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Enbridge Line 6B MP 608
Marshall, MI Pipeline Release

Kalamazoo River Residual Oil Monitoring and Maintenance Work Plan

Prepared for Michigan Department of Environmental Quality

Enbridge Energy, Limited Partnership

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FIGURES

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LIST OF ACRONYMS

cfs	Cubic Feet Per Second
cm	Centimeter
Enbridge	Enbridge Energy, Limited Partnership
ft.	Feet
GPS	Global positioning system
HASP	Health and Safety Plan
Line 6B	The pipeline owned by Enbridge Energy, Limited Partnership that runs just south of Marshall, Michigan
LDB	Left Descending Bank
MDEQ	Michigan Department of Environmental Quality
MP	Mile Post
OHWM	Ordinary High Water Marks
PNAs	Polynuclear Aromatic Hydrocarbons
RDB	Right Descending Bank
Rule 50	Rule 323.1050, from the Part 4 Water Quality Standards for Part 31 of Public Act 451 of 1994, as amended.
SHC	Saturated Hydrocarbons
Sheen SOP	*Sheen Differentiation Methods – SOP*
sq. ft.	Square Feet
TEH	Total Extractable Hydrocarbons
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Work Plan	*Kalamazoo River Submerged Oil Monitoring and Maintenance Work Plan*

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1.0 INTRODUCTION

This *Kalamazoo River Residual Oil Monitoring and Maintenance Work Plan* (Work Plan) is designed to address the monitoring and maintenance of residual oil in the Kalamazoo River. In addition, the Work Plan is designed to transition monitoring and maintenance activities of residual oil locations from the United States Environmental Protection Agency (U.S. EPA) to the Michigan Department of Environmental Quality (MDEQ).

This Work Plan outlines activities for monitoring and maintaining areas where sheen has been observed or may have the potential to occur throughout the Kalamazoo River.

1.1 Background

On July 26, 2010, Enbridge Energy, Limited Partnership (Enbridge) discovered a release of crude oil from the pipeline owned by Enbridge that runs just south of Marshall, Michigan (Line 6B) in the vicinity of its pump station. The Enbridge Line 6B crude oil release occurred below grade level via a break in the pipeline at Mile Post (MP) 608, which eventually emerged onto the ground surface, flowed over land following the natural topography into Talmadge Creek, and proceeded to flow downstream into the Kalamazoo River. Following the release, Enbridge performed extensive response activities under the direction of the U.S EPA and the MDEQ to remove oil from Talmadge Creek and the Kalamazoo River system.

As part of the response activities, monitoring of sheen has been conducted along the Kalamazoo River from the confluence with Talmadge Creek to the Morrow Lake Dam. Monitoring of sheen along the Kalamazoo River has been performed since shortly after the Enbridge Line 6B crude oil release in July 2010 as part of continuing operation and maintenance activities. Sheen monitoring has been performed on a daily basis by air, water, and/or land, as appropriate, and sheen has been periodically tested using the various methods to determine the nature of the identified sheen (i.e., biogenic or oil). Observations of sheen, including location, area, and type have been recorded and documented. Historically (generally when the sheen covered 100 square feet (sq. ft.) or greater), sheen response crews have been dispatched to remove the observed oil sheen. In general, sheens have been monitored and characterized through the use of situational awareness,

poling activities, and sediment trap monitoring. Situational awareness included visual observation along the entire Kalamazoo River including public use areas and bridges.

Poling, a technique involving the agitation of soft sediment and visual observation of resultant sheening and globule coverage has been conducted on transects riverwide and within specific focus areas since 2010. Since 2010 poling activities have been conducted as annual reassessments to monitor potential submerged oil throughout the Kalamazoo River.

As a continuation of the response to the July 2010 Line 6B crude oil release, a total of 17 sediment trap locations have been monitored since 2012. Sediment trap monitoring has included the collection of bathymetry data, poling observations, and sediment samples for fingerprint analysis in accordance with the approved *Sediment Trap Monitoring and Maintenance Plan* submitted to the U.S. EPA, dated July 10, 2012 (Enbridge, 2012a). A subset of seven of these natural and anthropogenic depositional locations was chosen, in consultation with the U.S. EPA and United States Geological Survey (USGS), for the enhancement of natural trapping capabilities through the installation of sediment trap structures. "Sediment trap structures" consist of conifer tree structures placed in-channel to enhance the natural trapping and settling that takes place in these depositional geomorphic settings. One of the historic sediment traps (Ceresco Dam) has been removed and is currently in the process of final restoration. These activities have caused an increase of downstream sediment transportation. Enbridge will provide evaluation of existing efforts and potential proposed enhancements for MDEQ review by July 17, 2014.

1.2 Objective and Purpose

The objective of this Work Plan is to monitor and maintain select sediment traps, monitor historic and newly identified petroleum sheen locations, and conduct annual poling at chosen focused locations. The purpose of monitoring these locations is to visually observe, evaluate, recover (as appropriate), and document occurrences of petroleum sheen to demonstrate compliance with Rule 323.1050, from the Part 4 Water Quality Standards for Part 31 of Public Act 451 of 1994, as amended (Rule 50). This information will be used to assess the existence of potential trends in sheen observations and facilitate a comparison of observed sheen locations and the location and timing of public use along the Kalamazoo River. In addition, the sediment traps will be evaluated to determine their effective capacity based on the ability to collect and retain sediment.

1.3 Health and Safety Requirements

An Enbridge *Health and Safety Plan – Revision 7* submitted to the U.S. EPA and MDEQ, dated April 30, 2013 (HASP) (Enbridge, 2013a) has been developed to present a consolidated set of rules, safe work practices, and procedures related to the Enbridge Line 6B response activities. Enbridge site-specific training will address health and safety, and provide guidance in order to prevent incidents and injuries to site workers. The site-specific training is required by all contractors who will be working on-site. All contractors will ensure each worker has completed the Enbridge health and safety training prior to work commencing.

It will be the responsibility of the worker to be familiar with the procedures outlined within this work plan, with site-specific procedures, the current site-specific HASP, work plans and standard operating procedures under which the work will be conducted, and proper data collection and documentation of response activities.

2.0 OBSERVATION METHODS

Sheen observations will be conducted along the Kalamazoo River from the confluence with Talmadge Creek to the Morrow Lake Dam. Observations will be conducted through monitoring of previously identified sheen management locations, new reports of sheen, public parks on the river, public boat launches, and sediment trap locations. The monitoring frequency at these locations is detailed in the subsequent sections. In addition, Enbridge has established and maintains a hotline number for the public to communicate their concerns to Enbridge regarding sheen occurrences. This hotline has been available throughout the response activities and remains available. Enbridge continues to encourage the public to use the hotline to report any perceived sheen occurrences related to the Line 6B crude oil release. The Enbridge Marshall Information Hotline is: 1-800-306-6837. The sheen monitoring methods are described in *Section 2.1*. An annual poling survey will be conducted to observe the occurrence of sheen when sediment throughout the Kalamazoo River is agitated using the poling technique. Annual poling surveys will be conducted during the summer months of July and August. The poling methods are described in *Section 2.4*.

2.1 Sheen Monitoring Methods

The Kalamazoo River, from its confluence with Talmadge Creek to Morrow Lake Dam (MP 39.85) will be monitored by water and/or land, as appropriate, on a weekly basis in accordance with the *Sheen Differentiation Methods – SOP* (Sheen SOP) provided in *Attachment A*. The Sheen SOP has been modified from the approved *Sheen Differentiation Methods – SOP EN-205* dated May 3, 2012 (Enbridge, 2012b) to update the sheen identification tests for this Work Plan. In general, the six chosen sediment traps, the Mill Ponds area, the Morrow Lake Delta and Morrow Lake following the dredge will be monitored through the use of boats while boat launches, public parks on the river, and select bridges will be monitored by land. In addition, sheen observations reported by the public through the use of the Enbridge Marshall Information Hotline, or any other source, will be evaluated during monitoring events. As the monitoring program progresses, these methods may be altered in concurrence with the MDEQ. The MDEQ will be notified the week prior to conducting monitoring events to allow for appropriate planning of MDEQ oversight. *Figure 1* depicts the locations of the boat launches, public parks, and select bridges that will be used for sheen monitoring by land and by water. *Table 1* lists all of the 2013 sheen observations, a subset of this table was used to determine additional areas to be monitored by water. The information collected during these activities will be recorded on the monitoring/response form(s) (*Attachment B*). A sheen monitoring evaluation process flow chart is provided in *Attachment C.* During monitoring, crews will:

- Observe and document the following river characteristics at each monitoring location:
    - Geomorphic setting (e.g., cut bank, point bar, back channel, oxbow, etc.).
    - Sediment and Water temperature (when monitoring by boat).
    - Public use potential will be evaluated (e.g., High, Medium, and Low, etc.) based on if the sheen observation locations are likely to be accessed by the public. The methods used in determining the public use potential are described in *Section 2.1.1*.
- Observe the following additional characteristics if sheen is observed:
    - Water level (general site observation and actual elevation from nearest gauging station),
    - If possible, collect global positioning system (GPS) coordinates of the sheen observations,

- If GPS points are offset due to limited access (i.e., shallow water, excessive thickness of soft sediment) then notes will be included in the data collection,
- If possible, determine potential sheen origin or release mechanism and the direction and distance of travel,
- Perform visual observation for the presence and area (sq. ft.) of sheen, and
- If possible, determine the type of sheen (biogenic or oil) using the stick test and if required, a jar shake test.

2.1.1 Public Usage Rankings

Each public use area will be evaluated and assigned a usage ranking based upon accessibility and potential activity. The usage rankings will be recorded on the monitoring/response form as “high”, “moderate”, or “low”. For instance, access points such as boat ramps or cultural sites (e.g. historic bridge park, known swimming areas) will be given a “high” ranking; parks or public lands will be given high to medium rankings depending on field evaluation; bridges will be given medium to low usage rankings based upon field observations.

2.1.2 Sheen Sampling

If observed sheen is greater than 100 sq. ft., a sheen sample may be collected (at the discretion of Enbridge) by Enbridge personnel to help identify the potential source of the observed oil sheen. The collected sheen sample would be analyzed for the following:

- Polynuclear aromatic hydrocarbons (PNAs) by gas chromatography/mass spectrometry selected ion monitoring:
  - Extended PNA list: PNA_{34}, including parent and alkyl homologues and
  - Petroleum Biomarkers: terpenes, hopanes, and cholestanes.
- Saturated hydrocarbons (SHC) and total extractable hydrocarbons (TEH) by gas chromatography/flame ionization detector:
  - SHC: alkanes/isoprenoids and
  - TEH: n-C9 through n-C44.

2.1.3 Sheen Recovery

If the observed oil sheen is equal to or greater than 100 sq. ft., the oil sheen will be removed using hand skimming or sweeping techniques and will be revisited three consecutive days. If the oil sheen is less than 100 sq. ft. it may also be removed at the discretion of the sheen

monitoring team. Alternate techniques, such as a sweep boat, may be implemented based on the area of oil sheen observed and site conditions. An evaluation will be conducted to determine if additional sheen collection or possible use of containment may be necessary to minimize downstream migration of observed sheen.

Sheen monitoring and potential recovery will be discontinued at a particular location following evaluation of recurring data that determines the sheen is either biogenic, or three consecutive fingerprint samples determine the sheen is not Line 6B crude oil and upon written concurrence by the MDEQ. Sheen determined to be biogenic based on the results of the sheen differentiation testing in accordance with the Sheen SOP will not be recovered.

Sheen monitoring and possible recovery detailed in *Section 2.1* will generally be conducted between the months of May and October.

2.2 Annual Poling Survey

Annual poling surveys will be conducted in July and August when water and sediment temperatures reach and/or exceed and remain 60°F or above in accordance with the *Sediment Poling Standard Operating Procedure* submitted to the U.S. EPA, dated May 22, 2013 (Enbridge, 2013b) provided as *Attachment D*.

As described in Section 2.3, based upon an evaluation of sediment accumulation in the MP 10.4 sediment trap, an additional round of poling will be conducted in the MP 10.4 sediment trap if significant sediment has accumulated. This poling will be conducted in accordance with the guidelines described in the preceeding paragraph.

Poling surveys have been conducted annually in 2010, 2011, 2012, and 2013. The results of the historic poling activities, depicted on *Figure 2*, are categorized as ‘none’, ‘light’, ‘moderate’, or ‘heavy’. Approximately 700 focus areas from the 2013 poling survey, also depicted on *Figure 2,* have been identified along the Kalamazoo River based on past poling results, geomorphic setting, depositional environment, and other information.

The 2014 poling focus areas will incorporate every location within the Kalamazoo River where a ‘moderate’ or ‘heavy’ result was identified during the 2012 and 2013 annual surveys. In addition, all transects that were monitored in 2013 will be included in the 2014 annual survey. Additional poling transects were added in the engineered channel upstream

of Ceresco Dam. Any areas determined to be "dry" or located in the overbank at the time of poling will not be poled.

Figure 3 shows the 2014 focus poling locations and transects which were chosen based upon the 2012 and 2013 poling data. The poling data shown is inclusive of the following:

- E 4.0 Boom Monitoring (Rounds 1 through 6),
- Morrow Lake Delta Monitoring (Rounds 1 through 7),
- Morrow Lake Monitoring (Rounds 1 through 7), and
- Sediment Trap Monitoring (Rounds 1 through 4, 3A and 4A).

The 2014 poling survey is planned to begin in July of 2014 and will incorporate areas below the 35th Street Bridge upon completion of the dredge activities. Poling will be conducted in the six sediment traps during the annual poling event. Prior to conducting an annual poling event, maps showing historic focus poling locations and results will be submitted to the MDEQ within the end of year report evaluation. The 2014 results will be discussed and evaluated by the MDEQ and Enbridge for concurrence on the target number and geographic arrangement of the final subset of locations to be visited during subsequent annual poling events.

Target poling points will be excluded if they are located in areas of the former Ceresco Impoundment that are now considered overbank and dry due to the removal of the Ceresco Dam.

The information collected during the annual poling surveys will be summarized in a poling survey report including tables, and figures to be submitted for review and approval to the MDEQ within 30 days following the completion of the entire annual poling event. Any recommendations for future assessments will be submitted in the end of year report evaluation.

2.3 Sediment Trap Monitoring and Evaluation

As a continuation of the response to the July 2010 Line 6B crude oil release, a total of 17 sediment trap locations have been monitored since 2012. As part of the transition from the existing sediment trap maintenance and monitoring program (created with U.S. EPA oversight) to a program overseen by MDEQ starting in 2014, a reduced number of

representative sediment traps will be monitored and maintained, as detailed in *Section 2.3.1*. The MDEQ and Enbridge have concurrence to monitor a subset of 6 of the 17 sediment traps going forward.

A subset of two of these six sediment traps, MP 14.75 right descending bank (RDB) and MP 19.25 left descending bank (LDB), were chosen in consultation with the U.S. EPA and USGS, for the enhancement of natural trapping capabilities through the installation of man-made sediment trap structures. "Sediment trap structures" are structures made out of largely intact conifer trees placed in-channel to enhance the natural trapping and settling that takes place in these depositional geomorphic settings. A sediment trap structure is located at MP 14.75 RDB at the downstream end of the sediment trap. Also, MP 19.25 LDB contains two sediment trap structures with one located at the upstream end and one located at the downstream end of the sediment trap. A typical sediment trap structure construction detail is shown on *Figure 4*. Sites were selected for sediment trap structure placement based upon the results of hydraulic calculations in addition to 2-dimensional hydrodynamic modeling of representative flow scenarios. The sediment traps were monitored monthly with bathymetry collected on a quarterly basis.

2.3.1 Sediment Trap Locations

A total of six sediment trap locations have been selected for continued evaluation from areas within various geomorphic features along the Kalamazoo River. This subset of six locations was selected based on the following criteria:

- Accessibility: Site accessibility was determined based on property access for monitoring and potential response actions to minimize the amount of impact to regulated wetlands,
- Geomorphology: Geomorphic locations were determined through mapping and modeling to confirm that the trap is a depositional area containing soft sediment, and
- Bathymetry: Historical bathymetry has been evaluated from five rounds of bathymetry to assess that the areas accumulate soft sediment.

The sediment trap locations agreed upon between Enbridge and MDEQ are as follows:

- MP 10.40 North,
- MP 10.50 Left 2,
- MP 14.75 RDB,

- MP 19.25 LDB,
- MP 21.50 RDB, and
- MP 37.75 Island.

Figure 4 shows the six sediment trap locations chosen based on the above criteria. Sediment trap locations will be monitored, via land and water as appropriate on a weekly basis (as a part of the weekly sheen monitoring task identified in *Section 2.1*) to monitor sheen and a maximum of four events for bathymetry data collection**.** The four bathymetry events scheduled will begin in the spring as soon as weather and river flows safely allow teams to access the sediment traps and include a winter event prior to winter ice formation. Also, the four bathymetry events scheduled may be altered depending on flows that exceed 1,500 cubic feet per second (cfs) as outlined in *Section 2.3.5*.

2.3.2 Sediment Trap Monitoring

At each of the six sediment trap locations, an initial monitoring survey will be conducted. The monitoring event will begin at sediment trap MP 10.4 and proceed down river or as appropriate. Prior to implementing any sediment trap monitoring events the MDEQ will be notified at least one week in advance to allow for oversight planning. This data will be collected and used to determine the size and shape of the geomorphic feature as well as to determine changes within the geomorphic features during subsequent monitoring activities. The monitoring survey data as well as the post-dredge verification bathymetry data will serve as a baseline for subsequent monitoring events and will include the following detailed field mapping as described:

- Determine the Ordinary High Water Mark (OHWM) where applicable,
- Measure channel width,
- Measure channel length,
- Measure depth of water,
- Classification and description of the geomorphic setting,
- Global positioning system location of the sediment trap structure and aerial extent of the sediment trap boundary,
- Recover sheen generated during monitoring activities, and
- Measuring the length, width, and height of the installed sediment trap structures, where applicable, and the depth below the water surface.

The 2014 monitoring objectives for each of the six sediment traps are as follows:

- Monitor weekly for sheen observations identified in *Section 2.1*,
- Recover sheen generated during monitoring activities identified in *Section 2.1*,
- Conduct poling during the annual poling event identified in *Section 2.2*,
- Determine the potential total capacity of the sediment traps as well as the effective capacity for the period observed through evaluation of bathymetry baseline data, subsequent bathymetry rounds, and proximity of the sediment bed elevations to the OHWM,
- Measure the fluctuations of the sediment bed elevations within the six sediment traps via four annual bathymetric survey events starting in the spring, and
- Determine if maintenance is necessary to preserve the sediment trap structures or the capacity of the sediment traps.

The total capacity of the sediment traps will be determined by multiplying the mapped aerial extent by the average difference between post dredge bed elevation and the OHWM. The effective capacity will be 50 % of the total capacity.

Dredging activities were conducted in 2013 at sediment traps MP 10.40 N, MP 10.50 L2, MP 14.75 RDB, and MP 21.50 RDB. Upon the completion of the dredge, bathymetry measurements were collected at each location to verify the final depth of the dredge. For these locations, the baseline elevation for future monitoring will be the recorded elevation collected during this activity. In addition, because dredge activities were not conducted throughout the entire footprint of each sediment trap, additional bathymetry will be collected during 2014 in the areas that were not dredged and included to complete the baseline bed elevation for all of the dredged sediment traps.

Dredging activities are planned to be conducted during 2014 within the MP 37.75 LDB sediment trap. Upon completion of dredge activities bathymetry will be conducted at predetermined locations to verify final depth of the dredge. This bathymetry along with additional bathymetry collected in areas not dredged during 2014 will be used as the baseline bed elevations for this sediment trap.

Since dredge activities were not conducted at the MP 19.25 LDB sediment trap a uniform grid pattern will be generated for consistency of bathymetry data collection. *Figure 5* shows the evenly spaced grid pattern and the dredged areas. The results of the monitoring will be

documented and provided to the MDEQ following the completion of data collection as outlined in *Section 3.0*.

2.3.3 Sediment Trap Sheen Monitoring

Each sediment trap location shown on *Figure 5* will be monitored once per week for a 20 minute time period for potential sheen observations. If sheen is observed, a sheen test will be conducted in accordance with the Sheen SOP as outlined in *Section 2.1*. Observations that will be documented in the field include:

- Weather conditions (e.g., temperature of air and water, wind, overcast, etc.),
- The presence or absence of sheen,
- Description of sheen (e.g., color, associated globules, etc.),
- Specific location of the sheen within the sediment trap,
- Approximate areal extent of sheen,
- Determine if the sheen is biogenic or oil sheen using the stick test, and
- Any other information that can possibly identify the source.

Any sheen observations will be documented on a field form shown in *Attachment A*. If sheen is observed at any of the monitored sediment traps and covers more than 100 sq. ft. of surface area, or is generated during bathymetry monitoring activities, sheen collection will be conducted to minimize potential downstream migration as discussed in *Section 2.1.1*. In addition, if the observed sheen covers more than 100 sq. ft. of surface area, a return visit will be scheduled the following day. If sheen is observed on more than 100 sq. ft. of surface area three consecutive days in a row during this monitoring event, an action plan will be developed and submitted to MDEQ. A sample of the sheen may be collected for subsequent laboratory analysis as outlined previously in *Section 2.1*.

2.3.4 Bathymetry Measurements

Beginning at sediment trap MP 10.4, bathymetry measurements will be conducted four times at an evenly spaced interval beginning in July 2014. Preliminary bathymetry measurements were collected in June 2014 and will be provided to MDEQ. The timing and frequency of the bathymetry events will be modified, depending on flow rates as discussed in *Section 2.3.5*, through discussions with the MDEQ with the intent of optimizing the observance of sediment movement related to flow conditions. If sheen is generated during bathymetry data collection, the sheen will be recovered as discussed in *Section 2.1.1*. The purpose of the

bathymetry measurements is to document possible changes in sediment bed elevations and to identify the gross variation of sediment deposition or erosion within the sediment traps. These measurements will be conducted at the same locations if data was collected during post-dredge verification in the 2013 field seasons. The spatial extent for the predetermined verification points will be uniform across the entire sediment traps. The verification points have been determined by using a grid pattern with a spacing of approximately 25 feet (ft.) between verification points. At each of the verification points, the bathymetry will be measured with a Trimble S6 Robotic Total Station, 1 arcsecond Robotic Total Station, and Trimble TSC3 data collector, or equivalent units to gather vertical (1 centimeter (cm) accuracy) and horizontal (2 cm accuracy) coordinates. Bathymetry data collection will occur from bankfull to bankfull, with a number of survey points evenly spaced and appropriate to the size of each sediment trap. The spacing between bathymetry points will be no greater than 25 ft. apart. Bathymetry will be collected along the banks to identify slope breaks with three survey points within the geomorphic features. The spacing of the verification points may be decreased to no less than 10 ft. apart to avoid possible data gaps within the sediment bed as necessary. The data collected at each survey point will include the above mentioned criteria (i.e., depth of water). The target bathymetry verification points are shown on *Figure 5.*

2.3.5 Additional Bathymetry Frequency

The four bathymetry events will be adjusted, in consultation with the MDEQ, following storm events to evaluate if significant deposition/erosion is correlated with storm driven increases in river discharge. When flows exceed 1,500 cfs, as measured at the USGS Kalamazoo River at Battle Creek gauge (USGS 04105500), additional surveys may take place depending on the time frame between previous or subsequent bathymetry rounds. A flow rate of 1,500 cfs was chosen based upon a review of the historic flow rates observed at the USGS Kalamazoo River at Battle Creek gauge station during the past eight seasons.

3.0 MAINTENANCE AND REMOVAL OF SEDIMENT

A site-specific plan will be developed if removal of sediment is agreed upon by Enbridge and the MDEQ as the most prudent management strategy based on the process outlined below. The schedule for sediment removal will also be determined through discussions between MDEQ and Enbridge at such a time that sediment removal is agreed upon as the necessary course of action. The discussion and evaluations to determine sediment removal will take

into account the amount of deposited/eroded sediment within the sediment traps (as determined by the annual data), the amount of 'moderate' and 'heavy' poling results observed annually, the distance upstream of a sediment trap where 'moderate' and 'heavy' poling results, sheen observations and the potential for compliance in accordance with Rule 50. The evaluation process is outlined in a flow chart provided in *Attachment E*.

The sediment trap structures will be evaluated to determine their effectiveness and if maintenance, enhancement, or removal is required. An evaluation report will be submitted to MDEQ as outlined in *Section 4.4* and *Section 5.0*. The MDEQ and Enbridge will discuss the results of the evaluation report to determine the appropriate response to address these potential triggers. Appropriate response activities (to be agreed upon in consultation with the MDEQ) shall be evaluated to facilitate the goal of removing residual Line 6B oil that poses an unacceptable conformance with applicaple regulations. Such response activities include additional monitoring, containment, strategic sediment recovery, and sediment removal. All removal or recovery activities will be conducted under a newly generated permit or as a modification to the following permits:

- *Permit #12-13-0002-P* issued by the MDEQ on April 26, 2012 (MDEQ, 2012a) and
- *Permit #12-13-0014-P* issued by the MDEQ on July 30, 2012 (MDEQ, 2012b).

If the removal of the sediment trap enhancement structures is necessary, the removal will be coordinated with MDEQ in accordance with the specifications in the above mentioned permits.

4.0 MONITORING FREQUENCY AND REPORTING

The MDEQ will be notified one week prior to initiating each type of monitoring and once again upon completion any of the monitoring activities. As detailed above, the monitoring frequency will vary between activities. The reporting frequency for each monitoring aspect is described in the following sections.

4.1 Sheen Monitoring

Sheen management monitoring will be conducted on a weekly basis along the Kalamazoo River. The information collected during these activities will be summarized in a brief informational memorandum consisting of, but not limited to, table(s), figure(s), and the

monitoring/response form(s). The memorandum will be submitted via email to the MDEQ on Wednesday of each week documenting observations from the previous week.

4.2 Annual Poling

Poling survey activities will be conducted on an annual basis at predetermined focus locations agreed upon by Enbridge and the MDEQ. A final poling survey report will be generated and submitted to the MDEQ within 30 days of completing the annual poling survey.

4.3 Sediment Trap Bathymetry

Bathymetric survey events will be conducted in the sediment traps for four events beginning in the summer of 2014. Adjustments to the bathymetry rounds and sheen monitoring will be conducted when Kalamazoo River discharge rates exceed 1,500 cfs. Where 2013 dredge activities have occurred baseline bathymetry will be determined from post-dredge verification data and compared to all subsequent bathymetry rounds. All sediment trap bathymetry will be submitted to the MDEQ within 30 days of data collection to allow for comparison and data evaluation.

4.4 Year End Data Evaluation

An annual report will be generated to evaluate all data collected during each field season (e.g., 2014, 2015, 2016, etc.), to summarize and to determine the need for further monitoring, adjustments to the plan, or possible removal action from this plan. Further recommendations for future assessments will be submitted in the end of year report evaluation. The evaluation of the data will consider all data collected each calendar year, such as, sheen management data, annual poling data, and sediment trap monitoring and the proximity to potential public use areas. The evaluation will include the frequency of observations near high use/low use public areas or within sensitive ecological areas. The evaluation will assess the presence of any ongoing water quality impairment to narrative criteria as specified in Rule 50 (R 323.1050). Information collected during these activities will also be used to supplement the ongoing overall evaluation of the effects of residual Line 6B crude oil remaining in the river.

5.0 SCHEDULE

Upon approval of the Work Plan, monitoring will commence for the 2014 field season. Subsequent years sheen monitoring will begin generally between May and October. At the completion of each year all data will be evaluated and used to determine the need for future monitoring. Activities and tasks described herein will be performed between April 2014 and the end of the 2016 calendar year and are subject to final approved scope of work, weather conditions, and other unforeseen circumstances beyond Enbridge's control. This work plan and monitoring schedule will continue until the end of the 2016 field season unless a petition by Enbridge, acceptable to the MDEQ, discontinues, in part or in its entirety, the above presented work scope.

6.0 REFERENCES

Enbridge, 2012a. Enbridge Energy, Limited Partnership Line 6B MP 608 Pipeline Release, Marshall, Michigan; *Sediment Trap Monitoring and Maintenance Plan*. July 10, 2012.

Enbridge, 2012b. Enbridge Energy, Limited Partnership Line 6B MP 608 Pipeline Release, Marshall, Michigan;*Sheen Differentiation Methods – SOP EN-205.* May 3, 2012

Enbridge, 2013a. Enbridge Energy, Limited Partnership Line 6B MP 608 Pipeline Release, Marshall, Michigan; *Health and Safety Plan - Revision 7.* April 30, 2013.

Enbridge, 2013b. Enbridge Energy, Limited Partnership Line 6B MP 608 Pipeline Release, Marshall, Michigan; *Sediment Poling Standard Operating Procedure*. May 22, 2013.

MDEQ, 2012a. Michigan Department of Environmental Quality Water Resources Division; *MDEQ Joint Permit for Kalamazoo River – Subsurface Sediment Structures (14 Sites), Permit #12-13-0002-P.* April 26, 2012.

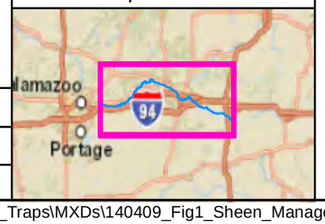
MDEQ, 2012b. Michigan Department of Environmental Quality Water Resources Division; *MDEQ Joint Permit for Kalamazoo River – Subsurface Sediment Structures (11 Sites), Permit #12-13-0014-P.* July 30, 2012.

Figures

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Areas By Water
- Sediment Trap Site Boundary
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 10,000 20,000

Scale in Feet

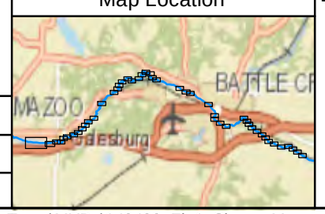
FIGURE 1
SHEEN MONITORING AREAS OVERVIEW
SHEET 1 OF 58
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations_Sheet1.mxd

Aerial Photography Date: April 2011 over NAIP 2010

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 2 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations.mxd

Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location

Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 3 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

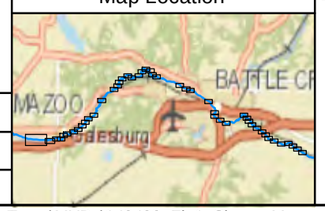
Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations.mxd

Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 4 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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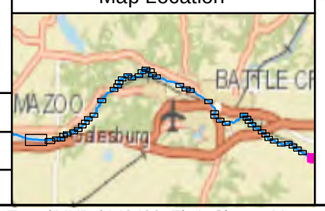
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 5 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location

Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 6 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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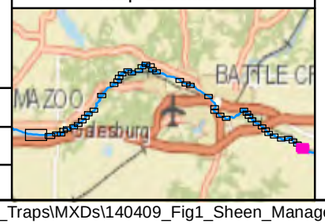
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 7 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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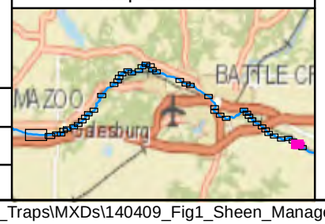
ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 8 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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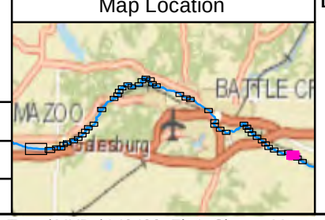
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 9 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: April 2011 over NAIP 2010

MP 6.75

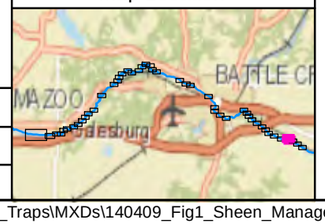
MP 6.50

MP 7.00

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 10 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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MP 7.50

MP 7.25

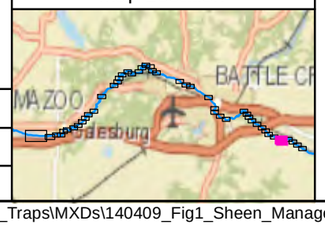
MP 7.00

Angler's Bend

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 11 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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ENBRIDGE

Drawn:	JW	6/25/2014
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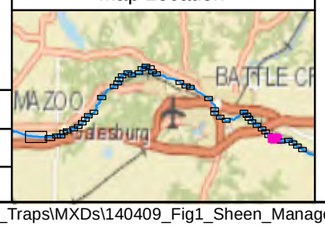
Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 12 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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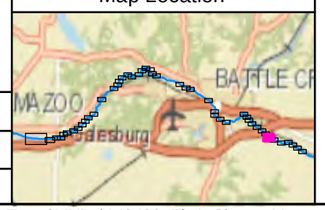
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 13 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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ENBRIDGE

Drawn:	JW	6/25/2014
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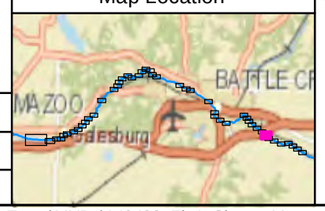
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

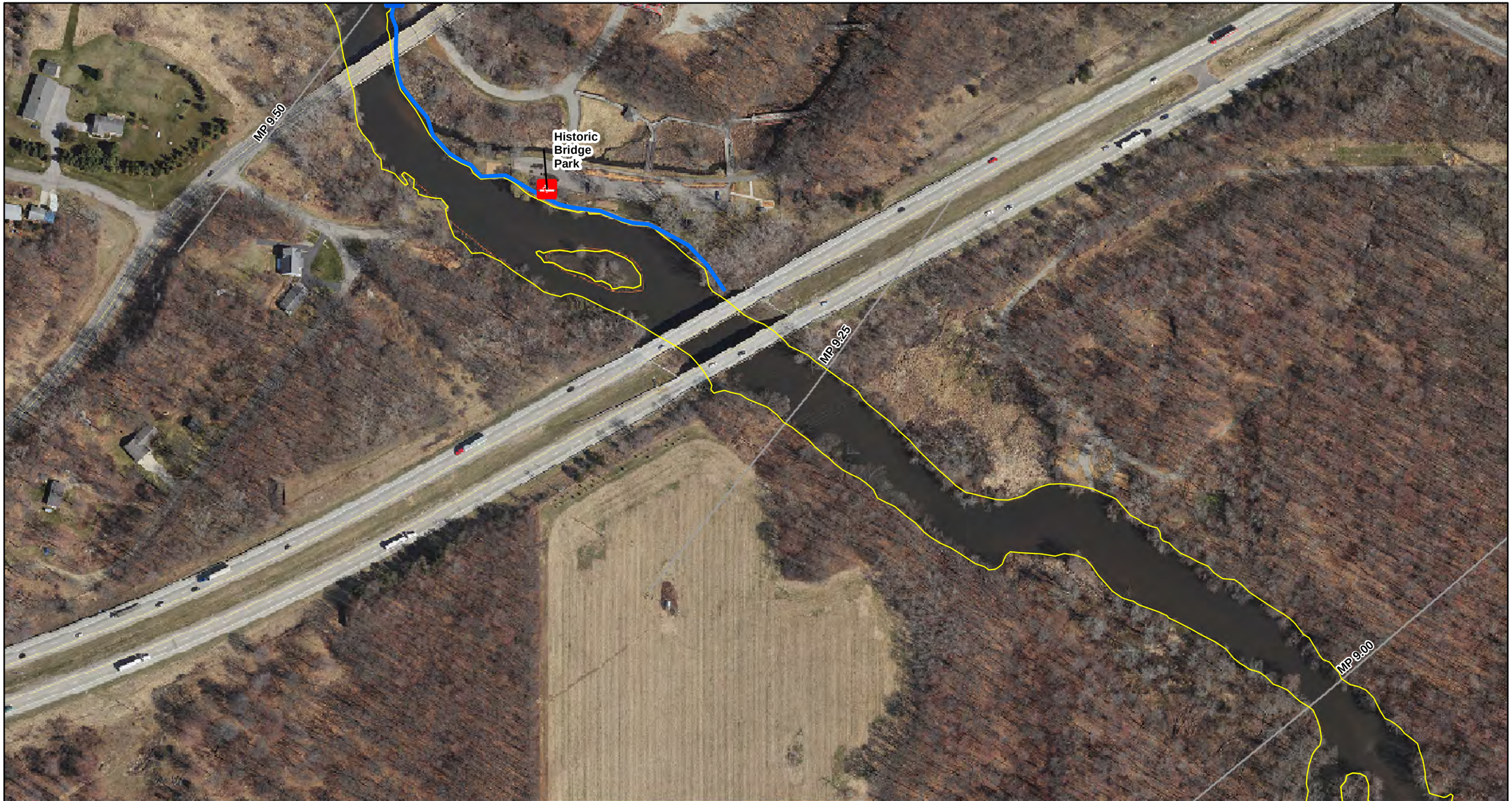
Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 14 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations.mxd

Aerial Photography Date: April 2011 over NAIP 2010



Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
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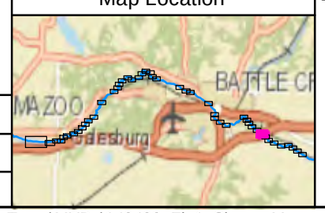

Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 15 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: April 2011 over NAIP 2010

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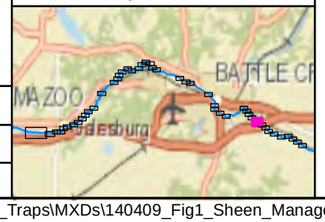
Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 16 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: April 2011 over NAIP 2010

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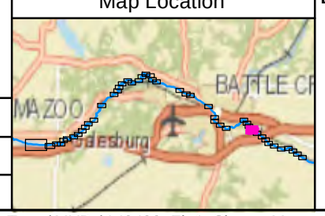
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 17 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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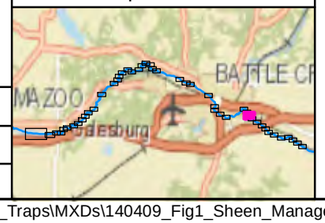
Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 18 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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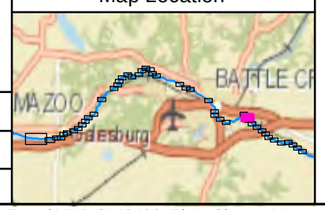
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 19 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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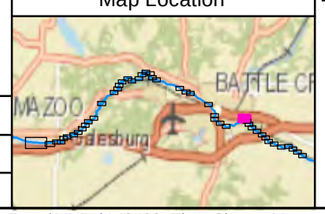
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 20 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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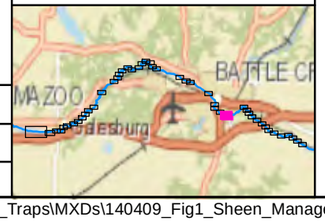
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 21 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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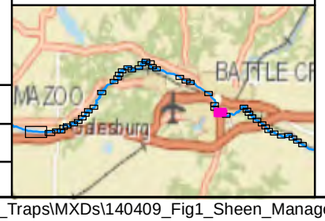
Aerial Photography Date: April 2011 over NAIP 2010

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 22 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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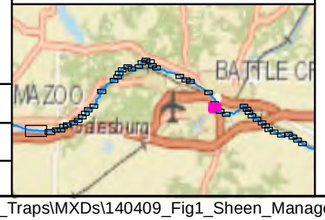
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 23 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

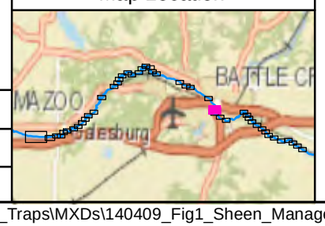
Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations.mxd

Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

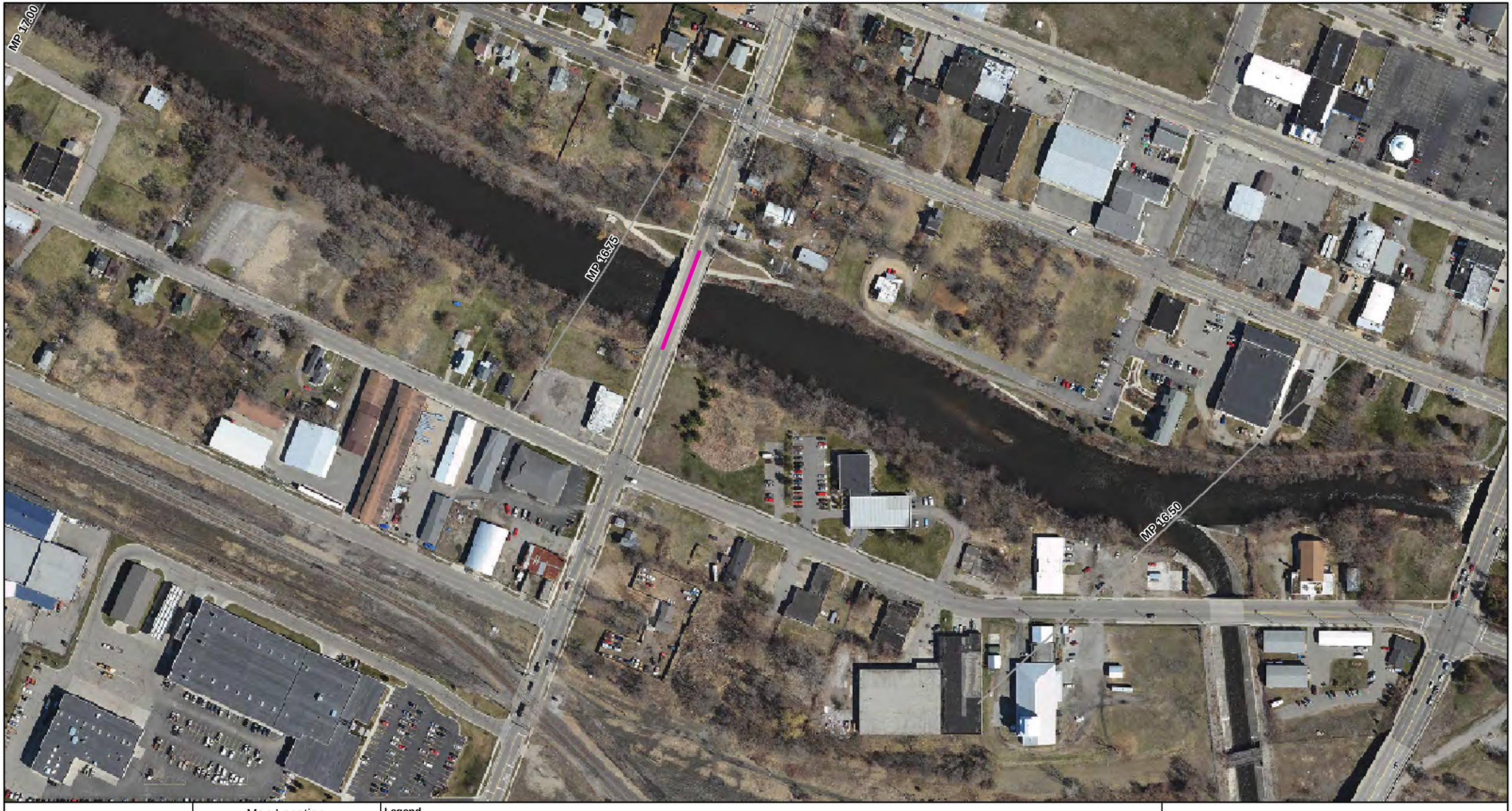
Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 24 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Z:\Work\GIS\Submerged_Oil\Sediment_Traps\MXDs\140409_Fig1_Sheen_Management_Locations.mxd

Aerial Photography Date: April 2011 over NAIP 2010



ENBRIDGE

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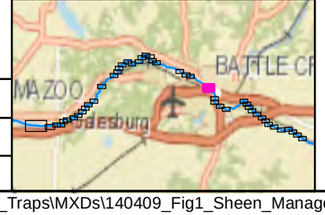
Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 25 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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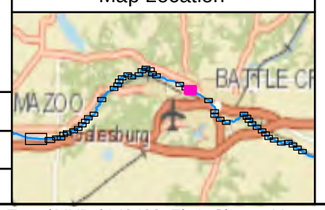
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 26 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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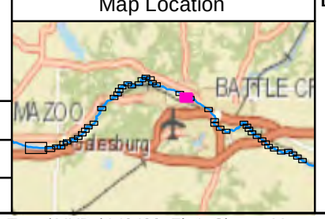
Aerial Photography Date: April 2011 over NAIP 2010

ENBRIDGE

Drawn:	JW	6/25/2014
Approved:	EE	6/25/2014
Project #:	60313732	

Map Location



Legend

- Bridge Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Land
- Sheen Monitoring Focus Area By Water
- Sediment Trap Sheen Monitoring Focus Area
- Quarter Mile Grid Segment
- Public Boat Launch
- Public Canoe Launch
- Enbridge Boat Launch

N

0 250 500

Scale in Feet

FIGURE 1
SHEEN MONITORING AREAS
SHEET 27 OF 58

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: April 2011 over NAIP 2010