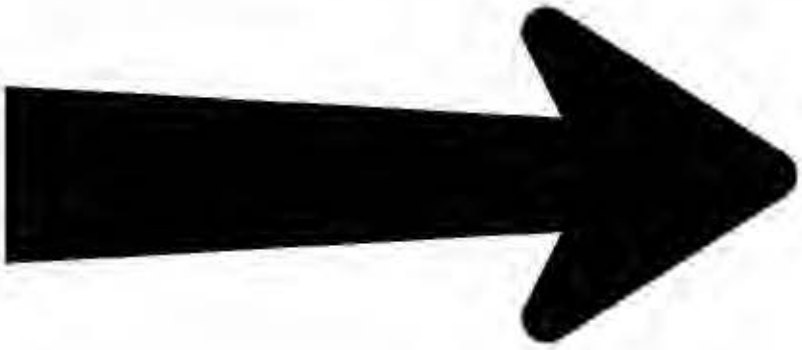
ROSEN USA

Inline Inspection Survey Report

ROSEN USA Project Number 0-1000-11600

Enbridge Energy Limited Partnership

20" Crude Oil Pipeline
Line 5 NO-MA – Straits of Mackinac (West)
EGP Survey Date: September 5, 2012



Client	Enbridge
ROSEN Proj. No.	0-1000-11600
ROSEN Line Name	20" MAK-WES
Inspection Type	EGP
Inspection Date	September 5, 2012
Report Date	October 4, 2012
Issue Number	1

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Table of Contents

1 | Introduction 4

2 | Management Summary 5

2.1 Management Summary Statement 5
2.2 EGP Inspection Findings Summary 6
2.3 Anomaly Type Distribution Chart 7
2.4 Geometry Listing 8
2.5 Inspection Parameters 9
2.5.1 Pipeline Information 9
2.5.2 Data Quality Summary 10
2.5.3 Data Analysis Parameters 11

3 | Inspection Activities and Data Quality 12

3.1 Pre-Inspection Activities 12
3.1.1 Cleaning and Gauging Pig Data Sheet 12
3.2 Electronic Geometry Pig (EGP) 13
3.2.1 EGP Data Sheet and ILI Tool Calibration Certificate 14
3.2.2 EGP Tool Velocity 14
3.2.3 EGP Tool Temperature 14
3.2.4 EGP Tool Rotation 14

4 | Detailed Inspection Results 15

4.1 List of Marker Positions 16

5 | Attachments 17

5.1 Site Inspection Report/Survey Completion Report 17
5.2 Immediate Notifications Listings 17
5.3 Above Ground Marker Sheets 17
5.4 Inspection Verification Results 17
5.5 Electronic Data Discs 17
5.6 Technical Reference 17

1 | Introduction

This Inline Inspection Survey Report describes the pipeline inspection carried out by ROSEN in the 20" Line 5 NO-MA – Straits of Mackinac pipeline segment in September of 2012. This report has been distributed as follows:

Enbridge Energy, Limited Partnership (Enbridge)	Ms. Jaqueline Pina	2 copies
ROSEN	Central File	1 copy

The inspection activities included the following:

- Internal Geometry Inspection with the ROSEN Electronic Geometry Pig (EGP)
- Preparation and submission of the Inline Inspection Survey Report

The data is automatically searched for pipeline anomalies using ROSEN Automated Feature Search Software (AFS). Thereafter, data evaluation personnel interactively verify the results utilizing proprietary software. All results are stored in database files (dbf). More information regarding this process can be found in the separate binder entitled Technical Reference.

This Inline Inspection Survey Report includes the results of the Electronic Geometry Pig (EGP) inspection run performed by ROSEN. The recorded EGP distance is used as the master distance for reporting all inspection results. All anomalies that meet or exceed the reporting thresholds established for this project are listed in this report.

All distances are given in imperial units. Upstream distances are designated with a minus sign (-). All anomalies are referenced to the upstream girth weld.

The EGP center distance of the first valve in the launcher station has been set to 0.00 feet to aid in field measurement efforts.

A Management Summary is provided in Section 2. Detailed inspection results are given in Section 4. All technical information, including Terms and Definitions, Performance Specifications, and Dig Procedures, are provided in the separate Technical Reference binder.

ROSEN thanks Enbridge for the assistance and cooperation received during the course of this project.

2 | Management Summary

This section describes the general condition of the inspected pipeline. For more detailed findings please refer to Section 4.

2.1 Management Summary Statement

No anomalies have been reported for this survey.

As requested by Enbridge, joint numbers established during the evaluation process have renumbered based on the Baseline Pipe Book provided by Enbridge.

2.2 EGP Inspection Findings Summary

The findings of the inspection activities performed in this line segment are listed below.

Installations

Valves:	2
Tees/taps:	2
Others (sleeves, flanges, etc.):	9
Total:	**13**

2.3 Anomaly Type Distribution Chart

This pie chart displays the different types of anomalies identified during the inspection and the relative percentage of the entire anomaly population each type represents.

Please note that no anomalies reported qualify for this graph and therefore this graph has not been included.

2.4 Geometry Listing

This list contains deformation anomalies, as reported per Enbridge reporting requirements, prioritized based on OD reductions, up to a maximum of 25 anomalies. The remaining deformation anomalies that meet reporting criteria are located in the Pipeline Listing.

The Geometry Listing includes the following information:

- Absolute distance in feet
- Upstream Girth Weld
- Relative Distance in feet
- Feature Orientation
- Minimum ID in inches
- Ovality % OD
- Dent Depth in inches
- Dent Depth (%)
- Most Significant Point Distance in feet
- MSP Orientation
- Dent Axial Length in inches
- Dent Circumference Width in inches
- Half peak height pos. (u/s shoulder)
- Half peak height pos. (d/s shoulder)
- Half peak height pos. (circ. start shoulder)
- Half peak height pos. (circ. end shoulder)
- Dent with multiple Apex
- Dent oriented off axis
- Dent associated with GW
- Dent in close proximity
- Comments

For details on anomaly descriptions please refer to the Technical Reference.

Please note that no anomalies reported qualify for this list and therefore this list has not been included.

2.5 Inspection Parameters

This section summarizes the parameters applicable to the in-line inspection activities carried out on this pipeline section in September of 2012.

2.5.1 Pipeline Information

nominal diameter (NPS) [inches]	20.00
type of pipe	SMLS
grade	Grade A
nominal wall thickness [inches]	0.687, 0.812
MOP [PSI]	330
design pressure [PSI]*	2061, 2436*
SMYS [PSI]	30000
minimum bend radius	1.5D
length [miles]	4.16
built in	1950-1951
pipeline product	Crude Oil
inspection history	2008

**Note: Design Pressure has been calculated according to ANSI/ASME B31.4*

2.5.2 Data Quality Summary

The data acquired during the EGP survey, performed on September 5, 2012, meets ROSEN's data quality criteria as per API Standard 1163 - In-line Inspection Systems Qualification Standard. The API Standard 1163 was used by ROSEN for data analysis.

The optimum velocity range for this EGP survey is between 0.33 feet per second and 11.16 feet per second. Tool velocity during the inspection of this segment was within this range.

- Minimum Tool Velocity: 0.00 feet per second
- Average Tool Velocity: 14.82 feet per second
- Maximum Tool Velocity: 15.21 feet per second

The optimum temperature range for this EGP survey is between 32 and 140 °F.

- Average Temperature: 84°F

During the survey of this segment, tool rotation was acceptable based on this specific tool configuration. As a result, there were no impacts on performance specifications based on established turn rates and acquired top position per sampling interval.

- Minimum Turn Rate: -177.00 degrees per feet
- Maximum Turn Rate: 177.00 degrees per feet

The resulting inspection data meets ROSEN's Data Quality/Acceptance Criteria per API Standard 1163 - In-line Inspection Systems Qualification Standard, thereby ensuring compliance with published EGP Performance Specifications.

2.5.3 Data Analysis Parameters

The reporting thresholds applied to this line segment are as follows:

- for *joint* features (--J--): ≥ 2% OD reduction (EGP)
- for *close to weld* features (-C---): ≥ 2% OD reduction (EGP)
- for *weld* features (W----): ≥ 2% OD reduction (EGP)

The standard reporting threshold is ≥ 2%.

3 | Inspection Activities and Data Quality

3.1 Pre-Inspection Activities

Not Applicable.

3.1.1 Cleaning and Gauging Pig Data Sheet

Not Applicable.

3.2 Electronic Geometry Pig (EGP)

The segment was inspected with the ROSEN Electronic Geometry Pig (EGP). One (1) EGP run was performed during the inspection.

ROSEN Inspection Survey Technicians Jonathan Braley and Joshua Suehr performed the field activities.

Please note the following EGP run information:

Inspection Conditions

Inspection Direction	North Straits to Mackinac Station
Launching Date/Time	September 5, 2012 / 01:51 PM
Receiving Date/Time	September 5, 2012 / 02:14 PM
Duration	23 minutes
Average Tool Velocity	14.82 feet per second
Maximum Tool Velocity	15.21 feet per second
Propellant	Crude Oil
Pressure (max.)	190 PSI
Temperature	84°F

Tool Condition after the Run

Cup Wear	None
Debris	None
Damage	None

Recorded Data

Start of Data Recording	-49.66 feet
End of Data Recording	21624.74 feet (4.11 mi.)
Recorded Tool Rotation	Acceptable

Marker Information (Above Ground Markers)

Four (4) markers were set and successfully established for this line segment. Please refer to Section 4.1 List of Marker Positions for more information.

3.2.1 EGP Data Sheet and ILI Tool Calibration Certificate

The standard tool data sheet and ILI Tool Calibration Certificate for the ROSEN EGP tool used during this inspection is attached hereafter.

3.2.2 EGP Tool Velocity

The EGP tool used during this inspection was programmed to operate within a velocity range of 0.33 feet per second to 11.16 feet per second. The EGP velocity during the inspection is constantly recorded. On basis of the velocity information, the minimum and maximum velocity versus the pipeline length is calculated in sampling intervals and can be seen on the following velocity graph.

3.2.3 EGP Tool Temperature

The EGP Tool Temperature graph displays the recorded temperature encountered during the survey. Because the temperature probe is housed inside the tool, it takes approximately 30 minutes for the probe to register the actual product temperature.

3.2.4 EGP Tool Rotation

The EGP Tool Rotation graph displays the rotation of the EGP tool during the survey. The rotational position, provided in degrees, is measured counter-clockwise looking in the downstream direction.



4 | Detailed Inspection Results

The detailed results of the inspection activities are presented in the following format:

- List

All distances are expressed in feet [ft.]. Upstream distances are designated with a minus (-). All pipeline anomalies are referenced to the upstream girth weld.

4.1 List of Marker Positions

During these inspection activities, the ROSEN Above Ground Marker (AGM) system was utilized.

All marker positions recorded during the inspection are provided in the attached list, which includes the following information:

- Comment
- Chainage source
- Location name
- Location mile post
- Location kilometer post
- Offset in feet
- Distance in feet
- Sub type code
- Northing
- Easting
- Elevation
- ILI run id
- Id
- Chainage in feet
- Alternate Offset in feet
- Joint number
- Northing
- Easting
- Latitude (degrees)
- Longitude (degrees)
- UTM Zone
- DATUM
- Depth of Cover
- GPS Accuracy
- Source
- Tracking Date
- Relative Distance to U/S Weld

The Above Ground Marker Location Sheets are provided in Section 5.

5 | Attachments

5.1 Site Inspection Report/Survey Completion Report

The Site Inspection Report/Survey Completion Report is attached hereafter.

5.2 Immediate Notifications Listings

Not applicable.

5.3 Above Ground Marker Sheets

The Above Ground Marker Sheets are attached hereafter.

5.4 Inspection Verification Results

Inspection verification results have not been received as of the submission of this report.

5.5 Electronic Data Discs

The ROSOFT Client Software data disc(s) for this line is attached. Please refer to the ROSOFT Manual for information regarding installation of this data and operation of the ROSOFT Data Management Software.

5.6 Technical Reference

This Technical Reference is applicable to all inline inspection activities carried out by ROSEN in the course of ROSEN Project Number 0-1000-11600. All reporting activities for this project fall under the guidelines of the Enbridge Reporting Profile and can be found on the accompanying ROSOFT disc(s).