



# MetroWest+

## Portishead Branch Line (MetroWest Phase 1)

TR040011

**Applicant: North Somerset District Council**

**5.6, Flood Risk Assessment, Part 14 of 17**

**Appendix O Part 1 of 3, Track culvert survey and track drainage details**

**The Infrastructure Planning (Applications: Prescribed Forms and Procedure)**

**Regulations 2009, regulation 5(2)(e)**

**Planning Act 2008**

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## Document history

<b>Project</b>	Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme
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Network Rail  
**Metrowest – Phase 1**  
Culvert Survey Report

W1097B-ARP-REP-ETR-000002

A01 | 11 May 2016

This report takes into account the particular instructions and requirements of our client.

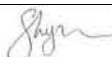

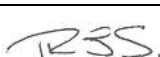
It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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# Document Verification

# ARUP

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Culvert Site Specification Location of Potential Culverts and Services Figures

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- B1 Bristol Water Records
- B2 Wessex Water Records
- B3 Network Rail Hazard Records

# 1 Introduction

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A desk study has been conducted to identify and evaluate the potential impact to any culverts crossing the railway alignment (live and disused) from Parson Street to Portishead for the MetroWest Phase 1 project.

A set of maps have been generated using ArcGIS based on NR asset information and site observations. These maps include data (where found) on any identified culverts, sewers and water mains found on site. Other features of interest such as flow accumulation points as identified by Lidar, catchpits, weepholes, filter drains etc. which may inform drainage proposals at GRIP 3/4 are also included.

All observations are summarised with Tables 1-3 along with concluding remarks, supported by the maps provided in Appendix A.



## 2 Methodology

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The assessment was built upon available data from multiple sources and expert opinions which led to the recommended actions.

Data for the culvert survey have been collated from various sources as indicated below with the external information sources (i.e. sources i, ii and iii) available in Appendix B:

- i. Bristol Water records
- ii. Wessex Water records
- iii. Network Rail National Hazard list
- iv. Surveys in the area
- v. Lidar data investigation

The column titles within the tables are described below.

- **ID:** identification ID individual to each culvert/sewer/main and other features
- **Location:** the location of the feature on the map in miles and chains.
- **Identified:** gives an indication of whether the asset has been identified during one of the surveys undertaken in the area
- **Type:** asset specimen as identified during surveys or from external information sources
- **Source:** indicates the origin of the information
- **Photos available:** availability of photo evidence from the Arup surveys
- **Observations:** descriptions of features based on comments from the external information sources or observations from the Arup surveys undertaken in the area

The following columns give an indication of the recommended action for each specific feature.

Please note that the location of some of the water features may be inaccurate due to multiple source consultation. Some items may be duplicated but where possible they have been eliminated using expert engineering judgement.

## 3 Results

The culverts have been separated as following:

- Beneath/adjacent to live railway (120m 64ch to 126mi 29ch); and
- Beneath/adjacent to disused track (126mi 29ch to 129mi 27ch)

The recommendations for each individual asset are presented to Table 1 (live railway assets) and Table 2 (disused track). Maps are presented in Appendix A for reference.

### 3.1 Actions for GRIP 5 Design

Where recommendations are made for additional survey, the additional data to be collected by the appointed surveyor may include:

- Culvert level information for assets crossing the railway alignment
  - Internal dimensions (taken upstream and downstream);
  - Culvert thicknesses (taken upstream and downstream)
  - Culvert invert levels (taken upstream and downstream);
  - Headwall dimensions and levels (upstream and downstream);
  - Channel cross-sections of any incoming or receiving ditches/open channels;
  - Photographs to support survey information;
  - De-vegetation, pumping, jetting and clear-out as necessary to undertake survey tasks.
- CCTV Survey to determine structural condition:
  - Including de-vegetation, pumping, jetting and clear-out as necessary to undertake survey tasks.

#### 3.1.1 Live railway (120mi 64ch to 126mi 29ch)

The culverts are presented in Table 1 with the following classifications:

<b>Not affected by works</b>	<p><b>No further action required (at GRIP 3/4)</b></p> <p>Some culverts identified are not expected to cross beneath the track or in particularly close proximity; these are unlikely to be affected by works.</p> <p>Some of these culverts are small assets which could not be found on site and are assumed to be redundant. If found during GRIP 5, the drainage engineer should be contacted immediately.</p>
<b>Anticipated to be affected by works</b>	<p><b>Third party asset; request information.</b></p> <p>For third party assets (Wessex Water and Bristol water) the responsible authority should be informed of the proposals. Records of each asset can be obtained from each to inform design and determine whether protection</p>

	measures and/or replacement/diversion is required; if this information is not available from the asset owner, additional survey may be required to take levels as recommended within Table 1
	<p><b>Survey to be undertaken.</b></p> <p>Sufficient information is unlikely to be available from third party. Survey should be undertaken to determine level information and assess impact caused by proposed works.</p>
	<p><b>Access limited; survey at additional cost.</b></p> <p>A number of culverts discharge to the River Avon and therefore may be inaccessible during some tidal events. Other culverts appear to be buried or obscured and will require preparation works such as de-vegetation to enable assets to be surveyed.</p> <p>It should be noted that survey for these assets may incur additional costs. Recommendations are made as to the importance of this information to the GRIP 3/4 design, however the ultimate decision on whether or not the survey should be undertaken lies with the client.</p>

### 3.1.2 Disused railway (126mi 29ch to 129mi 27ch)

It is recommended that the majority (all bar two - see below) of culverts identified along the disused section are replaced fully. This recommendation, as discussed and agreed with NR, is based on the need for extensive survey to determine whether or not the culverts are structurally sound enough to withstand the proposed track loading.

It is anticipated that most of these culverts will not be structurally sound enough over the NR required 60 year lifespan due to lack of maintenance and general degradation since the line closure. As such, it is expected that the conclusion of any survey works will likely recommend replacement for a significant portion of the culverts.

It is believed that the money saved in not carrying out surveys for all culverts will contribute significantly to the cost of replacement, without posing an additional programme constraint to GRIP 5 design.

It is recommended that two structures are further surveyed to assess their condition; the size/extent of the below structures would make their replacement complicated therefore a structural assessment is proposed to take place to determine if the below structures can be retained.

- **Siphon at 127mi 79ch [ID 70]**

This structure was identified by NR records as an 18" (approx. 600mm) cast iron siphon. Site visits identified the upstream chamber North of the track by the Station House, but a downstream chamber/outfall could not be found. A full replacement is not possible without understanding the existing asset.

The following recommendations can be made:

1. CCTV survey undertaken to determine what is happening downstream (and where) and assess the structural condition of the full culvert and chambers themselves; or
  2. Replace the section of the siphon beneath the disused track loading zone ONLY. Note; this solution will not confirm that the entire siphon is in suitable enough condition to convey flows away from the track (i.e. blockages etc. downstream will not have been identified/remedied).
- **1550mmØ culvert at 129mi 22ch [ID 76]**

This structure carries tidal flows beneath the track, and therefore will require more complex and expensive temporary works to replace. This is a critical asset under the authority of the North Somerset Internal Drainage Board; consent would be required to carry out any works to this culvert which may be conditional to meeting certain design requirements (i.e. increased design life etc.)

CCTV survey is required to determine the structural condition of the culvert and assess whether it can withstand the proposed track loading for the required lifespan.

It should be noted that the DRN responses for Trinity Footbridge recommend investigating the option of diverting this culvert during the GRIP 5 design; this along with discussions with the IDB will need to be taken into consideration at the next design stage.

For further information on these 2 assets, see Culvert Assessment Report: Pill to Portishead (W1097B-ARP-REP-EDR-000001).

## 4 Tables

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Table 1 Summary of culvert survey for assets along the Live railway  
[Parson Street Junction to Pill]  
120mi 64ch to 126mi 29ch



ID	Location	Identified on site?	Type	Directly under Track?	Source	Photo available	Observations	Topo	CCTV	De-veg	Limited Access	Recommended action to be completed at GRIP 5
1	120m 64ch	No	Unidentified Drainage	No	NR Hazards	No	Drainage, 12" EW pipe under road. Expected to be a gas main					Not affected by works; no further action required.
2	120m 64.5ch	No	Foul Water	No	Wessex Water	No	Buried foul water service Foul pipe below road, level information could not be obtained from Wessex Water.					Not affected by works, no action required.
3	121m 05ch	No	Culvert	Yes	Wessex Water	No	Culverted water course [Colliter's Brook]- Forms part of the EA Flood Defences. Access available from West.	✓				Review Metrobus investigations/request levels from EA. Inlet and outfall from one manhole to be surveyed. Ditch dimensions to be measured 25m upstream of the railway and 100m downstream. Crown level to sleeper level distance will be required.
4	121m 16ch	No	Foul Water	Yes	Wessex Water	No	Private foul water service (information from Wessex Water)					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
5	121m 17ch	No	Culvert	Yes	Wessex Water	No	Culverted water course. Railtrack 2"" brick arch with Armco inserts on up and down sides					Request levels from Wessex Water. Network Rail Hazard directory size not clear. Expected to be a large asset. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
6	121m 17ch	No	Foul Water	Yes	NR Hazards	No	Buried foul water service					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
7	121m 17.5ch	No	Culvert	Yes	Wessex Water & NR Hazards	No	Culverted water course. Railtrack 3"" brick arch also under STD at 0.52 and tip culverts					Request levels from Wessex Water. Network Rail Hazard directory size not clear. Expected to be a large asset. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
8	121m 23ch	No	Culvert	No	NR Hazards	No	Culverted water course. Railtrack 3" concrete pipes and brick, also under STD (information from NR Hazard list)				✓	Not believed to be affected by works; no further action required. If identified during GRIP 5, drainage engineer to be contacted immediately.
9	121m 23.5ch	No	Water Main	No	Bristol Water	No	BW duct. 21"cast iron					Request levels from Bristol Water If information unavailable, survey recommended to determine depth below track
10	121m 23.5ch	No	Water Main	No	Bristol Water	No	BW duct. 24"cast iron					Request levels from Bristol Water If information unavailable, survey recommended to determine depth below track
11	121m 31ch	No	Culvert	Yes	Wessex Water	No	Culverted water course					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
12	121m 31ch	No	Foul Water	Yes	NR Hazards	No	Buried foul water service, culvert under line					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
13	121m 35ch	No	Foul Water	Yes	NR Hazards	No	Buried foul water service, culvert under line					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
14	121m 50ch	No	Foul Water	No	Wessex Water	No	Buried foul water service. Drain running from Rownham Hill to RT land					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
15	121m 52ch	No	Unidentified Drainage	No	NR Hazards	No	New french drain	✓				Not expected under track At GRIP 5: Confirm presence / Request as-builts, or undertake survey to determine levels and extents.
16	121m 55ch	No	Surface Water	Yes	Bristol Water & NR Hazards	No	Culverted water course [Longmoor Brook] Forms part of the EA Flood Defences Railtrack 7""3"" sewer under line on skew				✓	Request levels from EA. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.). Note this culvert is extremely long; survey may be difficult.
17	121m 58.5ch	No	Foul Water	Yes	Wessex Water	No	Buried foul water service. Sewer under line on skew					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
18	121m 58.5ch	No	Foul Water		Wessex Water	No	Rising main sewer					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
19	121m 59ch	No	Foul Water	Yes	Wessex Water	No	Buried foul water service. Drain running along and under up side land at Clifton Bridge station and under line at finish mileage					If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
20	121m 59ch	No	Culvert	Yes	Wessex Water	No	Culverted watercourse					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
21	121m 61ch	No	Foul Water	Yes	Wessex Water	No	Private foul water service					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
22	121m 67ch	No	Surface Water	Yes	Bristol Water	No	Water main, 30" prestressed concrete pipe					Request levels from Bristol Water.
23	121m 68ch	No	Foul Water	Yes	Wessex Water	No	Foul sewer service					Request levels from Wessex Water. If information unavailable, U/S and D/S manholes should be opened at next nearest accessible location. Details to be recorded (Pipe DIA, IL etc.).
24	122m 04ch	Yes	Other	No	NR Hazards	Yes	Pipe/cavity in retaining wall identified. Purpose unknown.					No further action required.
25	122m 17ch	Yes	Other	No	Survey 20150817	Yes	Pipe identified on site, seems disused				✓	Access limitations due to tide. May prove inaccessible to investigate if survey is feasible.
26	122m 17ch	Yes	Surface Water	UNK	Survey 20150818	Yes	Culvert below steel pipe, flow good 600mm diameter. Initially not visible due to high tide.				✓	Access limitations due to tide. May prove inaccessible to investigate if survey is feasible.
27	122m 49ch	No	Possible Culvert / Drain	No	Survey 20150825	No	Possible catchment at bottom of rockface. Access from track only. Minimal flow if any.					Not expected to lie beneath track. No further action at this stage If found to lie beneath track at GRIP 5, drainage engineer to be notified immediately.
28	122m 73.5ch	No	Foul Water	Yes	Wessex Water	No	Foul water service under railway line					Request levels from Wessex Water. If possible next nearest manholes to be opened and details to be recorded (Pipe DIA, IL etc.).
29	122m 73.5ch	No	Foul Water	Yes	Wessex Water	No	Foul water service under railway line					Request levels from Wessex Water. If possible next nearest manholes to be opened and details to be recorded (Pipe DIA, IL etc.).
30	123m 23ch	Yes	Culvert	No	Survey 20150825	Yes	225mm clay pipe culvert. Accessible - 1.8m deep down				✓	Limitations due to tide. May prove inaccessible to investigate if survey is feasible.
31	123m 25ch	No	Unidentified Drainage	Yes	NR Hazards	No	Drain. Railtrack 12" square stone drain				✓	Limitations due to tide. May prove inaccessible to investigate if survey is feasible.
32	123m 27ch	Yes	Culvert	Yes	Survey 20150825	Yes	75mm iron pipe not flowing				✓	Limitations due to tide. May prove inaccessible to investigate if survey is feasible.
33	123m 27ch	Yes	Culvert	Yes	Survey 20150818	Yes	Channel scoured in mud. 225mm diameter pipe, clear with some ponding				✓	Limitations due to tide. May prove inaccessible to investigate if survey is feasible.
34	123m 31ch	No	Foul Water	Yes	Wessex Water	No	Buried foul water service. Drain runs under boundary on down side and under line at finish mileage					Request levels from Wessex Water.
35	123m 33ch	Yes	Culvert	UNK	Survey 20150818	Yes	Culvert identified with potential historic jetty adjacent to the culvert				✓	Buried, obscured by silt, therefore no survey is possible at this stage. If found on site during GRIP 5 design, drainage engineer to be notified immediately.

36	123m 35ch	Yes	Culvert	UNK	Survey 20150825	Yes	Buried culvert under mud. Fast flowing but inaccessible. Excavation needed. Appears collapsed. Devegetation also required				✓	Buried, obscured by silt, therefore no survey is possible. If found on site during GRIP 5 design, drainage engineer to be notified immediately.
37	123m 63ch	Yes	Possible Culvert / Drain	UNK	Survey 20150818	Yes	Possible culvert identified on site adjacent to overbridge. Channel scoured in mud. No culvert identified.					No further action at this stage. If found on site during GRIP 5 design, drainage engineer to be notified immediately.
38	124m 08ch	Yes	Culvert	No	Survey 20150818	Yes	Culvert identified adjacent to underbridge. No culvert directly beneath track. Outfalls to ditch through underbridge.					Not affected by works; no further action.
39	124m 27ch	No	Possible Culvert / Drain	No	Survey 20150818	Yes	Multiple channels evident in the area but unable to identify culvert.					No further action at this stage. If found on site during GRIP 5 design, drainage engineer to be notified immediately.
40	Off track	Yes	Open channel / Ditch	No	Environment Agency	Yes	Field drainage identified on site with a flat valve outfall. Environment Agency managed				✓	Details to be obtained from the Environment Agency. No accessible access point for survey.
41	Off Track, Avon Chapel Pill	Yes	Open channel / Ditch	No	Environment Agency	Yes	Field drainage identified on site with a flat valve outfall. Environment Agency managed.				✓	Details to be obtained from the Environment Agency. No accessible access point for survey.
42	Off Track, Avon Chapel Pill Outfalls	Yes	Open channel / Ditch	No	Environment Agency	Yes	Field drainage identified on site with a flat valve outfall. Environment Agency managed.				✓	Details to be obtained from the Environment Agency. No accessible access point for survey.
43	124m 46ch	No	Culvert	No	NR Hazards	No	Culvert. Railtrack 4" brick barrel				✓	NR hazard directory states very small size - unlikely to be a brick barrel. No access available.
44	125m 39ch	No	Water Main	No	Bristol Water and Wessex Water	No	Multiple services (clean water and foul water sewer)					Presumed above tunnel. No further action.
45	125m 39ch	No	Foul Water	No	Wessex Water	No	Foul water service					Presumed above tunnel. No further action.
46	125m 45ch	No	Water Main	No	Bristol Water and Wessex Water	No	Multiple services (clean water and foul water sewer)					Presumed above tunnel. No further action.
47	125m 45ch	No	Foul Water	No	Wessex Water	No	Foul water service					Presumed above tunnel. No further action.
48	125m 54ch	No	Foul Water	No	Wessex Water & NR Hazards	No	Buried foul water service. Sewer under land parallel to west side of road over tunnel					Presumed above tunnel. No further action.
49	125m 75ch	No	Unidentified Drainage	No	NR Hazards	No	Drain. Railtrack 12" square stone drain					Non-visible assumed asset is buried, therefore no further action possible. If found on site during GRIP 5 design, drainage engineer to be notified immediately.
50	126m 00ch	No	Culvert	No	Bristol Water & Wessex Water	No	Culverted water course					Below bridge, obtain records from Wessex Water.
51	126m 02.5ch	No	Foul Water	No	Bristol Water & Wessex Water	No	Buried foul water service					Below bridge, obtain records from Wessex Water.
52	126m 05ch	No	Foul Water	No	Bristol Water & Wessex Water	No	Buried Foul Water Service					Below enbankment, obtain records from Wessex Water
53	126m 26ch	No	Unidentified Drainage	UNK	NR Hazards	No	Drain. Railtrack 12" square stone drain					Non-visible assumed asset is buried, therefore no further action possible. If found on site during GRIP 5 design, drainage engineer to be notified immediately.
54	126m 29ch	No	Water Main	Yes	Wessex Water	No	Water main crossing the track (highway drain, foul water sewer and clean water) consistent information across all available records					Below bridge, obtain records from Wessex Water.
55	126m 29ch	No	Foul Water	Yes	Wessex Water	No	Foul water service crossing the track (highway drain, foul water sewer and clean water) consistent information across all available records					Below bridge, obtain records from Wessex Water.

Table 2 Summary of culvert survey for assets along the disused railway  
[Pill to Portishead]  
126mi 29ch to 129mi 27ch

ID	Location	Identified on site?	Type	Directly Under Track?	Source	Photo available	Observations	Topo	CCTV	De-veg	No further survey works	No access/ tide limiting	Recommended action to be completed at GRIP 5 design
56	126m 32ch	No	Culvert	Unknown	NR Hazards	No	NR Records: Culvert. Railtrack 2" stone slab deck (information from NR Hazard list, not present in other documents) <b>No evidence found on site, assumed buried.</b>				✓		No action required. If found on site during GRIP 5, drainage engineer to be notified immediately.
57	126m 43ch	No	Unidentified Drainage	Unknown	NR Hazards	No	NR Records: Drain. Railtrack 12" EW pipe drain (information from NR Hazard list, not present in other documents) <b>No evidence found on site due to heavy vegetation.</b>				✓		No action required. If found on site during GRIP 5, drainage engineer to be notified immediately.
58	126m 63ch	Yes	Culvert	Yes	Survey 20150818	Yes	No records. <b>Culvert and water mains identified on site adjacent to cattle creep</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading. Location of water main must be noted on GRIP 5 drawings.
59	126m 67ch	No	Culvert	Unknown	NR Hazards	No	NR Records: Culvert. Rail track 2" stone slab deck (information from NR Hazard list, not present in other documents). <b>No evidence found on site due to heavy vegetation.</b>						No action required. If found on site during GRIP 5, drainage engineer to be notified immediately.
60	126m 70ch	No	Possible Culvert / Drain	Yes	OS Master Map	No	No records; OS map suggests potential culvert. <b>No evidence found on site due to heavy vegetation.</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
61	127m 03ch	Yes	Culvert	Yes	Survey 20150818	Yes	No records <b>Culvert identified on site adjacent to overbridge</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
62	127m 04ch	No	Water Main	Yes	Bristol Water	No	Wessex Water and Bristol Water asset records: water mains crossing the rail (clean water and foul water sewer). <b>Not surveyed</b>				✓		Location must be noted on GRIP 5 drawings; no further action.
63	127m 24ch	Yes	Culvert	Yes	Survey 20150818	Yes	NR Records: Railtrack 2" 6" stone slab deck. <b>Culvert identified on site; potentially linked to ID 64 (not confirmed)</b>						Confirm connectivity (dye tracing). <b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
64	127m 25ch	Yes	Culvert	Yes	Survey 20150818	Yes	No records <b>Culvert under highway adjacent to track; potentially connected to ID 63 (not confirmed)</b>						Confirm connectivity (dye tracing). <b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
65	127m 35ch	Yes	Culvert	Yes	Survey 20150818	Yes	NR Records: Railtrack 18" stone slab deck. <b>Culvert identified on site.</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
66	127m 42ch	Yes	Culvert	Yes	Survey 20150818	Yes	NR Records: Railtrack 18" stone slab deck <b>Culvert identified on site</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
67	127m 60ch	No	Culvert	Yes	Yes	See report GS2/140569	NR Records: Railtrack 6" culvert over Stoke Brook <b>Culvert identified on site; No access due to heavy vegetation.</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
68	127m 68ch	No	Possible Culvert / Drain	Yes	OS Master Map	No	No records; OS map suggests potential culvert. <b>No evidence found on site due to heavy vegetation.</b>				✓		No action required. If found on site during GRIP 5, drainage engineer to be notified immediately.
69	127m 74ch	No	Unidentified Drainage	Unknown	NR Hazards	No	NR records: Drain. Railtrack 12" EW pipe drain <b>No evidence found on site, assumed buried.</b>				✓		No action required. If found on site during GRIP 5, drainage engineer to be notified immediately.
70	127m 79ch	No	Siphon	Yes	NR Hazards	No	NR records: Siphon. Railtrack 24" cast iron pipe siphon <b>Upstream chamber found on site, downstream could not be found.</b>	✓	✓	✓		✓	<b>Replace</b> section of culvert beneath track loading zone <b>AS A MINIMUM</b> . Downstream of siphon to be identified if possible. Full structural assessment (including CCTV and level survey) to be carried out to determine whether siphon is structurally sound enough for the proposed track loading.
71	128m 00ch	No	Water Main	Yes	Bristol Water	No	Bristol Water asset records: water mains crossing the rail (clean water). <b>Not surveyed</b>				✓		Location must be noted on GRIP 5 drawings; no further action.
72	128m 15ch	Yes	Culvert	Yes	See report GS2/140569	Yes	No records <b>Culvert identified on site</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
73	128m 42ch	Yes	Culvert	Yes	See report GS2/140569	Yes	No records <b>Culvert identified on site</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
74	128m 56ch	No	Water Main	Yes	Bristol Water	No	Bristol Water asset records: water mains crossing the rail (clean water). <b>Not surveyed</b>				✓		Location must be noted on GRIP 5 drawings; no further action.
75	128m 65ch	Yes	Culvert	Yes	See report GS2/140569	Yes	No records <b>Culvert identified on site</b>						<b>Replace</b> culvert (incl. upstream and downstream headwalls) to accommodate proposed track loading.
76	129m 22h	Yes	Culvert	Yes	See report GS2/140569	Yes	No records <b>Culvert identified on site</b>	✓	✓	✓		✓	Full structural assessment (including CCTV and level survey) to be carried out to determine whether culvert is structurally sound enough for the proposed track loading.
77	129m 27ch	No	Foul Water	Yes	Wessex Water	No	Wessex Water asset records: water mains crossing the rail (foul water). <b>Not surveyed</b>				✓		Location must be noted on GRIP 5 drawings; no further action.

Table 3 Other features of interest

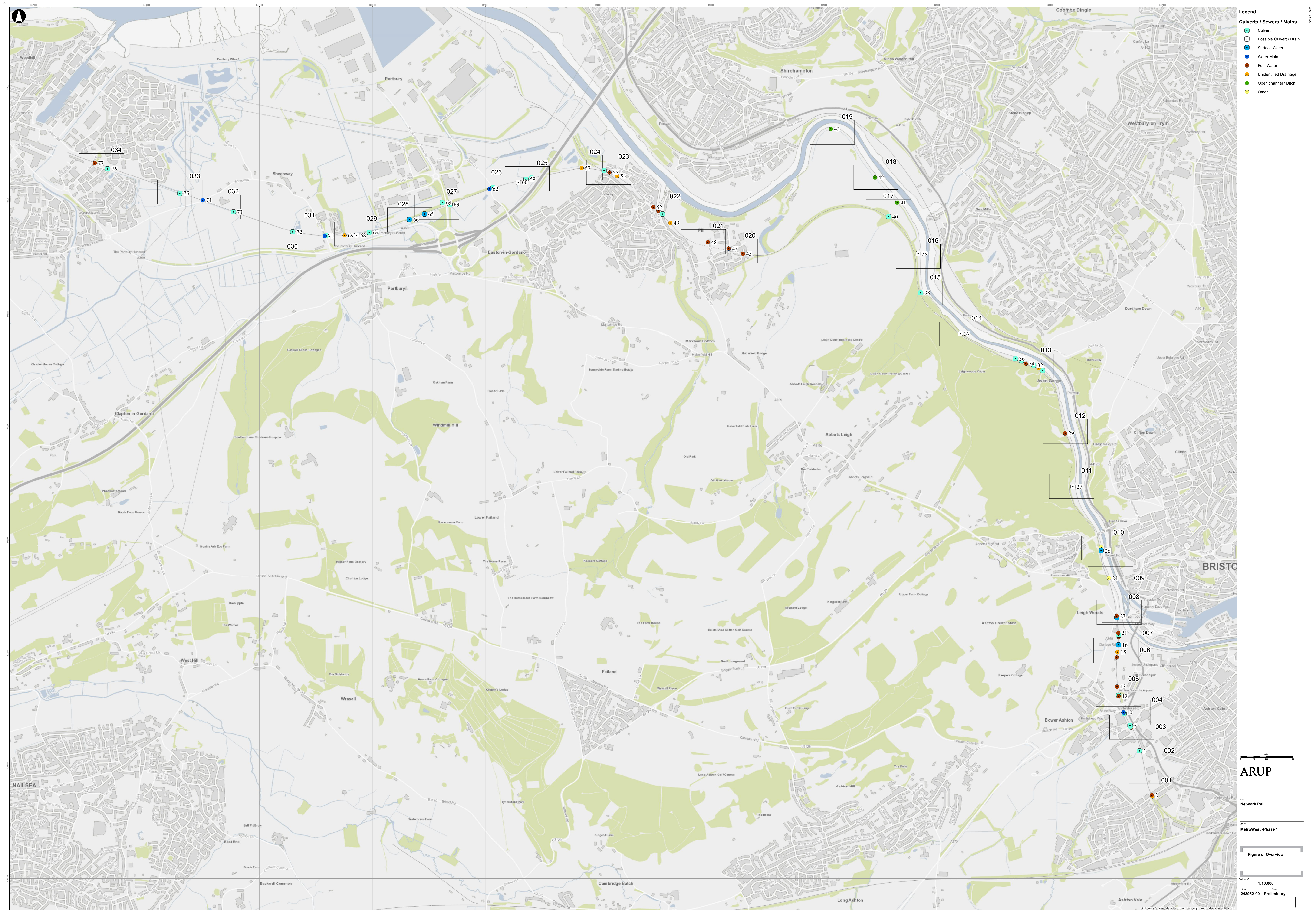
ID	Location	Source	Observations
1	121m 18.5ch	NR Hazards	Catch pit in UP Cress
2	121m 20ch	NR Hazards	Catch pit in UP Cress
3	121m 21ch	NR Hazards	New catch pit
4	121m 23ch	NR Hazards	New catch pit in UP Cress
5	121m 24ch	NR Hazards	Catch pit in UP Cress
6	121m 28ch	Lidar	Identified on Lidar as flow accumulation point
7	121m 68ch	Survey 20150818	Services near track and over bridge
8	121m 70ch	Survey 20150825	Manhole
9	121m 71ch	Survey 20150825	Fire main
10	121m 72.5ch	Survey 20150825	Manhole and wo manhole
11	121m 76ch	Survey 20150818	Water main and tank parallel to path
12	122m 07ch	Lidar	Identified on Lidar as flow accumulation point
13	122m 64.5ch	Lidar	Identified on Lidar as flow accumulation point
14	123m 21ch	Survey 20150825	Weepholes present, no flow
15	123m 23ch	Survey 20150825	Manhole on inside of road through bridge. Needs shovel and sledge, possibly blocked
16	123m 23.5ch	Survey 20150825	Water tank, disused
17	123m 23.5ch	Survey 20150825	100mm wide weephole with ponding
18	123m 27ch	Survey 20150825	Ditch present with no visible outlet
19	123m 43ch	Lidar	Identified on Lidar as flow accumulation point
20	123m 58ch	Survey 20150825	100m square weephole to be CCTV's. Fake black widow spider
21	123m 59.5ch	Survey 20150825	100m square weephole to be CCTV's. Fake black widow spider
22	123m 60ch	Survey 20150825	100m square weephole to be CCTV's. Fake black widow spider
23	123m 74ch	Lidar	Identified on Lidar as flow accumulation point
24	124m 05ch	Survey 20150825	Self contained ditch with no outlet
25	124m 21ch	Survey 20150818	Small cave in the wall adjacent to the railway
26	125m 29.5ch	NR Hazards	Catch pit
27	125m 31.5ch	NR Hazards	Catch pit
28	125m 33ch	NR Hazards	Catch pit
29	126m 6.5ch	NR Hazards	Catch pit drain
30	126m 08ch	NR Hazards	Catch pit drain
31	126m 10ch	NR Hazards	Catch pit drain
32	126m 13ch	NR Hazards	Catch pit drain
33	126m 16ch	NR Hazards	Catch pit drain
34	126m 18ch	NR Hazards	Catch pit drain
35	126m 21ch	NR Hazards	Catch pit drain



## Appendix A

### Culvert Survey Specification Location of Potential Culverts & Services Figures









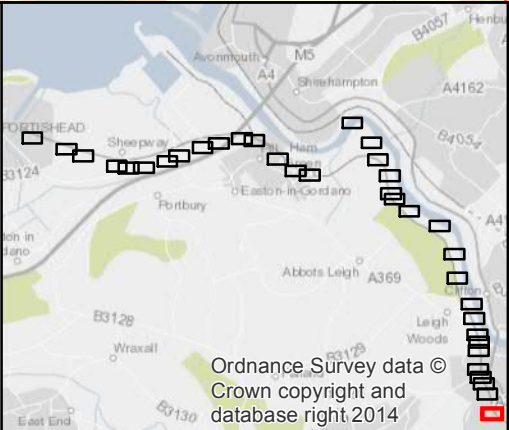
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

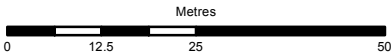
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts & services

Scale at A3  
1:1,000

Job No  
243952-00

Figure No  
001





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Legend

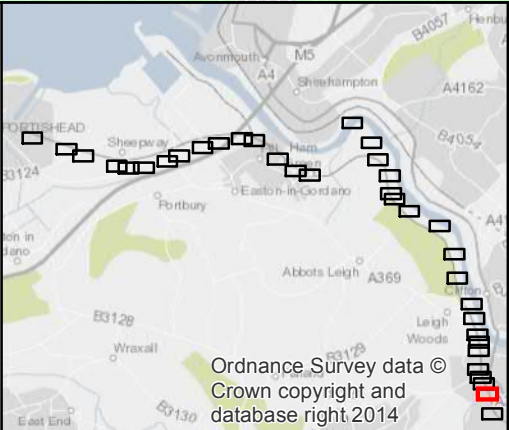
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

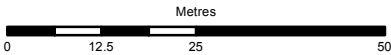
Rail / Services

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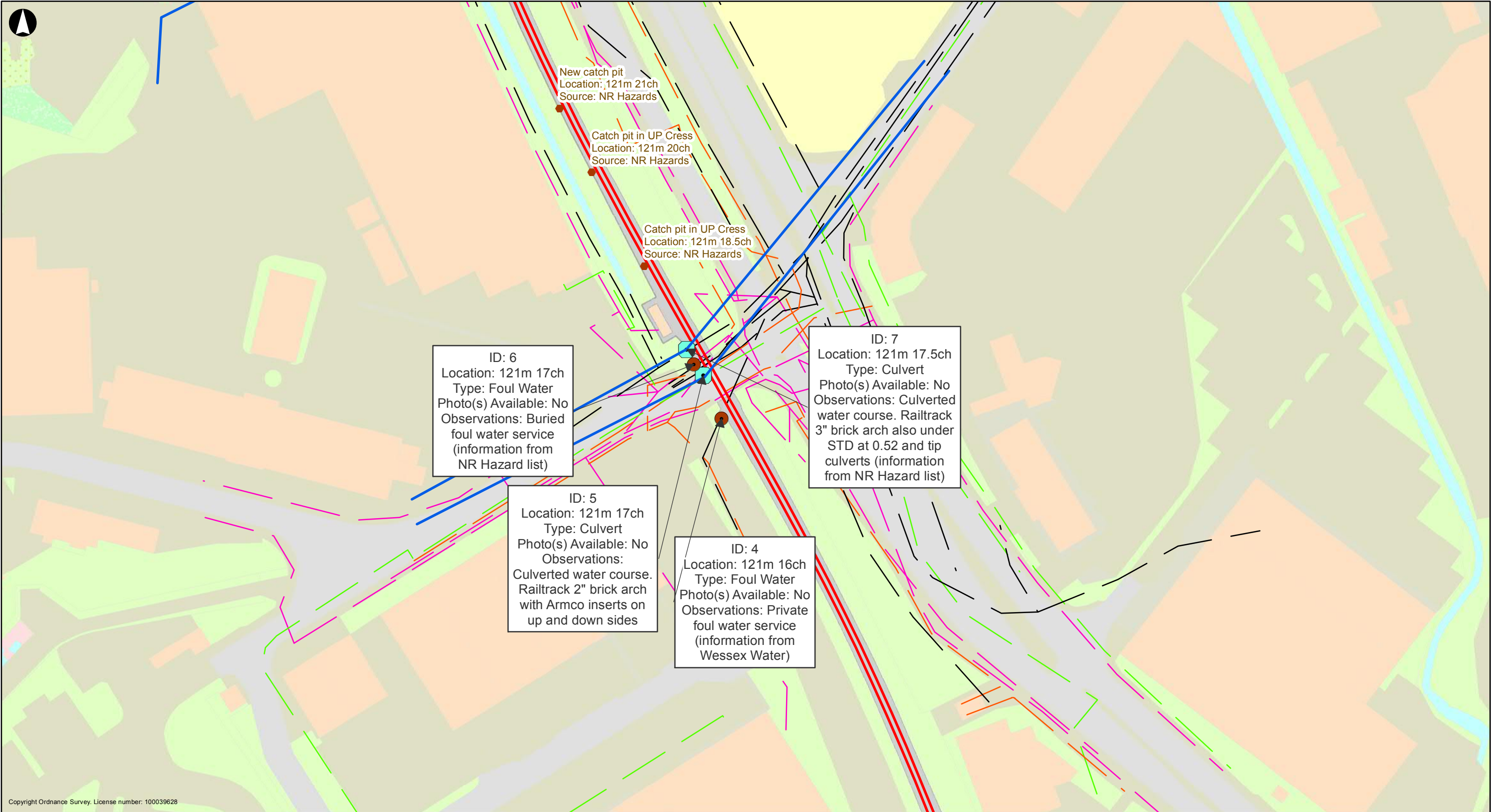
Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**002**





Legend

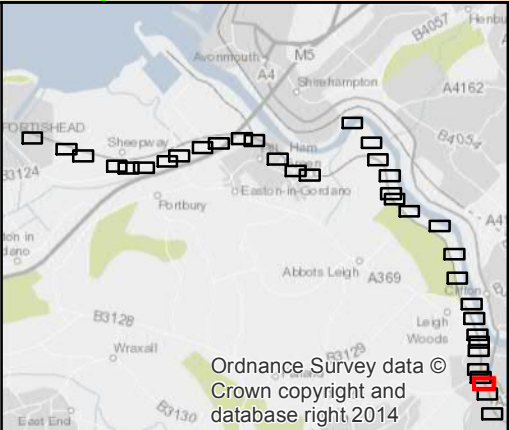
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

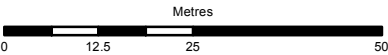
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
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- Additional Ducts



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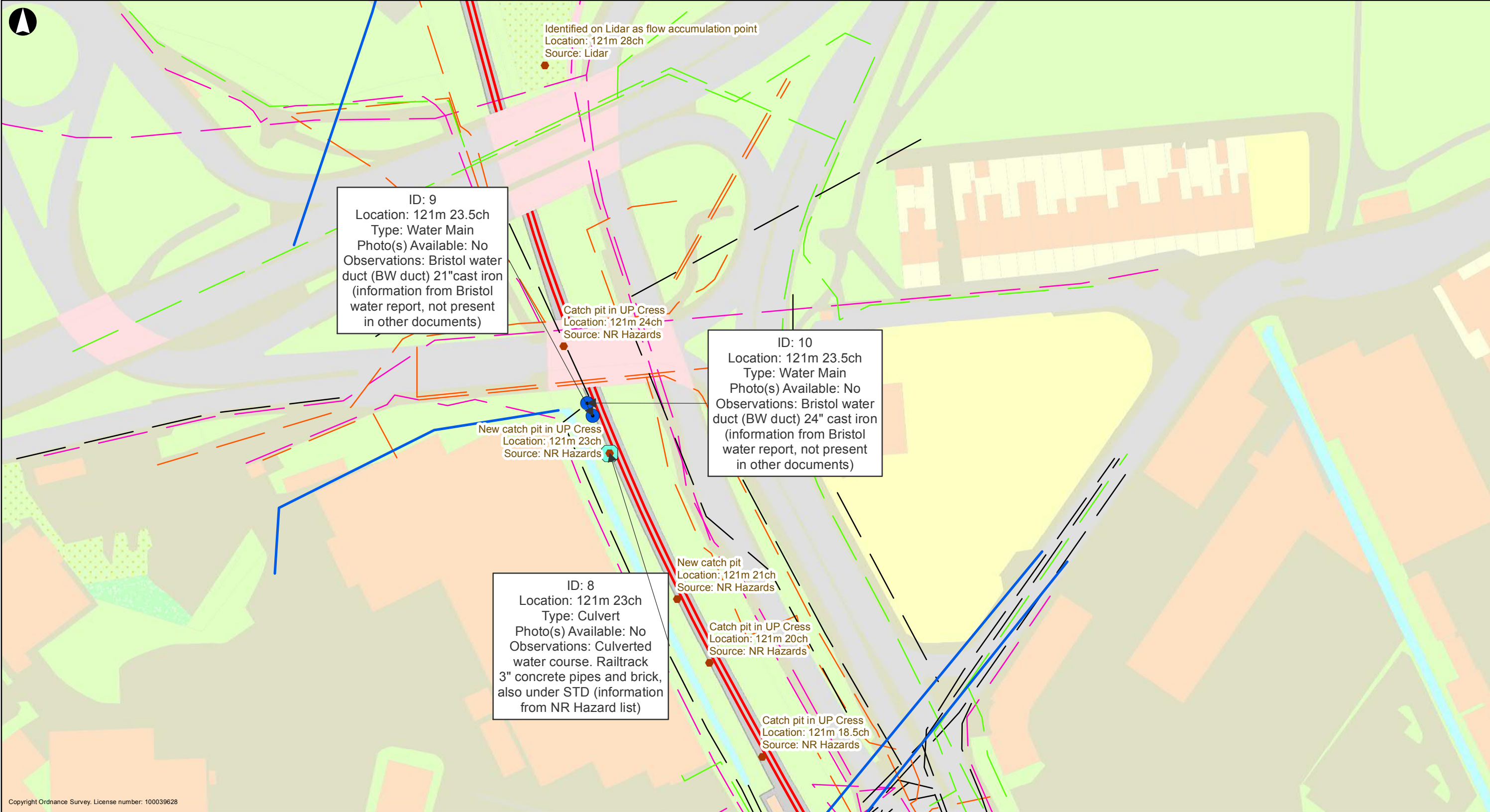
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**003**





Legend

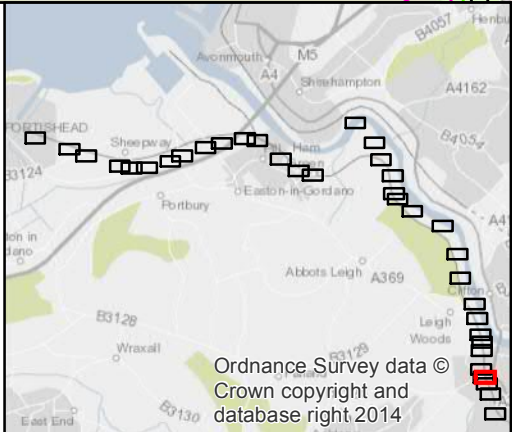
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

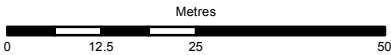
Rail / Services

- Rail (Proposed)
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- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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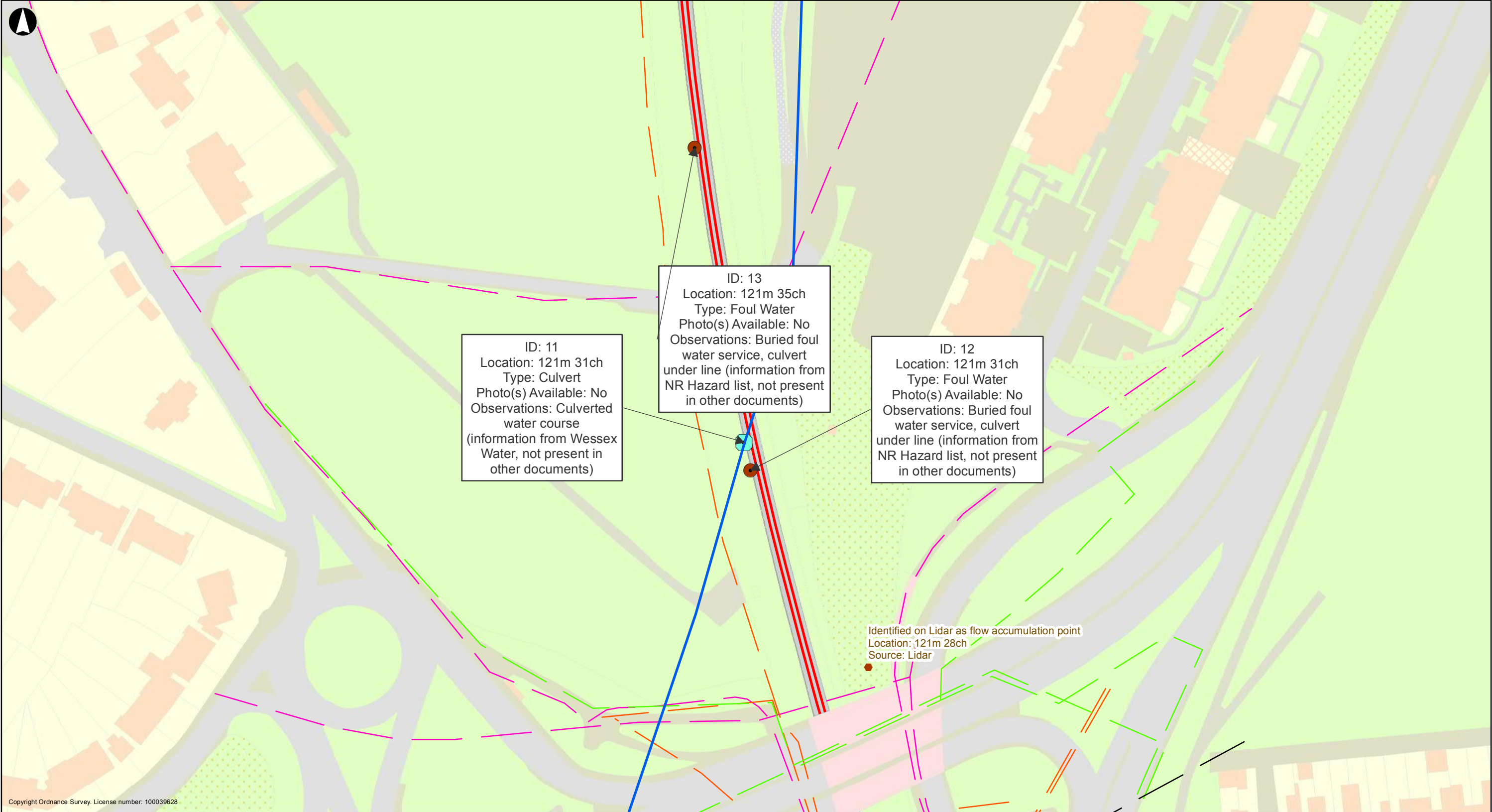
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
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Job No  
**243952-00**

Figure No  
**004**





Legend

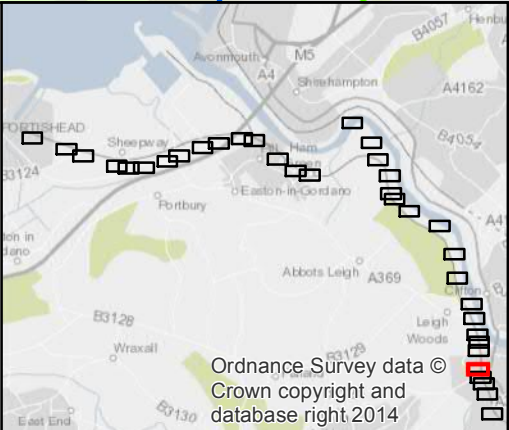
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

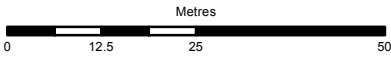
Rail / Services

- Rail (Proposed)
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- Gas Main
- Telecom Cable
- Additional Ducts



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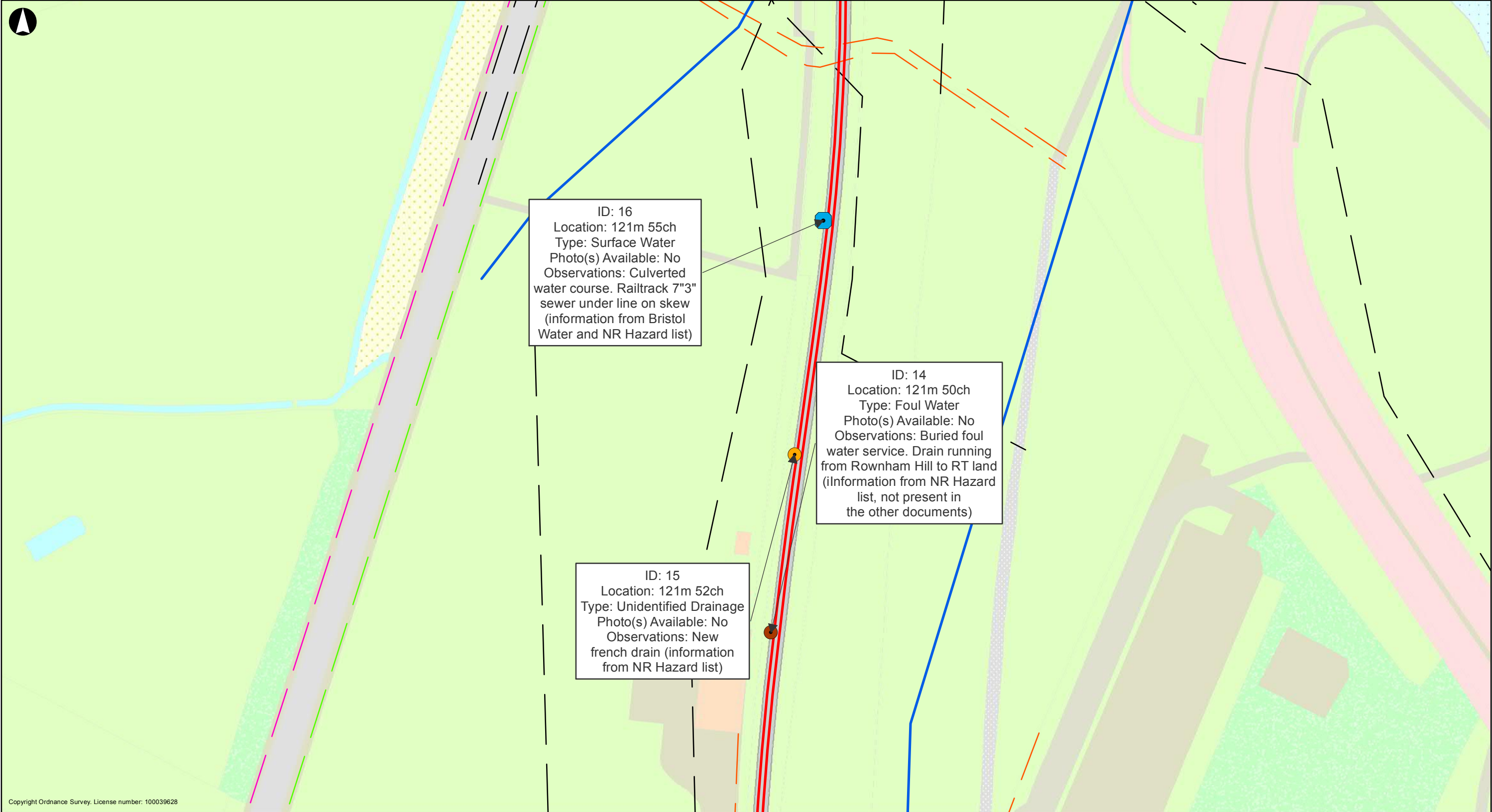
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

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Figure No  
**005**





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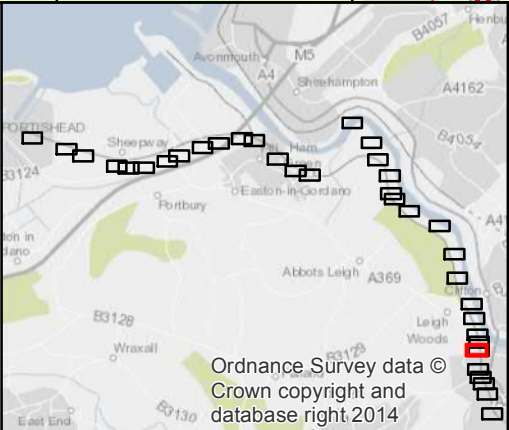
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

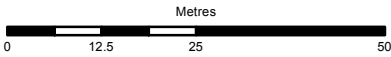
Rail / Services

- Rail (Proposed)
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- Electricity
- Gas Main
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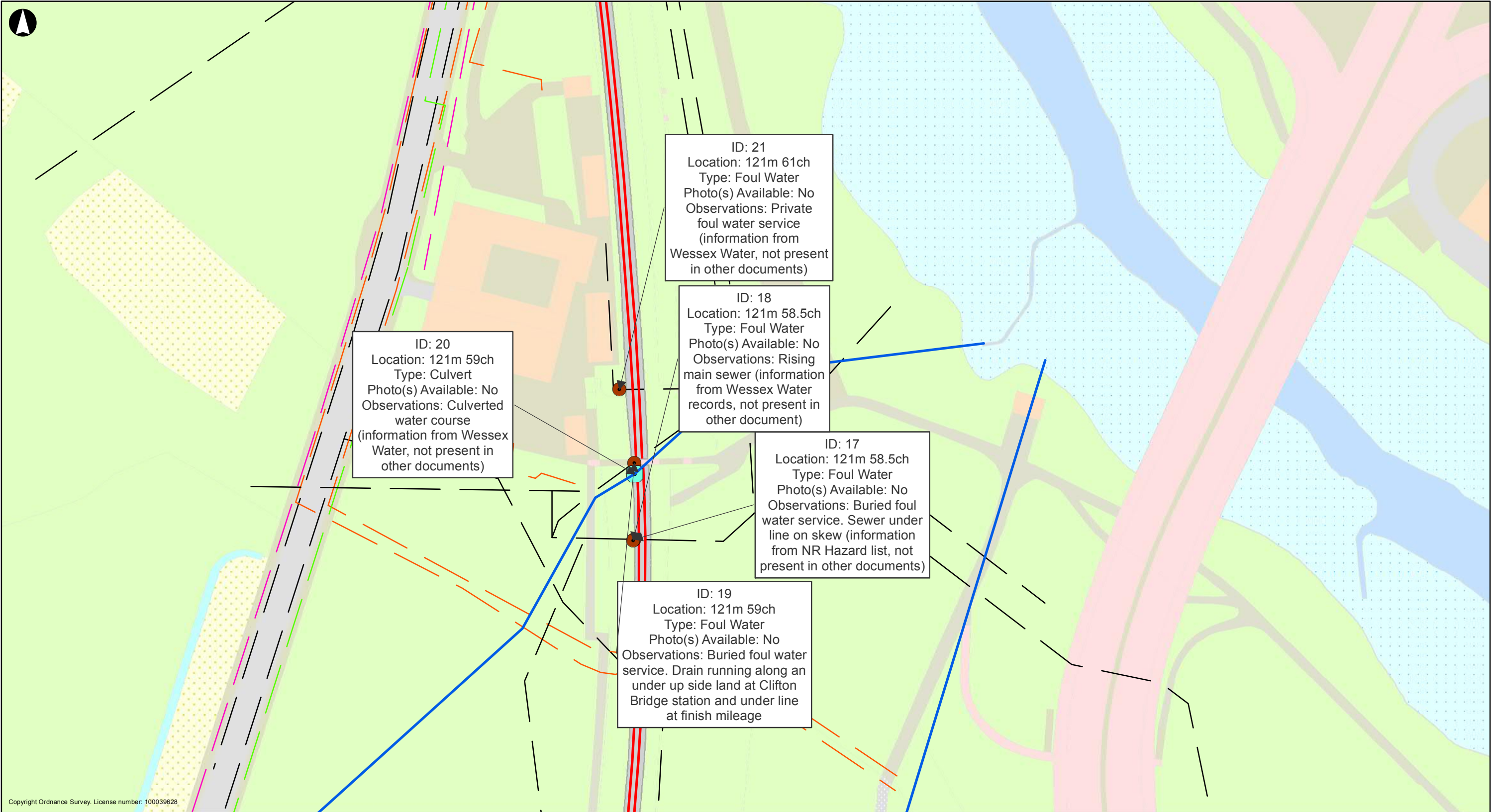
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

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**243952-00**

Figure No  
**006**





Legend

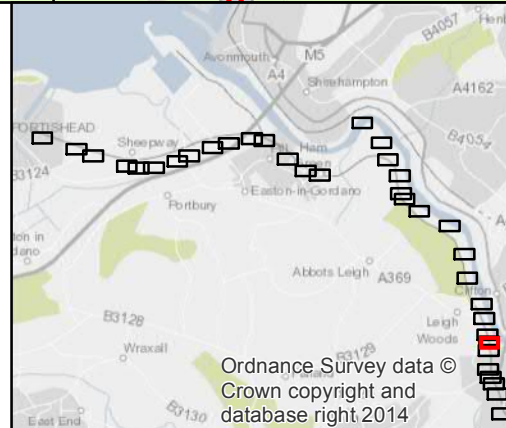
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

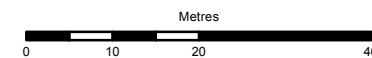
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Scale at A3

1:875

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Figure No

007





Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

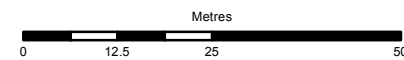
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Scale at A3

1:1,000

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Figure No

008





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Legend

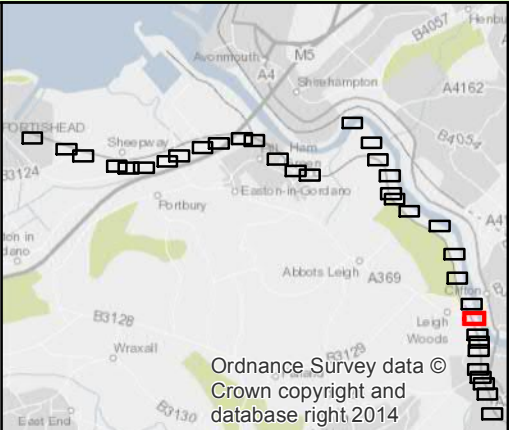
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

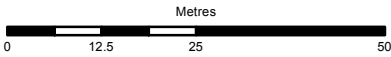
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
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Scale at A3  
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Figure No  
**009**





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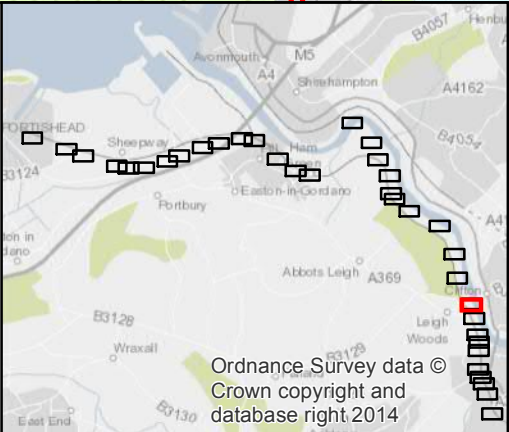
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- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

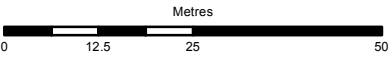
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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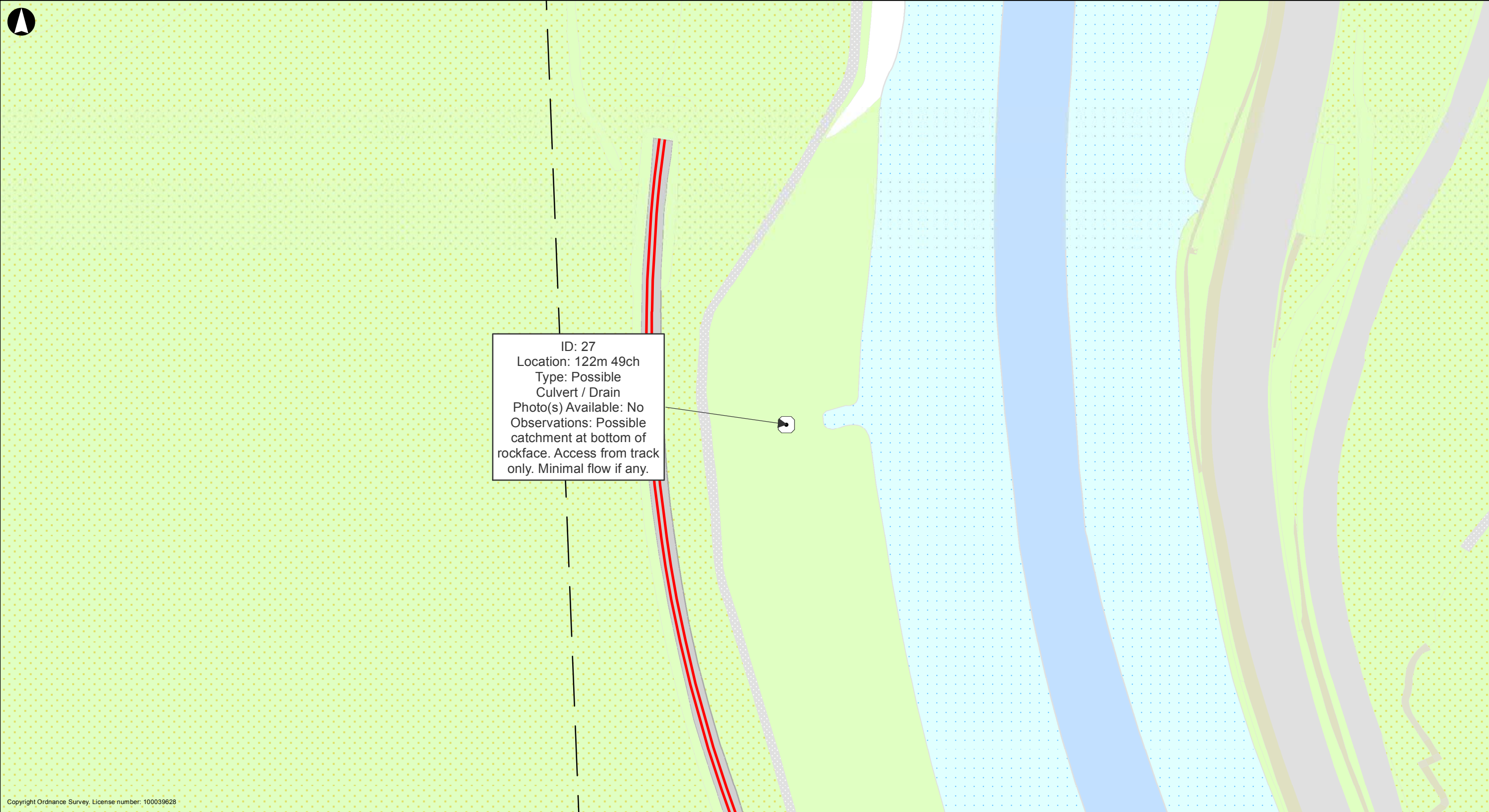
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Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**010**





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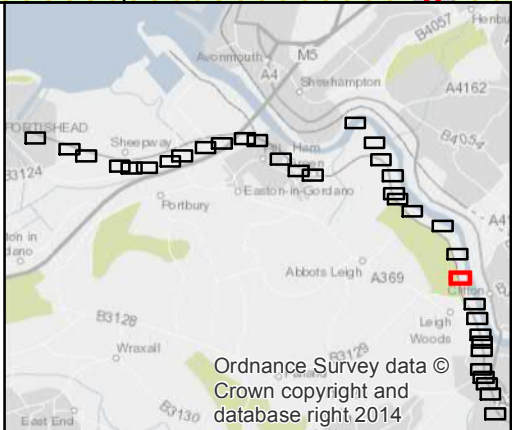
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

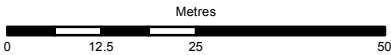
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Job No  
**243952-00**

Figure No  
**011**





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ID: 28  
Location: 122m 73.5ch  
Type: Foul Water  
Photo(s) Available: No  
Observations:  
Foul water service  
under railway line

ID: 29  
Location: 122m 73.5ch  
Type: Foul Water  
Photo(s) Available: No  
Observations:  
Foul water service  
under railway line

Legend

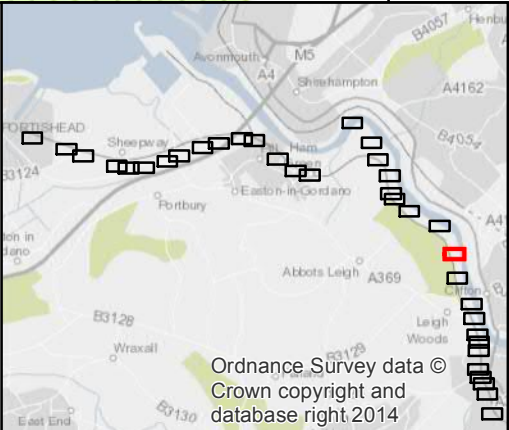
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

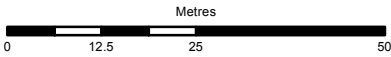
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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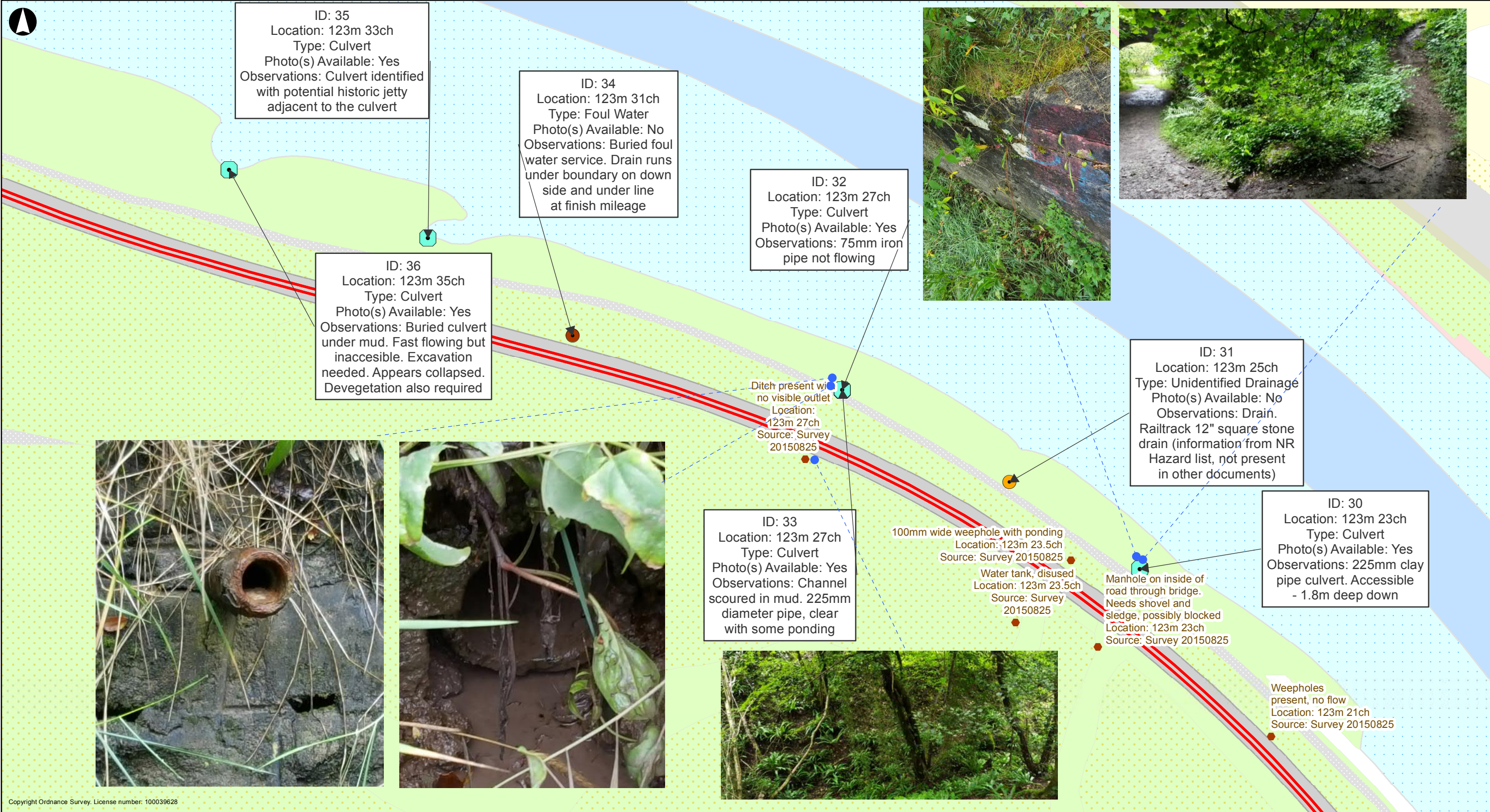
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**012**





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Legend

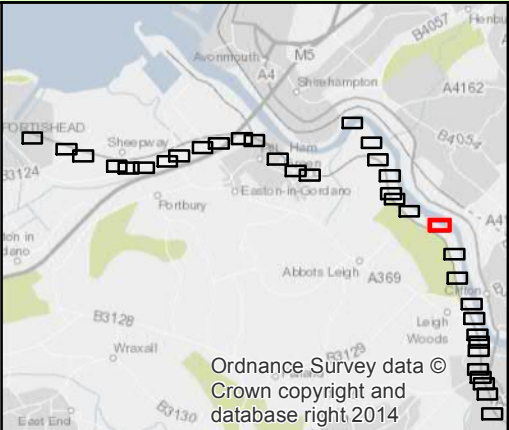
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

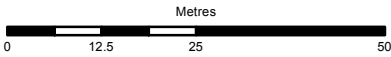
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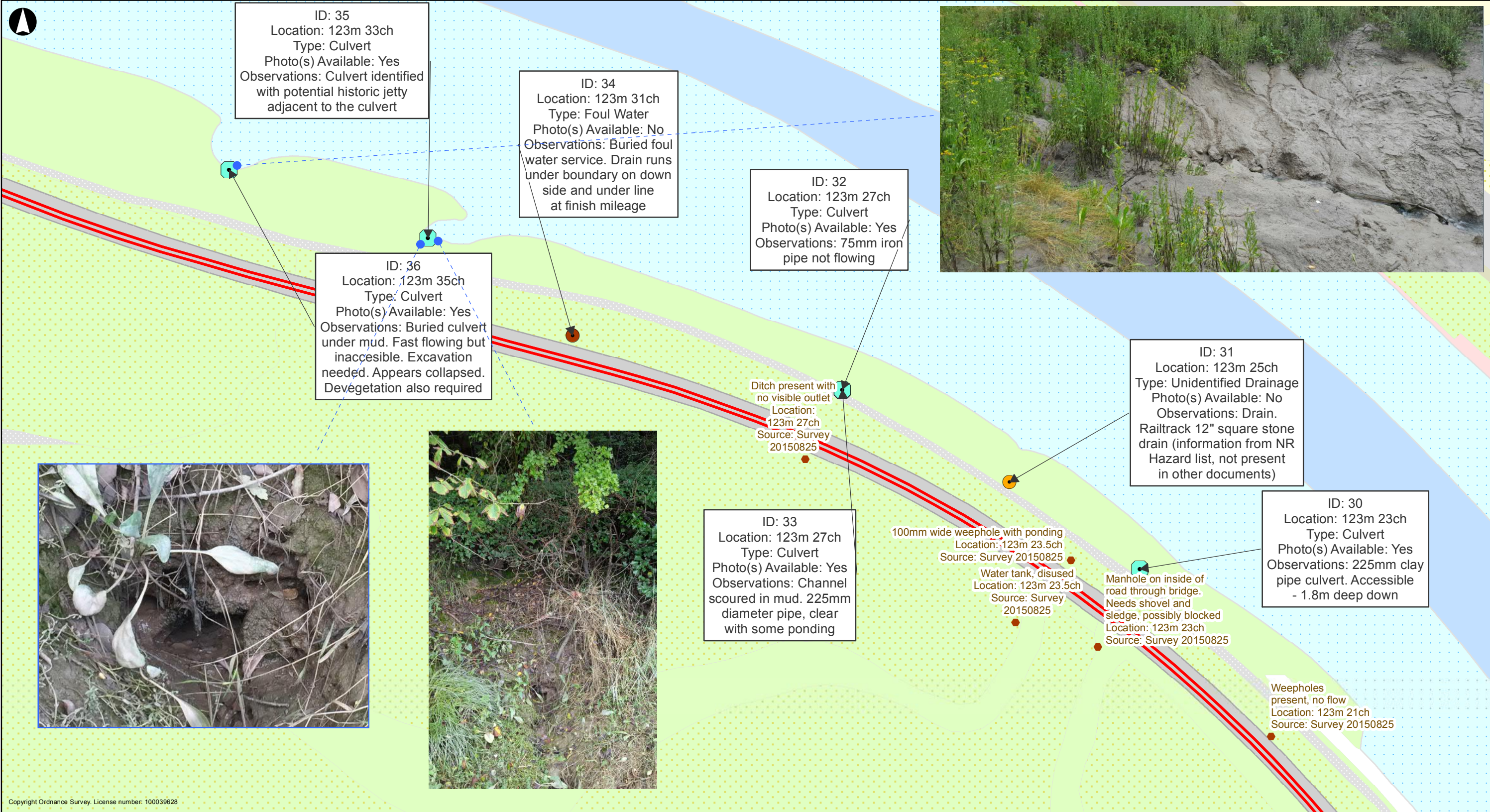
Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**013**





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Legend

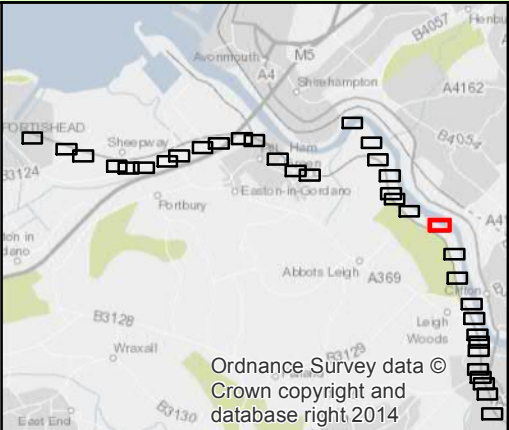
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

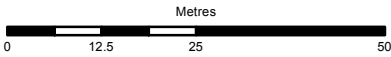
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**013**





ID: 37  
Location: 123m 63ch  
Type: Possible Culvert / Drain  
Photo(s) Available: Yes  
Observations: Possible culvert identified on site adjacent to overbridge. Channel scoured in mud.

100m square weephole to be CCTV's. Fake black widow spider  
Location: 123m 60ch  
Source: Survey 20150825

100m square weephole to be CCTV's. Fake black widow spider  
Location: 123m 59.5ch  
Source: Survey 20150825

100m square weephole to be CCTV's. Fake black widow spider  
Location: 123m 58ch  
Source: Survey 20150825

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### Legend

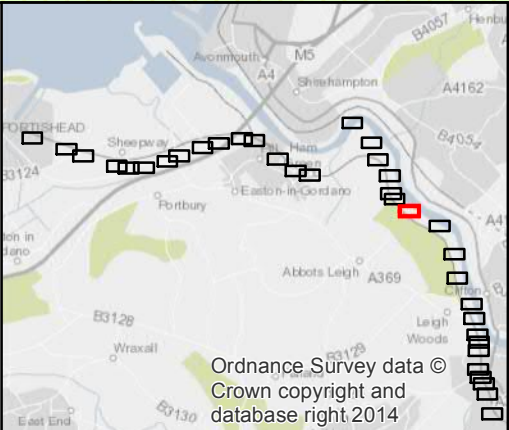
#### Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

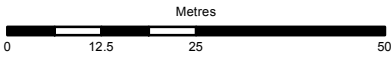
#### Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Client  
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**MetroWest**

**Culvert survey specification  
Location of potential culverts  
& services**

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**014**





ID: 38  
Location: 124m 08ch  
Type: Culvert  
Photo(s) Available: Yes  
Observations: Culvert identified adjacent to underbridge. No culvert directly beneath track. Outfalls to ditch through underbridge.

Self contained ditch with no outlet  
Location: 124m 05ch  
Source: Survey 20150825

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Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

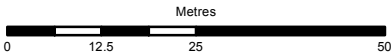
Rail / Services

- Rail (Proposed)
- Water Supply Main
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- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts & services

Scale at A3  
1:1,000

Job No  
243952-00  
Figure No  
015













ID: 39  
Location: 124m 27ch  
Type: Possible  
Culvert / Drain  
Photo(s) Available: Yes  
Observations: Multiple  
channels evident in  
the area but unable to  
identify culvert.

Small cave in the wall adjacent to the railway  
Location: 124m 21ch  
Source: Survey  
20150818

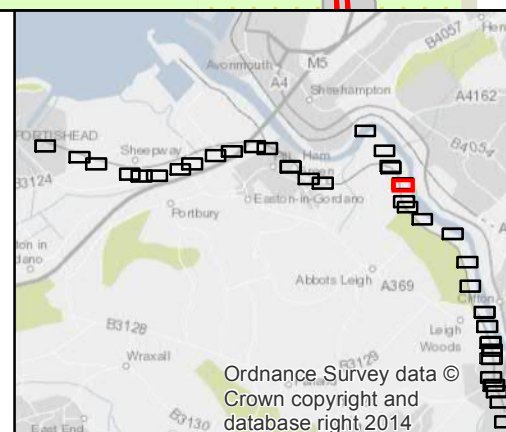
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## Culverts / Sewers / Mains

-  Culvert
-  Possible Culvert / Drain
-  Surface Water
-  Water Main

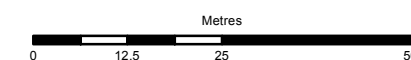
-  Foul Water
-  Unidentified Drainage
-  Open channel / Ditch
-  Other

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts  
& services

Scale at A3

**1:1,000**

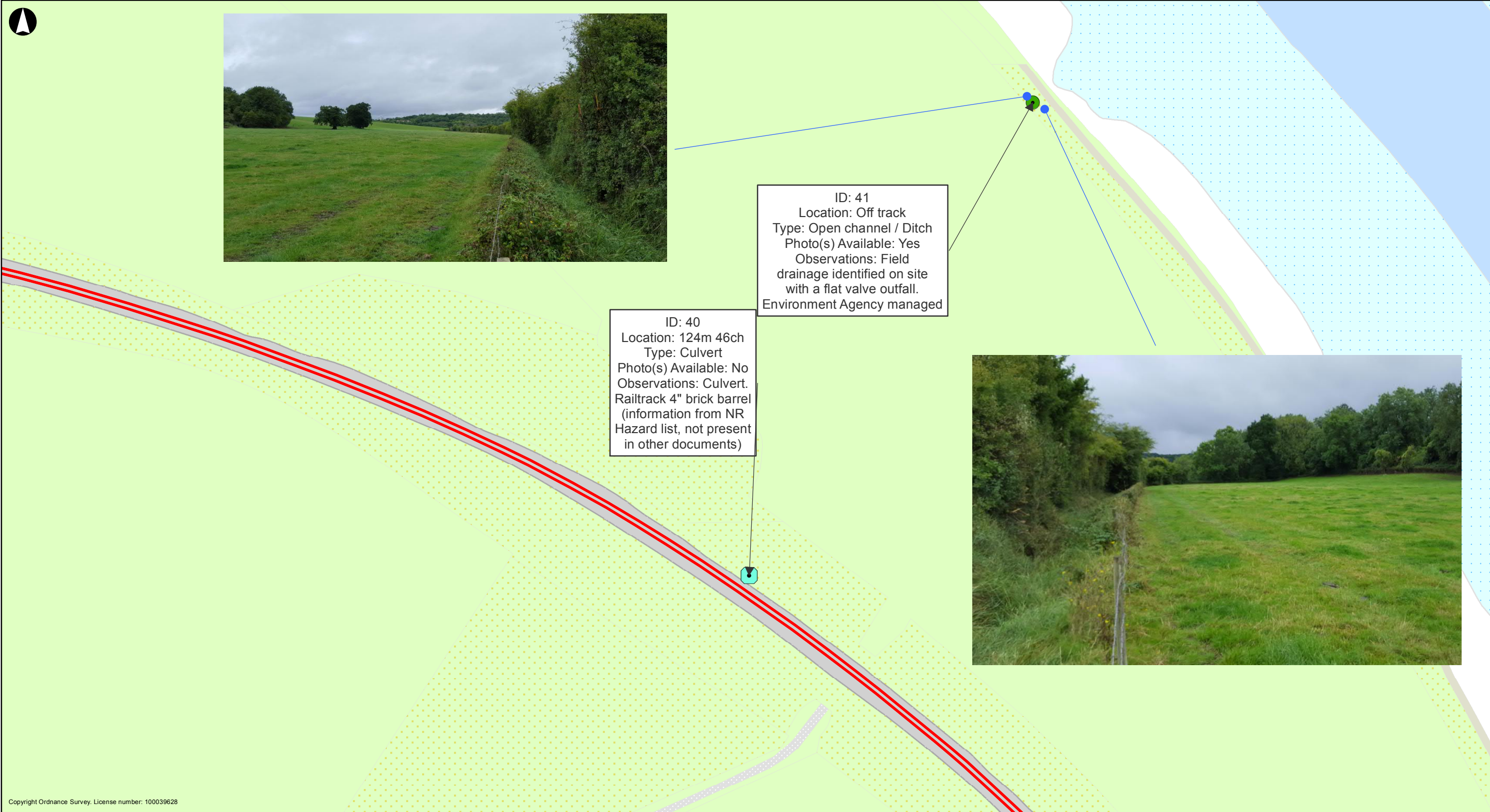
Job No. \_\_\_\_\_

**243952-00**

Figure No

016





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Legend

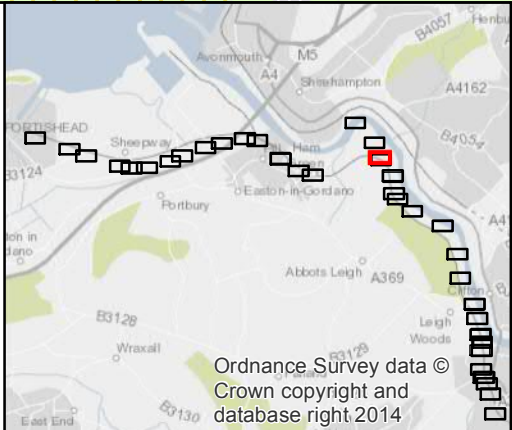
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

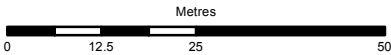
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**017**





ID: 42  
Location: Off Track, Avon  
Chapel Pill  
Type: Open channel / Ditch  
Photo(s) Available: Yes  
Observations: Field drainage  
identified on site with a  
flat valve outfall.  
Environment Agency managed.



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Legend

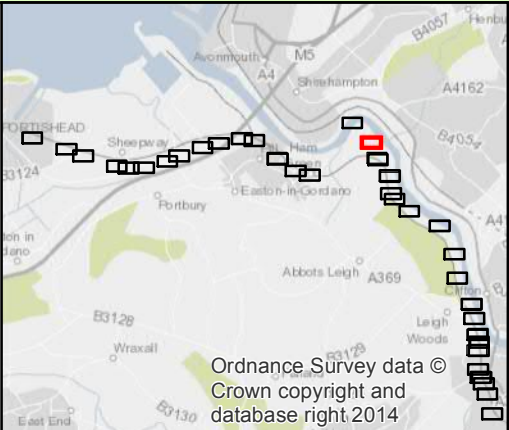
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

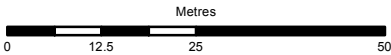
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**018**





ID: 43  
Location: Off Track, Avon  
Chapel Pill Outfalls  
Type: Open channel / Ditch  
Photo(s) Available: Yes  
Observations: Field  
drainage identified on site  
with a flat valve outfall.  
Environment Agency managed.

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Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

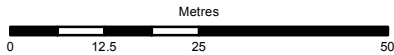
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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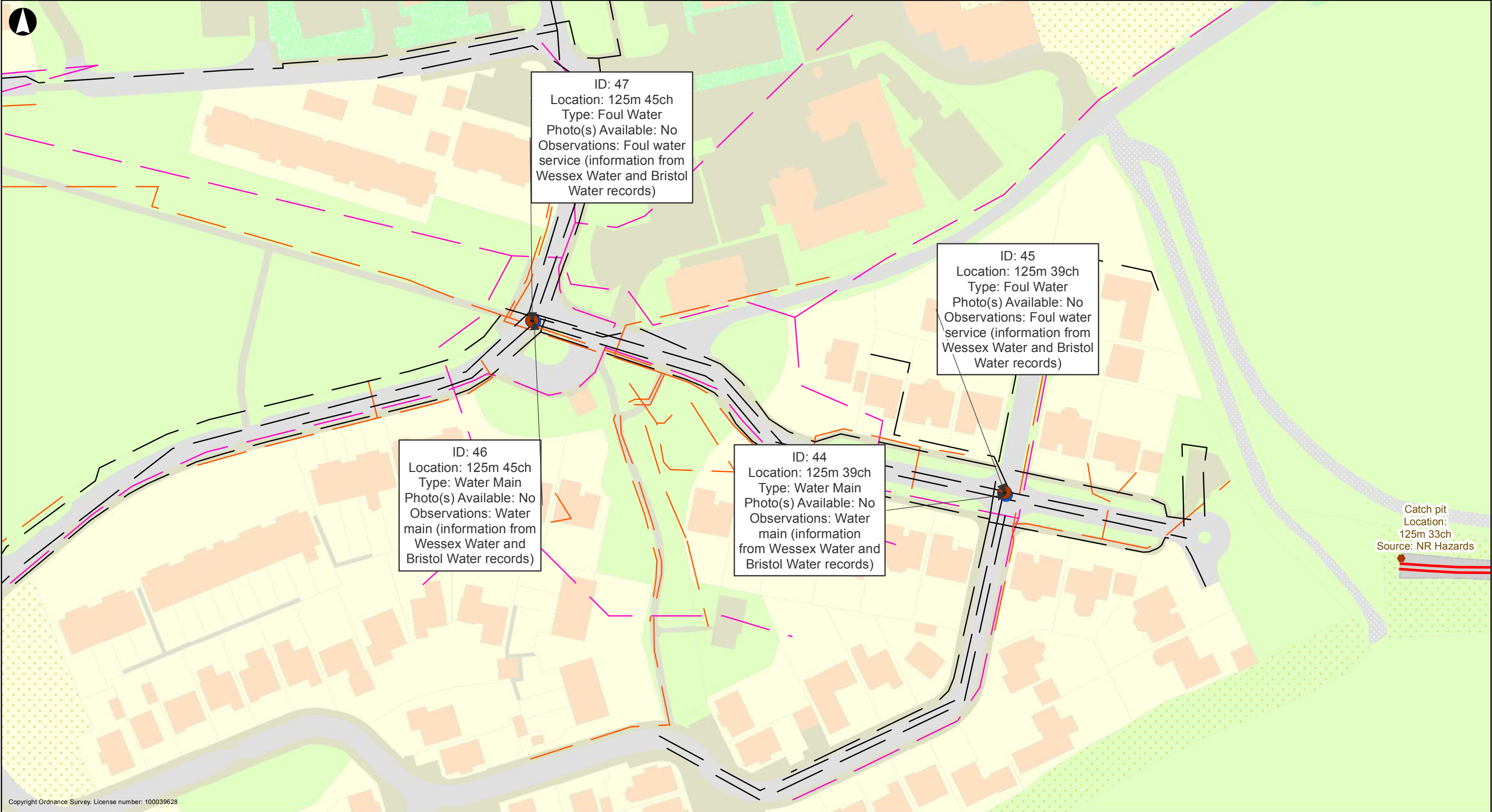
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**019**





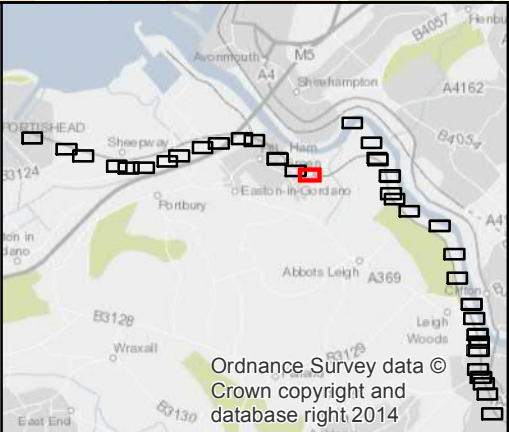
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

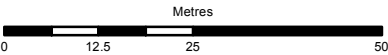
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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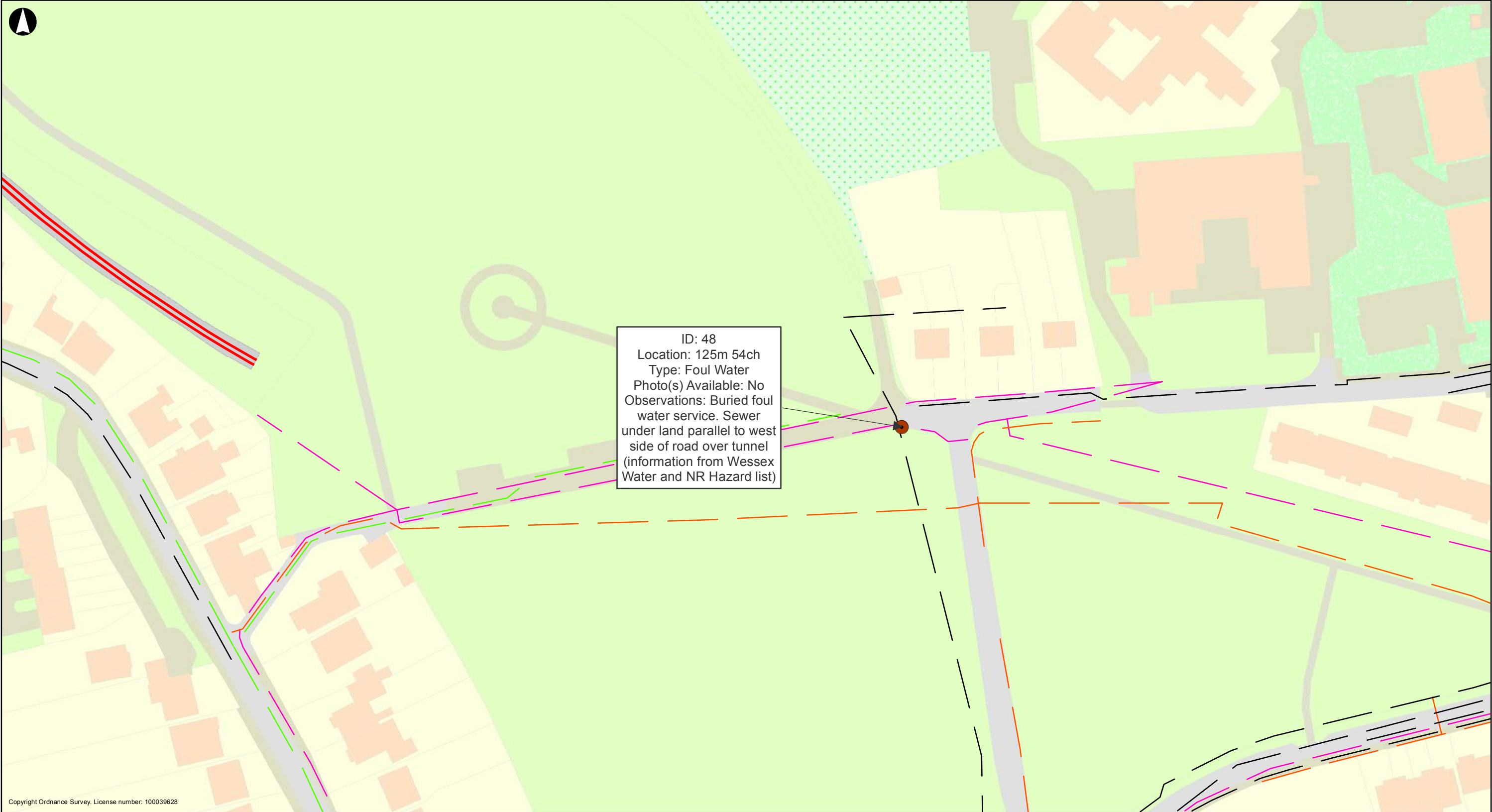
Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**020**





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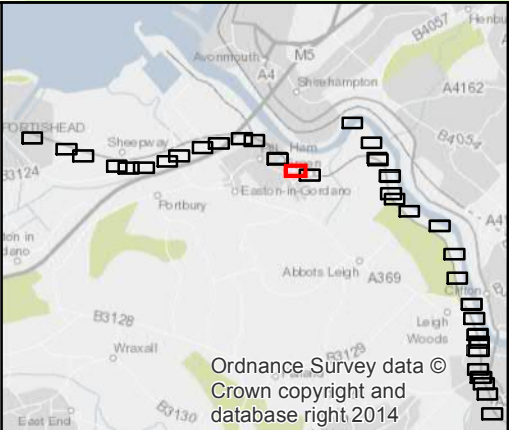
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

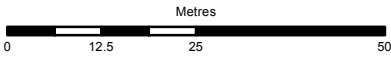
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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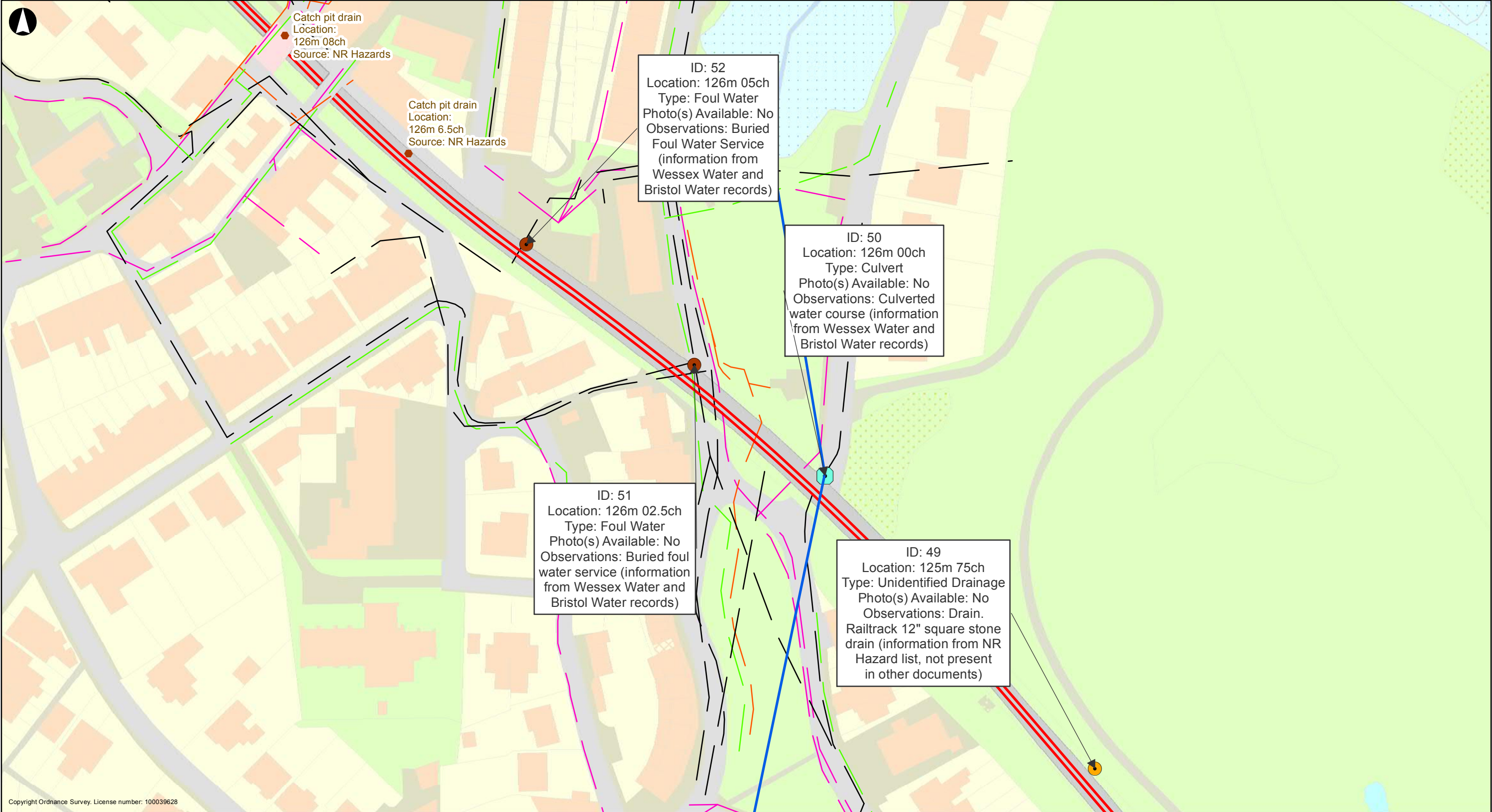
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**021**





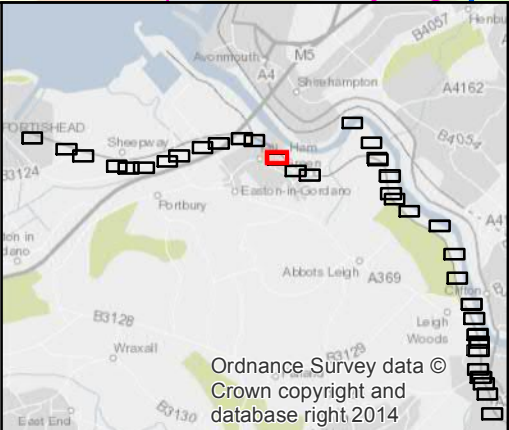
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

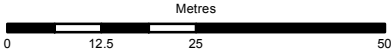
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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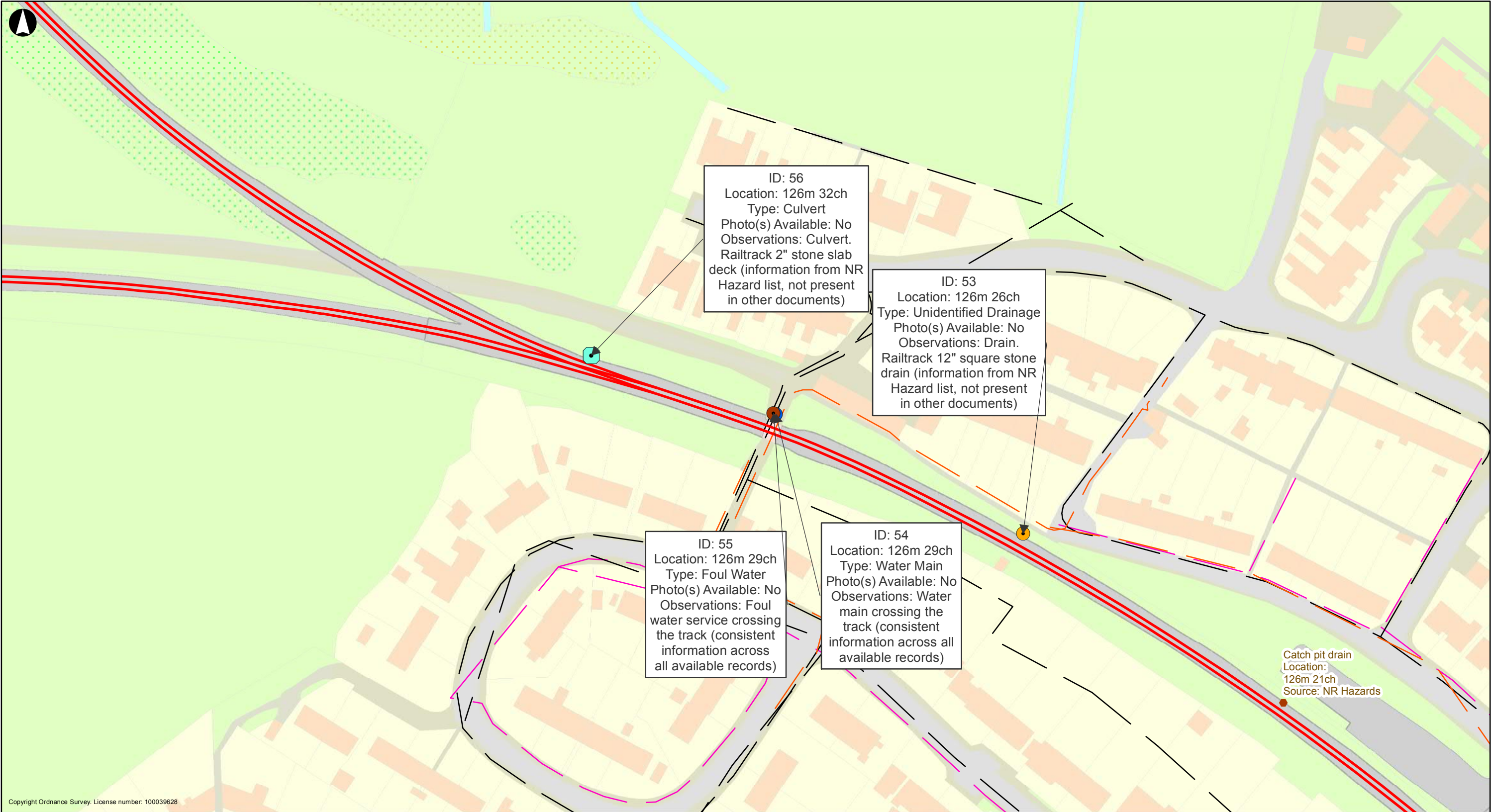
Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**022**





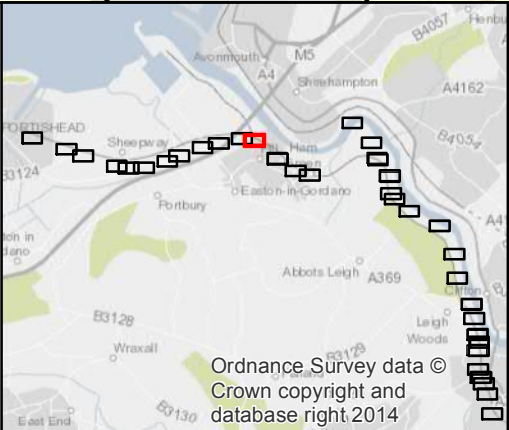
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

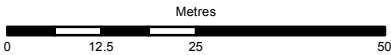
Rail / Services

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- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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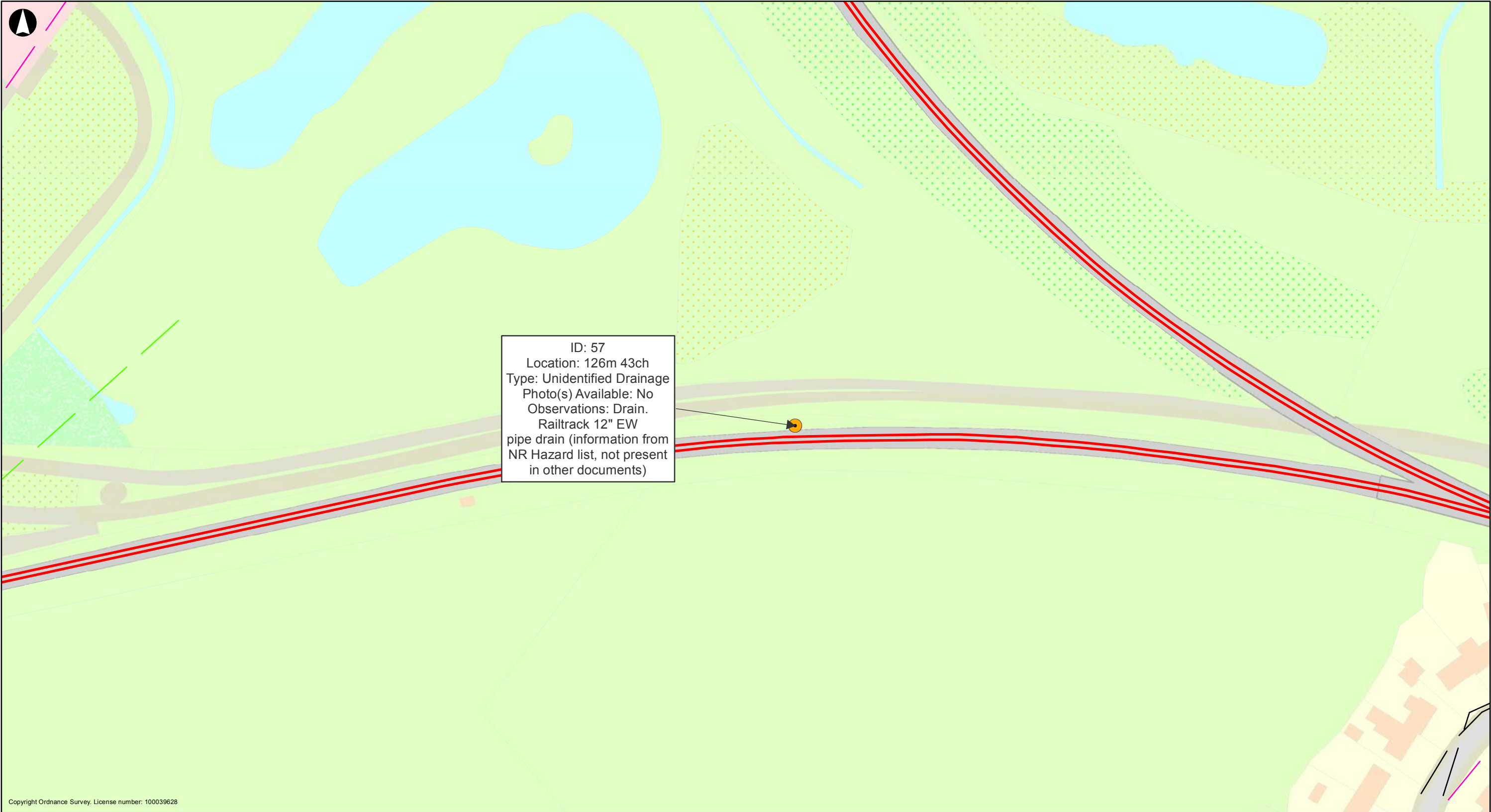
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**023**













ID: 57  
Location: 126m 43ch  
Type: Unidentified Drainage  
Photo(s) Available: No  
Observations: Drain.  
Railtrack 12" EW  
pipe drain (information from  
NR Hazard list, not present  
in other documents)







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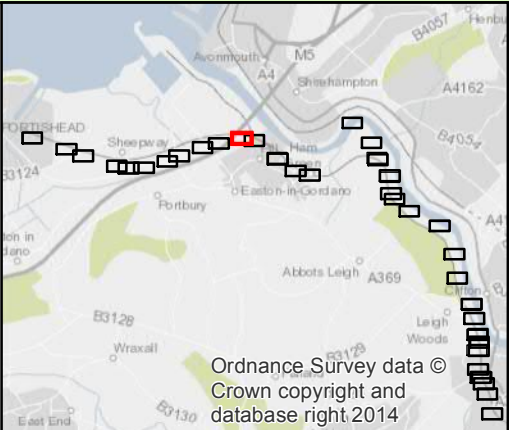
Legend

Culverts / Sewers / Mains

-  Culvert
-  Possible Culvert / Drain
-  Surface Water
-  Water Main
-  Foul Water
-  Unidentified Drainage
-  Open channel / Ditch
-  Other

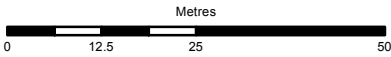
Rail / Services

-  Rail (Proposed)
-  Water Supply Main
-  Electricity
-  Gas Main
-  Telecom Cable
-  Additional Ducts



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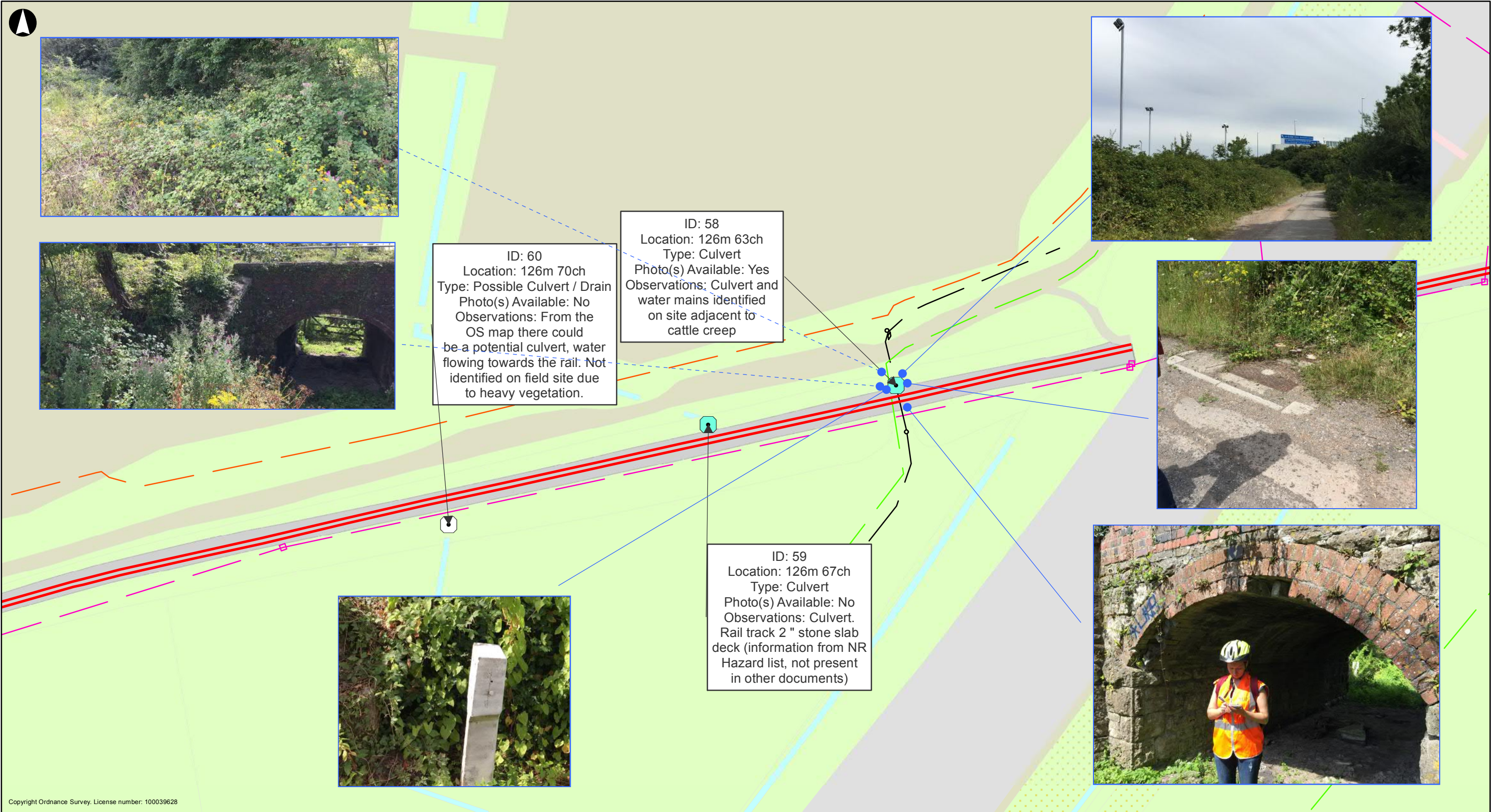
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**024**





Legend

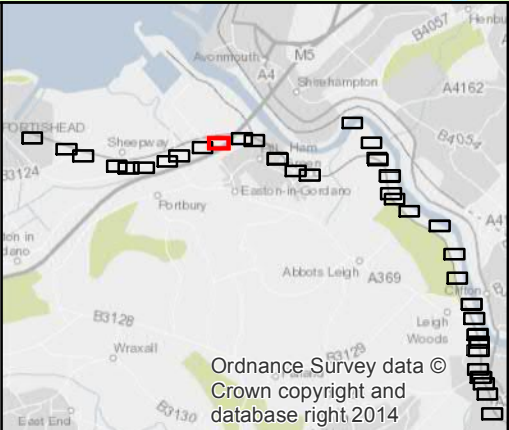
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

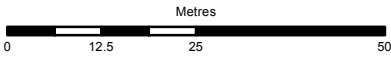
Rail / Services

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- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**025**





ID: 61  
Location: 127m 03ch  
Type: Culvert  
Photo(s) Available: Yes  
Observations: Culvert identified on site adjacent to overbridge

ID: 62  
Location: 127m 04ch  
Type: Water Main  
Photo(s) Available: No  
Observations: Water mains crossing the rail (clean water and foul water sewer) from Wessex Water and Bristol Water records



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Legend

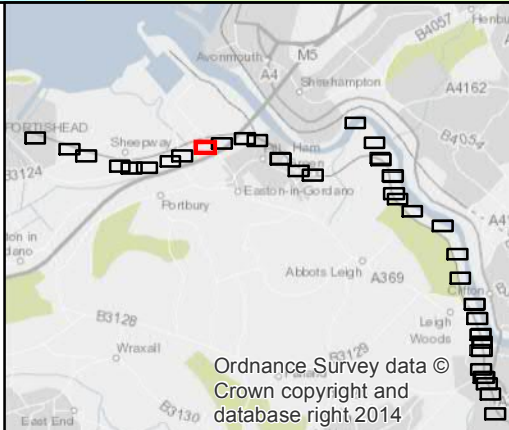
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

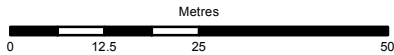
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Job Title

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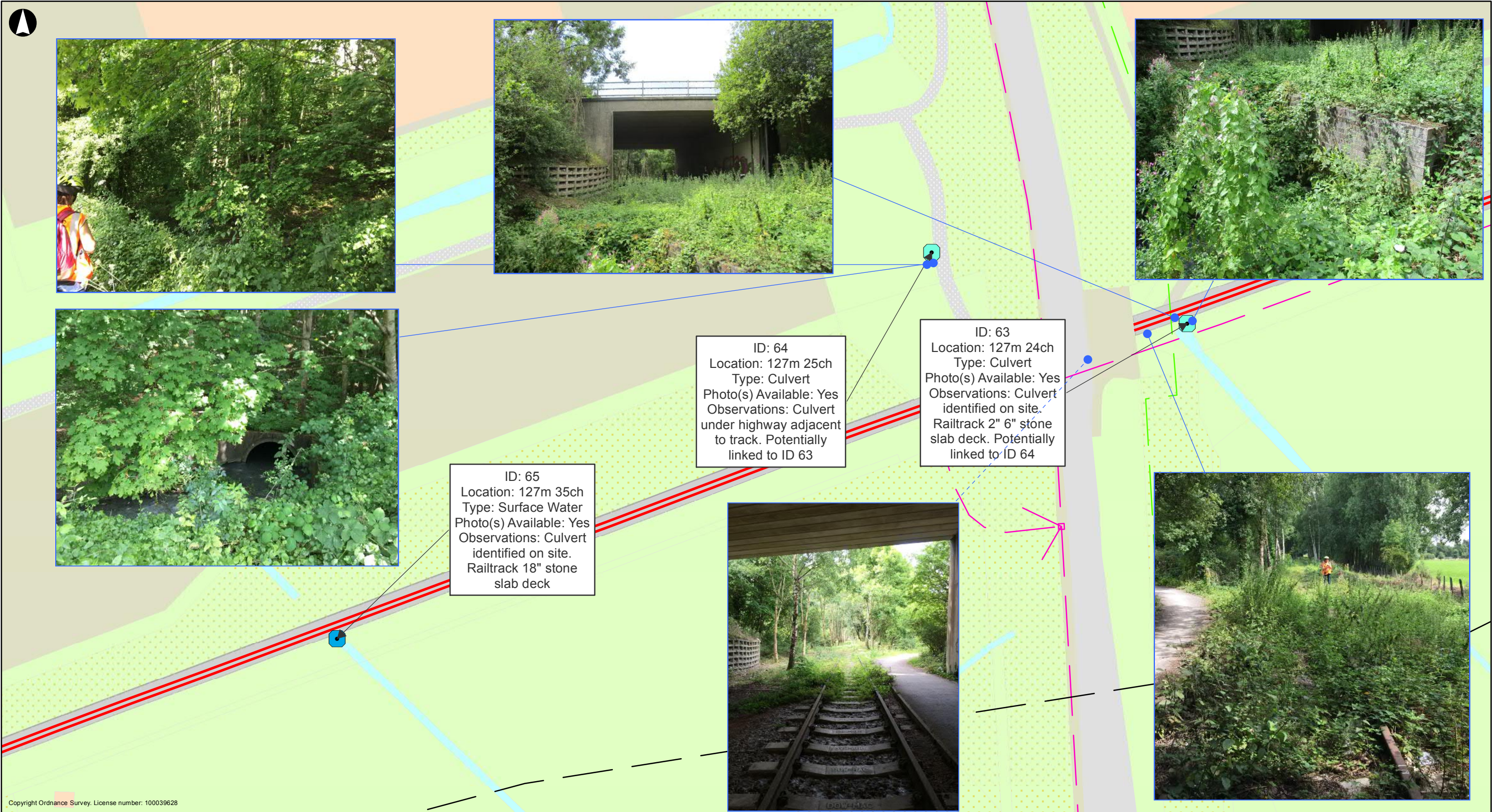
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
1:1,000

Job No  
243952-00

Figure No  
026





Legend

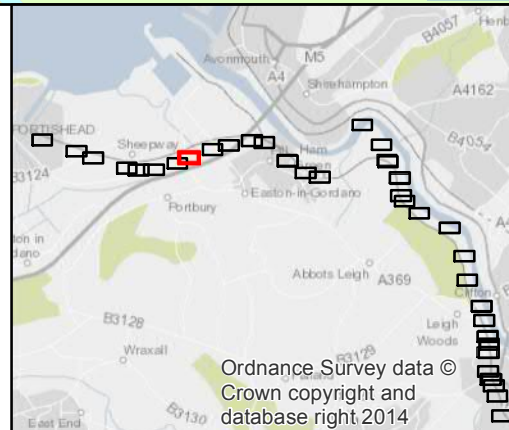
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

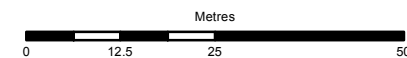
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Location of potential culverts  
& services

Scale at A3

1:1,000

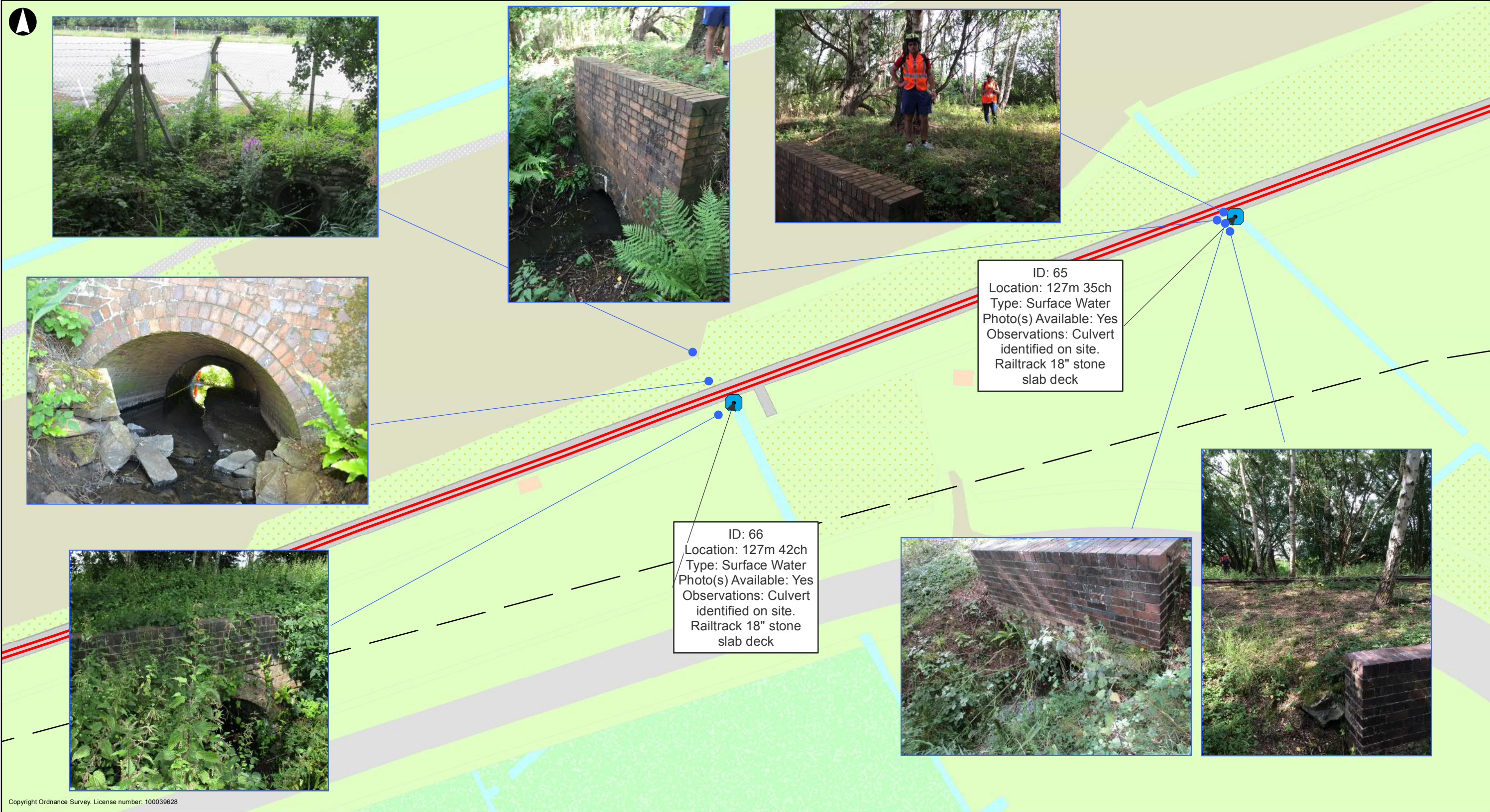
Job No

243952-00

Figure No

027





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Legend

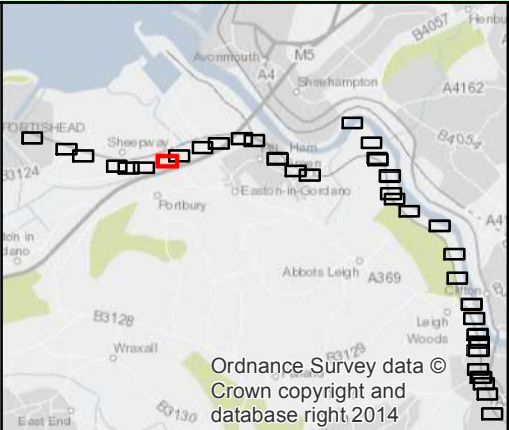
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

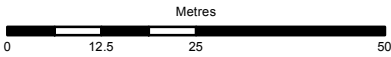
Rail / Services

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- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**028**





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Legend

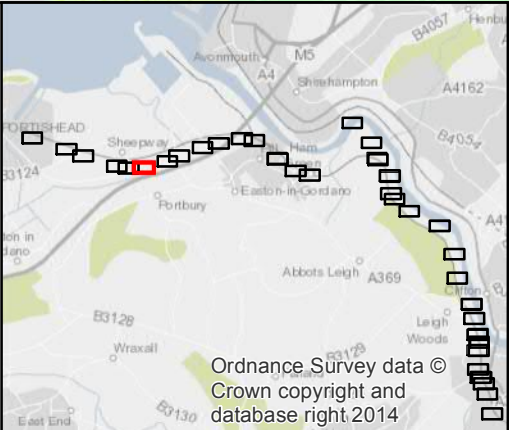
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

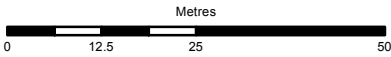
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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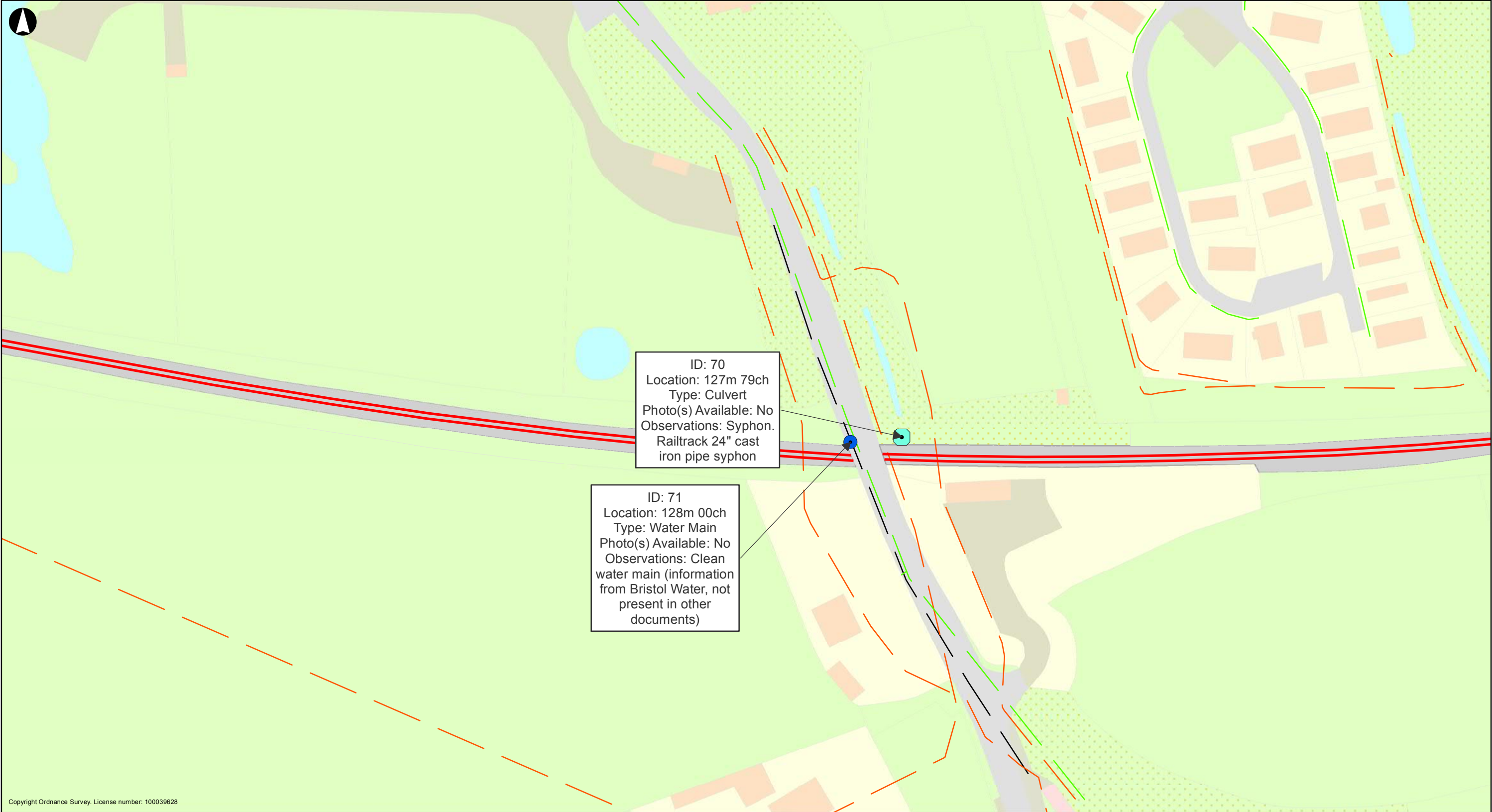
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**029**





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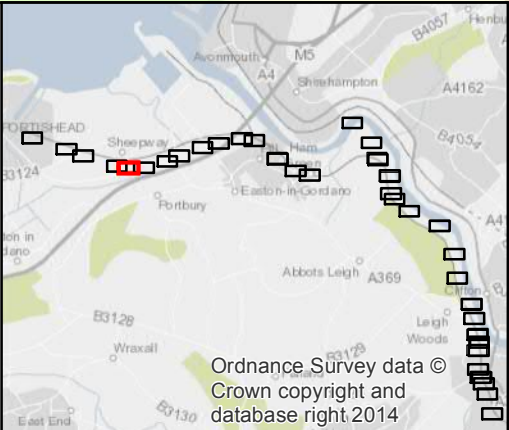
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

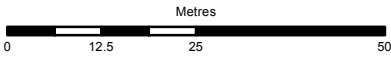
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Scale at A3  
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Job No  
**243952-00**

Figure No  
**030**





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ID: 72  
Location: 128m 14ch  
Type: Culvert  
Photo(s)  
Available: Yes  
Observations: Culvert identified on site



Legend

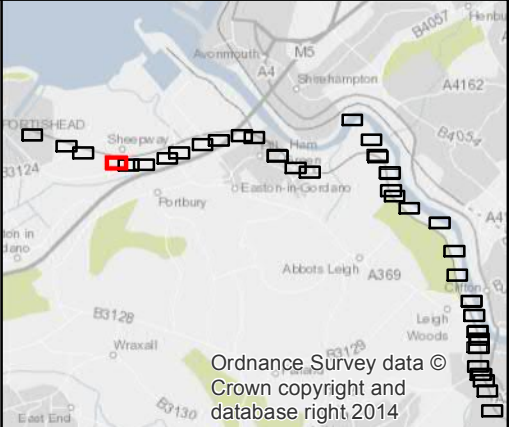
Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

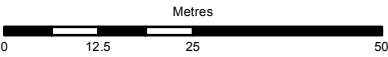
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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**Network Rail**

Job Title  
**MetroWest**

Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**031**





Copyright Ordnance Survey. License number: 100039628

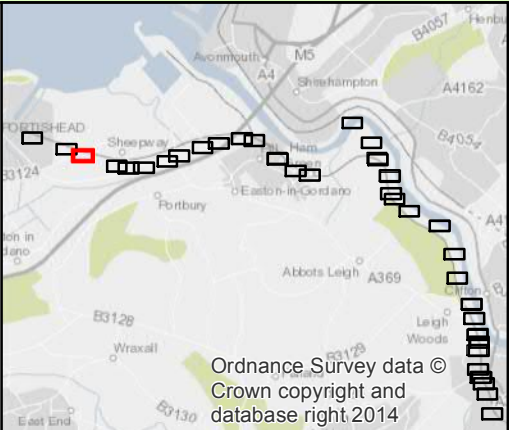
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

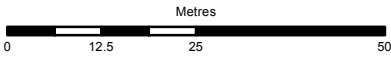
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



ARUP

63 St Thomas Street  
Bristol BS1 6JZ  
(T) +44 1179 765 432



Client  
**Network Rail**

Job Title  
**MetroWest**

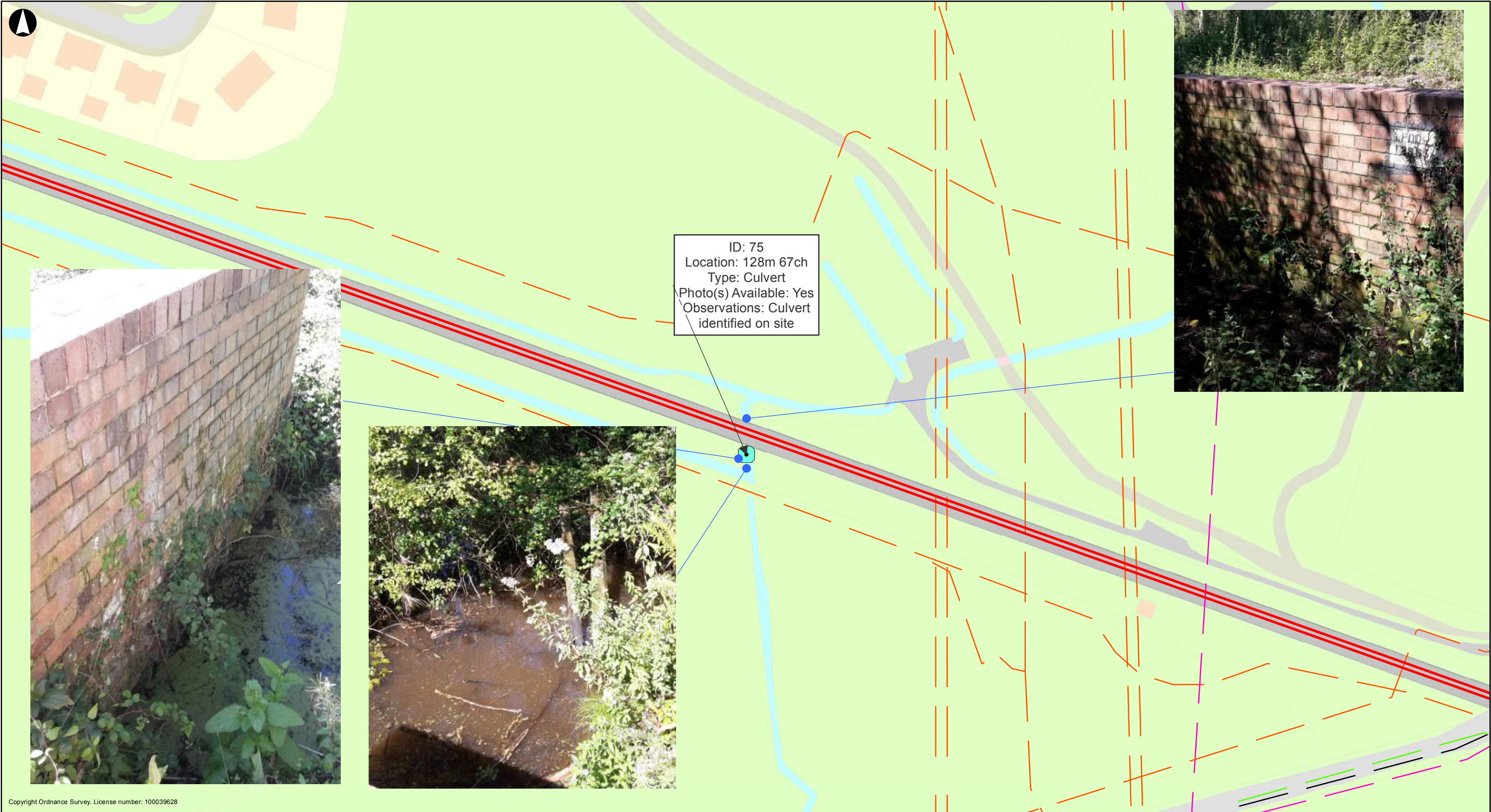
Culvert survey specification  
Location of potential culverts  
& services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**032**





## Legend

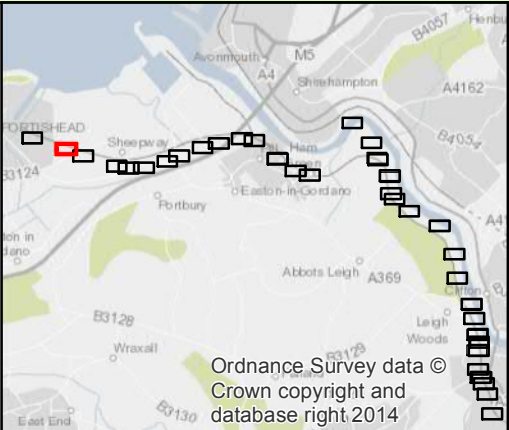
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- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main

- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

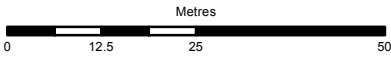
### Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Client

Network Rail

Job Title

MetroWest

Culvert survey specification  
Location of potential culverts  
& services

Scale at A3

1:1,000

Job No

243952-00

Figure No

033





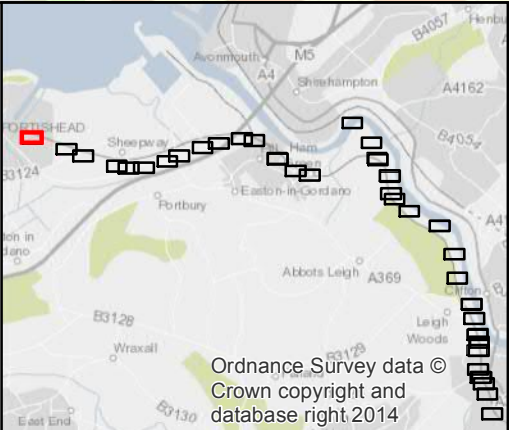
Legend

Culverts / Sewers / Mains

- Culvert
- Possible Culvert / Drain
- Surface Water
- Water Main
- Foul Water
- Unidentified Drainage
- Open channel / Ditch
- Other

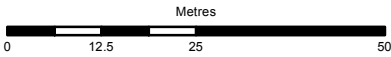
Rail / Services

- Rail (Proposed)
- Water Supply Main
- Electricity
- Gas Main
- Telecom Cable
- Additional Ducts



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Bristol BS1 6JZ  
(T) +44 1179 765 432



Client  
**Network Rail**

Job Title  
**MetroWest**

Culvert survey specification  
Location of potential culverts & services

Scale at A3  
**1:1,000**

Job No  
**243952-00**

Figure No  
**034**



## Appendix B

### External Information Sources



# B1 Bristol Water records

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Date: 31/03/14

Scale: 1:4181

Map Centre: 347716,176312

Data updated: 16/01/14

Clean Water Plan A3

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Water Main	
Communication Pipe	
Slip Lined Main	
Abandoned Main	

Fitting	
Hydrant	
Meter	
Valve	

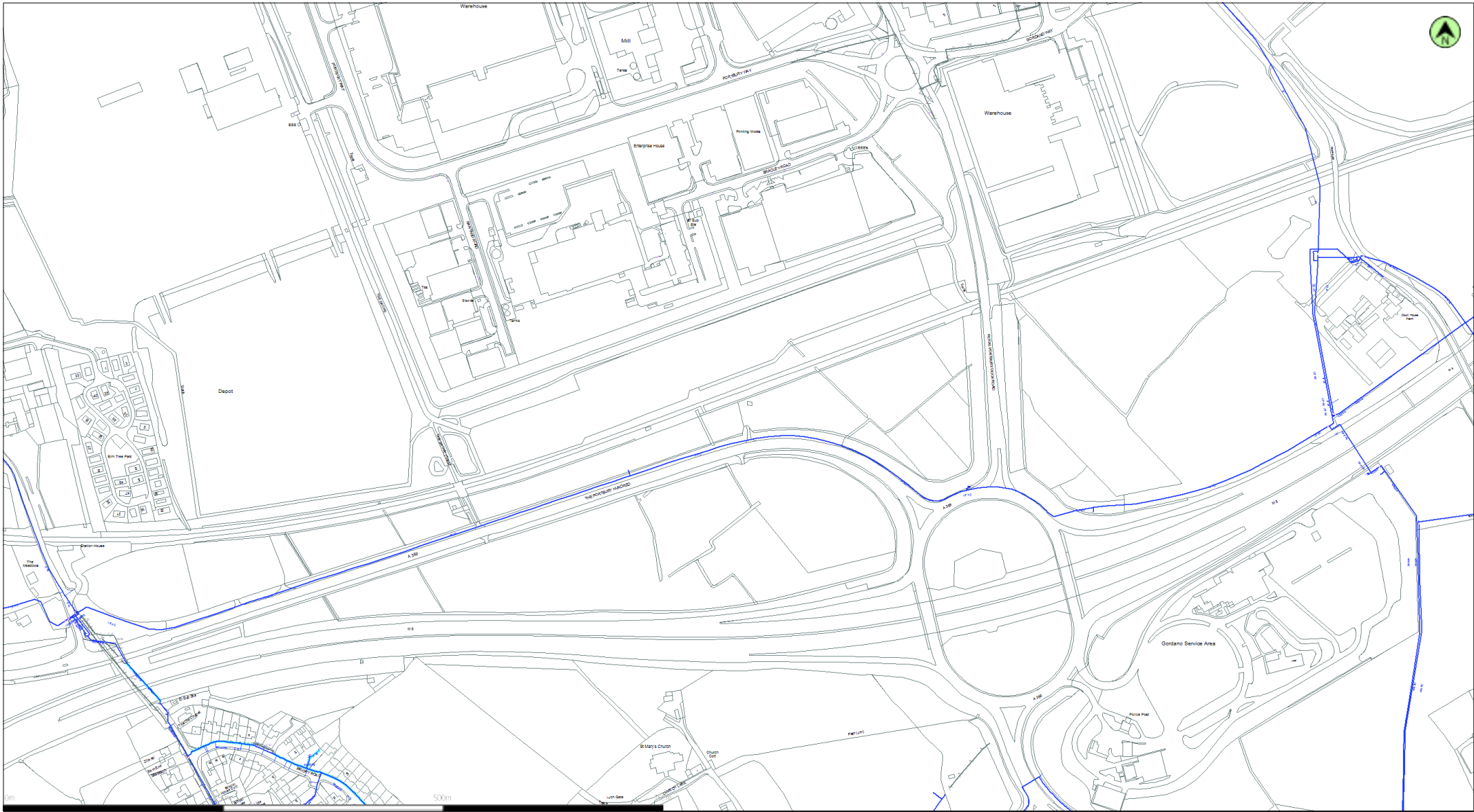
cameron.o'connor@n-somerset.gov.uk











Ordnance Survey Mapping © Crown Copyright 100018106      Date: 31/03/14      Scale: 1:4181      Map Centre: 350377,175839      Data updated: 16/01/14      Clean Water Plan A3

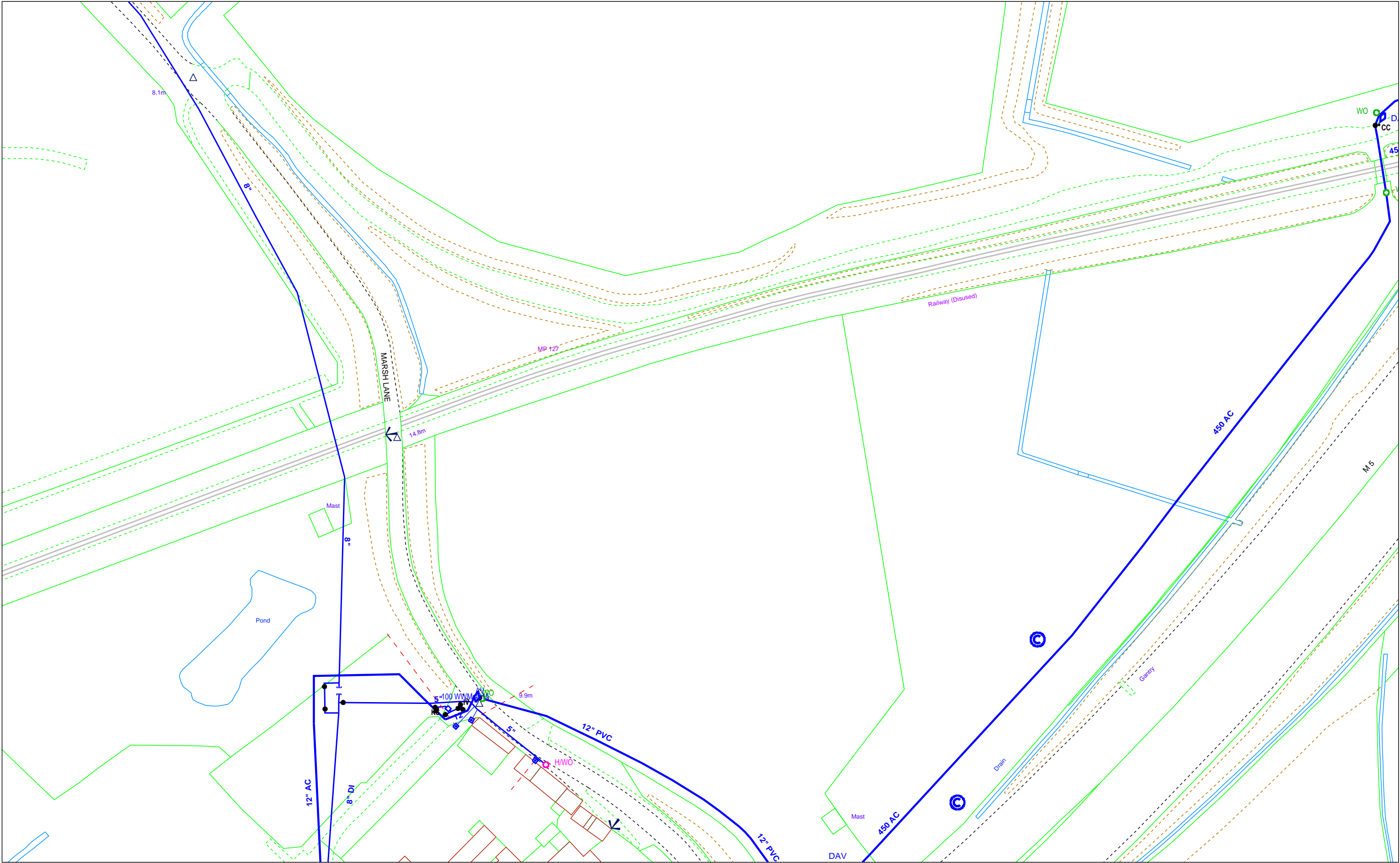
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Water Main		Fitting	
Communication Pipe		Hydrant	
Slip Lined Main		Meter	
Abandoned Main		Valve	

cameron.o'connor@n-somerset.gov.uk







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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

plot `1

COORDINATES AT THE CENTRE

351166 176106

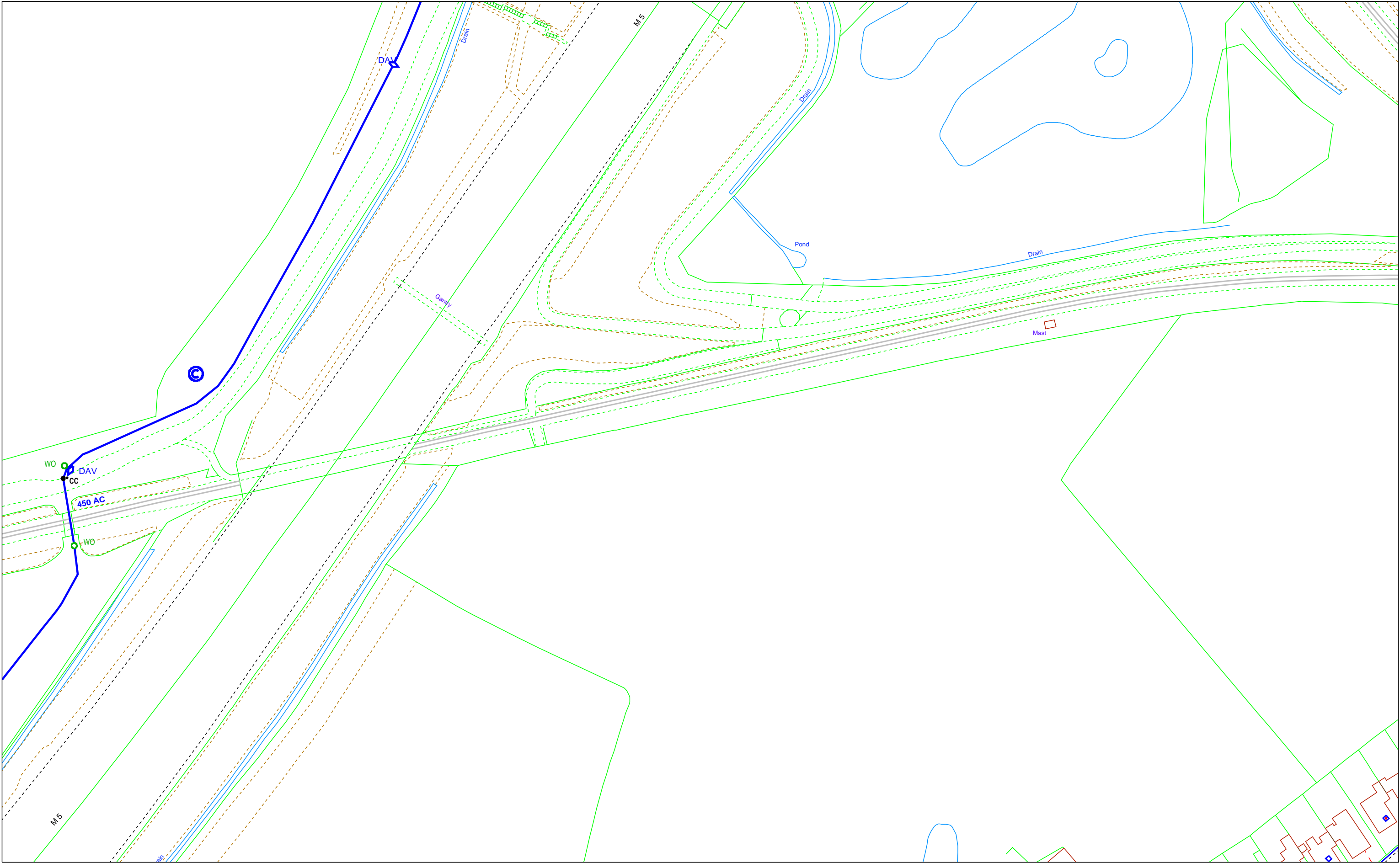
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Scale: 1:1250

A3

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

plot `2

COORDINATES AT THE CENTRE

351640 176234

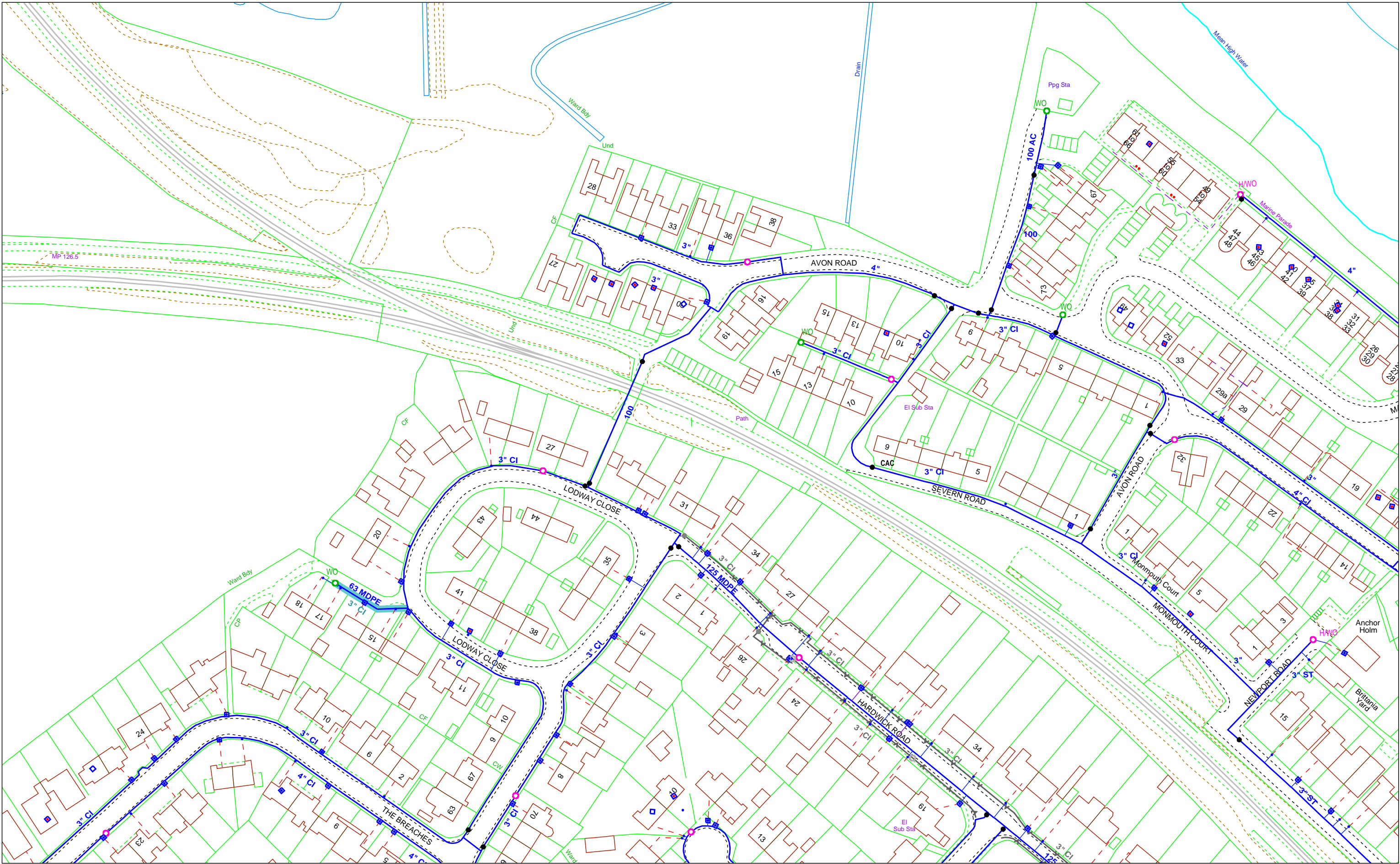
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A3

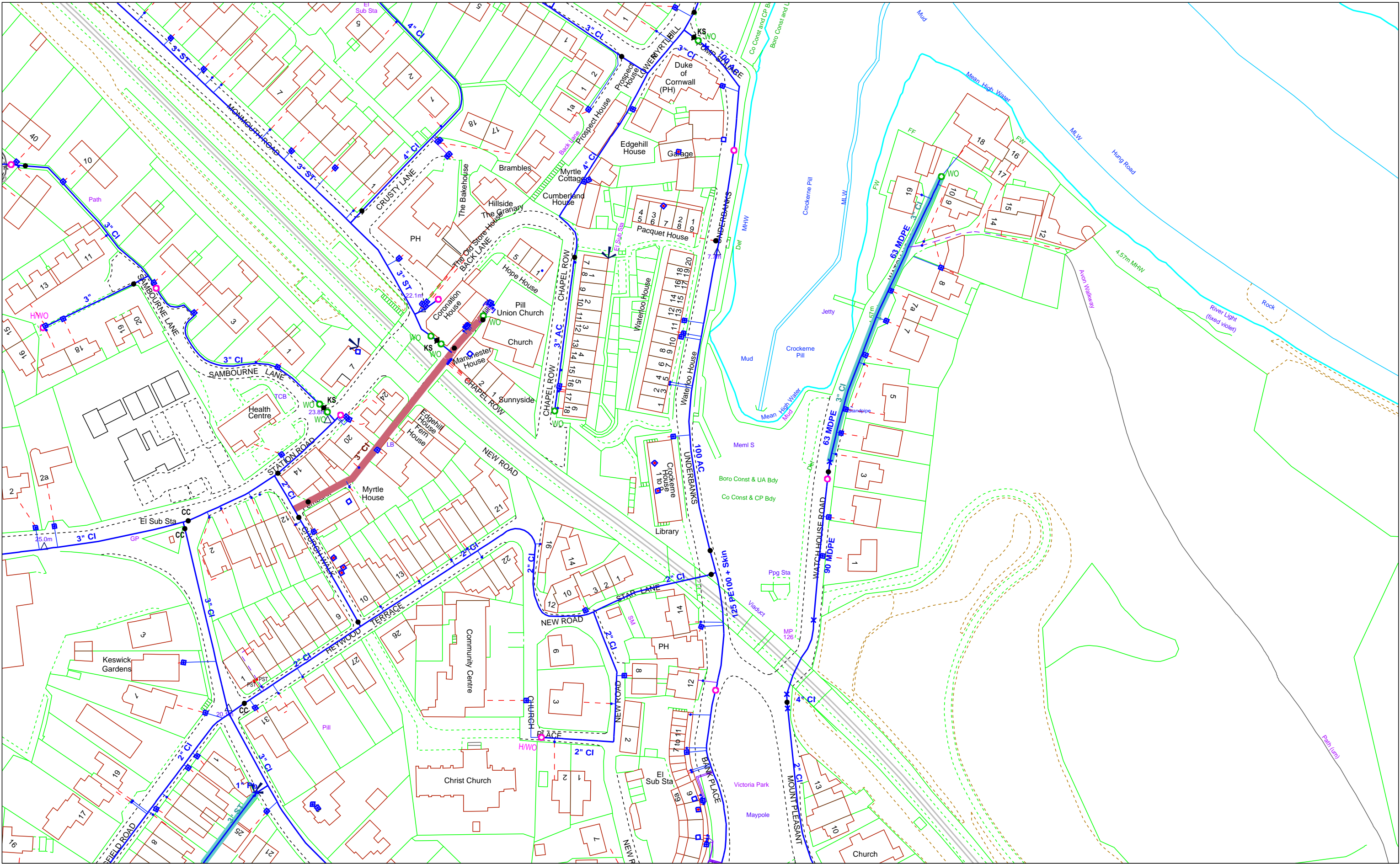
Page 60 of 121





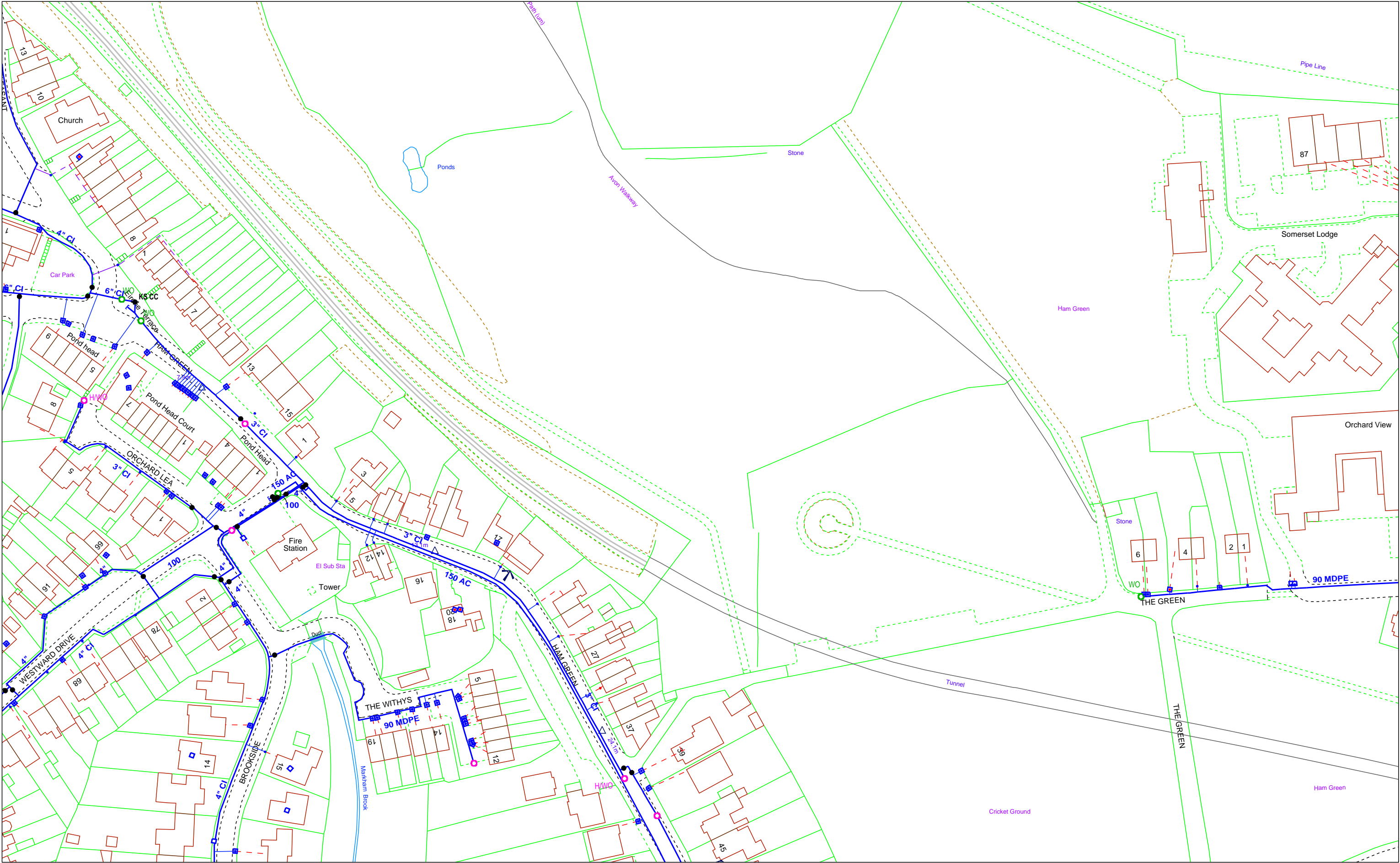
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>	<p><b>EXISTING</b></p> <p>MAINS</p> <p>RAW WATER</p> <p>BW DUCT</p> <p>SLIPLINED</p> <p>VALVES</p> <p>HYDRANT: FIRE WO</p>	<p><b>PROPOSED</b></p> <p>ABANDONED MAINS</p> <p>SLIPLINED</p> <p><b>OTHER</b></p> <p>CABLE WITH MAIN</p> <p>PRIVATE MAIN</p> <p>METER</p>	<p><b>SERVICE OBJECTS</b></p> <p>COMM. PIPE</p> <p>SUPPLY PIPE</p> <p>STOPTAP</p> <p>COMMON COMM. PIPE</p> <p>COMMON SUPPLY PIPE</p>	<p>plot '3</p> <p><b>COORDINATES AT THE CENTRE</b></p> <p>352124 176234</p>		<p><b>BRISTOL WATER</b></p>	
					<p>N</p>	<p>Date: 14/02/2014</p>	<p>A3</p>
						<p>Scale: 1:1250</p>	





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EXISTING	PROPOSED	SERVICE OBJECTS
MAINS	ABANDONED MAINS	COMM. PIPE
RAW WATER	SLIPLINED	SUPPLY PIPE
BW DUCT	OTHER	STOPTAP
SLIPLINED	CABLE WITH MAIN	COMMON COMM. PIPE
VALVES	PRIVATE MAIN	COMMON SUPPLY PIPE
HYDRANT: FIRE WO	METER	

N

plot `5

COORDINATES AT THE CENTRE

352819 175701

Date: 14/02/2014

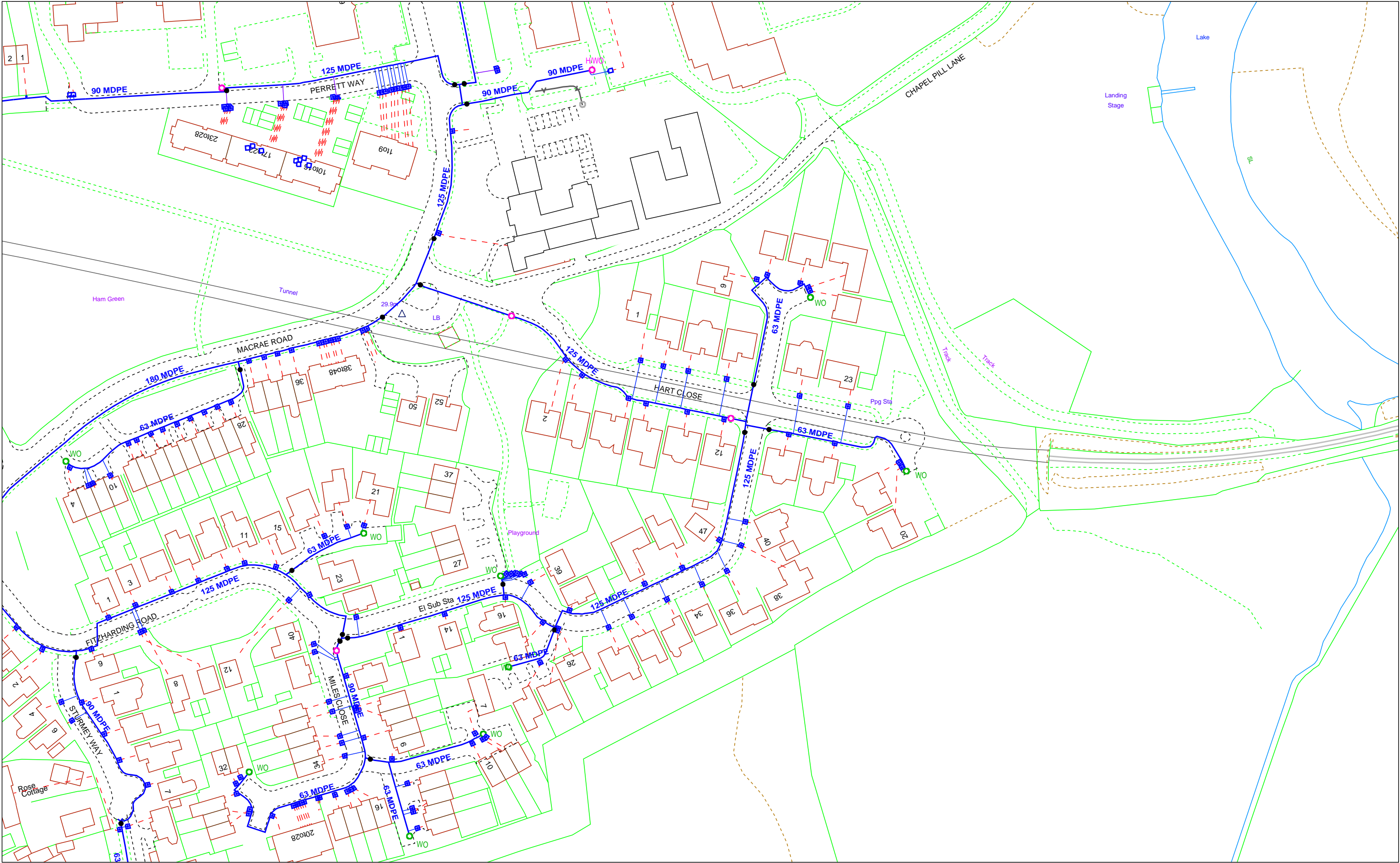
Scale: 1:1250

A3

BRISTOL WATER

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE		METER			

plot 6

COORDINATES AT THE CENTRE

353260 175524

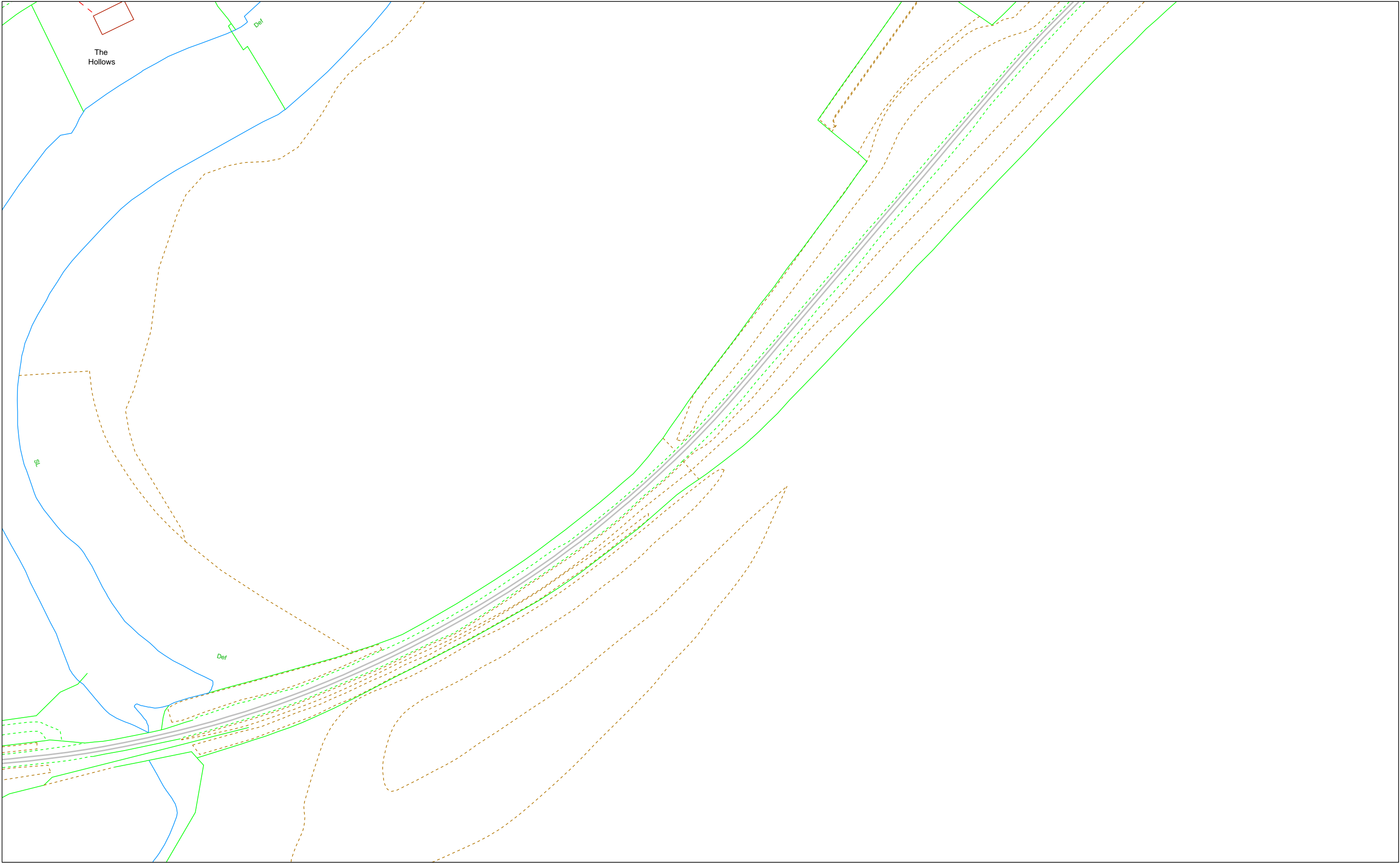
Date: 14/02/2014

Scale: 1:1250

A3

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

plot 7

COORDINATES AT THE CENTRE

353699 175634

Date: 14/02/2014

Scale: 1:1250

A3

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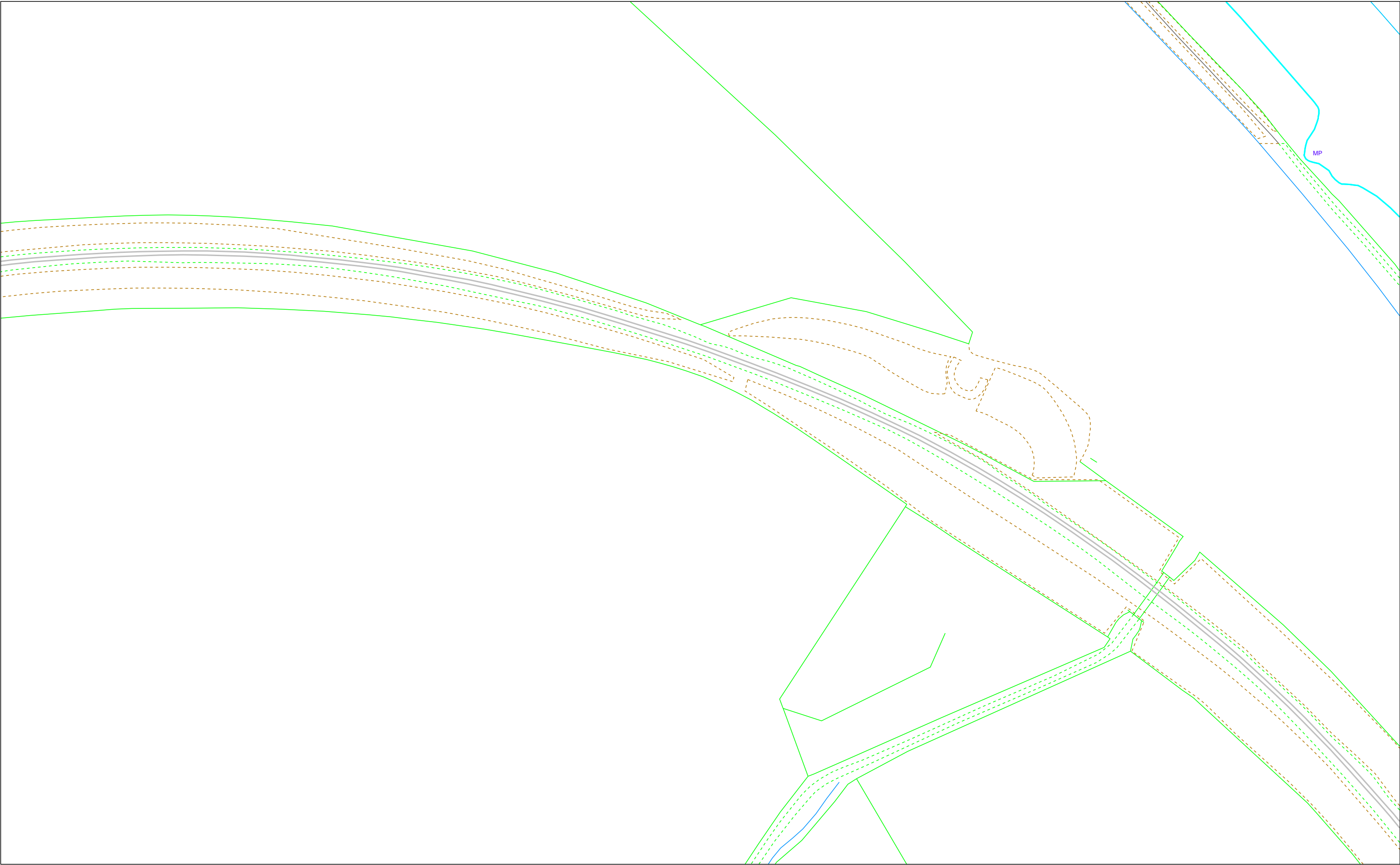




<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>	<p><b>EXISTING</b></p> <p>MAINS</p> <p>RAW WATER</p> <p>BW DUCT</p> <p>SLIPLINED</p> <p>VALVES</p> <p>HYDRANT: FIRE WO</p>	<p><b>PROPOSED</b></p> <p>ABANDONED MAINS</p> <p>SLIPLINED</p> <p><b>OTHER</b></p> <p>CABLE WITH MAIN</p> <p>PRIVATE MAIN</p> <p>METER</p>	<p><b>SERVICE OBJECTS</b></p> <p>COMM. PIPE</p> <p>SUPPLY PIPE</p> <p>STOPTAP</p> <p>COMMON COMM. PIPE</p> <p>COMMON SUPPLY PIPE</p>	<p>plot 8</p>		<p><b>BRISTOL WATER</b></p>		
	<p><b>N</b></p>				<p>COORDINATES AT THE CENTRE</p>		<p>Date: 14/02/2014</p>	
	<p>353957 175855</p>				<p>Scale: 1:1250</p>		<p>A3</p>	

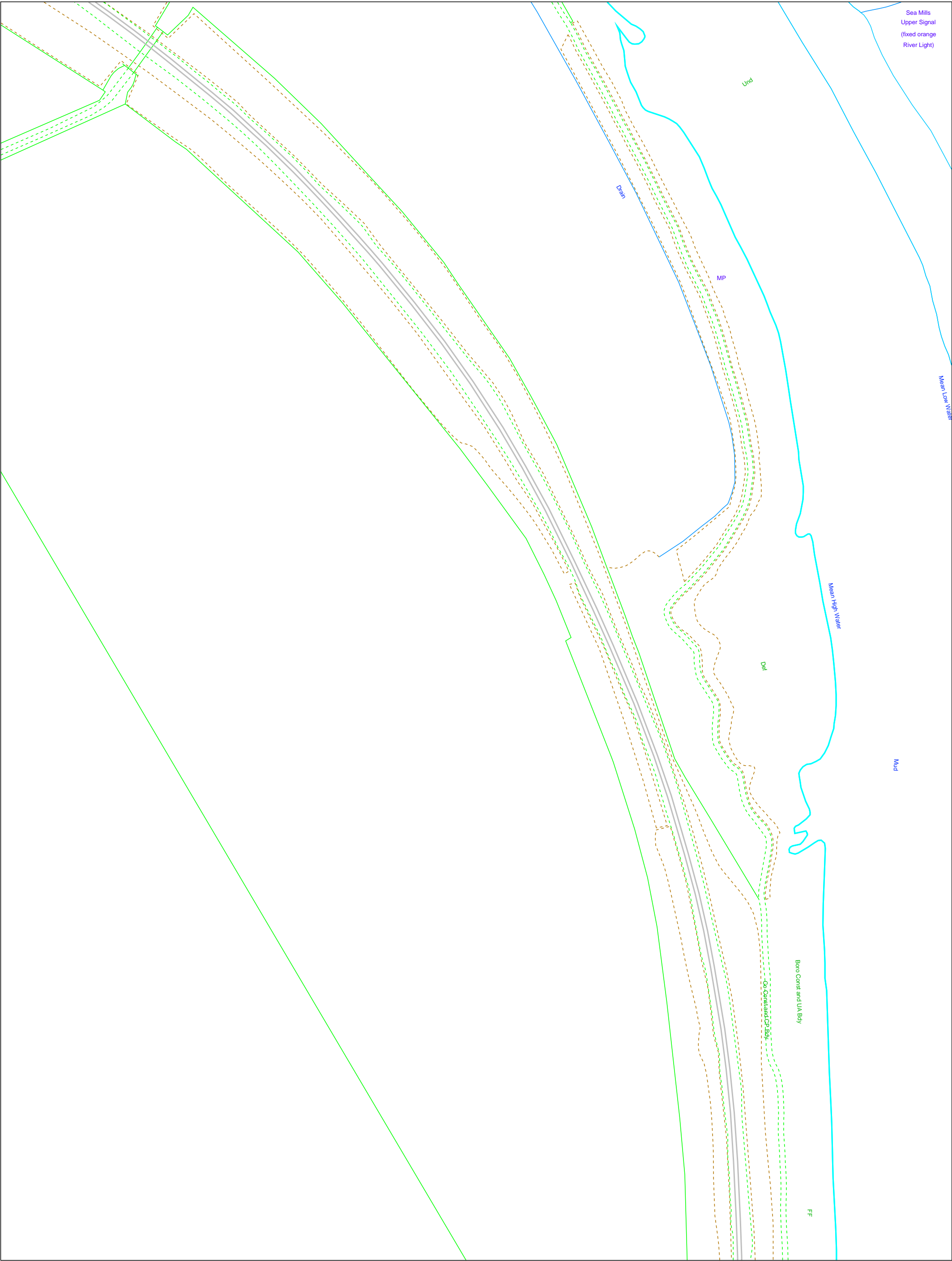
Page 66 of 121





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	<p><b>N</b> </p>	<p>COORDINATES AT THE CENTRE</p> <p>354436 175893</p>	<p>Date: 12/02/2014</p>				
			<p>Scale: 1:1250</p>	<p>A3</p>			





Scale: 1:1250 | A3 | Date: 12/02/2014

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

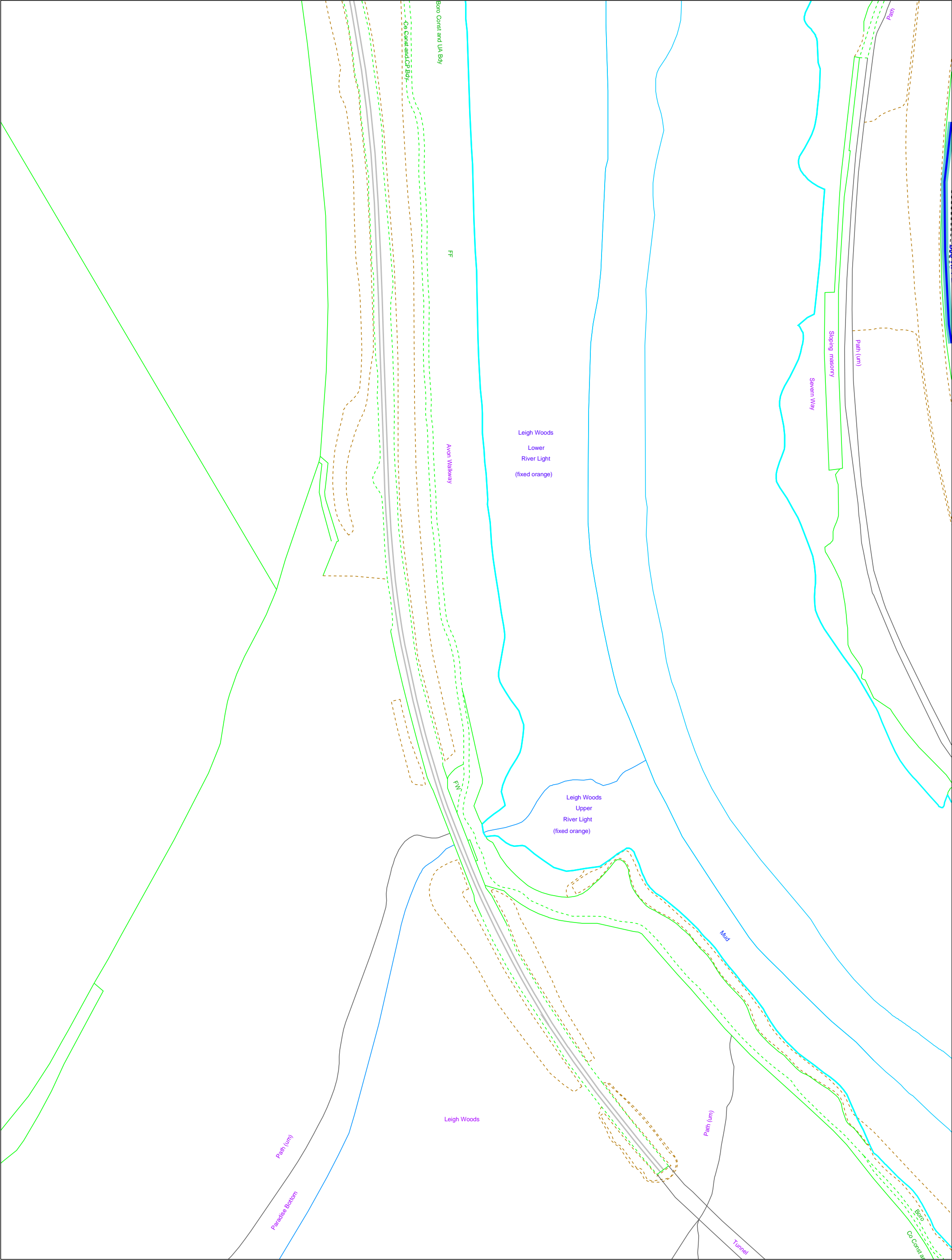
EH5WES112284: Part 6

COORDINATES AT THE CENTRE

354721 175619

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Scale: 1:1250

A3

Date: 12/02/2014

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

EH5WES112284: Part 5

N

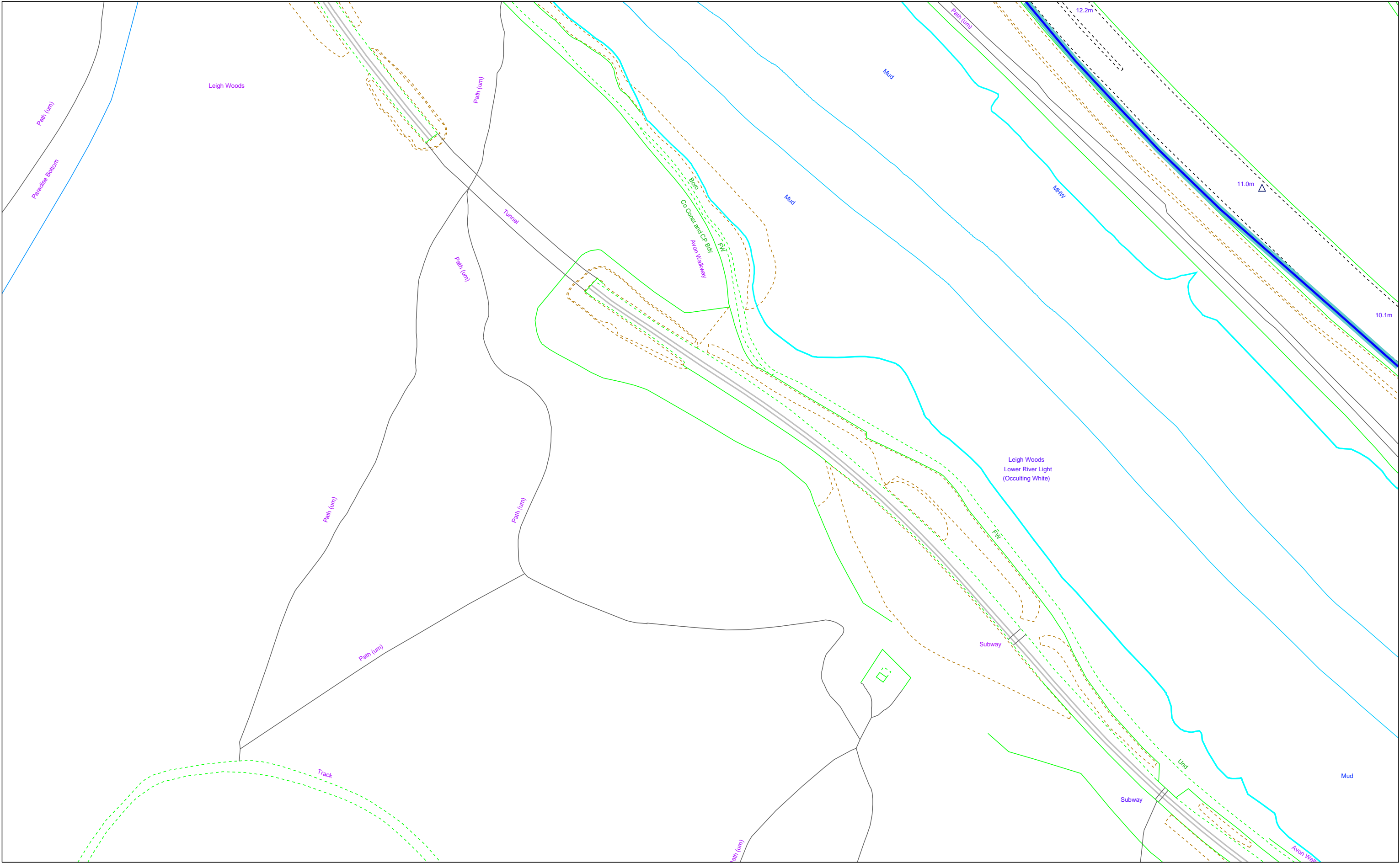
COORDINATES AT THE CENTRE

354853 175265

BRISTOL WATER

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

N

EH5WES112284: Part 4

COORDINATES AT THE CENTRE

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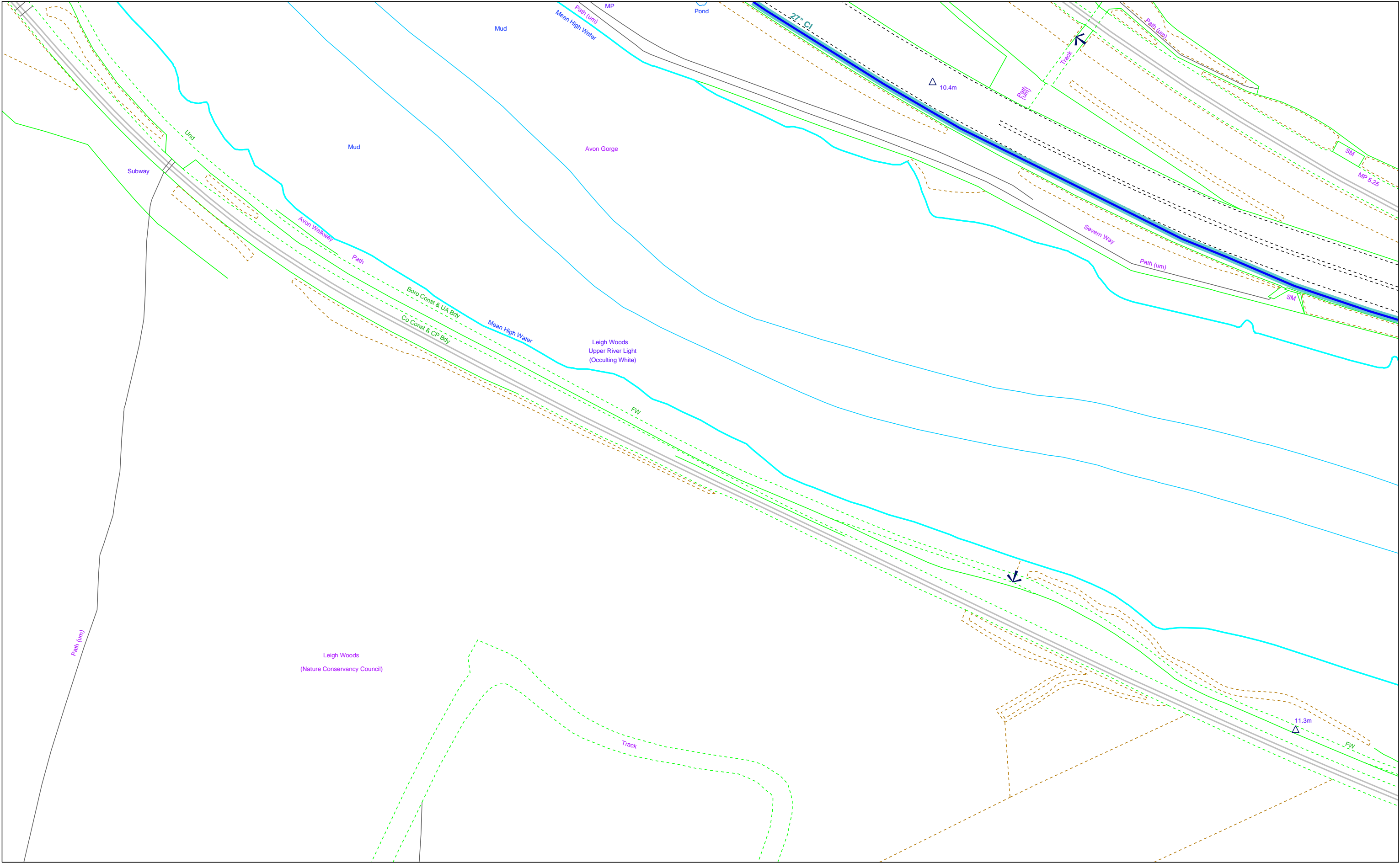
Date: 12/02/2014

Scale: 1:1250

A3

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

N

EH5WES112284: Part 3

COORDINATES AT THE CENTRE

355378 174732

Date: 12/02/2014

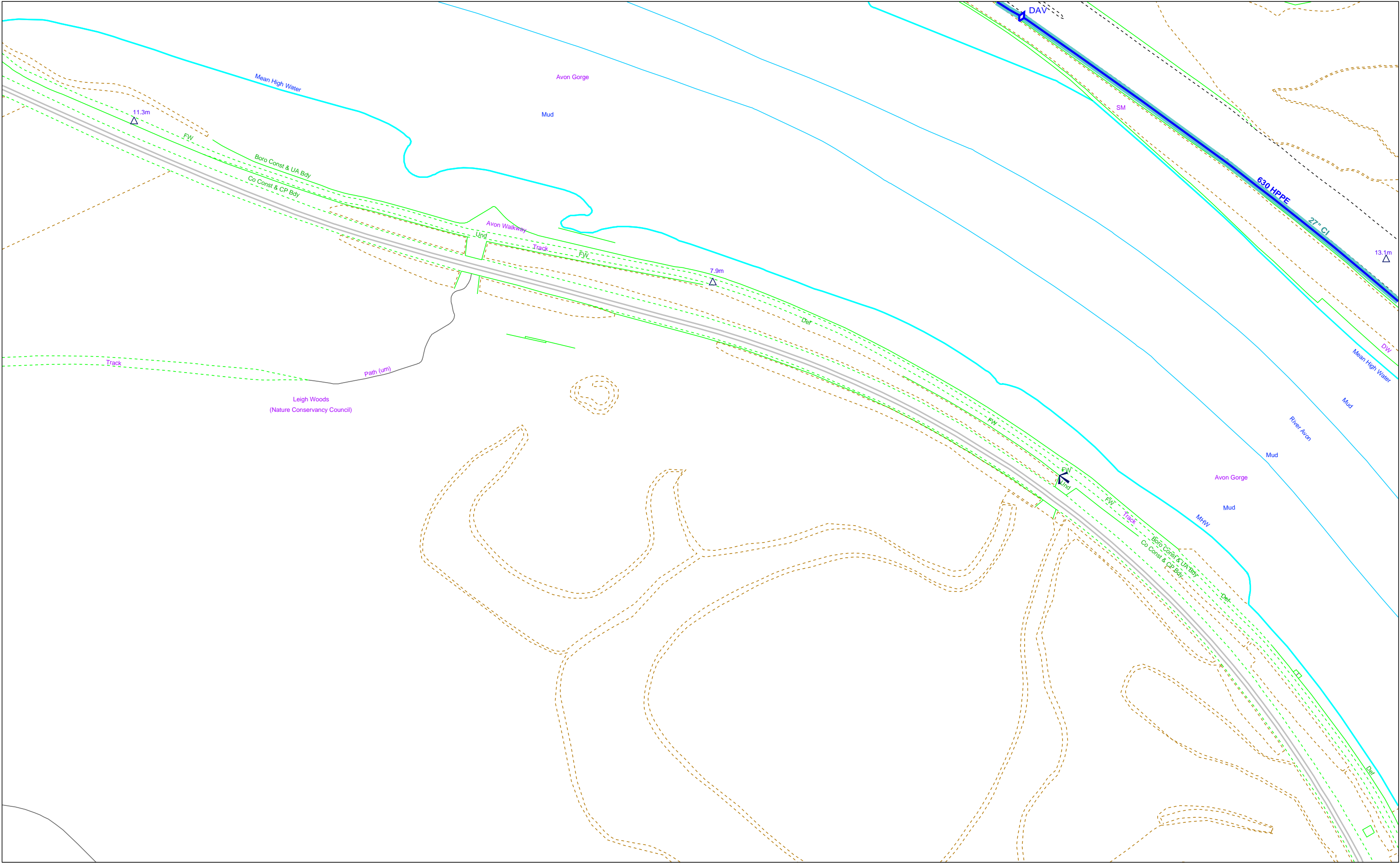
Scale: 1:1250

A3

**BRISTOL WATER**

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

N

EH5WES112284: Part 2

COORDINATES AT THE CENTRE

355798 174512

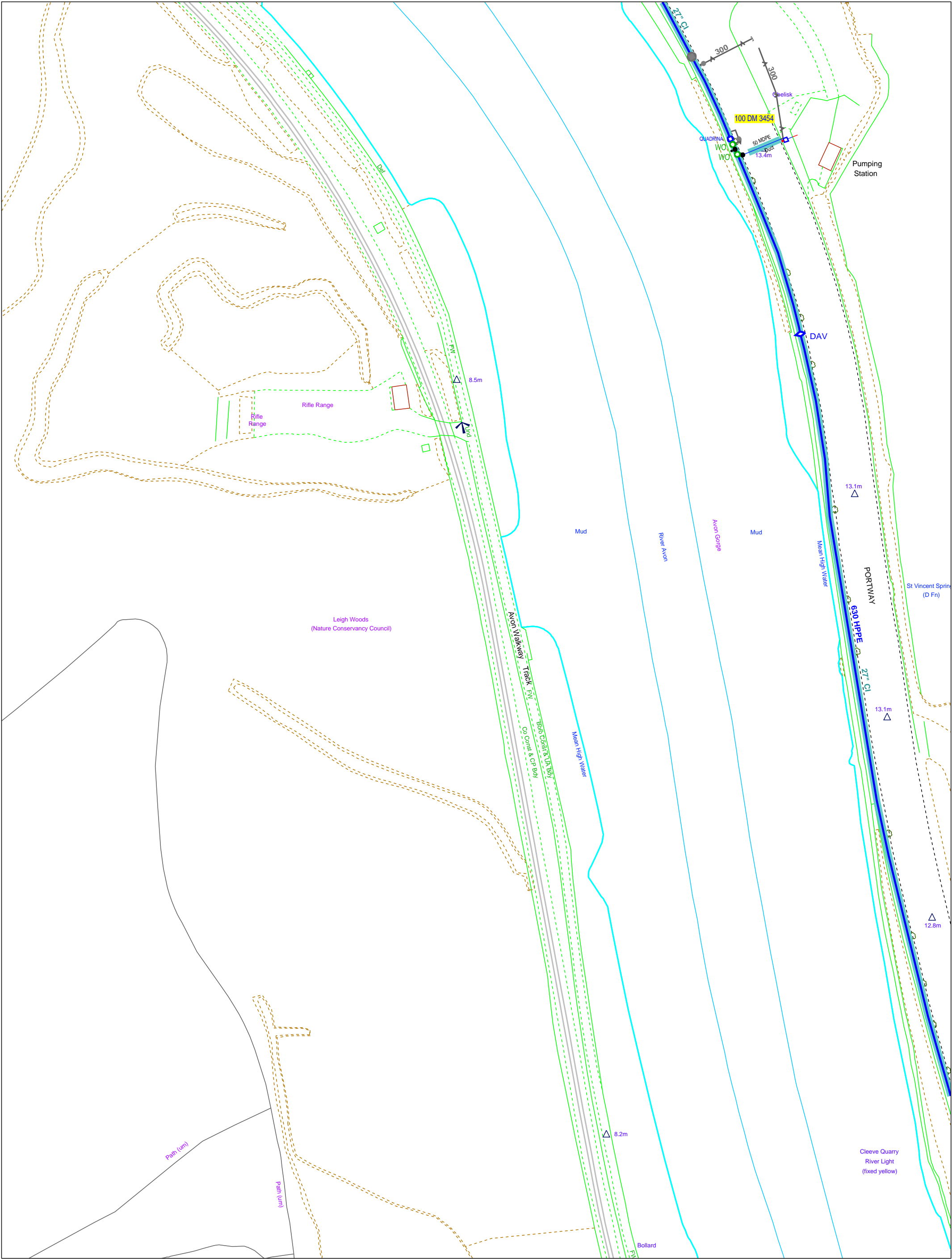
Date: 12/02/2014

Scale: 1:1250

A3

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Scale: 1:1250	A3	Date: 12/02/2014
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>		
<b>EXISTING</b>	<b>PROPOSED</b>	<b>SERVICE OBJECTS</b>
MAINS	ABANDONED MAINS	COMM. PIPE
RAW WATER	SLIPLINED	SUPPLY PIPE
BW DUCT	<b>OTHER</b>	STOPTAP
SLIPLINED	CABLE WITH MAIN	COMMON COMM. PIPE
VALVES	PRIVATE MAIN	COMMON SUPPLY PIPE
HYDRANT: FIRE WO	METER	

EH5WES112284: Part 1

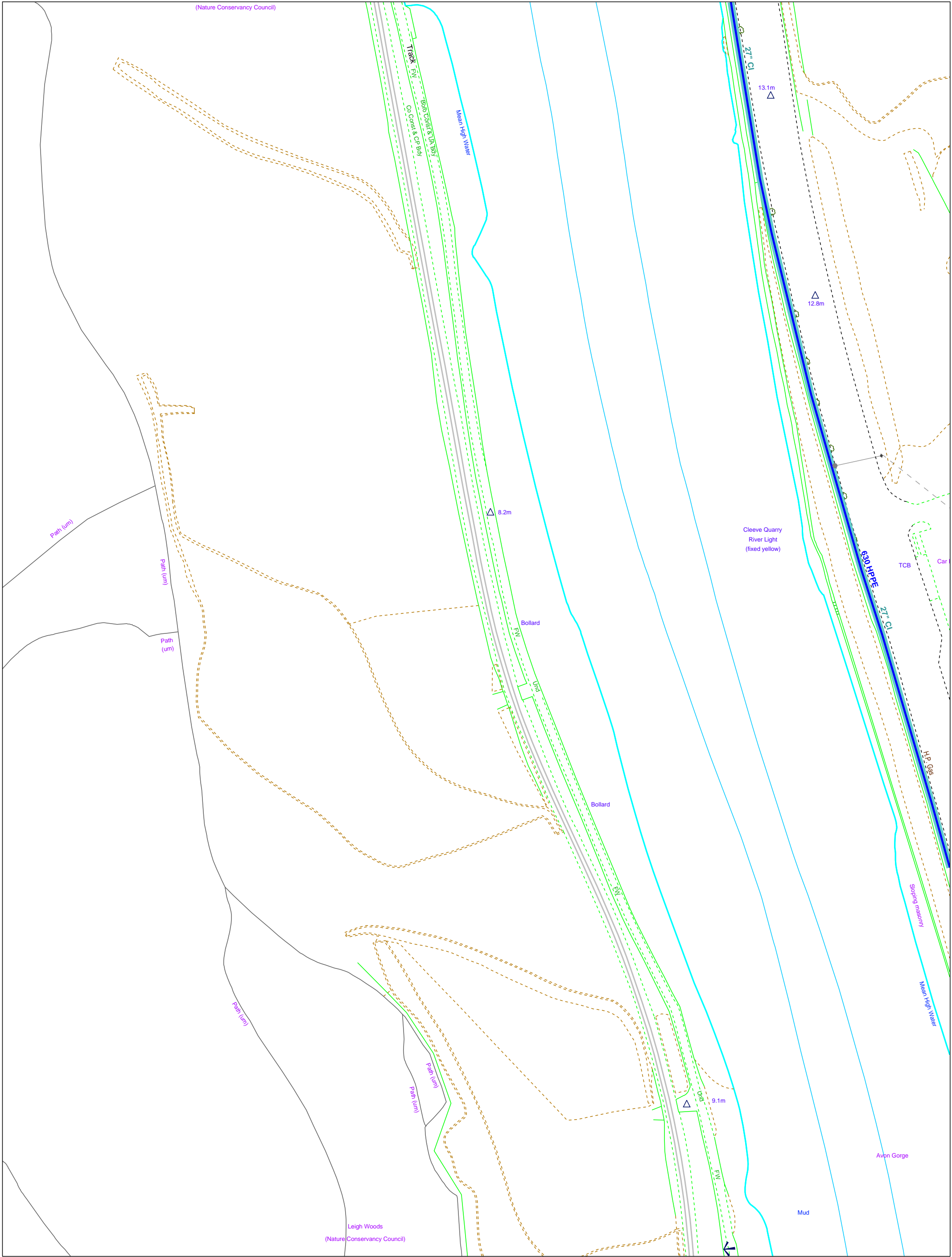
COORDINATES AT THE CENTRE

356076 174219

**BRISTOL WATER**

Page 73 of 121





Scale: 1:1250		A3	Date: 12/02/2014		
<small>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown. Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</small>					
<b>EXISTING</b>		<b>PROPOSED</b>		<b>SERVICE OBJECTS</b>	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		<b>OTHER</b>		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
HYDRANT: FIRE WO		METER			

COORDINATES AT THE CENTRE  
356119 173989

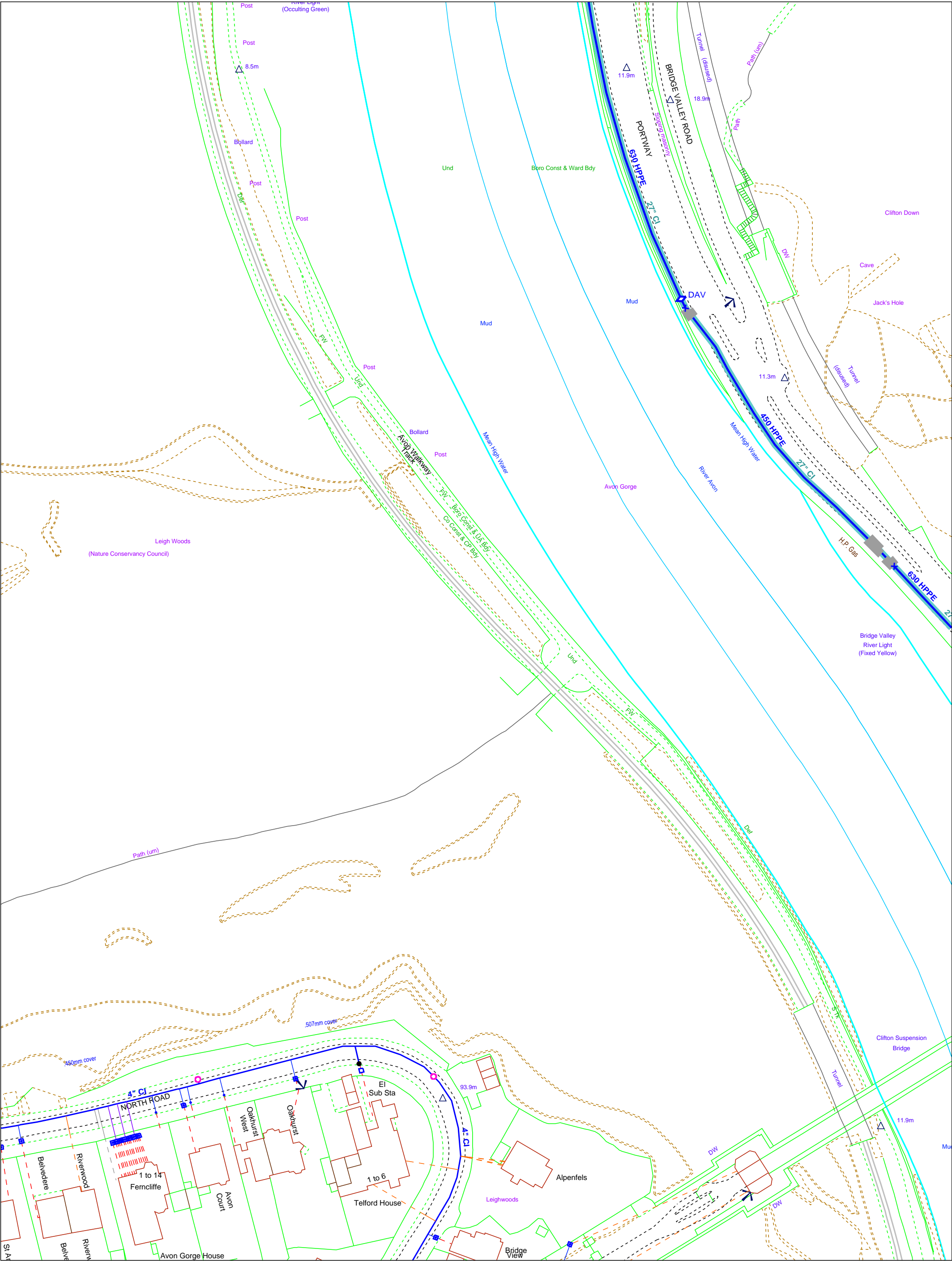
BRISTOL WATER

Page 74 of 121



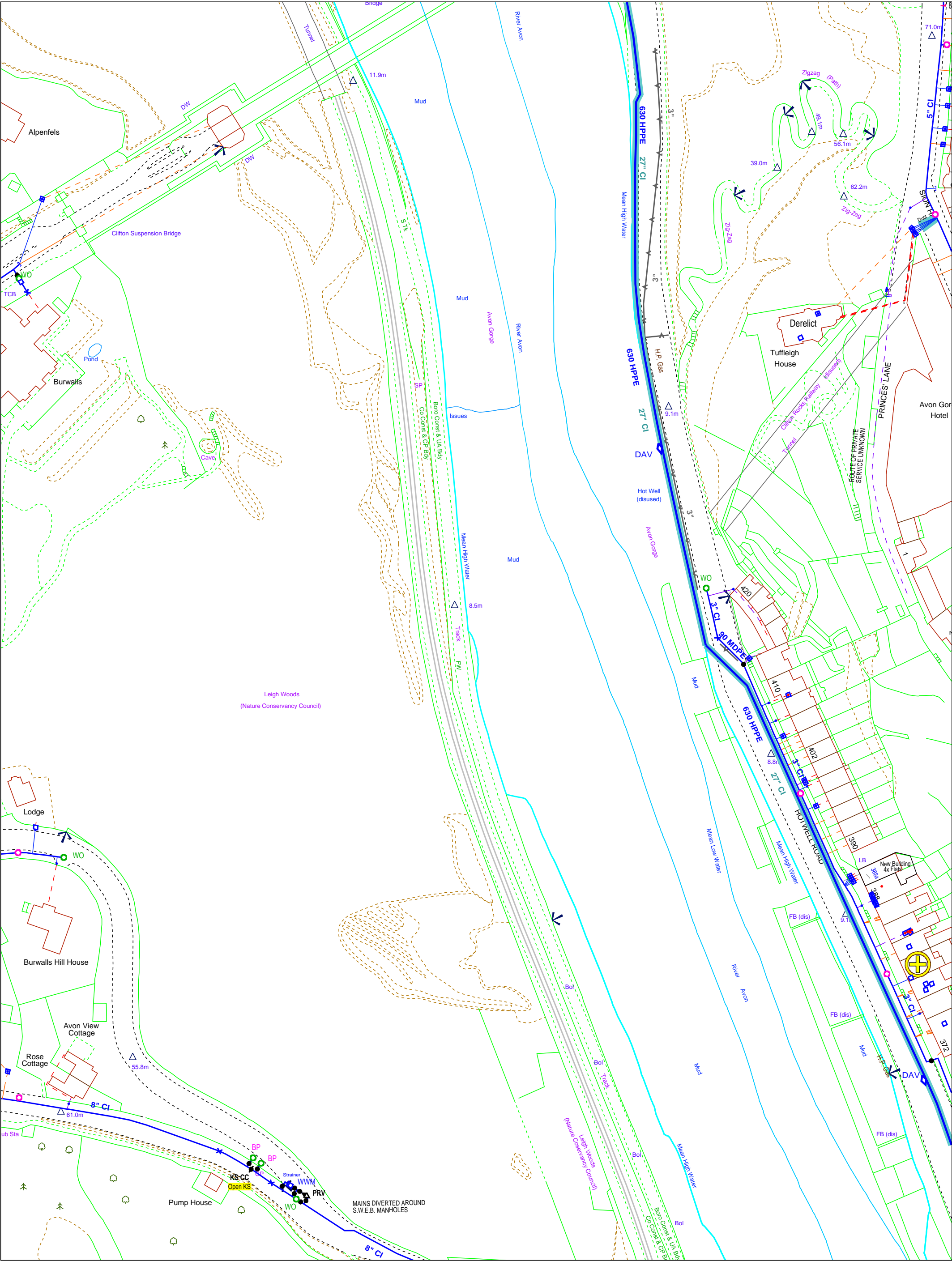






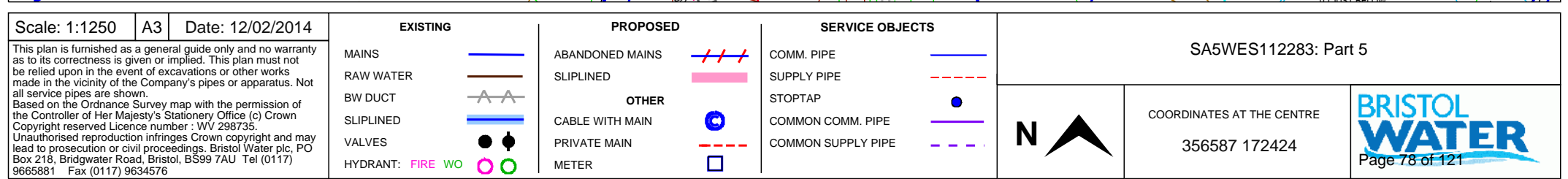
Scale: 1:1250   A3   Date: 12/02/2014		<b>EXISTING</b>		<b>PROPOSED</b>		<b>SERVICE OBJECTS</b>		SA5WES112283: Part 3		
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>		MAINS		ABANDONED MAINS		COMM. PIPE			COORDINATES AT THE CENTRE 356277 173216	 Page 76 of 121
		RAW WATER		SLIPLINED		SUPPLY PIPE				
		BW DUCT		<b>OTHER</b>		STOPTAP				
		SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE				
		VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE				
		HYDRANT: FIRE WO		METER						



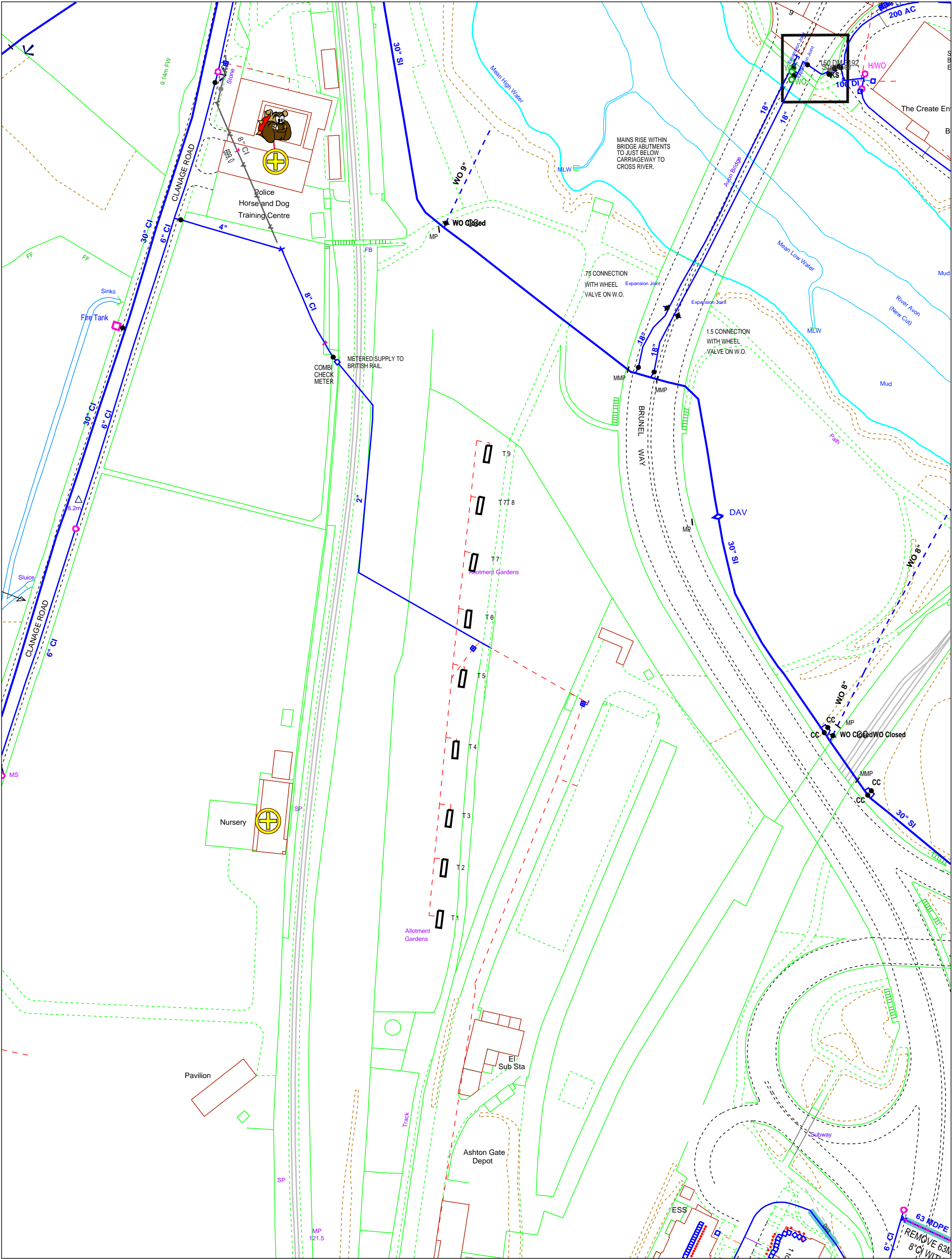


Scale: 1:1250   A3   Date: 12/02/2014		<b>EXISTING</b>		<b>PROPOSED</b>		<b>SERVICE OBJECTS</b>		SA5WES112283: Part 4		
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>		MAINS		ABANDONED MAINS		COMM. PIPE			COORDINATES AT THE CENTRE 356472 172830	 Page 77 of 121
		RAW WATER		SLIPLINED		SUPPLY PIPE				
		BW DUCT		<b>OTHER</b>		STOPTAP				
		SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE				
		VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE				
HYDRANT: FIRE		METER								









Scale: 1:1250	A3	Date: 12/02/2014
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>		
<b>EXISTING</b>	<b>PROPOSED</b>	<b>SERVICE OBJECTS</b>
MAINS	ABANDONED MAINS	COMM. PIPE
RAW WATER	SLIPLINED	SUPPLY PIPE
BW DUCT	OTHER	STOPTAP
SLIPLINED	CABLE WITH MAIN	COMMON COMM. PIPE
VALVES	PRIVATE MAIN	COMMON SUPPLY PIPE
HYDRANT: FIRE WO	METER	

SA5WES112283: Part 6

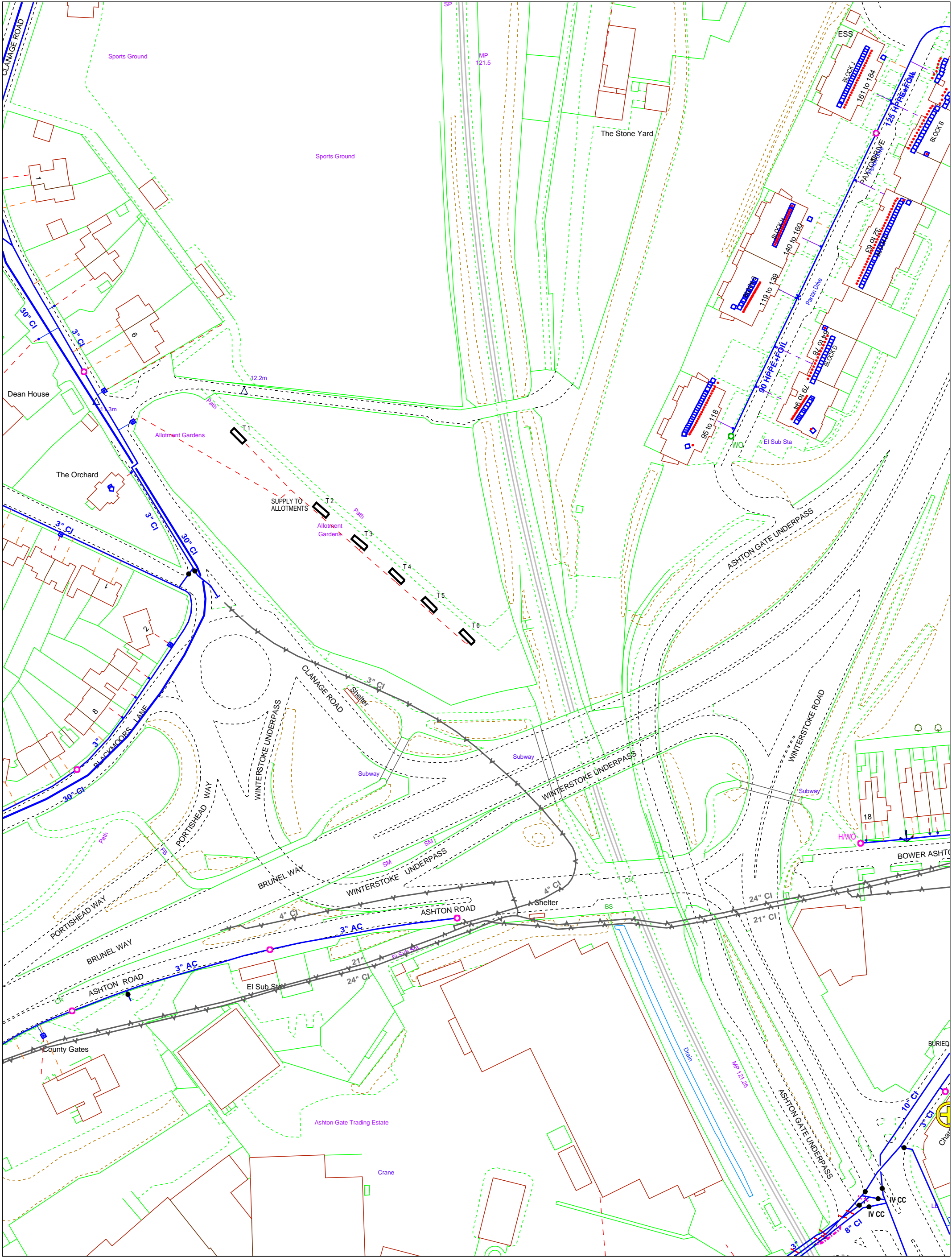
COORDINATES AT THE CENTRE

356655 172016

**BRISTOL WATER**

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Scale: 1:1250	A3	Date: 12/02/2014	<b>EXISTING</b>		<b>PROPOSED</b>		<b>SERVICE OBJECTS</b>		SA5WES112283: Part 7		
<p>This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of the Company's pipes or apparatus. Not all service pipes are shown.</p> <p>Based on the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office (c) Crown Copyright reserved Licence number : WV 298735.</p> <p>Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Bristol Water plc, PO Box 218, Bridgwater Road, Bristol, BS99 7AU Tel (0117) 9665881 Fax (0117) 9634576</p>			MAINS		ABANDONED MAINS		COMM. PIPE			COORDINATES AT THE CENTRE 356594 171581	 Page 80 of 121
			RAW WATER		SLIPLINED		SUPPLY PIPE				
			BW DUCT		<b>OTHER</b>		STOPTAP				
			SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE				
			VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE				
			HYDRANT: FIRE		METER						



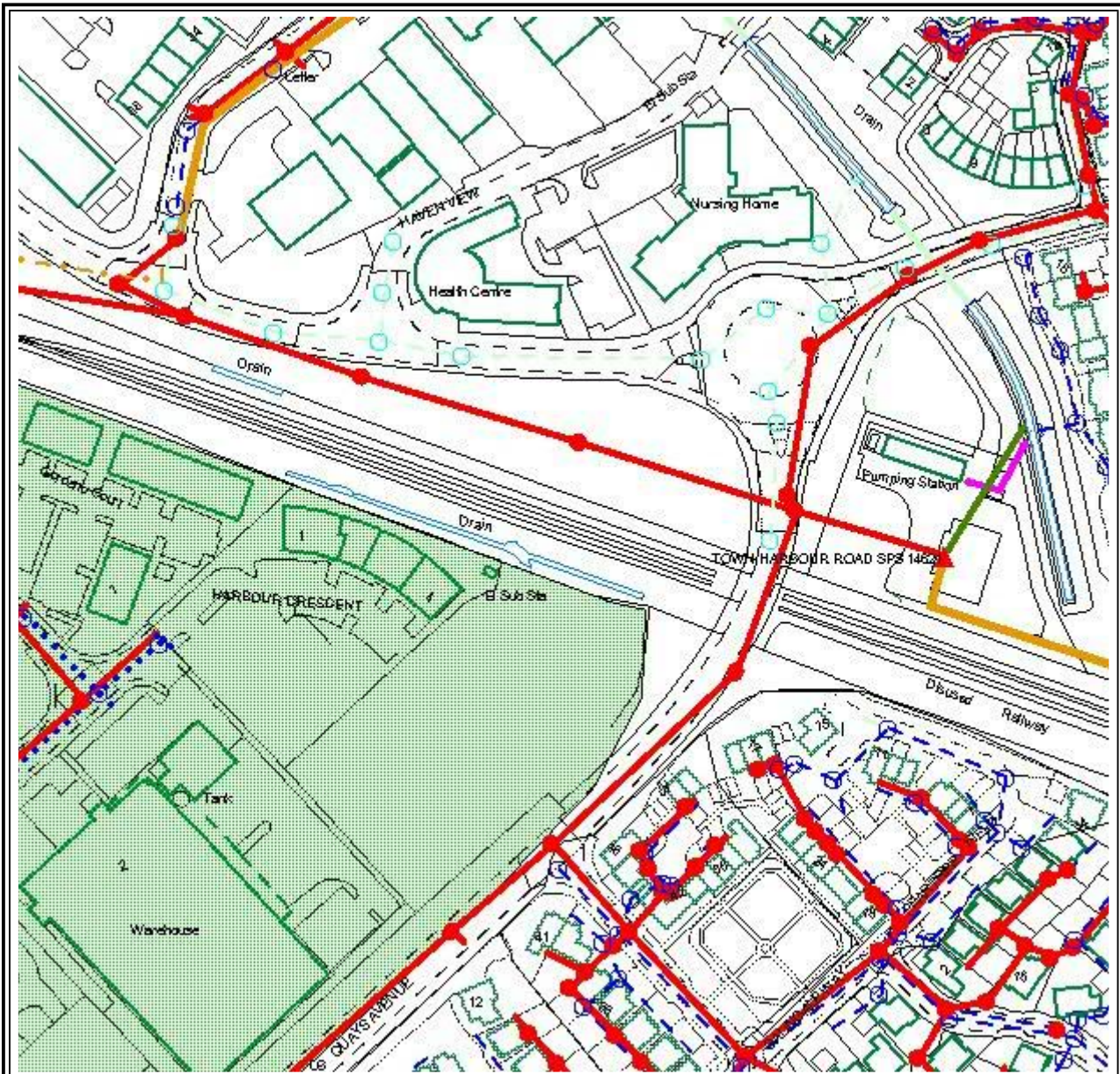
# B2      Wessex Water records

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## Complete Network



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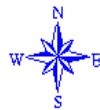
### WATER MAINS

Public	—
Private	- - -
Abandoned	...
Raw Water	- . -

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	—	—
Rising Main	—	—

Culverted Water Course	—
Highway Drain	- - -
Effluent Disposal Main	- . -



Scale 1:1998.

Centre (347478, 176361).

14/01/2013 15:09:11

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## Complete Network



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### WATER MAINS

Public	—
Private	- - -
Abandoned	...
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	...
Combined	—	...
Surface	---	...
Rising Main	---	...

Culverted Water Course	—
Highway Drain	---
Effluent Disposal Main	---



Scale 1:1998.

Centre (347751, 176272).

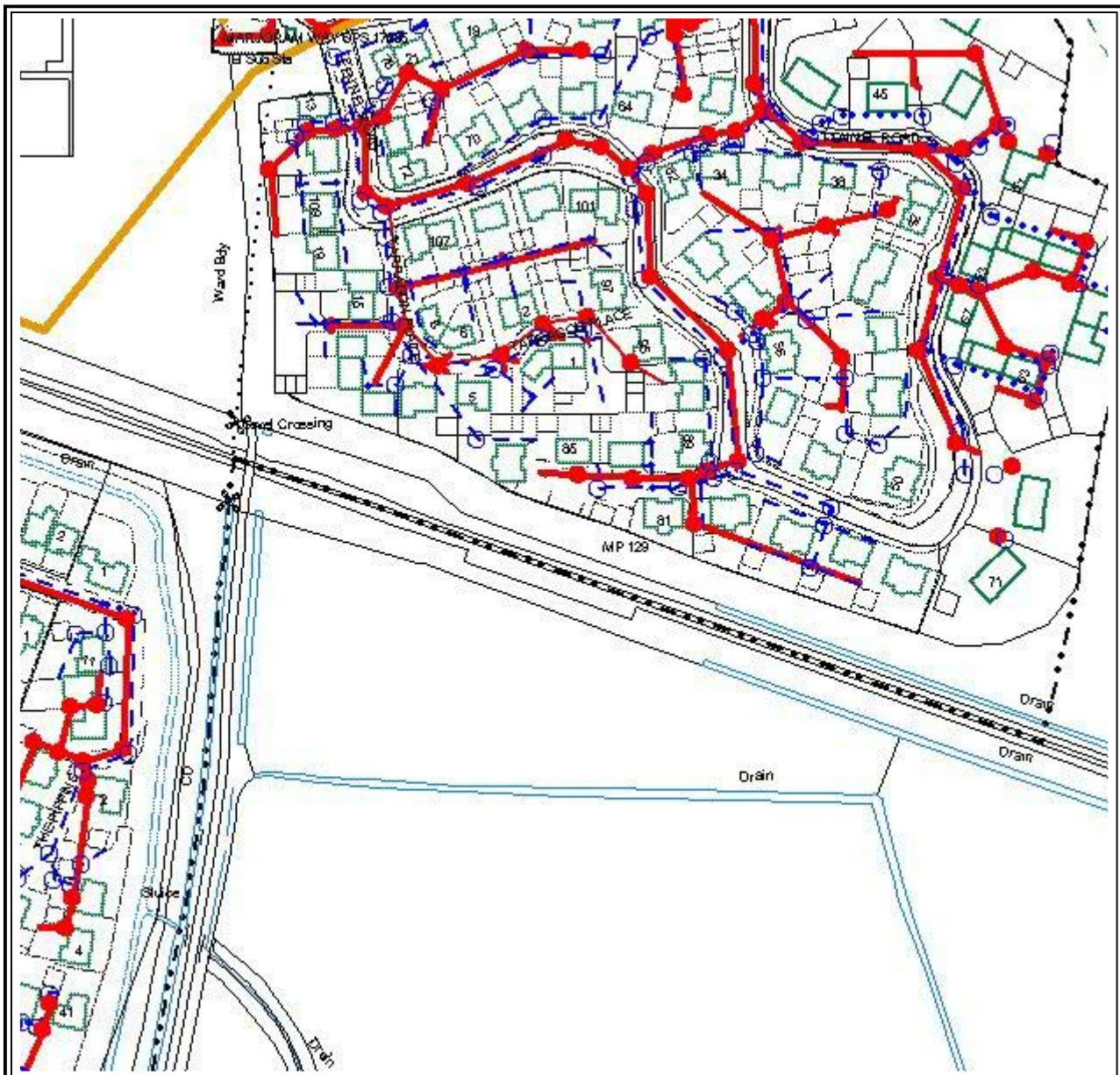
14/01/2013 15:08:38

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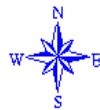
### WATER MAINS

Public	—
Private	- - -
Abandoned	...
Raw Water	- . - . -

### SEWERS

Public	Private/ Section 104
Foul	— ● —
Combined	- - - ● - - -
Surface	- . - . - ● - . - . -
Rising Main	- - - ● - - -

Culverted Water Course	—
Highway Drain	- - -
Effluent Disposal Main	- . - . -



Scale 1:1998.

Centre (348031, 176177).

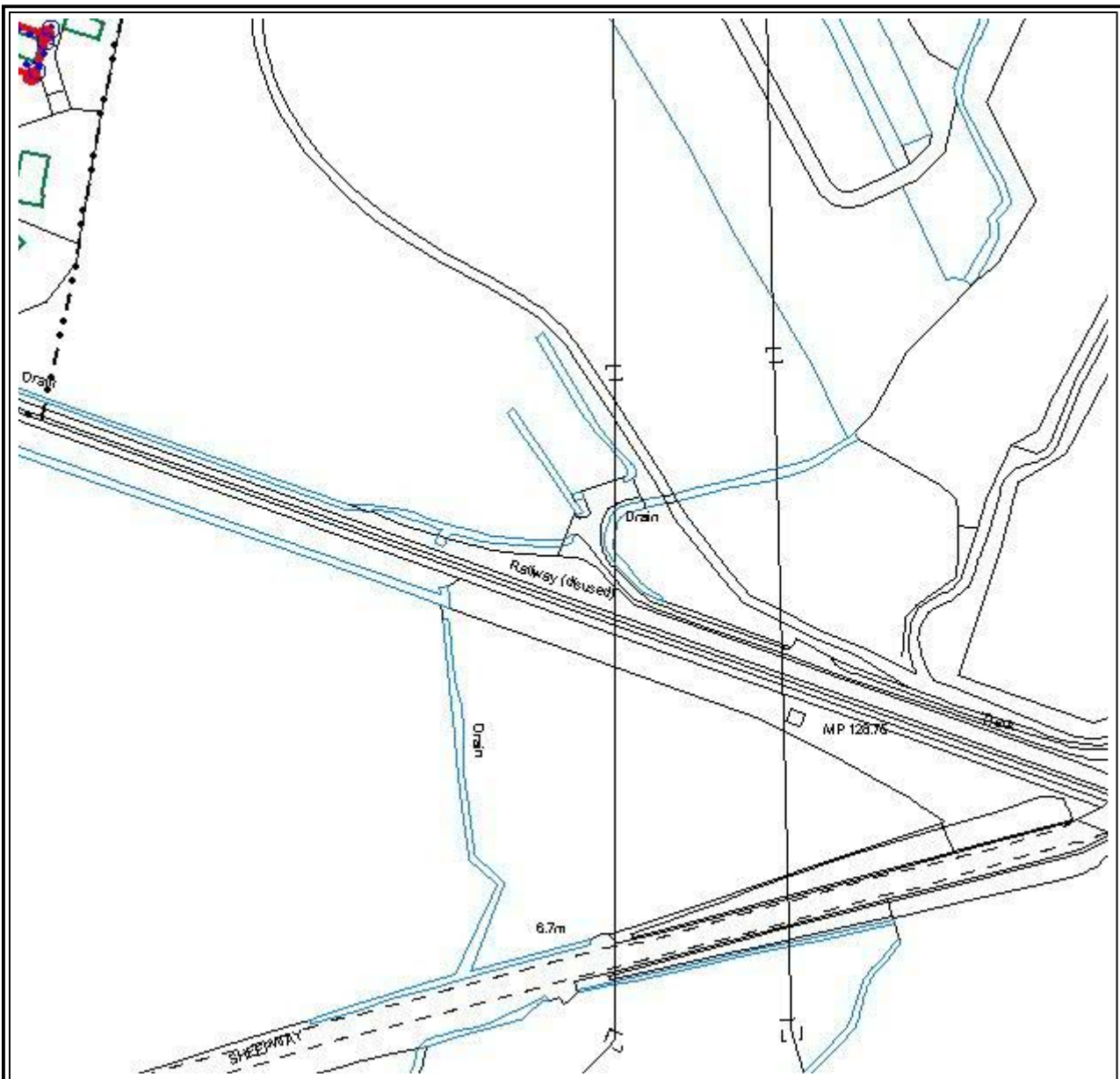
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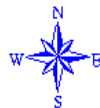
## WATER MAINS

Public	_____
Private	-----
Abandoned	-----
Raw Water	-----

## SEWERS

<b>SEWERS</b>	<b>Public</b>	<b>Private</b>	<b>Section 104</b>
Foul			
Combined			
Surface			
Rising Main			

Culverted Water Course —————  
Highway Drain - - - - -  
Effluent Disposal Main . . . . .



**Scale 1:2004.**

**Centre** (348331, 176080).

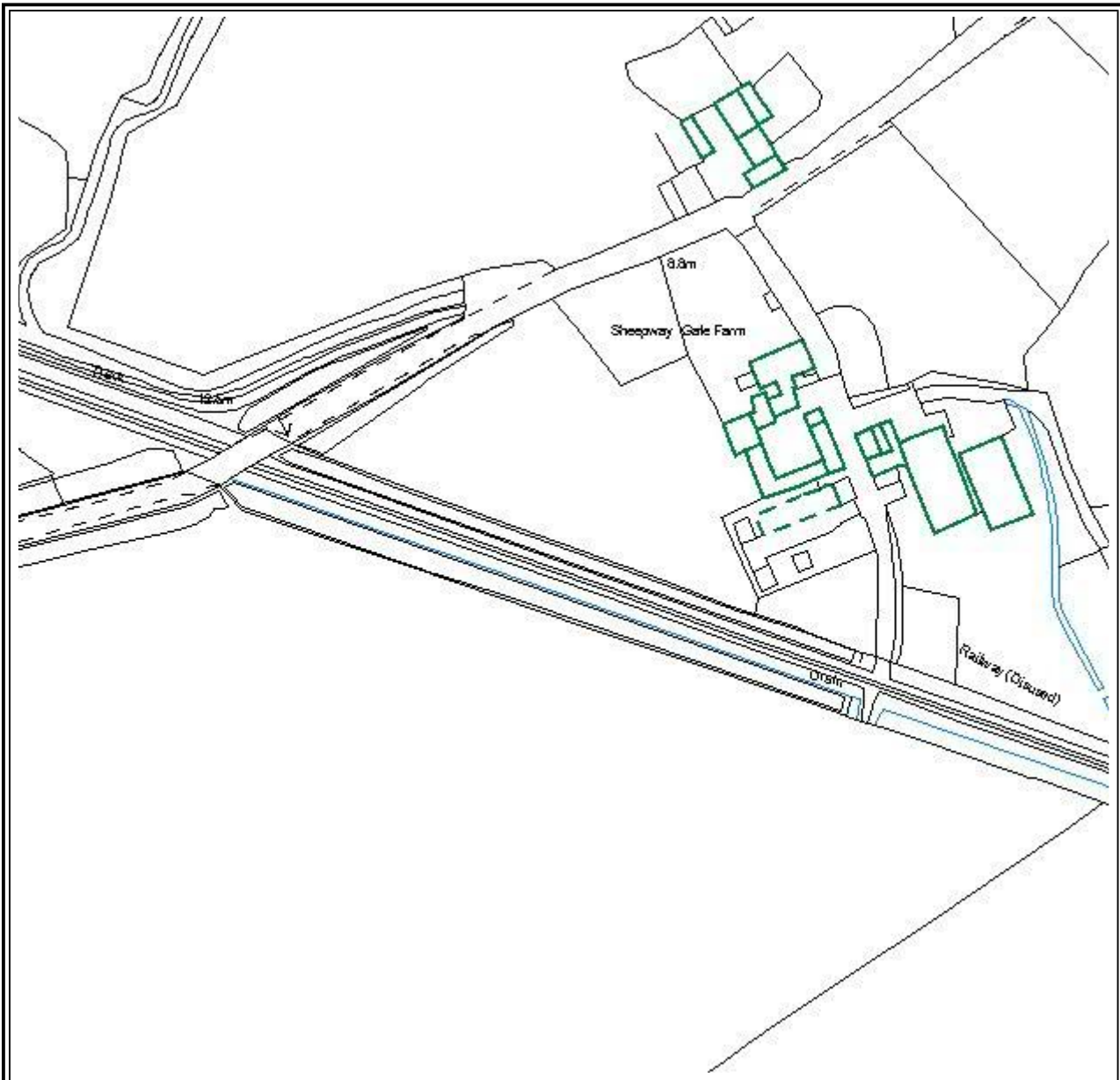
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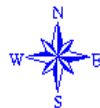
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	- . - . -
Raw Water	- - - - -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	- . - . -



Scale 1:1998.

Centre (348599, 175975).

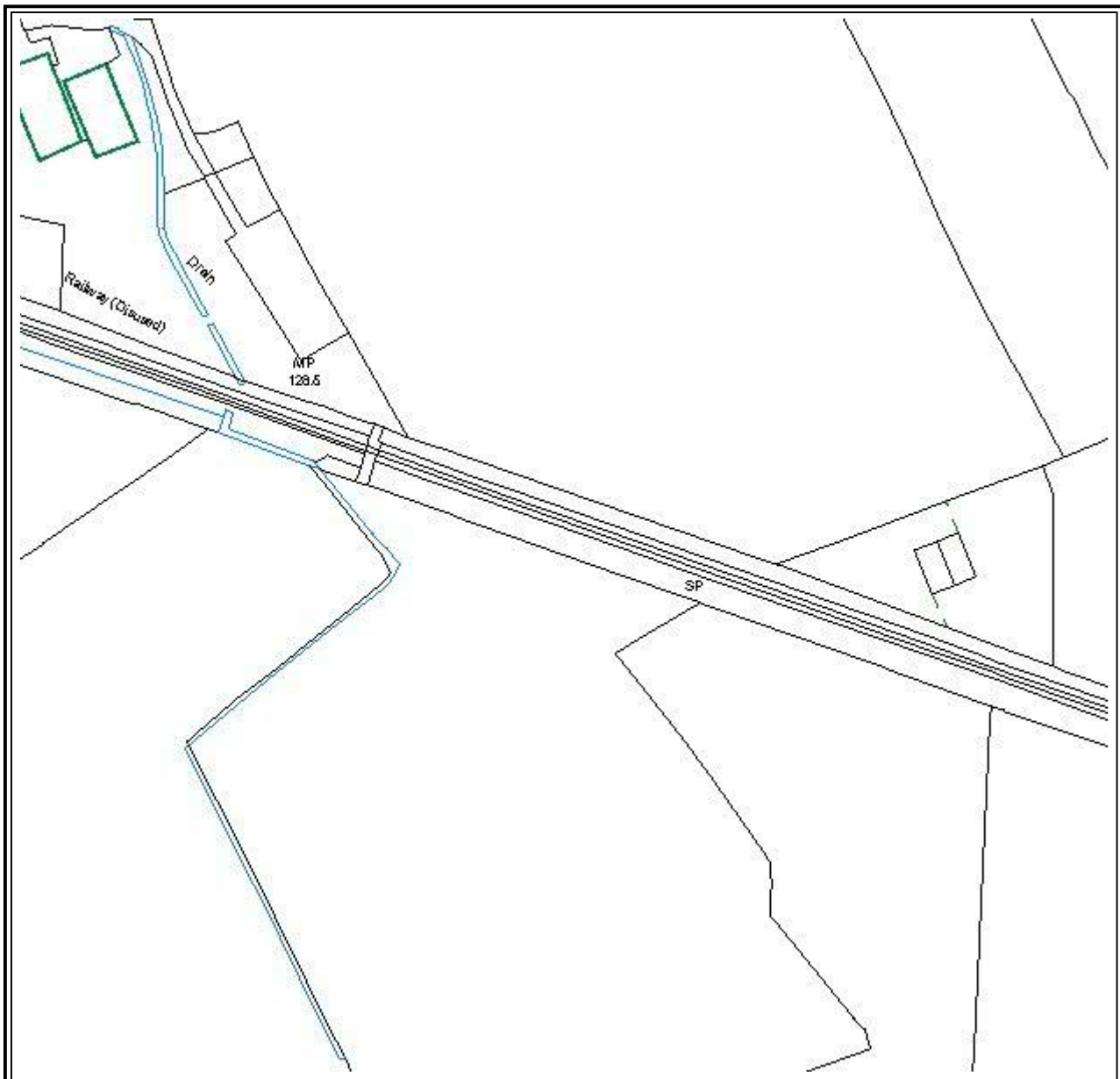
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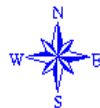
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	- - - - -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	.....



Scale 1:1998.

Centre (348868, 175863).

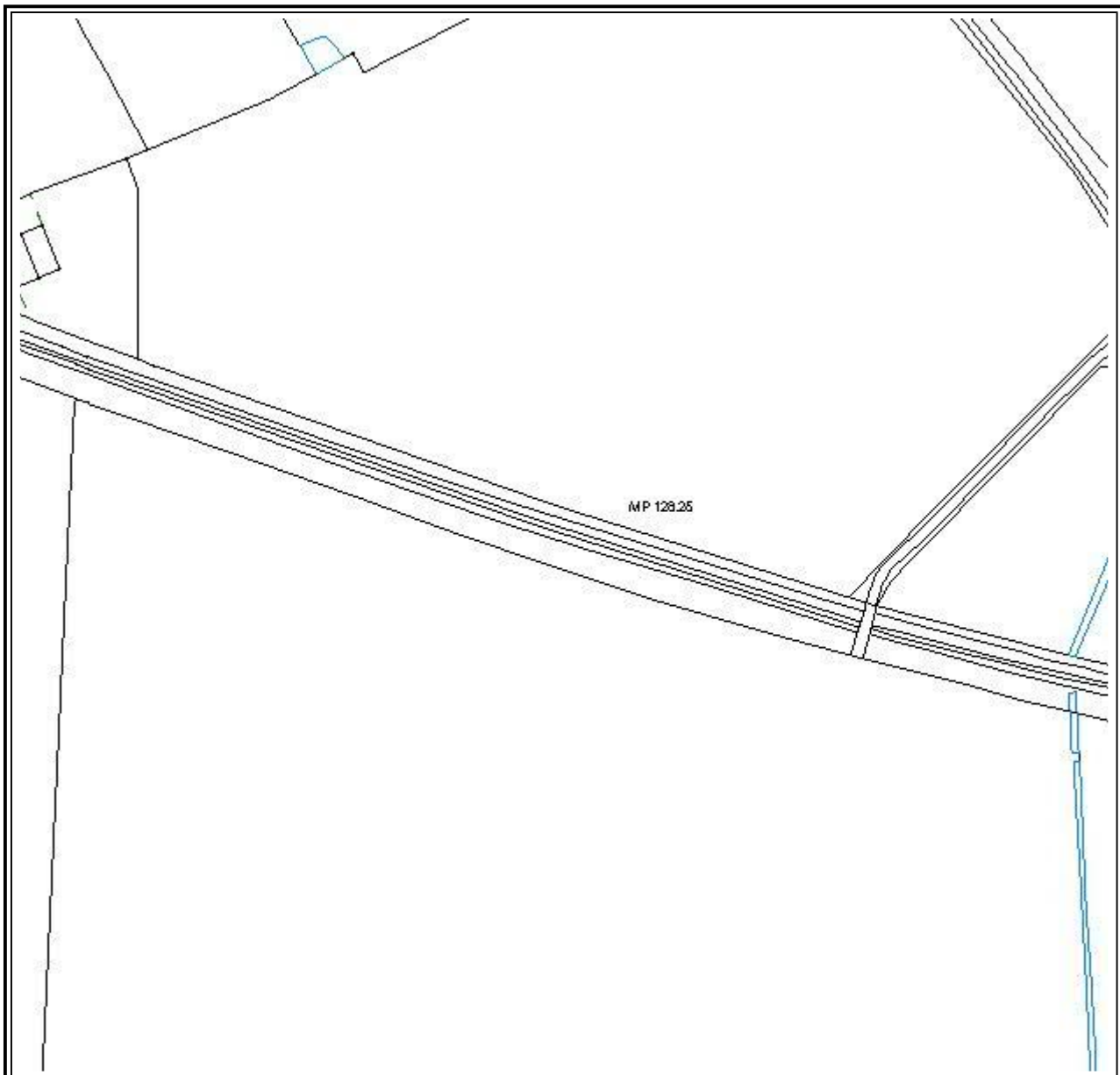
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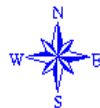
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	· · · · ·
Raw Water	- - - - -

### SEWERS

	Public	Private/ Section 104
Foul	—————	· · · · ·
Combined	—————	· · · · ·
Surface	- - - - -	· · · · ·
Rising Main	—————	· · · · ·

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	· · · · ·



Scale 1:2004.

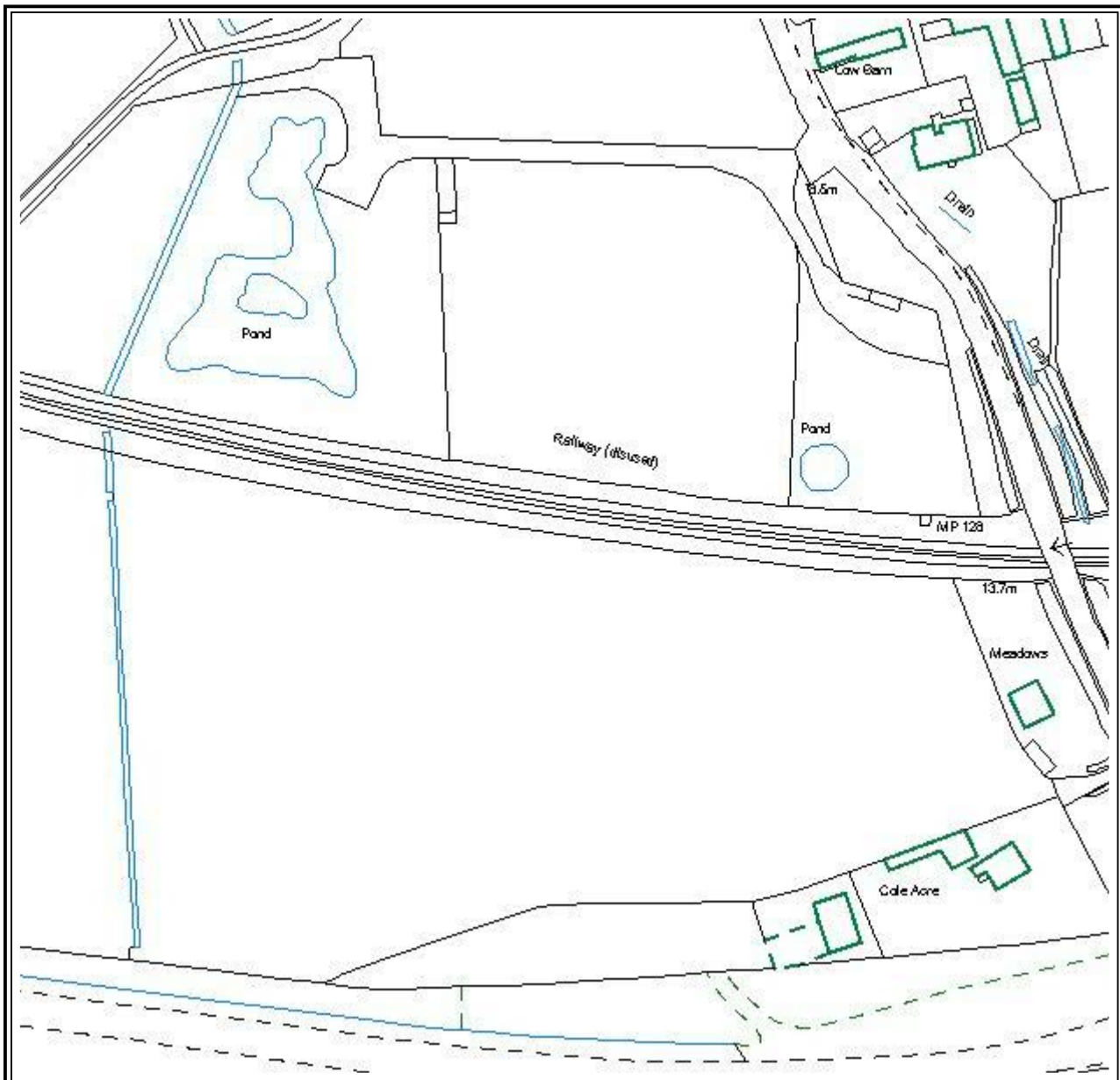
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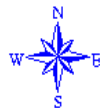
### WATER MAINS

Public	—
Private	- - -
Abandoned	...
Raw Water	—

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	—	—
Rising Main	—	—

Culverted Water Course	—
Highway Drain	- - -
Effluent Disposal Main	...



Scale 1:2004.

Centre (349434, 175692).

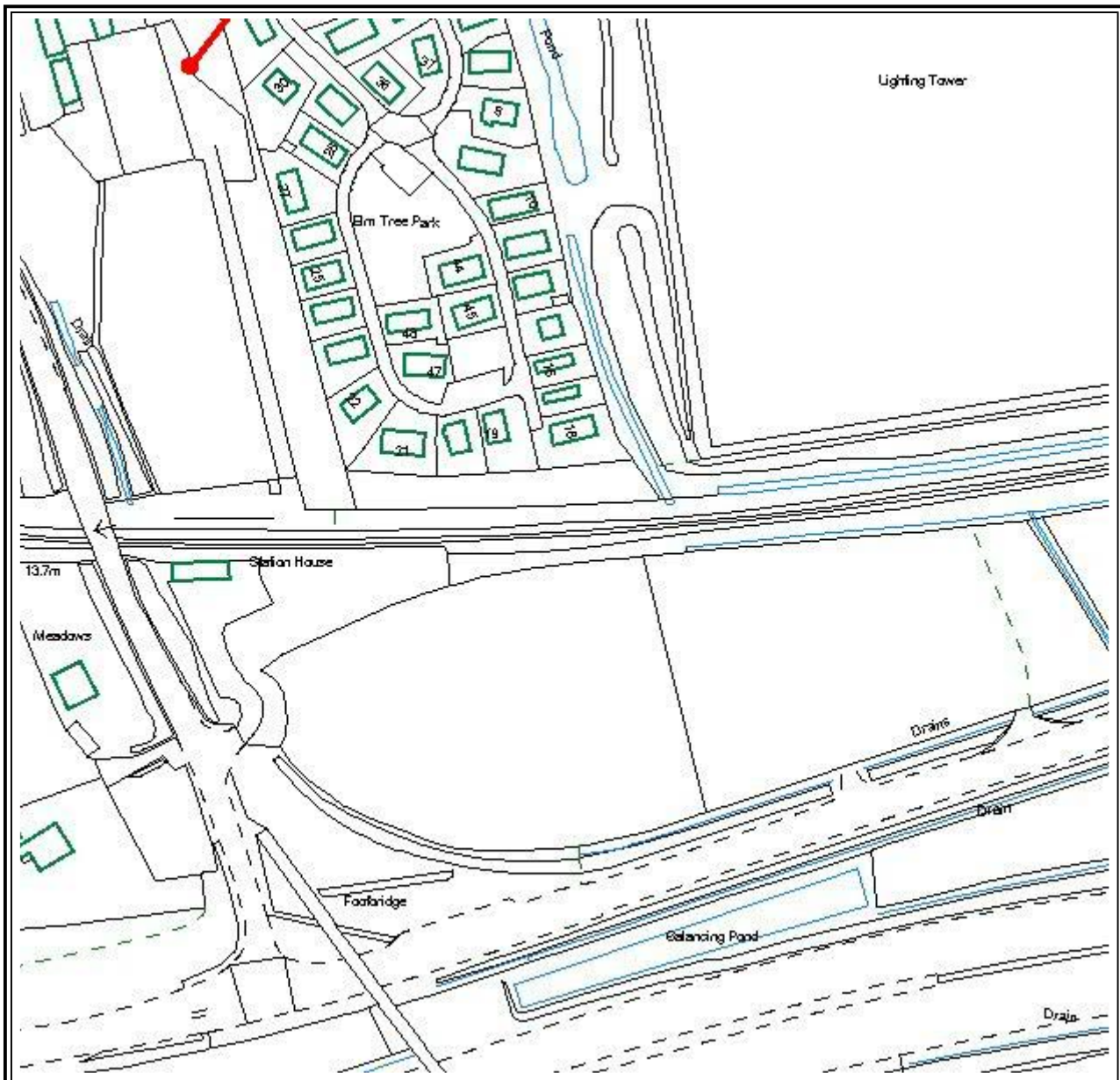
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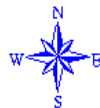
## WATER MAINS

Public	_____
Private	_____
Abandoned	_____
Raw Water	_____

## SEWERS

Line	Color	Symbol	Notes
Foul	Red	Solid Circle	
Combined	Purple	Circle with Horizontal Line	
Surface	Blue	Open Circle	
Rising Main	Orange	Triangle	

Culverted Water Course —————  
Highway Drain - - - - -  
Effluent Disposal Main . . . . .



**Scale 1:1998.**

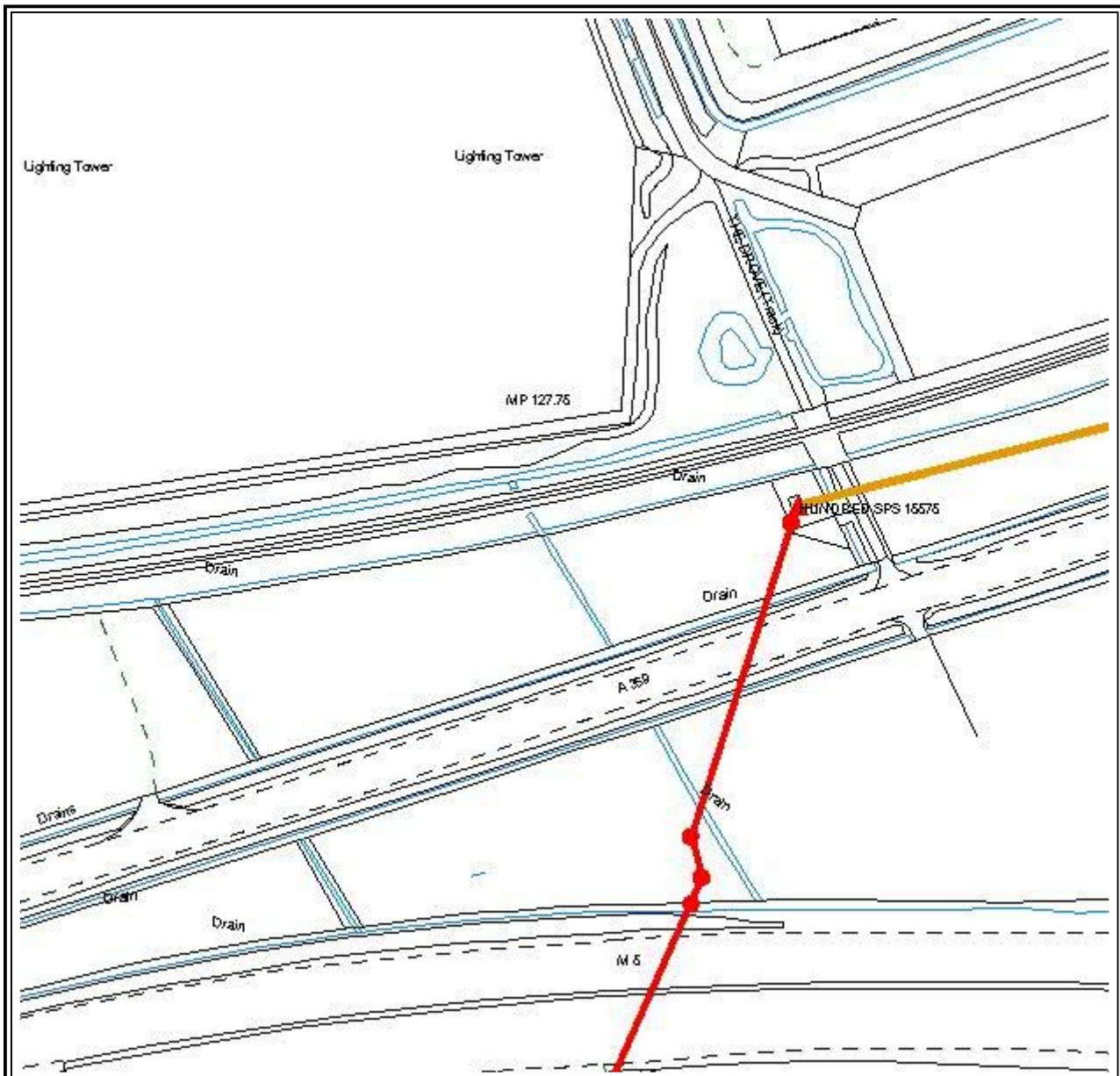
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14/01/2013 15:04:53

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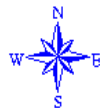
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	— · — · —

### SEWERS

	Public	Private/ Section 104
Foul	—————	·····
Combined	—————	·····
Surface	- - - - -	·····
Rising Main	—————	·····

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	·····



Scale 1:1998.

Centre (349984, 175712).

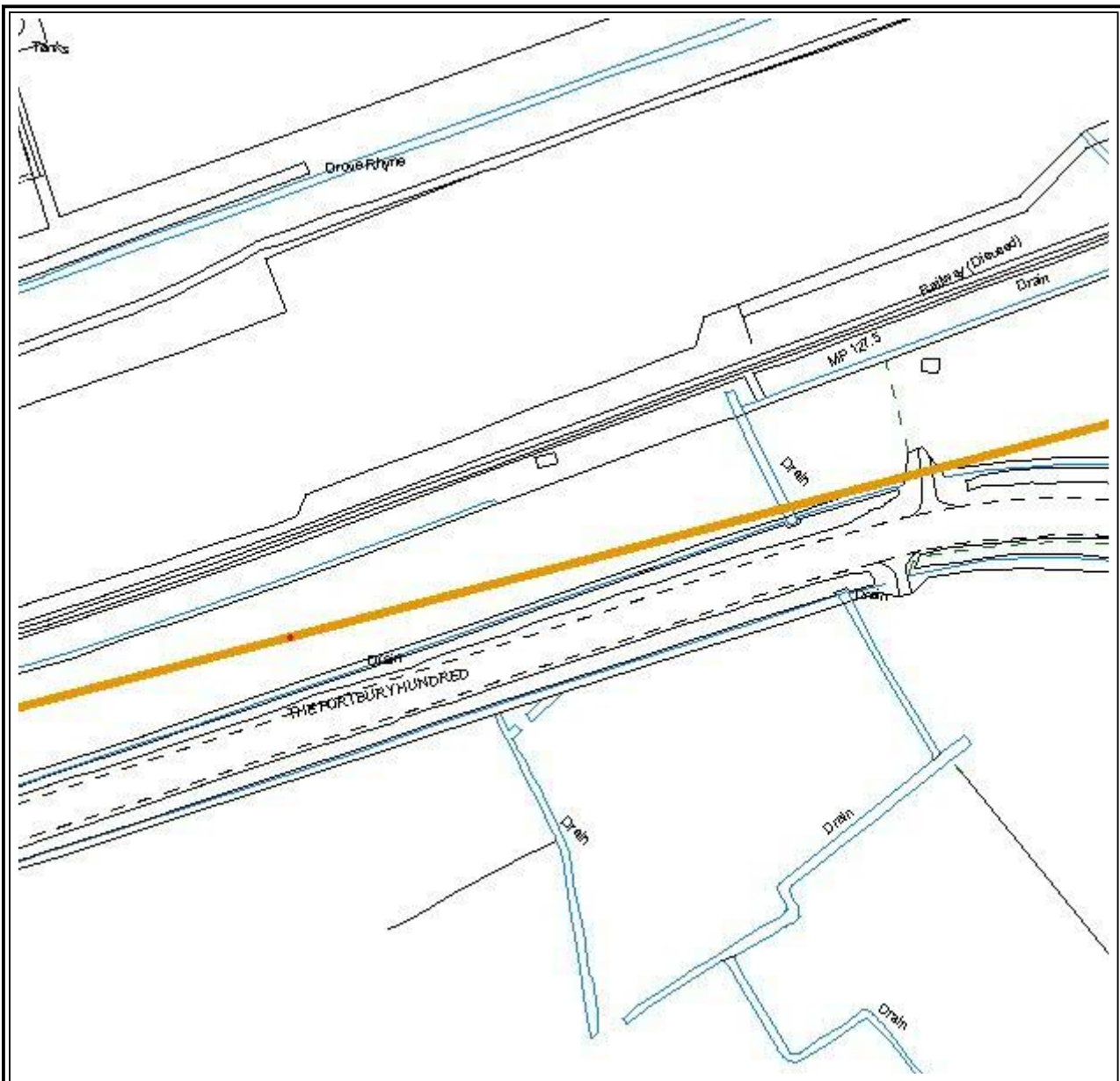
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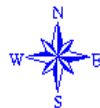
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	- . - . -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	.....



Scale 1:1998.

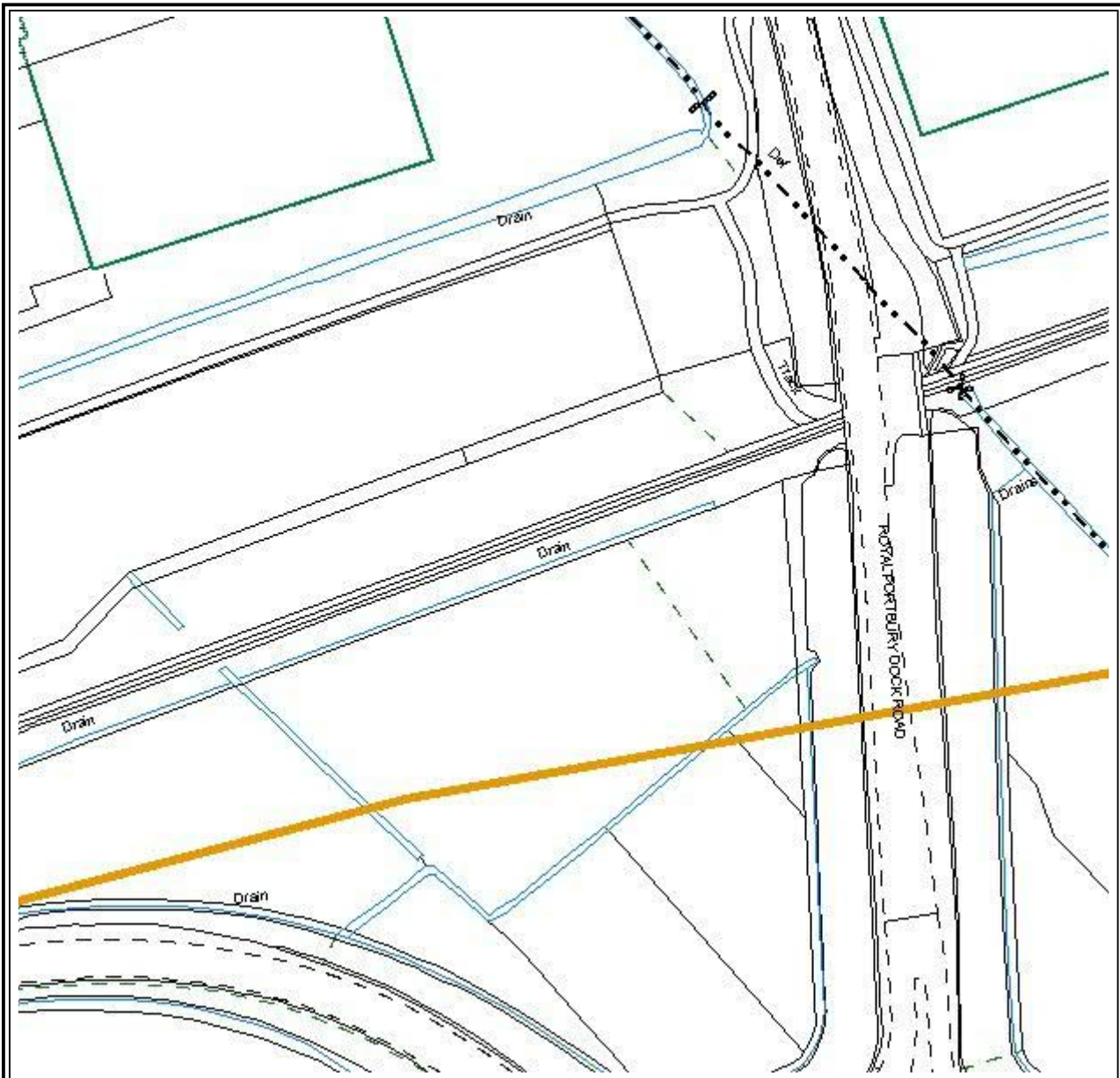
Centre (350279, 175788).

14/01/2013 15:03:50

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## Complete Network



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### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	- . - . -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	.....



Scale 1:2004.

Centre (350566, 175921).

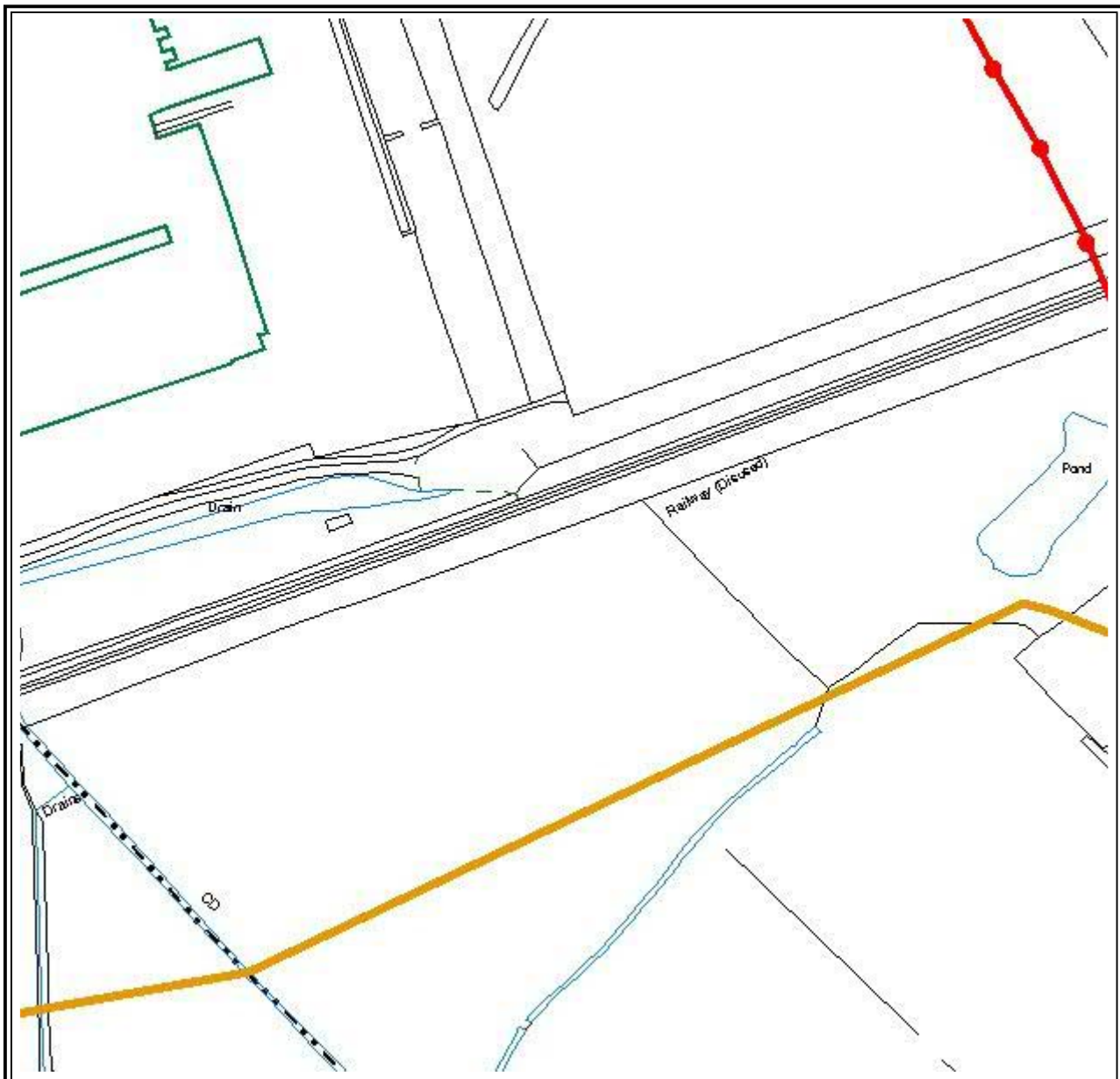
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## Complete Network



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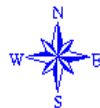
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	- . - . -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	.....



Scale 1:1998.

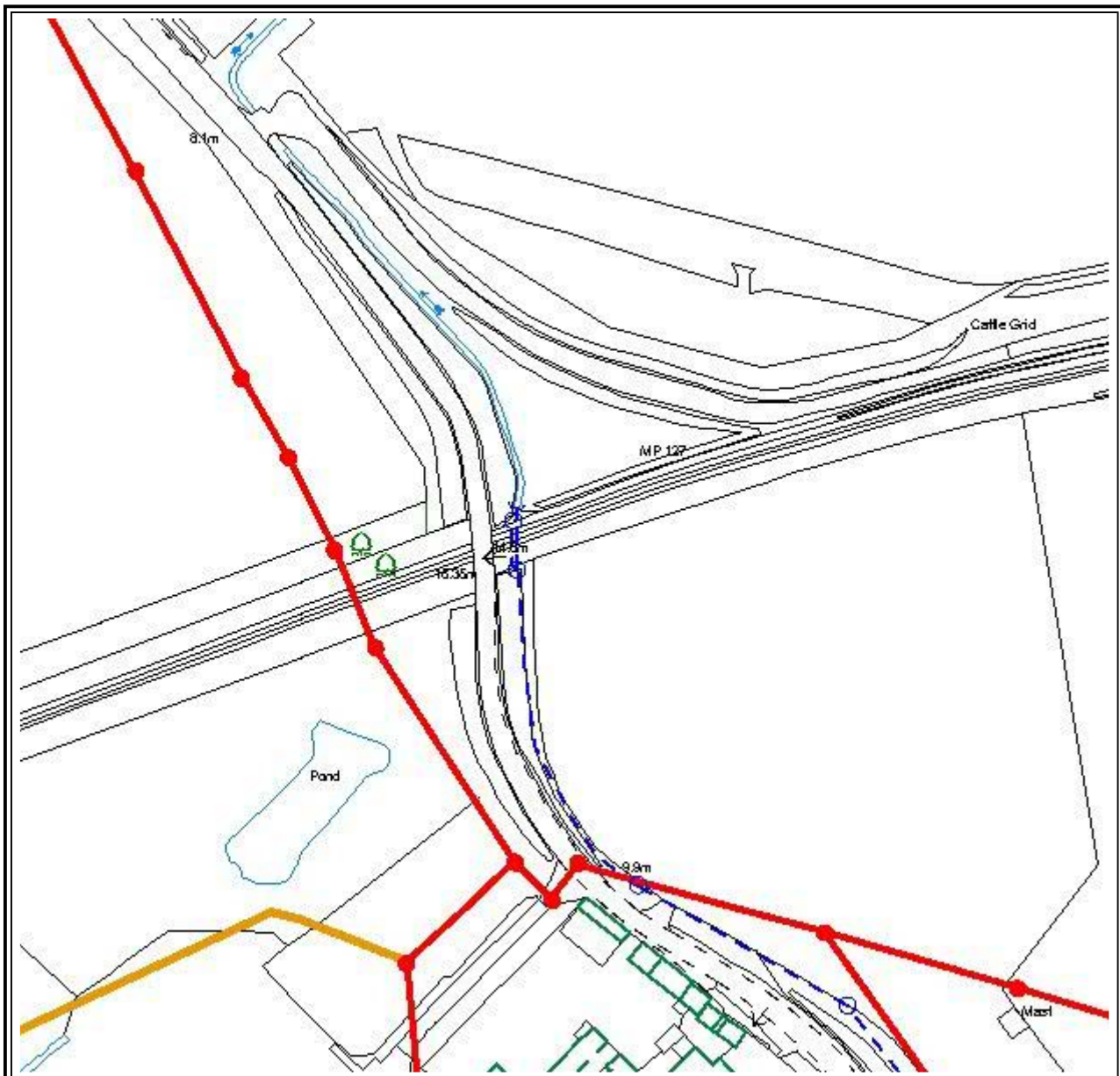
Centre (350853, 176016).

14/01/2013 15:02:47

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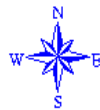
### WATER MAINS

Public	———
Private	- - - - -
Abandoned	· · · · ·
Raw Water	———

### SEWERS

	Public	Private/ Section 104
Foul	———	· · · · ·
Combined	———	· · · · ·
Surface	- - - - -	· · · · ·
Rising Main	———	· · · · ·

Culverted Water Course	———
Highway Drain	- - - - -
Effluent Disposal Main	· · · · ·



Scale 1:1998.

Centre (351079, 176109).

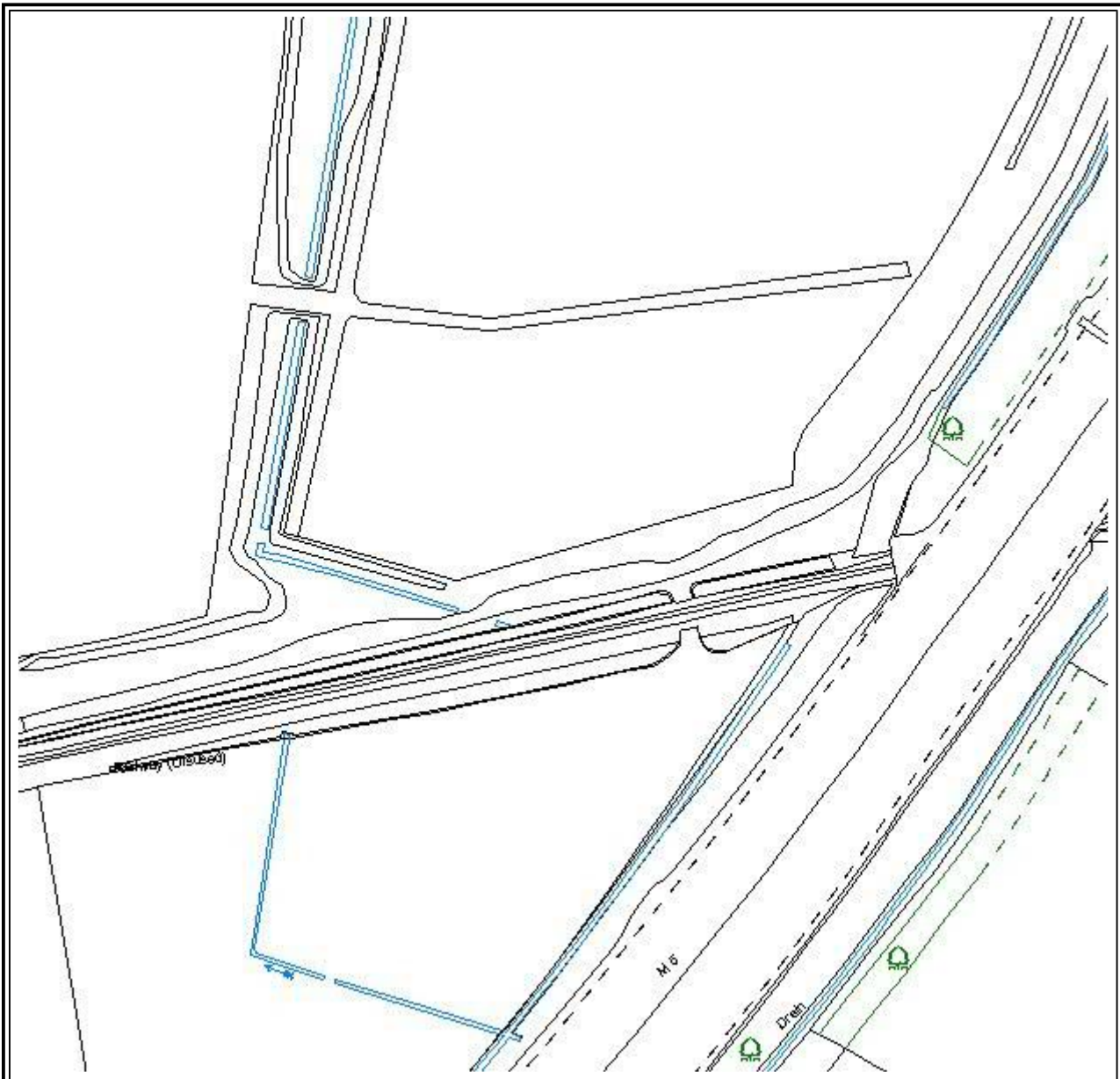
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## Complete Network



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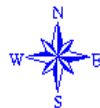
### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- · -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·

Culverted Water Course	—
Highway Drain	- - -
Effluent Disposal Main	- · -



Scale 1:2004.

Centre (351375, 176222).

14/01/2013 15:01:45

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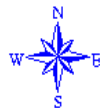
### WATER MAINS

Public	———
Private	- - - - -
Abandoned	.....
Raw Water	———

### SEWERS

	Public	Private/ Section 104
Foul	———	.....
Combined	———	.....
Surface	———	.....
Rising Main	———	.....

Culverted Water Course	———
Highway Drain	———
Effluent Disposal Main	———



Scale 1:1998.

Centre (351646, 176235).

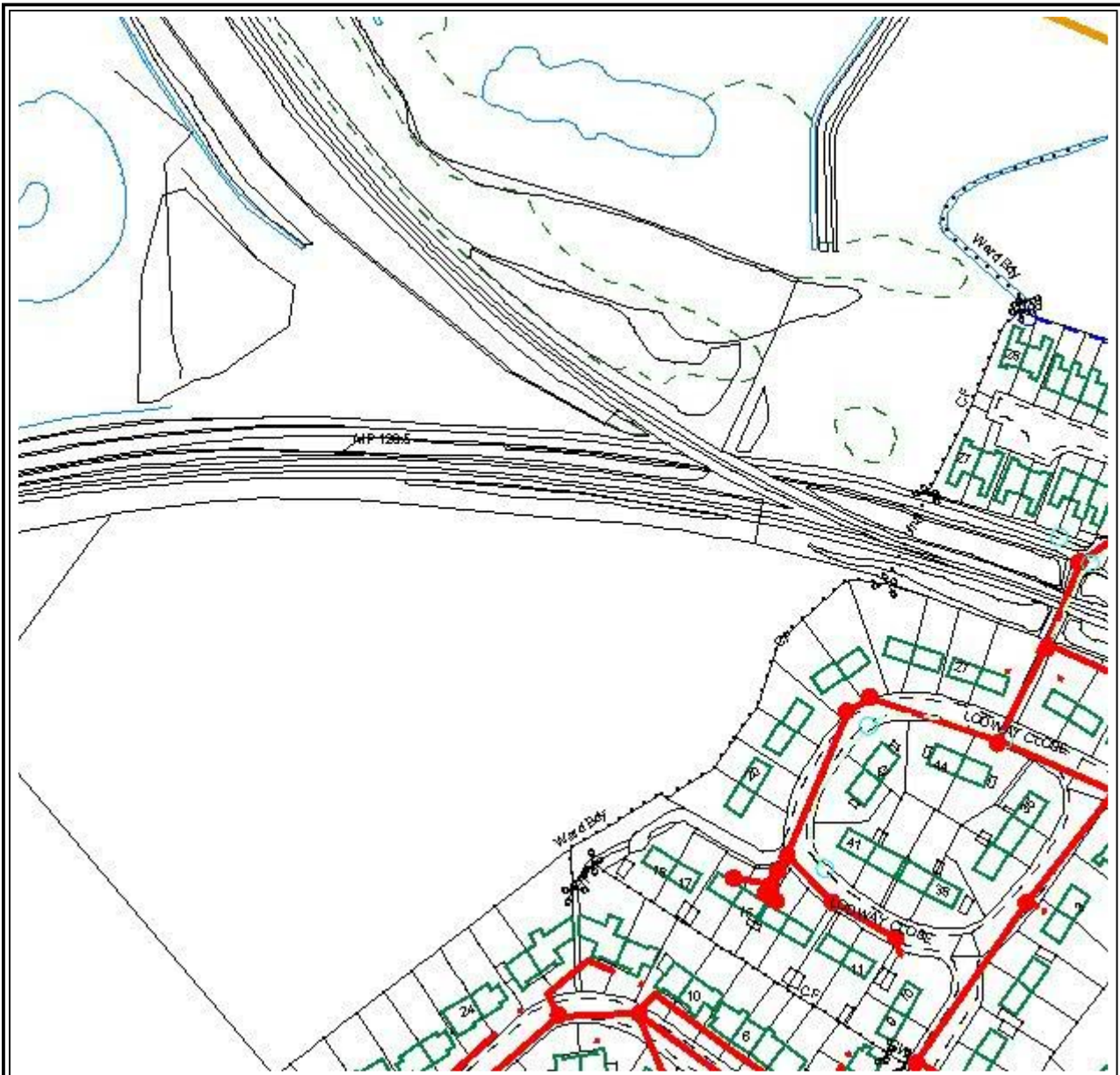
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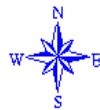
### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	.....

### SEWERS

Public	Private/ Section 104
Foul	.....
Combined	.....
Surface	.....
Rising Main	.....

Culverted Water Course	—————
Highway Drain	- - - - -
Effluent Disposal Main	.....



Scale 1:2004.

Centre (351950, 176267).

14/01/2013 14:59:37

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## Waste Network



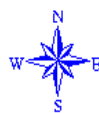
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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	---	---
Culverted Water Course	—	—
Highway Drain	---	---
Effluent Disposal Main	---	---



Scale 1:1248.

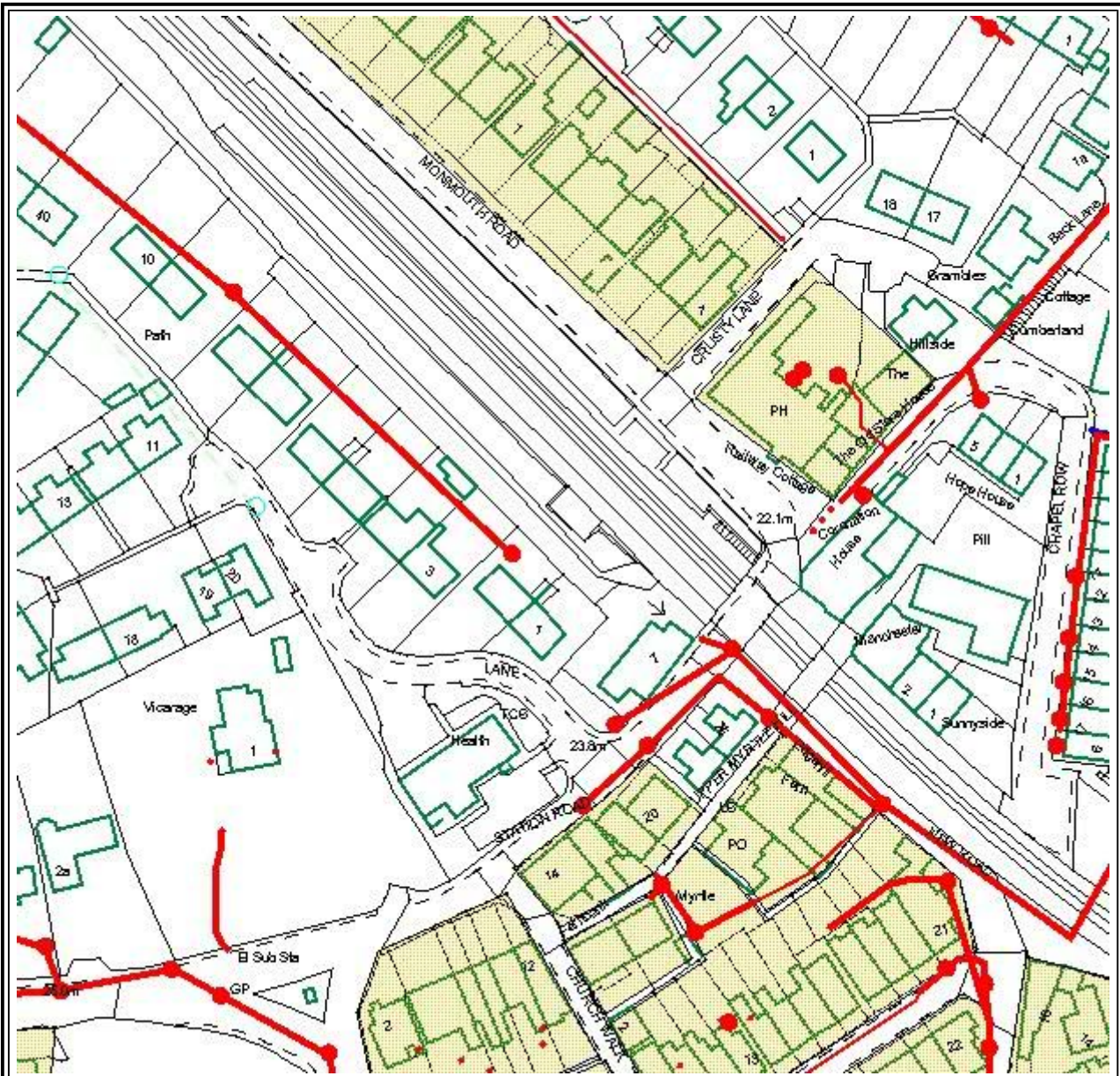
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12/02/2014 11:30:16

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## Waste Network



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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



Scale 1:1255.

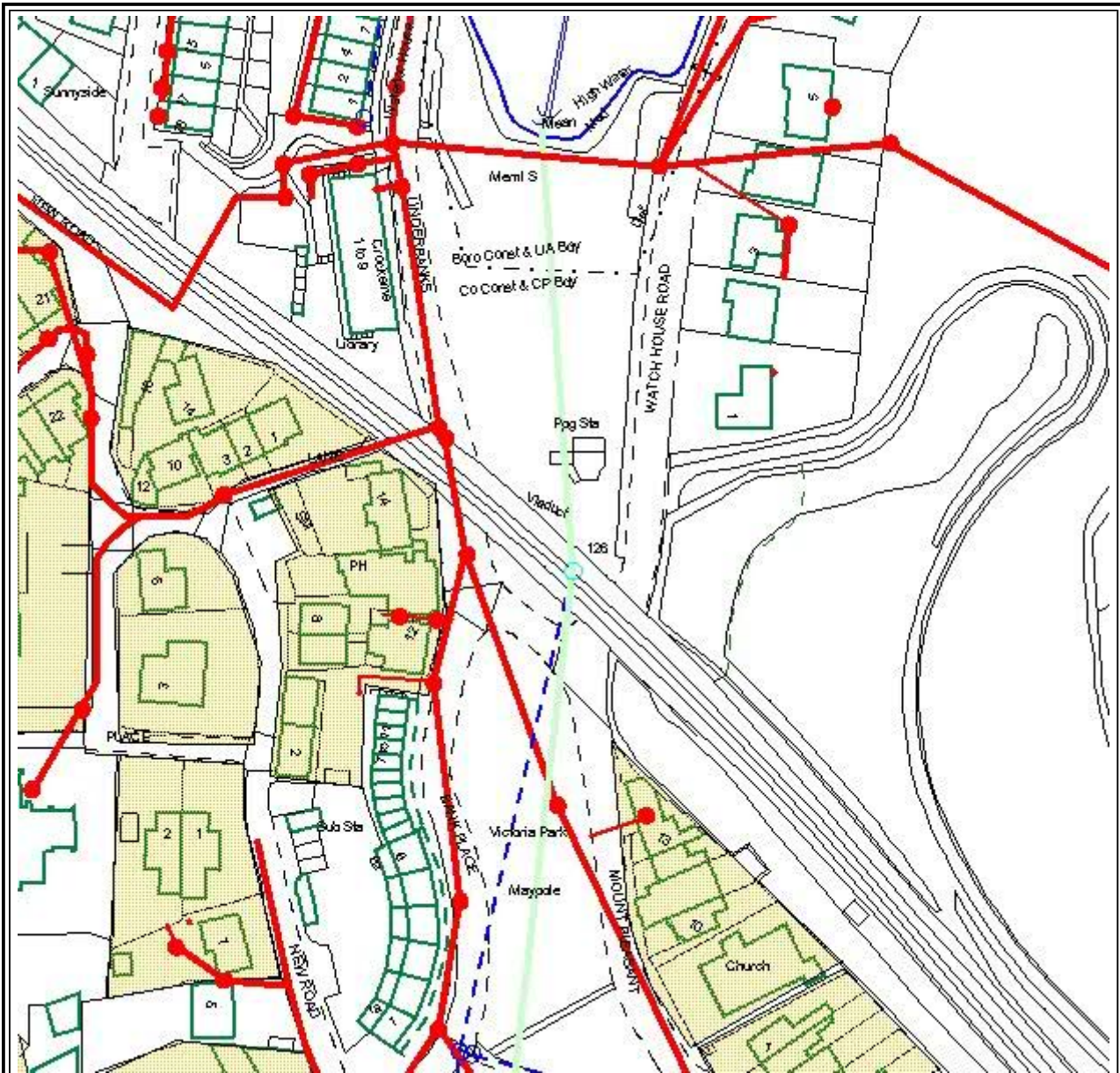
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12/02/2014 11:28:30

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## Waste Network



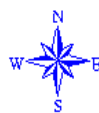
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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	---	---
Culverted Water Course	---	---
Highway Drain	---	---
Effluent Disposal Main	---	---



Scale 1:1248.

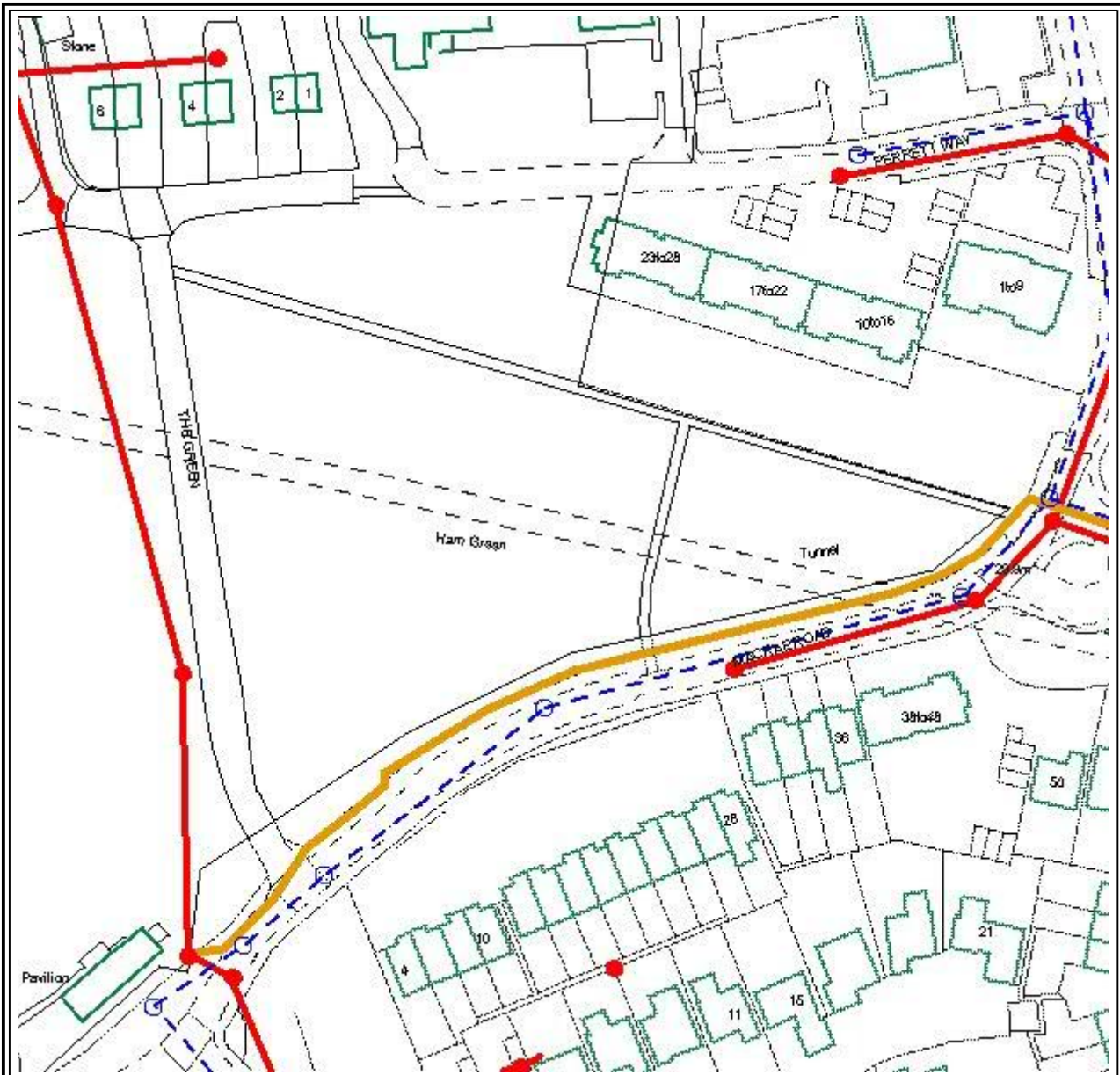
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## Waste Network



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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



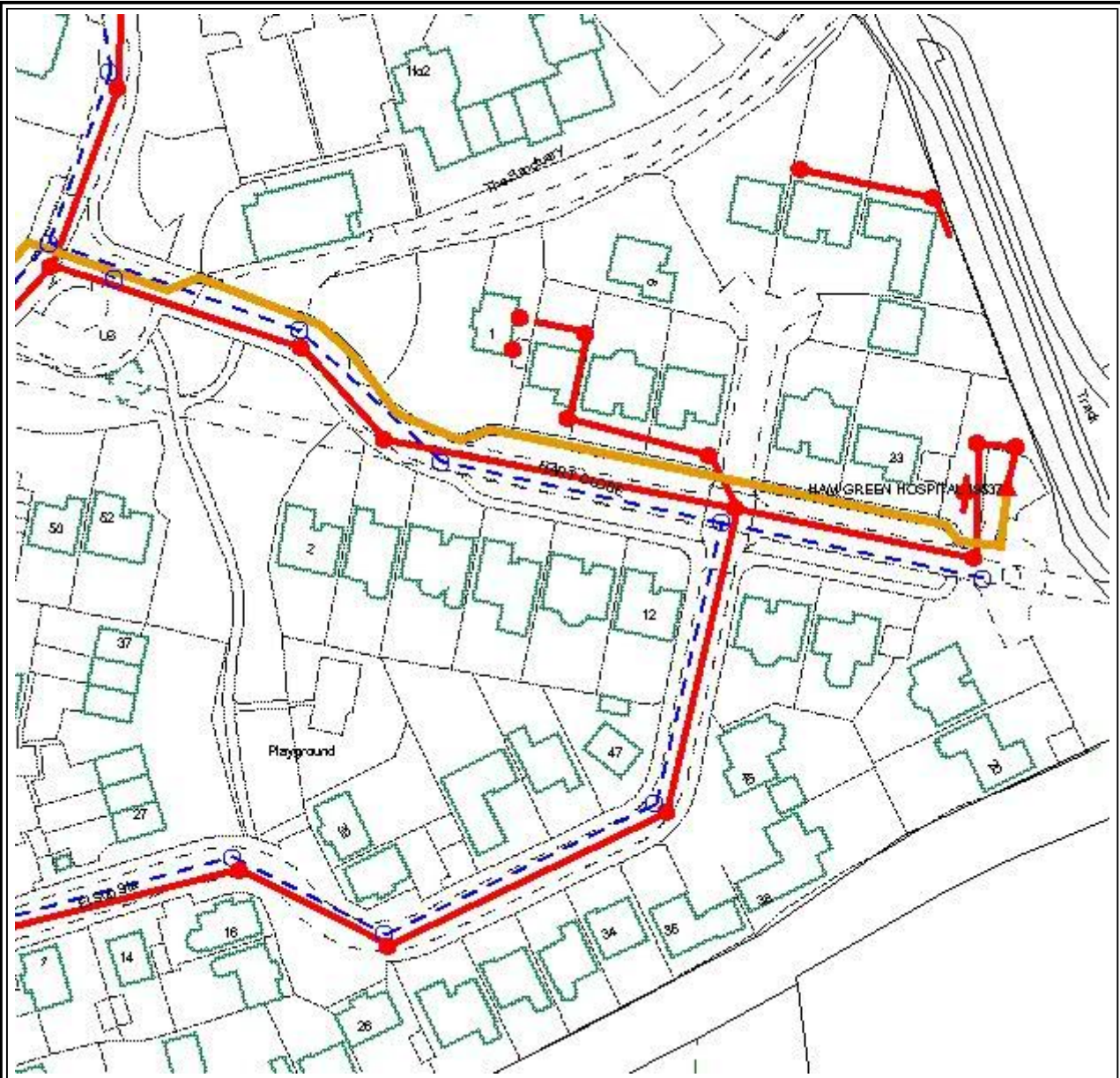
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12/02/2014 11:25:10

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## Waste Network



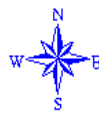
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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	—	—
Culverted Water Course	—	—
Highway Drain	---	---
Effluent Disposal Main	---	---



Scale 1:1248.

Centre (353251, 175528).

12/02/2014 11:22:43

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## Waste Network



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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	—	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	—	—
Effluent Disposal Main	—	—



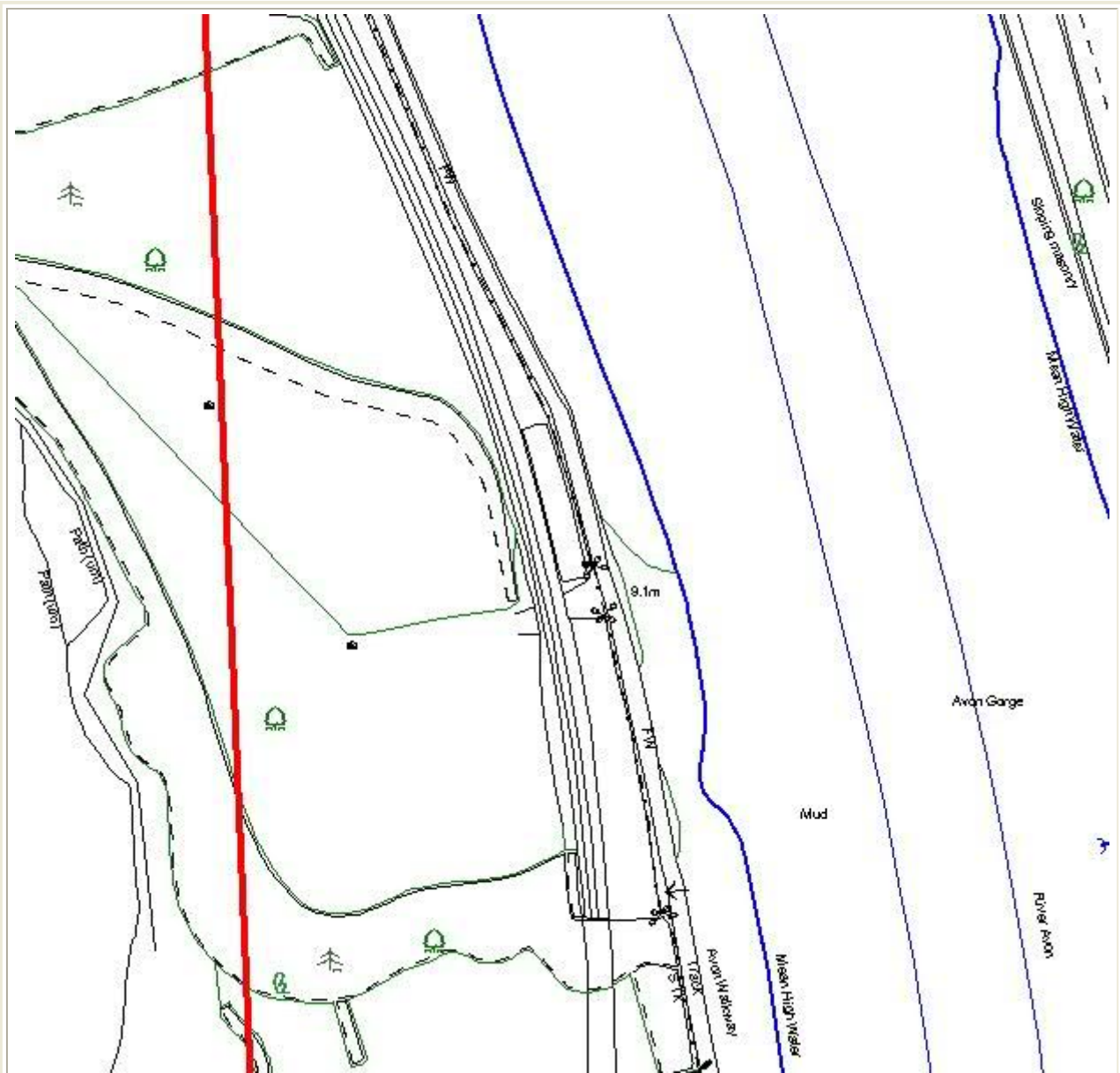
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## Waste Network



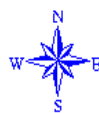
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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



Scale 1:1248.

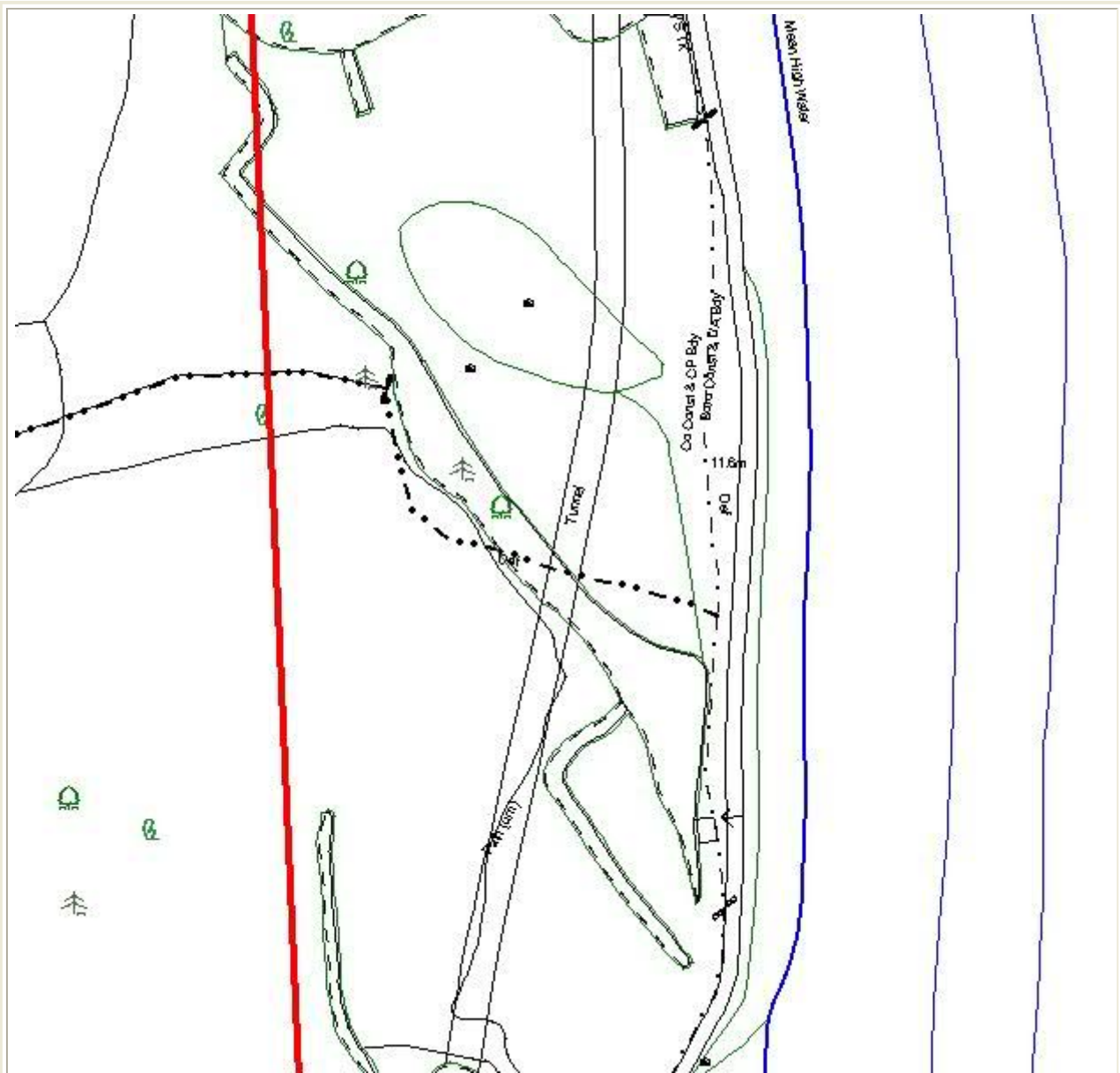
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## Waste Network



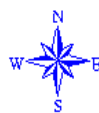
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### WATER MAINS

Public	—————
Private	- - - - -
Abandoned	.....
Raw Water	- - - - -

### SEWERS

	Public	Private/ Section 104
Foul	—————	.....
Combined	—————	.....
Surface	- - - - -	.....
Rising Main	—————	.....
Culverted Water Course	—————	.....
Highway Drain	- - - - -	.....
Effluent Disposal Main	—————	.....



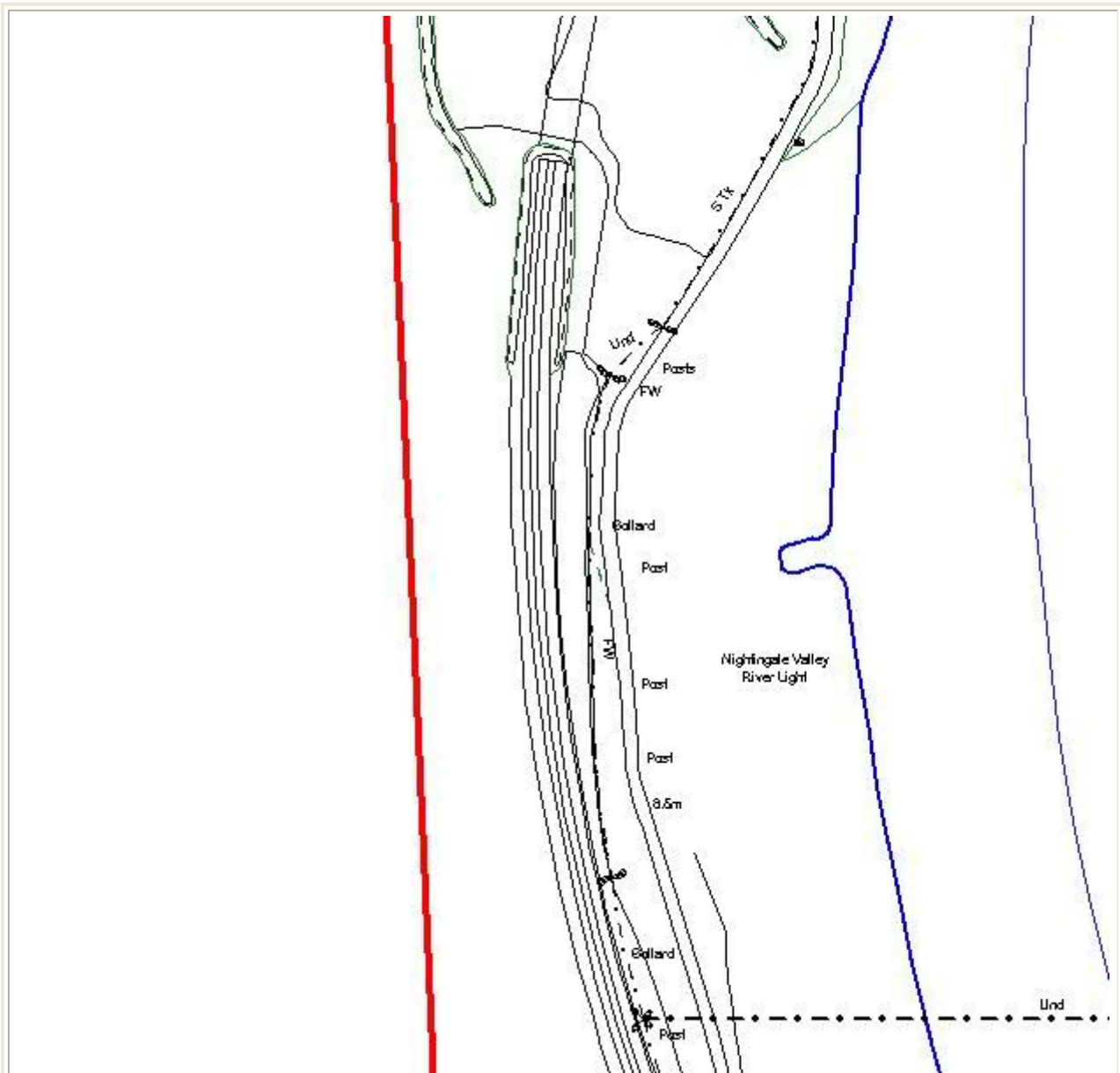
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Centre (356191, 173647).

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## Waste Network



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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	- - -	- - -



Scale 1:1255.

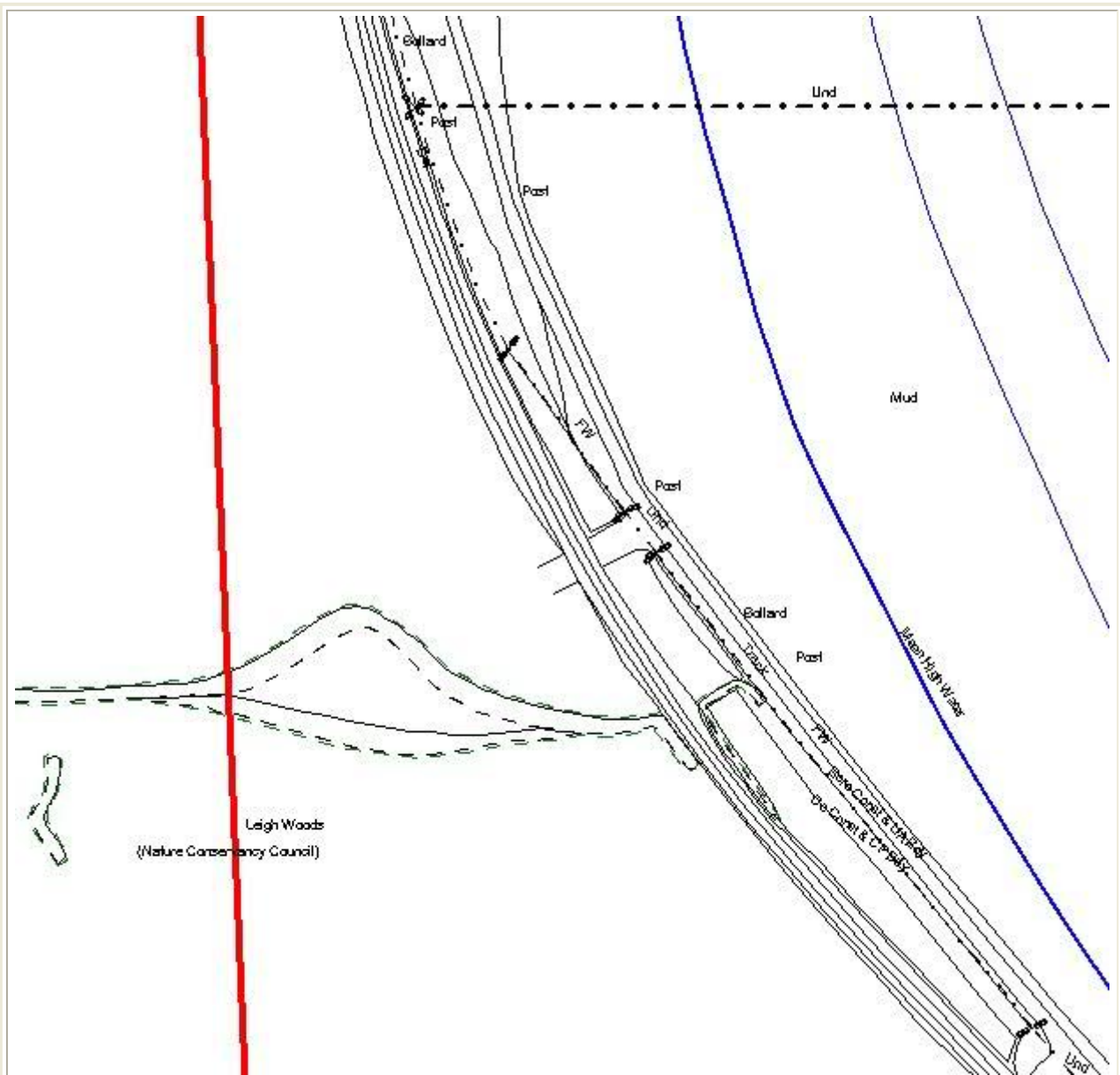
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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



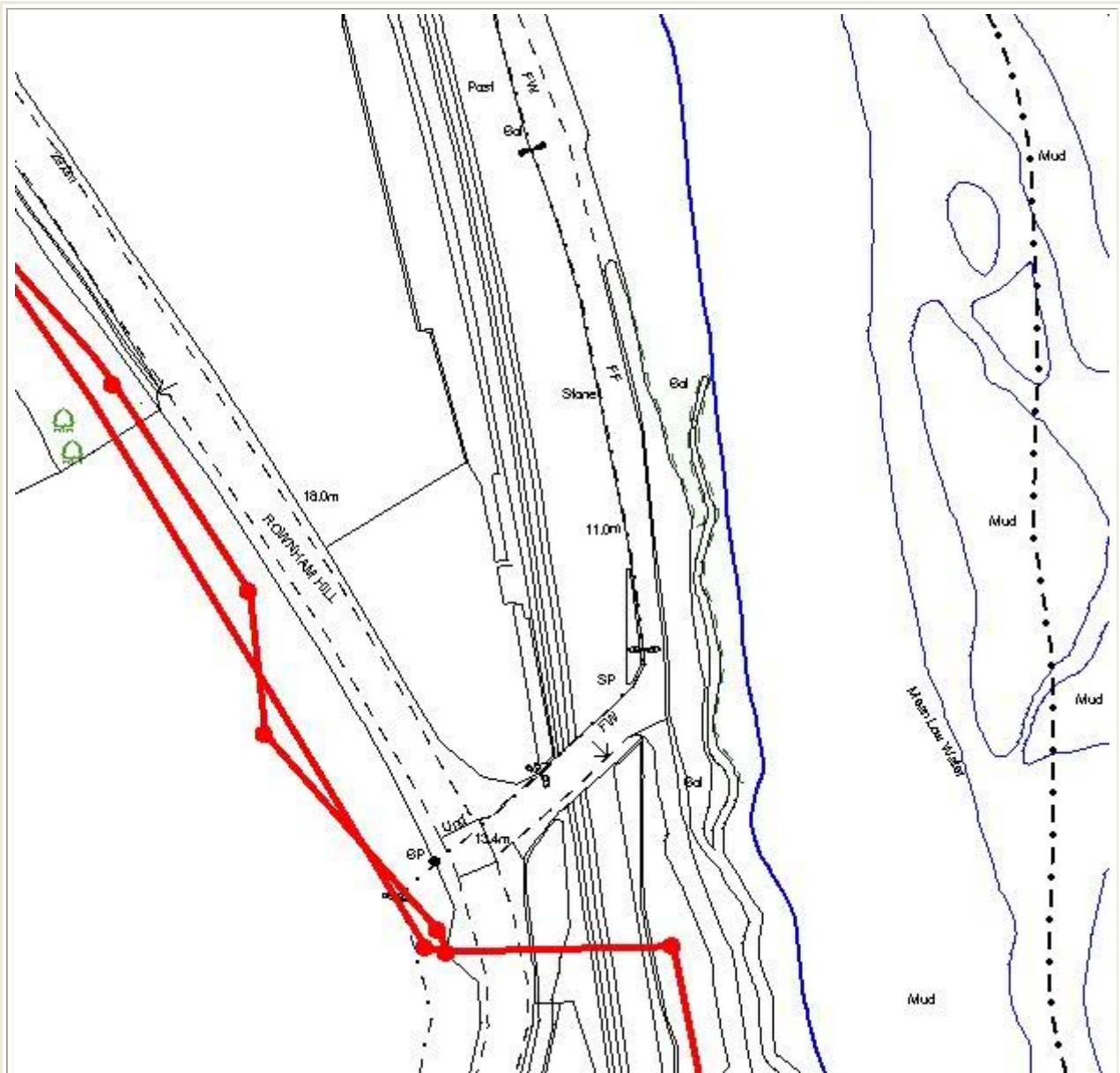
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Centre (356216, 173303).

12/02/2014 09:45:13

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## Waste Network



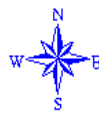
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### WATER MAINS

Public	———
Private	- - - - -
Abandoned	.....
Raw Water	———

### SEWERS

	Public	Private/ Section 104
Foul	———	.....
Combined	———	.....
Surface	———	.....
Rising Main	———	.....
Culverted Water Course	———	———
Highway Drain	———	———
Effluent Disposal Main	———	———



Scale 1:1255.

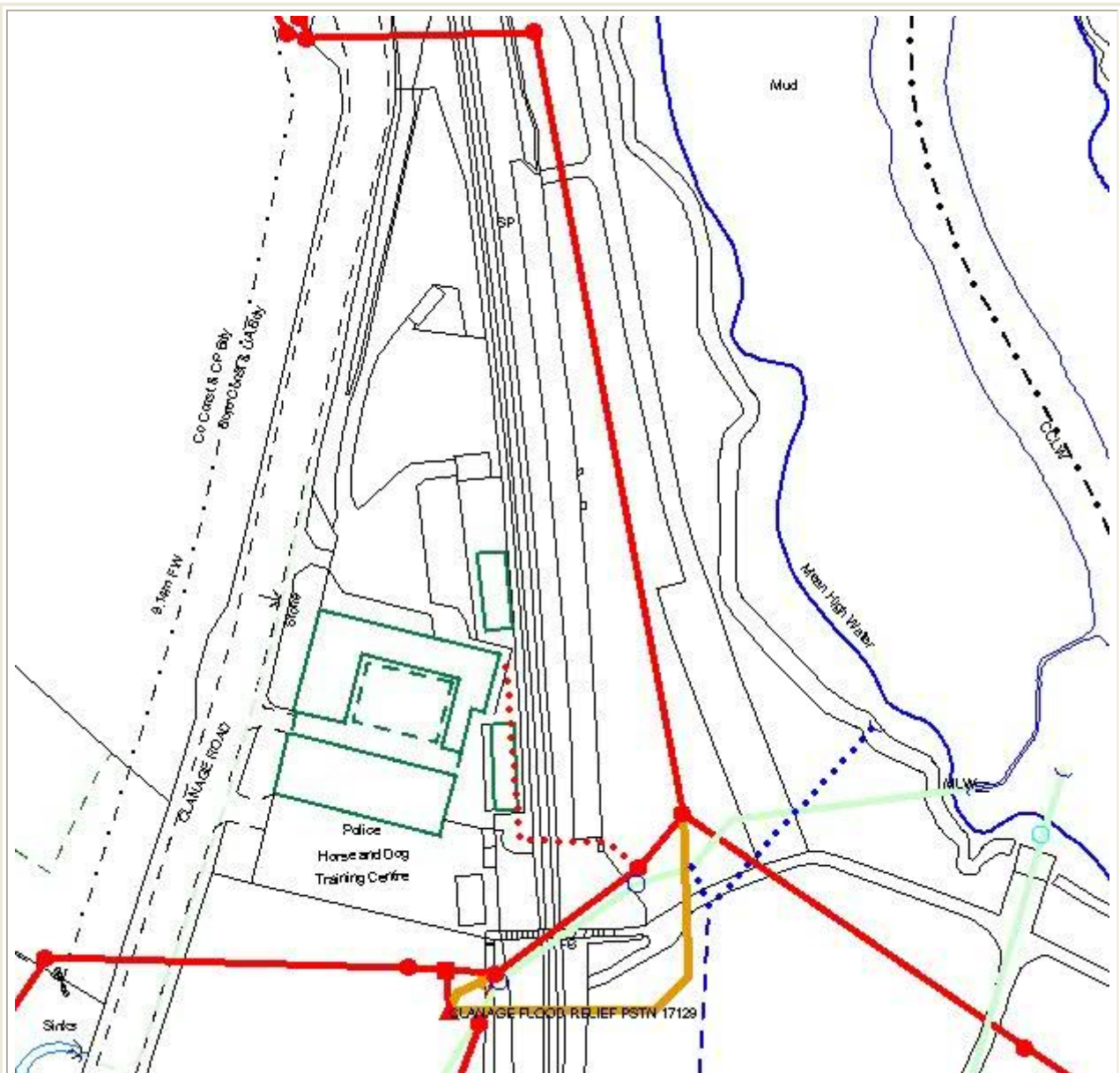
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12/02/2014 09:38:05

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## Waste Network



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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	—	—
Culverted Water Course	—	—
Highway Drain	---	---
Effluent Disposal Main	---	---



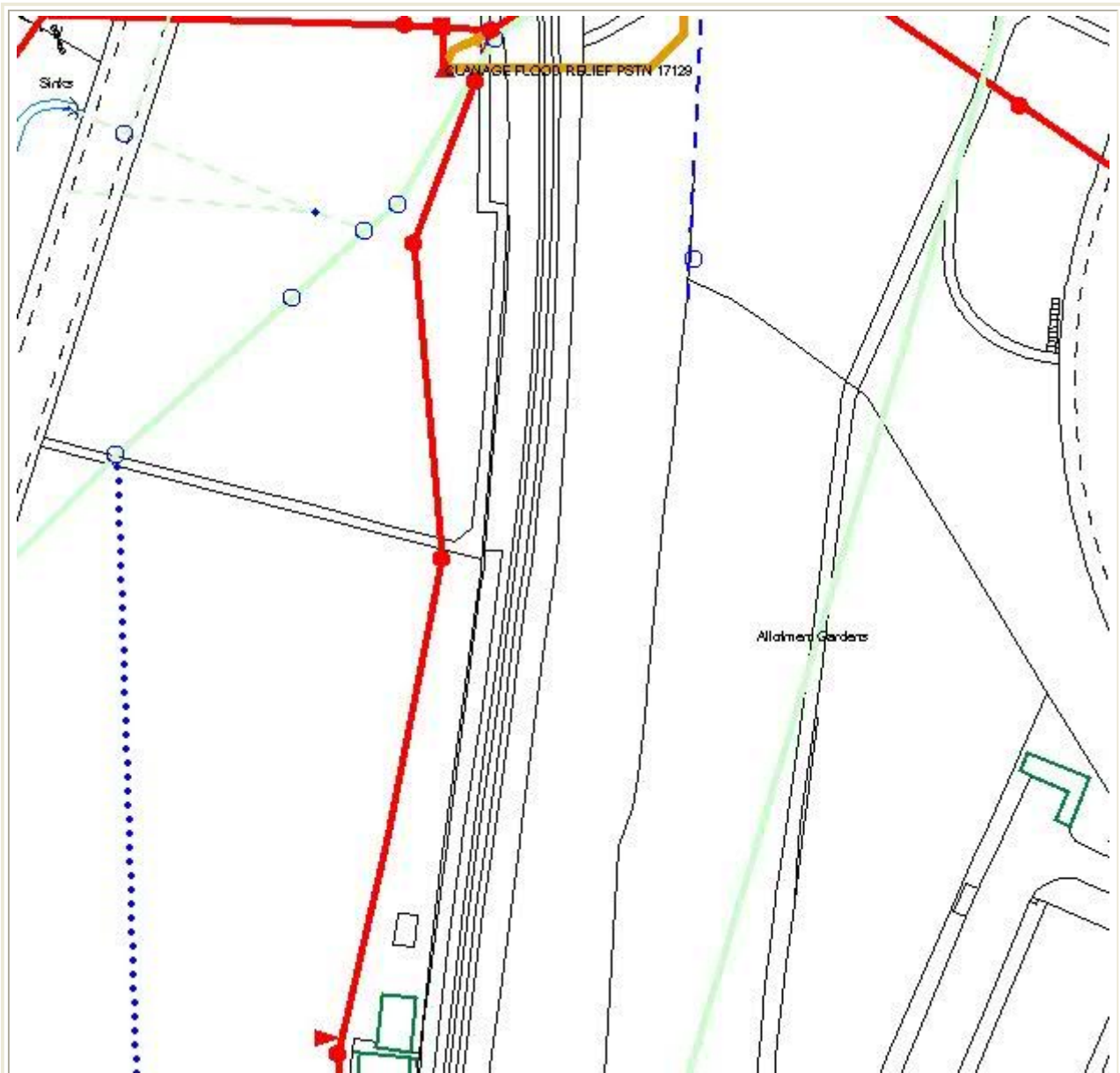
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Centre (356614, 172232).

12/02/2014 09:35:12

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## Waste Network



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### WATER MAINS

Public	———
Private	- - - - -
Abandoned	.....
Raw Water	———

### SEWERS

	Public	Private/ Section 104
Foul	———	.....
Combined	———	.....
Surface	———	.....
Rising Main	———	.....

Culverted Water Course	———
Highway Drain	———
Effluent Disposal Main	———



Scale 1:1248.

Centre (356615, 172056).

12/02/2014 09:31:24

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## Waste Network



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## **WATER MAINS**

Water Source	Public	Private	Abandoned	Raw Water
Public	_____			
Private	_____	_____		
Abandoned	_____	_____	_____	
Raw Water	_____	_____	_____	_____

## SEWERS

Foul			
Combined			
Surface			
Rising Main			

Culverted Water Course —————  
Highway Drain - - - - -  
Effluent Disposal Main . . . . .



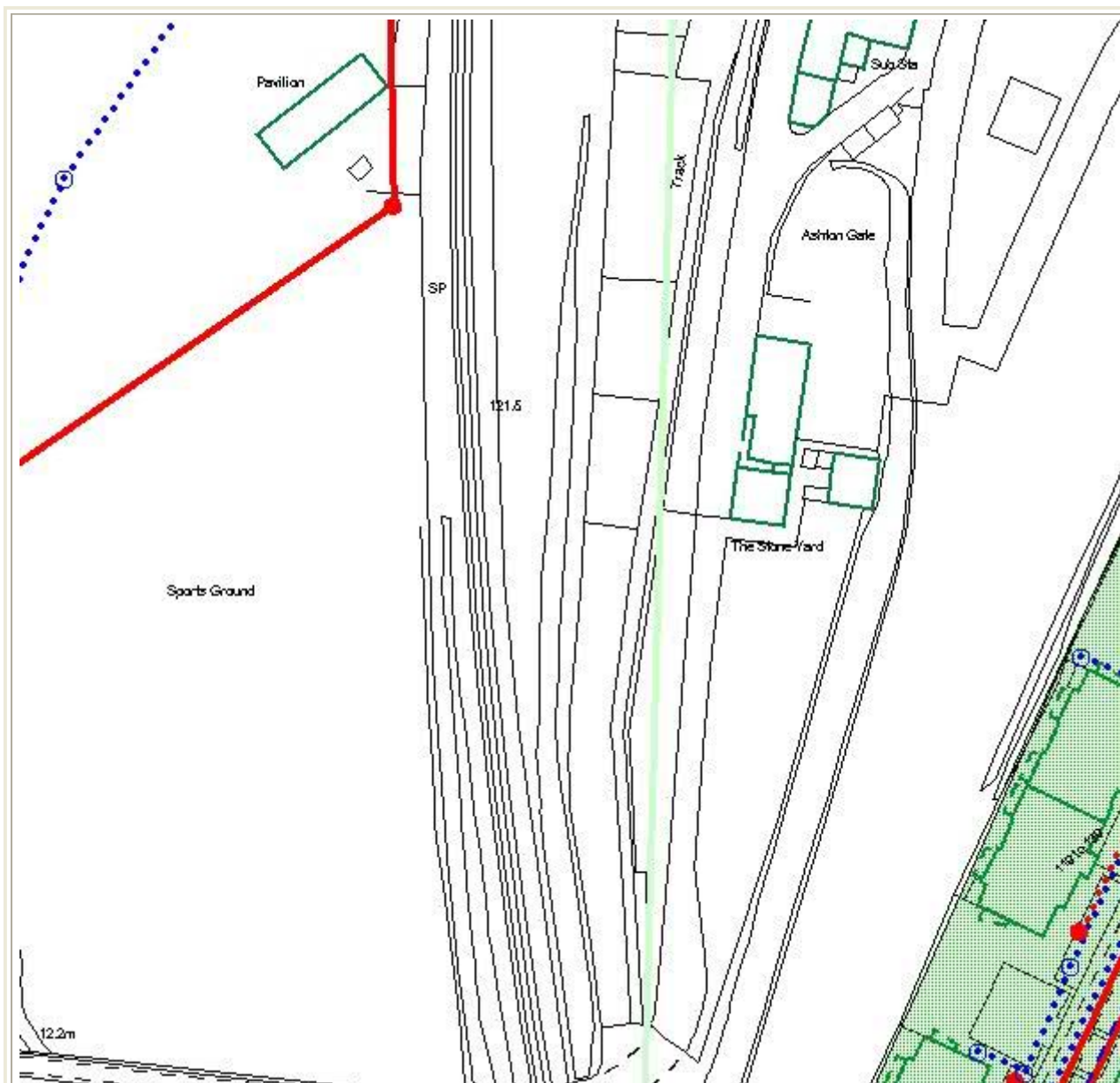
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**Centre** (356594, 171919).

12/02/2014 09:28:15

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## Waste Network













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## WATER MAINS

Public	_____
Private	- - - - -
Abandoned	- - - - -
Raw Water	- - - - -

## SEWERS

Foul    
 Combined    
 Surface    
 Rising Main    
 Culverted Water Course   
 Highway Drain   
 Effluent Disposal Main 



**Scale 1:1248.**

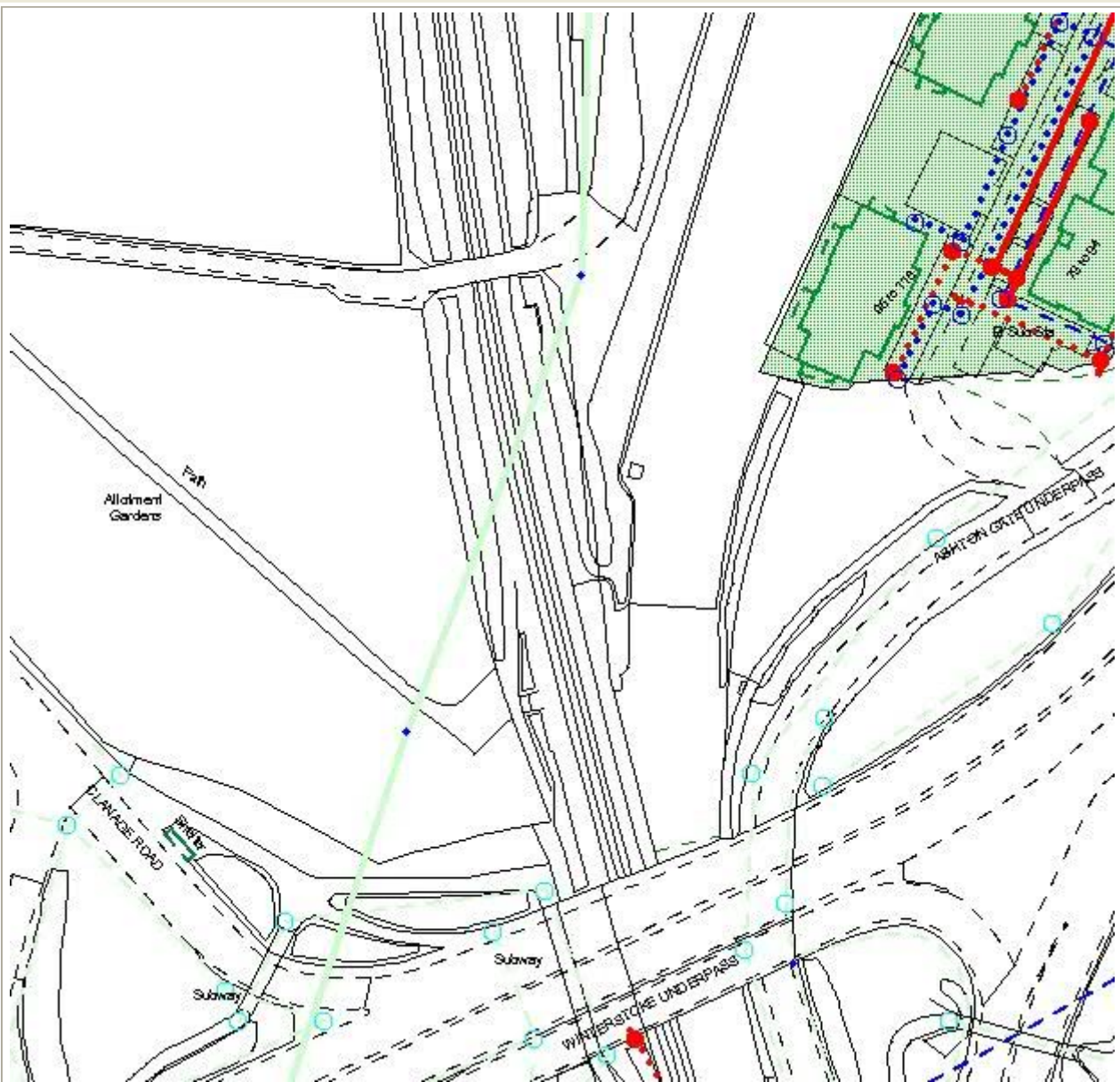
**Centre** (356608, 171764).

12/02/2014 09:24:57

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## Waste Network



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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	—	—
Culverted Water Course	—	—
Highway Drain	---	---
Effluent Disposal Main	---	---



Scale 1:1248.

Centre (356618, 171611).

12/02/2014 09:19:34

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## Waste Network



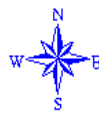
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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



Scale 1:1248.

Centre (356669, 171448).

12/02/2014 09:16:31

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## Waste Network



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### WATER MAINS

Public	—
Private	—
Abandoned	---
Raw Water	---

### SEWERS

	Public	Private/ Section 104
Foul	—	—
Combined	—	—
Surface	---	---
Rising Main	—	—
Culverted Water Course	—	—
Highway Drain	---	---
Effluent Disposal Main	---	---



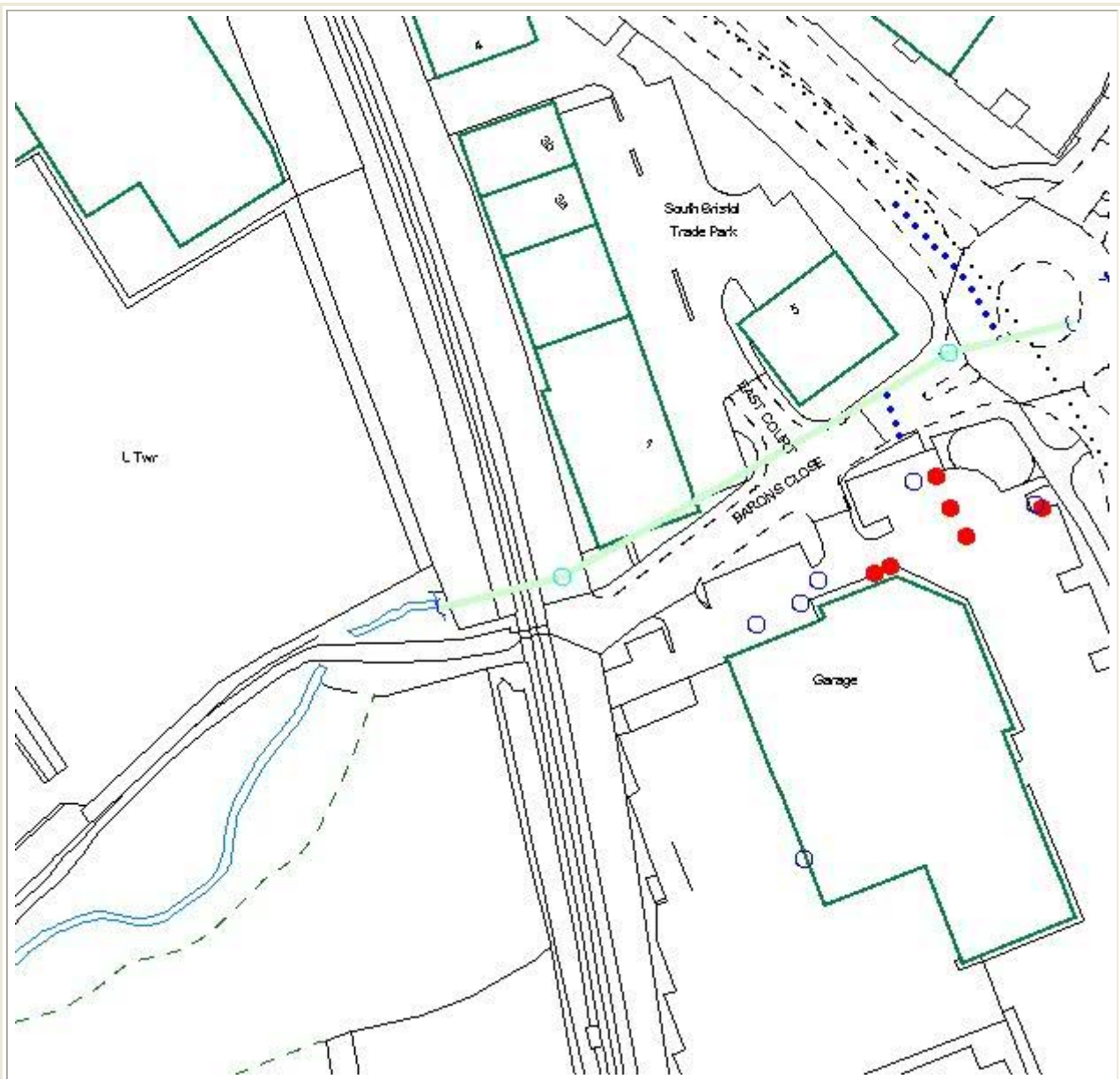
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Centre (356745, 171304).

12/02/2014 09:13:26

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## Waste Network



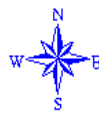
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### WATER MAINS

Public	—
Private	- - -
Abandoned	· · ·
Raw Water	- - -

### SEWERS

	Public	Private/ Section 104
Foul	—	· · ·
Combined	—	· · ·
Surface	- - -	· · ·
Rising Main	—	· · ·
Culverted Water Course	—	—
Highway Drain	- - -	- - -
Effluent Disposal Main	—	—



Scale 1:1255.







Centre (356815, 171140).


12/02/2014 09:09:41

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## Section 104 Areas

	Section 102 (Adopted)
	Section 102 Agreement
	S02PL
	Section 104 (Adopted)
	Section 104 Agreement
	Section 104 (Submitted)





 Pre1937 (poss S24)

## Structure Outlines





## Sewers

	Abandoned Sewer - Combined
	Abandoned Sewer - Foul
	Abandoned Sewer - Surface
	Culverted Watercourse
	Effluent Disposal Main - Abandoned
	Effluent Disposal Main
	Highway Drain
	OverFlow - Abandoned
	OverFlow - Private
	OverFlow - Public
	Proposed Sewer - Combined
	Proposed Sewer - Foul
	Proposed Sewer - Surface
	Private Sewer - Combined
	Private Sewer - Foul
	Private Sewer - Surface
	Public Sewer - Combined
	Public Sewer - Foul
	Public Sewer - Surface
	Section 104 Sewer - Combined
	Section 104 Sewer - Foul
	Section 104 Sewer - Surface
	Section 24 - Combined
	Section 24 - Foul
	Section 24 - Surface
	Status Undetermined - Combined
	Status Undetermined - Foul
	Status Undetermined - Surface
	Syphon - Combined
	Syphon - Foul

## Vent columns

	Vent Column - Combined
	Vent Column - Foul
	Vent Column - Surface
	Vent Column - Unknown

## Soakaways

	Soakaway - EDM
	Soakaway - Highway
	Soakaway - Surface
	Soakaway - Unknown

## Septic Tanks







## Sewage Pumping Stations

	SPS - Combined
	SPS - Culverted Watercourse
	SPS - Foul
	SPS - Highway
	SPS - Overflow
	SPS - Surface
	SPS - Unknown

## Pumping Main Features

	Pumping Main Feature - Air Valve
	Pumping Main Feature - Hatch Box
	Pumping Main Feature - Other
	Pumping Main Feature - Washout

## Overflows/Bifurcations

	Bifurcation - Combined
	Bifurcation - EDM
	Bifurcation - Foul
	Bifurcation - Overflow
	Bifurcation - Surface
	CSO - Combined
	CSO - Culverted Watercourse
	CSO - Foul
	CSO - Surface
	Overflow - Combined
	Overflow - Culverted Watercourse
	Overflow - Foul
	Overflow - Surface






## Manholes

	Section 104 Manhole - Combined
	Section 104 Manhole - Foul
	Section 104 Manhole - Storm
	Manhole - Public Combined
	Manhole - Culverted Watercourse
	Manhole - EDM
	Manhole - Public Foul
	Manhole - Highway Drain
	Manhole - Overflow
	Manhole - Public Surface
	Manhole - Private Combined
	Manhole - Private Foul
	Manhole - Private Surface
	Manhole - Unknown













## Inlets/Outfalls

	Gully - Culverted Watercourse
	Gully - Foul
	Gully - Highway
	Gully - Storm
	Gully - Unknown
	Inlet - Combined
	Inlet - Culverted Watercourse
	Inlet - EDM
	Inlet - Foul
	Inlet - Highway Drain
	Inlet - Surface
	Outfall - Combined
	Outfall - Culverted Watercourse
	Outfall - Effluent Disposal Main
	Outfall - Foul
	Outfall - Highway
	Outfall - Overflow
	Outfall - Surface
	Outfall - Unknown









## Ghost nodes/Junctions

	Ghost Node - Combined
	Ghost Node - Culverted Watercourse
	Ghost Node - EDM
	Ghost Node - Foul
	Ghost Node - Highway

## Cleanouts

	Flushing Chamber - Combi
	Flushing Chamber - Foul
	Flushing Chamber - Surface
	Flushing Chamber - Unknown
	Lamp Hole - Combined
	Lamp Hole - Foul
	Lamp Hole - Surface
	Lamp Hole - Unknown
	Rodding Eye - Combined
	Rodding Eye - Foul
	Rodding Eye - Surface
	Rodding Eye - Unknown

## Catchpits

	Catchpit - Combined
	Catchpit - Culverted Watercourse
	Catchpit - EDM
	Catchpit - Foul
	Catchpit - Highway
	Catchpit - Overflow
	Catchpit - Surface
	Catchpit - Unknown

## B3 Network Rail Hazard records

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ELR/ELR Name	START	END	DESCRIPTION	Local name	Track	Description
POD: PORTISHEAD BRANCH	120	126.0726	Hazard Undefined	PORTBURY AREA	All/Multiple Tracks	The Severnside Sirens warn of possible incidents involving dangerous substances. Siren sound: rising continuous noise followed by series of pulsating notes. Sirens tested 3rd day of each month at 3pm. If heard go inside, stay inside, tune in to local radio. Stay indoors until All Clear is given.
POD: PORTISHEAD BRANCH	120	130.0638	Buried Telecommunication Cables		All/Multiple Tracks	@Note: There could be buried telecoms cables throughout this ELR. If details of cable location are known this cable MUST be identified first before any ground penetration work is carried out.@
POD: PORTISHEAD BRANCH	120.0649	121.177	Conservation Area			Citywide Site of Nature Conservation Interest. < Rail Corridor >, Includes Wildlife Network Sites.
POD: PORTISHEAD BRANCH	120	120.1408	Hazard Associated With Drain		All/Multiple Tracks	ST570709-172 Railtrack 12" EW pipe under road Drain <confined space> - RAR Code: HSD - HAZARD V.10
POD: PORTISHEAD BRANCH	120	120.142	Buried Foul Water Service	Ashton Vale	All/Multiple Tracks	ST568707-1-172 William Cowlin & Son Agreement 60875 re sewer under road at UBr. Sewage - RAR Code: HBF - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.0116	Hazard Associated With Culvert	Ashton Containers	All/Multiple Tracks	Hazard associated with culvert and confined spaces.See work ref:D384/307.Portishead branch line refurbishment
POD: PORTISHEAD BRANCH	121	121.0366	Buried Telecommunication Cables	Portishead Branch	All/Multiple Tracks	Buried Telecoms cable crossing under track.Ducts only laid-1 x BT and 1 X Telewest.Ref>BS1
POD: PORTISHEAD BRANCH	121	121.0374	Hazard Associated With Culvert	Ashton Jnc	All/Multiple Tracks	ST566712-172 Railtrack 3" brick arch with Armco inserts on Up & Down sides Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10 New catchpit 2013.
POD: PORTISHEAD BRANCH	121	121.0385	Hazard Associated With Culvert	Ashton Level Crossing	All/Multiple Tracks	Hazard associated with culvert and confined spaces.See work ref.D384/307.Portishead Branch line refurbishment.
POD: PORTISHEAD BRANCH	121	121.0396	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST567714-1-172 William Cowlin & Son Agreement 52524 re sewer under line at site of Ashton LC. Sewage - RAR Code: HBF - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.0396	Hazard Associated With Culvert		All/Multiple Tracks	ST566713-172 Railtrack 3" brick arch also under STD at 0 52 and Tip Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
POD: PORTISHEAD BRANCH	121	121.0406	Hazard Associated With Culvert	Ashton Jnc	Up Main/Fast	Catch pit in UP Cess
POD: PORTISHEAD BRANCH	121	121.0517	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST567714-1-172 Strachan & Henshaw Agreement 85956 re drain running under down side of land W of Ashton Brookalongside existing sewer. Surface Water - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.0438	Hazard Associated With Culvert	Ashton Jnc	Up Main/Fast	Catch pit in UP Cess
POD: PORTISHEAD BRANCH	121	121.047	Hazard Associated With Culvert	ASHTON JNC	All/Multiple Tracks	New catch pit
POD: PORTISHEAD BRANCH	121	121.0502	Hazard Associated With Culvert	Ashton Jnc	Up Main/Fast	New catch pit in UP Cess
POD: PORTISHEAD BRANCH	121	121.0506	Hazard Associated With Culvert		All/Multiple Tracks	ST566716-172 Railtrack 3" conc pipes and brick, also under STD Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
POD: PORTISHEAD BRANCH	121	121.0527	Hazard Associated With Culvert	Ashton Jnc	Up Main/Fast	Catch pit in UP Cess
POD: PORTISHEAD BRANCH	121	121.0748	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST566717-1-172 Wessex Water Agreement 103937 <missing> re surface water culvert under line. Surface Water - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.0847	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST566718-1-172 Wessex Water Agreement 103937 <missing> re surface water culvert under line. Surface Water - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.11	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST565722-1-172 William Cowlin & Son Agreement 60571 <missing> re drain running from Rownham Hill to RT land. Surface Water - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.154	Hazard Associated With Drain	Ashton Gate	Up Main/Fast	New French drain
POD: PORTISHEAD BRANCH	121	121.121	Hazard Associated With Culvert		All/Multiple Tracks	ST566724-172 Railtrack 7"3" Armco arch Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
POD: PORTISHEAD BRANCH	121	121.131	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST566722-1-172 Bristol Corporation Agreement 81758 re sewer under line on skew. Sewage - RAR Code: HBF - HAZARD V.10
POD: PORTISHEAD BRANCH	121	121.1293	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST565722-1-172 Bristol Corporation Agreement 95991 re drain running along/under up side land at Clifton Bridge Station and under line at finish mileage. Surface Water - HAZARD V.10
POD: PORTISHEAD BRANCH	121	125.0605	Hazard Undefined	CLIFTON BRIDGE to MILES DOCK	All/Multiple Tracks	Towpath - strict weight limited is 4T. Vehicles are restricted to the centre of the bridge. Vehicles can only go along the towpath for 70 metres from Clifton Bridge. Beyond this point the erosion of the river bank is within 1 metre of the towpath. Gate to be kept locked at all times to prevent unauthorised access.
POD: PORTISHEAD BRANCH	122	122.0066	Hazard Associated With Culvert		All/Multiple Tracks	ST557746-172 Railtrack 3"6" brick arch on Up side, inlet at 105 78.75 Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
POD: PORTISHEAD BRANCH	122	122.0352	Hazard Associated With Culvert		All/Multiple Tracks	ST548752-172 Railtrack 18" conc pipe. NIBR Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10

<b>POD:</b> PORTISHEAD BRANCH	122	122.1617	Buried Foul Water Service	Ashton Gate	All/Multiple Tracks	ST560740-1-172 Bristol Corporation Agreement 97597 re sewer under line. Sewage - RAR Code: HBF - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	123	123.055	Hazard Associated With Drain		All/Multiple Tracks	ST535756-172 Railtrack 12" square stone Drain <confined space> - RAR Code: HSD - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	123	123.076	Buried Foul Water Service	Avon Gorge/Leigh Woods	All/Multiple Tracks	ST556746-1-172 William Cowlin & Son Agreement 49086 re drain runs under boundary on down side & under line at finish mileage. Surface Water - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	123	123.1479	Hazard Associated With Drain	Drain	All/Multiple Tracks	Hazard associated with drain and Hazard associated with shaft.Work Ref 384/307.Portishead Branch line Refurbishment.
<b>POD:</b> PORTISHEAD BRANCH	124	124.1012	Hazard Associated With Culvert		All/Multiple Tracks	ST518764-172 Railtrack 4" brick barrel Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	125.058	125.0655	Conservation Area			County Site of Nature Conservation Interest < Lake at Ham Green
<b>POD:</b> PORTISHEAD BRANCH	125	125.065	Hazard Associated With Culvert	Pill Tunnel	All/Multiple Tracks	Catch pit
<b>POD:</b> PORTISHEAD BRANCH	125	125.0693	Hazard Associated With Culvert	Pill Tunnel	All/Multiple Tracks	Catch pit
<b>POD:</b> PORTISHEAD BRANCH	125	125.0725	Hazard Associated With Culvert	Pill Tunnel	All/Multiple Tracks	Catch pit
<b>POD:</b> PORTISHEAD BRANCH	125	125.1188	Buried Foul Water Service	Pill Tunnel	All/Multiple Tracks	ST529756-1-172 Woodspring District Council Agreement 105465 re sewer under land parallel to W side of road over tunnel. Sewage - RAR Code: HBF - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	125	125.165	Hazard Associated With Drain		All/Multiple Tracks	ST510761-172 Railtrack 12" square stone Drain <confined space> - RAR Code: HSD - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.0143	Hazard Associated With Drain	PILL STATION	Down Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0177	Hazard Associated With Drain	PILL STATION	Down Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0211	Hazard Associated With Drain	PILL STATION	Down Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0278	Hazard Associated With Drain	PILL STATION	Down Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0345	Hazard Associated With Drain	HSD	Down Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0345	Hazard Associated With Drain	PILL STATION	Up Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0403	Hazard Associated With Drain	PILL STATION	Up Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0456	Hazard Associated With Drain	PILL STATION	Up Main/Fast	CATCHPIT DRAIN
<b>POD:</b> PORTISHEAD BRANCH	126	126.0572	Hazard Associated With Drain		All/Multiple Tracks	ST507760-172 Railtrack 12" square stone Drain <confined space> - RAR Code: HSD - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.065	Buried Foul Water Service	Pill	All/Multiple Tracks	ST520763-1-172 Energis Agreement 69579 re sewer under road at UBr or LC <plan not clear>. Sewage - RAR Code: HBF - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.065	Buried Foul Water Service	Pill	All/Multiple Tracks	ST520763-1-172 Long Ashton RDC Agreement 78472 re sewer under road at UBr. Sewage - RAR Code: HBF - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.0704	Hazard Associated With Culvert		All/Multiple Tracks	ST505759-172 Railtrack 2" stone slab deck Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.0946	Hazard Associated With Drain		All/Multiple Tracks	ST504758-172 Railtrack 12" EW pipe Drain <confined space> - RAR Code: HSD - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	126	126.1474	Hazard Associated With Culvert		All/Multiple Tracks	ST500757-172 Railtrack 2" stone slab deck Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.0044	Hazard Associated With Culvert		All/Multiple Tracks	ST492757-172 Railtrack Twin 4" conc pipes Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.0484	Hazard Associated With Culvert		All/Multiple Tracks	ST489758-172 Railtrack 2"6" stone slab deck Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.0726	Hazard Associated With Culvert		All/Multiple Tracks	ST487759-172 Railtrack 18" stone slab deck Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.0902	Hazard Associated With Culvert		All/Multiple Tracks	ST481762-172 Railtrack 18" stone slab deck Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.132	Hazard Associated With Culvert		All/Multiple Tracks	ST477763-172 Railtrack 6"culvert over Stoke Brook. Constrn? Culverts <confined space> - RAR Code: BBUC or HSL - HAZRAD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.154	Hazard Associated With Drain		All/Multiple Tracks	ST475764-172 Railtrack 12" EW pipe Drain <confined space> - RAR Code: HSD - HAZARD V.10
<b>POD:</b> PORTISHEAD BRANCH	127	127.1738	Hazard Associated With Syphon		All/Multiple Tracks	ST473765-172 Railtrack 24" CI pipe Syphon <confined space> - RAR Code: HSY - HAZARD V.10



Network Rail

**Metrowest**

## GRIP 3 Track Drainage Design Report

W1097B-ARP-REP-EDR-000002

A05 | 12 January 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 243952-00

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## Document Verification

ARUP




<b>Job title</b>		Metrowest		<b>Job number</b>	
				243952-00	
<b>Document title</b>		GRIP 3 Track Drainage Design Report		<b>File reference</b>	
<b>Document ref</b>		W1097B-ARP-REP-EDR-000002			
<b>Revision</b>	<b>Date</b>	<b>Filename</b>			
P01	13 Oct 2015	<b>Description</b>	First draft		
			Prepared by	Checked by	Approved by
		Name	Sinead Lynch	Evangelos Kaffas	Simon Wheat
		Signature			
P02	23 Nov 2015	<b>Filename</b>	2015-11-10_FormA_AiP.docx		
		<b>Description</b>	Comments incorporated from IDC/IDR 20/11/15		
			Prepared by	Checked by	Approved by
		Name			
		Signature			
A01	10 Dec 2015	<b>Filename</b>	2015-12-10_GRIP3_Drainage_Report.docx		
		<b>Description</b>			
			Prepared by	Checked by	Approved by
		Name	Sinead Lynch	Evangelos Kaffas	Rob Snell
		Signature			
A02	22 Mar 2015	<b>Filename</b>	2016-03-22_GRIP3_Drainage_Report.docx		
		<b>Description</b>	Incorporating draft DRNs		
			Prepared by	Checked by	Approved by
		Name	Sinead Lynch	Evangelos Kaffas	Rob Snell
		Signature			

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# Document Verification

Page 2 of 2

<b>Job title</b>		Metrowest		<b>Job number</b>		243952-00	
<b>Document title</b>		GRIP 3 Track Drainage Design Report				<b>File reference</b>	
<b>Document ref</b>		W1097B-ARP-REP-EDR-000002					
<b>Revision</b>	<b>Date</b>	<b>Filename</b>	2016-09-30_GRIP3_Drainage_Report A02.1.docx				
A02	30 Sept 2016		Incorporating draft DRNs				
			<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>		
		<b>Name</b>	Sinéad Lynch	Evangelos Kaffas	Rob Snell		
		<b>Signature</b>					
A03	9 Nov 2016	<b>Filename</b>	2016-11-09_GRIP3_Drainage_Report A03.docx				
		<b>Description</b>					
			<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>		
		<b>Name</b>	Sinéad Lynch	Evangelos Kaffas	Simon Wheat		
		<b>Signature</b>					
A04	9 Dec 2016	<b>Filename</b>	2016-12-05_GRIP3_Drainage_Report A04.docx				
		<b>Description</b>					
			<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>		
		<b>Name</b>	Sinéad Lynch	Evangelos Kaffas	Simon Wheat		
		<b>Signature</b>					
A05	12 Jan 2018	<b>Filename</b>	2018-01-09_GRIP3_Drainage_Report A05.docx				
		<b>Description</b>					
			<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>		
		<b>Name</b>	Keelan Shelton	Evangelos Kaffas	Simon Wheat		
		<b>Signature</b>					

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Pill Station

Potential Existing Outfall from Geoff Kearney

# 1 Introduction

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The Metrowest Phase 1 programme aims to provide half-hourly local service for the Severn Beach line, Bath to Bristol line and to re-open the Portishead line with new stations at Portishead and Pill.

This project will see the passenger service between Parson Street Junction and Portishead Station re-established, which will require the upgrade of existing track, (including track doubling between 4750m to 6480m and 12970m to 13470m) and reinstatement of the disused track between Pill and Portishead.

Arup are contracted to provide design services to enable track classification as track category 4 (current track category 5) and ensure its suitability for increased line-speeds for both passenger and freight services. This involves the assessment / upgrade of permanent-way, drainage, structures, earthworks and other assets along the route.

Track drainage works are proposed and outlined herein, to ensure there is sufficient drainage along the route to facilitate the line speed improvements and adequately drain the track formation. Earthworks drainage are to be covered in the separate earthworks submission.

A GRIP 3 design for MetroWest was completed in January 2017 however following funding reviews a number of changes and this revised GRIP 3 was commenced. This contained a number of amendments to the original scheme including:

- Reduced Service frequency
- Reduced line speed on the POD line to match existing
- Removal of double track at Ashton Junction
- Ashton Gate Level Crossing to be retained
- Renewal of Parson Street Junction to provide a single line connection to the mainline
- Reduction in size of Portishead Station

It should be noted that the track design between Pill viaduct and Portishead Station was signed off under the previous GRIP 3 submission. Any design information between Pill Viaduct and Portishead Station presented in this report is included for completeness only and is not subject to Network Rail review.



## 2 Baseline Information

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### 2.1 Design Standards & Parameters

The following apply for the drainage design on all catchments and are in line with NR/L3/CIV/005 - Railway Drainage Systems Manuals.

- **Return period:** The route between Parson's Street Junction and Portishead Station has been identified as a Primary route and as such, the drainage scheme has been designed for a 1 in 25 year storm event. An additional 20% allowance is made to account for climate change.
- **Spacing between catchpits:** A standard interval of 30m on a straight line has been provided (unless otherwise stated). Where drainage run follows the curve of the track, catchpit spacing may reduce to 15m.
- **Methods for estimating runoff:** Rough calculations using the Rational Method (for buildings/roof canopies) and the "Agricultural Development and Advisory Service" (ADAS) Method has been used to roughly size the drainage. Detailed calculations need to be undertaken at detailed design stage.
- **Self-cleansing velocities:** Pipe gradients have been set to allow Self-cleansing velocities of at least 0.75m/s (full bore flow).
- **Location of drainage from the track:** The minimum distance from the running edge of the nearest rail to the nearest point on the outside face of the catchpits is 1410mm to provide sufficient room for ballast cleaning activities (unless stated otherwise). Any 6-foot drainage will be located with the centreline of the pipe falling exactly between the two tracks.

### 2.2 Hydrological Assessment

Different types of terrain will have different hydrological characteristics:

- **At-Grade:** section of track on generally level ground; drainage requirements are determined by considering underlying geology and overland features.
- **Cutting:** Section of track which is lower than that of the surrounding land; drainage is usually required depending on the geology of the area.
- **Embankment:** Section of track which is elevated above the surrounding land; drainage is usually not required, unless dictated by formation design.
- **Tunnel:** Section of track lying within a tunnel; flows are contributed from either end, groundwater flows or seepage through the tunnel itself.

The stormwater entering the track drainage system is expected to be mainly due to direct and indirect rainfall; where water falls in the vicinity of the perforated system, and where water has travelled overland towards the network i.e. at-grade

and cutting areas. This has been considered when identifying catchments in addition to those with existing drainage which will require positive drainage.

### 3 Visual Inspection & Condition Assessments

A series of visual inspections took place between August and November 2015. The visual survey conducted by Arup engineers was based on Topographical Survey provided by Network Rail.

The aims of this visual inspection assessment were to:

- Determine the connectivity between catchpits;
- Take measurements of pipe diameters and invert levels;
- Assess the condition of the existing drainage in order to make informed decisions on which existing drainage runs can be maintained;
- Split the railway corridor into hydrological catchments;
- Identify unknown outfalls;

The existing drainage surveyed was classified based on its condition as in Table 1.

Table 1: Existing drainage condition descriptions

Condition	Description
Very good	Catchpits in good structural condition with minimum or no siltation, clearly identifiable flow (with no restrictions due to objects or silt) and with clearly identifiable incoming and outgoing pipes.
Good	Catchpits in good structural condition with minimum siltation, clearly identifiable flow (no restrictions due to objects or silt) and with clearly identifiable incoming and outgoing pipes.
Moderate	Catchpits which are in moderate structural condition (minor cracks etc.) Siltation is present but there is no severe obstruction to flow conditions or major pipe diameter loss. Incoming and outgoing pipes were clearly identifiable.
Poor	Catchpits with structural defects. Severe siltation and small to big size objects causing severe obstruction to flow conditions. Root infestation and vegetation growth may also be present. Major pipe diameter loss observed and measurements impeded due to half-buried pipes. There is potential for full buried pipes that were not observed.
Very Poor	Structural defects observed in most cases. Siltation has become so extensive that it forbids flow conditions. Pipes not visible in most cases with connectivity only assumed. Drainage has become fully ineffective.

The discussion and outcomes for each catchment based on this investigation is set out later in this report.



## 4 Catchment Overview

The drainage proposals in this report are analysed and documented on a catchment basis; a catchment has been defined as a drainage network which discharges from the Network Rail corridor to a single unique outfall. Catchments are suffixed UNK (unknown catchment) where no records of existing drainage/outfall exist and no proposed drainage is recommended. A desk study based on the Track Bed Investigation reports, Track Condition reports, site observations and historic observations (from Network Rail Asset Management) has been undertaken to determine the recommendations detailed herein. Table 2 provides an overview of each catchment; detailed assessments are outlined in following sections. A low cess strategy is recommended to be implemented in all areas that lack track drainage. See Appendix A1 for a catchment key plan.

Table 2: Catchment Overview. Note: all chainages relative to the proposed Down Portbury Centreline.

Cat ID	Chainage	Hydrology Assessment	Existing Drainage	Location of proposed drainage	Proposed Outfall locations	Track Bed Investigations
CAT1.1 Parson St Station	120mi 589y (3735m) to 120mi 200y (3382m)	This is an at grade catchment.	Existing 10-ft drain crosses to the 6-ft at the platform (3610m) and continues to an outfall East of Parson Street O/B. The drainage is in poor to moderate condition Up Relief Drainage to be investigated at next GRIP stage.	None. See Section 5 for justification.	N/A	N / A
CAT 1.2 Parson St. Junction	120mi 593y (3738m) to 120mi 1667y (4078m)	This catchments falls predominantly at-grade, with some areas falling within a cutting.	Existing 6-ft drain outfalls via a UTX to a make-shift infiltration device. The drainage condition is poor. The existing drainage clashes with the proposed track design and therefore will be replaced by proposed drainage; the infiltration outfall is to be abandoned.	New drainage is being proposed at approx. 3738m and continues in the Up Portbury cess before crossing to the 6-ft via UTX at 3948m for clearance inside of Coal Pit Lane OB. The run continues before crossing via UTX to the outfall at the Dn Portbury cess at 4078m	NR surface water sewer running in Dn Portbury cess. Further investigation of the outfall is recommended to take place in the next design phase.	TBI holes 01-03 TBI investigations identified dirty and slurried ballast with wet material found at 850mm below rail level (120mi 77y)

				Proposed tracks also encroach on existing surface water sewer which is a NR asset. Sewer diversion to be progressed at detailed design stage.		
CAT 1UNK	120mi 1667y (4078m) to 121mi 374y (5140m)	This catchment falls predominantly at-grade with some areas falling within a very shallow cutting.	N/A	None. See Section 7 for justification.	N/A	TBI holes 04-16 TBI investigations identified very dirty ballast, some cohesive and slurried. Wet material was identified at localised points (0.72m below rail level at 121mi 0y and 0.53m below rail levels at 121mi 222y)
CAT 2 Ashton Gate	121mi 374y (5140m) to 121mi 539y (5290m)	This catchment falls predominantly at-grade with some areas falling within a very shallow cutting.	Existing drainage located within the cess of the Down Portbury line. The condition of the drainage is unknown. The chambers were not accessed (solid lid with torx bolts)	None. See Section 8 for justification.	N/A	TBI holes 17-8 TBI investigations identified dirty ballast and wet material 0.58m below rail level at 121mi 550y.
CAT 2 UNK	121mi 539y (5290m) to 122mi 1133y (7430m)	This catchment falls within a highly variable terrain predominantly lying upon an embankment with sections of cutting intermittently occurring on one side of the track.	N/A	None. See Section 9 for justification.	N/A	TBI holes 19-45 TBI investigations identified dirty ballast throughout the catchment with some wet material and standing water found 0.78m below rail level at the low mileage end of the catchment (121mi 663y / approx. 5400m)



CAT 3 Clifton Tunnel 2	122mi 1133y (7430m) to 122mi 1425y (7695m)	This catchment falls within a tunnel; flows are contributed from seepage within the tunnel itself as well as some contributing runoff from directly outside of the tunnel.	An existing 3-catchpit drainage network run lies within the Dn Portbury cess of the tunnel with no outfall.  This drainage run is believed to be in poor condition as no outfall has been provided.	None. See Section 10 for justification	N/A	TBI holes 46-50  TBI investigations identified dirty to very dirty (mostly non-cohesive) ballast. No wet material or standing water was found.
CAT 3.1UNK	122mi 1425y (7695m) to 124mi 1309y (10790m)	This catchment passes through very variable terrain with areas of steep rock cliff to one side of track, high embankments and through a tunnel.	N/A	None. See Section 11 for justification.	N/A	TBI holes 51-96  TBI investigations across this very large catchment show very dirty (non-cohesive) ballast underlain by coarse ash up to 123m 880y before ballast condition deteriorates to a much more cohesive dirty ballast. There are some occurrences of stiff clay approximately 0.7m below rail level however no wet material or standing water was observed throughout.

CAT 3.2UNK	124mi 1309y (10790m) to 125mi 534y (11685m)	This catchment falls predominantly within a steep cutting (Cage Cutting) contributing overland flows to the track drainage; at higher mileage, the track runs across an embankment and viaduct.	N/A	None. See Section 12 for justification.		TBI holes 97-105 TBI investigations identified very dirty ballast (cohesive underlain by non-cohesive) throughout, with no evidence of wet material or standing water.
CAT 4 Pill Tunnel	125mi 534y (11685m) to 125mi 1474y (12540m)	This catchment falls mostly within Pill Tunnel with some contributing flows likely from the cutting outside both ends.	There is existing high installation drainage running in both cess along the length of the Tunnel. Towards the low mileage end, the drains meet via UTX in a chamber before continuing in the Up Portbury cess and discharging off track at approx. 11822m.	None. See Section 13 for justification.	Large sedimentation chamber off-track at approx. 11822m. From there the flows are directed to a sedimentation tank located under the viaduct arch and the final discharge point is a fish lake located below the track.	TBI holes 106-16 TBI investigations identified slightly dirty (following recent renewal) and very wet ballast throughout the tunnel catchment, with evidence of standing water ranging from approx. 0.85m below rail level at 125mi 1232y to approx. 0.52m below rail level and 125mi 858y.
CAT 4UNK	125mi 1474y (12540m) to 126mi 193y (12975m)	This catchment falls within a cutting at low mileage before passing over an embankment (and viaduct) towards the end of the catchment.	N/A	None. See Section 14 for justification.	N/A	TBI holes 117-22 TBI investigations identified very dirty ballast with wet material found locally at TBI 119 (125mi 1732y) and TBI 121 (126mi 57y) approx. 0.65m below rail level.



CAT 5 Pill Station	126mi 193y (12975m) to 126mi 594y (13340m)	This catchment is located within a cutting contributing overland flows to the track drainage.	Existing drainage runs in the right cess before crossing to the left cess at the start of the platform. An outfall has been identified in previous survey however this does not tie up with observations on site (to be confirmed at next GRIP stage). The condition of the drainage is good. The existing drainage clashes with the proposed track design and therefore will be replaced by proposed drainage.	New drainage is proposed in both cess from 13320m before both crossing to the 6ft at approx. 13199m. It continues through the 6-ft until 12948m where it crosses back to the Up cess and continuing to a final catchpit at 12960m.	Unknown.	TBI holes 123-5 TBI investigations identified very dirty (cohesive) ballast at both extents of the catchment, with less dirty ballast between. No wet material or standing water was identified by TBI.
CAT5 UNK	126mi 512y (13320m) to 129mi 440y (18000m)	This catchment is located predominantly at-grade or on top of an embankment.	N/A	None. See Section 16 for justification.	N/A	TBI holes 126 – 145 TBI investigations identified very dirty ballast throughout the catchment mostly underlain by coarse granular material. No wet material or standing water was identified by TBI.
CAT6 Portishead station	129mi 362y (18010m) to 129mi 715y (18250m)	This catchment is predominantly at grade.	N/A	New drainage is proposed in the down cess from 18010m to 13130m before outfalling off-track via UTX. New drainage is also proposed from 18250m in the Dn cess (and new platform drainage) which will outfall at the same point.	New outfall proposed to existing concrete-lined ditch ("The Cut Gordano") at approx. 25m off track at 18120m.	No TBI data available.

Using topographical information and GIS ArcMap, contributing areas will be identified for each catchment and used to generate flow outputs using the ADAS method at detailed design stage. Detailed description of each catchment follows below.

## 5 CAT1.1

This section of track is located mostly at grade and runs through Parson Street Station.

A topographical survey is available for this area providing catchpit locations and cover levels. Anecdotal information has been made available by Network Rail's Asset Management team for the outfall of this catchment.

### 5.1 Existing Drainage

19 catchpits were identified by the topographical survey installed on average every 20m. The drainage runs starts at 3735m within the 10-ft between existing Bristol Up Main and Up Relief and continues to 3610m where it crosses via UTX into the Main 6-ft through the station.

The track drainage appears to be in **poor condition**. The pipes appear to be solid wall perforated pipes with partial diameter loss noticed due to heavy siltation within the system. The catchpits are concrete frames with a mixture of concrete slab and steel screen covers (See Figure 1.) The drainage appears to be installed quite high despite the existing track crossing over the drainage system near the head of the run. The condition of the concrete chambers is generally poor with displaced and broken frames, and considerable siltation noted throughout.



Figure 1: Indicative CAT1.1 catchpit condition

Discussions with Network Rail Drainage Asset Management Team have identified that the drainage run through the station (6-ft drain) is under a separate remit to be rehabilitated and **not** as part of the proposed Phase 1 works.

There is an additional drain run in the Up Relief 6-ft between 3440m and 3560m which was not surveyed by the design team at this stage; this should be further investigated at the next GRIP stage.

The proposed rail alignment **does not affect** any of the existing catchpits and therefore a new drainage system is not required.



## 6 CAT1.2

This section of track is located mostly at-grade with some contributions from a cutting at the junction.

A topographical survey is available for this area providing catchpit locations and cover levels. Anecdotal information has been made available by Network Rail's Asset Management team for the outfall of this catchment.

### 6.1 Existing Drainage

12 catchpits were identified by the topographical survey installed on average every 20m located within the 6-ft.

The track drainage appears to be in **poor condition**. The pipes are solid or twin wall perforated pipes with partial diameter loss noticed, and the catchpits are concrete frames with steel screen covers (See Figure 2.) The drainage appears to be installed very high (close to sleeper level) and the structural condition of the chambers is generally poor with displaced and broken concrete frames.



Figure 2: Indicative CAT1 catchpit condition

The track drainage outfalls to a make-shift infiltration device next to the live railway. Mark Howells (Network Rail Senior Drainage Engineer) has confirmed that this is a large hole filled with ballast, underlain by impermeable Mercia mudstone and is therefore not a functioning outfall. This outfall arrangement is likely to flood during 1 in 50 year storm events posing a risk to the existing and proposed track works.

TBI records indicate very dirty and very wet ballast conditions suggesting the existing drainage is not functioning satisfactorily.

### 6.2 Proposed Drainage

The proposed track works encroach on the existing drainage therefore new drainage is required through the catchment.





require extension of the proposed track drainage to meet a point further downstream (NR confirmed this remains their asset to 4225m). This asset is to be further investigated at detailed design.

## 8 CAT 2

This section of track is located mostly at-grade.

A topographical survey is available for this area providing catchpit locations and cover levels.

### 8.1 Existing drainage

The existing drainage stretches from 5140m to 5290m, lying predominantly at-grade. The existing drainage is located in the Dn Portbury cess and drains from both ends of the catchment toward a central catchpit at approx. 5215m before discharging off-track to a concrete lined ditch running parallel to the track. 6No. AQUA SE Ø680mm catchpits with solid wall pipes were identified on site.



Figure 4: a) Outfall to concrete lined ditch, b) Route showing AQUA SE catchpits in the Dn cess (handrail to LHS of picture is on top of the outfall ditch). Note the lids have now been changed for grated steel lids.

The existing drainage has not been visually inspected due to difficulties in accessing the chambers. The drainage appears to relatively new, is believed to function satisfactorily and according to Mark Howells (Network Rail Senior Drainage Engineer) has not caused problems in the past.

The existing Aqua SE type catchpits are sufficiently far from the sleeper edge as to not pose a risk.

#### 8.1.1 Additional Drainage Features

There are 4No. existing gullies draining Ashton Gate level crossing. These appear to be adequate for draining the highway as there is no evidence of instances of flooding at this location and it is not anticipated that this system interacts with the

track or track drainage. TBI records also show no evidence of increased sedimentation introduced to the track from the highway however it cannot be determined at this stage whether or not this would be the case during a large storm event.

An existing foul sewer has been identified from Wessex Water asset maps as running below the proposed lines (See Figure 5). No catchpits, or evidence of this asset was found on site.



Figure 5: Existing Foul Sewer appears to lie below location of proposed Dn Portbury line

It should also be noted that Japanese Knotweed has been identified in the vicinity of the existing ditch headwall close to the level crossing. A risk note has been added to the P-Way drawings to ensure that this is considered during construction.

## 8.2 Proposed drainage

No proposed drainage is recommended in this area, as the existing drainage is in a good condition and is not affected by the proposed works.

## 9 CAT 2UNK

This catchment stretches from the boundary of Catchment 2 at 5330m to the boundary of Catchment 3 at 7430m. This catchment section of track falls within a highly variable terrain suggesting highly variable hydrology throughout; there appears to be free flow paths across the track and off embankments throughout the



catchment. The topographical survey showed no indication of existing drainage throughout the catchment, whilst the TBI identified no presence of standing water with only two occurrences of localised wet material most likely attributable to the poor ballast condition.

As such, this section is expected to drain freely. In addition, the trackbed is being renewed and lifted by 150-200mm throughout the catchment therefore the low cess will act as a natural drainage path away from the formation.

No new drainage system is proposed within the boundary of this catchment.

## 10 CAT 3

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This catchment falls within Clifton Tunnel 2 where flows are contributed to the track drainage from seepage within the tunnel itself as well as some contributing runoff from directly outside of the tunnel at both high and low mileage ends. An existing drainage network has been identified on topographical survey however no data has been found on the outfall.

### 10.1 Existing Drainage

The 3No. existing drainage catchpits appear to be AQUA SE Ø680mm chambers with steel covers. No visual inspection of the drainage took place as there were difficulties accessing the chambers. No outfall has been identified on topographical survey nor by visual inspection suggesting that this drainage network is **non-functioning**.

TBI records show no indication of wet material or standing water at surface or below ground which would suggest no drainage issues. However, historical wetbeds have been observed at the low-mileage end of the tunnel.

### 10.2 Proposed Drainage

During GRIP 3 design, discussions with Network Rail asset management team suggested that works were planned to address this issue therefore no additional drainage proposals were made.

This is to be reviewed at the next GRIP stage.

## 11 CAT 3.1UNK

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This catchment extends from the boundary of catchment 3 at 7695m to the start of Cage Cutting at 10790m. As per CAT 2UNK, this section of track transverses highly variable terrain, with areas of steep rock cliff to one side of the track again expected to have free flow routes across track and down a high embankment on the other side.

The topographical survey shows no indication of existing track drainage, with most rainfall expected to runoff the embankments. Recent TBI records show very dirty, cohesive ballast likely to be due to fallen vegetation in the area. Some of the ballast appears to be underlain by a stiff clay however, no wet material or standing water was observed throughout the catchment.

From this, it is expected that the area drains freely and along with the proposed track lift through the catchment, no new drainage is proposed.

## 12 CAT 3.2UNK

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This catchment extends from 10790m to 11685m, covering a large steep cutting which runs throughout the catchment. No existing drainage exists according to topographical survey and site visits within the cutting.

Track condition reports have noted wet beds potentially causing pumping erosion of the underlying material at points throughout the cutting, most notably in the vicinity of the Chapel Pill Ln Overbridge at 11170m, however no wet material or standing water was encountered on the TBI records.

Following further examination of the TBI records, it appears that the very dirty and cohesive ballast is underlain by non-cohesive material, sufficiently deep to minimise the risk of significant erosion and deterioration of the underlying geology (Mercia Mudstone). While there has been instances of standing water appearing at the surface, it is expected that this does drain down and out of the cutting albeit slowly due to the levels of fines close to surface caused by vegetation growth and detritus. With ballast cleaning, it is anticipated that any wetbed issues will dissipate.

It is also important to note that due to the steepness of the cutting itself, the contributing area is relatively small, with the adjacent land and associated runoff falling away from the banks of the cutting.

If drainage were to be installed, there would be significant risks associated:

a) Outfall to Ham Green fishing lakes

The only outfall option would be to run drainage to the Ham Green fishing lakes at 11770m. Due to the geology of the cutting and the levels of dirty ballast, this would risk increasing significant levels of silt into the drainage system which would ultimately outfall to the lakes. Without substantial intervention (sedimentation traps/chambers) this could cause death of fish within the lakes and even with intervention, may not be accepted by the local authorities.

b) Long drainage runs

Due to the length of the cutting, there is a risk that the long drainage runs would not meet the self-cleansing gradients and therefore will require a high maintenance regime in order to maintain functional.

c) Narrow cess



In some instances, the cess is too narrow to install a catchpit the 1.41m from nearest running line as is recommended by NR/LS/CIV/005/2C. 4-ft drainage, non-standard catchpits and/or interaction with earthworks would have to be investigated.

This assessment as discussed and agreed with Rob Emmons Network Rail Project Engineer (see Appendix B2 for minutes) concluded that the cutting is free-draining and although slow, does not pose a significant risk to the trackbed to require the high-risk/high-cost drainage installation that it would require.

Therefore, no formal track drainage is proposed throughout this catchment; note a **low cess** (minimum 0.5m below rail level) is proposed at the request of Network Rail.

## 13 CAT 4

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Catchment 4 covers a drainage network within Pill tunnel. The tunnel base is lined (approx. 480mm below rail level) and a high installation of perforated pipes in each cess starts at approximately 12450m carrying drainage down mileage to an outfall chamber in the Up cess at 11904m; a short section of drainage in the 4-ft at the low mileage end of the tunnel has been identified on as-built drawings however is expected to be non-functioning. An additional section of track lying within a cutting at the low mileage end drains toward the same outfall via a 3-catchpit drainage run starting at the Up cess at 11840m.

A topographical survey is available for this area providing catchpit locations and cover levels for the drainage run at the low mileage end of the tunnel, and chamber locations with some invert/soffit levels for the drainage within the tunnel.

The outfall chamber discharges to a large silt buster chamber located off-track at 11830m from where it discharges to a clarification tank below the arch of the bridge at 11790m. The final outfall is the fish lake under the viaduct.

### 13.1 Existing Drainage

The drainage systems within Pill Tunnel is installed very high, with sections of exposed pipes observed at the surface or laid with very shallow cover. As such there is evidence of blockages and partially collapsed pipes (Figure 6). It is believed that these pipes have been embedded in concrete; it appears the bed may not have been laid level throughout causing the pipe to be raised in places.



Figure 6: Indicative of high installation and resulting damage to drainage pipes

Downpipes intermittently collect water from the roof of the tunnel and discharge into the drainage system either directly into the informal chambers (see Figure 7) or straight onto the cess (figures x); there was also evidence of flows from the roof falling directly onto the 4-ft and cess.



Figure 7: Informal chambers within Pill tunnel; observed as twin wall pipes with top half cut out with concrete frame and steel grate.

The high installation in the Down cess appears to have little to no flow, whereas the Up installation shows evidence of flow and excessive siltation (Figure 8). From as-built drawings and signage outside of the tunnel, the undertrack lining is expected to be 480mm below rail level and appears to be in moderate condition.





Figure 8: Rodding points in the Up cess showed extensive siltation within the system

The 3-catchpit drainage system installed in the Up cess at the low mileage end of the tunnel appears to be in good condition, with little to no siltation observed on site (no photos available).

### 13.1.1 Existing Outfall

All drainage runs outfall to an existing 1200mm x 600mm chamber in the Up cess at 11904m. There are extremely high levels of siltation evident; a petrified valve seen in Figure 9 appears to have been installed to allow flows to drain toward a series of sedimentation and clarification tanks prior to discharge to the fish lakes under the viaduct at approximately 11790m.



Figure 9: Outfall chamber and clarification tank respectively.

TBI records unsurprisingly show very wet material and standing water throughout the tunnel with the lowest point occurring at approx. 11995m (85m into the tunnel). No wet material or standing water was observed outside of the tunnel.

### 13.1.2 Proposed Drainage

Due to the amount of water within the tunnel and the high installation of drainage there is potential for water and silt to sit within the formation and lead to subgrade deterioration.

Installing track slab would mitigate this risk, however was deemed to be prohibitively expensive following discussions with Network Rail. It is therefore proposed that Network Rail **increase the maintenance regime** of the drainage run and silt buster to clear blockages caused by siltation, reduce the amount of silt and water sitting within the formation and reduce the risk of pollution by siltation to the Ham Green lakes. A new maintenance access point is proposed to facilitate this at the up mileage end of the tunnel.

The gauging through the tunnel is already close to limiting values therefore a raised walkway cannot be installed. Further consideration should be given to providing safe excavation routes at the next GRIP stage.

## 14 CAT 4 UNK

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This catchment extends from the high mileage end of Pill Tunnel (12540m) toward the viaduct outside of Pill Station (12975m) falling within a cutting a low mileage end before passing over an embankment and viaduct towards the end of the catchment. The topographical survey shows no indication of existing track drainage. Recent TBI records show very dirty ballast, and some wet material found at approx. 0.5m below rail level at 125mi 1732y (TBI 119) and 126mi 57y (TBI 121). It is and most likely attributable to the underlying clay localised to these TBI holes and therefore is not indicative of this catchment.

It is expected that the area drains freely and as such, no new drainage is proposed.

## 15 CAT 5

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Catchment 5 stretches through Pill Station from 12975m to an anticipated outfall at 13260m falling between a cutting/retaining walls structures.

A topographical survey is available providing catchpit locations and cover levels for most catchpits in the system.

### 15.1 Existing Drainage

The existing drainage starts at 12978m in the Up cess collecting track drainage and flows from the adjacent Network Rail land off Monmouth Road before crossing via UTX to the Down cess at 13167m. The drainage run continues through the station to a final catchpit at 12982m where the pipe has been observed to lead off in an easterly direction away from the track; this has not been confirmed as an outfall.

Recent evidence (see Appendix D) provided by Geoff Kearney (Network Rail Track RAM) indicates that the outfall for this catchment may be under the car park area at 13268m where the head of the drainage run is thought to be. A CCTV investigation from the existing drainage catchpit at 13268m towards the car park area and downstream of the existing catchpit at 12981m at detailed design stage is recommended to confirm the existing outfall.



8No. rectangular catchpits with concrete frames and blue GRP lids have been identified and visually assessed on site which appear to be mostly free from structural defects.

The first catchpit found by topographical survey as verified on site, is **not** the head of the run as an additional pipe was observed coming in from high mileage. It is expected that any upstream catchpits have been buried. This catchpit also has incoming pipe from the adjacent unused (public owned) land; a gully observed on site appears to divert contributing flows from this area into the track drainage system.

There is considerable siltation observed in the downstream catchpits and despite TBI records indicating no wet material or standing water underneath the existing track, there is a very wet area with standing water observed between 13010m and 12930m which suggests that the drainage is not fully functioning, possibly due to pipe blockage or collapse (See Figure 10).



Figure 10: a) Final catchpit (condition indicative of all d/s catchpits)  
b) standing water observed within the cess

The final existing catchpit (Figure 10) shows an outgoing pipe heading East under the existing track however, this is not anticipated to be a short blind ended section of pipe and not the existing outfall. This is to be confirmed at the next GRIP stage.

## 15.2 Proposed Drainage

The new track encroaches on existing drainage therefore new drainage is proposed throughout the catchment to address the wet bed issue and account for increased impermeable areas (new station structure).

A new drainage run will start at 13320m in both cess and cross into the 6-ft at 13199m. From here it will continue within the 6-ft until 12948m. The outfall arrangements from that point onward is described below in Section 15.2.1

There are three existing gullies within the land adjacent to the head of the run. This land is to be developed into a car park (design by C2HM) and therefore the proposed drainage and connections points are yet to be confirmed.

Proposals do not provide provision for a future connection for drainage from the car park. A Petrol Interceptor would be required to intercept flows prior to discharging to the track drainage network and a formal agreement will need to be made between the land owner (North Somerset Council) and Network Rail regarding discharge to track drainage. Any connections will be confirmed at detailed design stage.

Drainage is proposed to drain the new station (including earthworks) which will again discharge to the track drainage; see W1097B-ARP-DRG-EDR-050101 for details. The increase in impermeable area has been factored into the contributing area for the track drainage.

### 15.2.1 Outfall

No outfall could be conclusively determined at this stage; additional survey is recommended at detailed design stage to confirm outfall and address accordingly.

Reviewing the system gradients, a low mileage outfall was anticipated, however recent survey (Appendix D) suggests that the outfall lies towards the head of the run (13268m) from an existing track drainage catchpit towards the car park area in the north. As discussed with the project team, a low mileage outfall is preferred at this stage due to the favourable gradients which can be achieved.

It is proposed to carry flows from the last catchpit off the viaduct and down into a new drain along Underbanks before ultimately discharging to the River Avon via a new outfall. Topographical survey at the proposed outfall location will be required at detailed design stage.

It should be noted that this design proposal will require buy-in from the council highways team as well as the Environment Agency (EA) due to the extent of the works. In addition, the proposals interact with an EA Flood Defence.

Initial discussions with the EA have confirmed that Flood Defence Consent will be needed for the outfall and should be pursued at detailed design stage; refer to C3 for correspondence. As this is a tidal outfall, the requirement for attenuation is not anticipated, however this will be confirmed under the conditions of the FDC during application.

Due to the flood sensitivity of the area, the drainage network is to be designed (at detailed design stage) to ensure that it does not increase flood risk to the area. At this stage, based on best available data, it is believed that the network would not compromise the effectiveness of the existing flood defences in the instance of a flood event, however this is **not confirmed**. It is recommended that further consultation with EA and investigation is undertaken during detailed design.

## 16 CAT 5 UNK

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Catchment 5 stretches from Pill Station at 13320m to Portishead Station at 18000m. The catchment falls predominantly at grade, or over an embankment.



The topographical survey shows no evidence of existing drainage networks, as was confirmed by multiple site visits. Recent TBI records show poor ballast conditions throughout with organic soils overlaying the ballast in areas as expected of a disused track. No wet material or standing water was found throughout the route suggesting that the area is draining well; no new drainage is proposed.

Following discussion with Network Rail, the following recommendations are made:

- A low cess is to be installed throughout (approx. 0.5m below rail level where possible) especially in the vicinity of Marsh Lane, Sheepway and Portbury Dock overbridges;
- All existing ditches to be cleared out and re-graded to maintain their function in draining the railway corridor;
- It is assumed that all but two culverts are replaced fully to ensure they are capable of withstanding the loads imposed by the proposed works in line with the recommendations made in W1097B-ARP-REP-ETR-000002.

## 17 CAT 6

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The topographical survey show no evidence of existing drainage within the area, as visually verified by Arup engineers on site.

The proposed works in the area (new station and overbridge) will significantly increase the impermeable surfaces in the area, thus increasing the runoff contributing to the track area. It is proposed to install new track drainage in order to cope with these increased flows.

### 17.1.1 Proposed Drainage

New track drainage is proposed to run through the extent of the new works starting at both 180010m and 18250m in the Down Portbury cess, continuing to 18099m where the run crosses via UTX to a large chamber off track which collects both track and station drainage. From here, flows are conveyed by carrier drain to the outfall as detailed below.

As confirmed by North Somerset Internal Drainage Board (NSIDB), no attenuation is required prior to discharging to the outfall; see Appendix C2.

Where existing ditches are being filled to facilitate other works (Gallingale Footbridge) a proposed filter drain with a 450mm diameter pipe at the bottom will receive the ditch flows and allow for a clear path towards the track drainage outfall. A full topographic survey of this ditch is to be carried out at detailed design stage in order to ensure that the existing capacity is retained in the new system. This drain is to be adopted by the council / NSIDB; an agreement should be pursued between NR / Council / NSIDB over the maintenance and responsibility of the pipe downstream of where all drainage systems meet.

For station drainage, please refer to W1097B-ARP-DRG-EST-101101 (Portishead Station Layout Plan.)

### 17.1.2 Outfall

It is proposed to outfall to The Cut (Gordano), a concrete lined channel which lies to the North of the proposed railway and carries flow out towards the EA Main River (name unknown).

This is a tide-locked channel under the responsibility of North Somerset Drainage board (NSDB). Initial discussions with NSDB have agreed that the outfall of track and station surface water drainage to “The Cut” is acceptable in principle without additional attenuation. NR are still to notify the EA of any works during the detailed design phase as there are EA assets (Portbury ditch) in the vicinity although the NSDB remain the consenting authority.

In order to meet this outfall, the proposed drain crosses a Wessex Water foul rising main and HV cables which appear to run parallel to the track. No level details have been found for these assets therefore the potential of a clash is an inherent risk in this Form A design. It is recommended that the asset is located via slip trench at detailed design.

An alternative option is to outfall to the upstream end of the Ø1055mm concrete culvert to the South of the railway which ultimately discharges into The Cut. This option would remove the risk posed by the rising main and HV cables without need for additional survey at detailed design stage, however would introduce siltation and additional flows into the upstream end of the culvert which would be of concern to the NSIDB. Furthermore, the NSIDB wish to see attenuation of flows should this option be pursued, however there is limited space in which to achieve this further complicating the arrangement.

Discussions are ongoing with the NSIDB to determine whether this will be acceptable in principle to them; it is noted that this is the preferred outfall option for Network Rail. For correspondence, please see Appendix C2.



## 18 Discharge Consents

For all proposed drainage works, consent is required to discharge into existing assets by the asset owner/responsible party:

- North Somerset Internal Drainage Board (NSIDB):

Portishead station and much of the disused railway lies within the remit of the NSIDB and therefore any works proposed to alter the drainage provision for the area requires their consent (as per the Land Drainage Act). This includes any new track or station drainage as well as any works impacting on existing ditches/channels and culverts.

- North Somerset Council (NSC):

North Somerset Council have statutory powers under the Land Drainage Act for ordinary watercourses (outside of the NSIDB boundary); any overland discharges or works to ditches/channels and culverts should be agreed and consented with them via Land Drainage Consent (LDC) process.

- Environment Agency (EA):

Flood Defence Consent (FDC) is required from the EA for any works to, or within 8m of an EA asset or classified 'Main River'.

Table 3: Discharge Consent Summary

Catchment	Consent Required	Responsible Party	Other Interested Parties
CAT 1.2 Parson's Street Junction (II)	✓	Network Rail	
CAT 5 Pill Station	✓	EA (FDC)	NSC Highways (notify if works to take place in road)
CAT 5UNK Pill to Portishead			NSIDB / NSC (notify about works to existing ditches)
CAT 6 (UNK) Portishead Station	✓	North Somerset Drainage Board (LDC)	EA (notify)

It should be noted that if existing outfalls are retained, new consent may not be required but all parties should be notified of the proposals during detailed design stage.

## 19 Water Quality

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Discussions with the EA have confirmed that the discharges of storm water as proposed do not pose a significant risk to the receiving watercourses in question, however the EA will provide a final view on a site-by-site basis following submission of detailed designs for consent application.

Water quality is of greatest concern between Pill and Portishead, where the proposals see a new line potentially introducing pollutants to the watercourses.

- At Pill, the EA have confirmed there is no significant risk however will review following submission of the Flood Defence Consent.
- At Portishead, the North Somerset Internal Drainage Board have already approved proposals in principle to discharge to 'The Cut' and confirmed that there is no need for attenuation or petrol interceptors.

Throughout the whole line, it should be noted that where the proposals cause a risk of introducing excessive siltation to receiving watercourses, an increased maintenance regime has been recommended to Network Rail to mitigate such risk.

In addition, the ballast will act as an interceptor for any potential oil spills, and as it is not expected that trains will discharge waste onto the track it is not anticipated that any significant pollutants will enter any watercourses due to the track proposals.



## 20 Key Risks

The key drainage risks which have not been possible to resolve in this Form A submission are summarised below in Table 4.

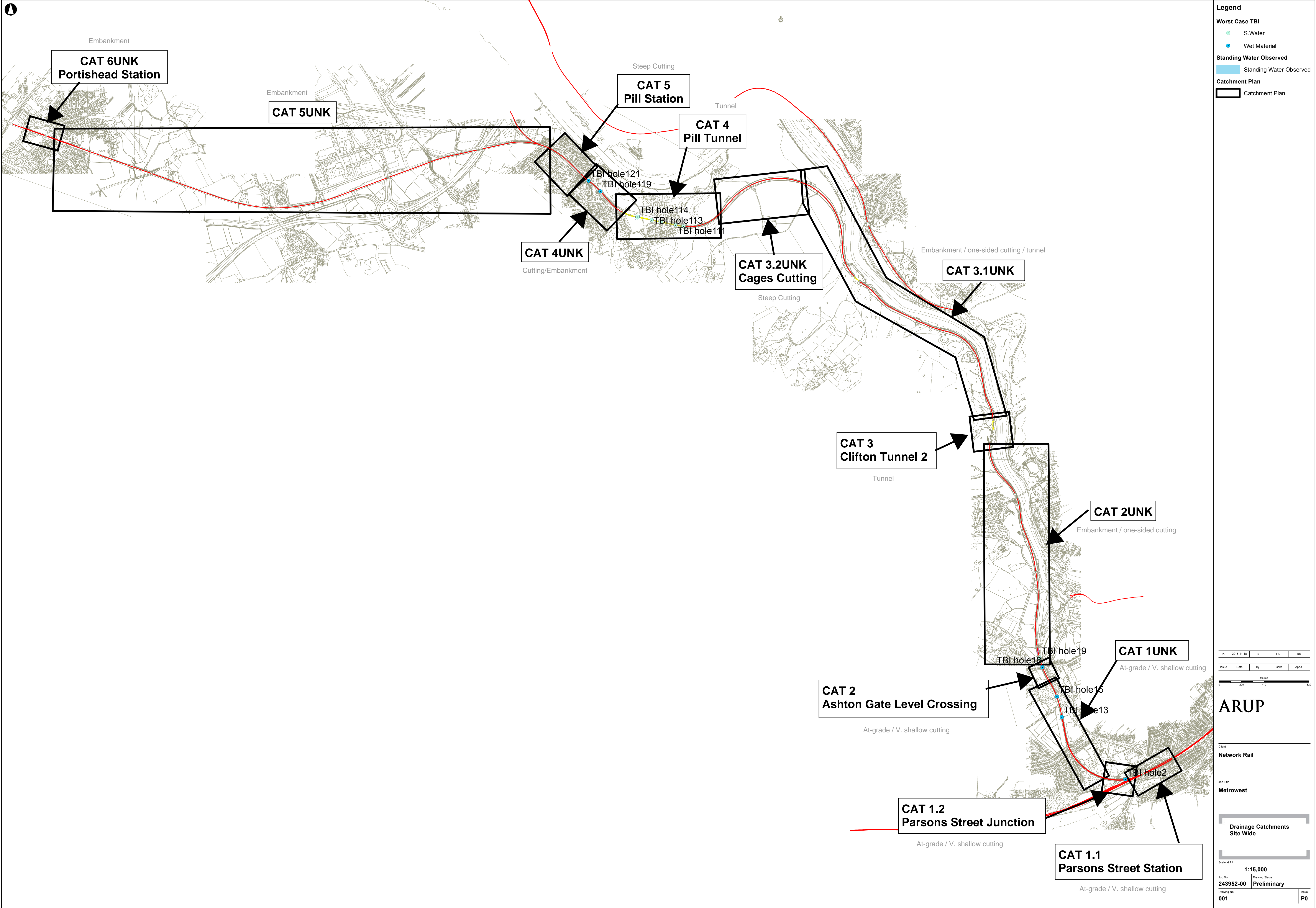
Table 4: Key Risks

Catchment	Key Risk	Mitigation at Form A	Mitigation at Form B
<b>CAT1.2</b> <b>Parson's Street Junction (II)</b>	Unconfirmed system with no data on levels, condition or capacity.  Proposed rail alignment encroaches on the expected sewer alignment.	Risk of sewer diversion requirements identified for worst-case cost considerations.	CCTV and trail pits to be undertaken at GRIP 5
<b>CAT3</b> <b>Clifton Tunnel 2</b>	No outfall therefore drainage deemed non-functioning	No works proposed at Form A on understanding that this would be addressed by Network Rail.	None.
<b>CAT4</b> <b>Pill Tunnel</b>	Poor condition drainage throughout	No permanent works proposed as agreed with NR. Recommendation made that maintenance regime is increased.	Jetting and CCTV survey to prove condition at NR request.
<b>CAT5</b> <b>Pill Station</b>	Existing OFL has not been confirmed.	Risk highlighted and initial discussions had with EA about new outfall to River Avon.	CCTV survey to identify OFL and assess condition at GRIP 5
<b>CAT6 (UNK)</b> <b>Portishead Station</b>	Proposed OFL will require drain to cross Foul rising main (Wessex Water asset) and HV cables. No information found on these assets yet.	Early engagement with asset owners	Survey (slip trench) at GRIP 5 to determine location/depth of these assets OR  Agreement with NSIDB to use alternative outfall (South of Railway).

## Appendix A

### Form A Proposals







# A1 Catchment Map

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## A2 Track Drainage Drawings

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The Form A track drainage proposals are presented in the following drawings, in line with the recommendations discussed within this report. Drawings are appended to Appendix A of the Form A report.

Drawing No.	Rev.	Drawing Title
W1097B-ARP-DRG-EDR-000101	A05	Parson Street Station (CAT 1.1) General Arrangement
W1097B-ARP-DRG-EDR-000102	A07	Parson Street Junction (CAT 1) General Arrangement
W1097B-ARP-DRG-EDR-000111	A06	Parson Street (CAT 1) Manhole Schedule
W1097B-ARP-DRG-EDR-000501	A05	S050 Pill Station (CAT 5) General Arrangement
W1097B-ARP-DRG-EDR-000511	A05	S050 Pill Station (CAT 5) Manhole Schedule
W1097B-ARP-DRG-EDR-000601	A04	Portishead Station (CAT 6) General Arrangement
W1097B-ARP-DRG-EDR-000611	A02	Portishead Station (CAT 6) Manhole Schedule
W1097B-ARP-DRG-EDR-001001	A03	Drainage Details Sheet 1
W1097B-ARP-DRG-EDR-001002	A03	Drainage Details Sheet 2
W1097B-ARP-DRG-EDR-001003	A03	Drainage Details Sheet 3

## Appendix B

### Drainage Review with Network Rail - Minutes



## **B1 Form A Drainage Review [2015-10-30]**

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# Minutes

# ARUP

Project title	Metrowest	Job number 243952-00
Meeting name and number	Track Drainage Meeting (Form A)	File reference
Location	Arup Bristol	Time and date 11:30-13:30 30 October 2015
Purpose of meeting	To discuss and agree drainage proposals throughout Metrowest works	
Present	Evangelos Kaffas EK (Arup) Rob Snell RS (Arup) Jeremy Masters JM (Network Rail)	Sinéad Lynch SL (Arup) Rob Emmons RE (Network Rail) Richard Patten RP (Arup)
Apologies		
Circulation	Those present Shaun Hartley	

## Action

*Note: all points to be actioned by drainage team (EK/SL) unless others are stated to provide input etc.*

### 1. CAT 1 – Parson's Street Junction

- Extend assessment back towards junction to ensure there is no other drainage in the area affected by the change in track alignment
- The proposed extension to drainage (3770m to 3860m) is dependent on embankment works agreed in the area (currently under review)
- Drainage requirements for At-Grade section (beyond existing outfall at 4080m) to be reviewed / addressed in report
  - o This will depend on where the Wessex Water sewer is found – survey to be undertaken as part of next stage of works
  - o Note to be added to Form A drawings to highlight risk RE: Wessex Water sewer
    - Unconfirmed location
    - Unknown levels / size / condition

RP/RS

Prepared by Sinéad Lynch

Date of circulation

Date of next meeting



# Minutes

Project title	Job number	Date of Meeting
Metrowest	243952-00	30 October 2015

## Action

- Assess drainage on the Main line to ensure no impact by our current track proposals?
  - o Is there an additional outfall in the area? Low lying land to the South.
  - o Can our proposed track drainage connect to the Main line drainage? Possible issues regarding consents.
  - o Add note to report to investigate further during next phase of works.

## 2. CAT 1UNK

RS

- RE agrees with proposals to do nothing if there are no historical issues within the area – preference for low cess to act as ‘backup’ drainage.

## 3. CAT 2 – Ashton Gate Level Crossing

- Catchpits are too close to proposed lines (approx. 1m from running line)
  - o Agreed to suggest replacement of drainage run to meet standard distances in Form A as worst case scenario (may present opportunity to value engineer out at later stage)
- Metrobus Bridge Alignment – check there is no clash (not expected as no drainage south of the crossing)
- Check to ensure runoff from road does not contribute to track drainage
  - o If it does, needs to be remedied with Highways Authority to ensure grit and fines does not enter track drainage system.
- Cover all points in Form A report

## 4. CAT 2UNK

- Check that there is no piled up rubbish/ballast which impedes free flow routes across track and off embankments.
- Agreed that no drainage is required

# Minutes

Project title	Job number	Date of Meeting
Metrowest	243952-00	30 October 2015

Action

## 5. CAT 3 – Clifton Tunnel 2

- RE observed some wet beds in southern end of tunnel and approx. 40m into tunnel itself – around 2.5yrs ago
- Jeff Kearney (JK) suggests Babcock are to remedy sub-standard works – discuss with JK
  - o Note to be added on drawings / report along the lines of “Current works addressing historic wet beds issue must be resolved prior to line speed rating”
  - o Either Babcock address or we do

JK

RE to advise

## 6. CAT 3.1UNK

- Check tunnels – any historic issues with wet beds to be addressed (JK to inform). Add note to drawings/ report
- Accepted that overall no drainage issues – no drainage to be proposed at Form A

EK/JK

## 7. CAT 3.2UNK – Cages Cutting

- Expected that deck drainage contributes to the wet beds observed by geo team / 2012 flooding
- Geo team rate earthwork as “Medium” category – may be proposed works, yet to be agreed
- Very steep banks with small contributing area so flows are not expected to be very large, and expected to drain out of the cutting (albeit slowly) – RE preference for no standing water longer than 2-3 days.
- No TBI records suggest wet material or standing water, wet beds may be due to the cohesive dirty ballast
  - o Potentially due to the level of vegetation falling on track
  - o TBI records show non-cohesive material underlying cohesive ballast with mercia mudstone much further below tracks
  - o As track to be lifted throughout the area, risk of pumping erosion not expected to be significant (RE)
- Risks of installing drainage discussed
  - o Increased siltation to Ham Green fishing lakes

RP



# Minutes

Project title	Job number	Date of Meeting
Metrowest	243952-00	30 October 2015

Action

- Long runs
- May not meet self-cleansing gradients
- Preference for Low Cess to act as ‘backup’ drainage
- Agreed that no drainage to be proposed at Form A

RS

## 8. CAT 4 – Pill Tunnel

- Ballast renewal (3-4yrs ago) has brought current speed limit to 30mph (running at 10mph due to informal agreement with residents) – we are increasing to 50mph (passenger) and 30mph (freight)
- Note to be added in Form A documents/drawings that existing drainage is “under maintenance...drainage system needs to be functional for 60 year design life before line speed increased.
  - Need for drainage to be considered from line speed perspective – PWAY team to input

RS/SW

## 9. CAT 4UNK

Agreed that there appears to be no historic issues with flooding – preference for Low Cess as ‘backup’ drainage. Check.

RE/RS

## 10. CAT 5 – Pill Station

- Car park is to be rebuilt (CH2M Hill for NSC) – formal agreement required (NR to lead?)
  - Track drainage needs to be designed to consider this; discuss with appropriate designers at CH2M Hill
- Section of proposed drainage goes through the existing platform
  - must be changed (back to 6-ft – see markup drawing)
  - diagonal UTX OK if necessary
- All existing must be made redundant or removed
- OFL must be CCTV surveyed
- French drain behind retaining walls to drain slopes; these outfall to track drainage and bring increased risk of siltation – add to risk notes.

JK

# Minutes

Project title	Job number	Date of Meeting
Metrowest	243952-00	30 October 2015

## Action

- JK may be able to advise on OFL; to be discussed at meeting  
Thurs 5<sup>th</sup>/ Fri 6<sup>th</sup> Nov

## 11. CAT 5UNK

- All in agreement RE no need for new drainage

## 12. CAT 6UNK

- Outfall to tide locked “The Cut”; JP and EK to meet NSDB on  
Tues 03/11/15 to discuss requirements
- Existing ditch currently being infilled under bridge/ramp
  - o RE preference to retain ditch (NSC may have aesthetic concerns) and have pile/pad foundations sitting within ditch
  - o This may allow us to take out track drainage for the area
- At detailed design, network to be modelled with tidal outfall
- Use of oversized pipes/large Type B manholes for attenuation; again modelling at next stage will confirm necessary attenuation in line with NSDB requirements

RS

(Next stage)

## 13. GENERAL

- All pipes to be half perforated (perforations on top) throughout job
- RE to provide NR account for Arup to access HD aerial photography
- Redundant pipes/catchpits – contractor to determine whether to be removed, filled or left dependent on case by case. Arup to highlight where they must **definitely** be removed.
- Replacing all culverts under new railway (CAT 5UNK) – can we guarantee a 60-80 year serviceable life? NR to consider.

RE

RE



## **B2      Drainage Technical Review [2015-11-06]**

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# Minutes

# ARUP

Project title	MetroWest Phase 1	Job number 243952-00
Meeting name and number	MetroWest Phase 1 Design Review Meeting <a href="#">Click here to enter text (type single space if not reqd).</a>	File reference <a href="#">Click here to enter text.</a>
Location	Swindon NR offices Rm 3.8	Time and date <a href="#">Click here to enter text.</a> 9 November 2015
Purpose of meeting	Design Review	
Present	Evangelos Kaffas, Simon Wheat, Rob Emmons, Dean Jackson	
Apologies	<a href="#">Click here to enter text.</a>	
Circulation	Those present Mark Howells, Sinead Lynch, Helen Dingle, Ed Olivier	
		Action
1.	<b>Parson Street Jn – Parson Street Station: The existing drainage run between the up main and up relief is being affected by the proposed track design. The drainage needs to be surveyed and further investigated. Parts of the drainage or the whole drainage system will need to be replaced. This has to be reflected at Phase 1 Design drawings for costing purposes.</b>	Evangelos Kaffas/Simon Wheat
2.	<b>Parson Street Jn: The OFL for the track drainage in Parson Street Jn is a Wessex Water Sewer running along the Dn Portbury cess. At this stage a note should be added to the drawing stating the following: “Unknown drainage system (OFL) to be identified prior to confirmation of detailed design”</b>	Evangelos Kaffas
3.	<b>Parson Street Jn: The above Wessex Water asset is being affected by the proposed track design. The first 100m from the head of the run onwards are clashing with the proposed track. Wessex Water to be notified of this.</b>	Evangelos Kaffas/Sinead Lynch
Prepared by	Evangelos Kaffas	
Date of circulation	<a href="#">Click here to enter text.</a>	
Date of next meeting	<a href="#">Click here to enter text.</a>	



# Minutes

Project title	Job number	Date of Meeting
MetroWest Phase 1	243952-00	9 November 2015

		Action
	<b>Arup may need to allow for the design of a 100m of Wessex water drainage. It is noted that at this stage it is not clear whether this asset belongs to Wessex Water or Network Rail.</b>	
4.	<b>Ashton Gate Level Crossing: Identify how close the proposed track gets to the existing drainage.</b>	Evangelos Kaffas
5.	<b>OFL of drainage run at Clifton 2 tunnel to be added as a risk to the risk register and to be mentioned in the Drainage Report. Dean Jackson to investigate the OFL.</b>	Dean Jackson/Evangelos Kaffas
6.	<b>Cages Cutting: Cesses in this area should generally be 0.5m below running edge level. This should be added in the drainage report.</b>	Evangelos Kaffas
7.	<b>A comment stating that no drainage is recommended in Pill tunnel but the maintenance regime of the existing drainage is required to be increased, to be added in the drainage report.</b>	Evangelos Kaffas
8.	<b>Rob Emmons requested that all pipes should be half perforated with the perforations on the top. This is believed to help with ballast pumping.</b>	Evangelos Kaffas
9.	<b>Check station drainage with Structures Team. The building's RAM is responsible for signing off the station drainage design and for maintaining it.</b>	Evangelos Kaffas/Hellen Dingle/Ed Olivier
10.	<b>Pill Station: Add last 6-ft catchpit as a risk. Find out if S&amp;C is moved 30m downstream.</b>	Evangelos Kaffas
11.	<b>Pill Station: Add OFL location/levels as a risk item.</b>	Evangelos Kaffas
12.	<b>Portishead Station: Add OFL location as a risk (pumping foul main is an obstacle)</b>	Evangelos Kaffas
13.	<b>Portishead Station: Investigate alternative OFL to the South entrance of the culvert.</b>	Evangelos Kaffas
14.	<b>Portishead Station: Send latest drawings to Mark Howells and Dean Jackson (+ general catchment dwg)</b>	Evangelos Kaffas

## **B3 IDC/IDR with Network Rail [2015-11-20]**

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# Minutes

# ARUP

Project title	MetroWest Phase 1	Job number 243952-00
Meeting name and number	MetroWest AiP IDC/IDR	File reference
Location	Arup Bristol. Staff Lounge	Time and date 09:00-17:00 20 November 2015
Purpose of meeting	IDC/IDR for AiP	
Present	<div> <div> Rob Snell (Arup) Phil Harrison (Arup) Sinéad Lynch (Arup) Rob Emmons (NR) Mark Howells (NR) Martin Worsfold (NR) </div> <div> Simon Wheat (Arup) Evangelos Kaffas (Arup) Jeremy Masters (NR) Helen Dingle (Arup) Ed Olivier (Arup) + NR buildings, signalling and P-way delegates </div> </div>	
Apologies		
Circulation	Those present Shaun Hartley	

*Note: these minutes cover drainage notes/actions only. Drainage team to action most points but individuals have been identified where they may have an interest or may help to address points.*

Action

## 1. Portishead Station

- Passive provision for platform extension must be included in Form A designs; update drawings to push drainage beyond 25-30m from platform.
- Agreed that station drainage (including the perforated drain under the maintenance route) is responsibility (and must be signed off by) of the Buildings RAM
- Single downpipe from canopy is risky
  - o Architects/Structures team to investigate multiple downpipe option (drainage team to inform)

EO

## 2. Portishead Track Drainage (CAT 6)

- Mark Howell happy with Form A solution
  - o Show OFL to D/S end of culvert for costing purposes

Prepared by Sinéad Lynch  
Date of circulation 23/11/2015  
Date of next meeting

# Minutes

Project title	Job number	Date of Meeting
MetroWest Phase 1	243952-00	20 November 2015

Action

- Risk carried forward of potential clash with foul rising main.
- Noted that changing outfall to the U/S end of culvert is likely to force track drainage deeper, but preferred option for NR (to mitigate above risk)
- All P-way drawings must show track and station drainage (for information)

SW

## 2.1 Gallingle Footbridge (in CAT 6)

- Increased deck and ramp width from 2 to 2.5m; increase in impermeable area but Form A drainage shows oversized 450mm Ø pipe therefore not expected to affect drainage
- Topographic survey of ditch required at detailed design; add to AiP report.

## 3. Pill to Portishead (CAT 5UNK)

- Ditch Strategy is required between Pill and Portishead to determine whether any intervention required
  - Cross-sections to be used to identify if there are any 'low point' between track and adjacent land.
  - If so, these ditches have to be assessed to ensure they are suitable for use to drain railway corridor (i.e. condition, outfall etc.)
- 3No. Overbridges (Portbury Dock, Marsh Lane and Sheepway)
  - Assess to see whether these need drainage. Low cess may be sufficient; check whether track is lifting enough to allow this.
- Culverts
  - Which culverts are NSC / NSIDB responsibility? Identify each culvert and owner on drawings
  - Do NSIDB want to maintain responsibility for maintaining their assets or are NR taking sole responsibility?
  - Fences across watercourses are not likely to be consented. Option to take fences to headwall however will need to provide gated access from NR land to access for maintenance; must be discussed with NSC / NSIDB.

SW

SW

JM/RE/MH

JM/RE/MH



# Minutes

Project title	Job number	Date of Meeting
MetroWest Phase 1	243952-00	20 November 2015

## Action

### 4. Pill Track Drainage (CAT 5)

MH Drainage Form A approved in principle (including OFL arrangement)

- Walkway/ fire escape route need to be shown on drawings. HD/SW
  - o Ideally catchpits between walkway and rail (check in line with geo works)
  - o If in walkway, D400 non-grated covers on catchpits to be flush with walkway (MH)
- Existing catchpit @ end of platform not visible on drawing – move label.
- MH confirmed:
  - o Matisa catchpits in 6-ft
  - o Mini-Stirling catchpits where 2+ pipes or narrow 6-ft
- Risk of existing buried catchpits throughout 6-ft; add note/risk to drawings.
- Assumed connectivity to be shown on drawings; note “existing to be removed”
- Add additional catchpit at 13000m to ensure pipe is equidistant from running rails where possible
- Use twin drainage system from Ch 13018m (collector drain unlikely to be useful at the proposed depth unless formation being renewed)
- Get consent (in principle) for new outfall to Avon from EA as worst case option to carry through to detailed design
- Ensure suspension of drain on viaduct is not rigid

### 5. Pill Station Drainage

Agreed in principle with MH and Buildings RAM

- Buildings RAM to own; Drainage RAM to own connection into track drainage.
- Add station drainage to 3D Model
- ACO at bottom of ramp in wrong place – move in drawing.

NOTE: All Pill drainage dependent on the structural assessment of the viaduct. May be change to the track alignment and/or station location which will impact drainage proposals.

# Minutes

Project title	Job number	Date of Meeting
MetroWest Phase 1	243952-00	20 November 2015

		Action
<b>6. Pill Tunnel (CAT 4)</b>		
MH agreed that no drainage is required in this scope of works – existing catchpit covers to be replaced (MH to action)		MH
<b>7. Cages Cutting (CAT 3.2UNK)</b>		
MH agreed that no formal drainage is required (no OFL potential) and supports proposal of low cess (0.5m BRL)		
<b>8. CAT 3.1UNK</b>		
MH agreed no formal drainage required		
<b>9. CAT 3 (Clifton Tunnel 2)</b>		
MH agreed works not in our remit.		
<b>10. CAT 2UNK</b>		
MH agreed no formal drainage required		
<b>11. CAT 2 (Ashton Gate)</b>		
MH agreed with proposals to retain existing (with installation of short sleepers where needed)		
- covers to be replaced (action with MH)		MH
- Japanese Knotweed present around OFL headwall – ensure risk note added onto drawings		
<b>12. CAT 1UNK</b>		
MH agreed no formal drainage required		
<b>13. CAT 1 (Parson's Street Junction)</b>		
MH agreed with proposals in principle		
- MH not convinced that sewer is a Wessex Water asset in the cess; to be confirmed during detailed design.		MH/EK
<b>14. Parsons Street Station (new catchment)</b>		
MH undertaking works to the 6-ft chambers at PSS; happy for us to redesign the run affected by our proposed rail alignment.		MH
- OFL East of the station (drop into sewer).		
- Design to be informed by site visit 26/11/15		



## Appendix C

### Consents & Correspondence

## C1 Wessex Water

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- 10<sup>th</sup> November 2015: Wessex Water Surface Water Sewer Diversion (Parson Street Junction)
- 14<sup>th</sup> December 2015: Sewer at Parson Street Junction - NR investigation (Mark Howells, Senior Drainage Engineer, NR)
- 07<sup>th</sup> December 2015: Wessex Water Foul Water Sewer Diversion (Ashton Gate Level Crossing)



## Sinead Lynch

---

**From:** Alex Macdonald <Alex.Macdonald@wessexwater.co.uk>  
**Sent:** 10 November 2015 11:14  
**To:** Sinead Lynch  
**Subject:** Parsons Street Junction [Filed 18 Nov 2015 17:07]  
**Attachments:** Diversion Application Guidance.pdf; Diversion Application.pdf; S185 Layout Drawing Requirements.pdf

Hi Sinead,

I have been forwarded the below email from my colleague James Rowles from the sewer protection team. It would appear you are proposing to divert the public surface water sewer hence why it has been sent to me to deal with.

Moving forward we will need you to promote a scheme to divert the sewer to Wessex Water. I have attached the Section 185 public sewer diversion application form and guidance to this email as well as the guidance notes for the layout drawing we will require. This diversion can be undertaken under option 2, where your contractors undertake the work under Wessex Water inspections.

Have a read through the guidance notes and should you have any questions please do not hesitate to contact me and I would be happy to discuss.

Kind regards,

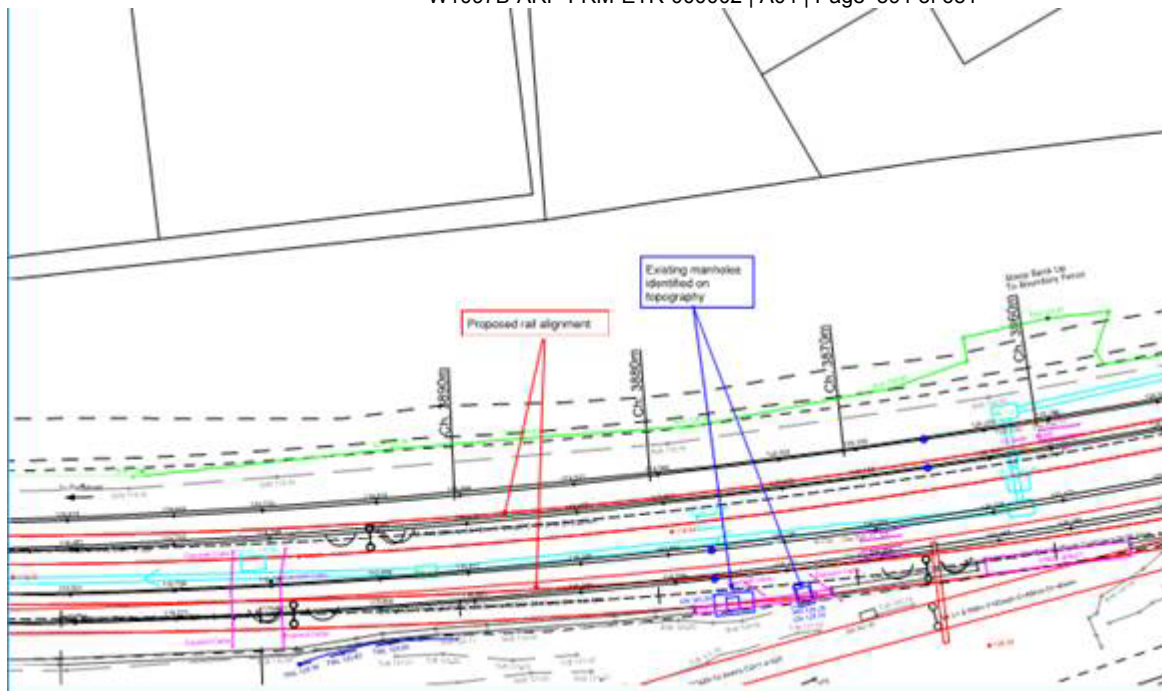
Alex MacDonald  
Wessex Water  
01225 522167

---

**From:** Sinead Lynch [[mailto:](#) ]  
**Sent:** 10 November 2015 10:15  
**To:** James Rowles  
**Cc:** Evangelos Kaffas; Rob Snell; Simon Wheat  
**Subject:** Parsons Street Junction

Morning James,

Following investigation of Parson's Street Junction, we have found 2No. manholes on the topography which suggest the presence of a drainage system (unconfirmed). Our proposed rail alignment encroaches on these manholes therefore we would be looking to remove/divert this asset. From the maps you provided, it appears that this may be your surface water sewer.



If so, would you please be able to confirm the process you would wish us to follow in order to apply for consent with regards to removing or diverting this section of the asset? No further manholes were identified on the topography therefore it would not be possible to confirm the extent that is affected at this stage, although the proposed rail alignment is only slewed away from existing alignment up to the S.Liberty Ln overbridge, at which point it follows the existing alignment. I have attached the asset maps to give an initial indication of the likely extent but note that this is not confirmed.

Please feel free to give me a call if you wish to discuss further,

Kind Regards,

**Sinéad Lynch**

Graduate Engineer | Water

**Arup**

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t +44 11 7988 6926

[www.arup.com](http://www.arup.com)

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---



## Sinead Lynch

---

**Subject:** FW: Information Request for asset in Ashton Gate

**From:** James Rowles [<mailto:James.Rowles@wessexwater.co.uk>]

**Sent:** 07 December 2015 11:44

**To:** Evangelos Kaffas

**Subject:** RE: Information Request for asset in Ashton Gate

Vic,

Unfortunately we do not have any information on record regarding levels or depth. It will therefore be important for you to undertake a full survey of the site in question to determine the actual drainage arrangements.

Regards

James Rowles  
Development Technician  
Developer Services  
01225 522174  
[sewer.protection@wessexwater.co.uk](mailto:sewer.protection@wessexwater.co.uk)

---

**From:** Evangelos Kaffas [<mailto:evangelos.kaffas@arup.com>]

**Sent:** 26 November 2015 15:22

**To:** James Rowles

**Cc:** Sinead Lynch; Rob Snell

**Subject:** RE: Information Request for asset in Ashton Gate

Dear James,

My name is Vic, I work with Sinead and I am the lead drainage engineer of the MetroWest Project.

Recently in one of the Wessex Water utility maps we noticed a short foul water sewer running next to the existing railway (please see image attached)

I have reasons to believe that this may be a redundant network due to its close proximity to the existing track. The Wessex Water map (attached) shows 3 manholes right next to the track in what appears to be the head of the run of a foul water sewer. The Topographical Survey in this area and a number of site visits identified no manholes in this area.

Please notice that the proposed design plans to run a new track where the existing one currently lies and this asset, if there, may prove to be an obstacle.

Could you please let us know if you have more information about this 2-pipe network or levels?

If this is actually in place, could you please advise what actions we should take / what consents are required in order to proceed?

Thank you very much

Kind Regards

## C2 North Somerset Internal Drainage Board

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- 3<sup>rd</sup> November 2015: RE: Outfall to North of Railway
- 30<sup>th</sup> November 2015: RE: Outfall to South of Railway



## Sinead Lynch

---

**From:** Evangelos Kaffas  
**Sent:** 10 December 2015 13:45  
**To:** Sinead Lynch  
**Subject:** FW: Portishead Metro West 1 Arup E-mail regarding Surface Water Outfalls

---

**From:** Evangelos Kaffas  
**Sent:** 30 November 2015 18:12  
**To:** 'Giles Oliver'; Dan Alsop  
**Cc:** John Philip; Rob Snell; Nuno Moura  
**Subject:** RE: Portishead Metro West 1 Arup E-mail regarding Surface Water Outfalls

Dear Giles and Dan,

Thank you very much for your reply.

In the first instance we will investigate further the outfall north of the culvert as originally agreed. If there are difficulties in achieving this, we will investigate other options and we will keep you informed.

Once again, thank you very much for the information you have provided.

Kind Regards

Vic

Evangelos Kaffas  
Water Engineer  
MSc/DIC MICE MTCG

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63 St Thomas Street Bristol BS1 6JZ United Kingdom  
d: +44 11 7988 6734 m: +44 79 6491 8467  
[www.arup.com](http://www.arup.com)

---

**From:** Giles Oliver [<mailto:theengineer@nslidb.org.uk>]  
**Sent:** 30 November 2015 15:19  
**To:** Evangelos Kaffas; Dan Alsop  
**Cc:** John Philip; Rob Snell  
**Subject:** RE: Portishead Metro West 1 Arup E-mail regarding Surface Water Outfalls

Dear Evangelos (Vic)

### Metro West 1 Arup E-mail regarding Surface Water Outfalls

Further to your previous request and reviewing the two sketches you submitted with your e-mail your request to put your new surface water outfall south of the railway line has issues.

We are aware that there are two twin pipes or Ducts which cross here and are not shown on your plans. These pipes / ducts would be restrictive to flows coming out of your proposed headwall location and flowing into the existing

culvert running north towards the cut. Also this length rhyme is very short and the proposed headwall would be difficult to access for maintenance in the position shown. We would look more favourably if the headwall was moved further upstream to the longer more open length of watercourse opposite the North Somerset Councils exiting pond outlet. This subject to any other restrictions that we may be unaware of. Also if the intention is to discharge this side of the railway we may require some attenuation given the longer flow path and the proximity to existing housing.

Apologies for not replying sooner but we now feel the above should be considered. As and when you have reviewed your options please re-submit for our consideration. As far as we are aware we have no records of what the Pipes or Ducts are referred to above.

Regards

Giles

Giles Oliver  
**Engineer**  
**North Somerset Levels IDB**  
 The Cider House  
 The Grange Business Park  
 Hewish  
 Weston-super-Mare  
 North Somerset  
 BS24 6RR

Tel: 01934 833388 Fax: 01934 833099

**Email:** [theengineer@nslidb.org.uk](mailto:theengineer@nslidb.org.uk)

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**From:** Evangelos Kaffas [<mailto:evangelos.kaffas@arup.com>]  
**Sent:** 17 November 2015 11:13  
**To:** Giles Oliver <[theengineer@nslidb.org.uk](mailto:theengineer@nslidb.org.uk)>; Dan Alsop <[DanAlsop@nslidb.org.uk](mailto:DanAlsop@nslidb.org.uk)>  
**Cc:** John Philip <[John.Philip@arup.com](mailto:John.Philip@arup.com)>; Rob Snell <[Rob.Snell@arup.com](mailto:Rob.Snell@arup.com)>  
**Subject:** FW: portishead

Dear Giles and Dan

Following my discussion with Giles last evening, I am putting down my arguments and a map explaining why an outfall from the track (Portishead Station) to "The Cut Gordano" may need to be in the south end of the Culvert (South of the Railway) instead of the North side.



Please note that an outfall to the North would mean that we have to pass above or under a Wessex Water pumping main which is expected to be over 0.5m in diameter. Wessex Water (please see attached e-mail) are not keen on having us digging anywhere around their asset. Additionally there are High Voltage cables that the drainage pipe must cross to discharge to the North.

Discharging to the south solves the above issues. Please see attached maps.

If the drainage board has not objections we would like to explore and design an outfall from the railway to the south end of the culvert.

I would appreciate it if you could let me know your initial thoughts on this matter.

Thank you very much

Kind Regards

[Evangelos Kaffas](#)  
Water Engineer  
MSc/DIC MICE MTCG

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[www.arup.com](http://www.arup.com)

## Sinead Lynch

---

**From:** Evangelos Kaffas  
**Sent:** 04 November 2015 11:10  
**To:** Sinead Lynch  
**Subject:** FW: PORTISHEAD METRO  
**Attachments:** Sewer Map Staion Area.pdf; DanCopyMetroWest Response to MWP1-JUN15CONSUL-20151103.doc

Thanks!

---

**From:** John Philip  
**Sent:** 03 November 2015 15:29  
**To:** Evangelos Kaffas  
**Subject:** FW: PORTISHEAD METRO

FYI – info from Dan Alsop (and Giles Oliver and David Crossman) at NSDB

John

---

**From:** Dan Alsop [<mailto:DanAlsop@nslidb.org.uk>]  
**Sent:** 03 November 2015 14:43  
**To:** John Philip  
**Cc:** Dan Alsop; Giles Oliver  
**Subject:** PORTISHEAD METRO

John,

Good to discuss this job with you and Vic this morning. Here is some of the information we discussed. Will leave you to forward to Vic.

Name of NSC Metro Project Manager is James Wilcox .  
Ditto Adoptions supremo Kevin Carlton.

I confirm any s/w discharge from the station complex will not require attenuation. (It is of interest to note that the bulk of the s/w off the new housing North of the railway discharges without attenuation.)

The outfall and any other new structure within 9m of the brink of the Cut will require a Land Drainage Act consent from the Board. I recommend the relevant drawings should be submitted in draft form for our comments prior to formal submission. The procedure / application forms / etc for the latter may be accessed on our website [www/nslidb.org.uk](http://www/nslidb.org.uk)

I attach an extract from the Wessex mapping showing the route of the rising main from the pumping station where it is close to the railway.

Also attached is Giles' response to the recent public consultation exercise which should be read in conjunction with my earlier letter to C2HM Hill a copy of which you were given this morning.

I will search my records later for any level info on the Cut. Failing that Nigel J-G will be your best bet.

We look forward to receiving draft drawings of the scheme as soon as possible.



I confirm that we would expect the railway works to include any necessary measures to ensure the effectiveness of the lineside ditches and their connectivity with the principal ditches which are shown of the annotated coloured plans Giles gave you this morning.

Please address any future communication to Giles who is based at our Hewish office. He will copy me in as necessary. If required my telephone numbers are 01 297 444 502 and 07 712 010 264.

Kind regards,

**Dan**

Dan Alsop  
**Consultant Engineer**

**North Somerset Levels IDB**  
The Cider House  
The Grange Business Park  
Hewish  
Weston-super-Mare  
N. Somerset  
BS24 6RR

Tel: 01934 833388 Fax: 01934 833099

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## C3 Environment Agency

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- 24<sup>th</sup> November 2015: Comments on Water Quality
- 26<sup>th</sup> November 2015: Comments on Outfall to River Avon at Pill



## Sinead Lynch

---

**From:** Evangelos Kaffas  
**Sent:** 10 December 2015 11:04  
**To:** Sinead Lynch  
**Subject:** FW: MetroWest Phase 1 Water Quality Discharge

---

**From:** Hall, Roger [mailto:roger.hall@environment-agency.gov.uk]  
**Sent:** 24 November 2015 11:32  
**To:** Evangelos Kaffas  
**Cc:** Stratton, Chris  
**Subject:** RE: MetroWest Phase 1 Water Quality Discharge

Dear Vic

Thank you for your email.

As discussed, these discharges of storm water do not pose a significant risk to the receiving watercourses at these locations. However the Environment Agency would require more specific detail of the drainage design, estimated flow rate and location of the discharge before giving a final view. The Environment Agency consider the sensitivity of the receiving water for discharges at locations on a case by case basis. The Environment Agency is concerned regarding the potential for new and altered track drainage to cause problems with discharges containing unacceptable levels of silt and causing pollution to watercourses.

Kind regards

Roger Hall

Environment Officer  
Bristol Avon Land & Water

E-mail: [roger.hall@environment-agency.gov.uk](mailto:roger.hall@environment-agency.gov.uk)  
Tel: 02030 252 088  
Address: Environment Agency, Bath Road Industrial Estate, Chippenham, SN14 0AB

---

**From:** Evangelos Kaffas [mailto:evangelos.kaffas@arup.com]  
**Sent:** 23 November 2015 11:33  
**To:** Hall, Roger  
**Cc:** [Chris.Stratton@environment-agency.gov.uk](mailto:Chris.Stratton@environment-agency.gov.uk); Rob Snell; Simon Wheat  
**Subject:** MetroWest Phase 1 Water Quality Discharge

Dear Roger

My name is Vic and am an Arup engineer working on the MetroWest Rail project which is the new rail passenger line from Bristol Temple Meads to Portishead.

Following our discussion on Thursday 19 Nov we agreed that the water quality of track drainage being proposed for the above route does not pose a threat to receiving watercourses.

Just to summarize what was discussed and give you some further information there are 3 drainage networks that are being proposed along the track.

1. Parson Street Junction: An existing track drainage system is proposed to be replaced by new drainage system that will outfall to a **Wessex Water surface water sewer**. The outfall location and discharge rates are under discussion with Wessex Water.
2. Pill Station: A new track drainage system is being proposed in this area with a final outfall to the **River Avon**. A flood defence consent is being sought with the EA.
3. Portishead Station: A new track drainage system is being proposed in this area with a final outfall to **“The Cut Gordano” which is a viewed rhyne of the North Somerset IDB**. We have already been given a consent to discharge to “The Cut”.

Previously we discussed that discharging surface water from the rail environment to a watercourse/public sewer does not pose a water quality concern. Please note that our design does not include parking areas and/or rail depot areas.

I would appreciate it if you could you please confirm that you are in agreement with the above.

Thank you very much

Kind Regards

Vic

Evangelos Kaffas  
Water Engineer  
MSc/DIC MICE MTCG

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## Sinead Lynch

---

**From:** Walton, Tracy <tracy.walton@environment-agency.gov.uk>  
**Sent:** 26 November 2015 14:56  
**To:** Evangelos Kaffas  
**Subject:** RE: MetroWest Project / Outfall to the Avon River

Hello Evangelos

Thank you for your email and preliminary design drawing.

I note the location of the proposed outfall structure on the Markham Brook that discharges into the river Avon and confirm that a flood defence consent will be required, along with relevant drawings and method statement. A Flood Defence consent form and supporting advice is available on our website at:  
<https://www.gov.uk/government/publications/flood-defence-consent-england-and-wales>

The Officer that covers this area is Jody Grabham, within our Partnership & Strategic Overview team for the West of England.

If you have specific queries regarding planning please contact David Pring in Sustainable Places, via their email:  
[nwx.sp@environment-agency.gov.uk](mailto:nwx.sp@environment-agency.gov.uk)

We will await your flood defence consent application in due course.

Regards

Tracy

**Tracy Walton BA (Hons)**  
**Partnerships & Strategic Overview - West of England Officer**

**Flood and Coastal Risk Management**  
Wessex Area Bridgwater Office  
The Environment Agency

Rivers House, East Quay, Bridgwater, TA6 4YS

Direct Dial 02030250333  
Email: [tracy.walton@environment-agency.gov.uk](mailto:tracy.walton@environment-agency.gov.uk)

---

**From:** Evangelos Kaffas [mailto:evangelos.kaffas@arup.com]  
**Sent:** 23 November 2015 11:55  
**To:** Bridgwater.FDCs  
**Cc:** Wood, Melvin; Chris.Stratton@environment-agency.gov.uk; Sinead Lynch; Rob Snell; Simon Wheat  
**Subject:** MetroWest Project / Outfall to the Avon River

**FAO Tracy Walton**

Dear Tracy

I'm writing to inform you that Arup are carrying out preliminary design of rail works in connection with the MetroWest Project reinstating the railway from Portishead to Pill (and Temple Meads). As it affects The Avon River in Pill (North Somerset), we would like to confirm the EA's interests and requirements.

I enclose some sketches outlining the project proposals. The immediate points we would like to run through are the discharge of surface water from the new station and track drainage to the River Avon at approximately X:352546 Y:175980. I would comment that the designs are preliminary, subject to change and would be grateful for them to be treated as confidential at this stage.

Given that this is an outfall which is subject to tidal effect (outfall will be tide locked during high tide) I was wondering if a Flood Defence Consent or other is required or not. I would appreciate it if you could let me know your initial thoughts, or identify an EA contact with whom I could discuss our proposals further.

Thank you very much

Kind Regards

Evangelos Kaffas  
Water Engineer  
MSc/DIC MICE MTCG

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## C4 AquaFab

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## Sinead Lynch

---

**From:** David Langley <David@aquafab.co.uk>  
**Sent:** 13 November 2015 16:23  
**To:** Sinead Lynch  
**Subject:** Portishead SE60 Chambers [Filed 18 Nov 2015 17:08]

Hi Sinead,

As promised I spoke with our technical man and he has advised that with regards the sleeper ends touching/ being within 50mm of the chambers, the chambers should be fitted with a galvanised steel lid seating frame (as per our larger chambers and retro fitable if not already present) and surrounded with concrete if possible, although this is not critical. He advised that this size of chamber has been previously installed under similar circumstances, with sleeper ends virtually touching the chamber wall, at Coventry Station.

Regards

Dave Langley

Sales Manager – Southern Region



07810 351 075

[www.aquafab.co.uk](http://www.aquafab.co.uk)



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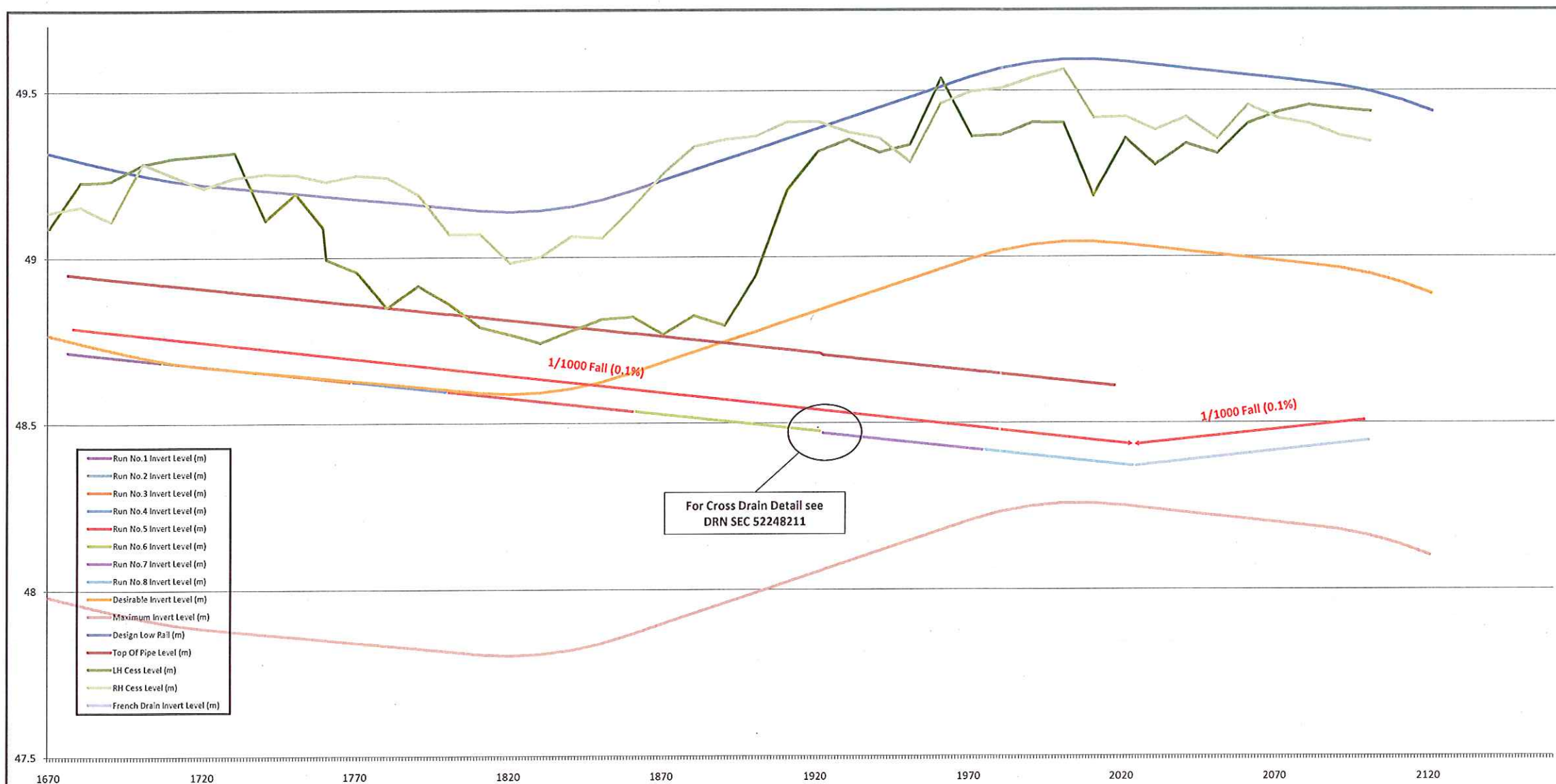
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## Appendix D





### Pill Station

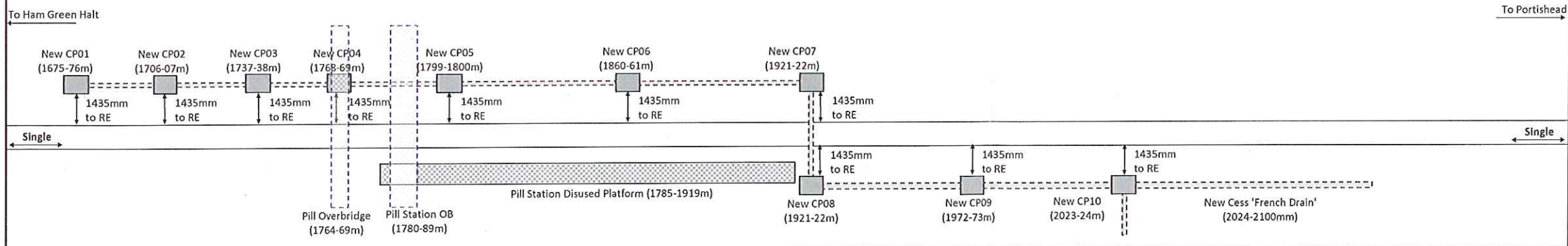
Potential Existing Outfall from Geoff  
Kearney


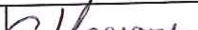


# NOTES:

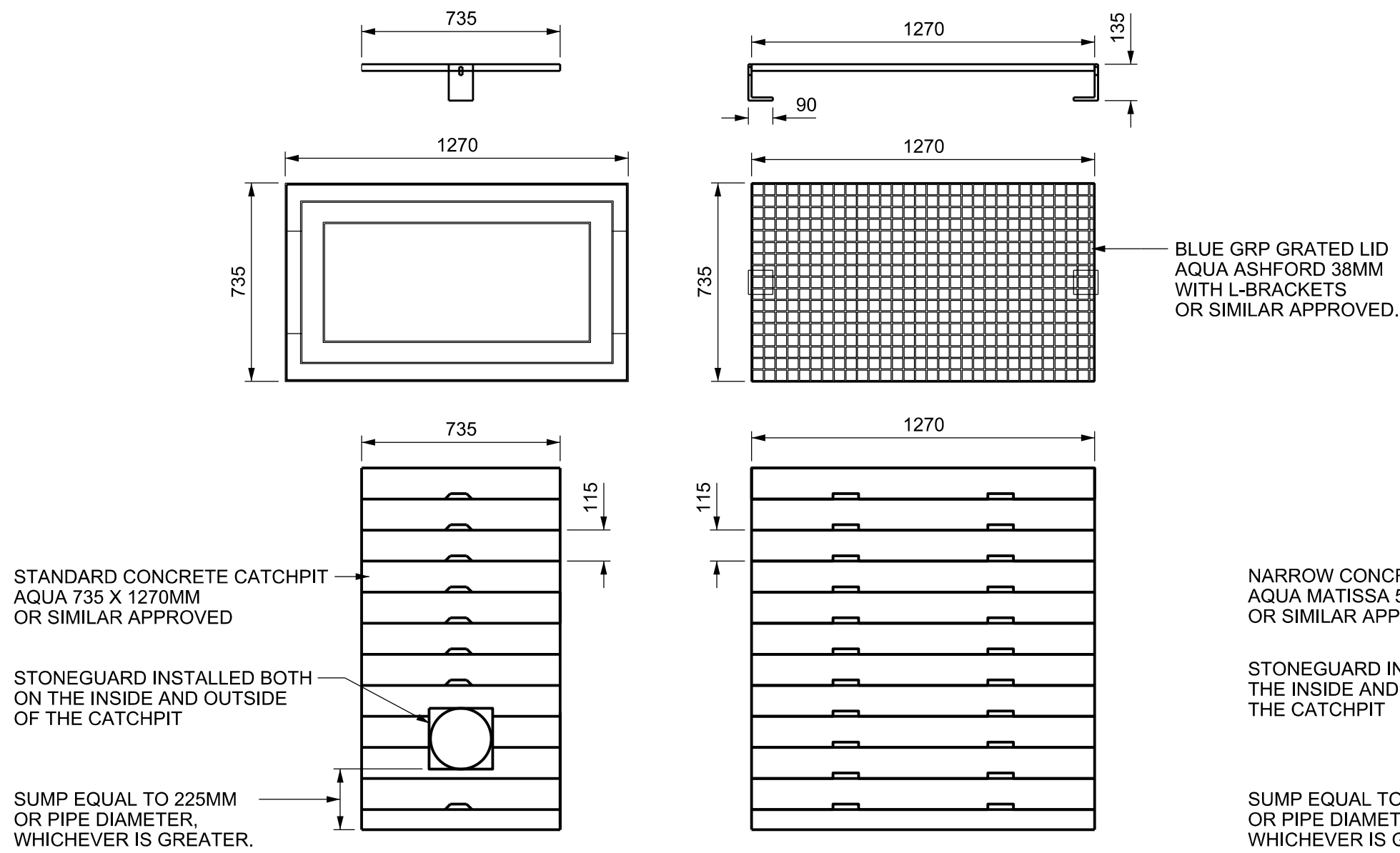
1. Minimum invert level plotted at 100mm below formation level versus NR/L3/CIV/005/2C, Section 3.3.3, which states minimum invert level to ensure top of pipe has 150mm of cover when installed. This is asked for in the Particular Specification. Desirable invert level plotted as 150mm below formation level as per NR/L3/CIV/005/2C, Section 3.3.3. Maximum invert level plotted as 1050mm below ground level as per NR/L3/CIV/005/2C.
2. No lateral restrictions on the positioning of catch pits; Specification asks for the centre line of the drainage pipe to be about 1730mm from the RE. This dimension is increased to 1800mm to ensure there is sufficient clearance from the closest face of the catch pits to the nearest running edge as described in NR/L3/CIV/005/2C, Section 3.4;
3. Catch pits located at 30 metre intervals from catch pit 01 to catch pit 05 due to track curvature. Catch pit 05 to 06 & 06 to existing catch pit 07 located at 60 metre intervals as track is straight through this section. Catch pit 09 located equidistance between catch pit 08 & catch pit 10, at 50m spacings.
5. For catch pit specification & construction details please see DRN MAT 52248211.
6. Collector pipe drains (catch pit 01 to catch pit 07 & catch pit 08 to catch pit 10) to be 225mm ID perforated. Carrier pipe drains (catch pit 07 to catch pit 08) to be 225mm ID solid wall.
7. Outfall adjacent catch pit 10 to be proven prior to installation.
8. Sufficient catch pit rings to be provided at each catch pit location to ensure the catch pit lid level is raised to ground level. Value drawn on Long Section is indicative only.

Drawing No:			DRN SEC 52248211		
Drawing Name:			Long Section		
Job Number:			52248211		
Mileage From:			126m 77y		
Mileage To:			126m 540y		
Site:			Pill Station Drainage		
ELR:			POD		
Amend.:	N/a	By:	N/a	Reason:	N/a
Datum Milepost:			126m 0c		
For Cross Section See:			DRN TCS 52248211		
Design Date:			23/7/2012		
	Name:		Signature:		Date:
Designed By:	F.Redman				07-02-13
Checked By:	M.Evill				6-2-
Approved By:	F.Caublot				7/2/13



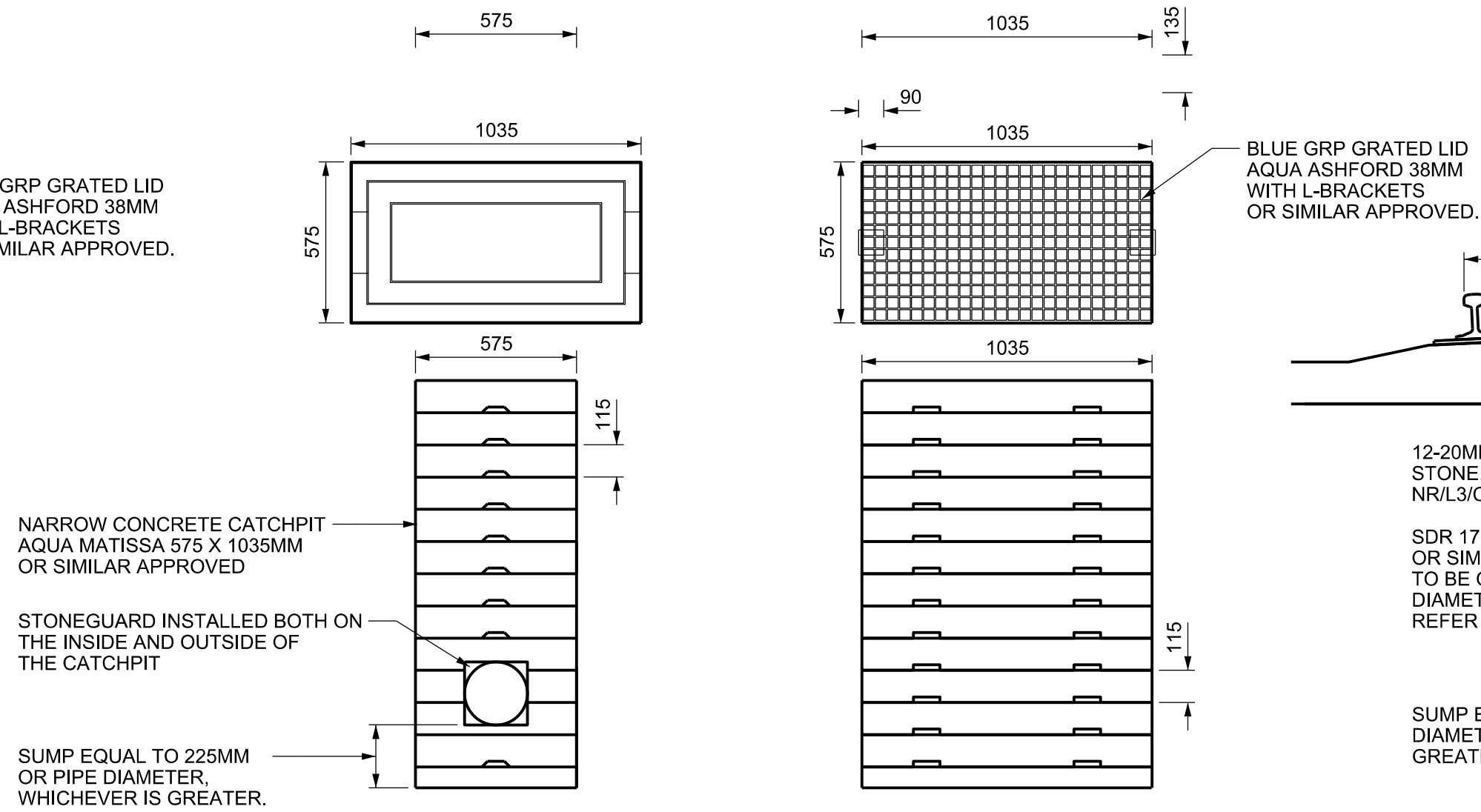
NETWORK RAIL AFC ENDORSEMENT			
This drawing has been reviewed by the Network Rail Project Engineer and endorsed as being able to be issued as AFC			
Name	A. KEARNEY	Signature	
Title	Project Engineer	Date	7-2-13



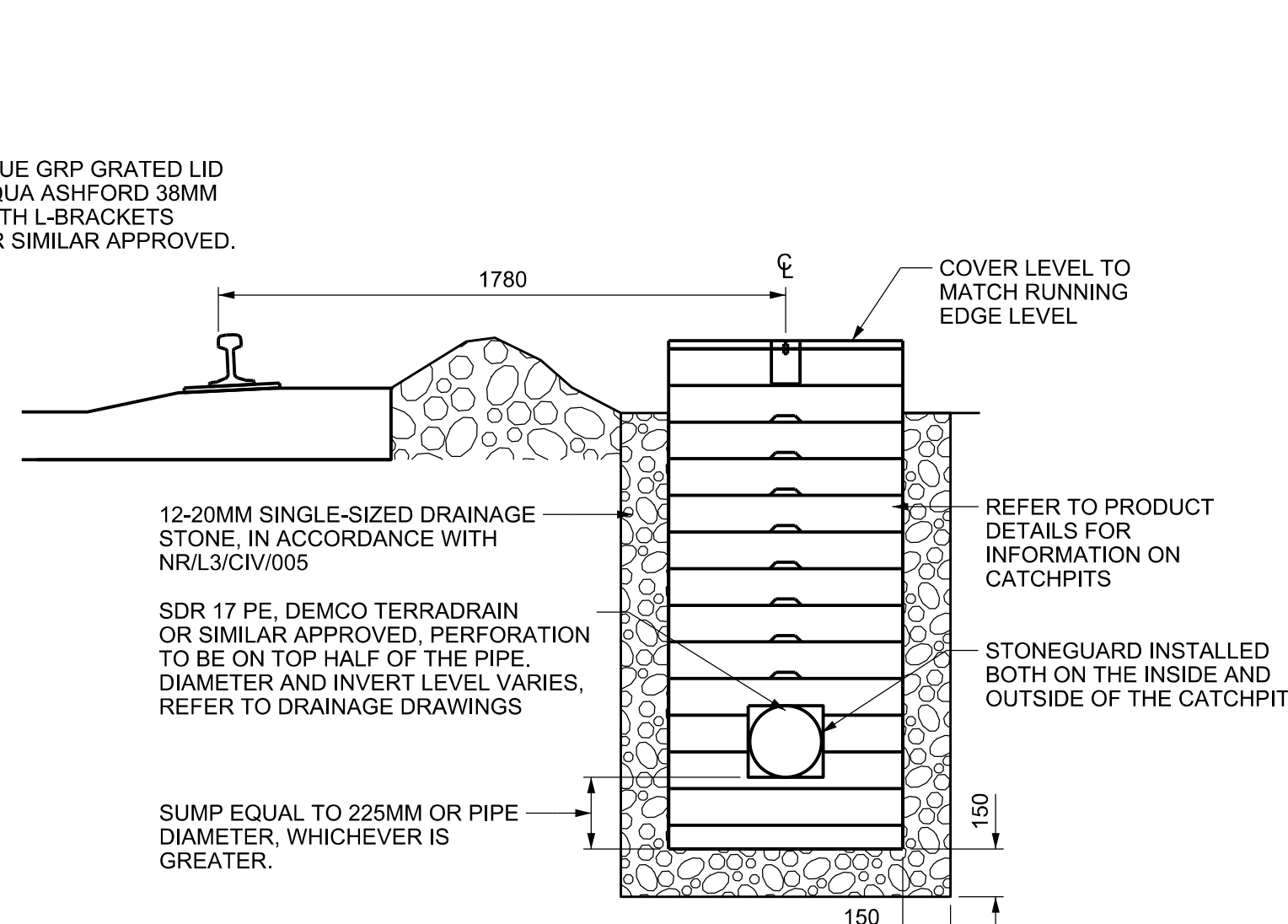


DETAIL NO. 001  
AQUA STANDARD  
CONCRETE FRAME CATCHPIT  
PRODUCT DETAIL  
SCALE 1:20

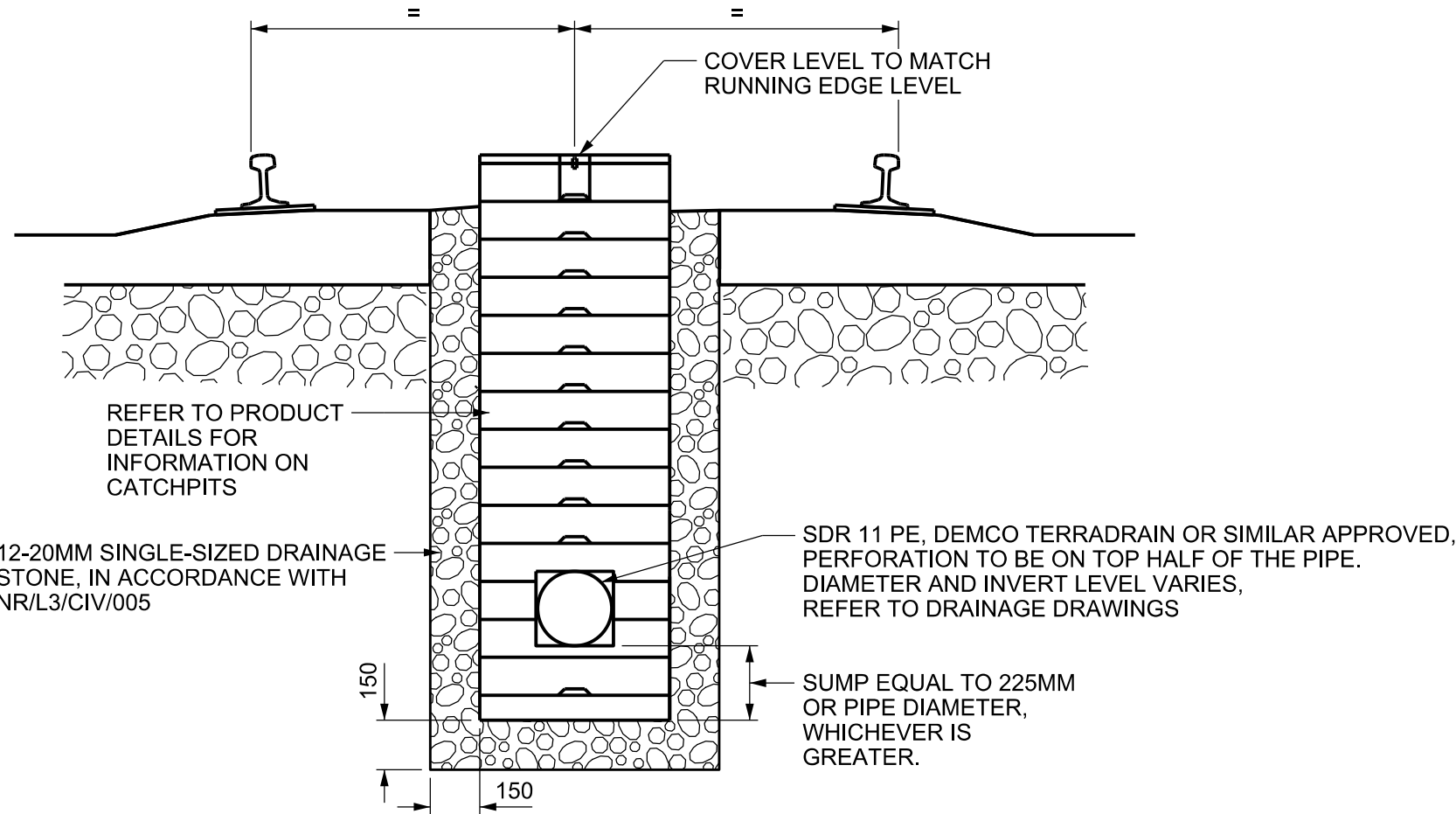
REFER TO DETAIL 3 FOR INSTALLATION



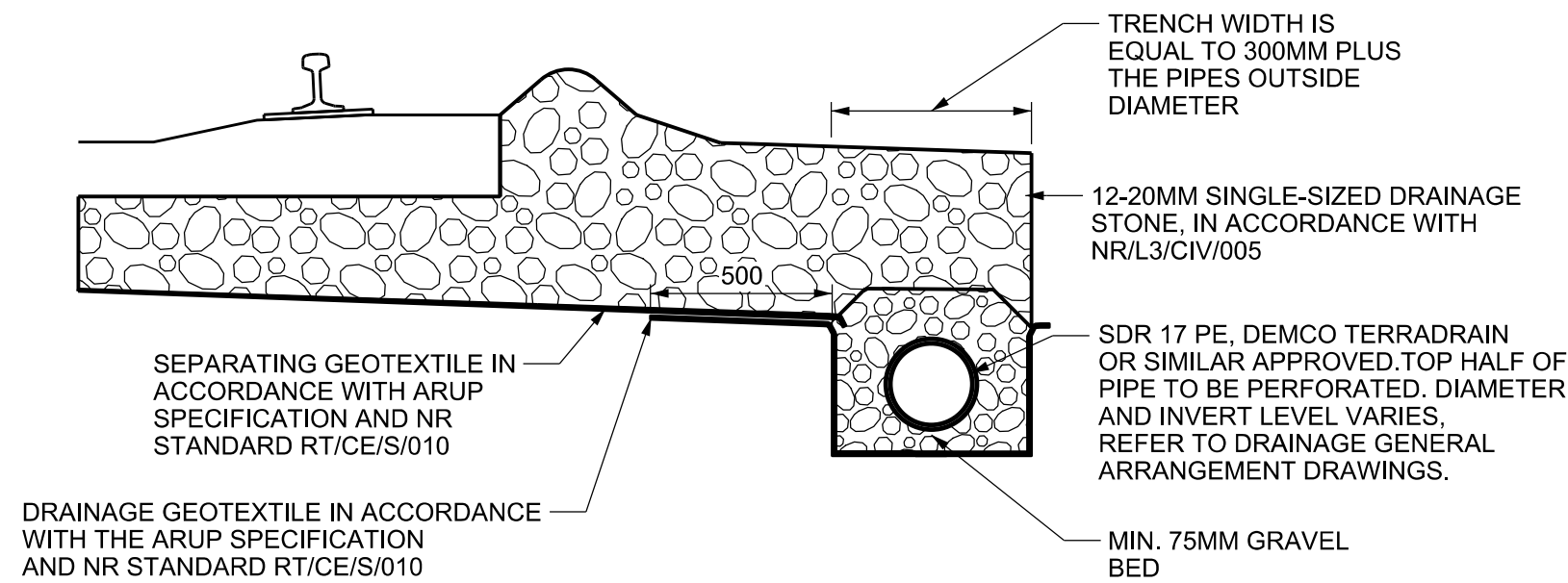
DETAIL NO. 002  
AQUA MATISA  
CONCRETE FRAME CATCHPIT  
PRODUCT DETAIL  
SCALE 1:20



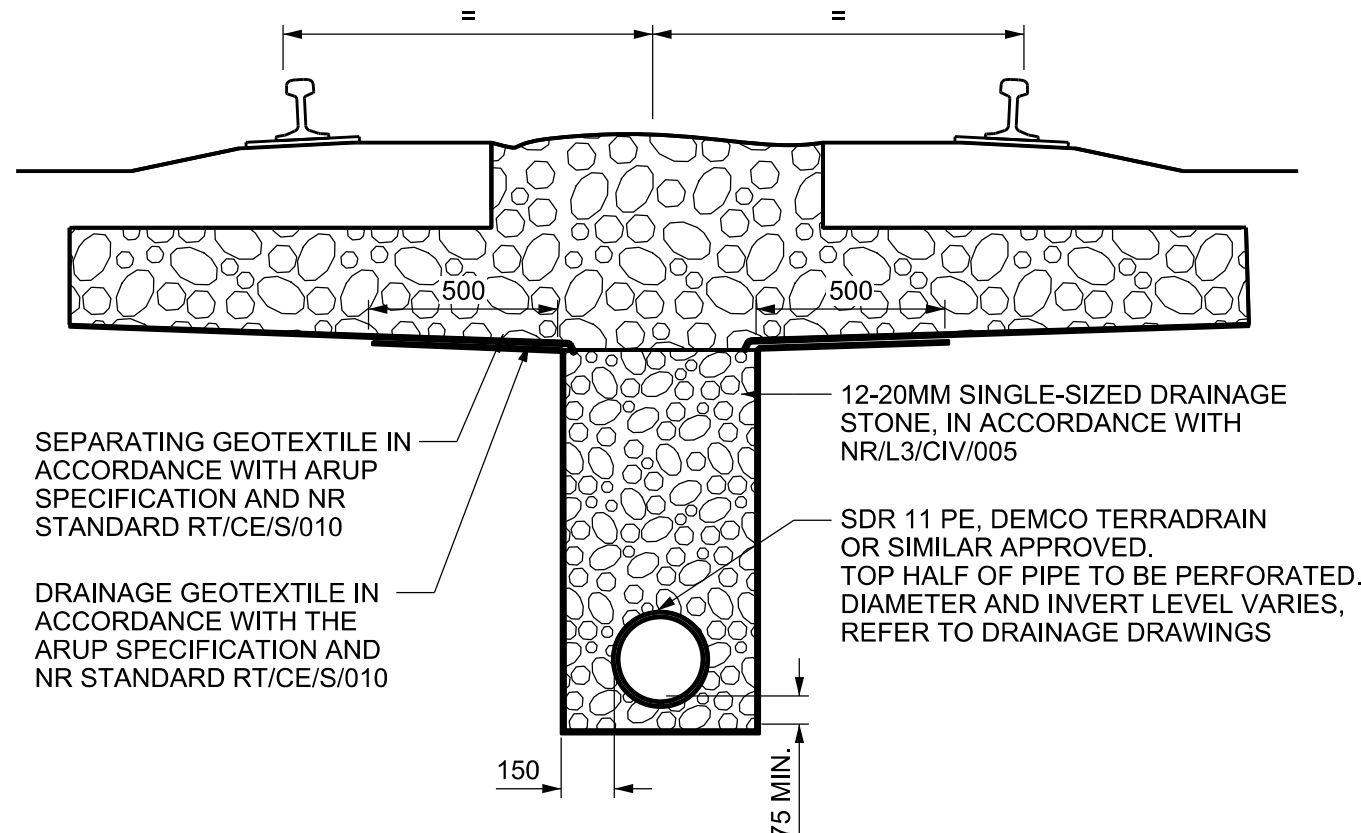
DETAIL NO. 003  
TYPICAL CESS CATCHPIT  
INSTALLATION  
SCALE 1:20



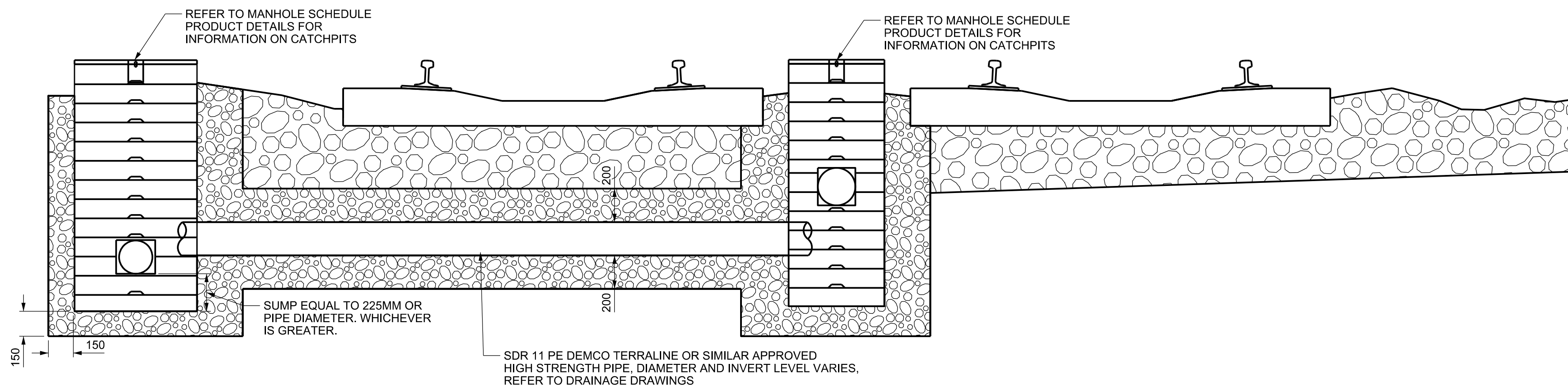
DETAIL NO. 004  
TYPICAL 6 FOOT CATCHPIT  
INSTALLATION  
SCALE 1:20



DETAIL NO. 005  
TYPICAL CESS PIPE  
SCALE 1:20



DETAIL NO. 006  
TYPICAL 6 FOOT PIPE  
SCALE 1:20



DETAIL NO. 007  
TYPICAL UTX  
SCALE 1:20

Legend/Notes

1. ALL LEVELS AND DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. DO NOT SCALE FROM THIS DRAWING. ONLY FIGURED DIMENSIONS AND LEVELS TO BE USED.
3. THE LOCATIONS OF EXISTING SERVICES SHOWN ON THIS DRAWING HAVE BEEN COMPILED FROM BURIED SERVICE INFORMATION PROVIDED BY NETWORK RAIL. ACCURACY CAN NOT BE GUARANTEED.
4. CHAINAGE DATUM IS 4000.000M AT THE 120M 40CH MILE POST. REGULAR CHAINAGE MARKERS PRESENTED ON LAYOUT DRAWINGS ARE MEASURED ALONG THE PROPOSED UP PORTBURY/PORTBURY SINGLE CENTRELINE.
5. THIS DRAWING IS BASED UPON TOPOGRAPHICAL SURVEY PROVIDED BY SEVERN PARTNERSHIP ON 19TH SEPTEMBER 2015.
6. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE LOCATION AND DEPTH OF ALL EXISTING SERVICES, MAINS AND CABLES PRIOR TO CONSTRUCTION.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY SUPPORTS AND/OR RESTRICTIONS ON SEQUENCE OF CONSTRUCTION. CONSTRUCTION METHODOLOGY TO BE DETERMINED BY CONTRACTOR AND IDENTIFIED IN RELEVANT METHOD STATEMENTS.
8. FOR FORMATION DESIGN REFER TO TRACK BED DESIGN REPORT.
9. FORMATION TO BE LAID WITH FALL AS INDICATED ON RELEVANT CROSS SECTIONS.
10. CATCHPITS AND UTX CHAMBERS TO BE MINIMUM 1410MM FROM NEAREST RUNNING EDGE WHERE PRACTICAL.
11. PERFORATED PIPES ARE TO ONLY BE PERFORATED ON THE TOP HALF.
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13. ALL EXISTING CATCHPITS AND PIPES SHOULD BE FOUND AND LOCATIONS IDENTIFIED. ALL EXISTING DRAINAGE THAT IS TO BE MADE REDUNDANT MUST BE RECOVERED (REMOVED) WHERE PRACTICABLE.
14. EXISTING CULVERTS MUST BE STRUCTURALLY ASSESSED AND RETAINED / REPLACED AS NECESSARY.
15. NEW HEADWALLS AND INLETS SHOULD BE BACKFILLED TO ENSURE GROUND BEHIND IS LEVEL TO THE TOP OF THE HEADWALL STRUCTURES.
16. ALL COVER LEVELS ARE SET AT HIGHEST RAIL LEVEL TO MAINTAIN VISIBILITY AND ACCESS, UNLESS OTHERWISE SPECIFIED.
17. DRAINAGE CONSENTS HAVE NOT BEEN GRANTED. TO BE PURSUED DURING DETAILED DESIGN STAGE.

Rev	Date	Description of Revisions	Drawn	Chkd	Appr	Suitability
A01	17/12/15	ISSUED FOR FORM A		KS	RS	SW
A02	10/11/17	ISSUED FOR IDC		KS	RS	SW
A03	12/01/18	ISSUED FOR FORM A		KS	RS	SW

FOR FORM A REVIEW



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Project	METROWEST PHASE 1
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Drawing Title	DRAINAGE DETAILS SHEET 1
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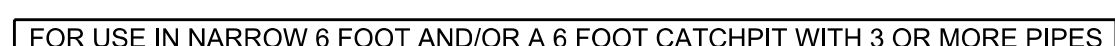
Designed	E KAFFAS	Signed	[Signature]	Date	12/01/18
Drawn	K SHELTON	Signed	[Signature]	Date	12/01/18
Checked	R SNELL	Signed	[Signature]	Date	12/01/18
Approved	S WHEAT	Signed	[Signature]	Date	12/01/18

Scale(s)	As Shown	ELR & Mileage	POD
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Alternative Reference		Sheet	1 of 3
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Drawing Number	W1097B-ARP-DRG-EDR-001001	Revision	A03
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|-------------------|----------|--------------------------|-------|-------------|------|
| A01               | 17/12/15 | ISSUED FOR FORM A        | KS    | RS          | SW   |
| A02               | 10/11/17 | ISSUED FOR IDC           | KS    | RS          | SW   |
| A03               | 12/01/18 | ISSUED FOR FORM A        | KS    | RS          | SW   |
| Rev               | Date     | Description of Revisions | Drawn | Chkd        | Appr |
| Status            |          |                          |       | Suitability |      |
| FOR FORM A REVIEW |          |                          |       | S3          |      |



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Project	METROWEST PHASE 1
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Drawing Title	DRAINAGE DETAILS SHEET 2
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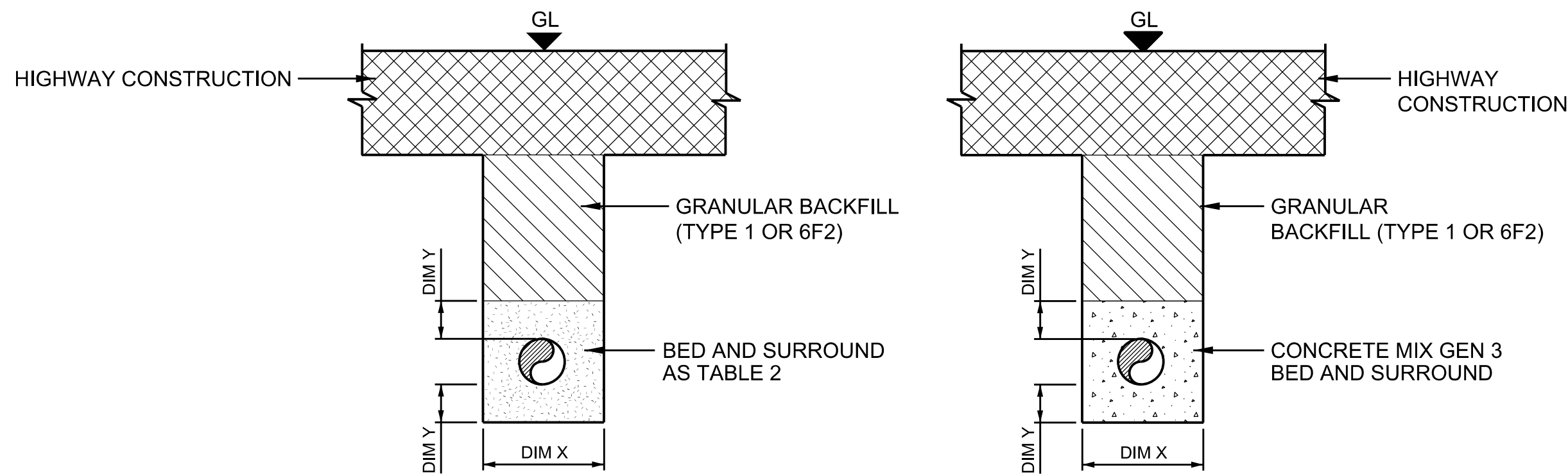
Designed	E KAFFAS	Signed		Date	12/01/18
Drawn	K SHELTON	Signed		Date	12/01/18
Checked	R SNELL	Signed		Date	12/01/18
Approved	S WHEAT	Signed		Date	12/01/18

Scale(s)	ELR & Mileage
As Shown	POD

Alternative Reference	Sheet 2 of 3
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Drawing Number	Revision





TO BE USED WHERE COVER TO PIPES IS MORE THAN  
1200MM - TRAFFICKED AREAS  
OR  
600MM - LANDSCAPING AREAS

TYPE X

TO BE USED WHERE COVER TO PIPES IS LESS THAN  
1200MM - TRAFFICKED AREAS  
OR  
600MM - LANDSCAPING AREAS

TYPE Z

TABLE 1

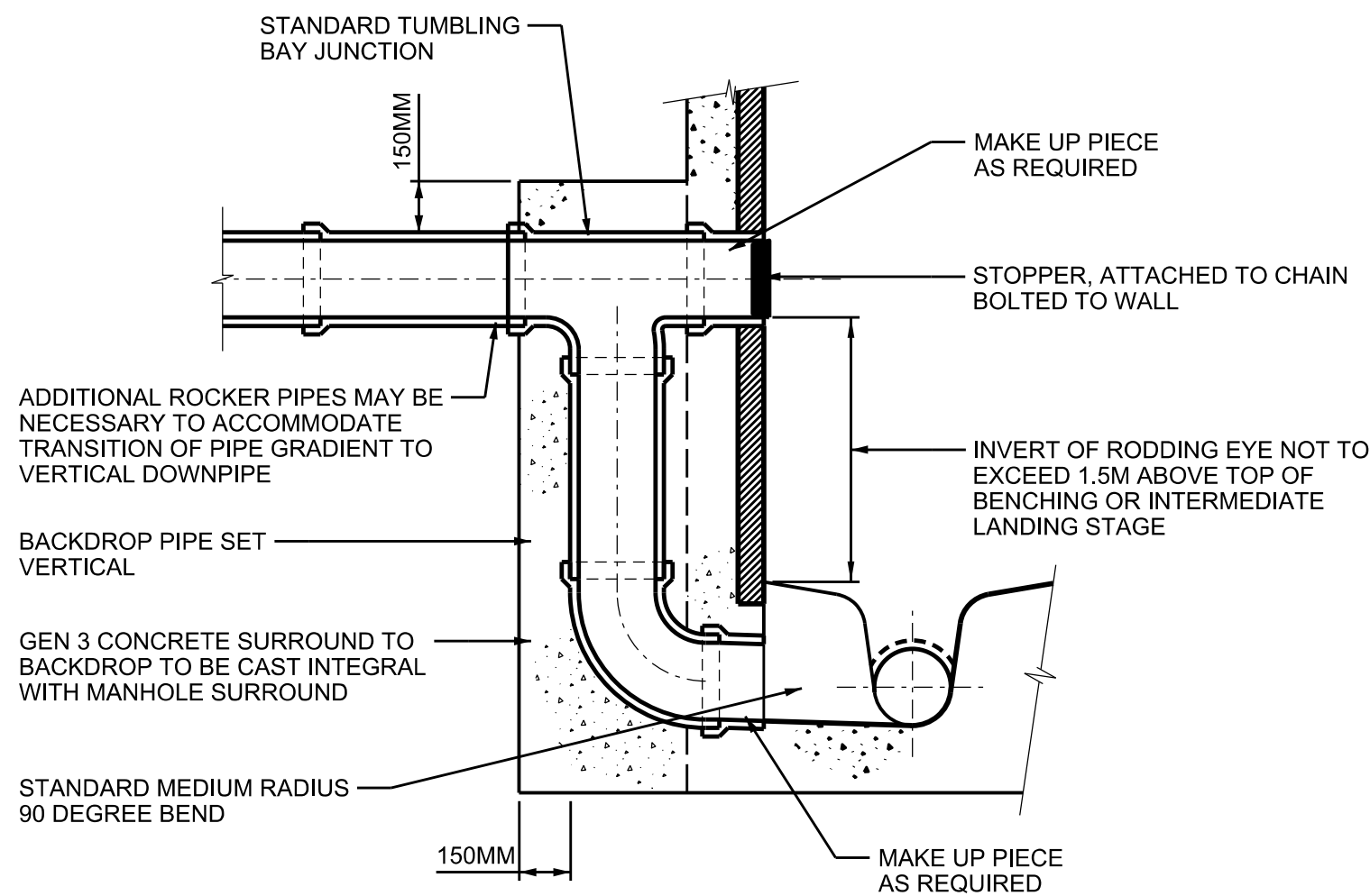
PIPE DIA.	DIM 'X'		DIM 'Y'
	MAXIMUM	MINIMUM	
100	550	450	100
150	600	490	100
225	700	580	150
300	750	680	150
375	1050	950	150
450	1150	1030	150
525	1200	1120	150
600	1350	1240	150
675	1450	1330	150

TABLE 2

PIPE DIA.	AGGREGATE	
	GRADED	SINGLE SIZE
100	-	10
150	14-5	10 or 14
225 & 300	14-5 or 20-5	10, 14 or 20
375 to 525	14-5 or 20-5	14 or 20
Over 525	14-5, 20-5 or 40-5	14, 20 or 40

TABLE 3

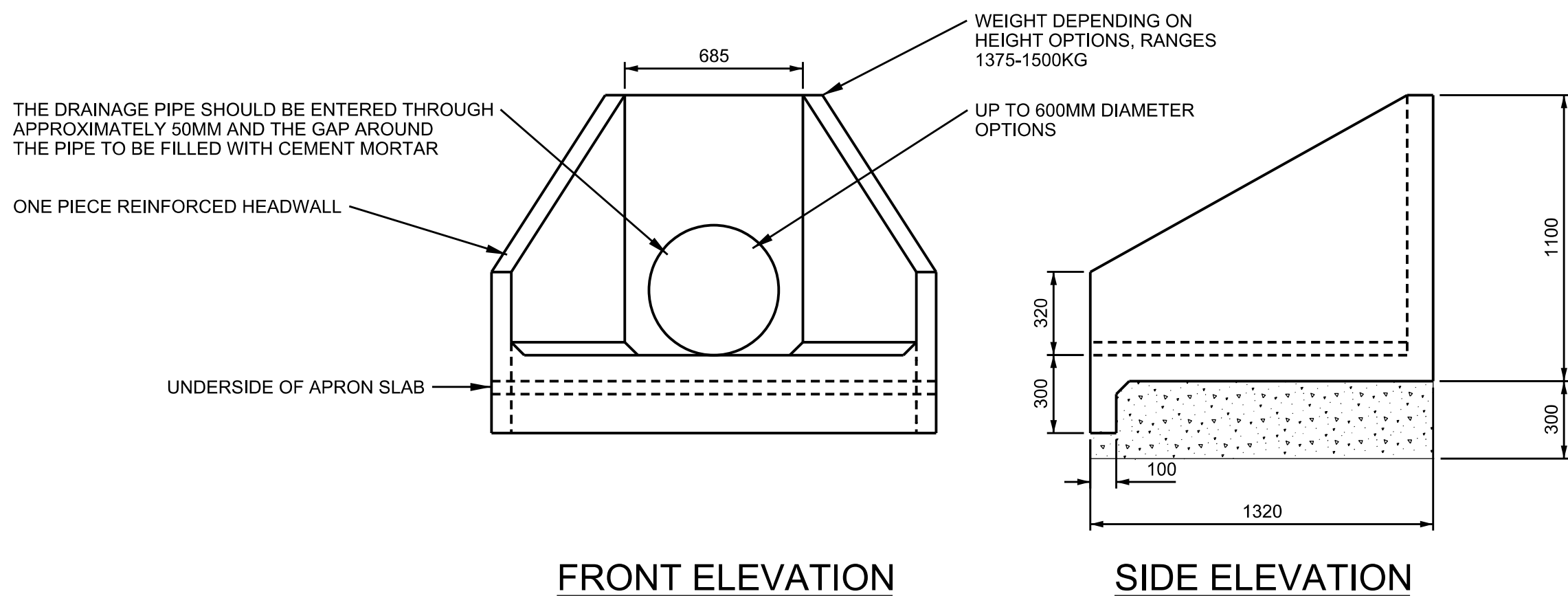
PIPE DIAMETER (MM)	ROCKER PIPE LENGTH (MM)
150 to 600	600



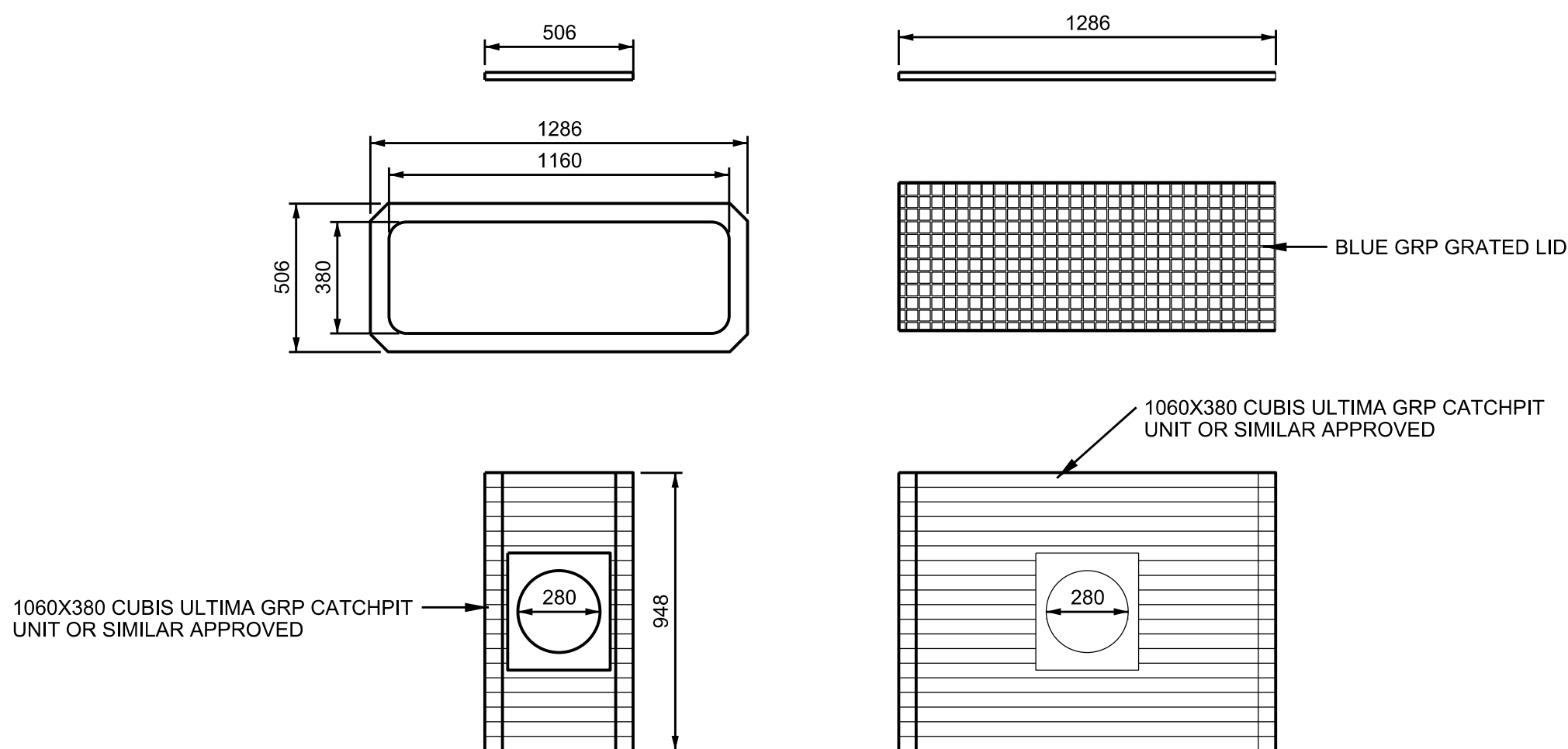
MINIMUM DIMENSIONS REQUIRED TO CONSTRUCT BACKDROP	
PIPE DIA (MM)	MIN DIMENSION (MM)
100	530
150	630
225	915
300	1170

DETAIL 016  
TYPICAL BACKDROP DETAIL  
SCALE 1:25

DETAIL 015  
TYPICAL PIPE BEDDING DETAILS  
SCALE 1:20



DETAIL 017  
PRECAST 600 SERIES JKH HEADWALL OR SIMILAR APPROVED  
SCALE 1:20



DETAIL 018  
CUBIS ULTIMA 1060X380 CATCHPIT  
SCALE 1:20

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Rev	Date	Description of Revisions	Drawn	Chkd	Appr
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Status	Suitability
FOR FORM A REVIEW	S3



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Project  
**METROWEST PHASE 1**

Drawing Title  
**DRAINAGE DETAILS  
SHEET 3**

Designed	E KAFFAS	Signed	<i>[Signature]</i>	Date	12/01/18
Drawn	K SHELTON	Signed	<i>[Signature]</i>	Date	12/01/18
Checked	R SNELL	Signed	<i>[Signature]</i>	Date	12/01/18
Approved	S WHEAT	Signed	<i>[Signature]</i>	Date	12/01/18

Scale(s)	As Shown	ELR & Mileage	POD
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Alternative Reference		Sheet	3 of 3
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Drawing Number	W1097B-ARP-DRG-EDR-001003	Revision	
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