MEC (Extended SLOFEC) Caisson Inspection

Client:	**Client**
Facility:	**Client’s Platform**
Item Inspected:	**36” Caisson**
Inspection Method:	**MEC (Extended SLOFEC) Inspection**
Date Commenced:	**10/06/13**
Date of Completed:	**17/06/13**
Type of Report:	**Final Report**
Report Number:	**Kxxx**

nqa. ISO 9001 Registered

UKAS QUALITY MANAGEMENT 015

FPAL empowered by Achilles Registered Supplier Number: 10051207

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W W W . I N N O S P E C T I O N . C O M

MEC (Extended SLOFEC) CAISSON INSPECTION FINAL REPORT (Marinised MEC-MPS200)

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1.0) Test Object Data

Object Identification : 36” Production Caisson

Location of Object : Client’s Platform

Orientation of Scan : Longitudinal

Wall Thickness : Nominal 13mm and 25mm

Material : Carbon Steel

Surface Condition : Paint clean and free from loose debris

2.0) Inspection Summary

Only significant indications above 40% wall thickness loss are noted below, any lesser indications can be seen on the BMP colour mapping included in the Appendix.

Indications for Section 1 (13mm Wall)

TRACK Number	Distance form Start	Indication Depth	INT EXT	Notes
1	5.3m	40	In	Isolated indication
2	2.1m	40	In	Isolated indication
3				
4	1.1m + 8.3m	40% + 40%	In	Isolated indications
5				
6	2.5m + 6m	>50% + 40%	In	Isolated indications
7	3m + 4.5m	>50% + >50%	In	Isolated indications
8				
9				
10	4.5m	>50%	In	Isolated indication
11	4.1m	50%	In	Isolated indication
12				
13				
14				
15				
16	4.5m	50%	In	Isolated indication

Section 2 (25mm Wall) showed no significant indications

Perforated Weld

It was noted at the – 12m weld there was a hole in the upper toe of the circumferential weld, and this was found between tracks 6 and 7 on the NNE side of the caisson. It was approximately 13mm diameter with what appeared to be other smaller perforations near to and associated with it. Please see the video taken at the time of the inspection.

3.0) Inspection Task

As requested by the Client, a MEC (Magnetic Eddy Current) inspection was carried out on the 36” Produced Water Caisson, located on the Client’s Platform. This was carried out on the 10th to the 17th June 2013.

MEC is the next generation of fast corrosion mapping technique based on the further development of the SLOFEC (Saturation Low Frequency Eddy Current Technique).

The inspection was performed with a MEC technology scanner, MEC-MPS200.

MEC is regarded as a fast corrosion screening technique, detecting corrosion on either side of the wall inspected. This method of testing makes it practical to inspect the item from the external surface, whilst still in service and at operating temperatures.

The MEC testing team consisted of qualified engineers from Innospection Ltd and 3 rope access technicians.

All areas described under point 4.0 (Inspection Volume) were inspected with the MEC Scanner.

The inspection was carried out as a general screening to establish the extent of corrosion if any.

4.0) Inspection Personnel

Inspection Supervisor : Mark x, PCN Level II / Certification No x.
Inspection Operator : Chris x

5.0) Inspection Volume

The MEC Scans were completed in two sections between the caisson support guides. This was achieved by completing 16 tracks around the 36” caisson to give 360º coverage over a given length.

All accessible areas of the caisson were targeted for inspection.

6.0) Inspection Equipment

6.1) MEC Equipment

The inspection system consisted of the following MEC Equipment and accessories.

Scanner	:	Marinised of MEC-MPS200 Scanner.The MEC technique operates on magnetic field controlled high frequency Eddy Current and uses specifically developed Eddy Current sensors able to generate a Eddy Current field. By combining it with higher operating frequencies, the MEC technique offers enhanced defect detection capabilities including the ability to inspect through higher wall and coating thickness.
Description of Scanner	:	The MEC-MPS200 is a winch operated system equipped with electromagnets and multiplexed electronics. 8 sensors each with a width of 25mm are located between the pole shoes. 10 wheels, 5 at each side keep the tool in line and are adjustable in height for liftoff.
Scanning Speed	:	100% (approx.: 24m/min)
Eddy Current Instrument	:	IBM-AT-compatible computer with a single frequency Eddy current plug-in cards. Type: eddyMax.
Eddy Current Sensors	:	8 x EC-B-25 mm
Software Version	:	EddyMax Eddy Current Multiplex Software With trigger use – SN 20000997 TMT Version 5-10-05-27
Cable	:	78 meters of specific cable connection between the computer eddy current instrument and MEC (Magnetic Eddy Current)
Reference Plate	:	Comparative material, Wall thickness and curvature
Reference defects	:	20%, 40%, 60%, 80% FBH

7.0) MEC Equipment Setting

In general, the MEC system is calibrated using sample test samples with artificial reference defects. The reference samples should be of the same material and thickness as the surface to be inspected.

In the case of a coating being present on the surface to be inspected, the average thickness of the coating (if applicable) should also be simulated on the reference sample for the calibration.

Typical reference defects that are used are flat bottom holes or conical bottom holes are with a diameter of 5mm, 10mm and 20mm.

The depths of the artificial reference defects are typically 20%, 40%, 60%, 80% and 100%.

For calibration, the MEC system is driven over the reference defects and the channels are set (one sensor per channel) to give a sufficient sensitivity level for the detection of topside and underside corrosion defects.

The calibration is performed at beginning, after breaks, at the end of every shift or in the case of changes to the equipment.

The calibration results and reference defect data from the calibration sample, is always stored in the system.

The Eddy Current signal analysis is done online. The computerised equipment and the software allow the analysis of the signal amplitude [in div.] and signal phase [in °].

8.0) MEC Equipment Calibration

8.1) Equipment Calibration

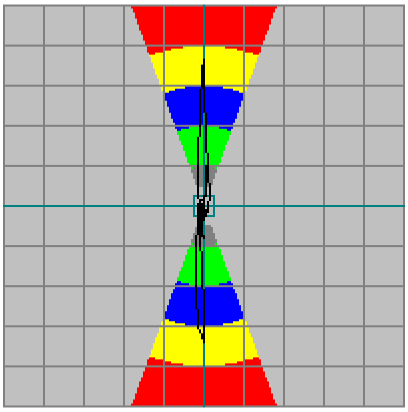
For internal corrosion detection, the differential mode was used. The frequency setting used for Channel 1-8 (differential mode) was 100 KHz.

The amplitude of the signals was set so that the artificial reference defect (20mm Ø 60% depth) was set to 8 screen divisions. This is only classed as the initial pre-calibration setup and may then be further adjusted when the first true indication is detected.

Optimum signal/noise ratio and signal phase separation between the internal defect indications and other indications were considered when selecting a suitable test frequency.
The differential channels of all the sensors were set so that internal defects were indicated in the vertical signal phase direction as shown in the diagram below. By moving the scanner in the positive forward direction, the internal

defect signal would show the first peak down, followed by the second peak up with an upward movement.

Sample signal display of internal defect



8.2) Calibration Control

The general setting and calibration was performed at the beginning of the inspection, with all calibration data being stored digitally. Calibration controls were performed at the beginning and end of each working shift and after any other significant interruption (i.e. breaks or lunch). Re-calibration is also deemed necessary when significant changes are made to the settings of the equipment.

8.3) Calibration Samples

The calibration samples are manufactured by Innospection Ltd in accordance to the setting standard requirements.

8.4) Change of Settings

In the event of any scanner adjustment, re-calibration is performed.

9.0) Inspection Procedures

The inspection was performed according to the following valid procedure:

MEC Caisson Procedure Number (Current Issue)

10.0) Inspection Performance

10.1) Scanner Movement

The scanner assistant, who was in permanent communication with the MEC operator, was responsible for positioning the scanner on the caisson surface.

The scanner was lowered by air hoist to a predetermined start point and then retrieved while the recording of the tracks was done, the scanned tracks being overlapped at all times.

All scans for the inspection were recorded in the reverse direction.

10.2) Scan Track Positioning

The caisson was then marked clearly at 16 points around the circumference to ensure that each track scanned was identified. The tracks were numbered in a clockwise direction when looking from the top.

10.3) Parameter Storage

The Eddy Current testing parameter was set during the calibration and digitally stored according to the scan direction and lift off.

11.0) Defect Analysis

All indications which showed a clear signal phase direction similar to that of the reference defects and had signal amplitude equivalent to that of the test piece were subjected to analysis.

Signals that are clearly out of the corrosion phase direction were not reported.

12.0) Comments to Inspection

- The caisson was stripped of growth and in a clean condition.
- Low noise levels
- During the inspection it was necessary to replace a couple of components.

13.0) Documentation

The inspection result, parameters and data are stored in the Innospection Limited archive database system.

14.0) Signature

Mark x
Senior MEC engineer.
Innospection Limited

Mike x
Level III Senior Inspection Engineer
Innospection Limited

APPENDIX 01

BMP MEC
Inspection Results

Client' Platform

36" Production Caisson

Client	:	Client
Location	:	Client's Platform
Pipe Ident	:	Production Caisson
Pipe Diameter	:	36"
Date	:	10/06/2013
K-No.	:	Kxxx

MEC PipeScan Report

36" Prodiction Caisson

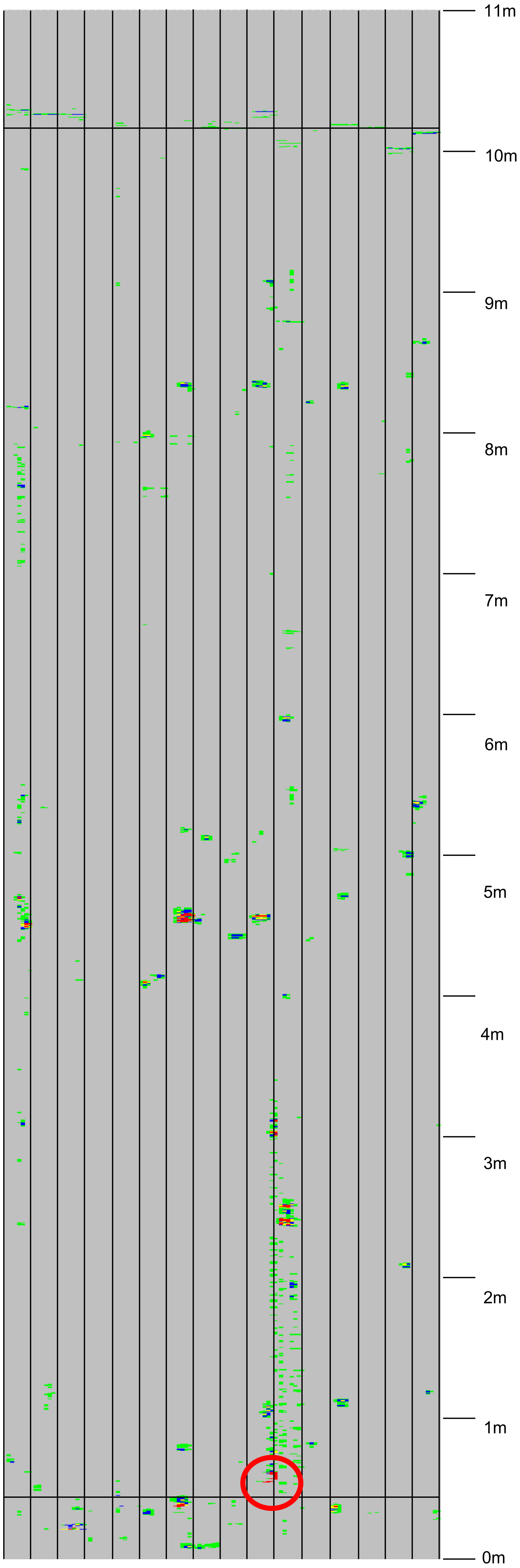
Indication View Section 1

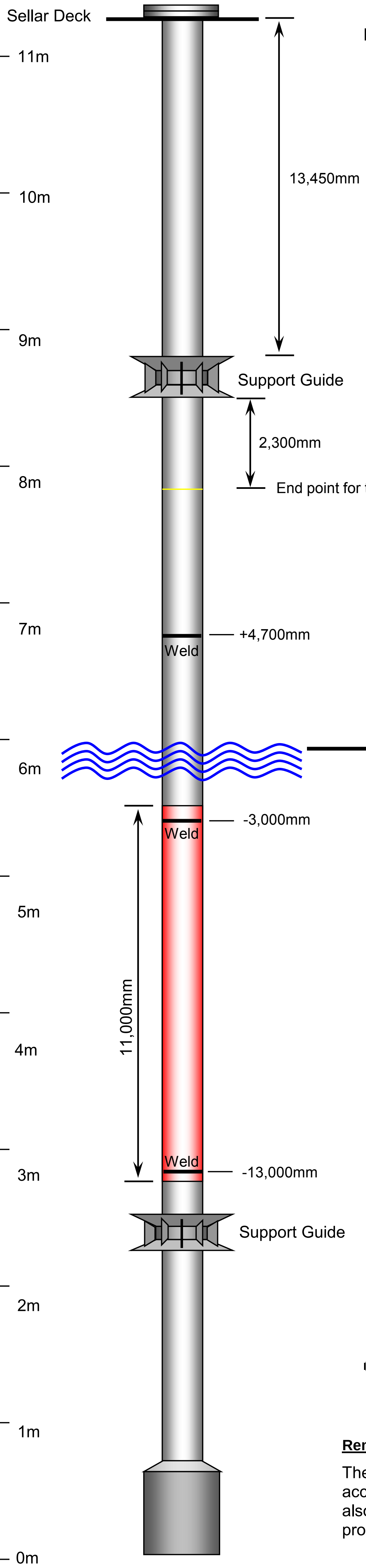
Location of perferated weld

Inspected Section

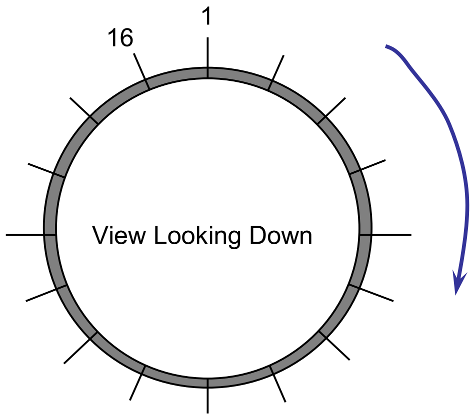
Caisson

Internal



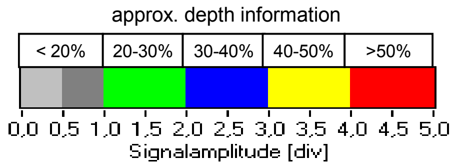


Scan Direction



Track number 1 is taken as rig North then clockwise to track 16

Signal Y-component / angle analysis window set for indication of internal defects with approx. depth information



Remarks

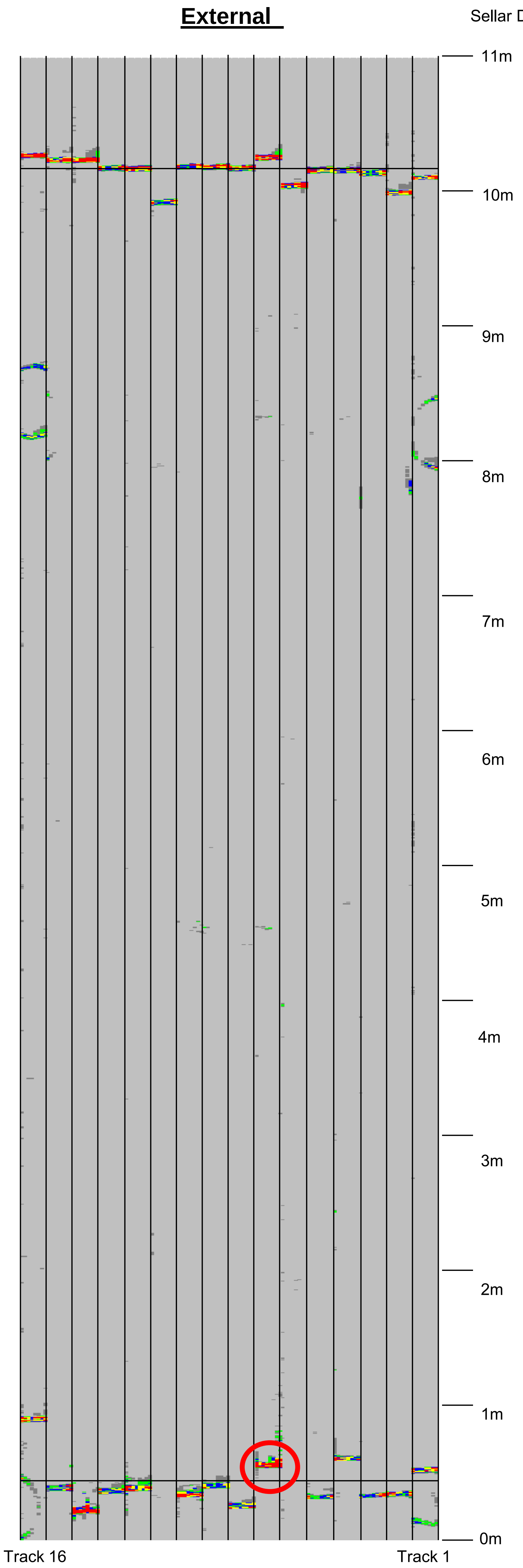
The BMP image is a representation of the area accessible by the MEC scanner. The image also shows (if any) the presence of indications proportional in depth to the colour chart above.

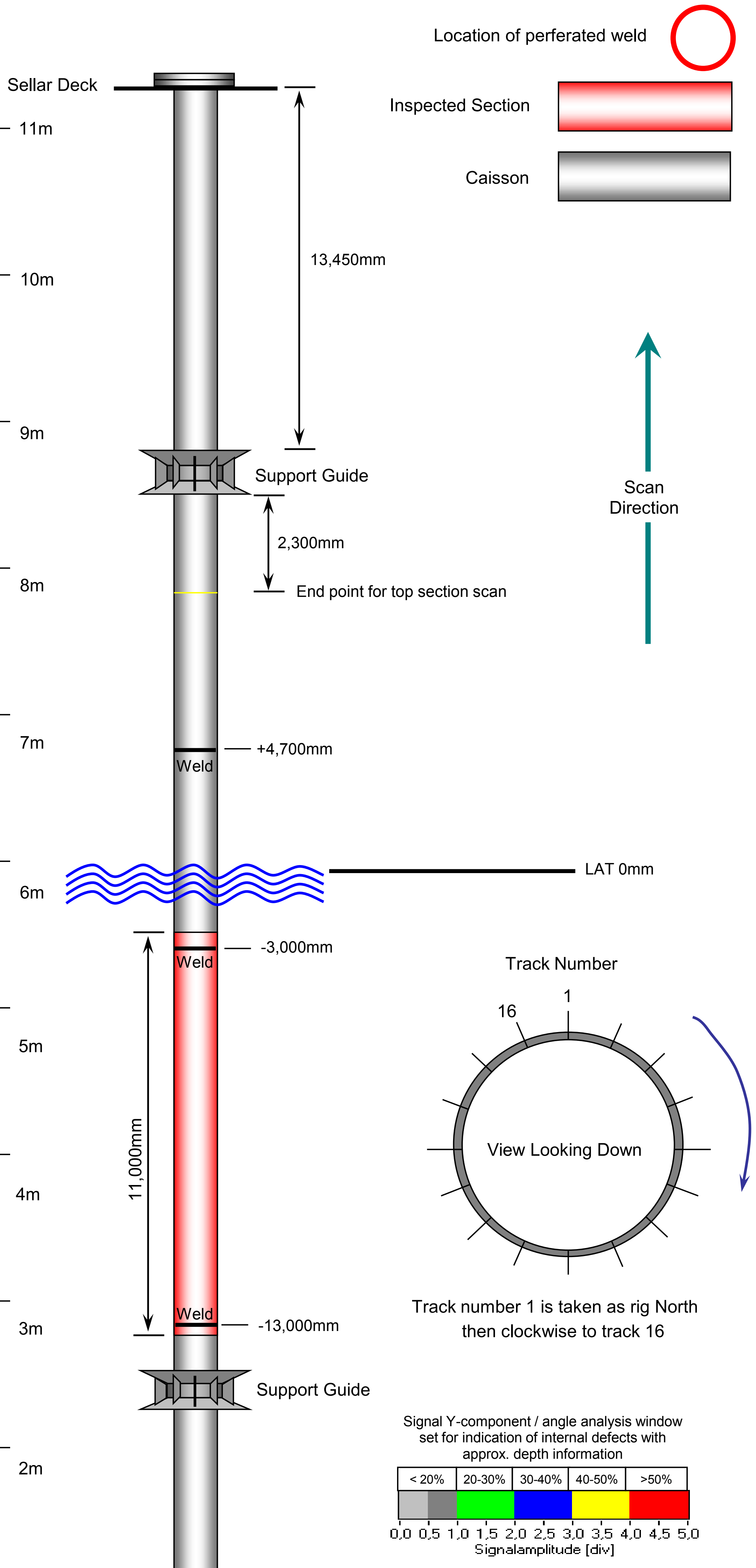
Client	:	Client
Location	:	Client's Platform
Pipe Ident	:	Production Caisson
Pipe Diameter	:	36"
Date	:	10/06/2013
K-No.	:	Kxxx

MEC PipeScan Report

36" Prodiction Caisson

Indication View Section 1





Remarks

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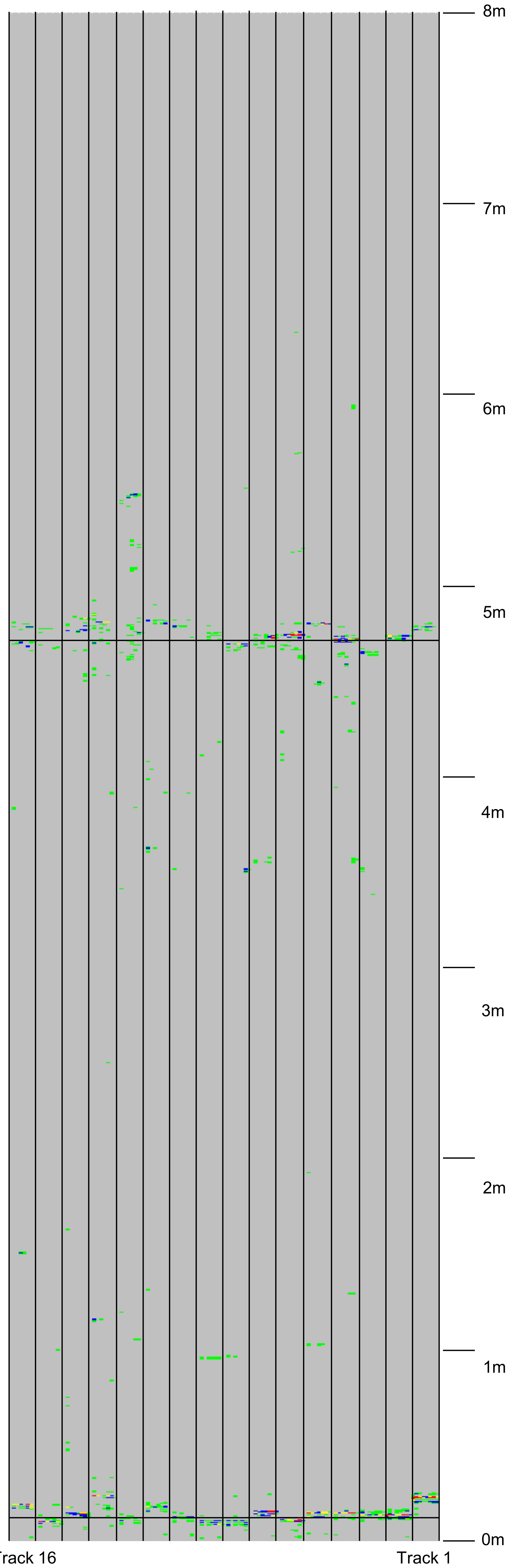
Client	:	Client
Location	:	Client's Platform
Pipe Ident	:	Production Caisson
Pipe Diameter	:	36"
Date	:	10/06/2013
K-No.	:	Kxxx

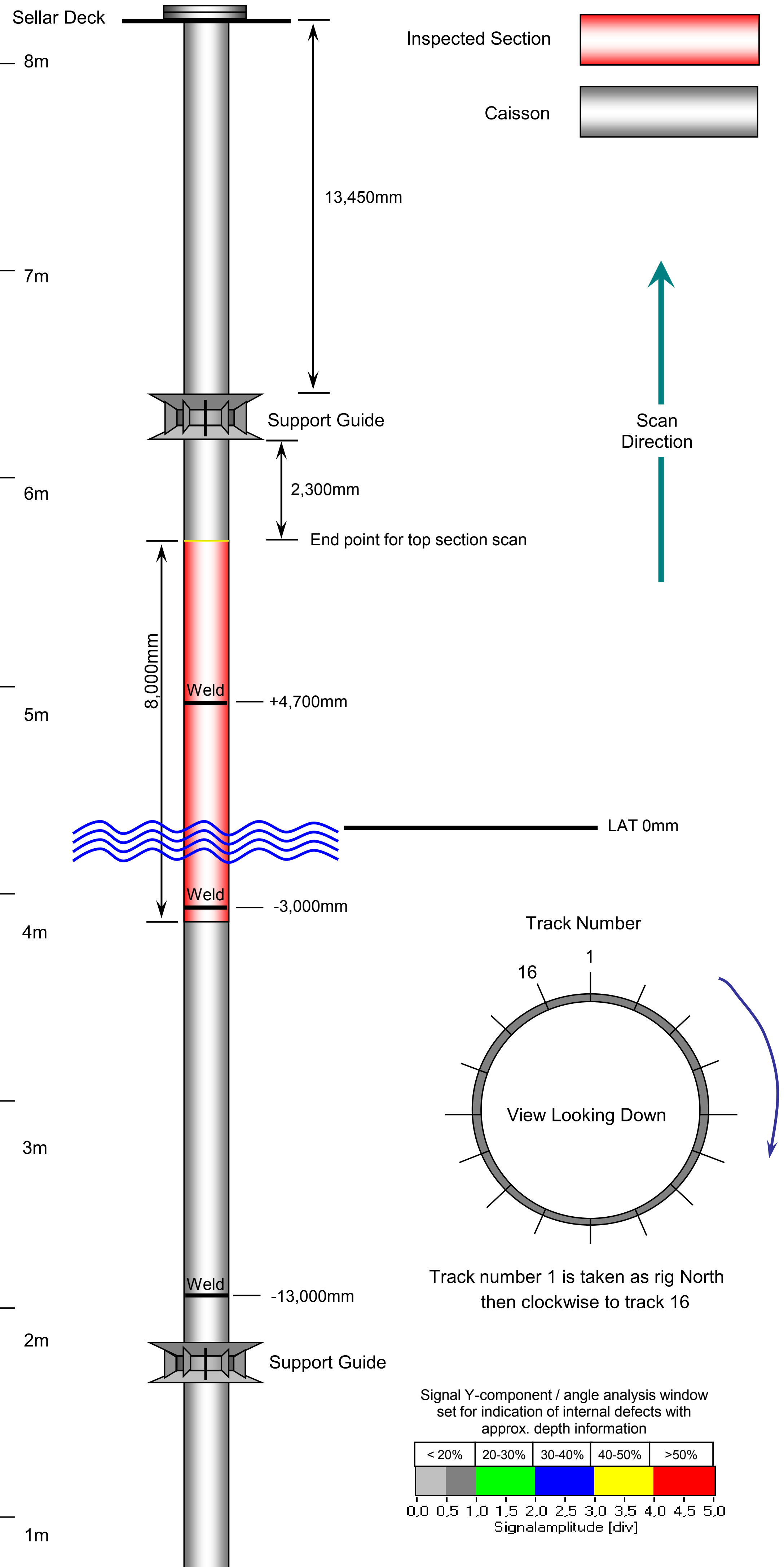
MEC PipeScan Report

36" Prodiction Caisson

Indication View Section 2

Internal





Remarks

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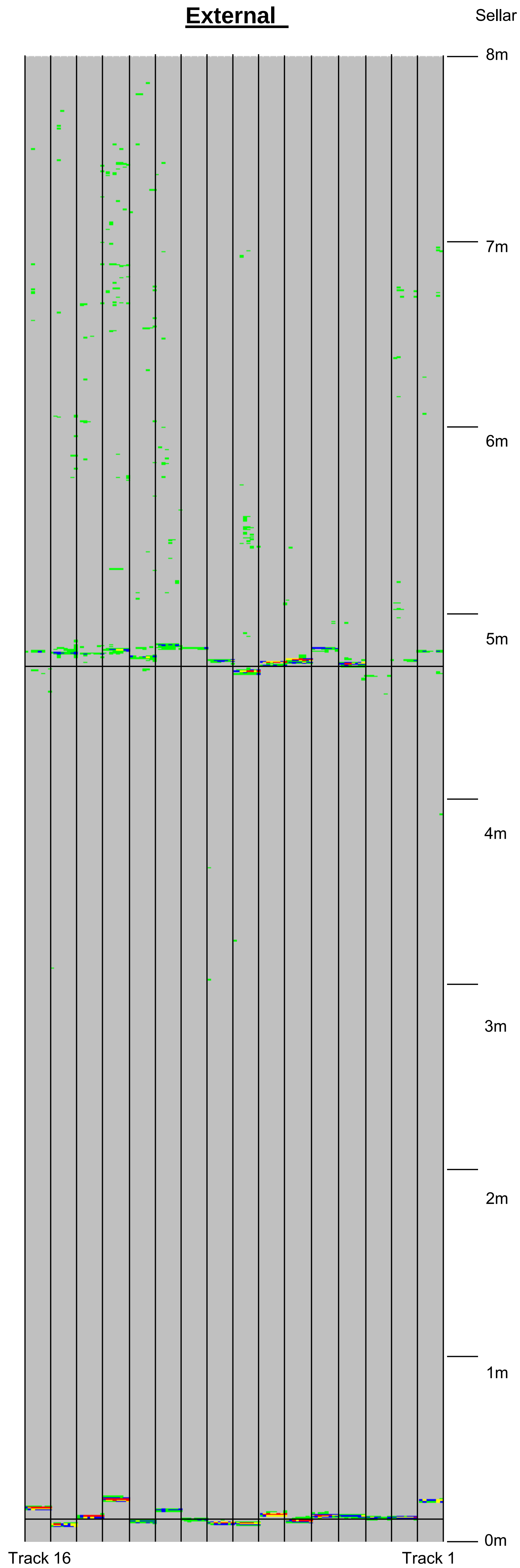
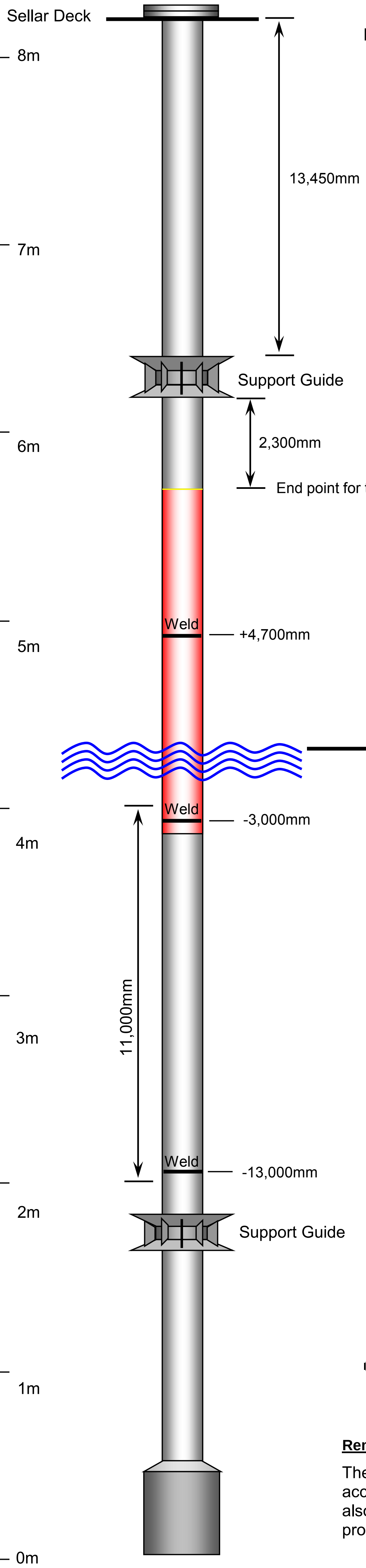
Client	:	Client
Location	:	Client's Platform
Pipe Ident	:	Production Caisson
Pipe Diameter	:	36"
Date	:	10/06/2013
K-No.	:	Kxxx

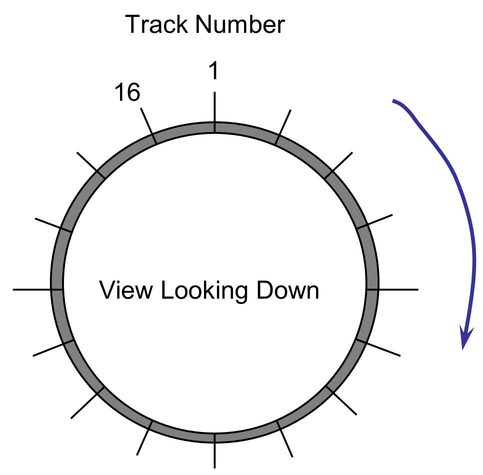
MEC PipeScan Report

36" Prodiction Caisson

Indication View Section 2







Track number 1 is taken as rig North then clockwise to track 16

Signal Y-component / angle analysis window set for indication of internal defects with approx. depth information

< 20%	20-30%	30-40%	40-50%	>50%

0,0 0,5 1,0 1,5 2,0 2,5 3,0 3,5 4,0 4,5 5,0
Signalamplitude [div]

Remarks

The BMP image is a representation of the area accessible by the MEC scanner. The image also shows (if any) the presence of indications proportional in depth to the colour chart above.