Technical Note

CLIENT:	Extra MSA
PROJECT:	Proposed Erection of a Motorway Service Area, Land to the North of Junction 11 of the M62, Warrington
SUBJECT:	Groundwater Technical Note in response to EA letter dated 14 Feb 2020 SO/2019/119672/03-L01
JOB NO.:	SH11739
DATE:	20 March 2020
PREPARED BY:	L Ballarini: Service Area Lead – hydrogeology and hydrology

Introduction

This technical note has been prepared in response to comments and requests for clarification relating to groundwater in the Environment Agency's (EA) letters (SO/2019/119672/03-L01) dated 14 February 2020 and (SO/2019/119237/02-L01) dated 12 March 2020. The technical note re-presents each EA comment and then provides WA's response to that comment below.

Groundwater Protection

EA comment: The closest borehole to site is R421 which exhibited a maximum groundwater level of 17.35m above ordnance datum (AOD). The elevation at this point is 22.18mAOD in line with this data and as such the groundwater level is expected to be at 4.83m below ground level (bgl).

Clarification is required as to whether this data is a long term maximum, as we know that groundwater levels in this area are heavily influenced by public water supply abstractions. These were unused for a number of years and groundwater rose to a maximum level in around 2012. We require confidence that the tanks would not become sub water table if the pumps were switched off again and the groundwater regime returned to a more natural state.

WA response: Borehole R421 is installed within the Sherwood Sandstone based on the information provided in the Hydrogeological Risk Assessment (HRA) for the neighbouring Risley Landfill site (DWG No: BF4946/5/HRA1 titled 'Conceptual Model' dated Feb 2017). No borehole logs are available for this borehole however based on the conceptualisation presented in the Hydrogeological Risk Assessment (HRA) for the neighbouring Risley Landfill site (DWG No: BF4946/5/HRA1 titled 'Conceptual Model' dated Feb 2017) this borehole

would appear to be overlaid by c. 9m boulder clay. The elevation of this borehole is reported to be 22.71m AOD and the maximum groundwater level recorded was 17.35m AOD (5.36m bgl). This is the maximum level recorded between March 2008 and October 2016 based on data provided by Biffa in their HRA and re-presented in Figure 1.

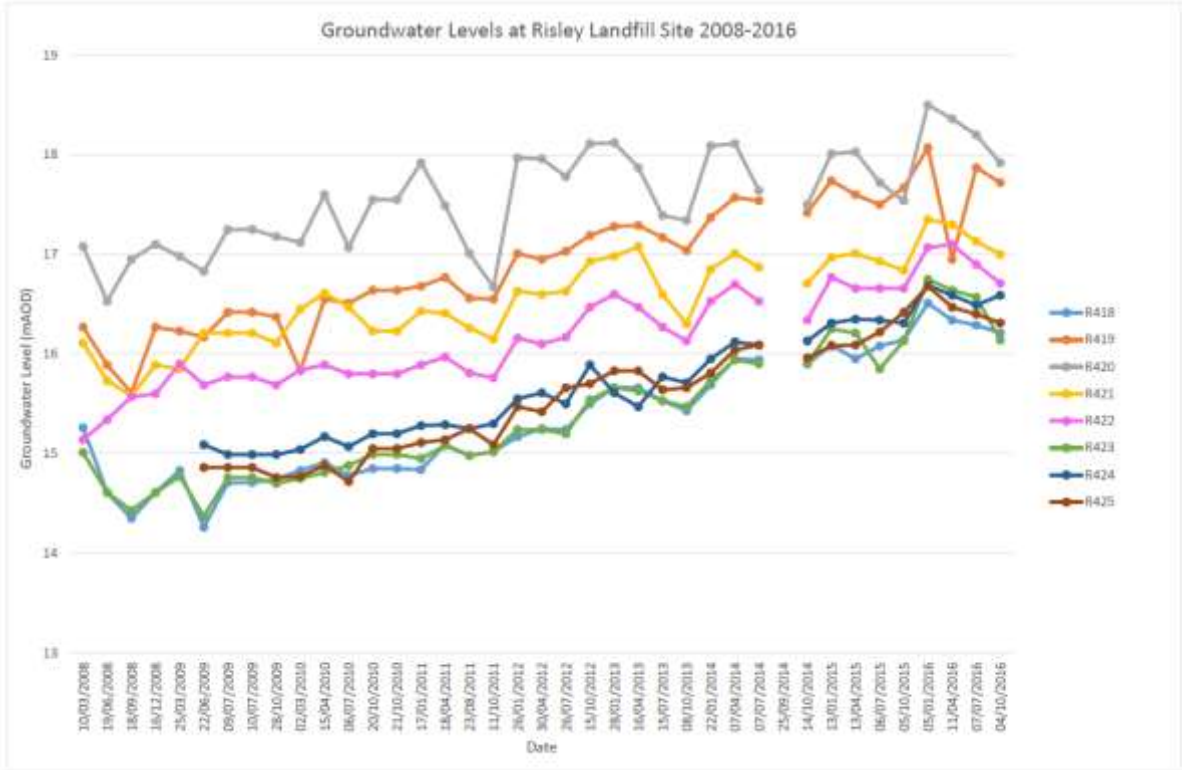


Figure 1: Groundwater monitoring levels for the Sherwood Sandstone (Risley Landfill HRA dated February 2017)

A location plan showing Sherwood Sandstone groundwater monitoring boreholes referred to within the Warrington MSA Water Resources Technical Paper of the Environmental Statement Part 2 is presented as DWG No: SH11739-062 –titled 'Groundwater Monitoring Locations' dated February 2020 and included with this Technical Note.

The groundwater within the Sherwood Sandstone is confined in this area, with the boulder clay in the proposed Fuel Filling Station (FFS) area proven to be greater than 4m in thickness. Nearby borehole logs identify the till as being between 7.2 – 13.1m in thickness. As such it would not be expected that with a maximum depth of the proposed tanks at 5m below ground level that the tanks would become sub water table. Whilst it is intended that the fuel tanks will sit above the ground water level, the tanks will be designed to mitigate against any risk of the groundwater level rising.

The first element in the design would be factory welding tank chambers to the tank cylinder, rather than bolting on site. This removes the risk of groundwater being able to ingress through fixings and creates a watertight seal preventing water entering the chamber, and any fuel leak egressing the chamber into the water course.

Once the welding has been carried out, the tanks will be coated with a 1,500 micron water resistant coating. This will allow the fully sealed and painted tanks to be immersed in groundwater whilst remaining protected from any potential rust.

By implementing this design method, should the groundwater levels rise potential issues, associated with rust and any potential ingress/egress at joints which could result in leaks, will have been removed. This approach has been applied on other Extra site's in the UK where tanks were positioned in contact with the groundwater table.

EA comment: TP109 shows that the clay in this area is laminated below 2.1m. If the tanks are to be installed in this layer, these laminations could provide a preferential pathway to the newly altered watercourse.

WA response: Whilst laminated clay was recorded in TP109 in the vicinity of the FFS no water strike was observed with it. The only water strike within the boulder clay was identified in TP104 associated with very sandy, very gravelly clay yet elsewhere on the site of the Proposed Development when boulder clay of this nature was recorded there were no water strikes. The boulder clay is classified as a secondary (undifferentiated) aquifer; where it has not been possible to attribute either Secondary A or Secondary B parameters to the material. The description of the boulder clay across the proposed Motorway Service Area (MSA) would not appear to meet the requirements of Secondary A (capable of supporting local level water supplies and baseflow to rivers) and may also struggle to meet the requirements of Secondary B (yielding limited amounts of groundwater through fractures and fissures) thus the potential for these deposits to provide a preferential pathway to the aligned brook is deemed to be limited.

EA comment: [Provide information on] finished floor level data including expected level of brook.

WA response: The following drawings are appended to this technical note to define the finished floor level data including expected level of the brook.

In terms of finished floor levels, Architecture 519 drawing RMS-519-ZZ-XX-DR-A-0703 revision P12 titled 'Combined Parameter Plan', submitted as part of the planning application, details the general proposed site levels and finished floor levels. We also attach a new drawing, Wardell Armstrong drawing SH11739-004E titled 'Indicative Levels Design', which confirms the levels shown on the Combined Parameter Plan as well as providing additional details of the indicative levels being considered across the site and to the brook.

Within the Wardell Armstrong Report SH11739 Appendix 3.1/Version 4 (Final) titled 'Flood Risk Assessment and Surface and Foul Water Drainage Strategy', submitted as part of the planning application, the contained Wardell Armstrong drawing SH11739-002D titled 'Brook Diversion Plan and Sections' details the proposed realignment of the brook and provides typical cross sections at 50m intervals. This shows the expected levels of the brook and the adjoining land.

To assist in the interpretation of the watercourse design, Wardell Armstrong drawing SH11739-061A titled 'Indicative Brook Diversion Long Section' was issued previously, in January 2020, to the EA showing the expected longitudinal profile of the realignment of the brook. Due to drawing re-numbering for this technical note, this drawing is attached but is now referenced SH11739-063 titled 'Indicative Brook Diversion Long Section' (this drawing shows the same information as SH11739-061A other than it is now numbered 063).

Section 3.6 of the flood risk assessment details the design of the watercourse and, to clarify the indicative water depths expected within the proposed channel, we attach an additional drawing, SH11739-064 titled 'Silver Lane Brook Watercourse Sections'. This drawing details the estimated water level depths based on a Mannings channel roughness coefficient of 0.04 and 0.08 and shows the water depth for the estimated 1 in 100-year storm event plus 40% climate change discharge rate from the restored landfill site. This shows water depth to be well within the channel's capacity for both roughness coefficients, including a freeboard allowance.

EA comment: [Provide information on] tank size and expected excavation levels for tank farm and bunds in this area

Ingleton Wood Martindales' response: The tank installation will be made up of a 3m diameter fuel tank with a 1.5m high manhole chamber. The tanks would sit on a concrete slab between 0.3 and 0.5m in depth. This would make the total depth of the tank excavation around 5m.

EA comment: Confirmation that the planning boundary does not encroach on the landfill site.

WA response: In 2018, a partial permit surrender was undertaken at the Risley Landfill site. The area surrendered was at the south eastern boundary of the landfill site and is an area approximately 75m wide by 575m long, running in a broadly north to south alignment. The area was associated with the main access to the former landfill facility and the boundary area running north from this. WA's drawing is included within this Technical Note (DWG No: SH11739-062 titled 'Groundwater Monitoring Locations' dated February 2020) and presents the modified permit boundary for Risley Landfill, as presented in Risley Landfill's permit EPR/BV7877IR/S009 dated 07/08/18 following acceptance of the partial permit surrender. The drawing shows that the MSA's Proposed Development boundary does not encroach on Risley Landfill's permitted site boundary.

EA comment: The landfill monitoring boreholes must be preserved. Their location needs to be identified and outside the red line boundary.

WA response: As identified above, the MSA planning red line boundary does not encroach on Risley Landfill's permitted green line boundary. There are a number of groundwater and gas monitoring boreholes located around the edge of the proposed MSA. However only R420, R421 and R424 are present within the red line boundary and included within the requisite surveillance for the Risley landfill. All groundwater and gas monitoring boreholes identified as part of Risley Landfill's requisite surveillance and located around / within the proposed MSA site will be protected throughout construction, operations, and access. Access to these boreholes by Biffa to undertake their monitoring has already been agreed via a Land Control Agreement between Biffa and Extra. There is thus no requirement for the locations of these boreholes to be excluded from the redline planning boundary.

EA comment: Based on the current proposals, we have insufficient detail to both understand the potential impacts [on WFD receptors] and propose appropriate mitigations.

WA comment: Further to discussions during the recent meeting between Extra, the EA and WA on 20 February 2020, we have provided an updated WFD compliance assessment (RPT No. SH11739/008 Revised Water Framework Directive Screening Assessment). This updated assessment incorporates the WFD data included with the water and ecological chapters of the EIA submission and additional supporting evidence as identified in letters received from the EA.

Enc.

DRAWINGS:

Wardell Armstrong - SH11739-062 Groundwater Monitoring Locations

Architecture 519 - RMS-519-ZZ-XX-DR-A-0703 Revision P12 Combined Parameter Plan

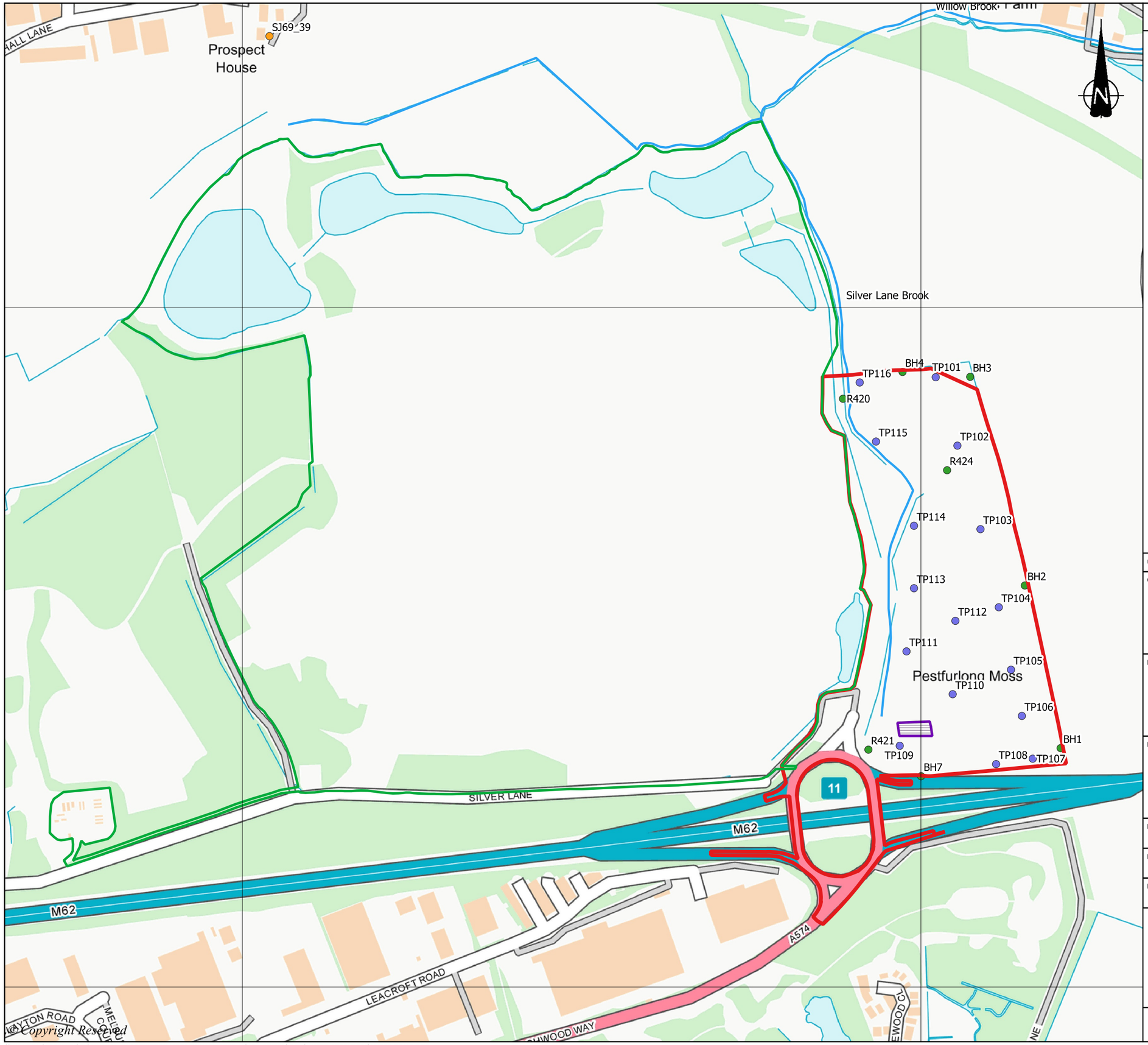
Wardell Armstrong - SH11739-004E Indicative Levels Design

Wardell Armstrong - SH11739-002D Brook Diversion Plan and Sections

Wardell Armstrong - SH11739-063 Indicative Brook Diversion Longsection

Wardell Armstrong - SH11739-064A Indicative Brook Cross Sections Showing Water Depth

DRAWINGS



DO NOT SCALE FROM THIS DRAWING

KEY

- Site Boundary
- Risley landfill Permit Boundary
- Proposed Fuel Filling Station
- Main Rivers
- 2018 WA Trial Pit
- Environment Agency Groundwater Monitoring Location
- Biffa Risley Landfill Monitoring Borehole

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT

Extra MSA Group

PROJECT

Warrington MSA J11/M62

DRAWING TITLE

Groundwater Monitoring Locations

DRG No.	REV
SH11739-062	A

DRG SIZE	SCALE	DATE
A3	1:5500	February 2020

DRAWN BY	CHECKED BY	APPROVED BY
BJ	LB	LB

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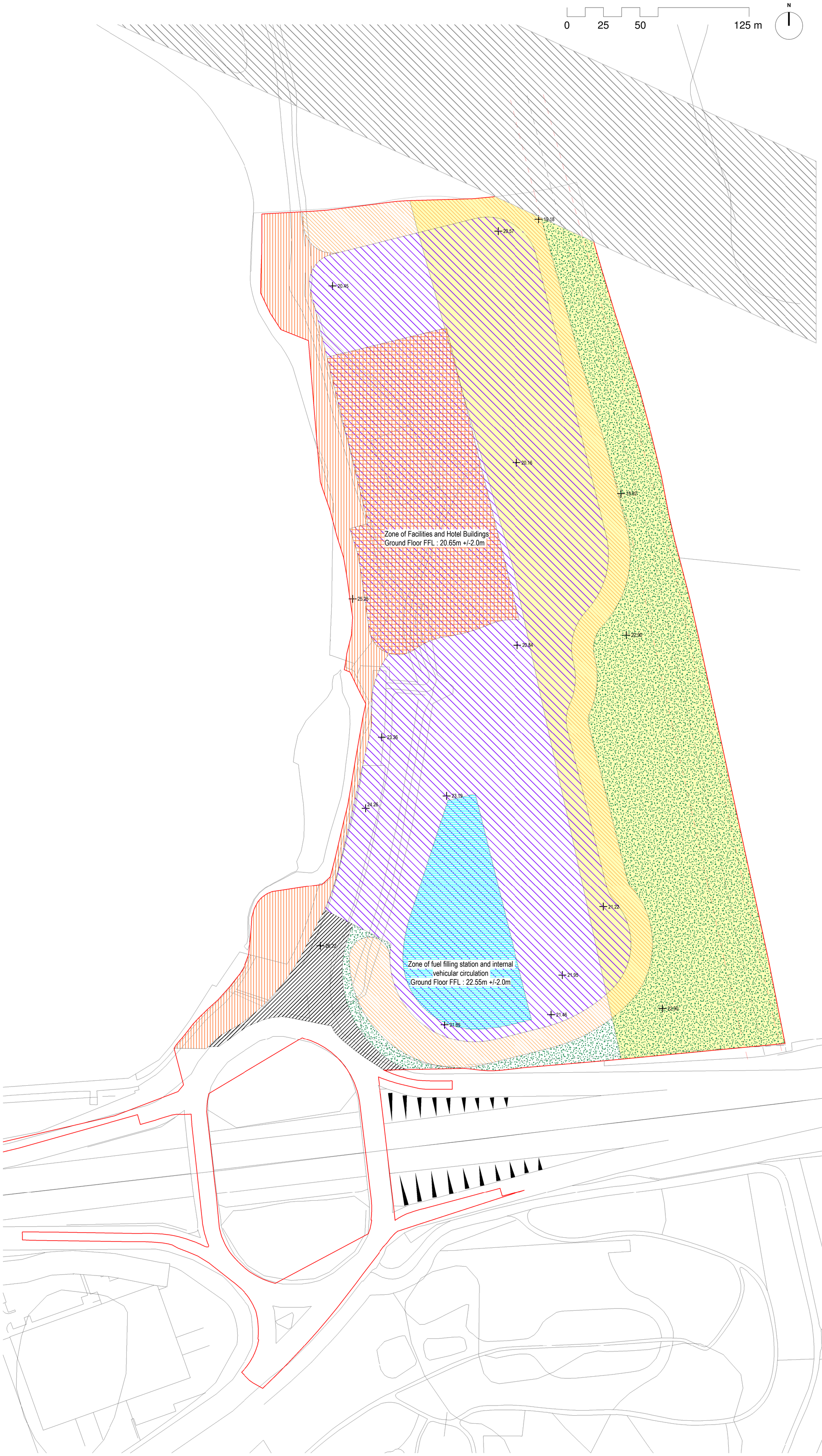
\\WA.LOCAL\PROJECTS\SH\SH11739 - WARRINGTON MOTORWAY SERVICE AR\03 - DESIGN\QGIS\WATER RESOURCES\HYDRO ES V.2.QGS



NOTES

The site boundary is based on Wardell Amstrong drawing no SH11739-006 with amendments discussed with Wardell Armstrong, Shoosmiths, Spawforths and i-transport and approved by Extra.

This red line boundary is to be used for planning purposes only.

All legal boundaries to be confirmed by the client.

Site and surrounding information based on Ordnance Survey Plan Information supplied by Spawforths. Licence no. 100022432

Area of restored landfill site amended to reflect current site conditions

KEY

Red line boundary

21.650 Spot Height - Proposed Level - With +/-0.5m tolerance to allow for scheme evolution

RESTRICTIVE ZONES

Position of gas pipeline as Wardell Armstrong survey drawing SH11739-019-B

Extents of 24m wide gas pipeline easment zone

Extents of HSE 96m Inner Consultation Zone from gas pipeline

Location of HS2 safe guarding zone as Wardell Armstrong drawing SH11739-003

DEVELOPMENT CELLS

Zone of Facilities and Hotel Buildings (including incidental landscaped areas) - Max building height 15m. This area also includes the service yard and external amenity spaces. With +/-2.0m tolerance to allow for scheme evolution and datum level adjustments. (Maximum 37.65m AOD)

Zone of Fuel Filling Station and internal vehicular circulation (including incidental landscaped areas) - Max building height 6.5m. With +/-2.0m tolerance to allow for scheme evolution and datum level adjustments. (Maximum 31.05m AOD)

Landscaped vehicle parking and circulation zone including drainage and ecological features

Extent of proposed access in and out of the site area

GREEN INFRASTRUCTURE

Existing and proposed landscaping, including ecological habitats and drainage

Diverted footpath zone and associated ecological habitat and landscaping

Corridor for Silver Lane Brook Diversion and associated ecological habitat and landscaping

Rev:	Date:	Description:	By:	Rvw:
P12	24.07.19	Outline Planning Issue	TW	JR
P11	16.07.19	Full update in line with Spawforths advice DTM 15.07.19	TW	TW
P10	08.07.19	Full update	MU	TW
P9	22.05.19	Planning Draft For Review	TW	NAB
P8	12.04.19	Site levels provided by Wardell Armstrong added	JLR	TW
P7	10.04.18	Updated restored landfill area. Amended brook diversion zone	JLR	TW
P6	18.03.19	Updated following comments	TW	TW
P5	15.03.19	Updated following comments and surveyed gas main	JLR	TW
P4	08.03.19	Updated following scheme revision	JLR	TW
P3	18.12.18	Updated parameter plans following client comment	SK	JR
P2	04.12.18	Parameters Plans revised following updated layouts	SK	JR
P1	03.12.18	Parameters Plans revised to Spawforths and Extra's comment	SK	JR

architecture 519

a. The Studio, Candle House, 1 Wharf Approach, Granary Wharf, Leeds, LS1 4GH
e. Leeds@architecture519.com
w. www.architecture519.com
t. 0113 213 5656

Client:

EXTRA MSA GROUP

Project No: 2562

Project Name: WARRINGTON MOTORWAY SERVICE AREA, J11 M62

Document Reference:

Project - Originator - Volume - Level - Type - Role - Number

RMS - 519 - ZZ - XX - DR - A - 0703

COMBINED PARAMETER PLAN

Status: Code — Suitability description

Revision: Code **P12** — Revision status Planning

Created By:	Reviewed By:	Date:	Scale at A1:
SK	SB	03.12.18	1 : 1250

DO NOT SCALE FROM THIS DRAWING

KEY:

- PROPOSED CONTOURS (0.1m INTERVALS)
- BUILDING FOOTPRINT
- RETAINING WALL
- TANKING
- GRADE BREAKS (LOW POINTS)
- GRADE BREAKS (HIGH POINTS)

NOTES:

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY AND SUBJECT TO DETAILED DESIGN.
2. LEVELS DESIGN SHOWN IS INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.
3. REFER TO DRAWING SH11739-002 FOR THE BROOK RIVER DIVERSION.
4. REFER TO DRAWING SH11739-003 FOR DRAINAGE ROUTING AND INFORMATION.
5. PROPOSED LEVELS SHOWN TO TIE IN WITH EXISTING LEVELS BASED UPON TOPOGRAPHIC SURVEY COMPLETED BY WARDELL ARMSTRONG DATED JANUARY 2019.
6. DESIGN BASED UPON ARCHITECTS LAYOUT REVISION P5 DATED 11-07-19.
7. CROSS SECTIONS SHOWN ON SH11736-005.
8. RETAINING WALL DESIGN IS INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.
9. VEHICLE RESTRAINTS BARRIERS NOT SHOWN, HOWEVER ARE REQUIRED ON ALL AREAS WHERE VEHICLE PROTECTION IS REQUIRED, AND ARE TO BE LOCATED WITHIN VERGE AREA ADJACENT TO ROAD.
10. PROPOSED FOOTPATH DIVERSION TO BE AS PER EXISTING LEVELS ALONG ROUTE SUBJECT TO DETAILED DESIGN.
11. BUND TO HOLD PEAT WITHIN HABITAT AREA TO BE NO STEEPER THAN 1 IN 3 GRADE AND MAX HEIGHT OF 22.4mAOD.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
E	PLANNING ISSUE. RED LINE BOUNDARY ADDED.	06.08.19	MB	JS	JS
D	PEAT BUND AREA UPDATED TO SUIT VOLUMES REQUIRED	24.07.19	AS	JS	JS
C	REVISED MASTERPLAN + LEVELS DESIGN	23.07.19	AS	JS	JS
B	REVISED MASTERPLAN + LEVELS DESIGN	22-07-19	PAG	SM	JS
A	REVISED LEVELS DESIGN	19-07-19	PAG	SM	JS

CLIENT

EXTRA MSA GROUP

PROJECT

MOTORWAY SERVICES, WARRINGTON

DRAWING TITLE

INDICATIVE LEVELS DESIGN

DRG No.	REV
SH11739-004	E

DRG SIZE	SCALE	DATE
A1	1:1000	03.05.19

DRAWN BY	CHECKED BY	APPROVED BY
AS	JS	JS

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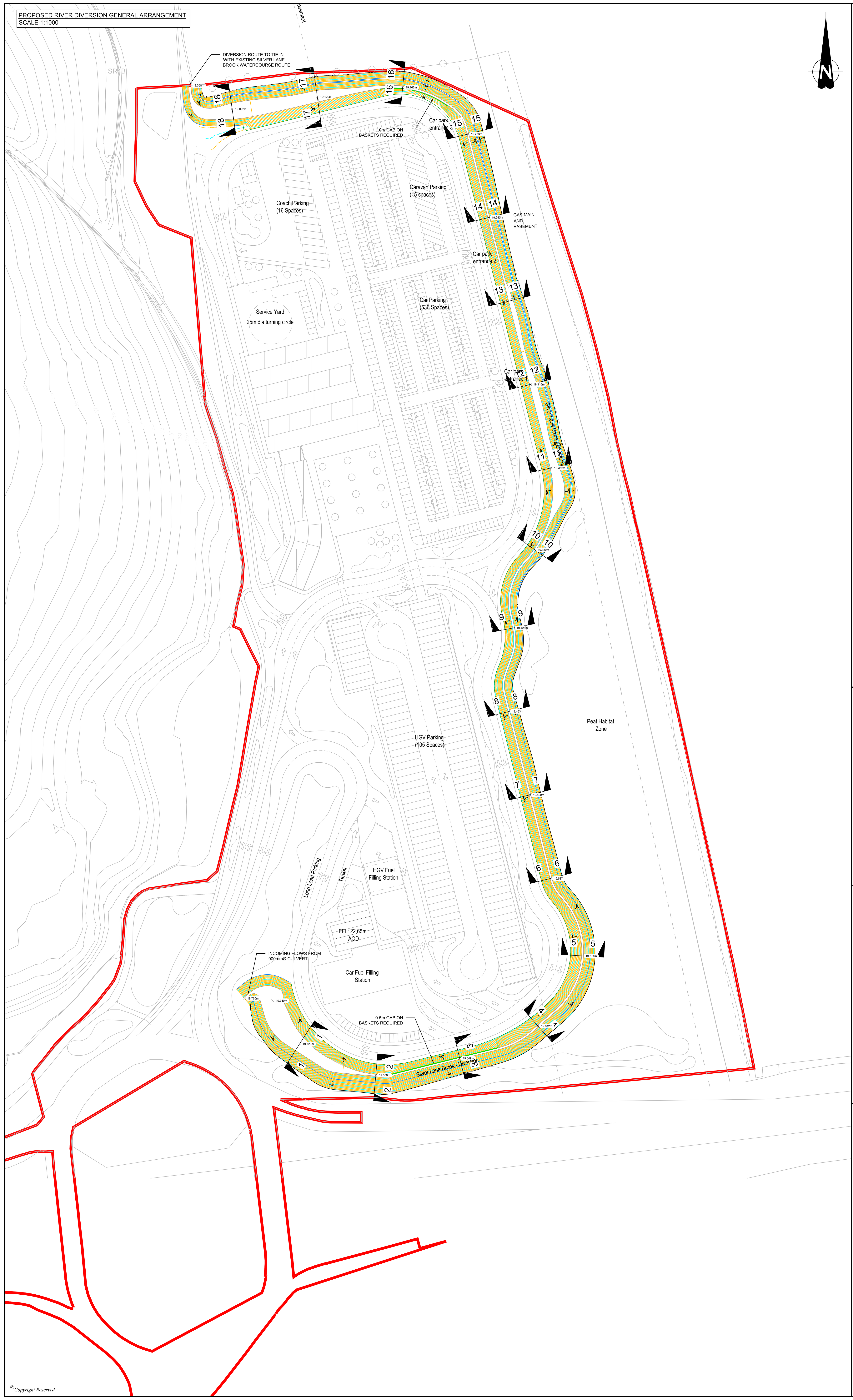
N:\SH\SH11739 - MOTORWAY SERVICES, WARRINGTON\03 - DESIGN\AUTOCAD\SH11739-004E & 005A - INDICATIVE LEVELS DESIGN + SECTIONS-.DWG

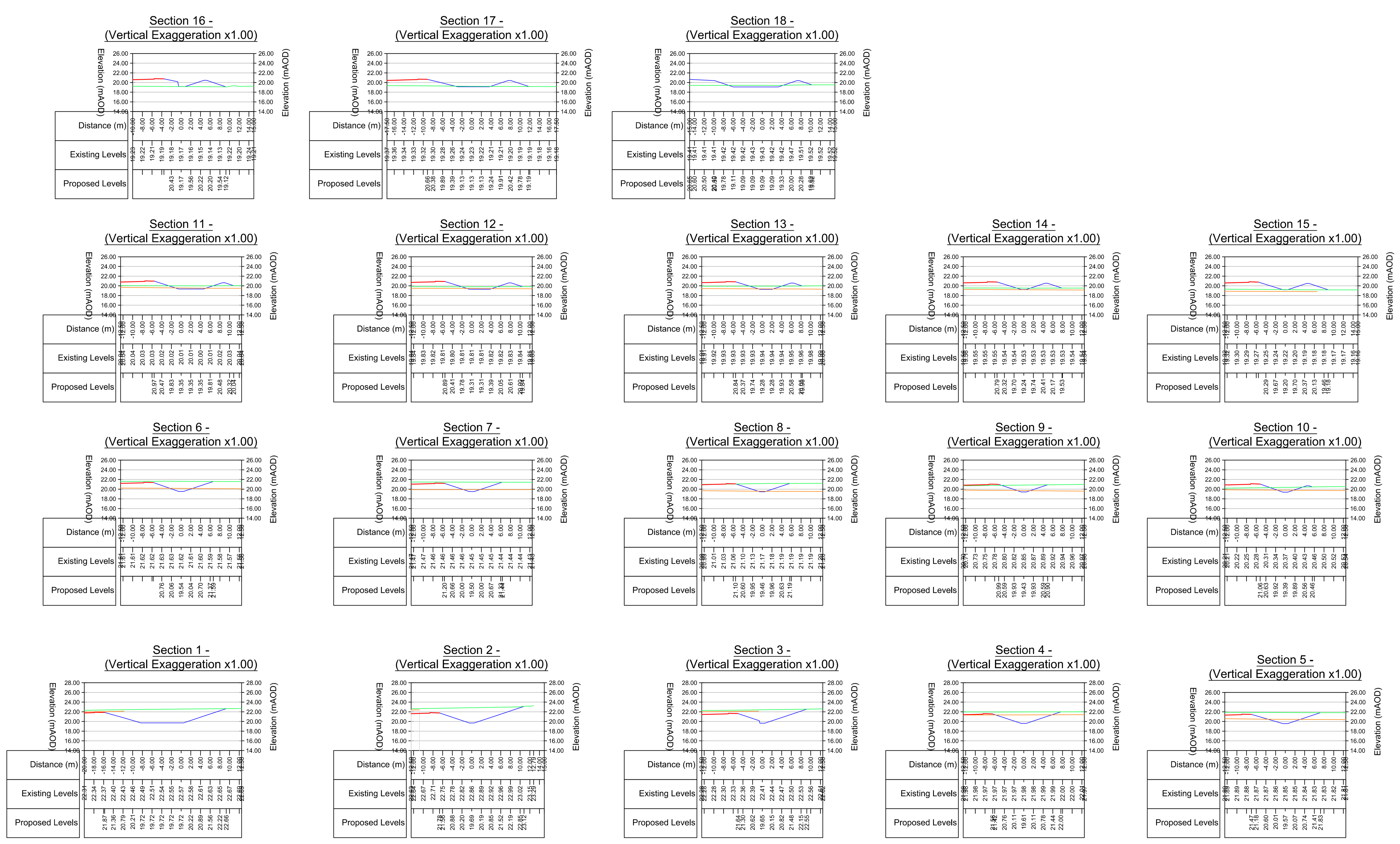
PROPOSED RIVER DIVERSION GENERAL ARRANGEMENT
SCALE 1:1000



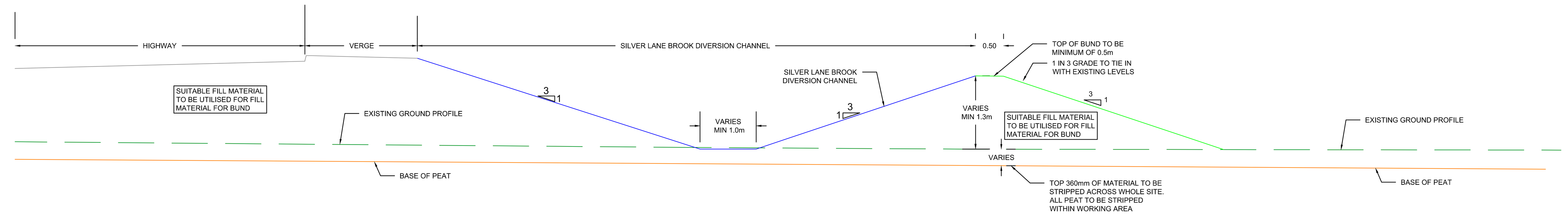
N:\SH\SH11739 - MOTORWAY SERVICES, WARRINGTON\03 - DESIGN\AUTOCAD\SCRATCHPAD\NEW-LAYOUT-DIVERSION.DWG

CROSS SECTIONS
SCALE 1:500

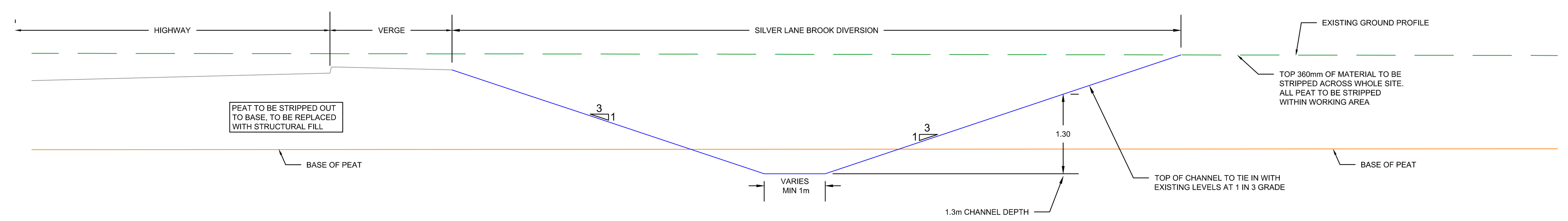
DO NOT SCALE FROM THIS DRAWING



TYPICAL SECTION OF SILVER LANE BROOK DIVERSION
ABOVE EXISTING GROUND LEVELS
SCALE 1:50



TYPICAL SECTION OF SILVER LANE BROOK DIVERSION
BELOW EXISTING GROUND LEVELS
SCALE 1:50



KEY

- 🟩 EXISTING GROUND PROFILE
- 🟥 PROPOSED ACCESS ROAD
- 🟦 BROOK CHANNEL
- 🟧 BASE OF PEAT

NOTES:

1. FOR OUTLINE PLANNING PURPOSES ONLY.
2. DRAWING TO READ IN CONJUNCTION WITH WARDELL ARMSTRONG FLOOD RISK ASSESSMENT DATED AUGUST 2019.
3. WATER COURSE DIVERSION SUBJECT TO DETAILED DESIGN & ENVIRONMENT AGENCY.
4. DRAWING ONLY SHOWS WATERCOURSE CORRIDOR, EXCLUDING DEVELOPMENT AND PEAT HABITAT ZONE.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
D	PLANNING ISSUE. RED LINE BOUNDARY ADDED.	06.08.19	MB	JS	JS
C	ROUTE CHANGED TO SUIT NEW LAYOUT & RETENTION OF PEAT ONSITE	16.07.19	AS	JS	JS
B	ADDITIONAL SPOT HEIGHTS ADDED	10.06.19	AS	JS	JS
A	BROOK DIVERSION ROUTE UPDATED	16.05.19	AS	JS	JS

CLIENT
EXTRA MSA GROUP

PROJECT
MOTORWAY SERVICES, WARRINGTON

DRAWING TITLE
BROOK DIVERSION PLAN AND SECTIONS

DRG No.	SH11739-002	REV	D
DRG SIZE A0	SCALE AS SHOWN	DATE 30/04/19	
DRAWN BY MB	CHECKED BY JS	APPROVED BY JS	

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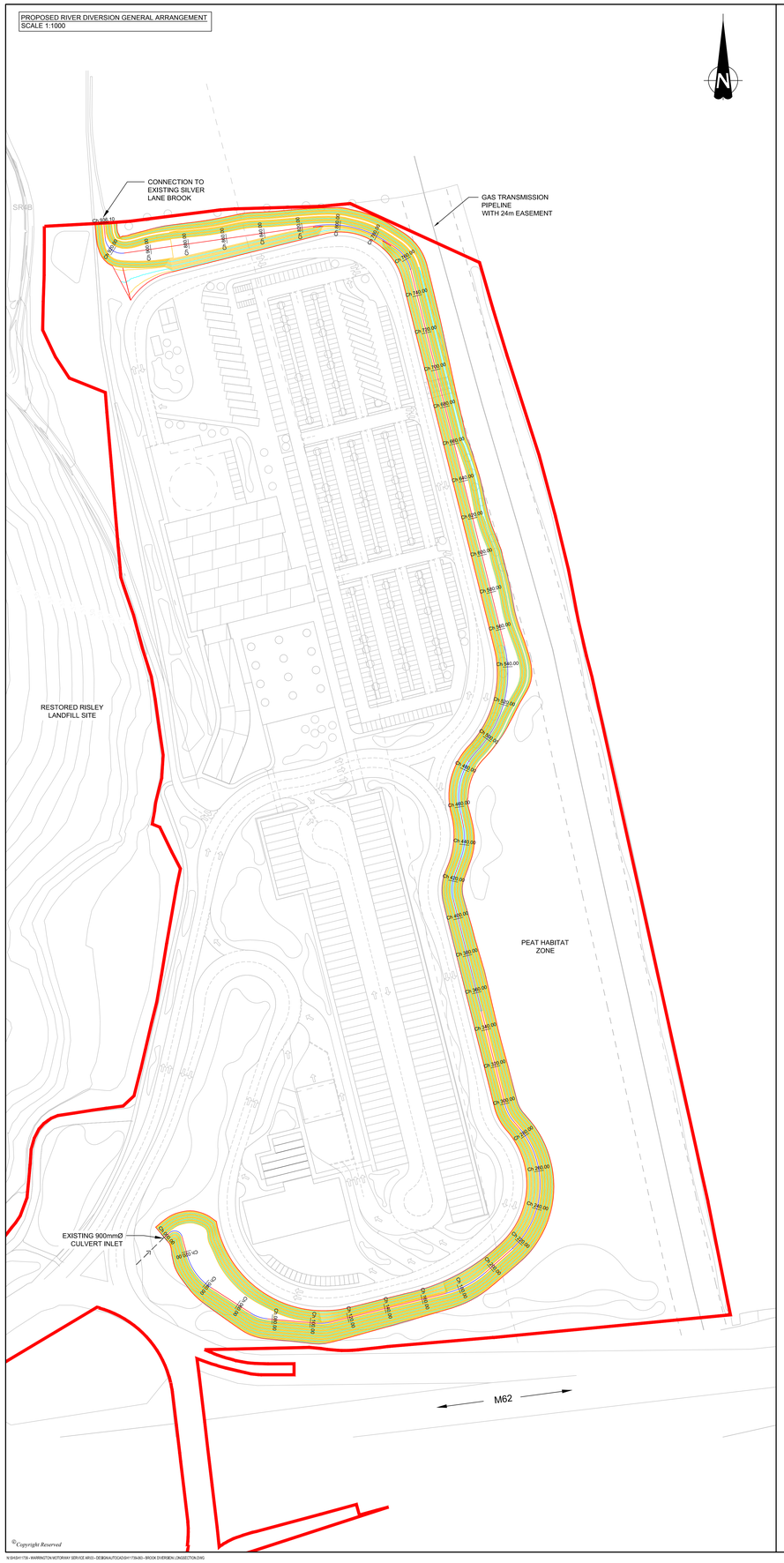
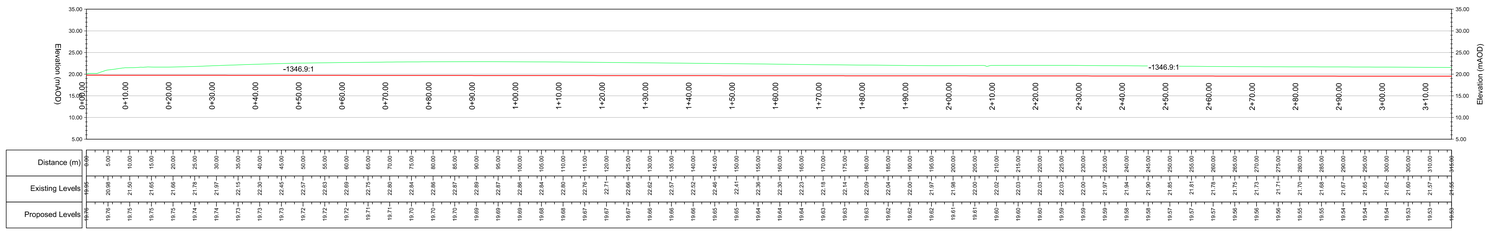
PROPOSED RIVER DIVERSION GENERAL ARRANGEMENT
SCALE 1:1000



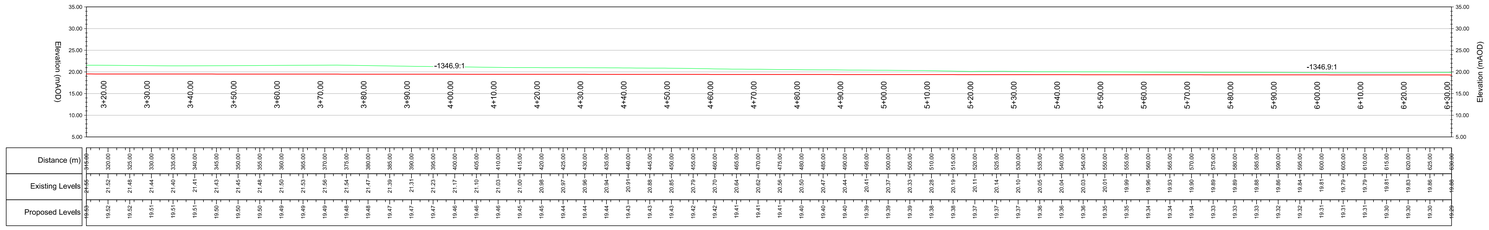
BROOK DIVERSION LONGSECTION
SCALE 1:500

DO NOT SCALE FROM THIS DRAWING

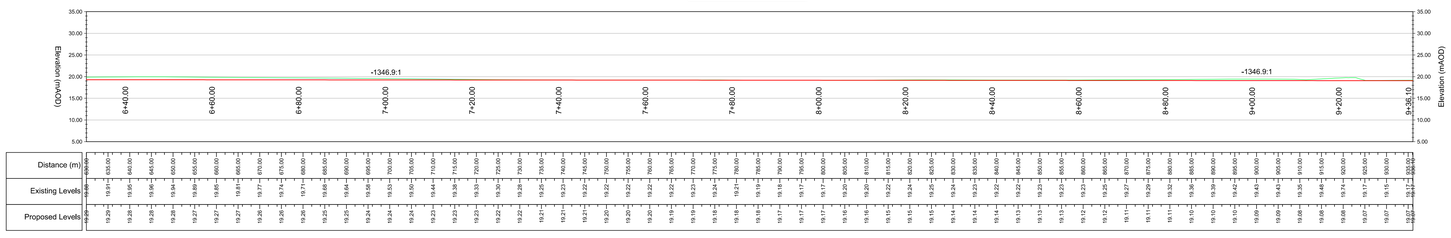
Brook Diversion Longsection
(Vertical Exaggeration x1.00)
(CH 0.00 to CH 315.00)



Brook Diversion Longsection
(Vertical Exaggeration x1.00)
(CH 315.00 to CH 630.00)



Brook Diversion Longsection
(Vertical Exaggeration x1.00)
(CH 630.00 to CH 936.10)



KEY

EXISTING GROUND PROFILE

PROPOSED BROOK DIVERSION CHANNEL

NOTES:

1. FOR OUTLINE PLANNING PURPOSES ONLY.
2. SILVER LANE BROOK DIVERSION SUBJECT TO DETAILED DESIGN AND AGREEMENT FROM EA.
3. ENCROACHMENT INTO CADENT GAS MAIN EASEMENT SUBJECT TO CONFIRMATION.
4. REFER TO DRAWING SH11739-002D FOR SILVER LANE BROOK DIVERSION CROSS SECTIONS AND TYPICAL CONSTRUCTION SECTION.
5. LONGSECTIONS SHOWN HAVE A VERTICAL EXAGGERATION X1.00

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD

CLIENT

EXTRA MSA GROUP

PROJECT

MOTORWAY SERVICES, WARRINGTON

DRAWING TITLE

INDICATIVE BROOK DIVERSION LONSECTION

DRG No. SH11739-063		REV -
DRG SIZE A0	SCALE AS SHOWN	DATE 11/12/19
DRAWN BY PAG	CHECKED BY AS	APPROVED BY JS

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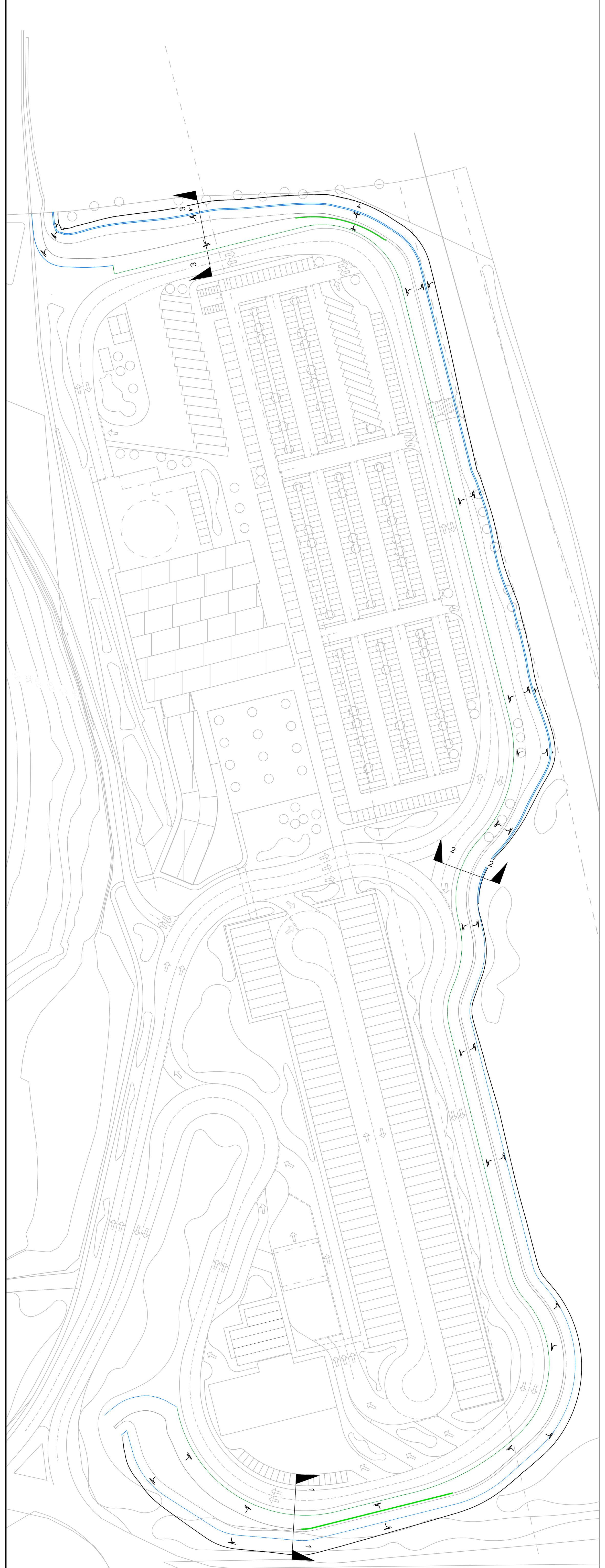
N:\SH\SH11739 - WARRINGTON MOTORWAY SERVICE AREA\3 - DESIGN\AUTOCAD\SH11739-063 - BROOK DIVERSION LONGSECTION.DWG

DO NOT SCALE FROM THIS DRAWING

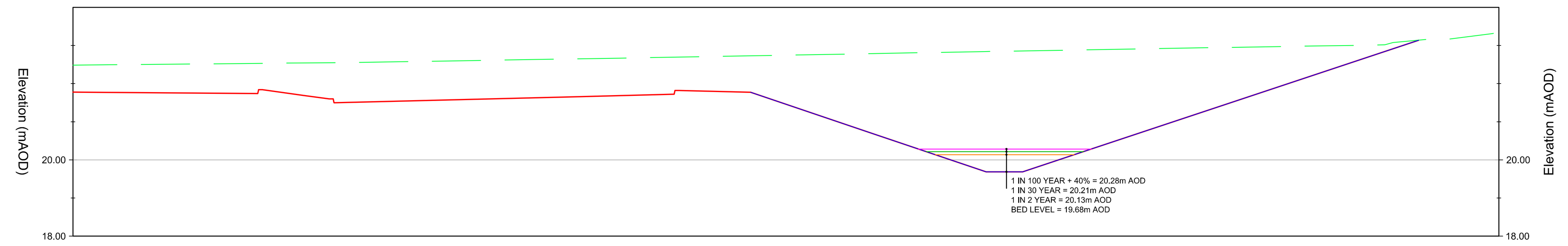
OVERALL SITE LAYOUT & SECTION LOCATIONS
SCALE 1:1000 @ A0



SILVER LANE BROOK SECTIONS WITH WATER DEPTHS
SCALE 1:100 @ A0

SECTION 1-1
MANNING'S COEFFICIENT 0.04

Section 1 - 1
(Vertical Exaggeration x1.00)



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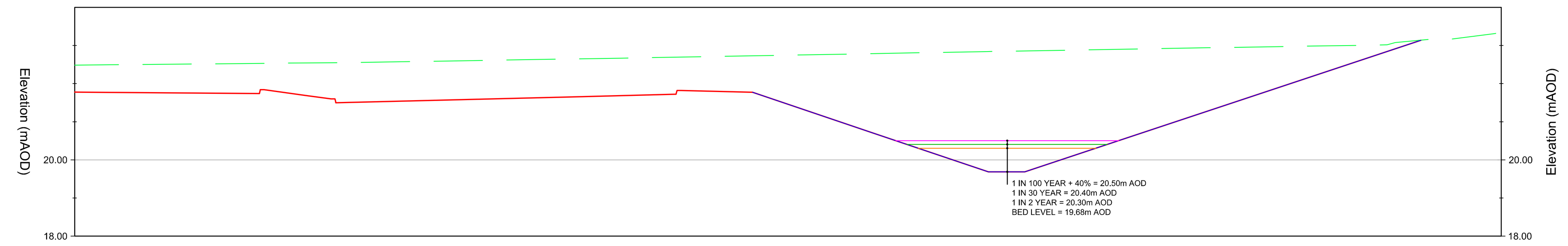
Existing Levels	22.50	22.52	22.54	22.56	22.60	22.63	22.66	22.70	22.73	22.77	22.81	22.84	22.88	22.91	22.94	22.98	23.01	23.16	
Proposed Levels	21.76	21.75	21.70	21.53	21.58	21.63	21.68	21.82	21.69	21.01	20.33	19.68	20.06	20.73	21.39	22.06	22.73		

SECTION 1-1
MANNING'S COEFFICIENT 0.08

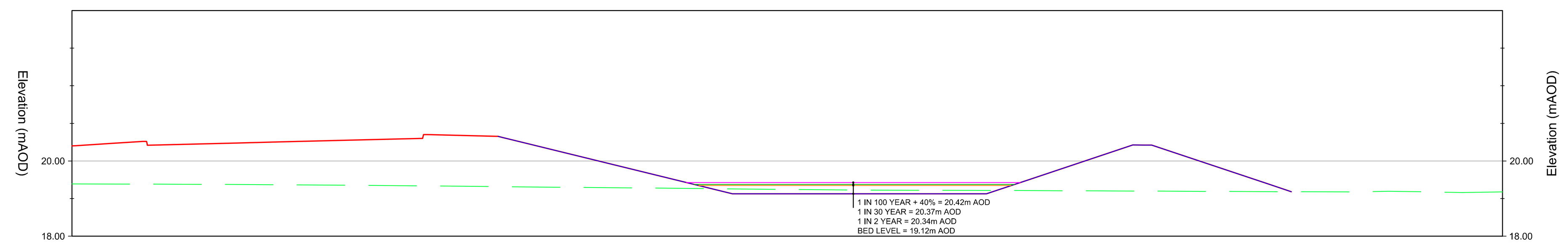
Section 1 - 1
(Vertical Exaggeration x1.00)



Distance (m)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00	37.34
Existing Levels	22.50	22.52	22.54	22.56	22.60	22.63	22.66	22.70	22.73	22.77	22.81	22.84	22.88	22.91	22.94	22.98	23.01	23.16	
Proposed Levels	21.76	21.75	21.70	21.53	21.58	21.63	21.68	21.82	21.69	21.01	20.33	19.68	20.06	20.73	21.39	22.06	22.73		

SECTION 2-2
MANNING'S COEFFICIENT 0.04

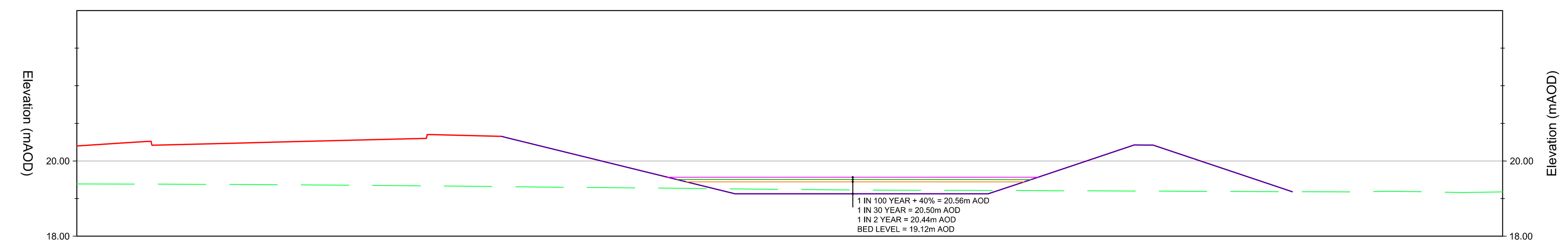
Section 3 - 3
(Vertical Exaggeration x1.00)



Distance (m)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00
Existing Levels	19.38	19.38	19.36	19.35	19.33	19.31	19.29	19.27	19.25	19.23	19.22	19.22	19.21	19.20	19.19	19.18	19.18	19.18
Proposed Levels	20.43	20.47	20.52	20.57	20.69	20.49	20.00	19.50	19.13	19.13	19.13	19.13	19.70	20.37	19.98	19.31		

SECTION 2-2
MANNING'S COEFFICIENT 0.08

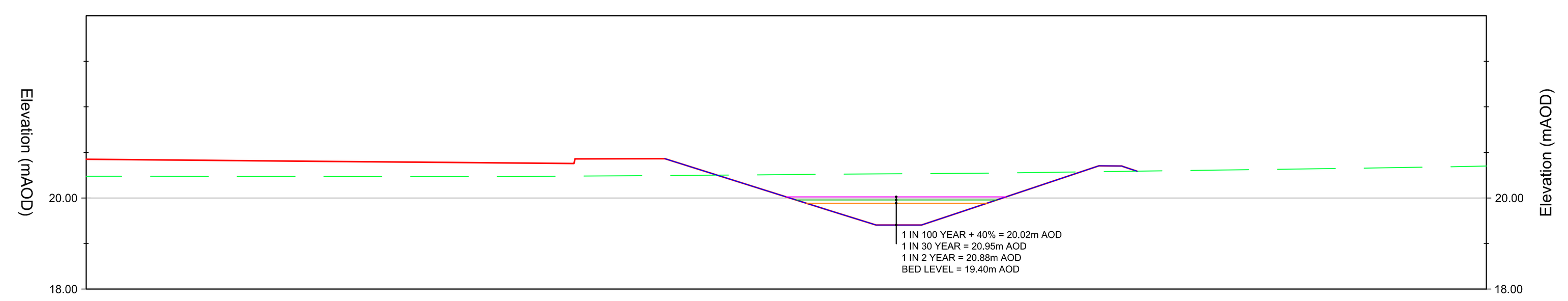
Section 3 - 3
(Vertical Exaggeration x1.00)



Distance (m)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00
Existing Levels	19.38	19.38	19.36	19.35	19.33	19.31	19.29	19.27	19.25	19.23	19.22	19.22	19.21	19.20	19.19	19.18	19.18	19.18
Proposed Levels	20.43	20.47	20.52	20.57	20.69	20.49	20.00	19.50	19.13	19.13	19.13	19.13	19.70	20.37	19.98	19.31		

SECTION 3-3
MANNING'S COEFFICIENT 0.04

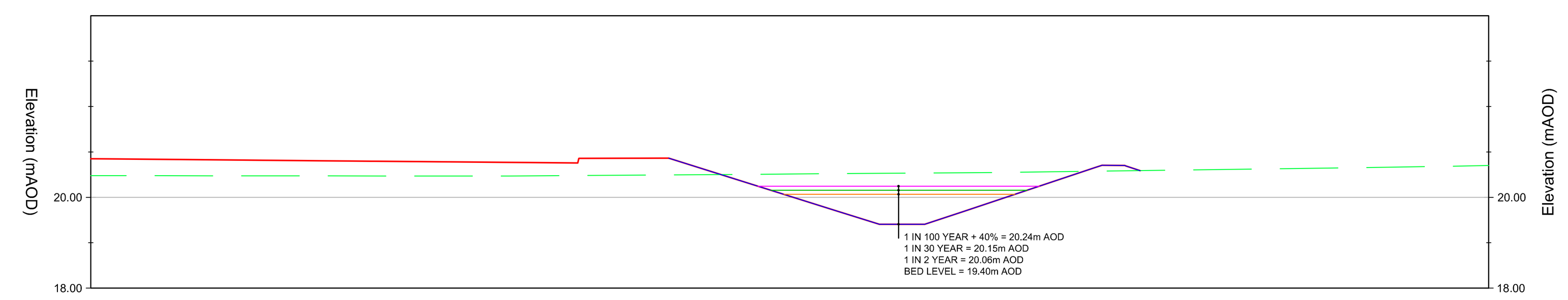
Section 2 - 2
(Vertical Exaggeration x1.00)



Distance (m)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
Existing Levels	20.48	20.47	20.47	20.47	20.47	20.49	20.50	20.52	20.53	20.55	20.57	20.60	20.63	20.65	20.69
Proposed Levels	20.83	20.81	20.80	20.78	20.76	20.86	20.46	19.83	19.41	19.95	20.62				

SECTION 3-3
MANNING'S COEFFICIENT 0.08

Section 2 - 2
(Vertical Exaggeration x1.00)



Distance (m)	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
Existing Levels	20.48	20.47	20.47	20.47	20.47	20.49	20.50	20.52	20.53	20.55	20.57	20.60	20.63	20.65	20.69
Proposed Levels	20.83	20.81	20.80	20.78	20.76	20.86	20.46	19.83	19.41	19.95	20.62				

KEY

- PROPOSED ONSITE PROFILE
- EXISTING PROFILE
- SILVER LANE BROOK
- 1 IN 2 YEAR WATER LEVEL
- 1 IN 30 YEAR WATER LEVEL
- 1 IN 100 YEAR + 40% CLIMATE CHANGE WATER LEVEL

NOTES:

1. ALL SECTIONS HAVE A VERTICAL EXAGGERATION OF x1.
2. REFER TO SILVER LANE BROOK CALCULATIONS FOR WHERE WATER DEPTHS WERE CALCULATED.
3. ALL INCOMING FLOWS PROVIDED BY BIFFA.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	DRAWING TITLE UPDATED	20.03.20	AS	JS	JS

CLIENT
EXTRA MSA GROUP

PROJECT
WARRINGTON SERVICES STATION

DRAWING TITLE
INDICATIVE BROOK DIVERSION CROSS SECTIONS SHOWING WATER DEPTHS

DRG No.		REV
SH11739-064		A

DRG SIZE	SCALE	DATE
A0	AS SHOWN	19.02.20

DRAWN BY	CHECKED BY	APPROVED BY
AS	JS	JS

wardell armstrong

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N:\SH\SH11739 - WARRINGTON MOTORWAY SERVICE AREA\03 - DESIGN\AUTOCAD\SH11739-064-A INDICATIVE BROOK WATER DEPTH CROSS SECTIONS.DWG