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Environmental Manager
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Llantrisant
Pontyclun
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Dear Martyn

**FACTUAL REPORT ON GROUNDWATER AND SURFACE WATER
SAMPLING IN JUNE 2016**

Date 12/07/2016

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 southern site boundary. This letter presents a factual report on the first of three scheduled rounds of monitoring to be undertaken from June 2016 to February 2017.

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Background

Ref LUK17-23222_01

Surface water monitoring during 2015/16 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 addressed by The Royal Mint, Ramboll Environ recommended that the surface water monitoring programme should be continued from selected sampling points at a frequency of once every four months, or until the contamination reduces to below the respective environmental quality standards (EQS).

Ramboll Environ also carried out groundwater sampling at the site which has previously identified elevated concentrations of metals in several areas. Elevated concentrations of nickel, copper and zinc have been identified in all boreholes monitored throughout 2015/16. 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.

Boreholes BH11 and BH12 were removed from the monitoring programme in 2015/16 and replaced with up gradient boreholes BH001, BH002 and COMAH area borehole BH801 which form part of the ongoing Site Protection and Monitoring Programme (SPMP).

During the last monitoring period (Report Ref: UK17-21704), statistical analysis of results indicated either 'no exceedances' or 'stable' trends for the main determinants of concern tested at BH001 and BH002; therefore, these boreholes have been omitted from the 2016/17 monitoring programme. SPMP boreholes are monitored on an annual basis by Ramboll Environ and are due to be sampled in August 2016 under the annual SPMP monitoring round.

Surface Water

Surface water samples were collected on the 30th June 2016 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, alkalinity cyanide and total petroleum hydrocarbons (TPH) 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 2016 are summarised in the attached table and are presented graphically on Figures 6, 7 and 8.

During the June 2016 monitoring, the maximum concentration of copper (0.016mg/l) was recorded at sampling point R7A, where the culverted stream emerges from site prior to entering the Nant Mychydd. This concentration exceeds the EQS of 0.001mg/l (for hardness between 0mg/l and 50mg/l CaCO₃). The concentration of copper also exceeded the EQS of 0.001mg/l 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 (0.018mg/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.

Whereas nickel has shown an overall decrease in concentrations over time at points R7 and R7A since sampling commenced, zinc and copper continue to fluctuate slightly above the respective EQS values. A culvert survey and subsequent cleaning has identified several areas of cracking and an inlet pipe into the culvert. Ramboll Environ understands that repair work to the culvert is intended to be commissioned by The Royal Mint in August 2016 (including decommissioning of the inlet pipe). Following on from the culvert repairs, concentrations would be expected to gradually decrease in the future.

Cyanide was recorded above the laboratory limit of detection (LOD) at sampling point R1 (0.02mg/l), which exceeds the assessment criteria of 0.01mg/l. Sample point R1 is located up-gradient of the site.

The TPH concentrations in this monitoring round were above the laboratory limit of detection in all sampling locations; therefore slightly exceeding the UK DWS of 0.01mg/l. The maximum TPH concentration was recorded at sampling point R7 (0.04mg/l), where the culverted stream enters the Nant Mychydd. TPH concentrations have remained stable or slightly decreased at all five sampling locations when compared to the previous round of monitoring in February 2016.

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 2016 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 June 2016 and the daily average based on data from 2006 to 2015 for June.

Table 1: Rainfall Data			
Date	Rainfall data (mm) *	June 2016 daily average (mm) *	2006 – 2015 June daily average (mm) *
25/05/15	4.3	4.36	3.13
26/05/16	2.3		
27/06/16	1.3		
28/06/16	9.9		
29/06/16	21.1		
30/06/16	4.3		
* Data gathered from 'IMIDGLAM3' weather station in Caerphilly located 13km East of site (www.wunderground.com) (accessed 11/07/16)			

The rainfall data indicates that rainfall in the period of June 2016 was similar to, though slightly greater than the average for recent years.

Groundwater Sampling

Groundwater samples were collected from the following boreholes: BH8, BH9, BH901R, BH10, BH13 BH32, and BH801 (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:

- During the most recent round of monitoring, the concentrations of nickel (0.154mg/l), copper (0.179mg/l) and zinc (0.316mg/l) in borehole BH8 all exceeded their respective EQS values of 0.02mg/l for nickel, 0.006mg/l for copper and 0.050mg/l for zinc. Concentrations of these determinands have all slightly increased since the previous round of monitoring in February 2016.
- Samples were collected from boreholes BH9 and the newly installed borehole (referred to as BH901R), that is acting as a replacement for borehole BH901. Concentrations of nickel, copper and zinc in boreholes BH9 and BH901R are all above their respective EQS values. The concentration of copper has slightly increased in BH9 since the previous round of monitoring (from 0.384mg/l to

0.736mg/l). All other concentrations of nickel, copper and zinc have decreased since February 2016. The most notable decreases were in borehole BH901R.

- Concentrations of nickel, copper and zinc have all slightly decreased in borehole BH10 since the previous round of monitoring; however, concentrations of nickel (0.029mg/l), copper (0.021mg/l) and zinc (0.059mg/l) were recorded slightly above the relevant EQS values in June 2016.
- In BH32, concentrations of nickel (0.236mg/l), copper (0.005mg/l) and zinc (0.585mg/l) have decreased slightly since the previous round of monitoring in February 2016. 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 2016.
- Concentrations of nickel (0.077mg/l), copper (0.053mg/l) and zinc (0.162mg/l) in borehole BH13 have remained similar to the previous round of monitoring in February 2016. Concentrations remain above the relevant EQS for these determinands.
- Borehole BH801, located in the north of the site (adjacent to the copper plating building) and included within ongoing SPMP groundwater sampling, was included in the most recent round of monitoring. Concentrations of nickel (0.075mg/l), copper (0.422mg/l) and zinc (2.253mg/l) were all recorded in exceedance of their respective EQS values.
- 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 BH10, with a maximum recorded value of 0.0009mg/l in BH8. 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 BH8 (pH 4.4), BH9 (pH 5.3), BH901R (pH 5.9), BH13 (pH 4.7), and BH32 (pH 5.8). 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 October 2016. Please do not hesitate to contact me if there is anything you wish to discuss.

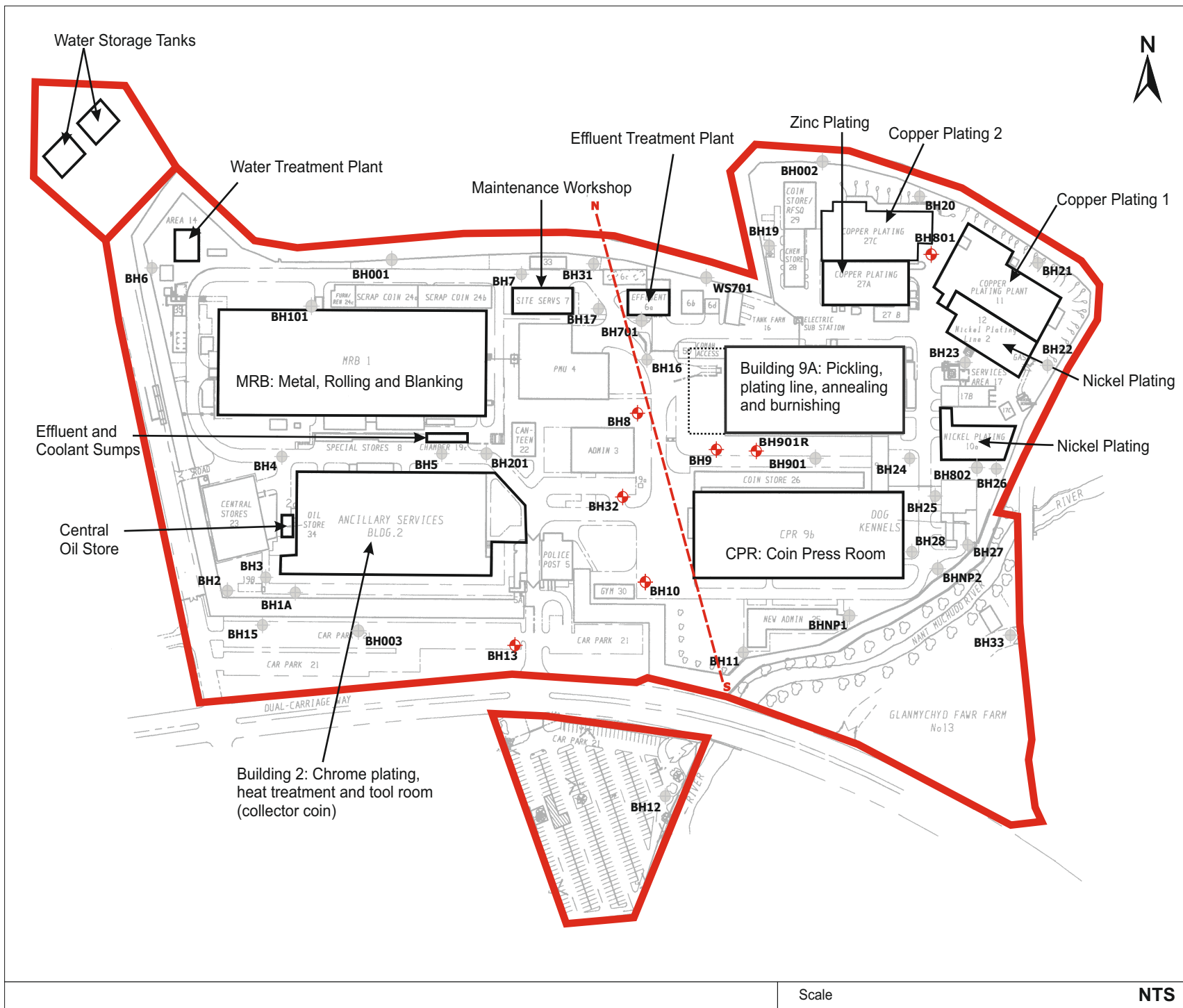
Yours sincerely

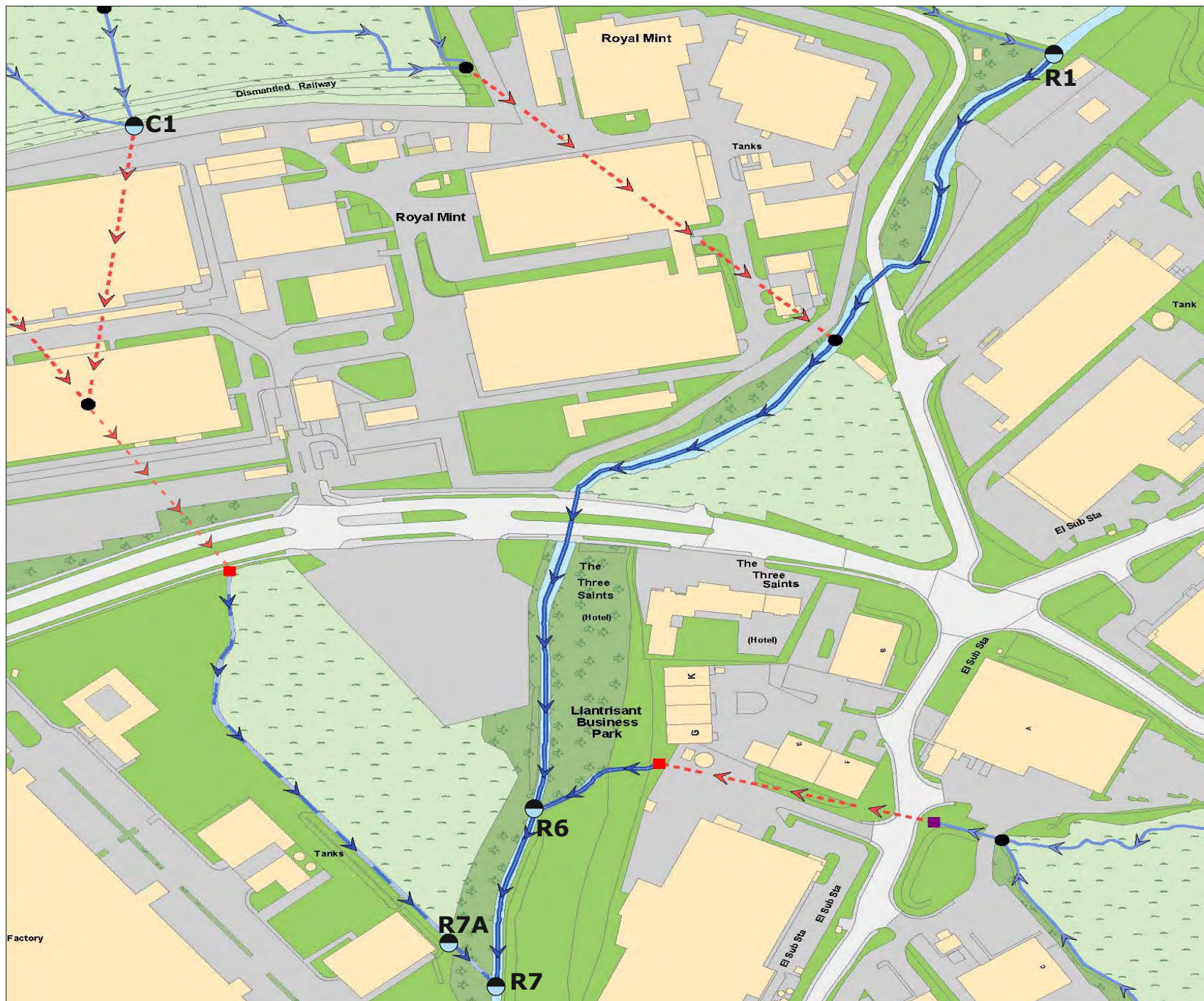


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Encl. Laboratory Testing Certificates
 Summary of Surface Water Monitoring Results
 Summary of Groundwater Monitoring Results
 Figure 1: Groundwater Sampling Borehole Location Plan
 Figure 2: River Sampling Locations
 Figure 3: Copper Graphical Representations – 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. **UK17-23222**

Issue **1**

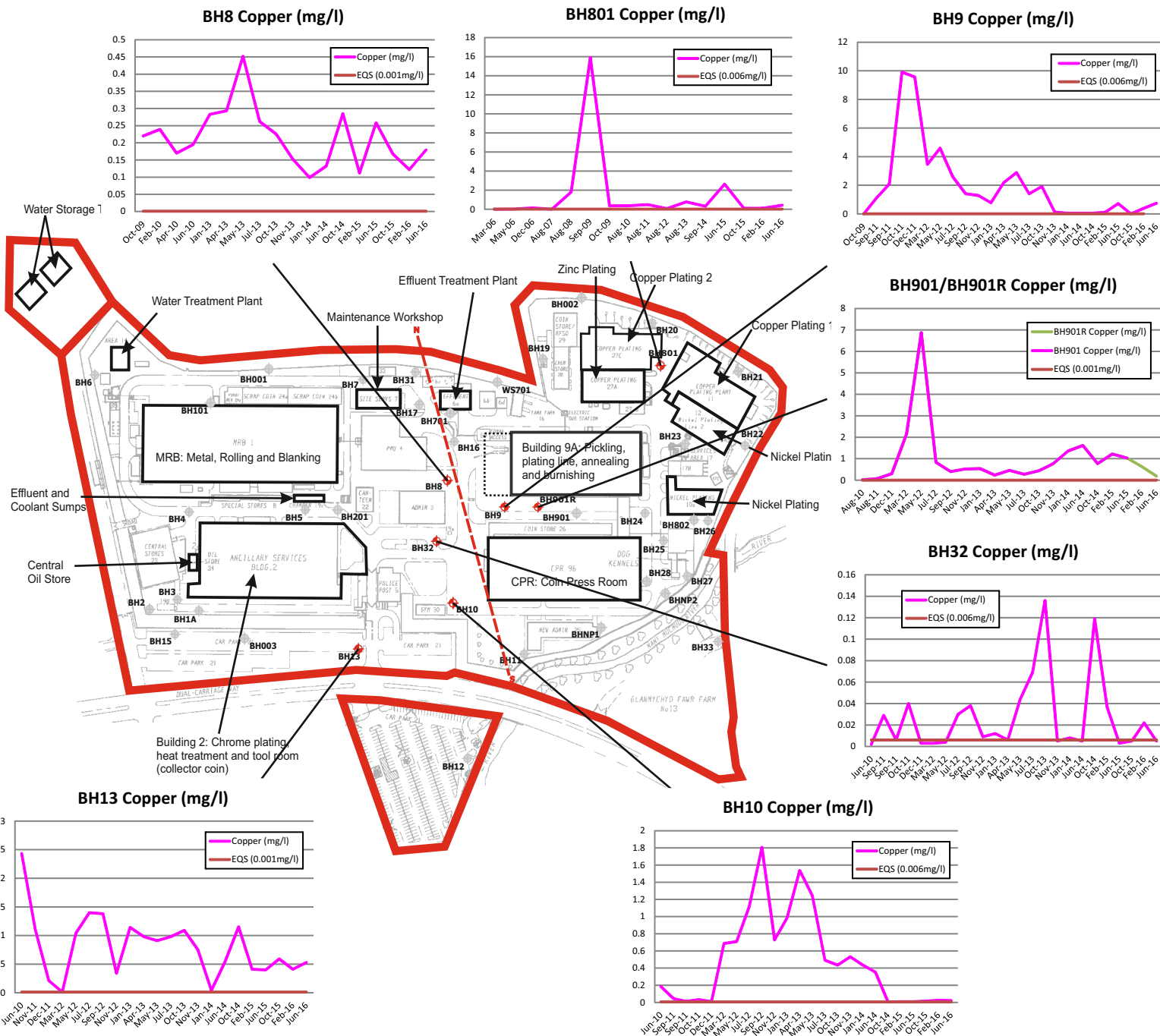
Date **June 2016**

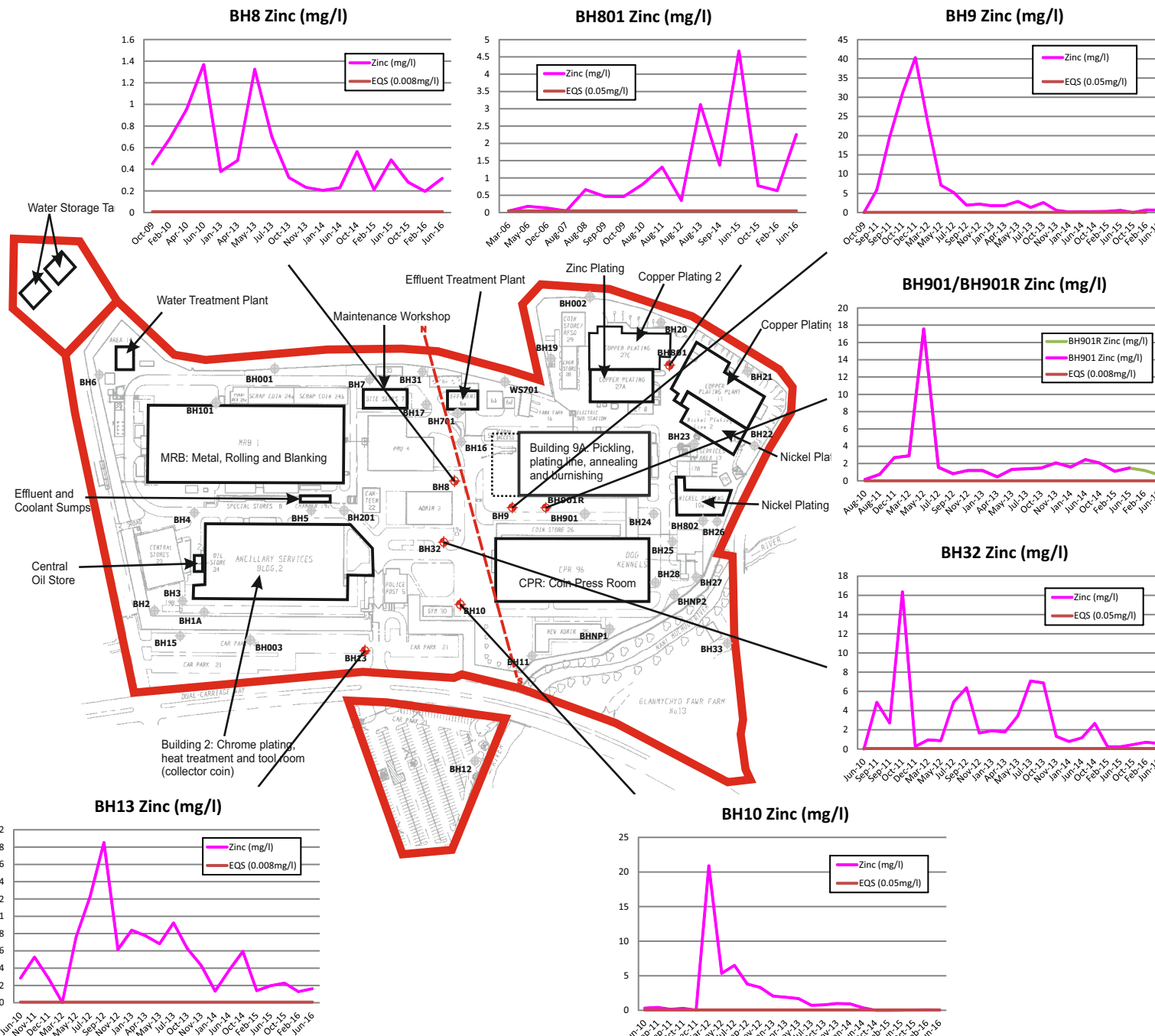
Drawn by **RH**

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Scale

NTS





Legend

Site Boundary

Sampled Boreholes

For borehole BH801 data presented between March 2006 and September 2014 was obtained during the Site Protection Monitoring Programme (SPMP) annual groundwater monitoring.

Title Figure 5: Graphical Representation of Zinc Concentrations

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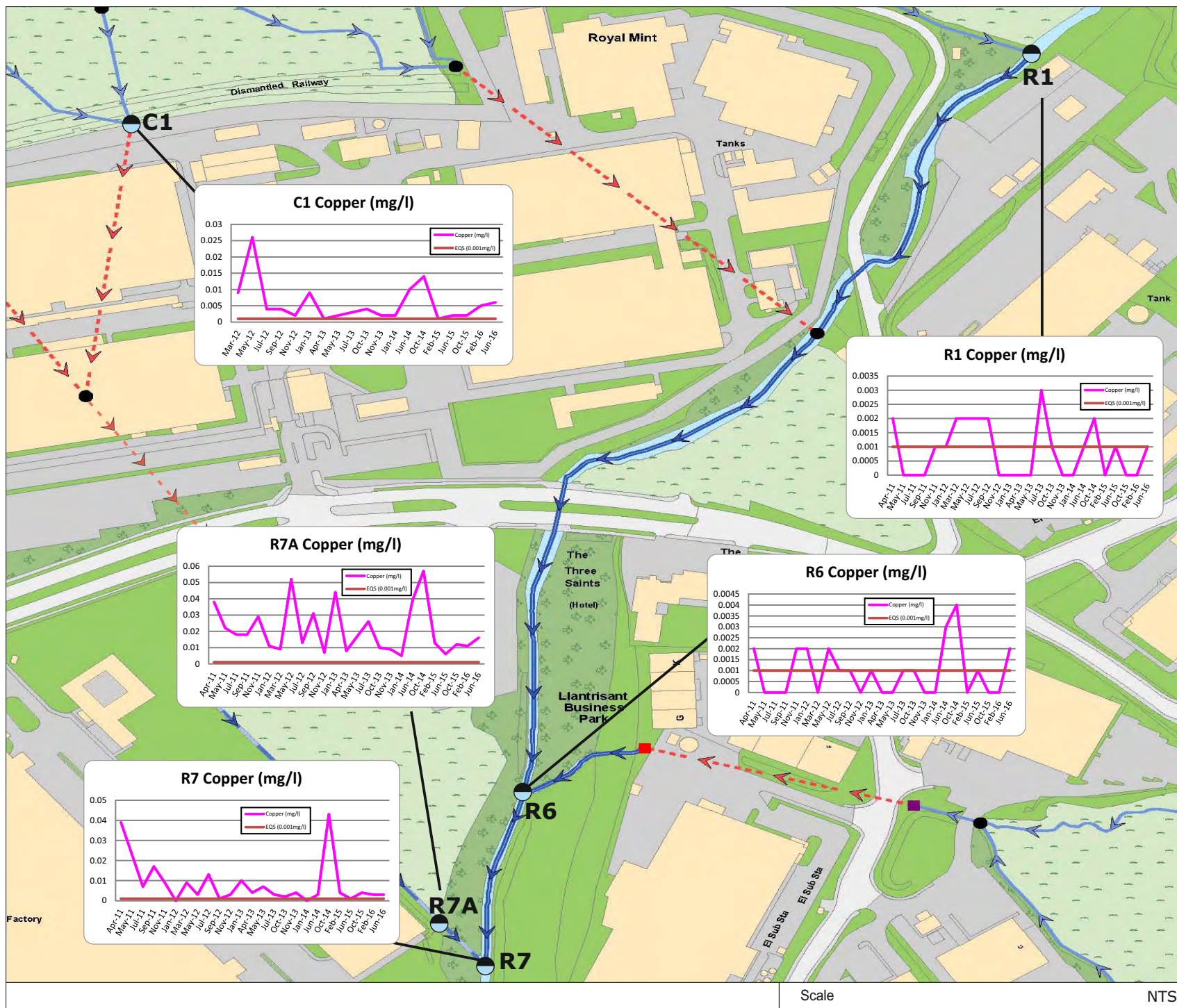
Issue 1

Date June 2016

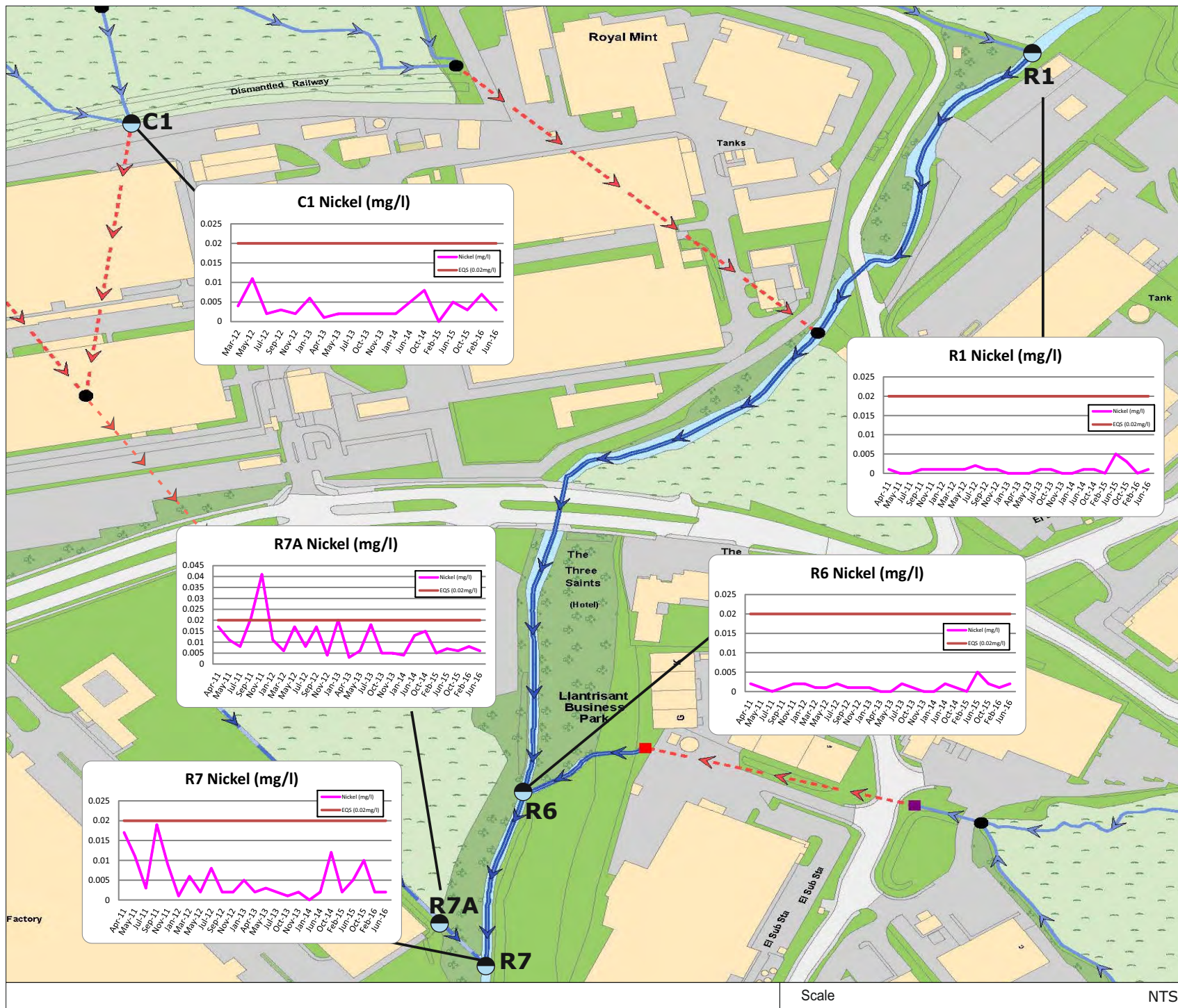
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Legend  River Sampling Locations	
Title Figure 6: Copper Concentration Graphs - Surface Water	
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Legend  River Sampling Locations	
Title Figure 7: Nickel Concentration Graphs - Surface Water	
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