# C305 – Eastern Running Tunnels

# I&M Close out report 600mm IP Gas Main beneath River Lea (Drive Y)

## CRL Document Number: C305-DSJ-U-RGN-CRG03-50144

**Supplier Document Number:**

**Contract MDL reference C08.079**

### 1. Contractor Document Submittal History:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|---|---|---|---|---|---|
| 2.0 | 06.06.2016 | [redacted] | | | For Approval |
| | | | | | |

### 2a. Stakeholder ReviewRequired? YES ☐ NO ☐

Stakeholder submission required: LU ☐ RfL ☐ NR ☐ LO ☐ DLR ☐ Other: _____

Purpose of submission: For no objection ☐ For information ☐

This document has been reviewed by the following individual for coordination, compliance, integration and acceptance and is acceptable for transmission to the above stakeholder for the above stated purpose.

Sign: _____ Role: _____ Name: _____ Date: _____

Sign: _____ Role: _____ Name: _____ Date: _____

### 2b. Review by Stakeholder (if required):

| Stakeholder Organisation | Job Title | Name | Signature | Date | Acceptance |
|---|---|---|---|---|---|
| | | | | | ☐ |
| | | | | | ☐ |

### 3. Acceptance by *Crossrail*:

| | *Crossrail* Review and Acceptance Decal | This decal is to be used for submitted documents requiring acceptance by *Crossrail*. |
|---|---|---|
| ☑ | Code 1. | Accepted. Work May Proceed |
| ☐ | Code 2. | Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| ☐ | Code 3. | Not Accepted. Revise and resubmit. Work may not proceed |
| ☐ | Code 4. | Received for information only. Receipt is confirmed |

Reviewed/Accepted by (signature): [redacted] Print Name: [redacted] Position: [redacted] Date: 01/07/16

Acceptance by *Crossrail* does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute *Crossrail* approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier.

| GEOCISA UK | C305-CLOUT-04022016 |
|---|---|

# I&M Close out report 600mm IP Gas Main beneath River Lea (Drive Y)
# C305-DSJ-U-RGN-CRG03-50144

***C305 Crossrail Eastern Running Tunnels***



**Current Version of the Documents & Signatures :**

| Revision: | Date: | Prepared by: | Checked by: | Engineering Approved by: |
|---|---|---|---|---|
| 2.0 | 06.06.2016 | [redacted] | | |
| | | | | |

**Document History :**

| Revision: | Date: | Prepared by: | Checked by: | Engineering Approved by: |
|---|---|---|---|---|
| 1.0 | 10.05.2016 | [redacted] | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

TABLE OF CONTENTS

## 1. CLOSE OUT REPORT PURPOSE

As stated in the specification: C122-OVE-Z4-RSP-CR001-00007 Rev 7.0, the purpose of this close-out report is to summarize the data from the instrumentation included in this document and to relate the recorded movements to the construction activities which produce any observed changes. For construction activities it is intended excavation of the C305 twin bored tunnels and dewatering of cross passages; impacts from other CRL contracts are not included in this report.

The long term readings have been used to demonstrate that the subsequent movement has reached an acceptably stable rate within the accuracy of the system in order to decommission and/or that C305 works are no longer impacting the area concerned.

As stated in the specifications the settlement rate of 2 mm/yr has been defined. Where this is not achieved this report seeks agreement from all parties that the rate is acceptably low enough to cease monitoring and decommission.

## 2. LOCATION OF THE WORKS

All instruments covered by this report are located at Limmo Shaft site and at Orchard Place compound, project chainage 84850 to 84710, Area 4 LIMMO SHAFT – CANARY WHARF.

All permissions were requested and received before any instruments were installed.

Drawings showing locations of instruments are included as Appendix A.

## 3. DOCUMENTATION SUMMARY

| CROSSRAIL NUMBER | DOCUMENT NAME | REASON FOR ISSUE |
|---|---|---|
| C305-DSJ-C2-RGN-CR144_WS155-50003 | Installation Report for I&M installed as per "600 mm IP Gas Main beneath River Lea". | Installation report |

## 4. SUMMARY OF INSTALLED INSTRUMENTATION ON SITE

The total number of instruments installed, as per installation report listed in Section 6 above, was:

- At East side:
  - 1 rod extensometer.
  - 9 levelling point.
- At West side:
  - 1 rod extensometer.
  - 5 levelling point.

Detailed information of the installed instrumentation is reported in Appendix B.

The average commissioning readings included in Appendix B have been used to calculate the relative movements provided in the graphs of this report.

## 5. CONSTRUCTION ACTIVITY

TBM Passage

- At East side:

| DRIVE Y | RINGS | PROJECT CHAINAGE | DATES |
|---|---|---|---|
| Eastbound | 13-28 | 84850 | 06/12/2012 to 12/12/2012 |
| Westbound | 13-28 | 84850 | 21/01/2013 to 25/01/2013 |

- At West side:

| DRIVE Y | RINGS | PROJECT CHAINAGE | DATES |
|---|---|---|---|
| Eastbound | 79-94 | 84710 | 18/01/2013 to 02/03/2013 |
| Westbound | 78-92 | 84710 | 18/01/2013 to 15/03/2013 |

**Stoppage period (only at West side):**

| | | |
|---|---|---|
| **Eastbound Drive-Y** | **Ring 87 (Project chainage 84730)** | **21/01/2013 to 09/02/2013** |
| | **Ring 88 (Project chainage 84730)** | **09/02/2013 to 28/02/2013** |
| **Westbound Drive-Y** | **Ring 79 (Project chainage 84740)** | **18/01/2013 to 09/02/2013** |
| | **Ring 87 (Project chainage 84730)** | **10/02/2013 to 12/02/2013** |
| | **Ring 88 (Project chainage 84730)** | **12/02/2013 to 27/02/2013** |
| | **Ring 89 (Project chainage 84720)** | **27/02/2013 to 14/03/2013** |

The periods of TBM passage and stoppage are related to the rings located close to the instrumentation included in this close out report.

CROSSPASSAGE CONSTRUCTION / DEWATERING

| | |
|---|---|
| CP 14 Dewatering | **Phase 1** 16th December 2013 to 17th January 2014 – 14 surface ejectors |
| | **Phase 2** 28th July 2014 to 17th November 2014 – 14 surface ejectors |
| | **Phase 3** 2nd April 2015 to 28th July 2015 – 14 surface ejectors + 22 in-tunnel wellpoints |
| | (17th November 2014 to 2nd April 2015 no dewatering to due to ground treatment being carried out) |
| CP 14 Construction | 26th May 2015 to 14th July 2015 |
| Limmo Dewatering | 4th November 2013 to 14th March 2016 |

## 6. METHODOLOGY

To determine the settlement rate the following methodology has been used. A Linear Regression has been applied for a defined period using long term readings is recorded after TBM construction. This uses the following formula:

$$b = \frac{\sum_{i=1}^{n}(X_i - \overline{X}_i) \cdot (Y_i - \overline{Y}_i)}{\sum_{i=1}^{n}(X_i - \overline{X}_i)^2}$$

Where:

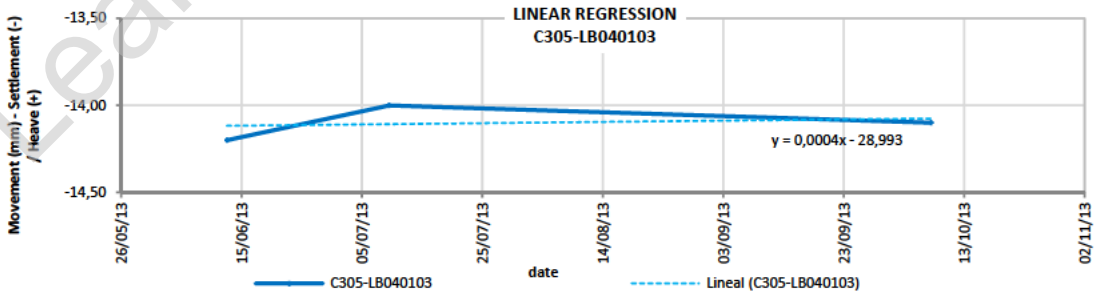
B =gradient
X = date
Y = vertical movement

From this, the settlement rate per day can be calculated and rate per year determined (negative value is for settlement, positive is for heave). For these values, the percentage at or below 2 mm/yr will be used to determine the trend of the section/area being considered. Also for comparison, values at or below 3mm/year are presented to highlight that the rate is close to achieving the 2 mm/yr.

Note the percentages of settlement rate presented in the sections below refer to values rounded to the nearest integer.

One example of this calculation can be seen below for the socket C305-LB040103 and its projection included in this Close Out Report.

| | Registered movement (mm) | | | RATE |
|---|---|---|---|---|
| | 12/06/2013 | 09/07/2013 | 07/10/2013 | mm/year |
| C305-LB040103 | -14.20 | -14.00 | -14.10 | 0.146 |



CALCULATION - C305-LB040103

| $X_i$ | $Y_i$ | $X_i - \overline{X}_i$ | $Y_i - \overline{Y}_i$ | $(X_i - \overline{X}_i)^2$ | $(X_i - \overline{X}_i) \cdot (Y_i - \overline{Y}_i)$ |
|---|---|---|---|---|---|
| 12/06/2013 | -14.2 | -47.94 | -0.10 | 2298.67 | 4.794 |
| 09/07/2013 | -14 | -21.03 | 0.10 | 442.17 | -2.103 |
| 07/10/2013 | -14.1 | 68.97 | 0.00 | 4757.17 | 0.000 |

| | | | |
|---|---|---|---|
| $\overline{X}_i$ | | 41485.53 | |
| $\overline{Y}_i$ | | -14.10 | |
| $\sum_{i=1}^{n} (X_i - \overline{X}_i)^2$ | | 7498.00 | (2) |
| $\sum_{i=1}^{n} (X_i - \overline{X}_i) \cdot (Y_i - \overline{Y}_i)$ | | 2.692 | (1) |
| m (SLOPE) | (1)/(2) | 0.0004 | |
| Rate (mm/year) | m * 365 | 0.146 | |

## 7. SUMMARY OF THE DATA

The methodology explained in section 6 for the Sockets is applied here to rod extensometers and levelling points.

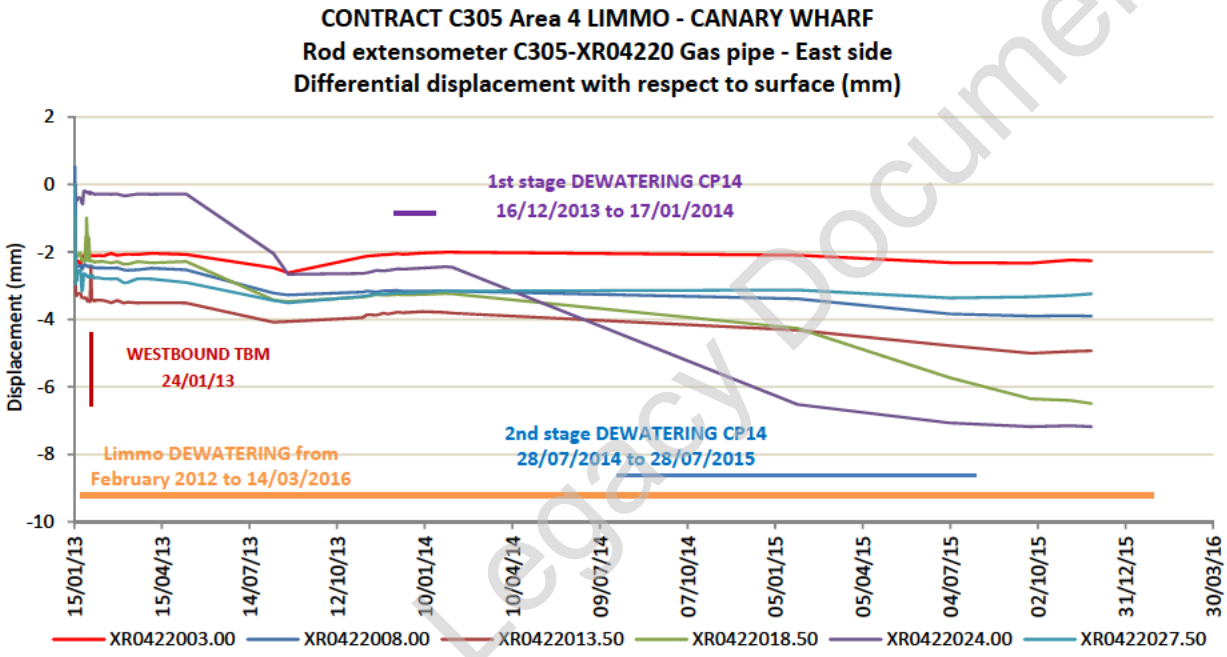
Note: For the following data plots #N/A refers to instances where readings were not taken for that sensor (e.g. damaged sensor, no access, etc.)

## GAS PIPE EAST SIDE

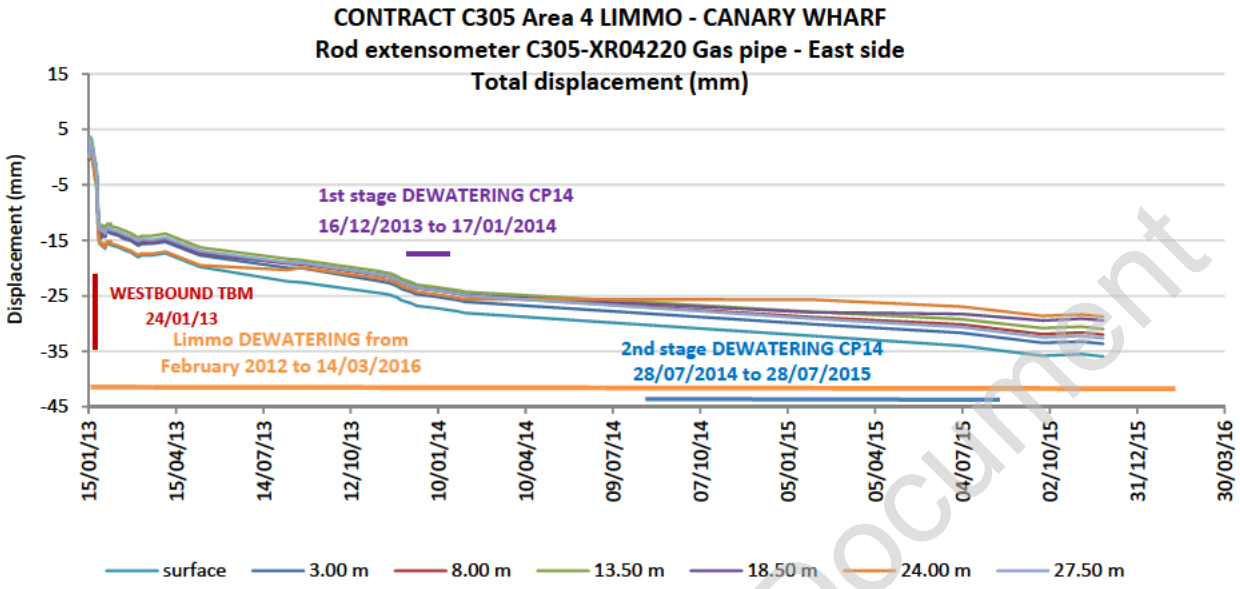
### ROD EXTENSOMETER

#### C305-XR04220

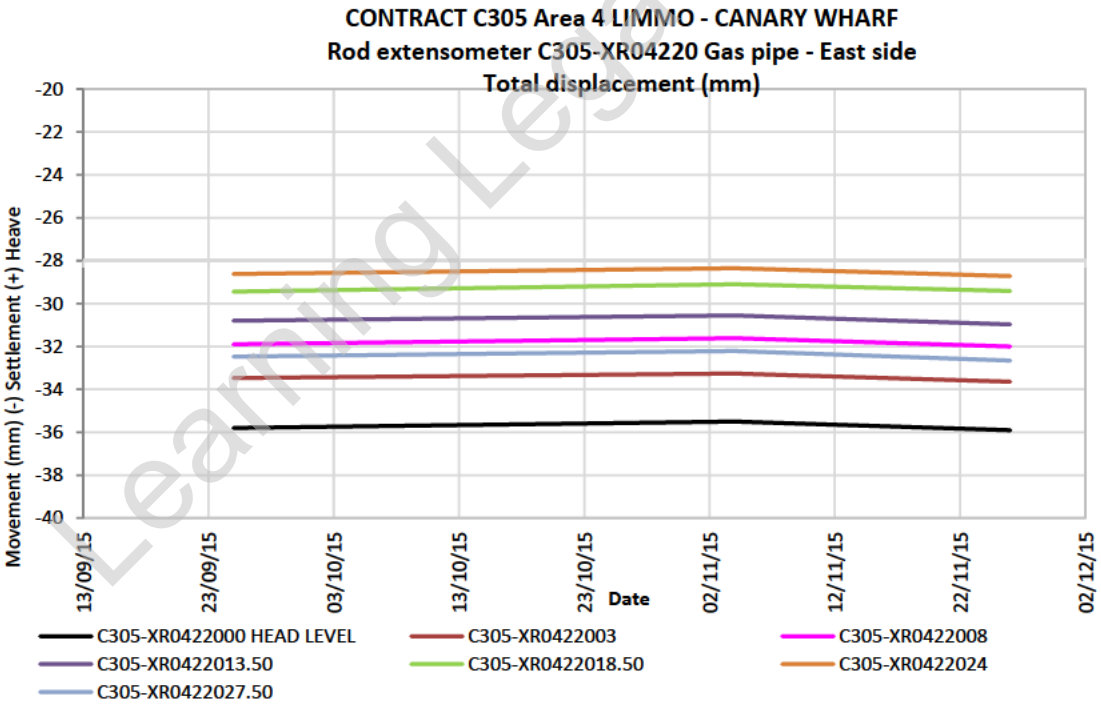
The graph presented below shows the readings from this rod extensometer, showing a maximum differential settlement with respect to surface of 3.5 mm during the Westbound TBM transit. A maximum of 7.18 mm of settlement was recorded in November of 2015.



The graph presented below shows the readings from this rod extensometer, showing a maximum total settlement of 15 mm during the Westbound TBM transit. A maximum of 35.9 mm of settlement was recorded in November of 2015.




The next plot shows the trend line adjustment for each rod:



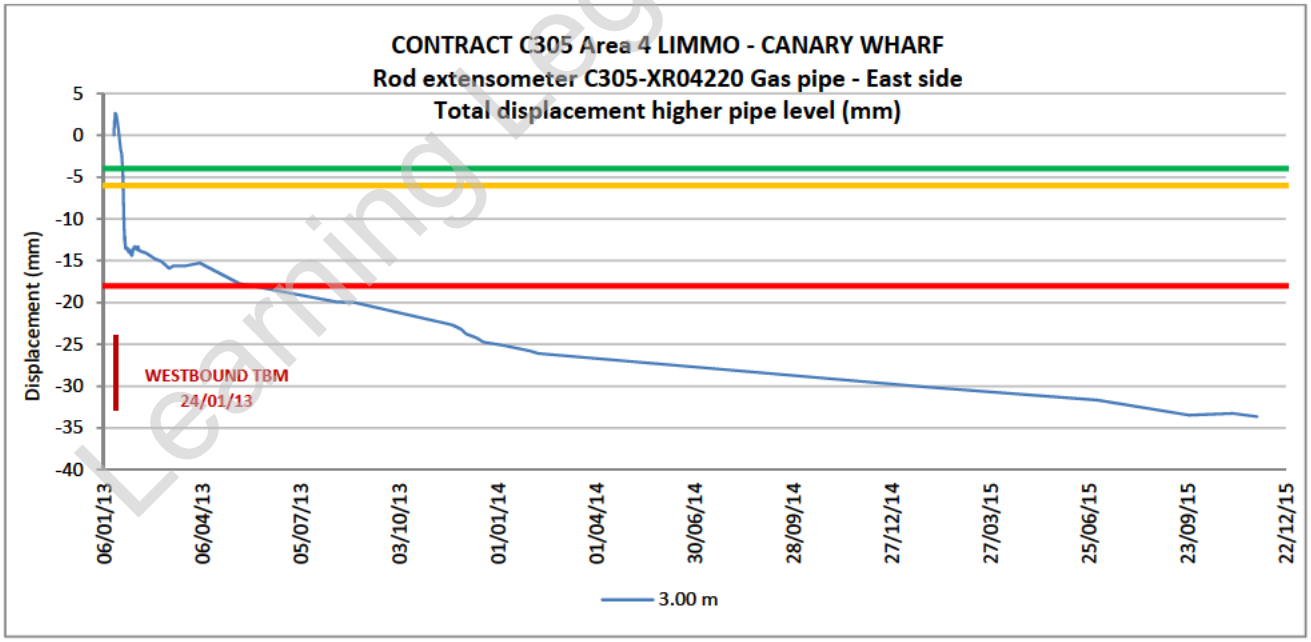
The table below illustrates the annual settlement rate for each rod of the extensometer:

| | Registered Movement (mm) | | | Rate (mm/year) |
|---|---|---|---|---|
| | 25/09/2015 | 04/11/2015 | 26/11/2015 | |
| C305-XR0422000 HEAD LEVEL | -35.80 | -35.50 | -35.90 | -0.185 |
| C305-XR0422003 | -33.47 | -33.26 | -33.64 | -0.658 |
| C305-XR0422008 | -31.90 | -31.61 | -32.00 | -0.206 |
| C305-XR0422013.50 | -30.80 | -30.55 | -30.97 | -0.614 |
| C305-XR0422018.50 | -29.44 | -29.10 | -29.41 | 0.560 |
| C305-XR0422024 | -28.62 | -28.35 | -28.72 | -0.224 |
| C305-XR0422027.50 | -32.47 | -32.21 | -32.66 | -0.697 |
| | Rate less than -2.5 mm/year | % less 2 mm/ year | | 100.00% |
| | Rate greater than -3.5 mm/year | % less 3 mm/ year | | 100.00% |

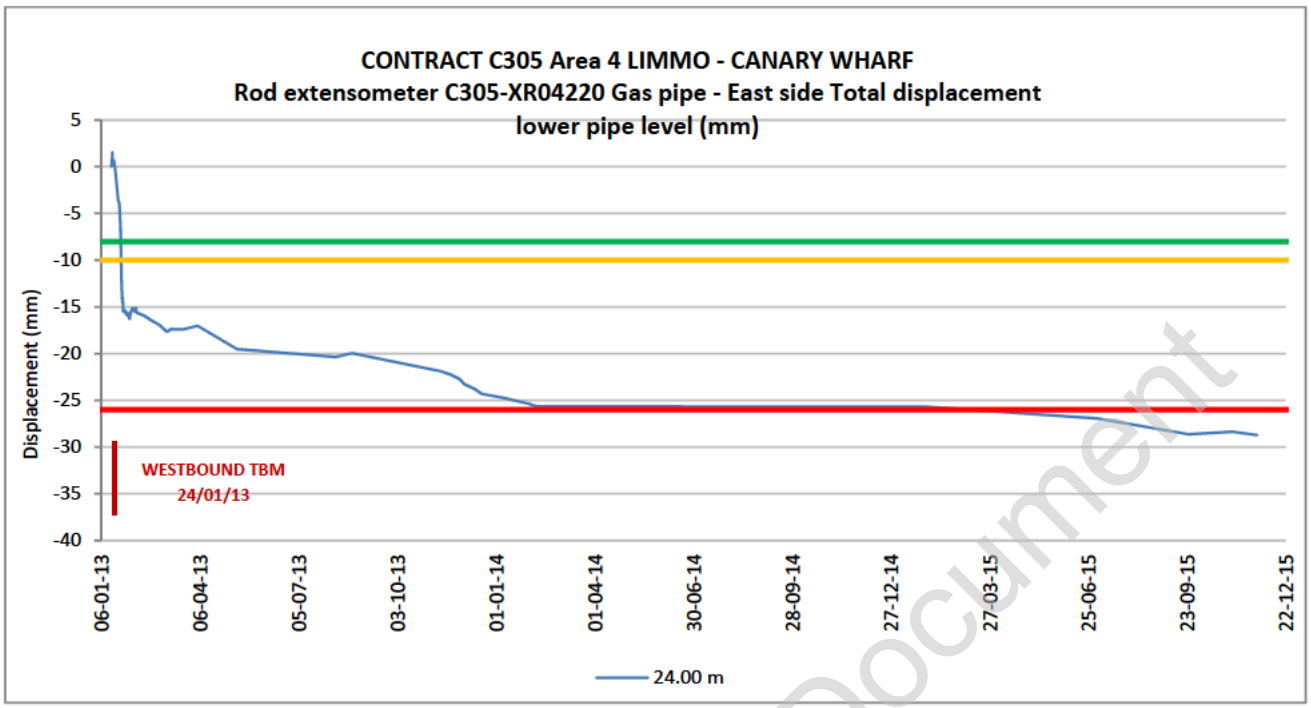
Note: All movements are in mm. (-) Settlement / (+) Heave
#N/A: No readings

The percentage of the rods with a settlement rate less than 2 mm/year and 3 mm/year is 100%

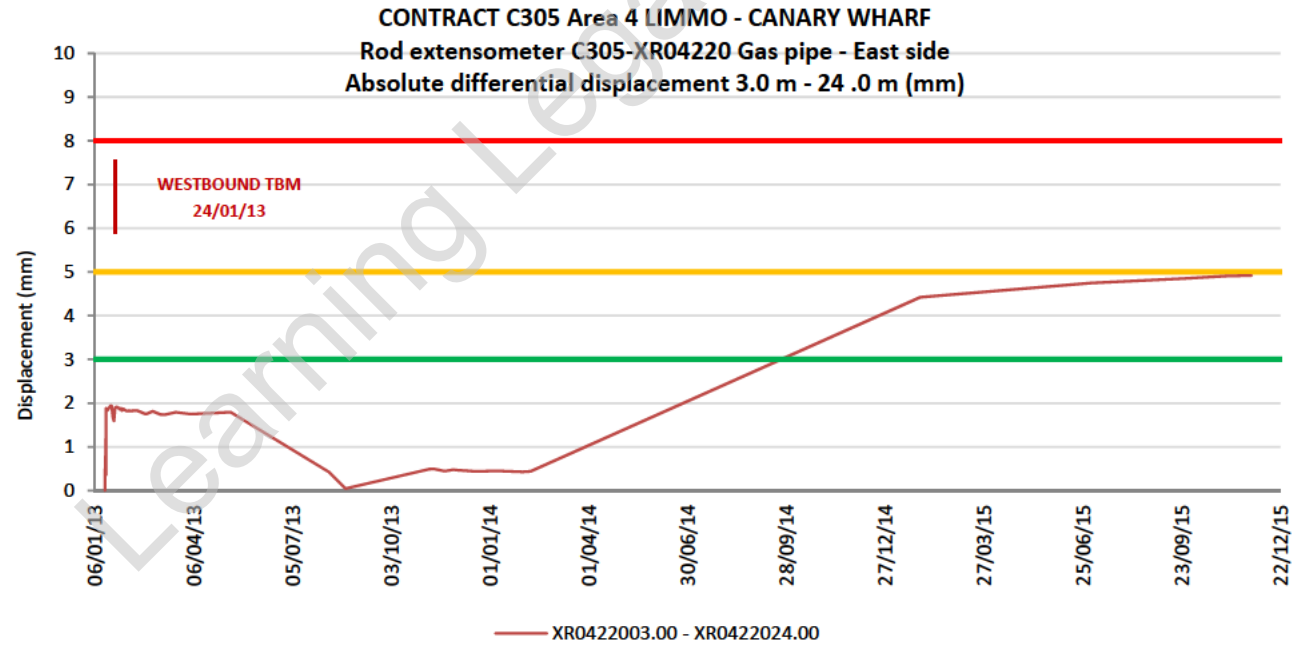
The graph presented below shows the readings from this rod extensometer, showing total displacement of higher pipe level. A maximum displacement of 33.64 mm was recorded in November of 2015.




The graph presented below shows the readings from this rod extensometer, showing total displacement of lower pipe level. A maximum displacement of 28.72 mm was recorded in November of 2015.



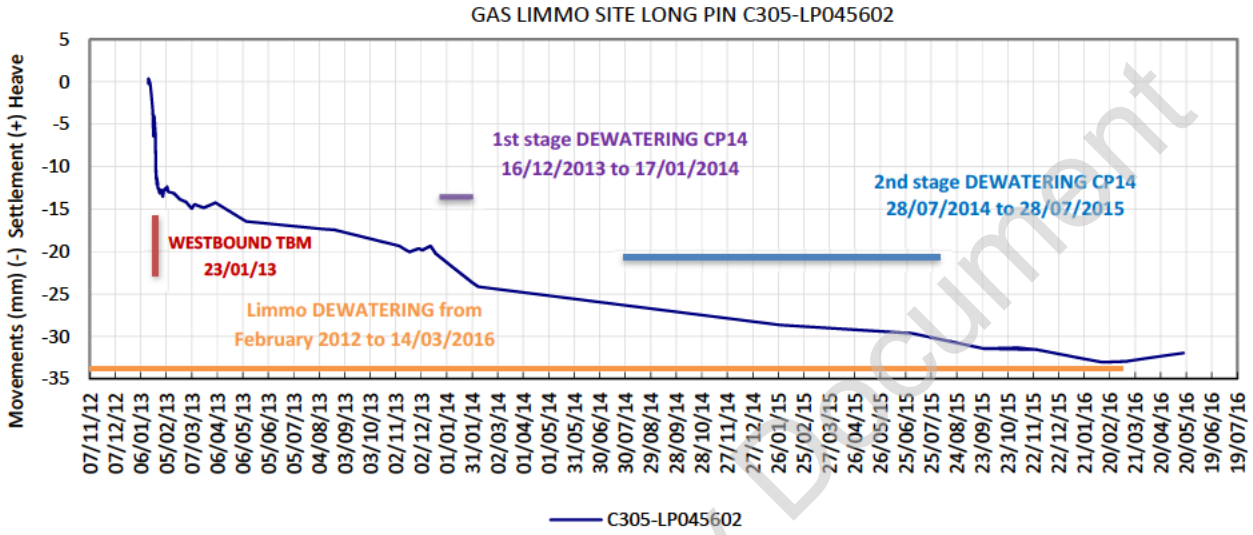

The graph presented below shows the readings from this rod extensometer, showing absolute differential displacement of both pipe levels. Absolute maximum displacement value of 4.92 mm was recorded in November of 2015.



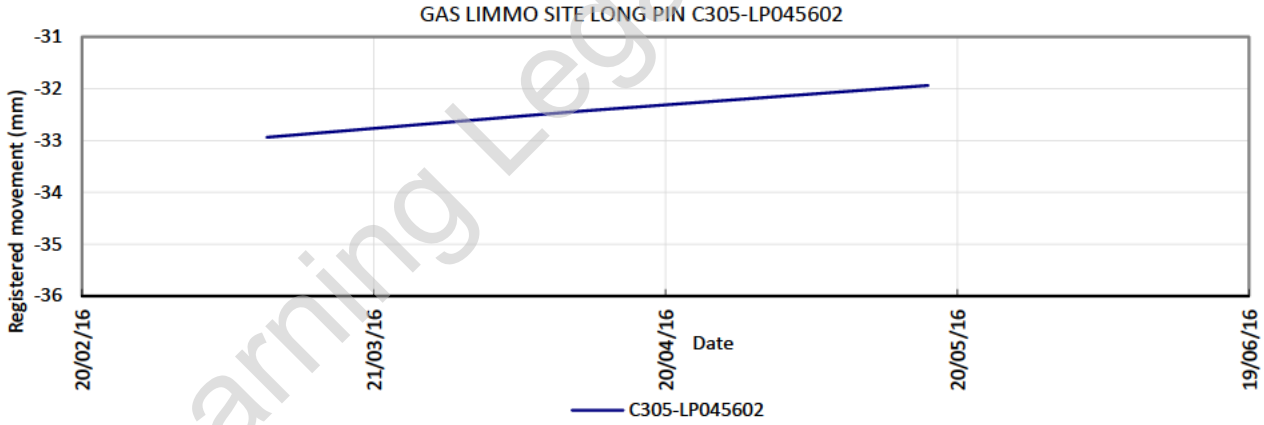
## LEVELLING POINTS

### LONG PIN C305-LP045602

The graph presented below shows the readings from the long pin. A maximum total settlement of 31.54 mm was recorded in May of 2016.




The next plot shows the trend line adjustment for long pin:




The table below illustrates the annual settlement rate for long pin:

| | Registered movement (mm) | | | mm/year |
|---|---|---|---|---|
| | 10/3/16 | 11/4/16 | 17/5/16 | |
| C305-LP045602 | -32.94 | -32.44 | -31.94 | 5.361 |
| | Rate less than -2.5 mm/year | | % less 2 mm/ year | 100% |
| | Rate greater than -3.5 mm/year | | % less 3 mm/ year | 100% |

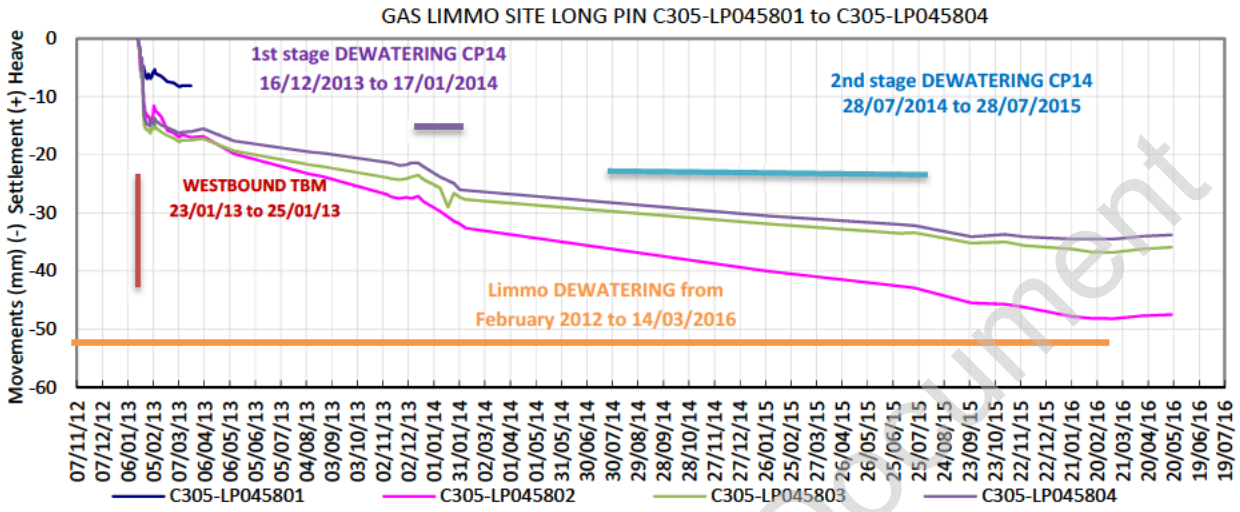
Note: All the movements are in mm. (-) Settlement / (+) Heave

#N/A: No readings

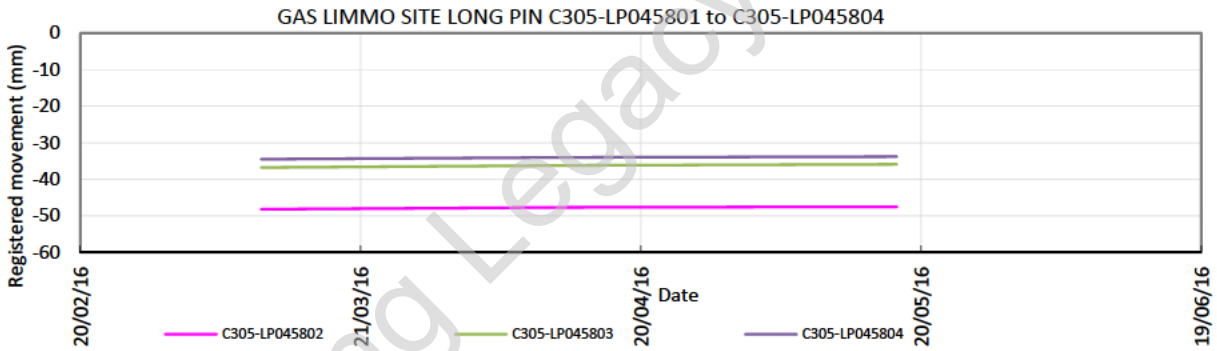
The percentage of the rods with a settlement rate less than 2 mm/year and 3 mm/year is 100%.

**C305-LP045801 to C305-LP045804**

The graph presented below shows the readings from the levelling points of this array. A maximum total settlement of 47.8 mm was recorded in May of 2016.




The next plot shows the trend line adjustment for C305-LP045801 to C305-LP045804:




The table below illustrates the annual settlement rate for C305-LP045801 to C305-LP045804:

| | Registered movement (mm) | | | mm/year |
|---|---|---|---|---|
| | 10/3/16 | 12/4/16 | 17/5/16 | |
| C305-LP045801 | #N/A | #N/A | #N/A | #N/A |
| C305-LP045802 | -48.2 | -47.70 | -47.50 | 3.740 |
| C305-LP045803 | -36.8 | -36.20 | -35.90 | 4.813 |
| C305-LP045804 | -34.5 | -34.00 | -33.80 | 3.740 |
| | Rate less than -2.5 mm/year | | **% less 2 mm/ year** | 100% |
| | Rate greater than -3.5 mm/year | | **% less 3 mm/ year** | 100% |

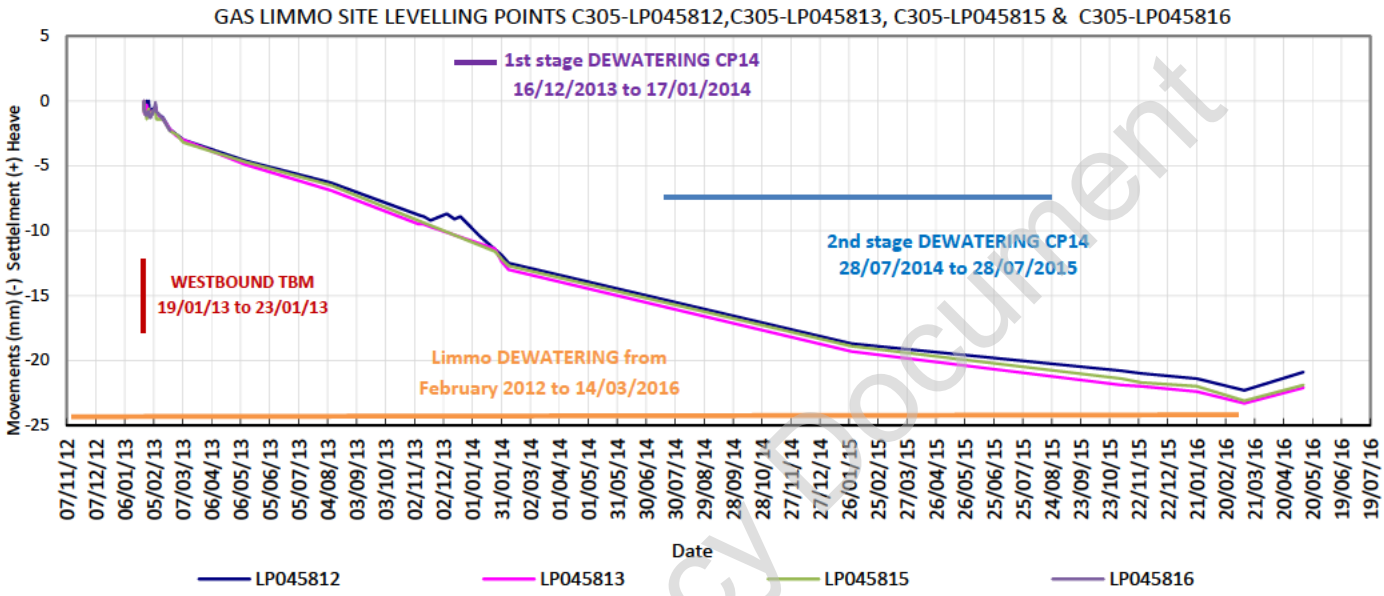
Note: All the movements are in mm. (-) Settlement / (+) Heave #N/A: No readings

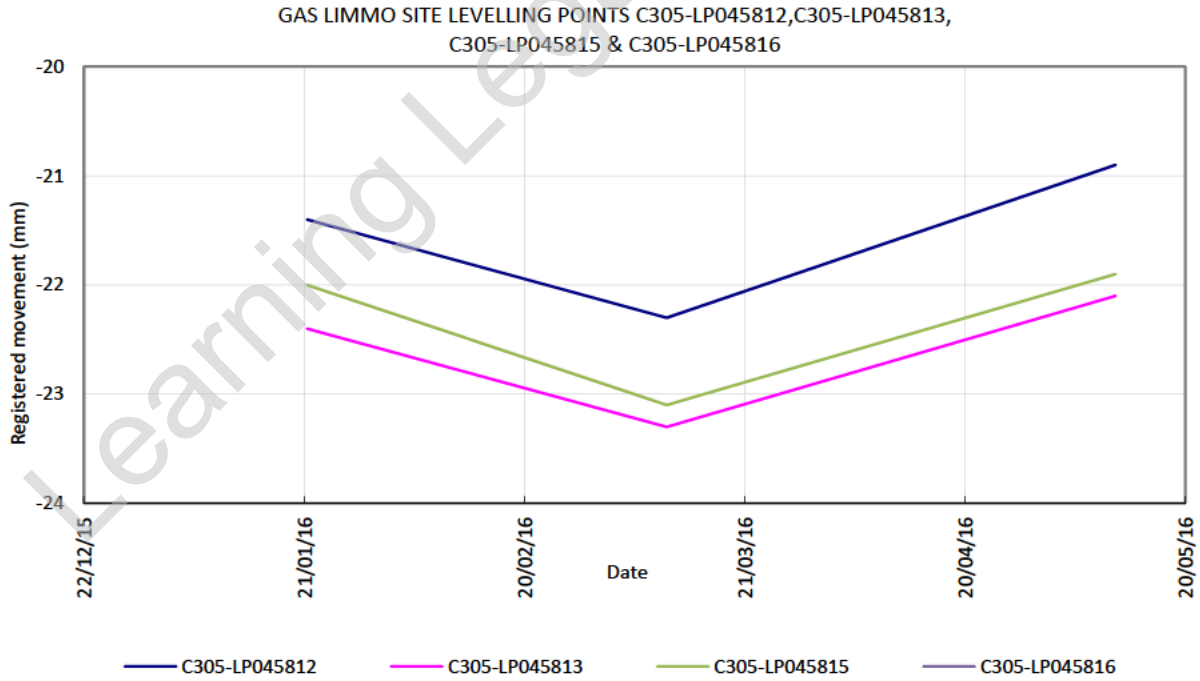
The percentage of the rods with a settlement rate less than 2 mm/year is 100% and rate less than 3 mm/year is 100%.

**C305-LP045812, C305-LP045813, C305-LP045815 & C305-LP045816**

The graph presented below shows the readings from the levelling points of this array. A maximum total settlement of 23.3 mm was recorded in May of 2016.

The next plot shows the trend line adjustment for C305-LP045812, C305-LP045813, C305-LP045815 & C305-LP045816:



The table below illustrates the annual settlement rate for C305-LP045812, C305-LP045813, C305-LP045815 & C305-LP045816:

| | Registered movement (mm) | | | mm/year |
|---|---|---|---|---|
| | 21/1/16 | 10/3/16 | 10/5/16 | |
| C305-LP045812 | -21.4 | -22.30 | -20.90 | 1.929 |
| C305-LP045813 | -22.4 | -23.30 | -22.10 | 1.245 |
| C305-LP045815 | -22 | -23.10 | -21.90 | 0.609 |
| C305-LP045816 | #N/A | #N/A | #N/A | #N/A |
| | Rate less than -2.5 mm/year | | **% less 2 mm/ year** | 100% |
| | Rate greater than -3.5 mm/year | | **% less 3 mm/ year** | 100% |

Note: All the movements are in mm. (-) Settlement / (+) Heave
#N/A: No readings

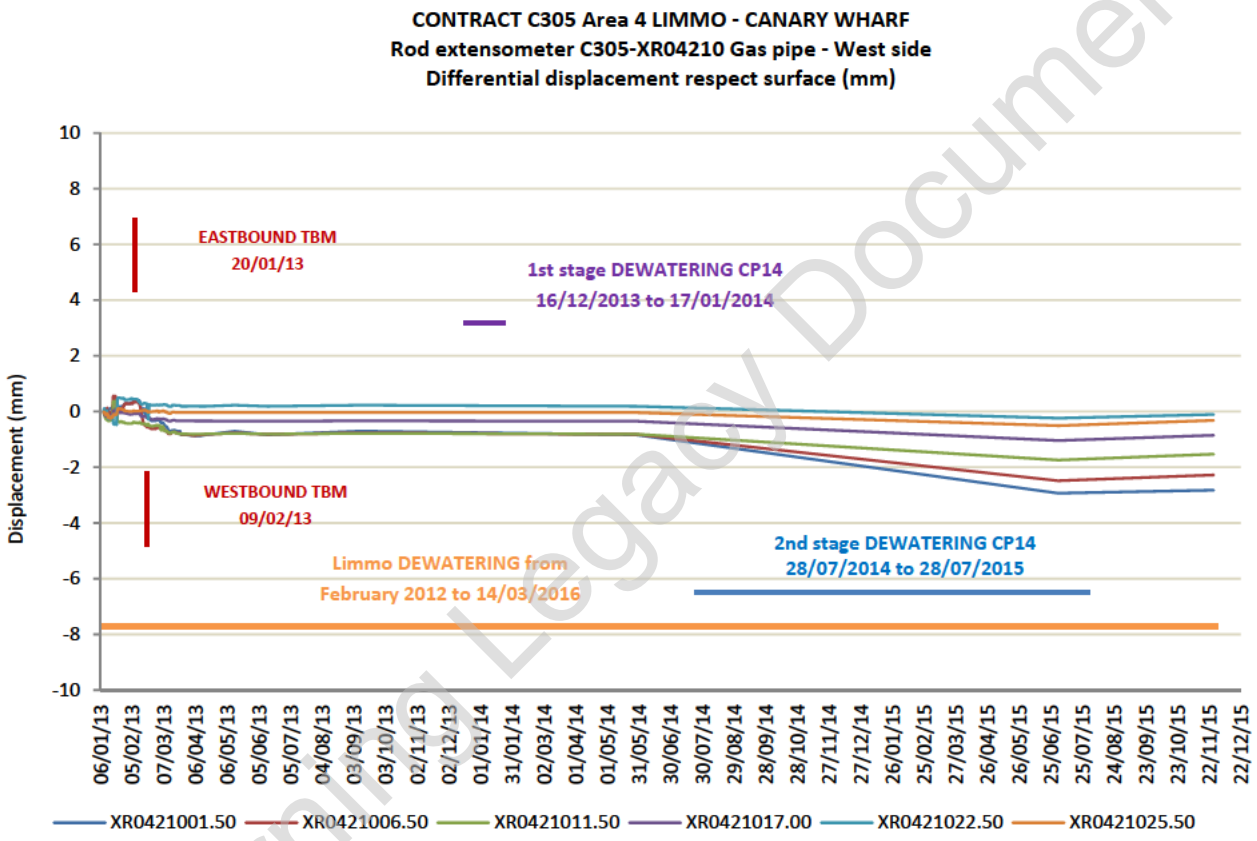
The percentage of the rods with a settlement rate less than 2 mm/year is 100%.

## GAS PIPE WEST SIDE

### ROD EXTENSOMETER

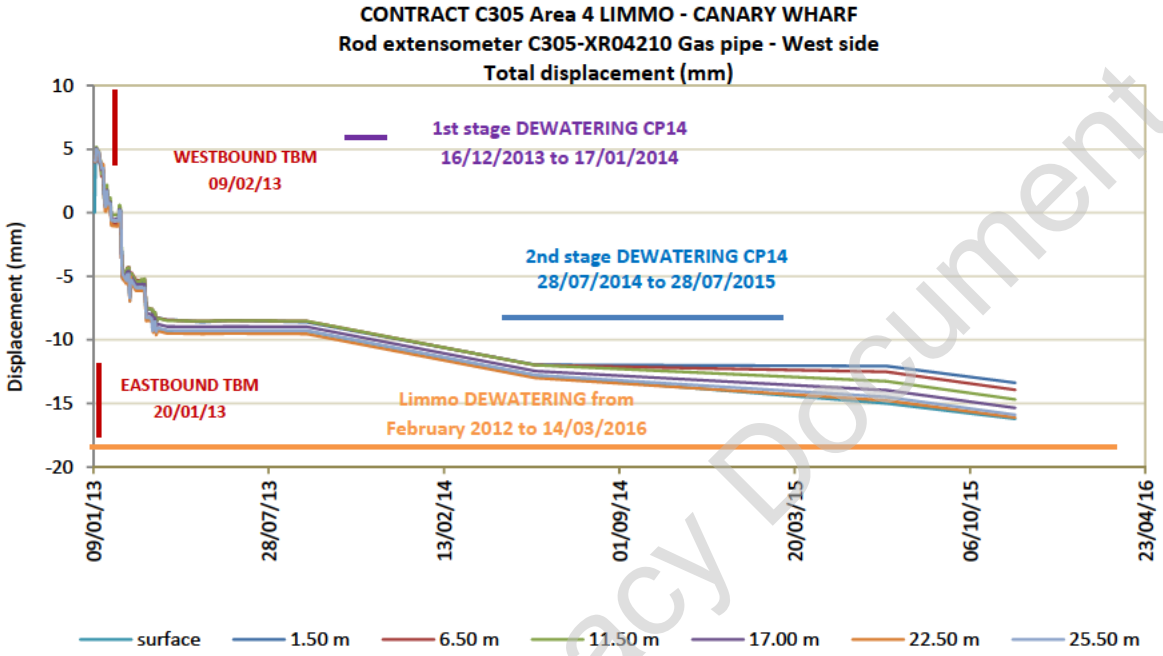
#### C305-XR04210

The graph presented below shows the readings from this rod extensometer, showing a maximum differential settlement with respect to surface of 0.48 mm during the Westbound TBM transit. A maximum of 2.93 mm of settlement was recorded in July of 2015.

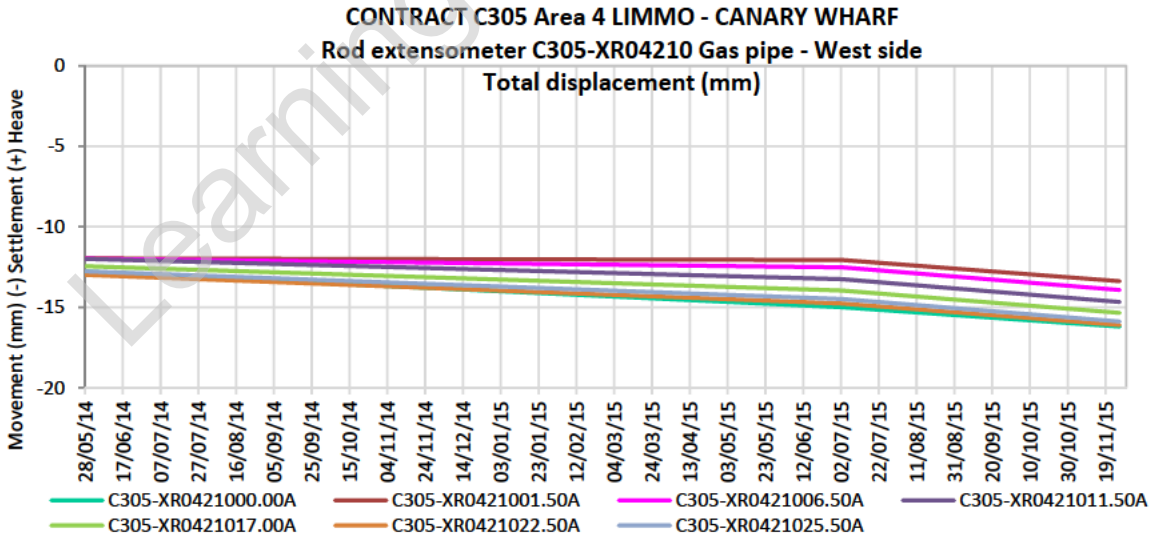


The graph presented below shows the readings from this rod extensometer, showing a maximum total settlement of 0.70 mm during the Westbound TBM transit. A maximum of 15.88 mm of settlement was recorded in November of 2015.

It was agreed between Crossrail and the C305 Contractor to set the initial readings at approximately 4 mm following baseline period.




The next plot shows the trend line adjustment for each rod.



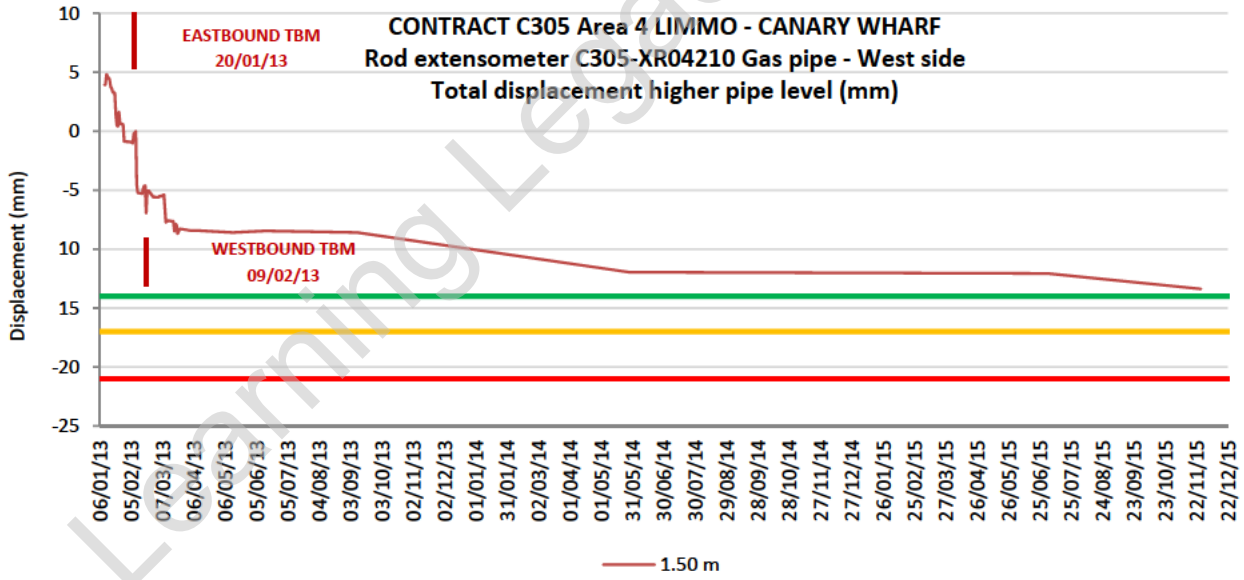

The table below illustrates the annual settlement rate for each rod of the extensometer.

| | Registered Movement (mm) | | | Rate (mm/year) |
|---|---|---|---|---|
| | 28/05/2014 | 02/07/2015 | 26/11/2015 | |
| C305-XR0421000.00A | -12.80 | -15.00 | -16.20 | -2.214 |
| C305-XR0421001.50A | -11.96 | -12.07 | -13.38 | -0.764 |
| C305-XR0421006.50A | -11.98 | -12.52 | -13.93 | -1.125 |
| C305-XR0421011.50A | -11.99 | -13.26 | -14.67 | -1.656 |
| C305-XR0421017.00A | -12.46 | -13.96 | -15.35 | -1.813 |
| C305-XR0421022.50A | -12.99 | -14.76 | -16.10 | -1.978 |
| C305-XR0421025.50A | -12.77 | -14.49 | -15.88 | -1.973 |
| | Rate less than -2.5 mm/year | % less 2 mm/ year | | 100% |
| | Rate greater than -3.5 mm/year | % less 3 mm/ year | | 100% |

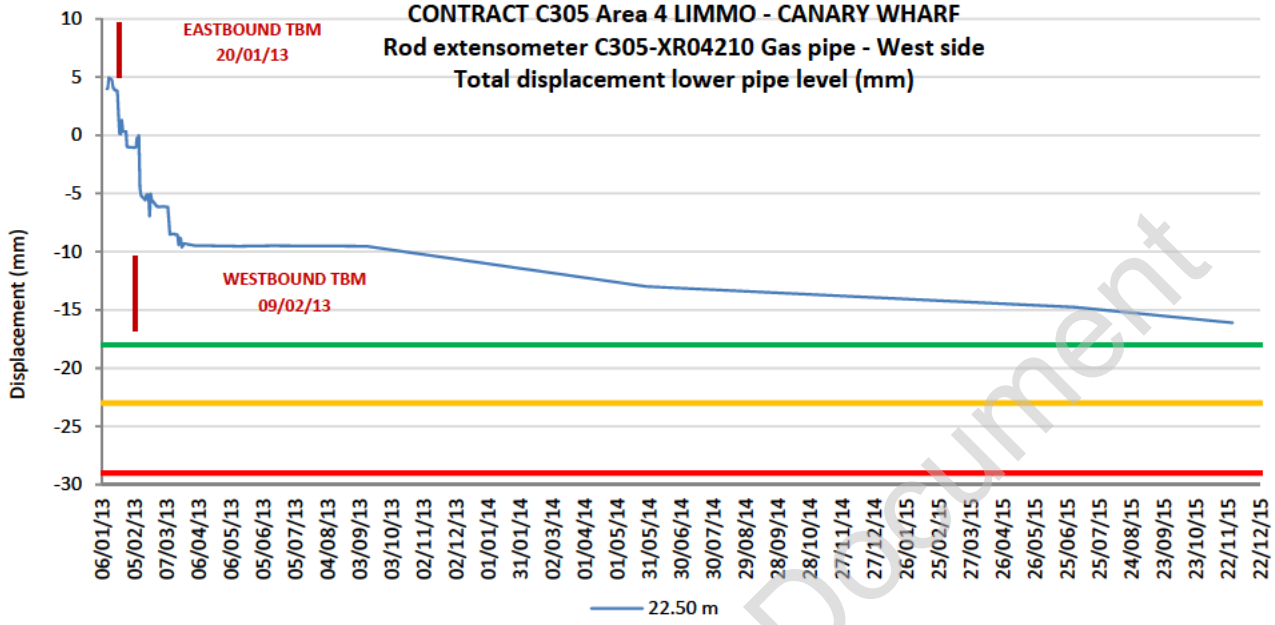
Note: All the movements are in mm. (-) Settlement / (+) Heave
#N/A: No readings

The percentage of the rods with a settlement rate less than 2 mm/year and 3 mm/year is 100%

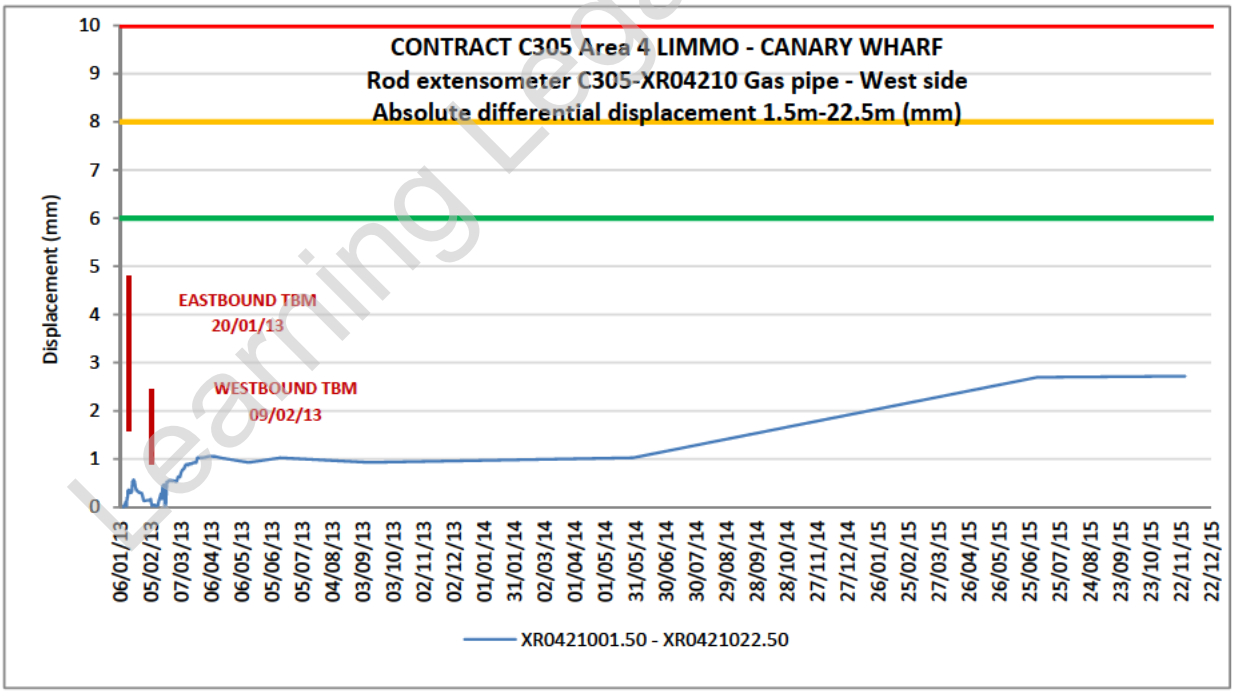
The graph presented below shows the readings from this rod extensometer, showing total displacement of higher pipe level. A maximum displacement of 13.38 mm was recorded in November of 2015.



The graph presented below shows the readings from this rod extensometer, showing total displacement of lower pipe level. A maximum displacement of 16.1 mm was recorded in November of 2015.



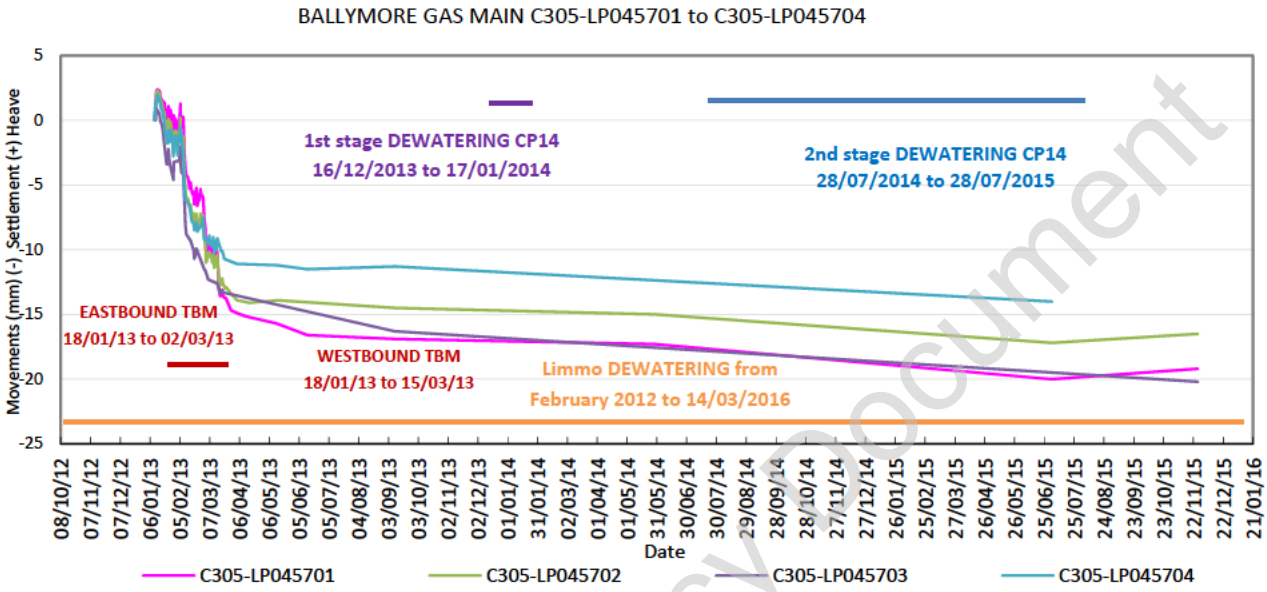

The graph presented below shows the readings from this rod extensometer, showing absolute differential displacement of both pipe levels. Absolute maximum displacement value of 2.72 mm was recorded in November of 2015.



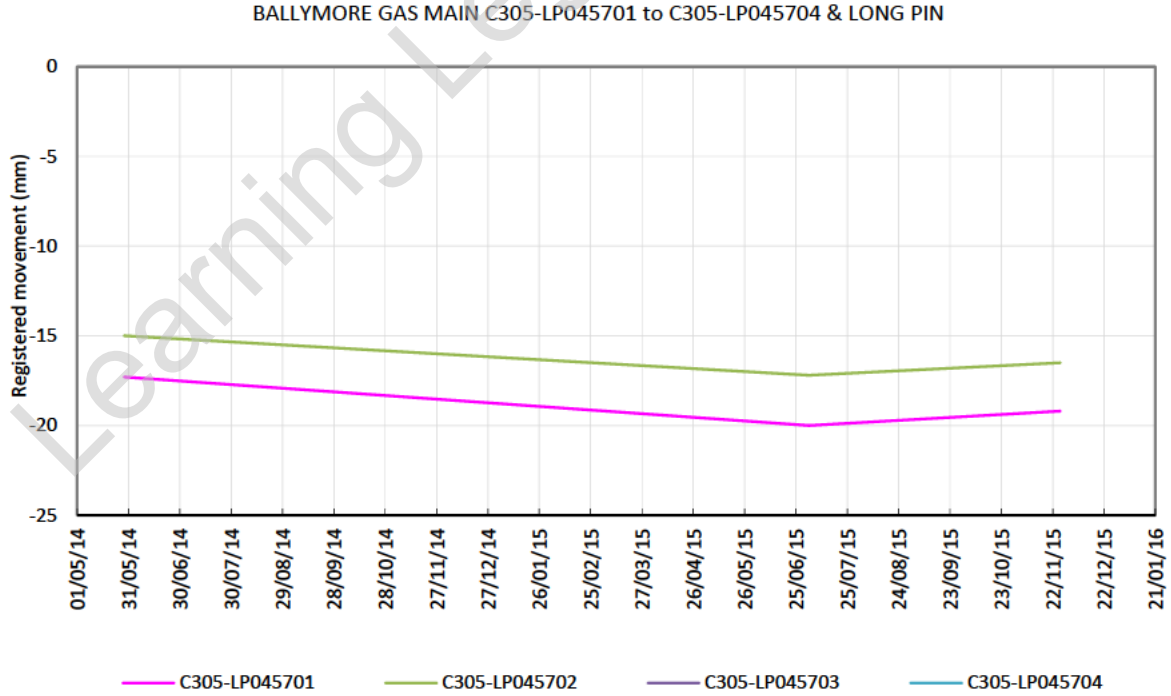
## LEVELLING POINTS

### C305-LP045701 to C305-LP045704

The graph presented below shows the readings from the levelling points of this array, showing a maximum total settlement of 20.2 mm recorded in November of 2016.




The next plot shows the trend line adjustment for C305-LP045701 to C305-LP045704:



The table below illustrates the annual settlement rate for C305-LP045701 to C305-LP045704:

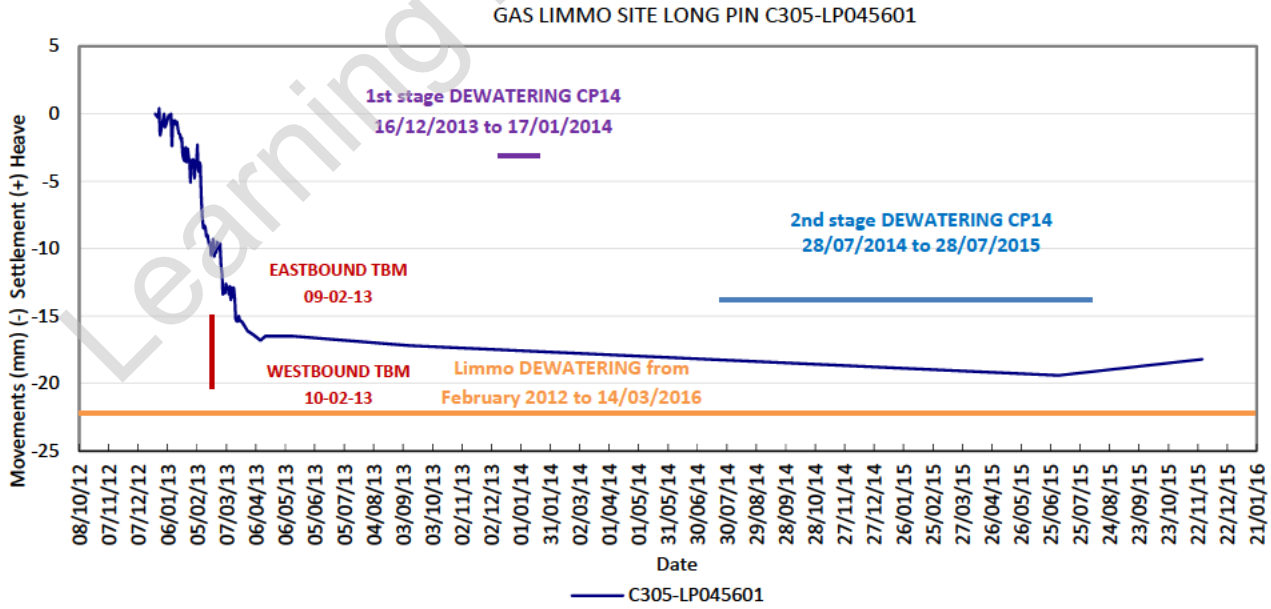
| | Registered movement (mm) | | | mm/year |
|---|---|---|---|---|
| | 28/5/14 | 2/7/15 | 26/11/15 | |
| C305-LP045701 | -17.3 | -20.00 | -19.20 | -1.520 |
| C305-LP045702 | -15 | -17.20 | -16.50 | -1.213 |
| C305-LP045703 | #N/A | #N/A | -20.20 | #N/A |
| C305-LP045704 | #N/A | -14.00 | #N/A | #N/A |
| | Rate less than -2.5 mm/year | | **% less 2 mm/ year** | 100% |
| | Rate greater than -3.5 mm/year | | **% less 3 mm/ year** | 100% |

Note: All the movements are in mm. (-) Settlement / (+) Heave
#N/A: No readings

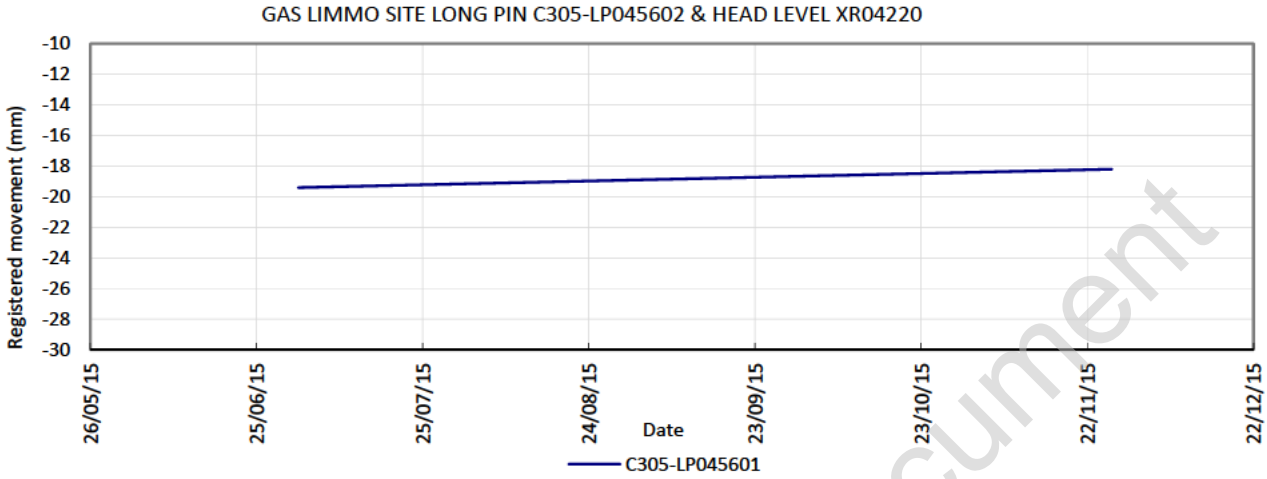
The percentage of the rods with a settlement rate less than 2 mm/year and 3 mm/year is 100%

## LONG PIN C305-LP045601

The graph presented below shows the readings from the long pin. A maximum total settlement of 19 mm was recorded in July of 2015.



The next plot shows the trend line adjustment for long pin:




The table below illustrates the annual settlement rate for long pin:

| | Registered movement (mm) | | | mm/year |
|---|---|---|---|---|
| | 28/5/14 | 2/7/15 | 26/11/15 | |
| C305-LP045601 | #N/A | -19.40 | -18.20 | 2.983 |
| | Rate less than -2.5 mm/year | | **% less 2 mm/ year** | 100% |
| | Rate greater than -3.5 mm/year | | **% less 3 mm/ year** | 100% |

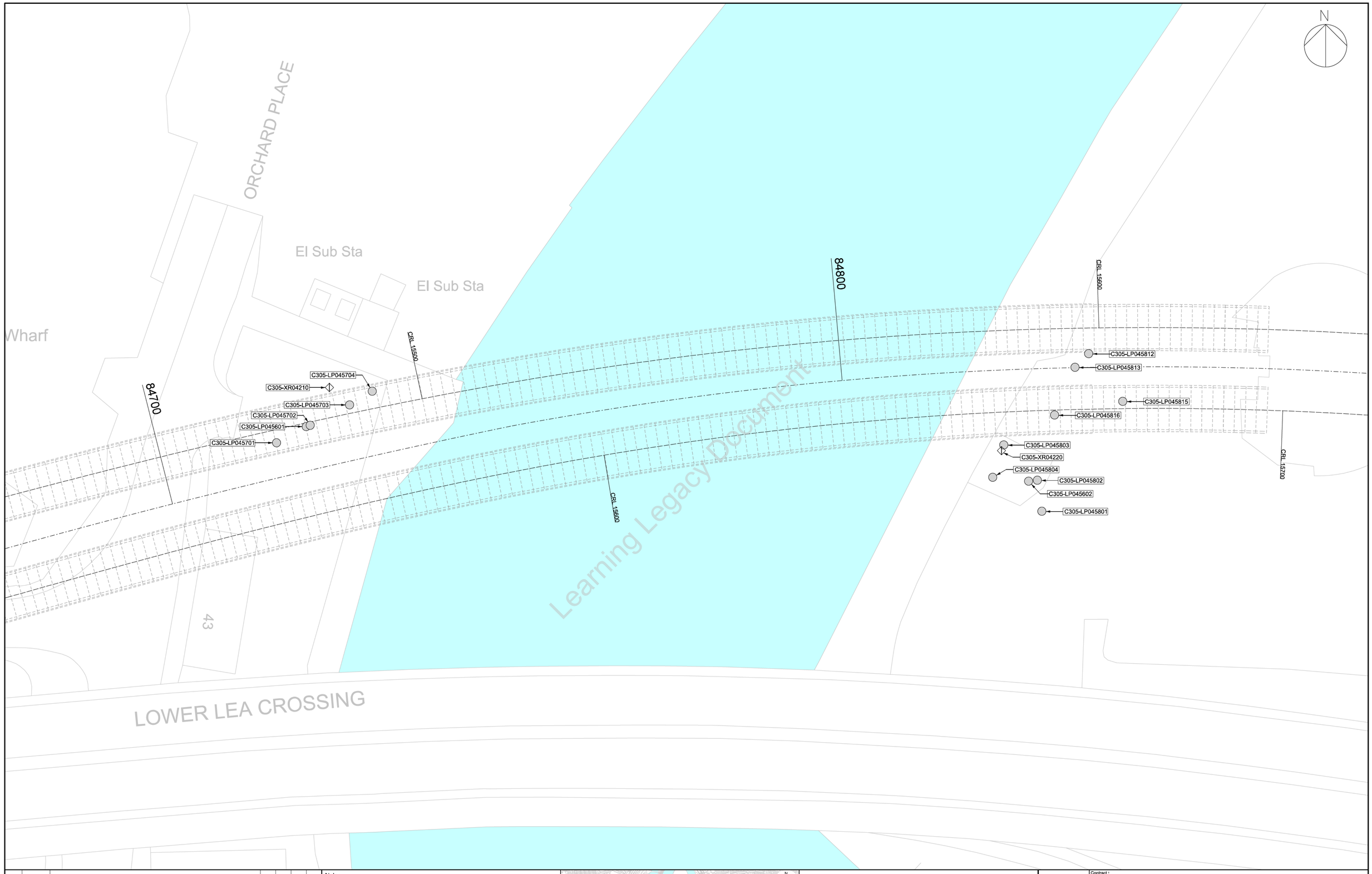
Note: All the movements are in mm. (-) Settlement / (+) Heave
#N/A: No readings

The percentage of the rods with a settlement rate less than 2 mm/year and 3 mm/year is 100%.

## 8. SUMMARY STATEMENT

It has been agreed in a meeting between the Project Manager, the Designer, the Contractor and the Sub Contractor that the instrumentation covered herein, for monitoring ground movement effects of Crossrail works, including long term effects, can be closed out for decommissioning as trends of the monitoring points were approaching or had achieved the specified 2 mm/year settlement rate.

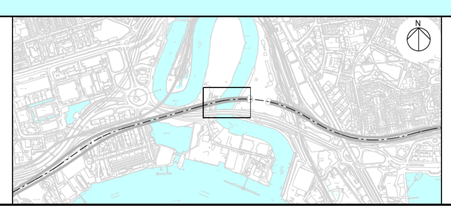
# APPENDIX A: INSTRUMENT LOCATION




| Rev. | Date | Description | By | Chkd | App | Auth |
|---|---|---|---|---|---|---|
| | | | | | | - |
| | | | | | | - |
| | | | | | | - |
| | | | | | | - |
| P01 | 11/04/2016 | First Issue | MD | MD | MD | - |

Notes

- Levelling Points
- Rod Extensometer




5m 0 5m 10m 15m 20m 25m
1:250 @ A1

Crossrail Limited
25 Canada Square
Canary Wharf
London
E14 5LQ



www.crossrail.co.uk

Contract : Tunnels East - Drive Y LIM to FAR & Drive Z SGJ to PML & Drive G

Originator : Dragados Sisk Joint Venture

Location : Crossrail Tunnels - Drive Y (Limmo Peninsula to Farringdon Stn)

Title : Instrumentation & Monitoring
Installation report for I&M Installed as per
600mm IP Gas Main beneath River Lea
C305-DSJ-U-GMS-CR144 WS155-50003

By : M.DAVIS
Chk : M.DAVIS
App : M.DAVIS
Auth : _

| Scale : | Drawing and CAD file No : | Rev : | Suitability : |
|---|---|---|---|
| 1:250 @ A1 | C305-DSJ-C2-DDA-CRT00_ST006_1-08179 | P01 | S4 |

Fit for authorisation

RESTRICTED

C305-DSJ-C2-DDA-CRT00_ST006_1-08179.dgn 11/04/2016 16:02:18

# APPENDIX B: SUMMARY OF INSTRUMENTATION INSTALLED ON SITE

GEOCISA UK

| IRS Installation Record Sheets – Rod Extensometer | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sensor Type | | Date Installation | Sensor ID | SENSOR Location - GPS reading (m) | | | Commissioning Readings Head level (m)<br>Commissioning Readings Rod Extensometer (mm) | | | |
| | | | | Eastings X | Northings Y | Elevation Z (mATD) | | | | |
| | | | | | | | 17/01/2013 | 17/01/2013 | 17/01/2013 | AVERAGE |
| Rod Extensometer | C305-XR042010 | 29/12/2012 | HEAD LEVEL | 89602.623 | 35510.033 | 104.560 | 105.1079 | 105.1087 | 105.1077 | 105.1081 |
| | | 29/12/2012 | C305-XR142010.27.00 | 89602.623 | 35510.033 | 104.560 | 98.0504 | 98.0500 | 98.0502 | 98.0502 |
| | | 29/12/2012 | C305-XR142010.22.50 | 89602.623 | 35510.033 | 104.560 | 97.5894 | 97.5889 | 97.5893 | 97.5892 |
| | | 29/12/2012 | C305-XR142010.18.00 | 89602.623 | 35510.033 | 104.560 | 98.6464 | 98.6467 | 98.6467 | 98.6466 |
| | | 29/12/2012 | C305-XR142010.13.50 | 89602.623 | 35510.033 | 104.560 | 97.9998 | 98.0006 | 98.0002 | 98.0002 |
| | | 29/12/2012 | C305-XR142010.09.00 | 89602.623 | 35510.033 | 104.560 | 102.0433 | 102.0440 | 102.0444 | 102.0439 |
| | | 29/12/2012 | C305-XR142010.04.50 | 89602.623 | 35510.033 | 104.560 | 103.0124 | 103.0118 | 103.0124 | 103.0122 |
| | | | | | | | 16/01/2013 | 16/01/2013 | 16/01/2013 | AVERAGE |
| Rod Extensometer | C305-XR042020 | 13/01/2013 | HEAD LEVEL | 89701.206 | 35500.772 | 107.007 | 106.3322 | 106.3331 | 106.3328 | 106.3327 |
| | | 13/01/2013 | C305-XR0422003.00 | 89701.206 | 35500.772 | 107.007 | 52.9506 | 52.9499 | 52.9495 | 52.9500 |
| | | 13/01/2013 | C305-XR0422008.00 | 89701.206 | 35500.772 | 107.007 | 50.2098 | 50.2103 | 50.2099 | 50.2100 |
| | | 13/01/2013 | C305-XR0422013.50 | 89701.206 | 35500.772 | 107.007 | 69.1097 | 69.1105 | 69.1098 | 69.1100 |
| | | 13/01/2013 | C305-XR0422018.50 | 89701.206 | 35500.772 | 107.007 | 60.7096 | 60.7105 | 60.7099 | 60.7100 |
| | | 13/01/2013 | C305-XR0422024.00 | 89701.206 | 35500.772 | 107.007 | 81.6702 | 81.6694 | 81.6704 | 81.6700 |
| | | 13/01/2013 | C305-XR0422027.50 | 89701.206 | 35500.772 | 107.007 | 50.6195 | 50.6200 | 50.6205 | 50.6200 |

GEOCISA UK

| IRS Installation Record Sheets – Levelling Points | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sensor Type | Sensor ID | Date Installation | Status | Sensor Location - GPS Reading | | | Commisioning Readings (m) | | | |
| | | | | Eastings X (m) | Northings Y (m) | Elevation Z (mATD) | Average | 28/05/2014 | 02/07/2015 | 26/11/2015 |
| Levelling Point | C305-LP045701 | 10/01/2013 | Installed | 89594.8700 | 35501.9300 | 105.020 | 104.9592 | 104.9595 | 104.9591 | 104.9590 |
| Levelling Point | C305-LP045702 | 10/01/2013 | Installed | 89599.8100 | 35504.4900 | 105.100 | 105.0472 | 105.0469 | 105.0476 | 105.0471 |
| Levelling Point | C305-LP045703 | 10/01/2013 | Installed | 89605.5800 | 35507.4800 | 105.165 | 105.1081 | 105.1080 | 105.1084 | 105.1079 |
| Levelling Point | C305-LP045704 | 10/01/2013 | Installed | 89608.9000 | 35509.4900 | 105.210 | 105.1636 | 105.1639 | 105.1632 | 105.1637 |
| Levelling Point | C305-LP045601 | 21/12/2012 | Installed | 89599.2200 | 35504.3100 | 104.946 | 104.9458 | 104.9453 | 104.9464 | 104.9457 |
| | | | | | | | 04/11/2015 | 26/11/2015 | 21/01/2016 | AVERAGE |
| Levelling Point | C305-LP045801 | 17/01/2013 | Installed | 89707.1300 | 35491.8800 | 106.965 | 107.1228 | 107.1233 | 107.1224 | 107.1227 |
| Levelling Point | C305-LP045802 | 16/01/2013 | Installed | 89706.4700 | 35496.4400 | 107.102 | 107.1021 | 107.1024 | 107.1015 | 107.1024 |
| Levelling Point | C305-LP045803 | 17/01/2013 | Installed | 89701.5500 | 35501.6100 | 106.974 | 106.9736 | 106.9737 | 106.9733 | 106.9738 |
| Levelling Point | C305-LP045804 | 16/01/2013 | Installed | 89699.9300 | 35496.8700 | 106.922 | 106.9222 | 106.9224 | 106.9218 | 106.9224 |
| | | | | | | | 25/09/2015 | 04/11/2015 | 26/11/2015 | AVERAGE |
| Levelling Point | C305-LP045602 | 14/01/2013 | Installed | 89705.1920 | 35496.3000 | 107.277 | 107.2153 | 107.2159 | 107.2147 | 107.2153 |
| | | | | | | | 24/11/2015 | 21/01/2016 | 10/03/2016 | AVERAGE |
| Levelling Point | C305-LP045812 | 25/01/2013 | Installed | 89714.022 | 35515.153 | 107.417 | 107.1408 | 107.1405 | 107.1410 | 107.1409 |
| Levelling Point | C305-LP045813 | 25/01/2013 | Installed | 89712.349 | 35513.147 | 107.147 | 107.0934 | 107.0928 | 107.0936 | 107.0938 |
| Levelling Point | C305-LP045815 | 25/01/2013 | Installed | 89719.254 | 35508.331 | 107.120 | 107.0576 | 107.0582 | 107.0572 | 107.0574 |
| Levelling Point | C305-LP045816 | 25/01/2013 | Installed | 89709.179 | 35506.722 | 107.112 | 107.0702 | 107.0705 | 107.0700 | 107.0701 |