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ENVIRONMENTAL SERVICES

SPECIAL SERVICES

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Re: 2012 Straits of Mackinac Pipeline Inspection & Repair Project

Dear Mr. Prew,

Attached you will find the job overview report. This report will contain detailed information from the Enbridge Energy, Straits of Mackinac pipeline inspection and repair project. Included with this report are the Remotely Operated Vehicle (ROV) inspection logs, video survey logs, construction logs, excel spreadsheet detailing current span information and Auto Cad drawing of spans to date.

ROV inspection and survey services took place August 24, 2012 – August 28, 2012 for Enbridge Energy's Straits of Mackinac pipelines, the east and west legs, while diving services took place September 2, 20102 – September 29, 2012.

Thank you for allowing Veolia ES Special Services, Inc. to perform survey and diving services. If there are any questions, please don't hesitate to call or email me.

Sincerely,



Chris Bauer
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Project Overview

Veolia ES Special Services, Inc was retained by Enbridge Energy Inc. to inspect and repair the east and west, 24 inch diameter steel pipelines which cross the Straits of Mackinac in Michigan. These lines run parallel to each other and are separated by approximately 1200 feet along the 4.6-mile length of the crossing and are situated in water depths ranging from 0 to 260ffw. Both lines are buried at the shoreline out to water depths of approximately 50 to 60 feet and then lie primarily uncovered on the bottom.



The focus of this project was to inspect, identify existing conditions and repair areas which could potentially compromise the safety of the pipelines. Examples of these conditions could include exposed or unsupported areas of pipe, items such as fish traps or cable lying on or next to the pipeline or damage caused by an impact. In past surveys it was determined that the exposed pipelines are now unsupported in many areas along the crossing.

ROV inspection services mobilized to Mackinaw City on August 23, 2012 while diving services mobilized on September 1, 2012. Both Systems were de-mobilized to Cheboygan on September 29, 2012. The inspection services were conducted with an (ROV), acoustical tracking system and video recording devices indicating that there were numerous spans exceeding Enbridge Energy's tolerances for unsupported span length. As such, Veolia was mobilized to place designed supports within these problem spans. This report includes data on this repair operation as well as the initial inspection.

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Operations

Veolia ES Special Services, Inc., Durocher Marine and SeaView Systems completed mobilization of the inspection barge/tug at Durocher Marine's Cheboygan yard and mobilized to the Mackinaw City Dock. From the Mackinaw City dock, the inspection barge would mobilize to the work site where Veolia, Durocher Marine and SeaView went through a series of equipment calibration procedures.

Enbridge Energy's pipeline inspections started August 24, 2012 on the west pipeline leg. The diving operations barge and equipment mobilization began at Durocher Marine's yard as well. On September 1, 2012, mobilization of the primary tug and diving operations barge to the Mackinaw City dock occurred, where the vessels would dock for the entire job. From Mackinaw City, the diving operations barge, equipment and personnel would mobilize to repair affected areas along Enbridge Energy's east and west crude oil pipelines crossing the Straits of Mackinac. Veolia ES Special Services, Inc. provided the navigation, positioning and diving operations while Durocher Marine provided the tug boats, inspection and diving barges, anchors and a crane. SeaView supplied a remotely operated vehicle (ROV) to support video inspection and dive support.

In planning the repair operations of the pipelines, the west pipeline would first be filled with NGL and then be shutdown for the entire survey. The east pipeline would then follow the same procedure as the west. Affected areas of concern were determined by Enbridge Energy management viewing documentation from data previously collected in 2010 and the new data collected in 2012. A full ROV inspection of both pipelines was completed ahead of the diving operations. Spans of pipeline that were over 90' in length were targeted for repair. All repairs were preformed while crude was flowing in the pipelines Please note that the dates below represent the days the repairs took place. The reason for gaps in the dates is due to standing by for NGL transition, the transition from ROV to dive operations or weather induced downtime.

ROV survey operations for the west line began on August 24th, 2012 and were completed on August 25, 2012.

ROV survey operations for the east line began on August 27th, 2012 and were completed on August 28, 2012.

Dive repair operations for both the east and west lines began on September 2nd, 2012 and were completed on September 29th, 2012. The spans that were repaired are as follows: (In order)
E-61B, E-01B-A, W-24, E-66A, W-59B, E-42, W-59A, W-12, W-64, W-72A, W-23B, W-72B, E-32A, E-61C, E-52, W-60B, W-41A

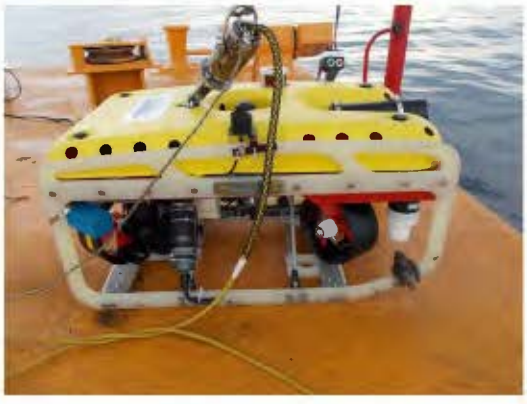
Additional miscellaneous repair, debris removal and dent inspection were also performed. These tasks included:

- Three dent inspections near or within spans, W-10, W-23B and W-69
- The removal of rope around anchor W-59A
- Anchor repair of W-58A rolled rubber on bottom saddle
- Attempted tighten of a loose top saddle on anchor W-60A

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Summary of Methods / Equipment Limitations

Remotely Operated Vehicle – SeaEye "Falcon"



The "Falcon", a Remotely Operated Vehicle (ROV) system, is extremely versatile and can be employed to carry out a variety of tasks including surveying, searching and inspections. A pilot on the surface controls the vehicle remotely by sending commands to the vehicle tether. The vehicle can be moved in any direction or by using the autopilot facility remain accurately on course and depth to provide a stable platform. The pilot can also control the vehicle's video system, lighting and any other equipment fitted to the unit.

For this inspection, the vehicle was fitted with a Linkquest USBL tracking system in concert with an RTK GPS system and Hypack software. In use, the ROV was fitted with a Linkquest acoustic transponder, which sends out a sound signal to be picked up by a hydrophone mounted on the side of the surface support barge. The offsets of the vehicle as calculated by Hypack, is fed to the navigation computer that plots a corresponding XY position based on Real Time Kinematics (RTK) information from the GPS. Video from the on-board camera is recorded in a digital format, with the surveyor following position information from the Hypack navigational software. Once data has been gathered as acoustic records, video documentation is encouraged in order to provide definitive ground truthing of the indications on the sonar record.



In operation, the tug and barge is positioned over the pipeline using a live boat operation for the survey. With evidence of a strong fixed RTK lock as well as a solid return from the vehicle tracking system, the vehicle is launched from the surface to begin its descent to the bottom. Once on bottom, the operator utilizes the navigation system to guide the vehicle to the pipeline. With the pilot free to fly the vehicle, the survey supervisor takes notes with further direction given by the client representative on site. "Parking" the vehicle at the desired location attains accurate location of anomalies, while the Linkquest tracking and RTK stabilize and update the position. This position is noted in the inspection log for future reference. After taking a fix on the span location, anchor or other items of interest the ROV, tug and barge would proceed along the pipeline to the location. With the survey running a live boat operation, Veolia was able to survey more efficiently.

The main limitations to this equipment are related to water clarity (visibility), water current, surface weather and wave conditions. In highly turbid water conditions, an acceptable video record is impossible to generate. Fortunately water clarity for this project was exceptional, allowing for a very clear video record. Higher water velocities (current) can pose difficulties in keeping the vehicle on station, or even getting it to the target. At times high currents hampered dive operations but never became a problem during survey operations

The most prevalent limitation of this equipment is imposed by weather conditions. High winds/waves make for difficulties in launch and recovery of the equipment. Throughout the survey period weather was ideal, however during dive operations weather played a large roll and a substantial amount of weather downtime was incurred.

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Equipment Overview (Inspection Operations)

Veolia mobilized the Remotely Operated Vehicle (ROV), a vessel and additional equipment from Cheboygan, MI to Mackinaw City, MI for the inspection. This package consisted of the following:

- 140' x 40' Barge
- Tug boat
- ROV LARS – Launch and Recovery System
- SeaEye Falcon - Remotely Operated Vehicle with all associated equipment
  - Typhoon Camera
  - Tilt Unit
  - Lighting
  - Compass
  - Depth Sensor
- Comprehensive field spares kit
- Linkquest tracking, Ultra short base line acoustic tracking system
- CSI Vector Sensor for Heading
- Motion Reference Unit (MRU)
- Trimble R5-R6 GPS System - Real Time Kinematics (RTK) (centimeter accuracy)
- Computer navigation system
- Computerized and digital video recording equipment
- Offshore safety package

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Diving Operation and Equipment

The project superintendent is in contact with immediate personnel on treatment gas stores, equipment and equipment start-up. In turn, the tug boat captain is in contact with the USCG for shipping traffic concerns, weather reports and will report this information to the project superintendent. At this point, the project superintendent and client representative will make the determination of project location and a decision to sail.



Span coordinates identified from the 2010 ROV survey were used to plot anchor and mooring locations. The barge was than positioned over anchor locations identified by the Hypack navigation system. The Hypack navigation program, located on the barge, brings in information provided from the RTK GPS, Vector Sensor, Motion Reference Unit (MRU) and Link-quest tracking, which is then relayed to a monitor on the tug for the tug captain to follow. The anchors are then dropped approximately 750' from the pipeline and 1000' apart. Once both anchors are in position (2 anchor spread off the stern of the barge) the barge was towed into position and held in place with a constant speed and heading from the tugboat.



The SeaEye Falcon ROV was launched so that a specific repair procedure and location can be selected. Locations were selected based on their proximity to the center of the span or as determined by Enbridge's on site representative, type of bottom encountered (smooth or irregular, hardness) and span height.

The dive bell was then lowered to the work site, guided by the ROV. Adjustments were then made for barge positioning.

When positioning of the barge was finished, guided by the remotely operated vehicle, the hydraulic drilling tool was then lowered to the work area and held by the crane approximately 5' away from the pipeline.



The screw anchor and saddle support, which is a prefabricated design, is designed to drill along both sides of the pipeline. Extensions can be added, for adjustment with sub-bottom material or span height. When drilling into the sub-bottom, a specified hydraulic pressure must be met. At that time, the upper and lower saddle supports were installed. Placing the support over and under the pipeline and then all-thread bolts bring all the support saddles together.

Dive operation begins and bottom time starts when the diver leaves the surface. Once on bottom, the diver brings the drilling tool over the pipeline and lowers the drilling tool into place. Once in place, drilling proceeded. The Diver monitored the drilling process until completion. When drilling is complete, the 3-pin assembly is disconnected and the hydraulic tool is lifted off the screw assembly and safely placed off the East Side of the pipeline to prevent dragging back into the pipe. The Diver then assembled the anchor and saddle into place. A repair (as detailed in above) is completed.



The final inspection and position of the pipeline repair was recorded from the ROV and the diver was brought to the surface and decompressed. This process usually entailed multiple dives to complete. The same ROV and equipment detailed above for video survey operations was utilized for dive support.

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Equipment Overview (Diving Operations)

The following equipment was mobilized to Durocher Marine's yard in Cheboygan, MI for setup on barges:

- Mixed gas control Trailer
- 2 – 54" deck decompression chambers
- 4 – Hot water machines
- 2 – Quincy 5120 diver's air compressors
- 150kw Multi-quip generator
- Class 2 diving bell and Man Rated Handling system
- Hydraulic drilling tool
- 2 – Hydraulic hose reels
- 2 – Underwater video and lighting systems
- SeaEye Falcon - Remotely Operated Vehicle with all equipment and spares (Inspection Class)
- Link Quest tracking Plus tracking system with 4 beacons
- 2 - Hypack navigation computers
- CSI Vector Sensor for Heading
- 2 – 600' Diver's umbilicals
- Mixed gas stores
    - 100% Oxygen (Decompression gas)
    - 8416 HeO2 (Bottom mix)
    - 8614 HeO2 (Bottom mix, emergency gas)
    - 6040 HeO2 (Decompression gas)
    - 6040 Nitrox (Treatment gas)
- Miscellaneous diving and construction equipment (Hoses, extension cords, tools, etc.)
- Helical Screw Anchors and Supports

    - Due to space and weather considerations, the above equipment was setup in storage containers and sea fastened to the barge. The Hypack navigation equipment was centralized in the dive container, tracking the barge heading and position, ROV position, bell position and anchor drilling tool position. With the primary navigation being controlled from the dive container, a monitor was installed in the tug boat for navigation.

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Findings

The Remotely Operating Vehicle (ROV) survey inspection took place August 24th, 2012 – August 28th, 2012 on the east and west pipelines. The diving operations followed 4 days behind the ROV inspections. Data obtained during the 2012 ROV survey inspection closely followed past findings and data obtained in the 2010 survey. During this time, Enbridge Energy made the determination as to which spans would be repaired. The pipeline would have crude flowing through the line during anchor installation. Both the east and west pipelines show intermittent suspension over their entire length of the lines. Previous grout bag repairs were noted on the east and west lines where the pipeline no longer rested on the bag. The exposed portion of the pipeline is heavily covered in zebra mussel growth, making a detailed analysis of the coating and actual pipe condition impossible. Additionally, areas of debris encroachment were noted.

The attached span logs identify repaired spans, location of all spans, with northing / easting coordinates to each. Also included with this report is an external hard drive with a very detailed informational spreadsheet of each span. Some of the information included in this spreadsheet: 2004 / 2005 span numbers, length, height, northing, easting, longitude, latitude and description.



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