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Environmental Manager
The Royal Mint
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Dear Martyn

**FACTUAL REPORT ON GROUNDWATER AND SURFACE WATER
SAMPLING IN JUNE 2015**

Date 07/07/2015

Ramboll Environ UK Limited ("Ramboll Environ") was instructed by The Royal Mint to carry out surface water sampling from selected locations in the Nant Mychudd River and groundwater sampling from selected boreholes in the area of Building 9A, the Coin Press Room ("CPR"), the COMAH area and the northern and southern site boundaries. This letter presents a factual report on the first of three scheduled rounds of monitoring to be undertaken from June 2015 to February 2016.

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Background

Surface water monitoring during 2014/15 identified elevated concentrations of copper and zinc in the culverted stream that enters the Nant Mychudd (sampling points R7 and R7A). While the source of contamination is being investigated by The Royal Mint, Ramboll Environ recommended that the surface water monitoring programme should be continued from selected sampling points at a reduced frequency of once every four months, or until the contamination reduces to below the respective environmental quality standards (EQS).

Ref LUK17-21715_01

Ramboll Environ also carried out groundwater sampling at the site which has previously identified elevated concentrations of metals in several areas. With the exception of boreholes BH11 and BH12, elevated concentrations of nickel, copper and zinc have been identified in all boreholes monitored throughout 2014. The pH was also below [more acidic than] the acceptable EQS range in several locations across the site. It was recommended that monitoring should continue from selected boreholes at a frequency of once every four months, or until the contamination reduces to below the respective EQS.

Due to recorded results from boreholes BH11 and BH12 being stable and consistently below the EQS over the last few years; these boreholes have been

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removed from the monitoring programme and replaced with up gradient boreholes BH001, BH002 and COMAH area borehole BH108, which form part of the ongoing Site Protection and Monitoring Programme (SPMP). SPMP boreholes are monitored on an annual basis by Ramboll Environ.

Surface Water

Surface water samples were collected on the 4th June 2015 from five sampling locations on the Nant Mychydd River and the culverted watercourse that passes through the site (sampling points R1, R6, R7, R7A and C1), as shown on Figure 2. Samples were analysed for a range of metals, pH and alkalinity at a UKAS accredited laboratory. The laboratory certificates of analysis are attached which provide the method of analysis for each determinand. The surface water analysis results from April 2011 to June 2015 are summarised in the attached table and are presented graphically on Figures 6, 7 and 8.

During the June 2015 monitoring, the concentration of copper exceeded the EQS of 0.001mg/l (for hardness between 0mg/l and 50mg/l CaCO₃) at all sampling points. A concentration of 0.01mg/l was recorded at sampling points R1, R6 and R7. The maximum recorded concentration of copper was 0.06mg/l at sampling point R7A, where the culverted stream emerges from site prior to entering the Nant Mychydd. The concentration of copper also exceeded the EQS at sampling point C1 (0.004mg/l) where the watercourse to the north of the site is culverted under the site. It should be noted that sampling location C1 is upstream of the site.

The concentration of zinc exceeded the EQS value of 0.008mg/l (for hardness between 0mg/l and 50mg/l CaCO₃) at sampling point R7A (0.010mg/l) during the most recent round of monitoring.

Concentrations of nickel were below the EQS value of 0.02mg/l (for hardness between 0mg/l and 50mg/l CaCO₃) at all surface water sampling locations; however, the concentrations had all increased slightly since the previous round of monitoring.

The TPH concentrations in this monitoring round were below the laboratory limit of detection in all sampling locations, with the exception of C1 (0.02mg/kg), which slightly exceeds the UK DWS of 0.01mg/l, located upstream of the site. TPH concentrations have remained stable or slightly decreased at four of the five sampling locations when compared to the previous round of monitoring in February 2015; the concentration slightly increased at C1.

Natural Resources Wales (formerly The Environment Agency Wales) has requested that rainfall data is collected at the time of sampling since this may influence the levels of contaminants in the receiving watercourse. In order to provide data for the June 2015 round of monitoring, weather station information for a location approximately 13km east of the site (weather station reference IMIDGLAM3) has been obtained (www.wunderground.com).

This data are presented in Table 1 below. Rainfall data has been provided for the five days preceding the monitoring visit and compared with the daily average rainfall for 5th May to 4th June 2015 and the daily average based on data from 2006 to 2014 for May and June.

Table 1: Rainfall Data			
Date	Rainfall data (mm) *	5 th May to 4 th June 2015 daily average (mm) *	2006 – 2014 May/June daily average (mm) *
30/05/15	0.0	3.8	3.3
31/05/15	9.7		
01/06/15	22.9		
02/06/15	15.2		
03/06/15	0.5		
04/06/15	0.0		
* Data gathered from 'IMIDGLAM3' weather station in Caerphilly located 13km East of site (www.wunderground.com) (accessed 19/06/15)			

The rainfall data indicates that rainfall in the period of 5th May to 4th June 2015 was close to the average for recent years.

Groundwater Sampling

Groundwater samples were collected from the following boreholes: BH8, BH9, BH901, BH10, BH13, BH32, BH001, BH002 and BH108 (shown on Figure 1). Samples were analysed for a range of metals, pH and alkalinity at a UKAS accredited laboratory. The laboratory certificates of analysis are attached which provide the method of analysis for each determinand. The analysis results are summarised in the attached table and are represented graphically on Figures 3, 4 and 5.

The results have been benchmarked against previous analytical results from these monitoring wells and screened against EQS for freshwater. The results are summarised as follows:

- Borehole BH8 has been monitored since 2013. During the most recent round of monitoring, the concentrations of nickel (0.243mg/l), copper (0.258mg/l) and zinc (0.487mg/l) all exceeded their respective EQS values of 0.02mg/l for nickel, 0.001mg/l for copper and 0.008mg/l for zinc. Concentrations of these determinands have all slightly increased since the previous round of monitoring in February 2015.
- Concentrations of nickel, copper and zinc in boreholes BH9 and BH901 remain above their respective EQS values. The concentration of copper has slightly decreased in BH901 (from 1.219mg/l to 1.030mg/l). All other concentrations of nickel, copper and zinc have increased since February 2015. The most notable increase in concentration was for copper in BH9 (from 0.115mg/l to 0.720mg/l).
- Due to the consistently stable concentrations of nickel, copper and zinc (below their respective EQS values) in boreholes BH11 and BH12; these sampling locations have been removed from the monitoring programme for 2015/2016.
- Concentrations of nickel, copper and zinc in borehole BH10 have remained similar to the lower concentrations first recorded in October 2014. The concentration of nickel (0.013mg/l) was recorded below the EQS value of 0.02mg/l during the most recent round of monitoring. Concentrations of copper (0.008mg/l) and zinc (0.015mg/l) were recorded slightly above the relevant EQS values.
- In BH32, concentrations of nickel (0.097mg/l), copper (0.003mg/l) and zinc (0.226mg/l) have remained similar to the lower concentrations recorded in the previous round of monitoring in February 2015. Concentrations of nickel and zinc remain above the relevant EQS; however, the concentration of copper is below the EQS during the most recent monitoring round of June 2015.

- Concentrations of nickel (0.164mg/l), copper (0.04mg/l) and zinc (0.198mg/l) in borehole BH13 have remained similar or slightly increased since the previous round of monitoring in February 2015. Concentrations remain above the relevant EQS for these determinands.
- Groundwater monitoring wells BH001, BH002 and BH801, all located in the north of the site and included within ongoing SPMP groundwater sampling, were included in the most recent round of monitoring. Historically, concentrations of nickel, copper and zinc have all exceeded their respective EQS values in each of these sampling locations. During the most recent round of monitoring in June 2015 concentrations of copper (0.017mg/l) and zinc (0.101mg/l) exceed the EQS in BH001. Concentrations of nickel, copper and zinc were all recorded below the EQS values in BH002. In BH801 (located adjacent to the copper plating building), concentrations of nickel (0.079mg/l), copper (2.627mg/l) and zinc (4.669mg/l) were all recorded in exceedance of their respective EQS values. The most notable increase was the concentration of zinc, recorded at its most elevated concentration to date.
- Total chromium was not detected above the EQS value of 0.0047mg/l within any of the monitoring wells in the most recent monitoring round.
- The concentration of cadmium was recorded above the laboratory LOD (0.0001mg/l) in all boreholes except BH001, BH002 and BH10, with a maximum recorded value of 0.0028mg/l in BH901. All reported values are above the EQS value of 0.00008mg/l.
- The following determinands did not exceed the screening criteria in any of the boreholes: lead, arsenic, boron, mercury, selenium and vanadium.
- Low (acidic) pH values (<pH 6) were detected in samples from BH901 (pH 4.3) and BH13 (pH 5.8) only. Samples from these and several other locations have regularly recorded low pH values throughout the monitoring programme.

The next round of surface water and groundwater monitoring is due to be carried out in the first week of October 2015. Please do not hesitate to contact me if there is anything you wish to discuss.

Yours sincerely



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Manager

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Encl. Laboratory Testing Certificates
 Summary of Surface Water Monitoring Results
 Summary of Groundwater Monitoring Results
 Figure 1: Groundwater Sampling Borehole Location Plan
 Figure 2: River Sampling Locations
 Figure 3: Copper Graphical Representations – Groundwater

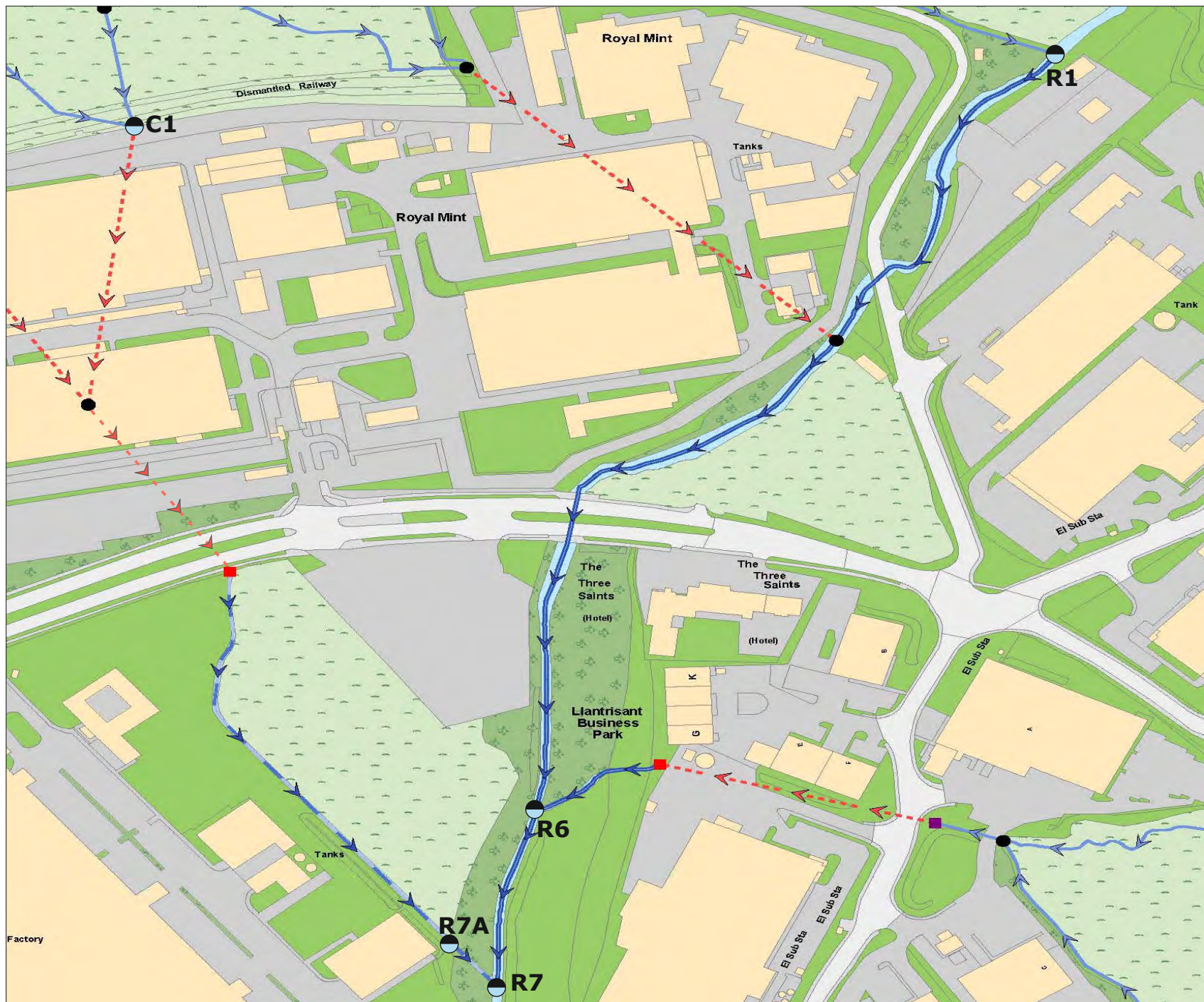
Figure 4: Nickel Graphical Representations – Groundwater

Figure 5: Zinc Graphical Representations – Groundwater

Figure 6: Copper Graphical Representations – Surface Water

Figure 7: Nickel Graphical Representations – Surface Water

Figure 8: Zinc Graphical Representations – Surface Water



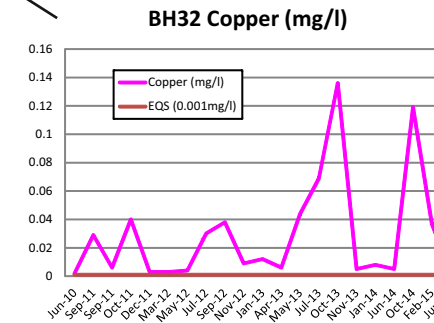
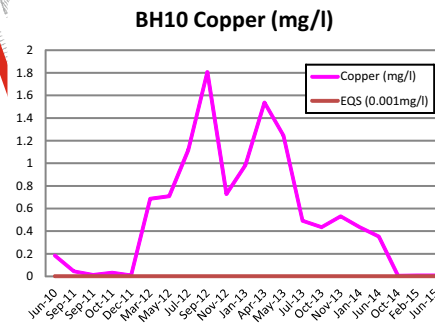
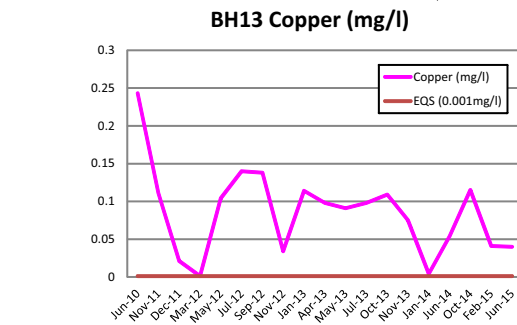
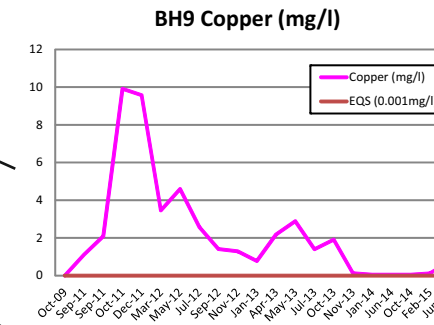
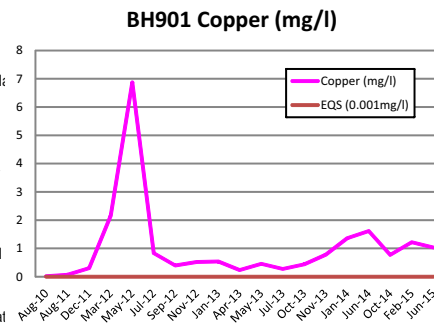
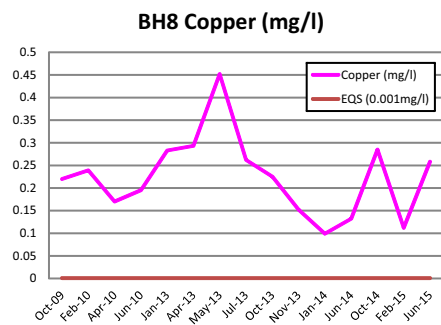
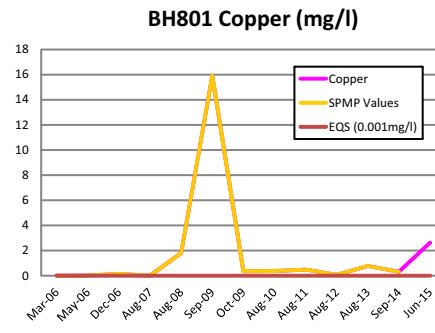
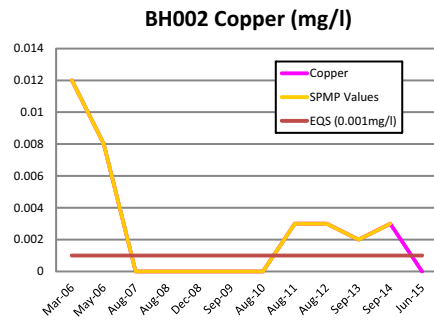
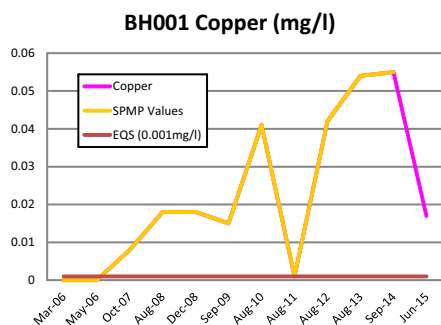
Legend

● River Sampling Locations

Title **Figure 2: River Sampling Locations**

Site **The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF72 8YT**

Client	The Royal Mint
Project No.	UK17-21704
Issue	1
Date	June 2015
Drawn by	RH



- Legend
- Site Boundary
 - Sampled Boreholes

Title **Figure 3: Graphical Representation of Copper Concentrations**

Site **The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF72 8YT**

Client **The Royal Mint**

Project No. **UK17-21704**

Issue **1**

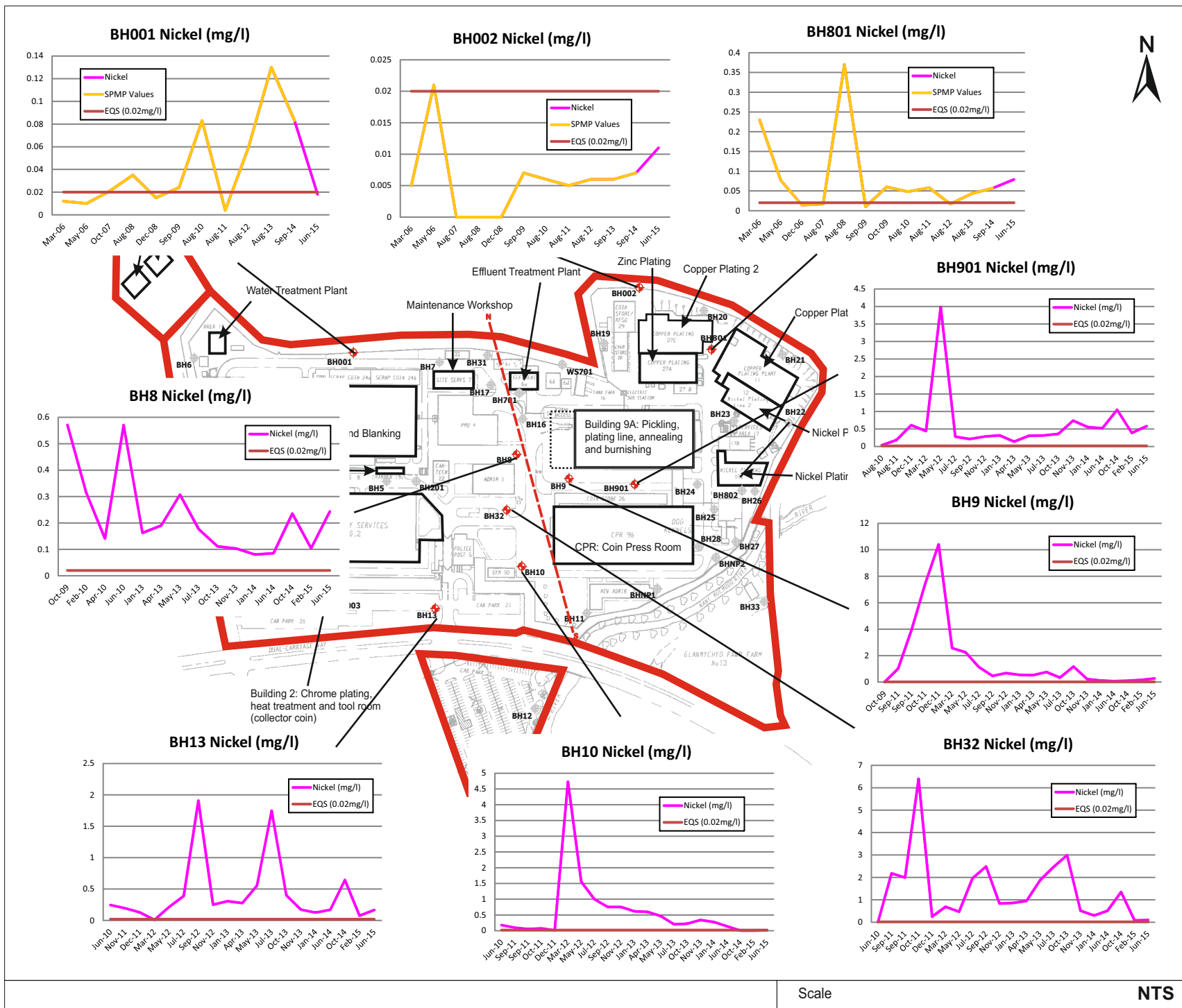
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Drawn by **RH**

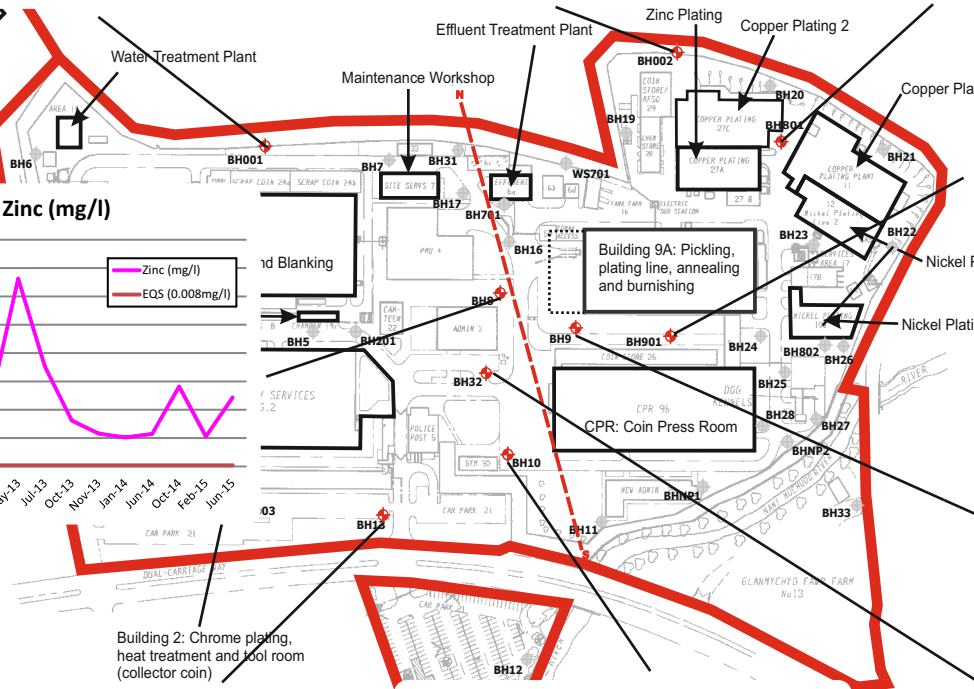
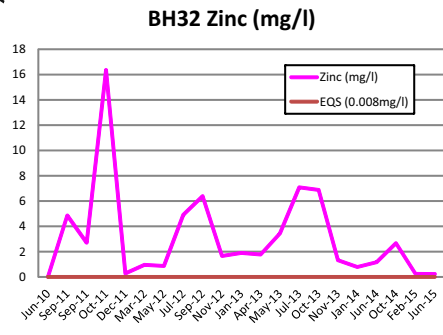
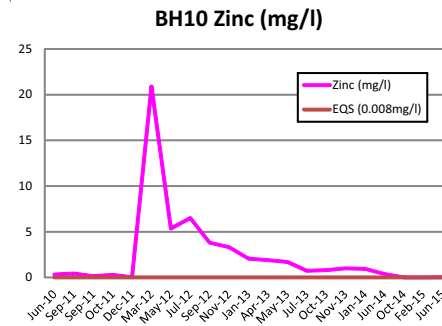
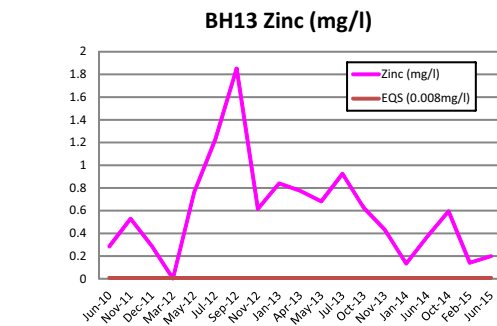
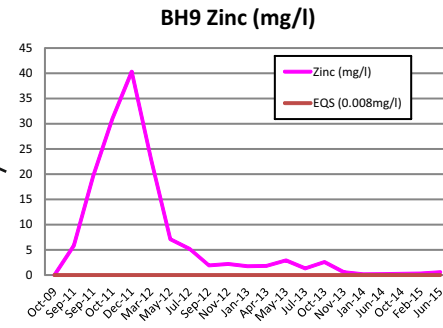
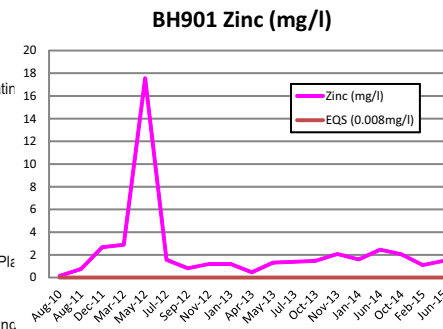
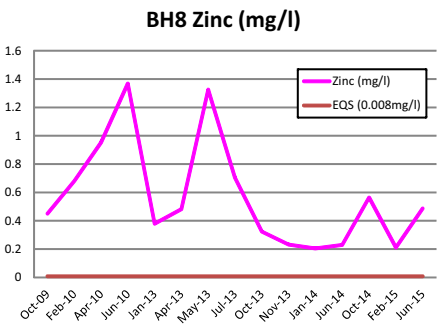
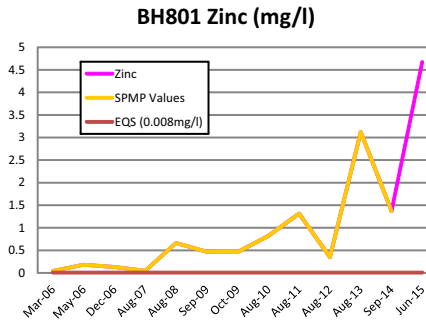
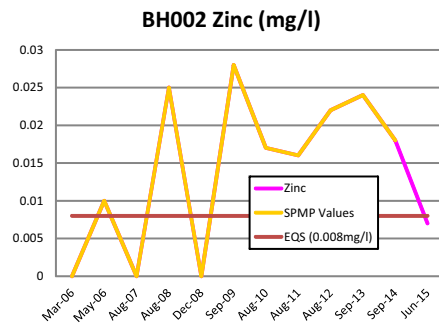
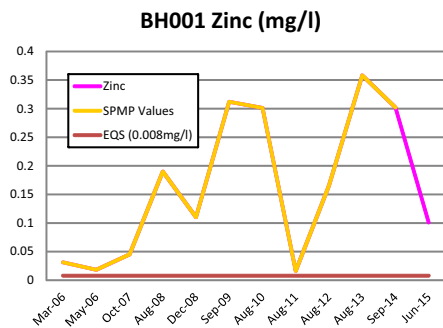


Scale

NTS



Legend	
	Site Boundary
	Sampled Boreholes
Title Figure 4: Graphical Representation of Nickel Concentrations	
Site The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF72 8YT	
Client The Royal Mint	
Project No. UK17-21704	
Issue 1	
Date June 2015	
Drawn by RH	



- Legend
- Site Boundary
 - Sampled Boreholes

Title **Figure 5: Graphical Representation of Zinc Concentrations**

Site **The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF72 8YT**

Client **The Royal Mint**

Project No. **UK17-21704**

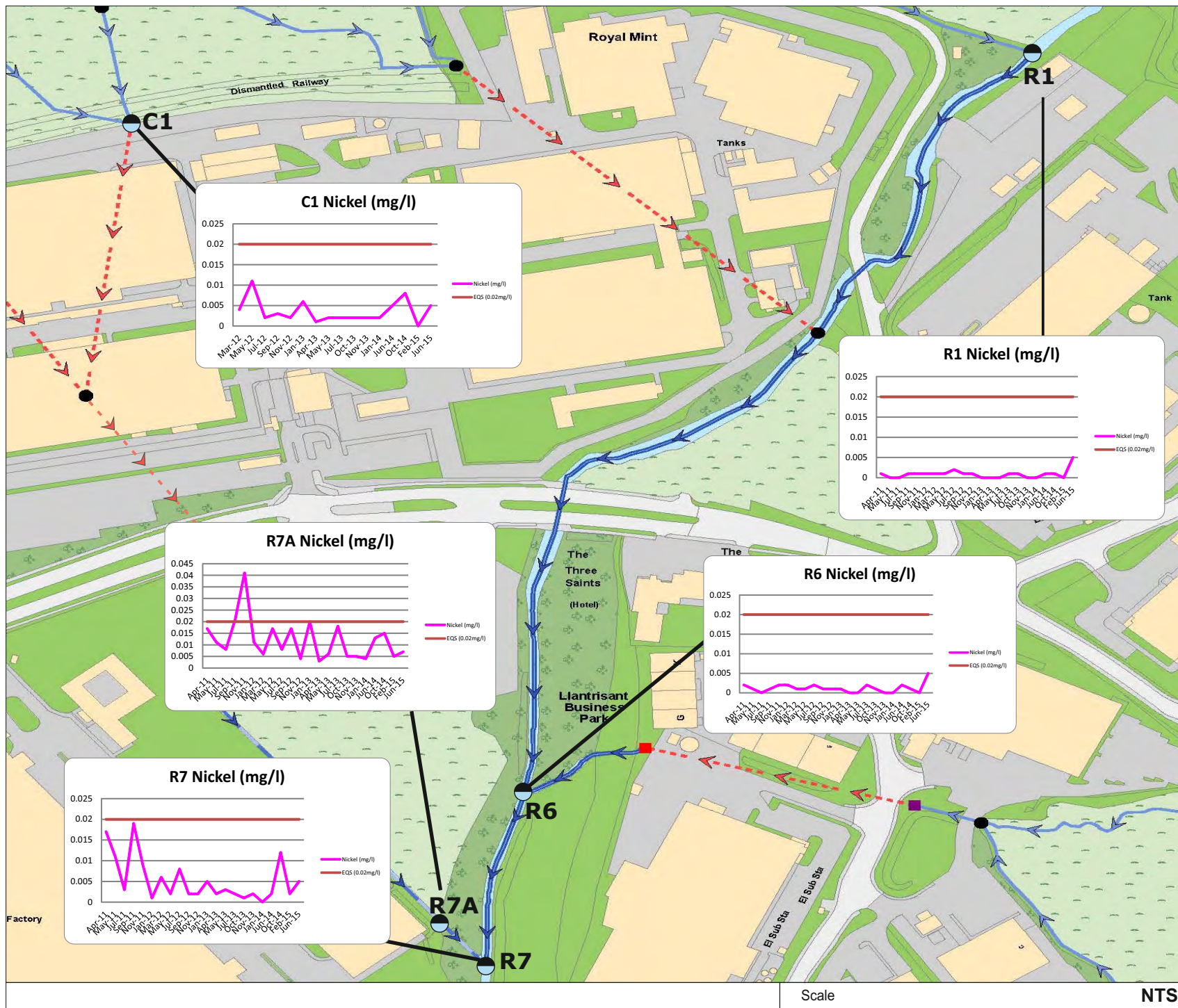
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Date **June 2015**

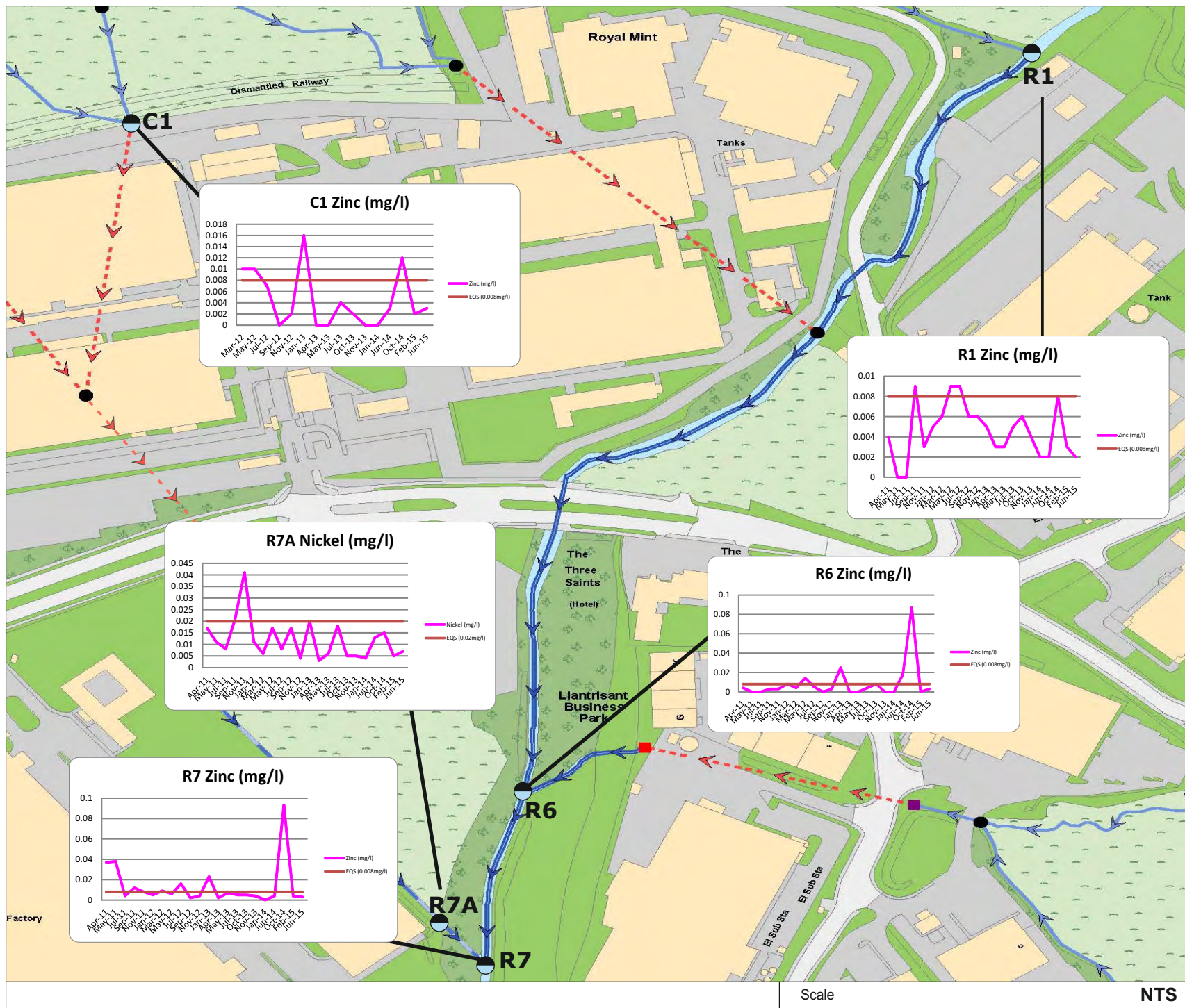
Drawn by **RH**



Scale **NTS**



Legend River Sampling Locations	
Title	Figure 7: Nickel Concentration Graphs - Surface Water
Site	The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF72 8YT
Client	The Royal Mint
Project No.	UK17-21704
Issue	1
Date	June 2015
Drawn by	RH



Legend River Sampling Locations	
Title Figure 8: Zinc Concentration Graphs - Surface Water	
Site The Royal Mint, Llantrisant, Pontyclun, Mid Glamorgan, CF22 8YT	
Client The Royal Mint	
Project No.	UK17-21704
Issue	1
Date	June 2015
Drawn by	RH
RAMBOLL ENVIRON	