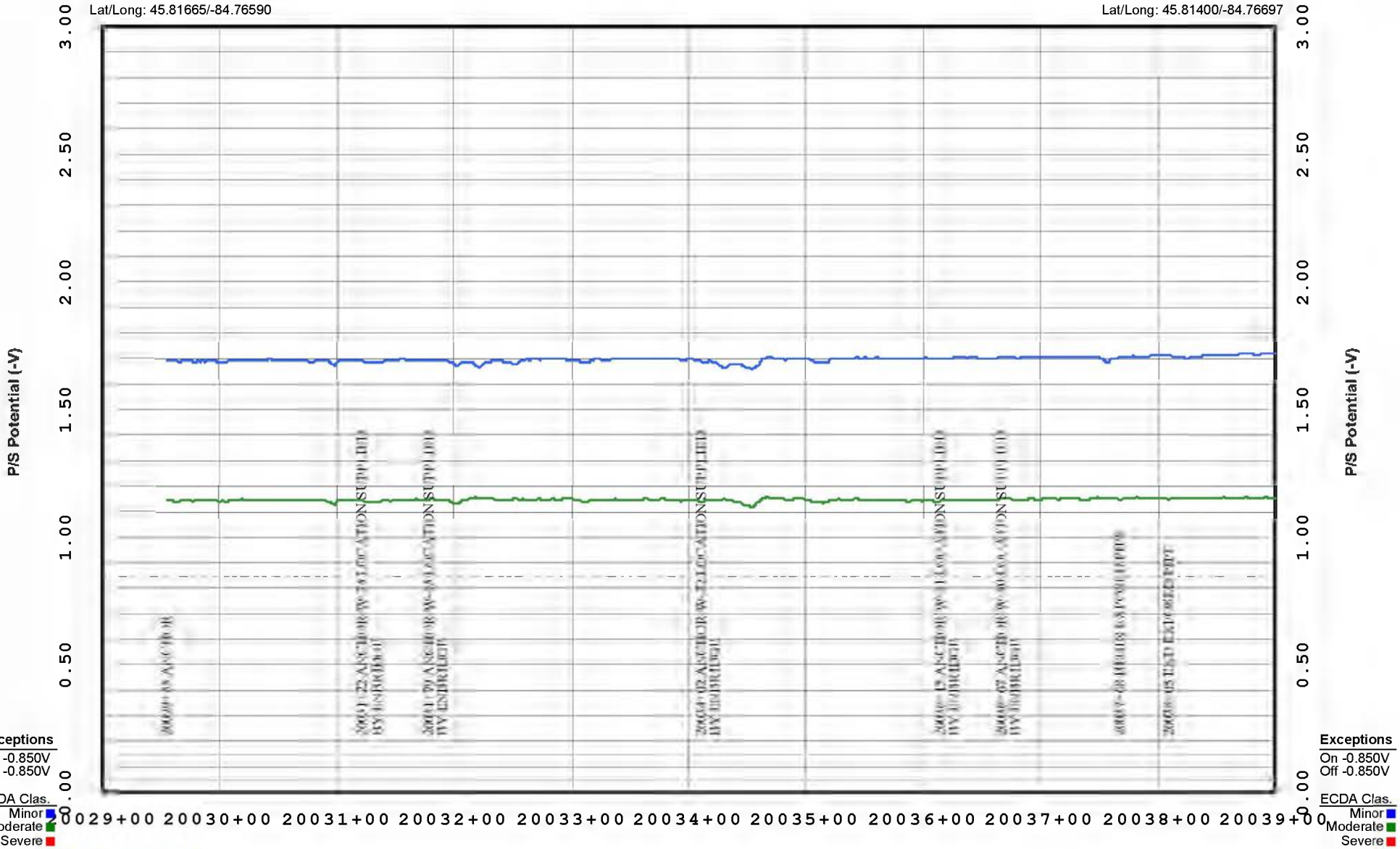
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CPGLog	Client: ENBRIDGE	Date: 09/15/18	
	Pipeline: WEST LINE AFT	File: 4020 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 7 of 20	Survey Direction

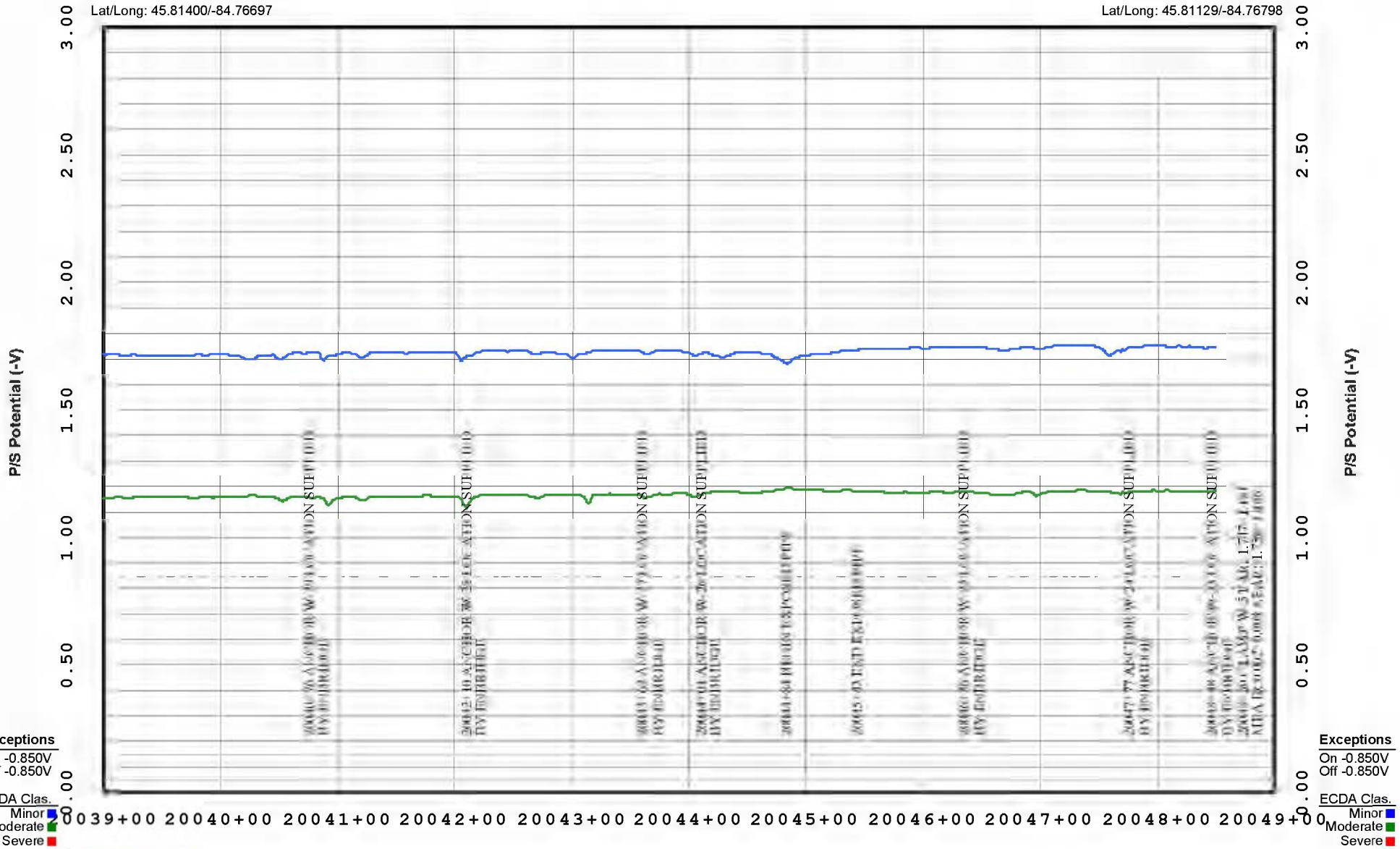
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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mears CPGLog	Client: ENBRIDGE	Date: 09/17/18	
	Pipeline: WEST LINE AFT	File: 4030 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 8 of 20	Survey Direction

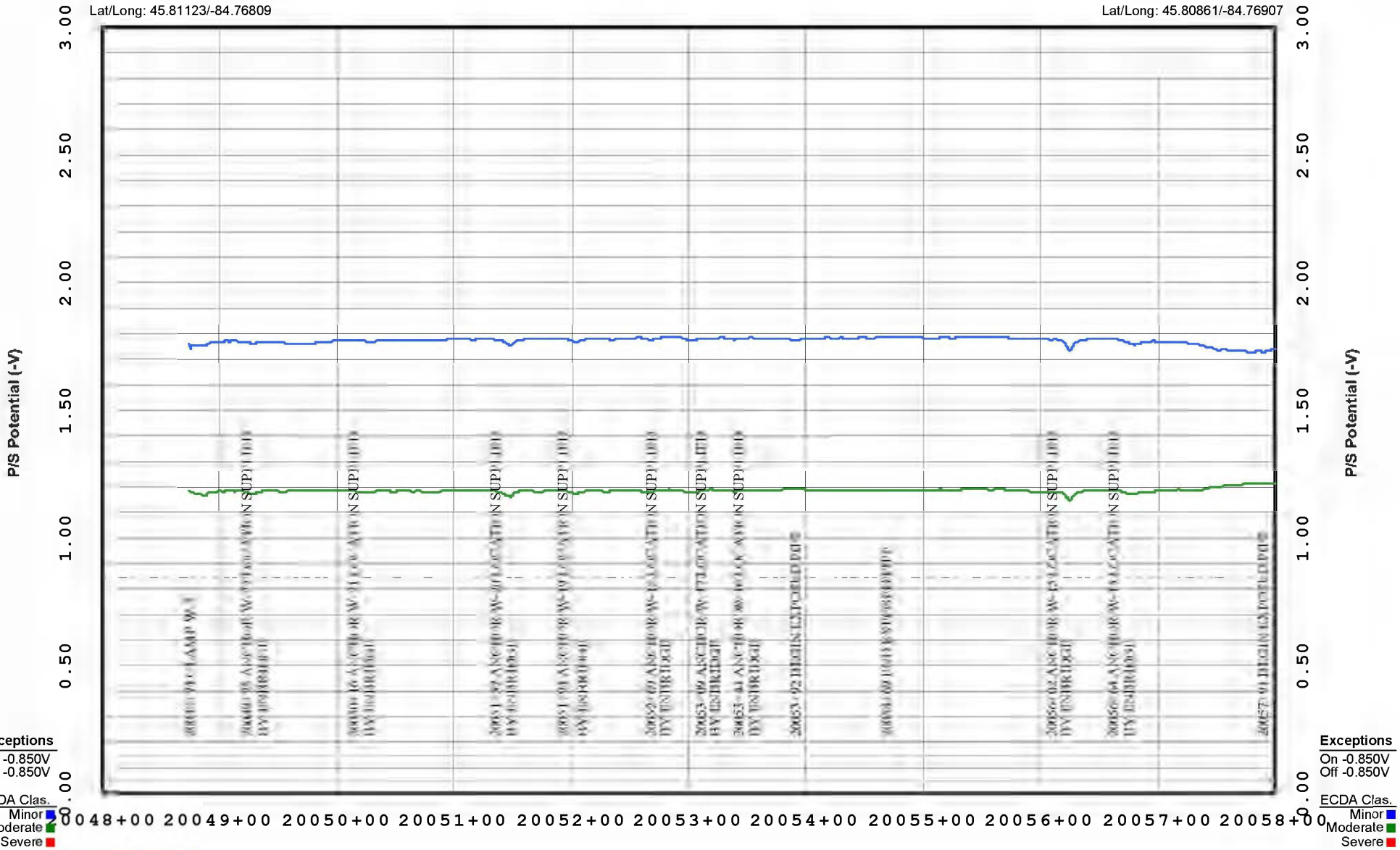
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CPGLog	Client: ENBRIDGE	Date: 09/17/18	
	Pipeline: WEST LINE AFT	File: 4030 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 9 of 20	Survey Direction

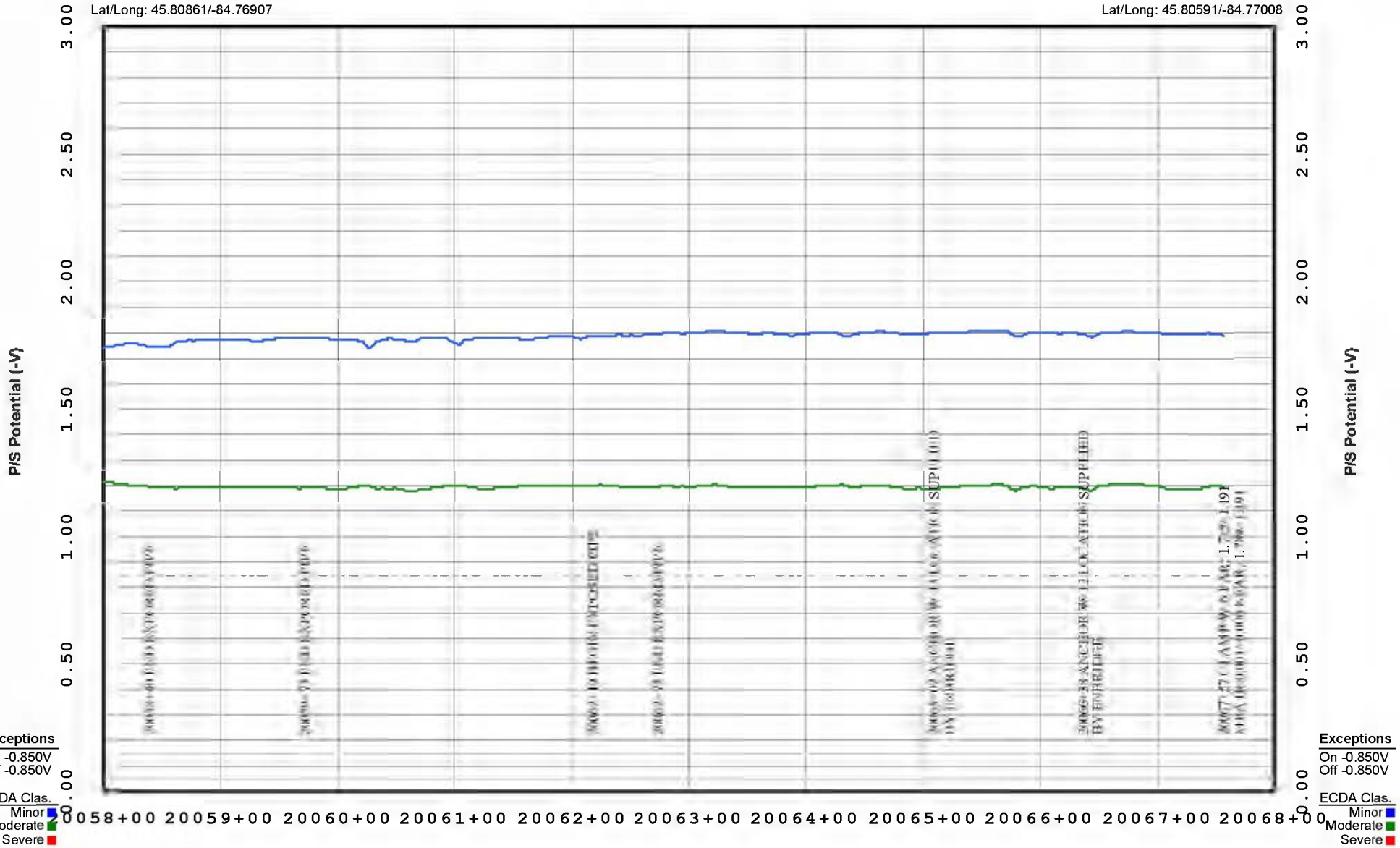
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE AFT	File: 4040 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 10 of 20	Survey Direction

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mears

CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 09/18/18

File: 4040 WEST AFT

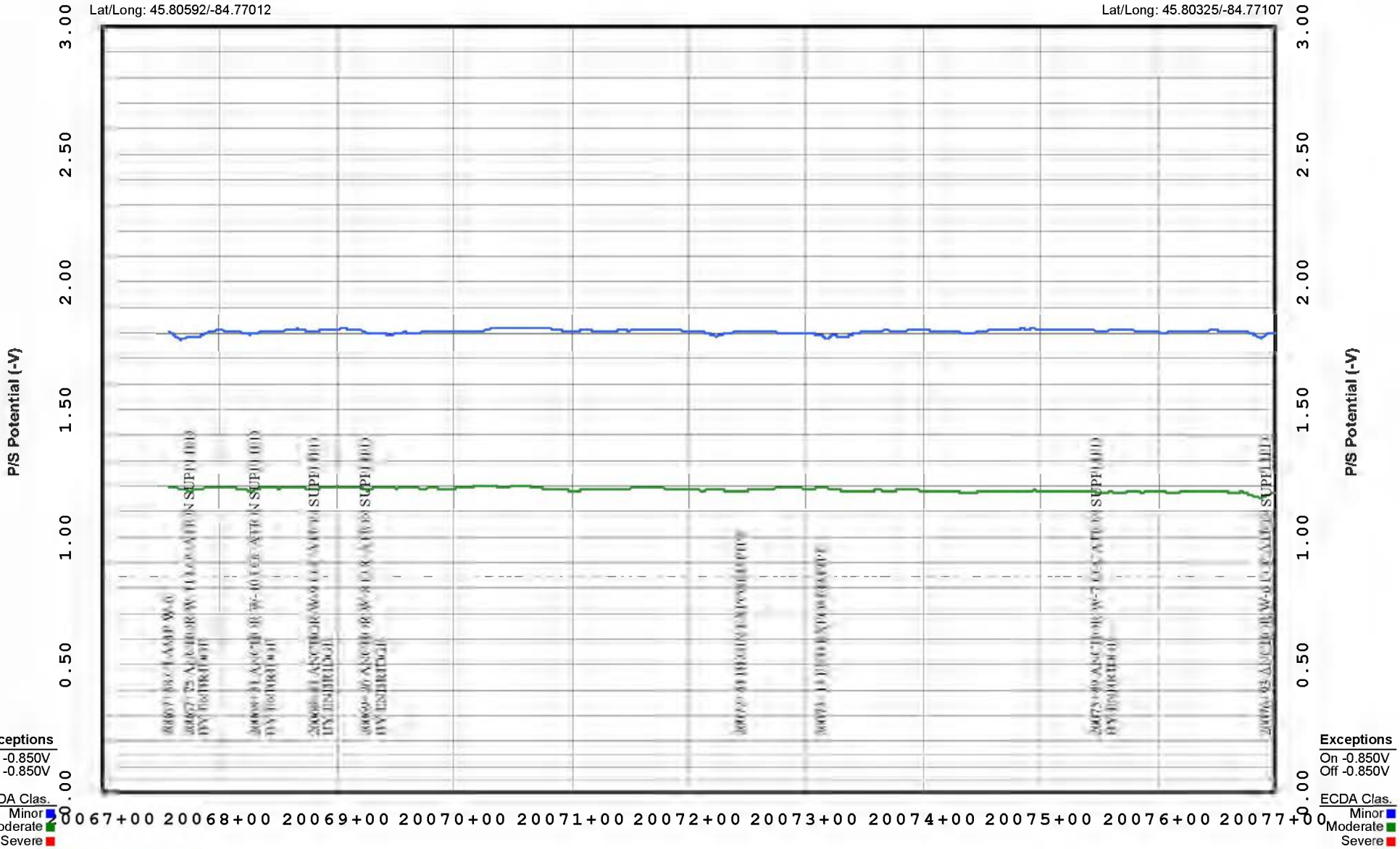
Mears Job Number. 9141883310

Page: 11 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

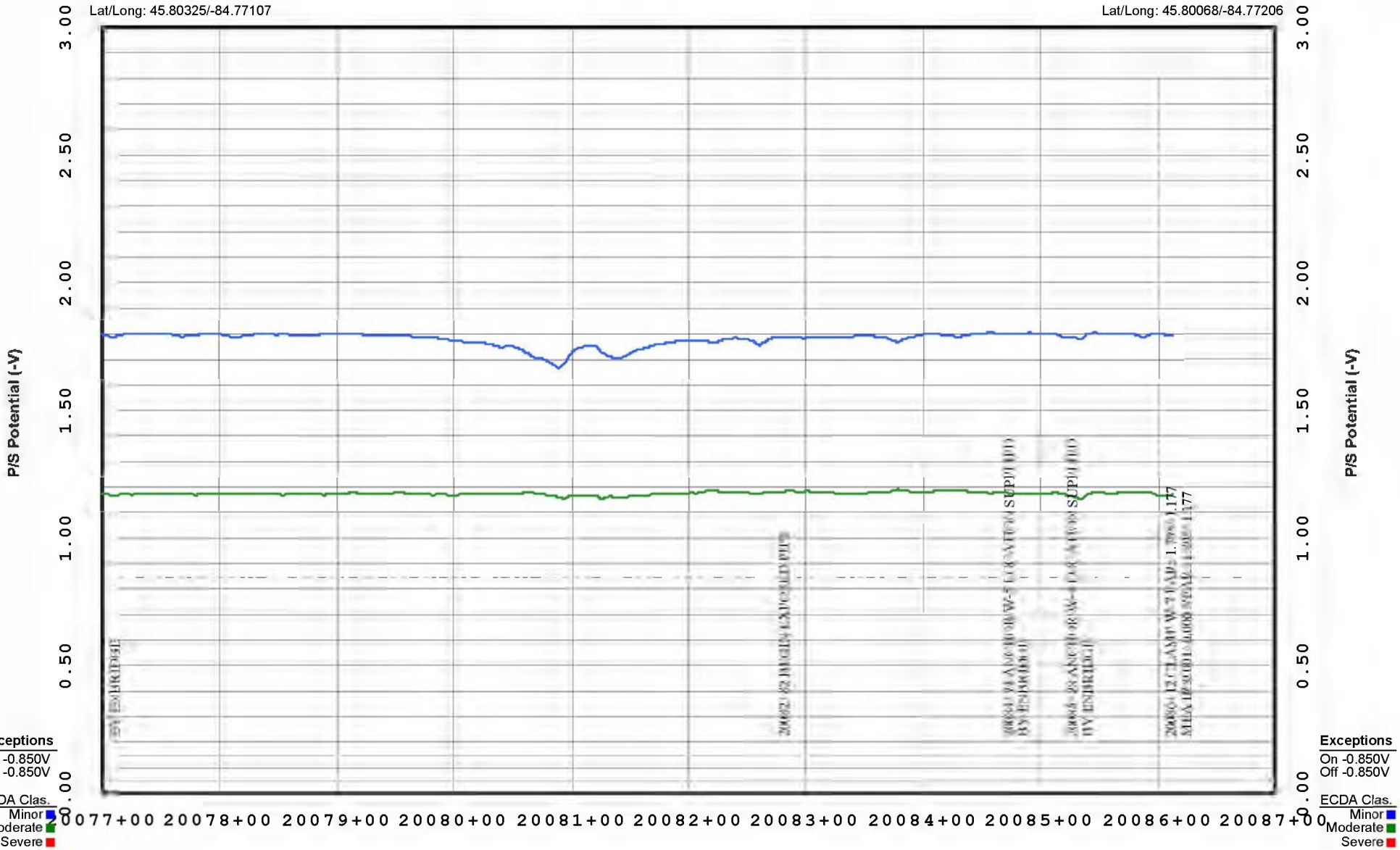
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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE AFT	File: 4050 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 12 of 20	Survey Direction

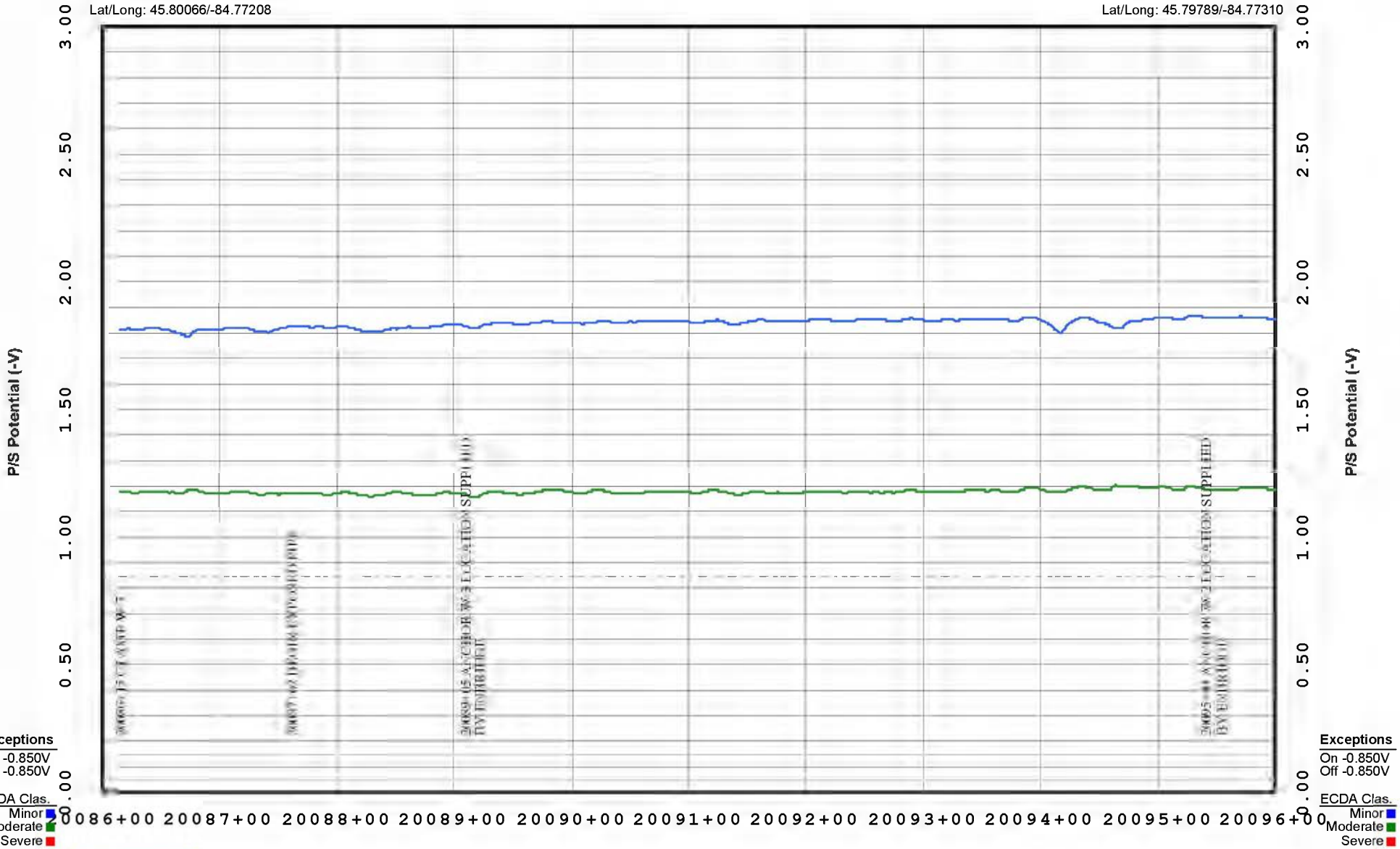
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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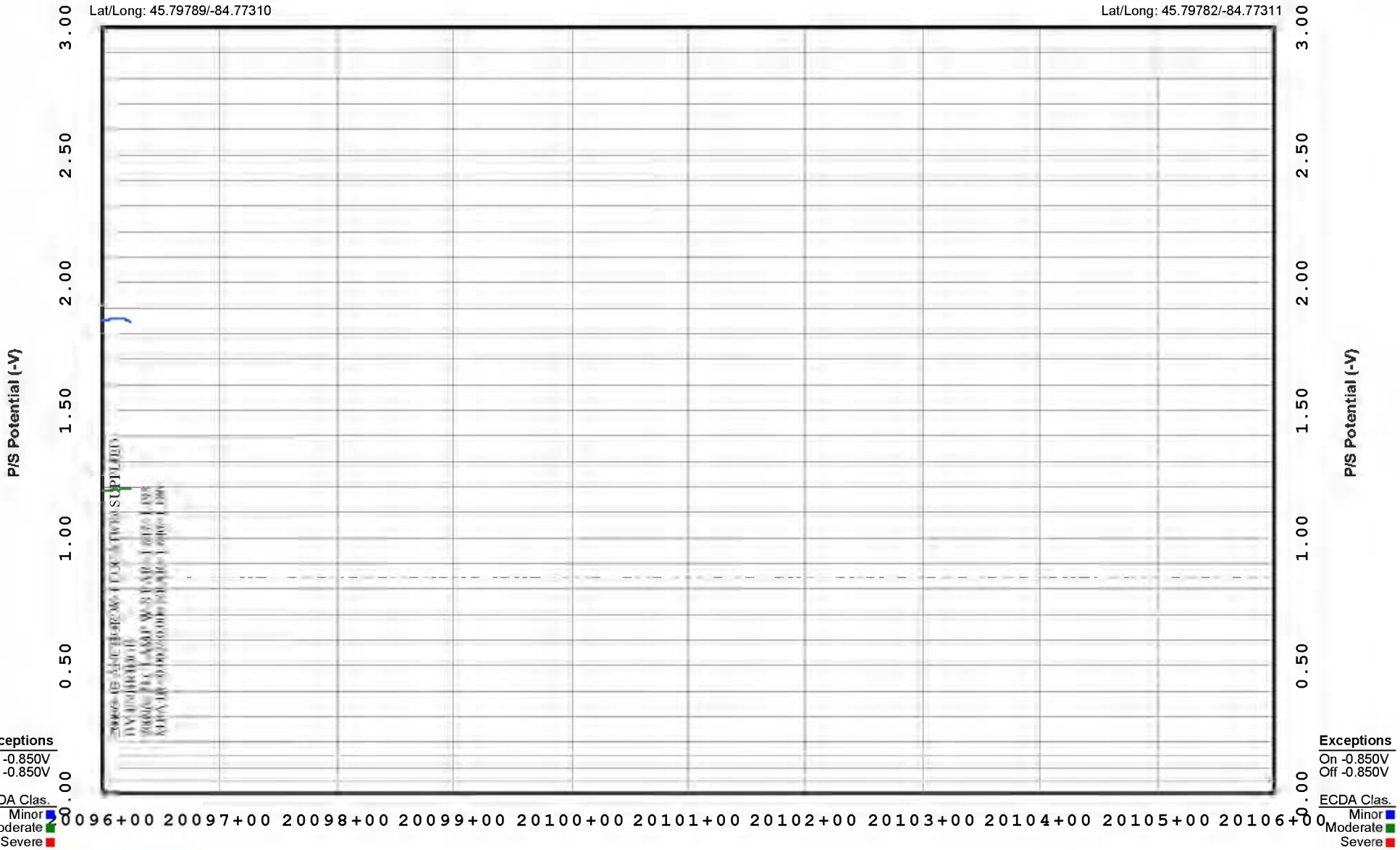
CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE AFT	File: 4050 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 13 of 20	Survey Direction

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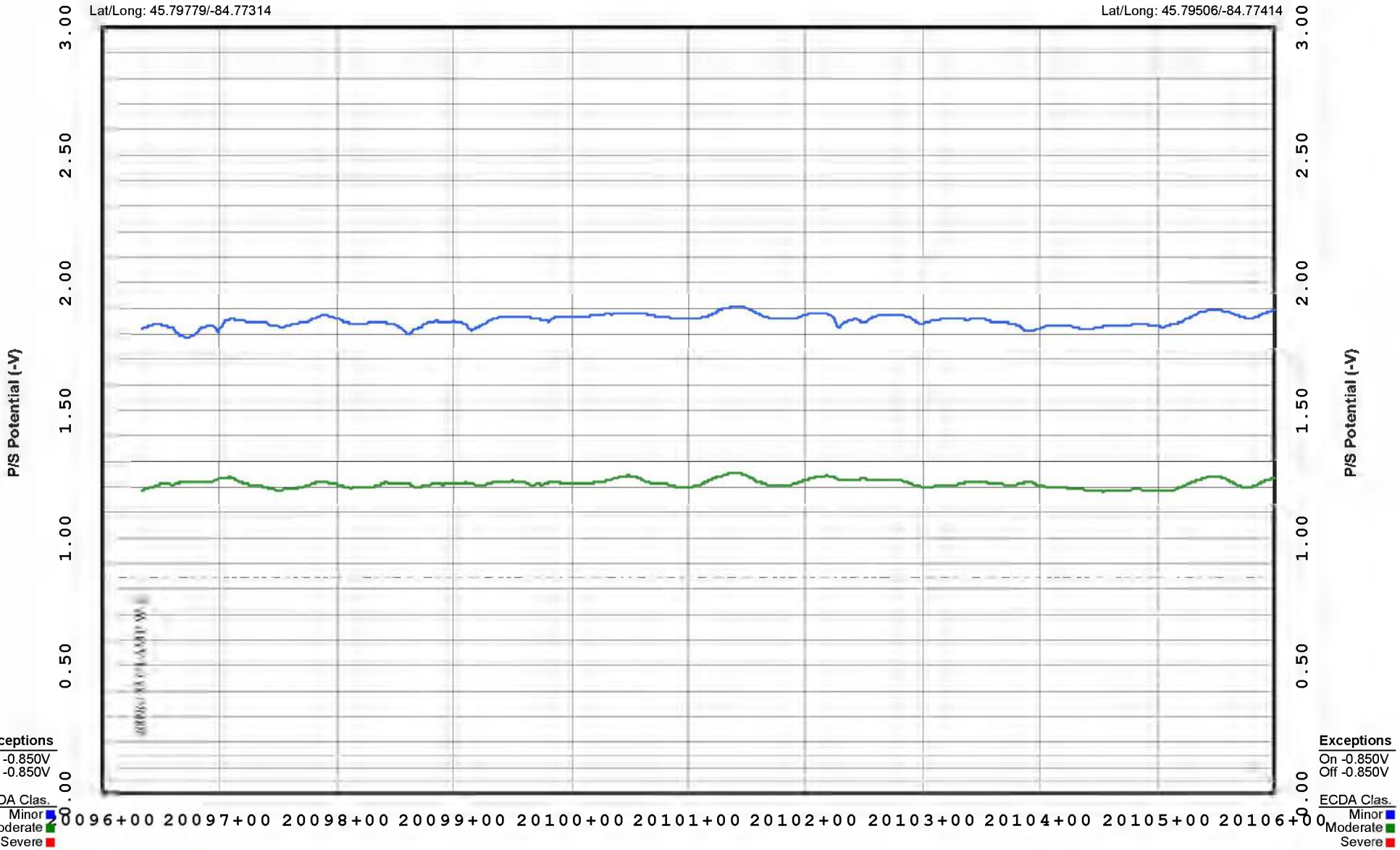
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	Pipeline: WEST LINE AFT	File: 4060 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 14 of 20	Survey Direction

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CPGLog	Client: ENBRIDGE	Date: 09/18/18	
	Pipeline: WEST LINE AFT	File: 4060 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 15 of 20	Survey Direction

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 10/09/18

File: 4070 WEST AFT

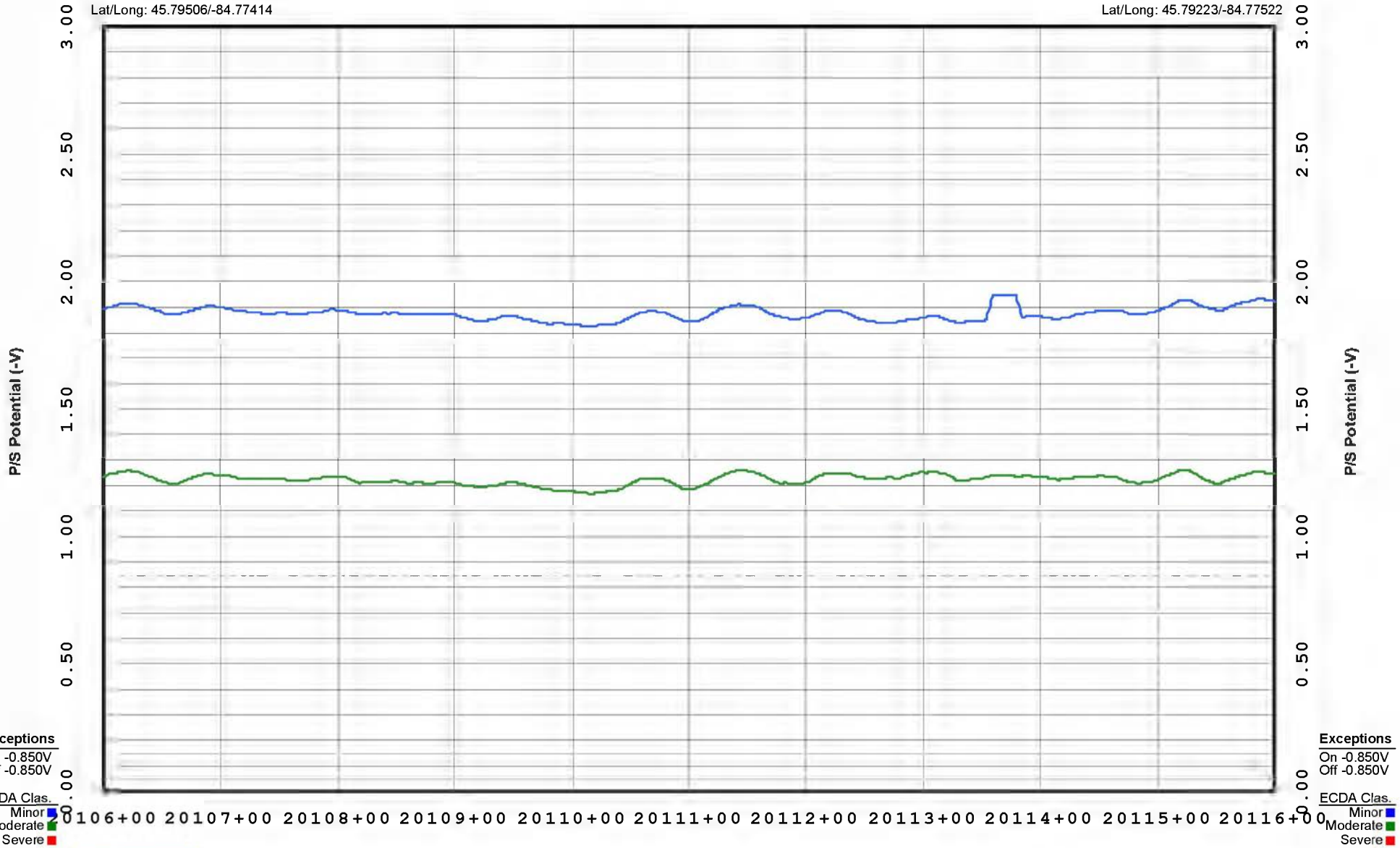
Mears Job Number. 9141883310

Page: 16 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 10/09/18

File: 4070 WEST AFT

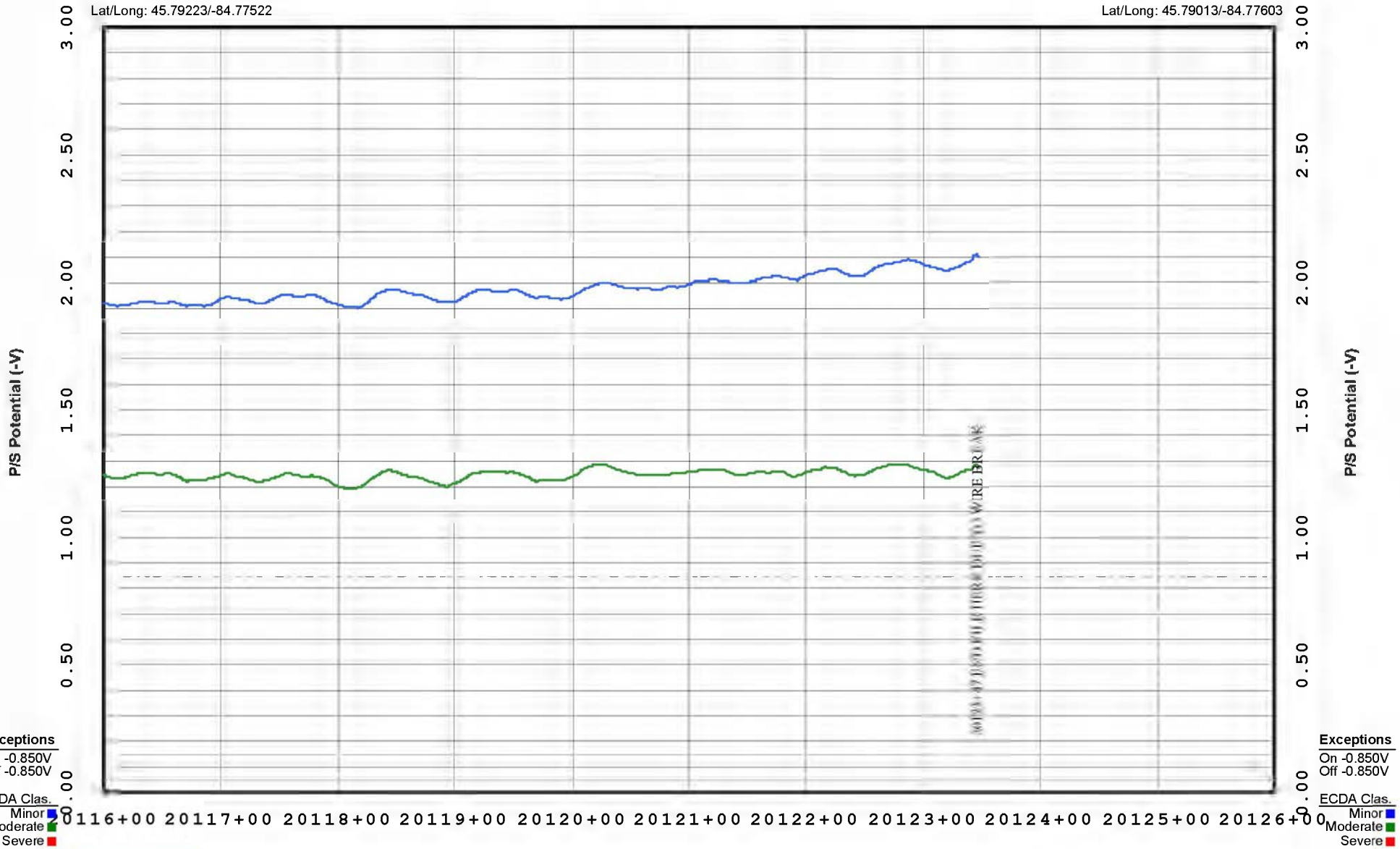
Mears Job Number. 9141883310

Page: 17 of 20

Survey Direction

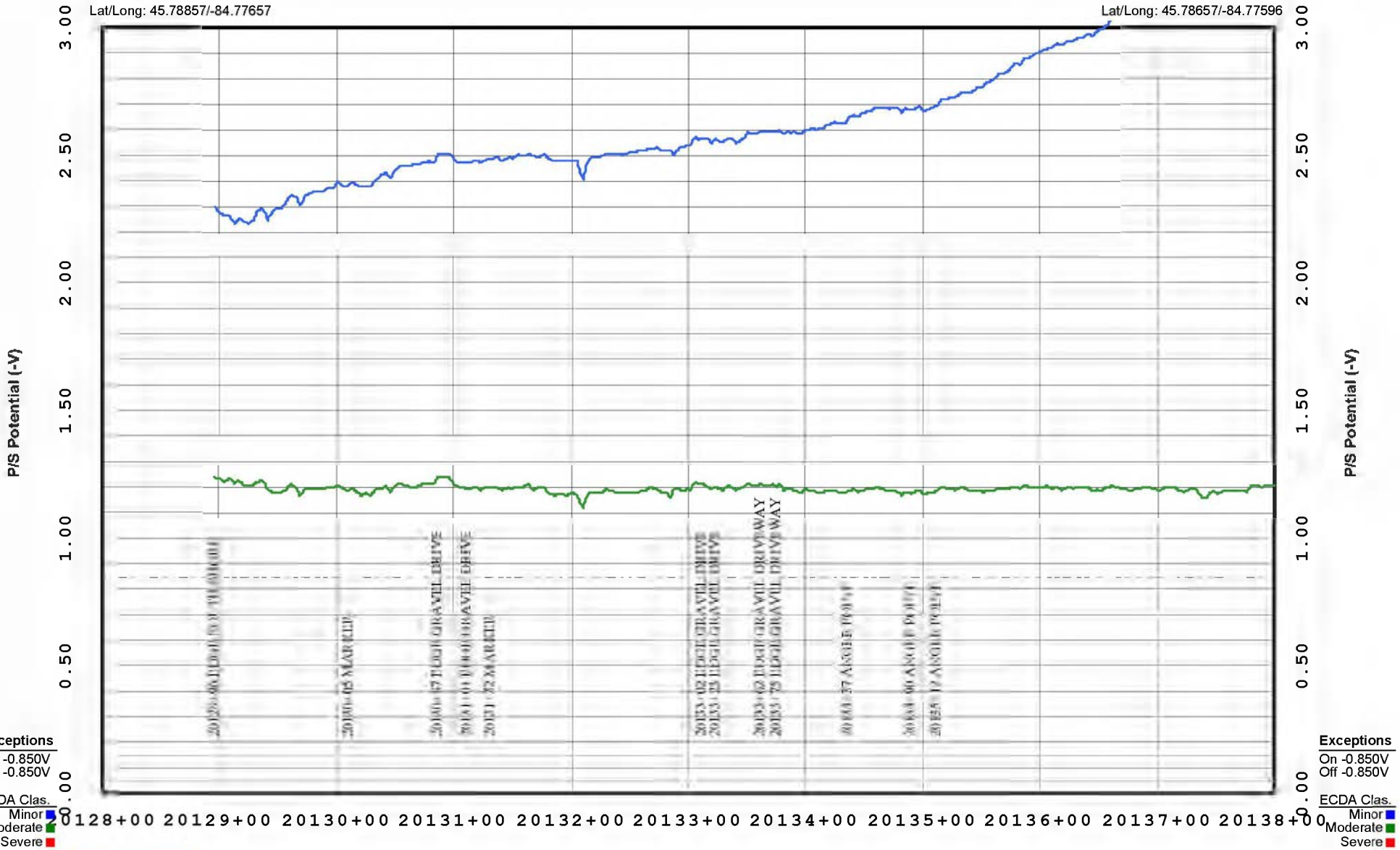
MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog	Client: ENBRIDGE	Date: 10/09/18	
	Pipeline: WEST LINE AFT	File: 4070 WEST AFT	
	On / Off	Mears Job Number. 9141883310 Page: 18 of 20	Survey Direction

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CPGLog

Client: ENBRIDGE

Pipeline: WEST LINE AFT

On

Off

Date: 09/19/18

File: 5050 S SHORE WEST LEG

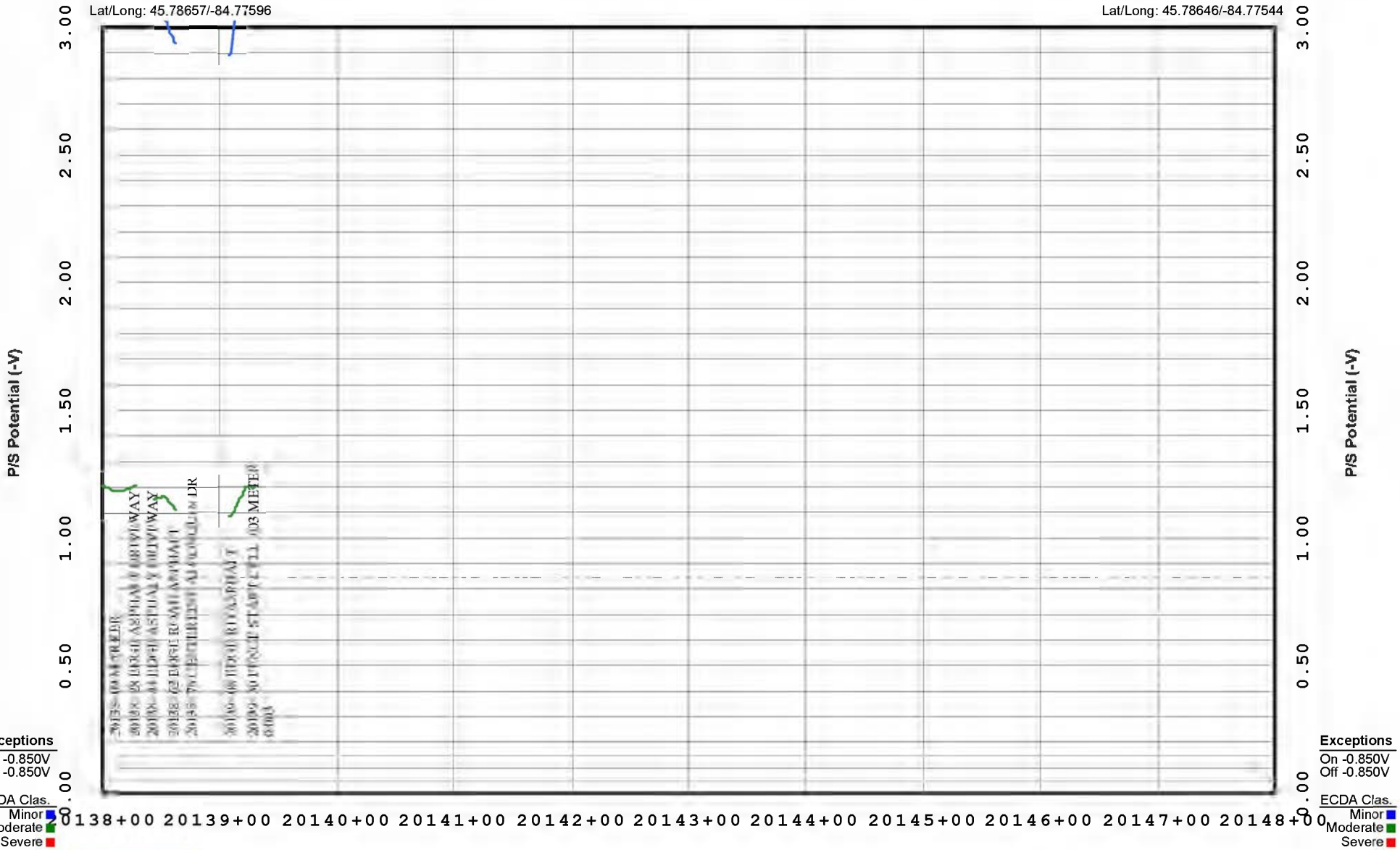
Mears Job Number. 9141883310

Page: 19 of 20

Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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CPGLog	Client: ENBRIDGE	Date: 09/19/18	
	Pipeline: WEST LINE AFT	File: 5050 S SHORE WEST LEG	
	On / Off	Mears Job Number. 9141883310 Page: 20 of 20	Survey Direction

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

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377+50
19938+00

19936+99 FENCE ENBRIDGE NORTH [illegible] STATION
19937+03 VERIFIED READS P/S:-1.[illegible] .105

19940+80 ANGLE POINT
19941+02 ANGLE POINT
19941+19 ANGLE POINT
19941+39 ANGLE POINT

19943+14 MARKER
19943+40 EAST EDGE ROAD

19943+87 CENTERLINE GRAVEL ROAD ELECTRIC CP DEEPWELL GROUNDBED TO WEST
19944+18 EDGE GRAVEL ROAD

19944+68 TEST STATION CONNECTED TO

19945+60
19945+70 CENTERLINE BOULEVARD ROAD
19945+80
19945+90 [illegible]

19946+41 BEGIN AT NORTH EDGE [illegible] AC:0.740 CELL 0.003 METER 0.000

377+75
19945+20

378+00
19946+40

MILEAGE CALCULATED FROM SURVEY STATIONING

-0.000
-0.500
-0.850
-1.000
-1.500
-2.000
-2.500
-3.000

CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850

SURVEY DIRECTION

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Copyright November, 1991

ENBRIDGE

ENBRIDGE
AFT FILE
West Line Aft

Length of RAPSheet: 3940 FEET / 0.90 MILE(S)	Date Drawn: 03/21/19
Page(s): PAGE(S) 1 OF 8	Project Number: 9141883310
Drawn By: HART SMALLEY	Project Manager: KURT LAWSON
FILE: West Line AFT.rapx	

ENBDNR0009935

378.00
1925+40

375.25
1897 +60

375.00
1892+40

MILEAGE CALCULATED
FROM SURVEY STATIONING

-2.500

-2.000

-1.500

-1.000

-0.850

-0.500

CIS SURVEY
ON
OFF

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

Project Number
914188310

Project Manager
KURT LAWSON

Drawn By
HART SMALLEY

2 OF 8

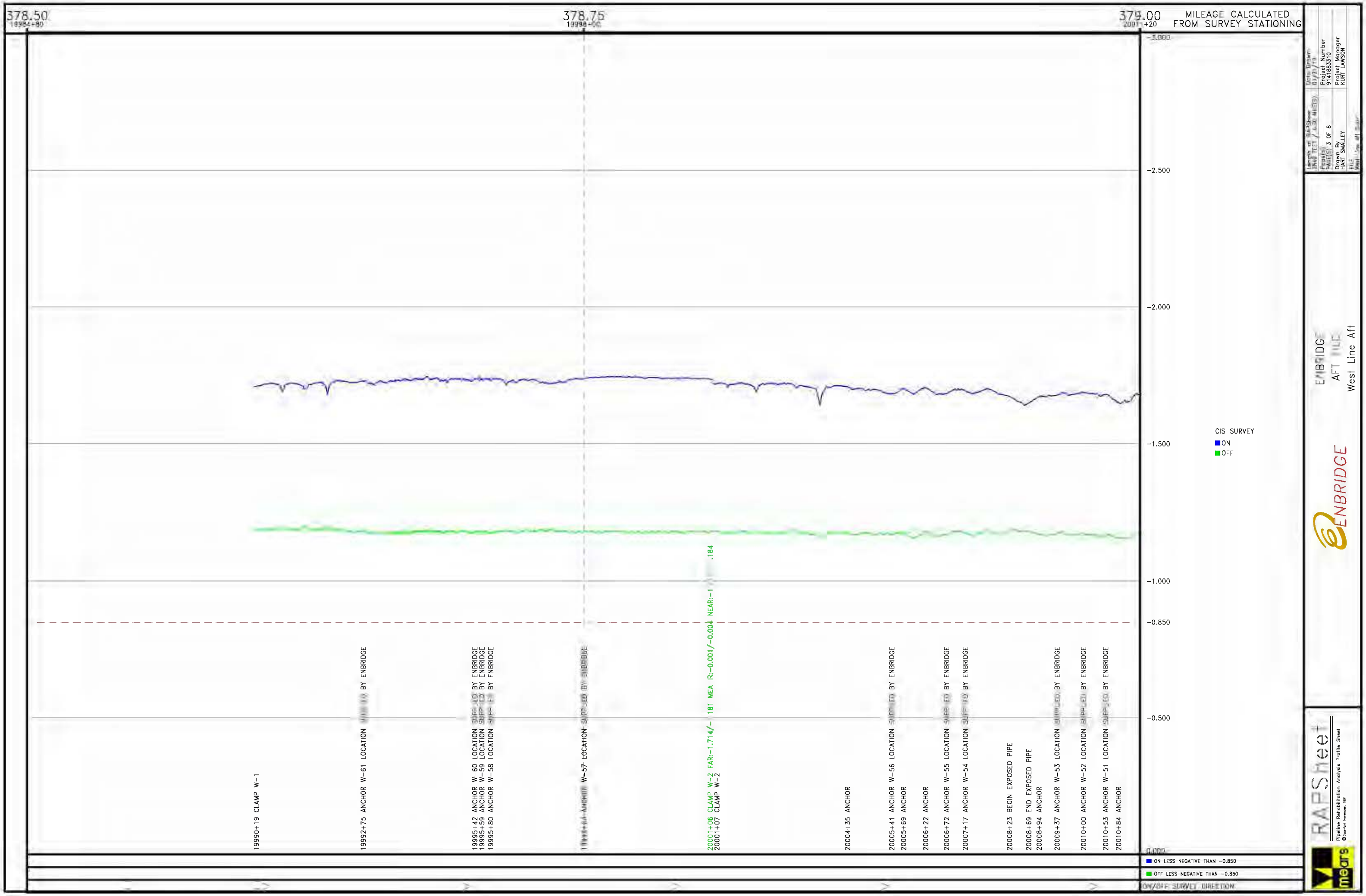
ENBRIDGE

AFT

West Line Aft

Pipeline Rehabilitation Analysis Profile Sheet

©Stantec November, 1991


378.50
19984+80
378.75
19988+00
379.00
20001+20
MILEAGE CALCULATED FROM SURVEY STATIONING
-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000
CIS SURVEY
ON
OFF
19990+19 CLAMP W-1
19992+75 ANCHOR W-61 LOCATION
19995+42 ANCHOR W-60 LOCATION
19995+59 ANCHOR W-59 LOCATION
19995+80 ANCHOR W-58 LOCATION
20001+06 CLAMP W-2 FAR:-1.714/-.181 MEA IR:-0.001/-0.004 NEAR:-1.184
20001+07 CLAMP W-2
20004+35 ANCHOR
20005+41 ANCHOR W-56 LOCATION
20005+69 ANCHOR
20006+22 ANCHOR
20006+72 ANCHOR W-55 LOCATION
20007+17 ANCHOR W-54 LOCATION
20008+23 BEGIN EXPOSED PIPE
20008+69 END EXPOSED PIPE
20008+94 ANCHOR
20009+37 ANCHOR W-53 LOCATION
20010+00 ANCHOR W-52 LOCATION
20010+53 ANCHOR W-51 LOCATION
20010+84 ANCHOR
ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION
Length of 8.5"x11" Sheet (Not To Scale)
Page(s) Number(s) 3 OF 8
Drawn By HART SMALLEY
File West Line Aft.dwg
Date Drawn 01/31/19
Project Number 9141883310
Project Manager KURT LAWSON
ENBRIDGE
AFT LINE
West Line Aft
ENBRIDGE
RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
©Dynamic Risk, 1991
Y mears

379.00
20011+20

379.25
20024+40

379.50
20037+60

MILEAGE CALCULATED FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20011+26 ANCHOR W-50 LOCATION SURVEYED BY ENBRIDGE
20011+40 ANCHOR
20011+61 ANCHOR
20011+65 ANCHOR W-49 LOCATION SURVEYED BY ENBRIDGE
20012+09 ANCHOR W-48 LOCATION SURVEYED BY ENBRIDGE
20012+16 CLAMP W-3 FAR=-1.663/-0.001/-0.003 NEAR=-1.172
20012+17 CLAMP W-3
20012+35 ANCHOR W-47 LOCATION SURVEYED BY ENBRIDGE
20015+72 ANCHOR W-46 LOCATION SURVEYED BY ENBRIDGE
20016+09 ANCHOR
20016+53 BEGIN EXPOSED PIPE
20017+15 END EXPOSED PIPE
20017+63 ANCHOR W-45 LOCATION SURVEYED BY ENBRIDGE
20018+22 ANCHOR
20029+55 ANCHOR
20031+22 ANCHOR W-34 LOCATION SURVEYED BY ENBRIDGE
20031+79 ANCHOR W-33 LOCATION SURVEYED BY ENBRIDGE
20034+02 ANCHOR W-32 LOCATION SURVEYED BY ENBRIDGE
20036+15 ANCHOR W-31 LOCATION SURVEYED BY ENBRIDGE
20036+67 ANCHOR W-30 LOCATION SURVEYED BY ENBRIDGE

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of Sheet (Not To Scale) 24" x 36" (ANSI D)
Page(s) 4 OF 8
Drawn By HART SMALLEY
File West Line Aft 4.dgn
Units Drawn 01/31/19
Project Number 9141883310
Project Manager KURT LAWSON

ENBRIDGE
AFT
West Line Aft

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Means

ENBRIDGE

ENBDNR0009938

20037+68 BEGIN EXPOSED PIPE

20038+05 END EXPOSED PIPE

20040+76 ANCHOR W-29 LOCATION SUPPLIED BY ENBRIDGE

20042+10 ANCHOR W-28 LOCATION SUPPLIED BY ENBRIDGE

20043+62 ANCHOR W-27 LOCATION SUPPLIED BY ENBRIDGE

20044+01 ANCHOR W-26 LOCATION SUPPLIED BY ENBRIDGE

20044+84 BEGIN EXPOSED PIPE

20045+43 END EXPOSED PIPE

20046+36 ANCHOR W-25 LOCATION SUPPLIED BY ENBRIDGE

20047+77 ANCHOR W-24 LOCATION SUPPLIED BY ENBRIDGE

20048+48 ANCHOR W-23 LOCATION SUPPLIED BY ENBRIDGE

20048+50 CLAMP W-5 FAR:-1.747/- IR:0.002/-0.004 NEAR:-1 .186

20048+74 CLAMP W-5

20049+25 ANCHOR W-22 LOCATION SUPPLIED BY ENBRIDGE

20050+16 ANCHOR W-21 LOCATION SUPPLIED BY ENBRIDGE

20051+37 ANCHOR W-20 LOCATION SUPPLIED BY ENBRIDGE

20051+94 ANCHOR W-19 LOCATION SUPPLIED BY ENBRIDGE

20052+69 ANCHOR W-18 LOCATION SUPPLIED BY ENBRIDGE

20053+09 ANCHOR W-17 LOCATION SUPPLIED BY ENBRIDGE

20053+44 ANCHOR W-16 LOCATION SUPPLIED BY ENBRIDGE

20053+92 BEGIN EXPOSED PIPE

20054+69 END EXPOSED PIPE

20056+02 ANCHOR W-15 LOCATION SUPPLIED BY ENBRIDGE

20056+64 ANCHOR W-14 LOCATION SUPPLIED BY ENBRIDGE

20057+91 BEGIN EXPOSED PIPE

20058+40 END EXPOSED PIPE

20059+73 END EXPOSED PIPE

20062+19 BEGIN EXPOSED PIPE

20062+73 END EXPOSED PIPE

379.50
20037+60

379.75
20050+80

380.00
20064+00

MILEAGE CALCULATED FROM SURVEY STATIONING

0.000 -0.500 -0.850 -1.000 -1.500 -2.000 -2.500 -3.000

CIS SURVEY
ON
OFF

ON/OFF SURVEY DIRECTION

ON LESS NEGATIVE THAN -0.850

OFF LESS NEGATIVE THAN -0.850

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE

ENBRIDGE
AFT FILE
West Line Aft

Length of RAPSheet: 3960 FEET / 0.50 MILE(S)	Date Drawn: 04/21/10
Page(s): PAGE(S) 5 OF 8	Project Number: 9141883310
Drawn By: HART SMALLEY	Project Manager: KURT LAWSON
File: West line Aft S.pdf	

ENBDNR0009939

380.00
20064+00

20065+02 ANCHOR W-13 LOCATION SUPPLIED BY ENBRIDGE

20066+38 ANCHOR W-12 LOCATION SUPPLIED BY ENBRIDGE

20067+57 CLAMP W-6 FAR:-1.785/-[illegible]191 MEA IR:0.001/-0.006 NEAR:-1[illegible].191
20067+58 CLAMP W-6
20067+75 ANCHOR W-11 LOCATION SUPPLIED BY ENBRIDGE

20068+31 ANCHOR W-10 LOCATION SUPPLIED BY ENBRIDGE

20068+81 ANCHOR W-9 LOCATION SUPPLIED BY ENBRIDGE

20069+26 ANCHOR W-8 LOCATION SUPPLIED BY ENBRIDGE

20072+44 BEGIN EXPOSED PIPE

20073+13 END EXPOSED PIPE

20075+49 ANCHOR W-7 LOCATION SUPPLIED BY ENBRIDGE

20076+93 ANCHOR W-6 LOCATION SUPPLIED BY ENBRIDGE

380.75
20071+20

20082+82 BEGIN EXPOSED PIPE

20084+74 ANCHOR W-5 LOCATION SUPPLIED BY ENBRIDGE

20085+28 ANCHOR W-4 LOCATION SUPPLIED BY ENBRIDGE

20086+12 CLAMP W-7 FAR:-1.798/-[illegible]177 MEA IR:0.001/-0.006 NEAR:-1[illegible].177
20086+15 CLAMP W-7

20087+62 BEGIN EXPOSED PIPE

20089+05 ANCHOR W-3 LOCATION SUPPLIED BY ENBRIDGE

380.50
20091+40

MILEAGE CALCULATED FROM SURVEY STATIONING

DIRECTION OF SURVEY

OFF LESS NEGATIVE THAN -0.850

ON LESS NEGATIVE THAN -0.850

0.000 -0.500 -0.850 -1.000 -1.500 -2.000 -2.500 -3.000

CIS SURVEY
ON
OFF

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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ENBRIDGE

ENBRIDGE
AFT FILE
West Line Aft

Length of RAPSheet: 3940 FEET / 0.30 MILE(S)	Date Drawn: 03/21/19
Page(s): PAGE(S) 6 OF 8	Project Number: 9141883310
Drawn By: HART SMALLEY	Project Manager: KURT LAWSON
File: West_line_AFT_5.prt	

ENBDNR0009940

380.50
20090+40

380.75
20105+60

381.00
20115+80

MILEAGE CALCULATED
FROM SURVEY STATIONING

-3.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20095+43 ANCHOR W-2 LOCATION SURVEYED BY ENBRIDGE

20096+03 ANCHOR W-1 LOCATION SURVEYED BY ENBRIDGE
20096+24 CLAMP W-8 FAR:-1.847/-1.195 MEA IR:-0.002/-0.006 NEAR:-1.186
20096+33 CLAMP W-8

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet (ONE TEXT / 4.30 METER)
Page(s) / Sheet(s) 7 OF 8
Drawn By HART SMALLEY
File West Line Aft.dgn

Date Drawn 03/31/19
Project Number 9141883310
Project Manager KURT LAWSON

ENBRIDGE
AFT FILE
West Line Aft

ENBRIDGE

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Years

381.00
20115+80

381.25
20130+00

381.50
20145+20

MILEAGE CALCULATED
FROM SURVEY STATIONING

-5.000
-2.500
-2.000
-1.500
-1.000
-0.850
-0.500
0.000

CIS SURVEY
ON
OFF

20123+47 END FILE HERE DUE TO WWP BREAK
20128+96 EDGE SOUTH SHORE
WWP .003
20130+87 EDGE GRAVEL DRIVE
20131+01 EDGE GRAVEL DRIVE
20131+32 MARKER
20133+02 EDGE GRAVEL DRIVE
20133+23 EDGE GRAVEL DRIVE
20133+62 EDGE GRAVEL DRIVEWAY
20133+75 EDGE GRAVEL DRIVEWAY
20134+37 ANGLE POINT
20134+90 ANGLE POINT
20135+12 ANGLE POINT
20138+09 MARKER
20138+28 EDGE ASPHALT DRIVEWAY
20138+44 EDGE ASPHALT DRIVEWAY
20138+62 EDGE ROAD ASPHALT
20138+78 CENTERLINE ALGONQUIN DR
20139+08 EDGE RD ASPHALT
20139+30 FENCE START CELL .003 WWP .003

ON LESS NEGATIVE THAN -0.850
OFF LESS NEGATIVE THAN -0.850
ON/OFF SURVEY DIRECTION

Length of RAPSheet: 3840 FEET / 1170.30 METER
Page(s): 8 OF 8
Drawn By: HART SMALLEY
File: West Line Aft.sur
Date Drawn: 03/31/19
Project Number: 914883310
Project Manager: KURT LAWSON

ENBRIDGE
AFT FILE
West Line Aft

RAPSheet
Pipeline Rehabilitation Analysis Profile Sheet
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Mears

ENBRIDGE

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials Less Negative than -0.850 Volt

Enbridge

West Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
			NO OFF READS LESS NEGATIVE -0.850 V					
	Total Feet	0						

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Mears Project Number: 9141883310

MearsDP V5.33.0 MEARS-3B4NTR1 # HSMALLEY c:\users\hsmalley\desktop\en bridge\final integrated files\west\aft\west aftfinal.cdb

*4500 N. Mission * Rosebush, MI 48878 * (800) 632-7727 * www.mears.net*

Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

West Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19937+65	19945+92	827	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8413581518	-84.7551946854	45.8402225571	-84.7571850036
19945+95	19946+42	47	OFF READS MORE NEGATIVE -1.200 V	09/15/18	45.8402139427	-84.7571885421	45.8400819793	-84.7572428775
19990+85	19990+87	2	OFF READS MORE NEGATIVE -1.200 V	09/14/18	45.82753248	-84.76199026	45.8275277400	-84.7619922933
19991+39	19991+43	4	OFF READS MORE NEGATIVE -1.200 V	09/14/18	45.82736939	-84.76206730	45.8273594950	-84.7620720150
19991+92	19991+95	3	OFF READS MORE NEGATIVE -1.200 V	09/14/18	45.82721201	-84.76214724	45.82720272	-84.76215231
20057+48	20058+23	75	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8087563740	-84.7690146500	45.80854236	-84.76909057
20060+97	20061+05	8	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8077624800	-84.7693742020	45.8077405280	-84.7693825660
20062+16	20062+33	17	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8074252500	-84.7695022450	45.8073766040	-84.7695207200
20063+13	20063+29	16	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8071501160	-84.7696067280	45.8071040333	-84.7696242167
20064+23	20064+34	11	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8068377500	-84.7697253000	45.8068065700	-84.7697371450
20064+57	20064+67	10	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8067415700	-84.7697618217	45.8067129267	-84.7697726833
20065+49	20065+70	21	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8064804550	-84.7698609550	45.8064204100	-84.7698837550
20066+54	20066+93	39	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8061822933	-84.7699741317	45.8060704260	-84.7700201700
20070+19	20070+25	6	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.8051740720	-84.7703403820	45.80515838	-84.77034647
20094+64	20094+70	6	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.79826084	-84.77292450	45.79824570	-84.77292982
20094+78	20094+81	3	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.7982209520	-84.7729385200	45.7982129333	-84.7729413333
20095+27	20095+28	1	OFF READS MORE NEGATIVE -1.200 V	09/18/18	45.79808289	-84.77298711	45.7980799740	-84.7729881320
20096+43	20097+39	96	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79776173	-84.77313847	45.79748628	-84.77320634
20097+70	20098+09	39	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7973977040	-84.7732344880	45.7972874220	-84.7732696560
20098+16	20098+20	4	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7972675680	-84.7732770240	45.7972562280	-84.7732814940
20098+29	20103+02	473	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7972306800	-84.7732915020	45.79589669	-84.77381507
20103+05	20104+07	102	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7958882240	-84.7738184180	45.7956018840	-84.7739291980
20104+14	20104+19	5	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79558165	-84.77393703	45.7955667060	-84.7739428160
20105+20	20105+76	56	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7952835433	-84.7740523100	45.79512578	-84.77411330
20105+77	20109+09	332	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7951224340	-84.7741145980	45.79418407	-84.77447580
20109+34	20109+64	30	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7941148183	-84.7745021300	45.7940292280	-84.7745346960
20110+48	20110+90	42	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7937917340	-84.7746249980	45.7936741920	-84.7746697220

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Exception Report with GPS

Exception Report of Off Pipe to Soil Potentials More Negative than -1.200 Volts

Enbridge

West Line Aft

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Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
20111+12	20118+02	690	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.79361109	-84.77469372	45.7916612540	-84.7754352380
20118+20	20123+48	528	OFF READS MORE NEGATIVE -1.200 V	10/09/18	45.7916107920	-84.7754544340	45.7901282101	-84.7760314380
20128+96	20129+41	45	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.788571949	-84.776572886	45.7884426497	-84.7766196232
20129+60	20129+66	6	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7883880567	-84.7766393567	45.7883708168	-84.7766455883
20129+98	20130+05	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7882788460	-84.7766787952	45.7882585599	-84.7766858663
20130+41	20130+43	2	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7881542315	-84.7767222323	45.7881484355	-84.7767242527
20130+50	20130+65	15	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7881281494	-84.7767313238	45.7880846792	-84.7767464763
20130+68	20131+05	37	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7880759852	-84.7767495068	45.7879692194	-84.7767842609
20131+19	20131+20	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7879302065	-84.7767983848	45.7879274199	-84.7767993937
20131+28	20131+29	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7879051268	-84.7768074645	45.7879023401	-84.7768084733
20131+54	20131+59	5	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7878326743	-84.7768336947	45.7878187411	-84.7768387390
20131+60	20131+67	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7878159545	-84.7768397478	45.7877964480	-84.7768468098
20133+04	20133+18	14	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7874027181	-84.7769916981	45.7873623008	-84.7770060412
20133+23	20133+24	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7873478660	-84.7770111637	45.7873449790	-84.7770121883
20133+33	20133+37	4	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7873189964	-84.7770214088	45.7873074486	-84.7770255068
20133+47	20133+80	33	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7872785790	-84.7770357519	45.7871827027	-84.7770635519
20135+16	20135+17	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7868278786	-84.7770635101	45.7868264712	-84.7770607545
20135+85	20135+92	7	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867801856	-84.7767890206	45.7867760047	-84.7767600516
20135+94	20136+09	15	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867748102	-84.7767517747	45.7867658511	-84.7766896982
20136+58	20136+66	8	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7867109565	-84.7764999800	45.7866993441	-84.7764703565
20136+89	20136+92	3	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7866659585	-84.7763851890	45.7866616038	-84.7763740802
20137+79	20138+04	25	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7865850640	-84.7760434503	45.7865695023	-84.7759473459
20138+26	20138+29	3	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7865497451	-84.7758603428	45.7865468077	-84.7758483812
20139+23	20139+27	4	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7864627376	-84.7754742007	45.7864597573	-84.7754573049
20139+29	20139+30	1	OFF READS MORE NEGATIVE -1.200 V	09/19/18	45.7864582671	-84.7754488570	45.786457522	-84.775444633
	Total Feet	3738						

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CIS Skip Report with GPS

Report of any skips in the data with GPS

Enbridge

West Line Aft

Mears Group, Inc.
A QUANTA SERVICES COMPANY

Beginning Survey Stationing	Ending Survey Stationing	Feet	Comments	Region	Date	Beginning Latitude	Beginning Longitude	Ending Latitude	Ending Longitude
19946+42	19990+18	4377	BEGIN AT NORTH EDGE WATER AC:0.740 CELL 0.003 METER 0.000; CLAMP W-1		/ /	45.8400819793	-84.7572428775	45.8277210847	-84.7618792505
20019+52	20029+54	1003	ANCHOR		/ /	45.8194569489	-84.7649735786	45.8166502411	-84.7659040414
20123+48	20128+95	548	END FILE HERE DUE TO WIRE BREAK; EDGE SOUTH SHORE		/ /	45.7901282101	-84.7760314380	45.7885747889	-84.7765718980
20138+29	20138+43	15	EDGE ASPHALT DRIVEWAY; EDGE ASPHALT DRIVEWAY		09/19/18	45.7865468077	-84.7758483812	45.7865331002	-84.7757925606
20138+63	20139+07	45	EDGE ROAD ASPHALT; CENTERLINE ALGONQUIN DR; EDGE RD ASPHALT		09/19/18	45.7865136148	-84.7757129074	45.7864747962	-84.7755414566

Total Feet 5988

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