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Vinery Court, 58 Cardigan Lane
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Project

Proposed Enclosure for Batching Plant

Title

Drainage Strategy

Client

Naylors Concrete

MSJ Job No 224033

Document No
224033 GEN 0001 – Drainage Strategy

Rev P2 Date 05/06/2024

Issue Record

MSJ

Status	Rev	Description	By	Chk		Date
S2	P1	Initial Drainage Strategy	DS	MH		05/06/2024
S2	P2	Plan dwg Appendix E revised. Silt Trap added.	MH			14-06-24

Contents

Introduction

This design document is for the surface water drainage for the proposed Naylor Concrete enclosure for batching plant. It should be read in conjunction with the Flood Risk Assessment 224033 GEN 0001-P1 [Flood Risk Assessment], produced by Melia Smith and Jones.

Existing Drainage Infrastructure

See Existing Drainage Plans (Appendix A & B).

The existing site is a relatively small (0.4Ha), rectangular parcel within a wider industrial area. The land itself is relatively flat with only 300-400mm changes in level across the whole site, typically falling South to North and East to West. The site has a maximum level of approximately +72.740m AOD and a minimum level of +72.270m AOD. The parcel of site due for development currently houses 3 polytunnel structures and is part the wider Naylor Concrete site/compound.

An existing culverted watercourse (>50m long) passes the site approximately 300m to the North of the site. There is an abandoned canal 600m north beyond the rail lines and the River Dearne is approximately 1km North East of the site.

There are Yorkshire Water surface water drains (falling West to East) to the immediate South of the site (see Appendix B). A nearby network of private drainage has also been installed. These sewers have been surveyed and it has been observed that this private network connects into the adopted Yorkshire Water system North East of the site via a flow control device, with oversized pipes being used for attenuation.

Drainage Investigations

See Appendix A for Drainage survey drawing and Appendix C for accompanying results.

A CCTV survey of the existing off site sewer network has been carried out where possible. The current drainage on site and where it connects into the broader private network within the road to the east is in good condition and is reusable for the proposed development.

Existing Drainage

See Appendix D for existing drainage and run/off rates.

The existing surface water network in the immediate vicinity of the site consists of 2 drainage channels (between the polytunnels) and a land drain nearby. Water from the central polytunnel, and the inner half of the 2 neighbouring polytunnels flows towards the channels which connect into M/H1 and eventually connects into the oversized private attenuation pipe to the East. The same drainage channels extend beyond the footprint of the polytunnels to pick up surface water from the external area to the East.

Rainwater that falls on the outer half of the left polytunnel eventually makes it into the land drain nearby which connects into M/H2 (part of the existing private network described above).

Rainwater that falls on the outer half of the polytunnel on the right is unaccounted for.

It is important to note that the drainage from the Naylor site connects into the wider private network at an unrestricted rate.

The broader private surface water system (within the road and rest of site) discharges off site and into the Yorkshire Water network via a flow control (15l/s sec). Attenuated flow is stored in an oversized pipe located in the access road adjacent to the existing Naylor factory.

An analysis of the existing system surrounding the polytunnels (Appendix A). Based on the areas highlighted in Appendix D (1931m²) and the sites location, it has been approximated that the expected unrestricted run/off from site at present is 25.04l/sec (based on a value of 0.018l/sec/m² in accordance with Building Regs Doc H)

Proposed Drainage Design

See Appendix E & F

In accordance with the Approved Document H, adequate consideration has been taken to discharge via the following listed in priority.

1. Discharge via a soakaway or some other infiltration system
2. Discharge into a watercourse
3. Discharge into a sewer

Soakaway tests on the adjacent site have been carried out (see Appendix G) and infiltration rates proved that soakaways were not viable.

There are no watercourses in the immediate locality of the site, so discharge to a watercourse is not considered viable.

In accordance with DEFRA document Non-Statutory Technical Standards for Sustainable Drainage Systems, flows for previously developed sites should be restricted (as close to as reasonably practicable) to the Greenfield run off rate. Peak flow will therefore be restricted to Greenfield run/off for 1:1 year rainfall events. As the existing site currently discharges at an unrestricted rate, this is a significant improvement.

It is proposed to limit flow rates off site to IH124 Greenfield runoff rates. The table below suggests these rates based on a proposed impermeable developed area of 0.4Ha.

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 1	2.0	2.0	1.7	3.7	4.8

These limits are very low and to limit flow to these amounts is likely to need an orifice which would be liable to blockage. It is proposed therefore to limit surface water discharge to 3l/s. As shown in Appendix E, this will result in the requirement of an on-line attenuation structure with a volume of 256m³.

Due to the footprint of the proposed structure, an extent of the existing drainage channels as well as pipes, land drain and M/H1 are to be grubbed up/removed as shown in Appendix E. It is proposed that the new system will eventually make it to the new control manhole which will be placed in line with, and make use of the existing 150dia. pipe which will flow towards existing manhole M/H2 and the greater private network.

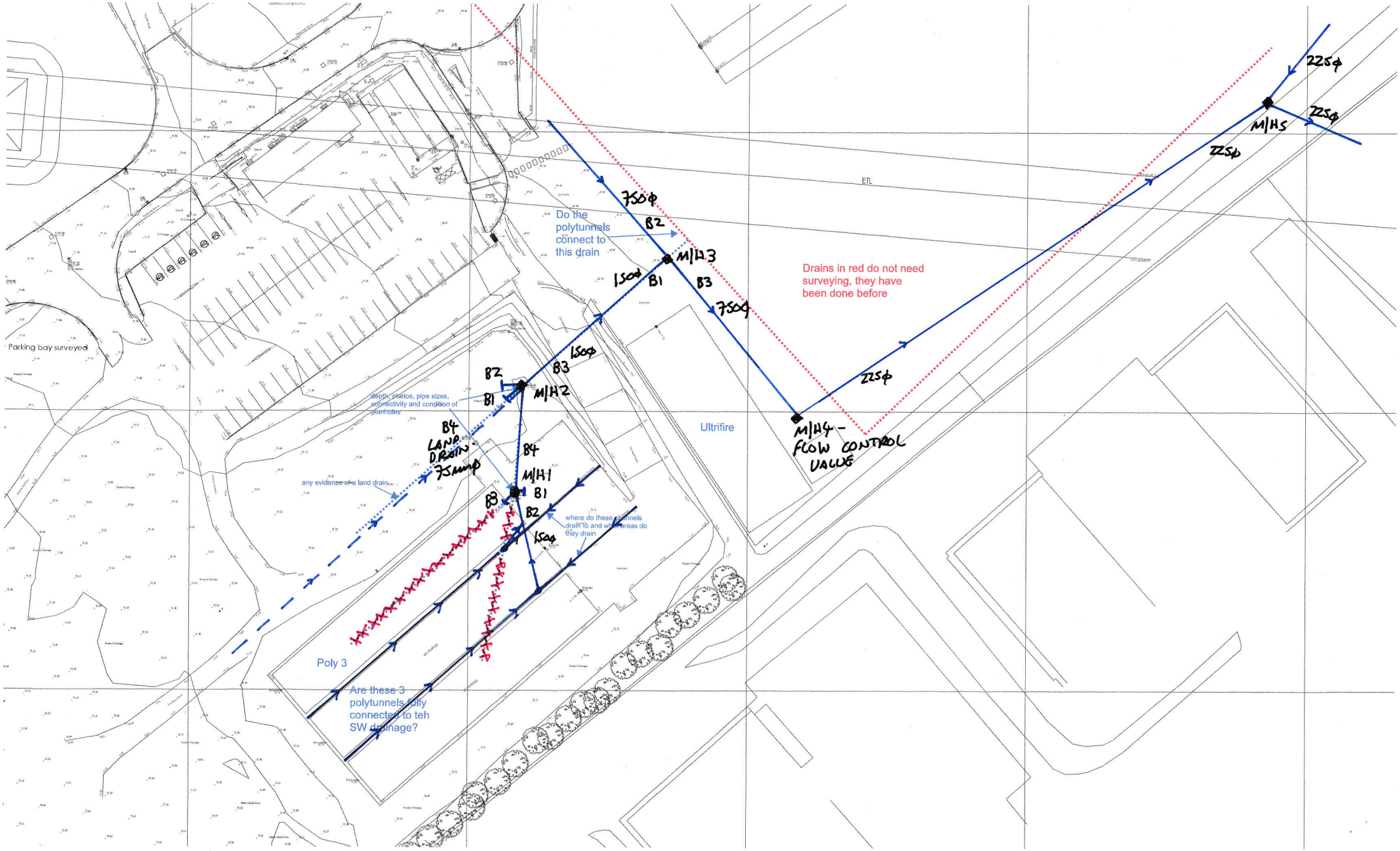
The surface water system has been designed so that:

- No surcharging occurs for 1 year return period storms
- Surcharging (but no flooding) occurs for 30year + 40% Climate Change return period storms
- No flooding occurs for 100 year + 40% Climate Change return period storms. This is because, due to the existing topo it is unlikely that floodwater will be contained on site.

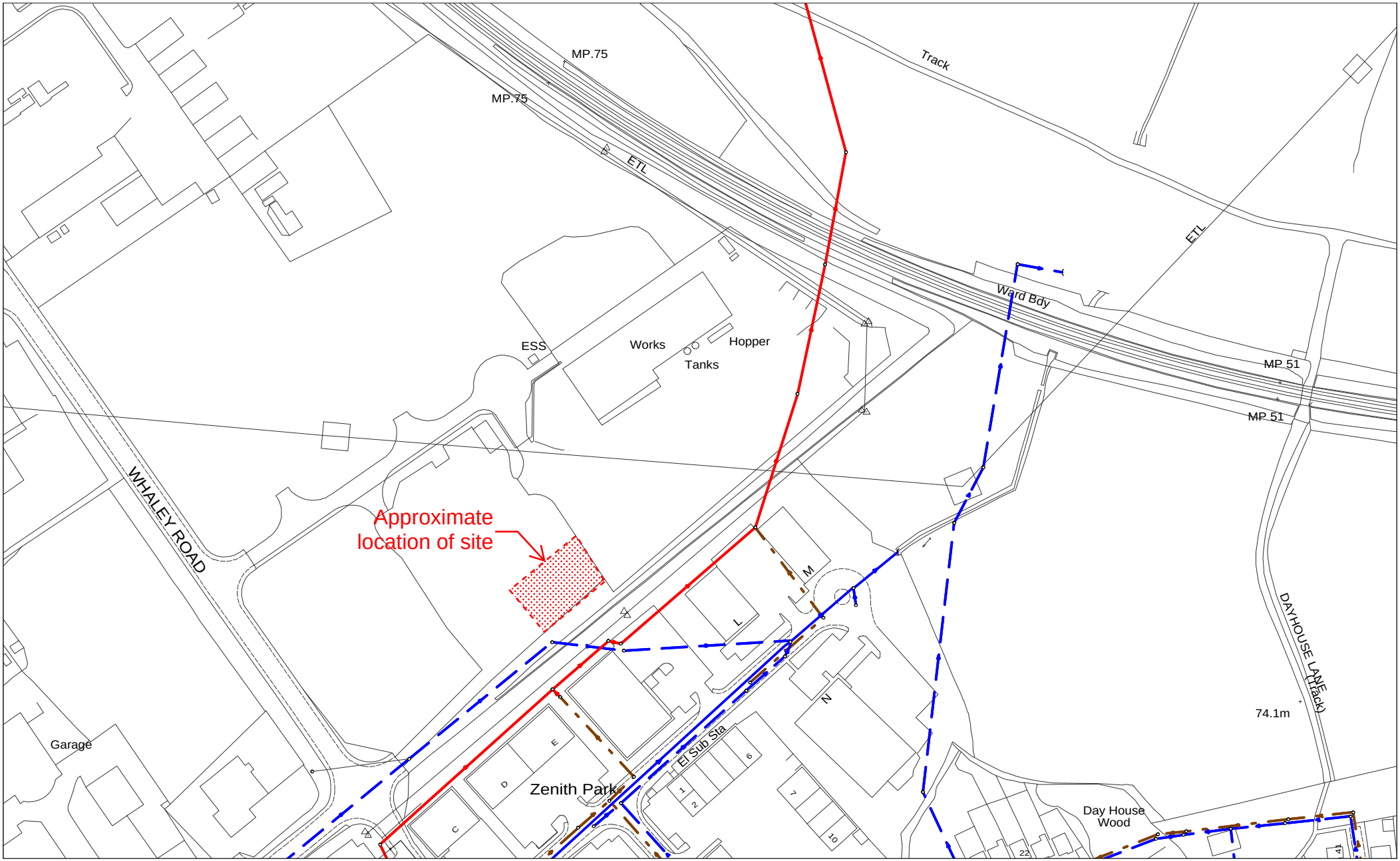
Foul Drainage

There are no requirements to the proposed structure that involve the handling of foul water.

APPENDIX A


Parking bay surveyed
Do the polytunnels connect to this drain
Drains in red do not need surveying, they have been done before
Ultrifire
depth, photos, pipe sizes, connectivity and condition of manholes
any evidence of a land drain
where do these polytunnels drain to and what areas do they drain
Poly 3
Are these 3 polytunnels fully connected to teh SW drainage?
M/H1
M/H2
M/H3
M/H4 - FLOW CONTROL VALVE
M/H5
B1
B2
B3
B4
LAND DRAIN 75mmΦ
150Φ
750Φ
225Φ

APPENDIX B



Date Requested : 03/11/2014, 12:24:16

Date Generated : 03/11/2014, 12:24:19

Scale : 1:2500

The position and depth of any YW apparatus shown on this map are approximate only.

UPN: Undefined

Originator: Z FAYYAZ, Appraisals, 01274 692645

APPENDIX C

G.P. DRAIN SURVEYS

CLEANING, JETTING, RE-LINING, REPAIRS & SURVEYS

REGISTERED OFFICE:
THORNY CROFT
56 B SCATCHERD LANE
MORLEY
LEEDS
LS27 OJJ

TEL\FAX: 0113 2533154
MOBILE: 07973 834690

Our Ref : GMP/lhg/3190

Your Ref : Mark Holmes

8th May 2024

Melia Smith & Jones Ltd
Vinery Court
58 Cardigan Lane
Leeds
LS4 2LD

For the attention of : Mark Holmes.

C.C.T.V. DRAINAGE SURVEY.

Site at Naylors Concrete Products Whaley Road Barugh Green Barnsley.

Manhole	Invert	Pipe Size	Material	Service	Chamber Size
1	1220mm	6”	Clay	Surface Water	460mm Dia
2	3420mm	6” & 3”	Clay & plastic	Surface Water	1200mm Dia
	1260mm Invert of plastic land drain				
3	2700mm	6” & 30”	Clay & concrete	Surface Water	1200mm Dia
	2060mm Invert of drain from M/H2				
4 Flow Control	3540mm	30” & 9”	Concrete & clay	Surface Water	1800mm Dia
5	3720mm	9”	Clay	Surface Water	1200mm Dia

M/H1 – B1
00.0 – Start scan
00.0 – Drain full of silt – capped off and out of use

Conclusion
Please see comments at the end of the report.

M/H1 – B2
00.0 – Start scan
00.0 to 08.0 – Mass of silt & debris
12.4 – Blind branch 3.0’clock from one drainage channel
18.7 – End survey at the other drainage channel
18.7 – Film in reverse
00.0 – End survey back at M/H1

Conclusion
Please see comments at the end of the report.

M/H1 – B3
00.0 – Start scan
00.2 – Drain capped off and out of use

Conclusion
Please see comments at the end of the report.

M/H1 – B4
00.0 – Start scan
05.1 – Line of the drain deviates slightly right
05.1 to 18.7 – Silt & debris within the drain
19.3 – Mass of debris on concrete slurry
19.3 – End survey at the mouth to M/H2

Conclusion
Please see comments at the end of the report.

M/H2 – B1
00.0 – Start scan
01.0 – Drain capped off and out of use

Conclusion
Please see comments at the end of the report.

M/H2 – B2
00.0 – Start scan
01.3 – Drain capped off and out of use

Conclusion
Please see comments at the end of the report.

M/H2 – B3
00.0 – Start scan
00.0 to 02.5 – Mass of silt and concrete slurry
02.5 – Survey abandoned
02.5 – Film in reverse
00.0 – End survey back at M/H2

Conclusion
Please see comments at the end of the report.

M/H2 – B4 – HIGH LEVEL PLASTIC LAND DRAIN
00.0 – Start scan
08.2 – Land drain compressed – unable to continue

Conclusion
Please see comments at the end of the report.

M/H3 – B1 – TOWARDS M/H2
00.0 – Start scan
00.0 to 33.9 – Concrete slurry within the drain
34.0 – Mass of debris and slurry at the same point M/H2 – B3 survey was abandoned
34.0 – Survey ended near M/H2

Conclusion
Please see comments at the end of the report.

M/H3 – B2
00.0 – Start scan
00.0 – View upstream of outfall drainage

Conclusion
Please see comments at the end of the report.

M/H3 – B3
00.0 – Start scan
00.0 – View downstream of outfall drainage

Conclusion
Please see comments at the end of the report.

COMMENTS ON OUT FINDINGS.

We were instructed to attend site to prove the connectivity of the surface water discharge from the roofs of the Poly-tunnels. The roofs on the three Poly-tunnels are dome shaped and all surface water discharges either side of each tunnel. The centre tunnel and one side of one tunnel and the other side of the other tunnel all discharge off the roofs and into the two drainage channels that are situated between the three tunnels. The two outer edge tunnels roofs discharge straight to ground. The right-hand side tunnel surface water will eventually discharge into the plastic land drain that we have called M/H1 – B4, there is no positive drainage for the left-hand tunnel, as this just discharges to waste land.

We proved the connectivity into the large diameter surface water system and what we have called M/H3 and got inverts and measurements to the outfall chambers M/H4 & M/H5.

We can see no reason why the outfall drainage from M/H1, M/H2 up to the discharge chamber M/H3 could not be used for the proposed development and all we would recommend is that the outfall drain between M/H1, M/H2 & M/H3 be high-pressure water jet/vac cleaned.

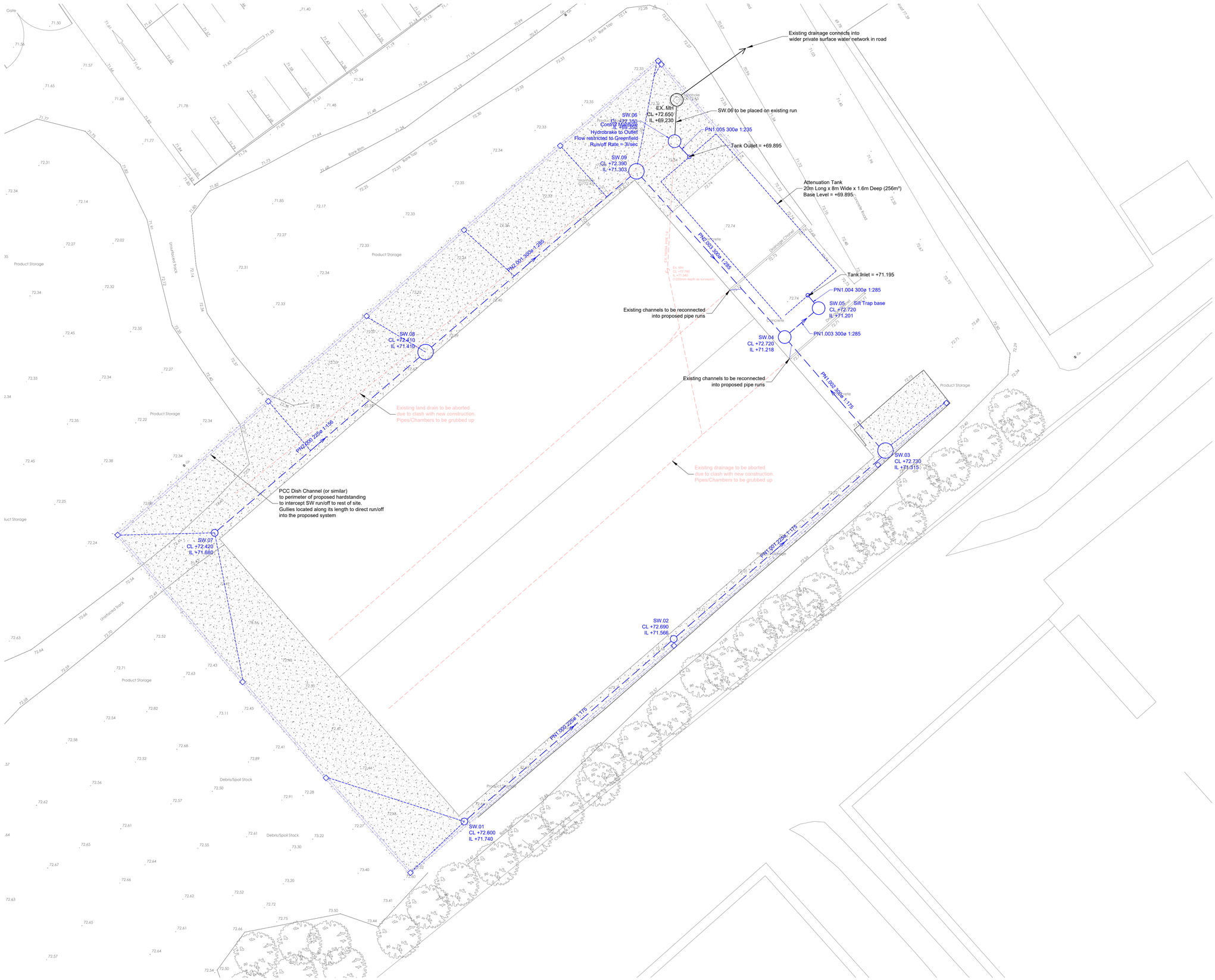
Please see drawing for reference.

END OF SURVEY.

APPENDIX D

SITE BOUNDARY
Area 268m²
Surface Water run/off unconnected but will eventually enter existing system via nearby land drain
Area 1095m²
Drains via existing existing network in ground
Area 568m²
Concrete hardstanding drains via drainage channels
Area 268m²
Surface Water run/off unconnected
Workshop
Concrete
Manhole
Product Storage
Unsurfaced Track
Debris/Spoil Stock
Concrete Road
Tarmac
Total Drained Area of Existing Development = 1931m²
Estimated Runoff = 25.04l/sec
(based on 0.018l/sec/m² in accordance with Building Regs Doc H)

APPENDIX E



General Notes

1. This drawing is to be read in conjunction with all other relevant Melia Smith & Jones and Architect's drawings and specifications.

Drainage Notes

1. Underground drains for surface water drainage shall conform to BS5955 Part 6
2. Manhole covers to be as follows:-
   D400 in parking areas
   A15 in non-parking areas
3. All branches to main drain to be 135°.
4. Rainwater and foul outlet positions to be confirmed by Architect.
5. Drains passing through manhole walls to be built in. A flexible joint shall be provided within 150mm of the face of the wall with a further flexible joint within 600mm of the first joint.
6. All gullies, rest bends, drainage channels, rodding eyes and attachments are to be installed strictly in accordance with the manufacturers printed instructions.
7. The drainage shall be installed and tested strictly in accordance with the manufacturers printed instructions, BS 8000, BS 8301 and Local Authority byelaws.
8. All existing manhole positions, invert levels & pipe sizes are to be confirmed on site by the contractor prior to commencement of work on site and be reported to MSJ.
9. All in-situ concrete to comply with BS 8500.
10. All precast concrete items to comply with BS 5911:PART 200.
11. Sulphate resisting cement (C20-DC2) and pre-cast concrete products must be used or a laboratory report provided proving that such measures are not necessary.
12. All private drainage works to comply with Approved Document `H' of the Building Regulations.
13. All gullies and rainwater outlets are to be trapped.

CDM Regulations - Drainage

1. All design work has been carried out with health & safety aspects given full consideration. Wherever possible risks have been eliminated from the design, however due to the nature of this type of work it is not possible to remove all risk.

The contractor shall provide satisfactory responses via suitable method statements as to the manner in which they propose to carry out the work and deal with any highlighted risk, in particular the following :-

- All trench excavations, regardless of depth.
- Guarding to edges of excavations to prevent injury.
- Guarding of the works outside normal working hours.
- Undermining of adjacent roads or structures.
- Confined spaces operations.
- Dealing with existing services.
- Traffic management on existing highways.
- Procedures to be followed in the event of an emergency.
- Methods of working where ground contamination may be present.
- Dealing with existing sewer flows.

The above list is by no means exhaustive, but does highlight operations that present a risk to both contractors and the general public.

Rev	Revision	By	Chk	Date
P2	Silt Trap added at SW.05.	MH		14:06:24
P1	First Issue	DS	MH	31.05.24

SCALE @ A1	ISSUING OFFICE	MSJ PROJECT NUMBER
1:200	Leeds	224033

STATUS	PURPOSE OF ISSUE
S3	Review & Comment

Melia Smith & Jones
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58 Cardigan Lane
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0113 2306080
www.msj.co.uk

PROJECT

Naylors Concrete Proposed Batching Plant

TITLE

Proposed Surface Water Drainage Layout

CLIENT

Martin Walsh Architectural

DRAWING NUMBER	REV
224033-MSJ-ZZ-XX-DR-D-4000	P2

APPENDIX F

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Data Type: Junctions Storm Phase: Storm	Company Address		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Sump Depth (m)	Chamber Shape
SW.01	Manhole	432236.516	408074.620	72.600	0.860	71.740	0.000	Circular
SW.02	Manhole	432259.476	408094.651	72.690	1.124	71.566	0.000	Circular
SW.03	Manhole	432282.703	408115.319	72.730	1.415	71.315	0.000	Circular
SW.04	Manhole	432271.644	408127.774	72.720	1.502	71.218	0.000	Circular
SW.05	Manhole	432275.369	408130.943	72.720	1.519	71.201	0.000	Circular
SW.06	Manhole	432259.568	408149.251	72.350	3.000	69.350	0.410	Circular
EX. MH	Manhole	432259.816	408153.799	72.650	3.420	69.230	0.000	Circular
SW.07	Manhole	432209.123	408106.294	72.420	0.740	71.680	0.000	Circular
SW.08	Manhole	432232.254	408126.126	72.410	1.000	71.410	0.000	Circular
SW.09	Manhole	432255.386	408145.957	72.390	1.087	71.303	0.000	Circular

Name	Diameter (m)	Access Required	Intersection Easting (m)	Intersection Northing (m)	Part Family	Lock
SW.01	0.450	☐			450ø IC	None
SW.02	0.450	☐			450ø IC	None
SW.03	1.500	☑	432282.703	408114.957	1500ø MH	None
SW.04	1.200	☐			1200ø MH	None
SW.05	1.200	☐			1200ø MH	None
SW.06	1.200	☐			1200ø MH	None
EX. MH	1.200	☐			1200ø MH	None
SW.07	0.450	☐			450ø IC	None
SW.08	1.500	☐			1500ø MH	None
SW.09	1.500	☐			1500ø MH	None

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
SW.01	Inlet	Roof Area (South)	(None)	No Restriction
	Inlet (1)	External Yard South/West	(None)	No Restriction
SW.02	Inlet	PN1.000 Roof Area (East) External Yard South/East	(None)	No Restriction
SW.03	Inlet	PN1.001 External Yard (East)	(None)	No Restriction
SW.04	Inlet	PN1.002 PN2.003	(None)	No Restriction
SW.05	Inlet	PN1.003	(None)	No Restriction
SW.06	Inlet	PN1.005	(None)	No Restriction
EX. MH	Inlet	PN1.006	(None)	No Restriction
SW.07	Inlet	Roof Area (West)	(None)	No Restriction
	Inlet (1)	External Yard North/West	(None)	No Restriction
SW.08	Inlet	PN2.000 Roof Area (North)	(None)	No Restriction
	Inlet (1)	External Yard North/East	(None)	No Restriction
SW.09	Inlet	PN2.001 External Yard (North)	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW.01	Outlet	PN1.000	Free Discharge
SW.02	Outlet	PN1.001	Free Discharge
SW.03	Outlet	PN1.002	Free Discharge
SW.04	Outlet	PN1.003	Free Discharge
SW.05	Outlet	PN1.004	Free Discharge
SW.06	Outlet	PN1.006	Free Discharge
SW.07	Outlet	PN2.000	Free Discharge
SW.08	Outlet	PN2.001	Free Discharge
SW.09	Outlet	PN2.003	Free Discharge

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Data Type: Stormwater Controls Storm Phase: Storm	Company Address		

Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	72.710
Depth (m)	1.600
Base Level (m)	69.895
Number of Crates Long	20
Number of Crates Wide	16
Number of Crates High	4
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m^3)	244.415

Inlets

Inlet PN1.004

Inlet Type	Point Inflow
Incoming Item(s)	PN1.004
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet PN1.005

Outgoing Connection	PN1.005
Outlet Type	Free Discharge

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Data: Type: Connections Storm Phase: Storm	Company Address		

Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
PN1.000	30.469	Pipe	175.040		0.6	225	72.600	71.740
PN1.001	30.852	Pipe	175.040		0.6	225	72.690	71.566
PN1.002	16.928	Pipe	175.040		0.6	300	72.730	71.315
PN1.003	4.890	Pipe	285.390		0.6	300	72.720	71.218
PN1.004	1.850	Pipe	285.390		0.6	300	72.720	71.201
PN1.005	2.360	Pipe	235.000		0.6	300	72.710	69.895
PN1.006	4.544	Pipe	8.574		0.6	150	72.350	69.760
PN2.000	30.469	Pipe	158.251		0.6	225	72.420	71.680
PN2.001	30.469	Pipe	285.390		0.6	300	72.410	71.410
PN2.003	24.392	Pipe	285.390		0.6	300	72.390	71.303

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock
PN1.000	72.690	71.566	225ø	Levels
PN1.001	72.730	71.390	225ø	Levels
PN1.002	72.720	71.218	300ø	Levels
PN1.003	72.720	71.201	300ø	Levels
PN1.004	72.710	71.195	300ø	Levels
PN1.005	72.350	69.885	300ø	Levels
PN1.006	72.650	69.230	150ø	Levels
PN2.000	72.410	71.485	225ø	Levels
PN2.001	72.390	71.303	300ø	Levels
PN2.003	72.720	71.218	300ø	Levels

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Details Type: Inflow Summary Storm Phase: Storm	Company Address		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
External Yard (East)	SW.03		Time of Concentration	0.022	100	0	100	0.022
External Yard (North)	SW.09		Time of Concentration	0.034	100	0	100	0.034
External Yard North/East	SW.08		Time of Concentration	0.022	100	0	100	0.022
External Yard North/West	SW.07		Time of Concentration	0.050	100	0	100	0.050
External Yard South/East	SW.02		Time of Concentration	0.004	100	0	100	0.004
External Yard South/West	SW.01		Time of Concentration	0.023	100	0	100	0.023
Roof Area (East)	SW.02		Time of Concentration	0.060	100	0	100	0.060
Roof Area (North)	SW.08		Time of Concentration	0.060	100	0	100	0.060
Roof Area (South)	SW.01		Time of Concentration	0.061	100	0	100	0.061
Roof Area (West)	SW.07		Time of Concentration	0.061	100	0	100	0.061
TOTAL		**0.0**		**0.398**				**0.398**

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Details Type: Network Design Criteria Storm Phase: Storm	Company Address		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

All Storms

Type: FSR

Return Period (years)	2.0
Region	England And Wales
M5-60 (mm)	19.0
Ratio R	0.350

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Backdrop (m)	0.425
Max. Backdrop (m)	1.925
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Reduced
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Prefill Manhole Sumps	☐
Perform No Discharge Analysis	☐

Rainfall

All Storms

Type: FSR

Region	England And Wales
M5-60 (mm)	19.0
Ratio R	0.350
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	40.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Details Type: Junctions Summary Storm Phase: Storm	Company Address		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW.01	All Storms: 100 years: +40 %: 15 mins: Winter	72.600	71.740	72.601	0.861	47.9	0.692	0.556	27.7	22.169	Flood
SW.02	All Storms: 100 years: +40 %: 15 mins: Winter	72.690	71.566	72.513	0.947	63.7	0.151	0.000	63.3	38.421	Flood Risk
SW.03	All Storms: 100 years: +40 %: 15 mins: Winter	72.730	71.315	72.025	0.710	75.6	1.254	0.000	74.3	44.506	Surcharged
SW.04	All Storms: 100 years: +40 %: 15 mins: Winter	72.720	71.218	71.922	0.705	168.2	0.797	0.000	167.4	104.029	Surcharged
SW.05	All Storms: 100 years: +40 %: 15 mins: Winter	72.720	71.201	71.675	0.474	167.4	0.536	0.000	167.0	104.009	Surcharged
SW.06	All Storms: 100 years: +40 %: 30 mins: Winter	72.350	69.350	70.347	0.997	68.2	1.127	0.000	67.2	128.270	Surcharged
EX. MH	All Storms: 100 years: +40 %: 30 mins: Winter	72.650	69.230	69.380	0.150	67.2	0.000	0.000	67.2	128.270	OK
SW.07	All Storms: 100 years: +40 %: 15 mins: Winter	72.420	71.680	72.421	0.741	62.9	1.388	1.270	53.7	28.764	Flood
SW.08	All Storms: 100 years: +40 %: 15 mins: Winter	72.410	71.410	72.305	0.895	78.7	1.582	0.000	76.4	50.608	Flood Risk
SW.09	All Storms: 100 years: +40 %: 15 mins: Winter	72.390	71.303	72.138	0.835	96.0	1.475	0.000	93.9	59.626	Flood Risk

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Details Type: Stormwater Controls Summary Storm Phase: Storm	Company Address		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	All Storms: 100 years: +40 %: 30 mins: Winter	70.382	70.382	0.487	0.487	151.1	74.030	0.000	0.000	68.2	128.791	69.711	OK

Project:	Date: 06/12/2023		
	Designed by: David	Checked by:	Approved By:
Report Details Type: Connections Summary Storm Phase: Storm	Company Address		

Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
PN1.000	All Storms: 100 years: +40 %: 30 mins: Winter	Pipe	SW.01	SW.02	72.600	72.445	0.225	29.817	0.8	0.82	32.2	Flood Risk
PN1.001	All Storms: 100 years: +40 %: 15 mins: Summer	Pipe	SW.02	SW.03	72.690	72.505	0.225	34.243	1.6	1.63	63.9	Flood Risk
PN1.002	All Storms: 100 years: +40 %: 15 mins: Winter	Pipe	SW.03	SW.04	72.730	72.025	0.300	44.506	1.1	0.89	74.3	Surcharged
PN1.003	All Storms: 100 years: +40 %: 15 mins: Winter	Pipe	SW.04	SW.05	72.720	71.922	0.300	104.029	2.4	2.56	167.4	Surcharged
PN1.004	All Storms: 100 years: +40 %: 15 mins: Winter	Pipe	SW.05	Cellular Storage	72.720	71.675	0.300	104.009	2.4	2.55	167.0	Surcharged
PN1.005	All Storms: 100 years: +40 %: 30 mins: Winter	Pipe	Cellular Storage	SW.06	72.710	70.382	0.300	128.791	1.0	0.94	68.2	Surcharged
PN1.006	All Storms: 100 years: +40 %: 30 mins: Winter	Pipe	SW.06	EX. MH	72.350	70.347	0.150	128.270	3.8	1.1	67.2	Surcharged
PN2.000	All Storms: 100 years: +40 %: 15 mins: Winter	Pipe	SW.07	SW.08	72.420	72.421	0.225	28.764	1.4	1.29	53.7	Flood
PN2.001	All Storms: 100 years: +40 %: 15 mins: Summer	Pipe	SW.08	SW.09	72.410	72.277	0.300	45.039	1.1	1.18	77.2	Flood Risk
PN2.003	All Storms: 100 years: +40 %: 15 mins: Winter	Pipe	SW.09	SW.04	72.390	72.138	0.300	59.626	1.3	1.43	93.9	Flood Risk

APPENDIX G

10.7 Drainage

Further settlements in the madeground deposits are possible and therefore measures should be incorporated into the design of the drainage to deal with this possibility.

All pipes should be flexible with flexible and watertight joints. In order to make allowance for future settlement, the design gradients should be steeper than the minimum allowed for the flow rate and pipe size.

In addition to the above, it is recommended that trenches are over-excavated to a depth of 600mm and backfilled with compacted granular material prior to pipe laying."

10.8 Soakaways

Soakaways were undertaken on this site in accordance with BRE365; however, the 2 No. tests failed on the initial run of three. It is not considered appropriate for soakaways to be adopted for the discharge to ground of surface water.

It should be noted that no slope stability assessment has been carried out on the cutting which forms the north-eastern boundary of the site. The cutting is circa 5m to 8m in height, with a railway at the base. It is considered prudent to divert where possible surface water from entering the slope. Gradients for hardstanding should shed surface water away from the slope where possible.

10.9 Road Design

Based on the types of near surface material encountered, it is recommended for preliminary design purposes a CBR value = 2% is adopted. Based on the types of near surface material encountered during the investigation, the likely subgrade material will comprise madeground. A CBR value of 1-2% is therefore recommended for preliminary design purposes.

Consideration should also be given to the use of geotextiles to allow reduction of capping thickness. The advice of a suitable contractor should be sought as to the most appropriate type of geotextile to use in the ground conditions encountered at this site.

It should be noted that the type of construction will depend on proposed finished pavement levels across the site and it is recommended the pavement design is reviewed once these levels are known. In this context, it is essential that further in situ CBR testing is carried out once formation levels are known to confirm design CBR values and reference should be made to the 'Design Guidance for Road Pavement Foundations', Interim Advice Note 73/06, Revision 1 (2009), when considering the CBR value appropriate for use.

Infiltration Test Report

BYRNELOOBY

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
HW	09/11/21	BRE Digest DG 365: 2016 & BS6297:2007+A1:2008				Length (m):	1.30	1.30	mE:	432157.00
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start:	End:	Width (m):	0.60	0.60	mN:	408348.00
JT	1	No	0.00	1.19	1.70	Depth (m):	2.50	2.50	m OD:	-

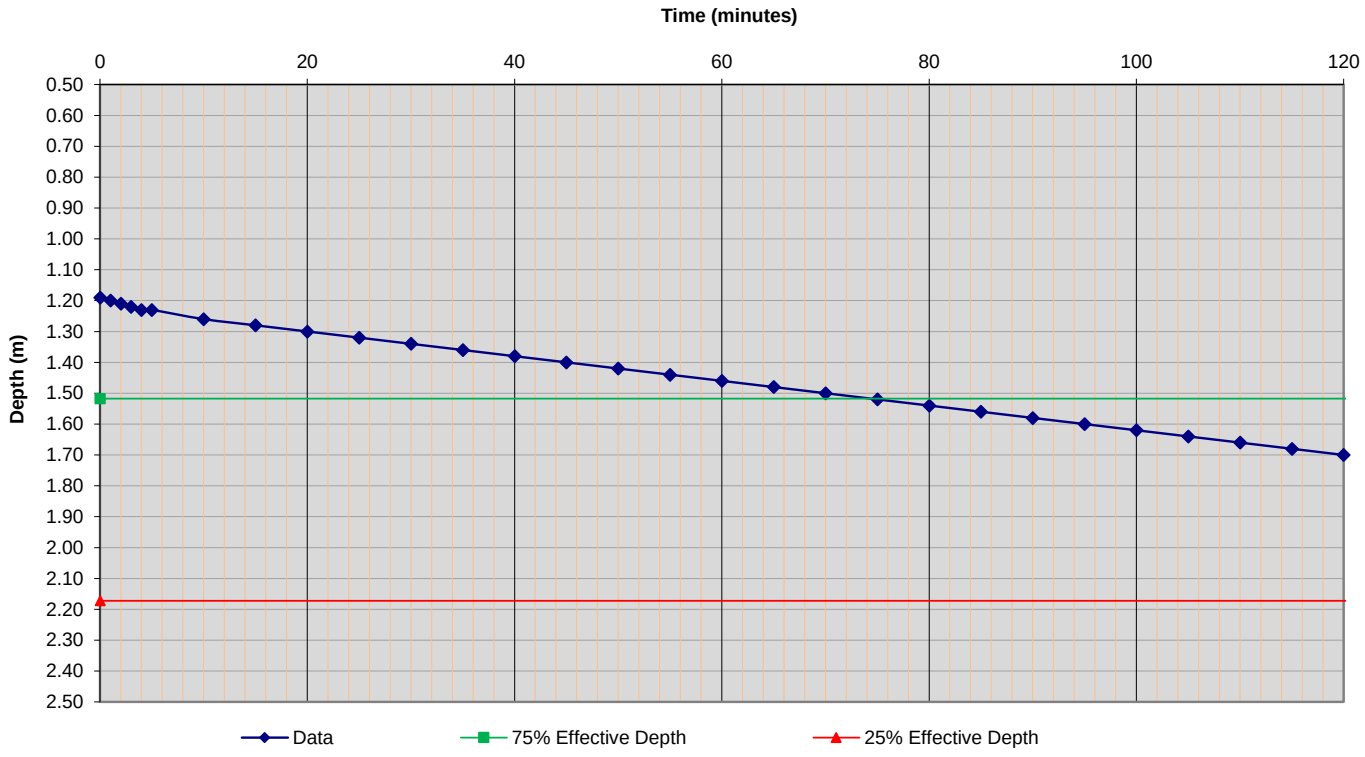
Elapsed time (mins):	Water depth (m below datum):	Elapsed time (mins):	Water depth (m below datum):
0	1.19	95	1.60
1	1.20	100	1.62
2	1.21	105	1.64
3	1.22	110	1.66
4	1.23	115	1.68
5	1.23	120	1.70
10	1.26		
15	1.28		
20	1.30		
25	1.32		
30	1.34		
35	1.36		
40	1.38		
45	1.40		
50	1.42		
55	1.44		
60	1.46		
65	1.48		
70	1.50		
75	1.52		
80	1.54		
85	1.56		
90	1.58		

Effective depth (m):		Elapsed time (mins) (from graph):	
75%	1.52	75%	35.00
50%	1.85	50%	100.00
25%	2.17	25%	190.00

Base area of pit	0.78	m^2
Mean surface area through which outflow occurs	3.27	m^2
Volume outflow between 75 and 25% effective depth	0.51	m^3

Soil infiltration rate, f	1.68E-05	$m^3/m^2/s$
Soil infiltration rate, f	6.05E-02	m/hr
Percolation Value, vp	1.42E+01	s/mm

Notes: Coordinates are approximate
Located at TP04



AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: FINAL

Project: WHALEY ROAD, BARUGH GREEN, BARNS
Proj. No: 14-K0030
Client: Melia Smith & Jones Limited

Test reference: **SA01**

Infiltration Test Report

BYRNELOOBY

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
HW	09/11/21	BRE Digest DG 365: 2016 & BS6297:2007+A1:2008				Length (m):	0.60	0.60	mE:	432202.00
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start:	End:	Width (m):	1.50	1.50	mN:	408386.00
JT	1	No	0.00	1.46	1.47	Depth (m):	2.50	1.25	m OD:	-

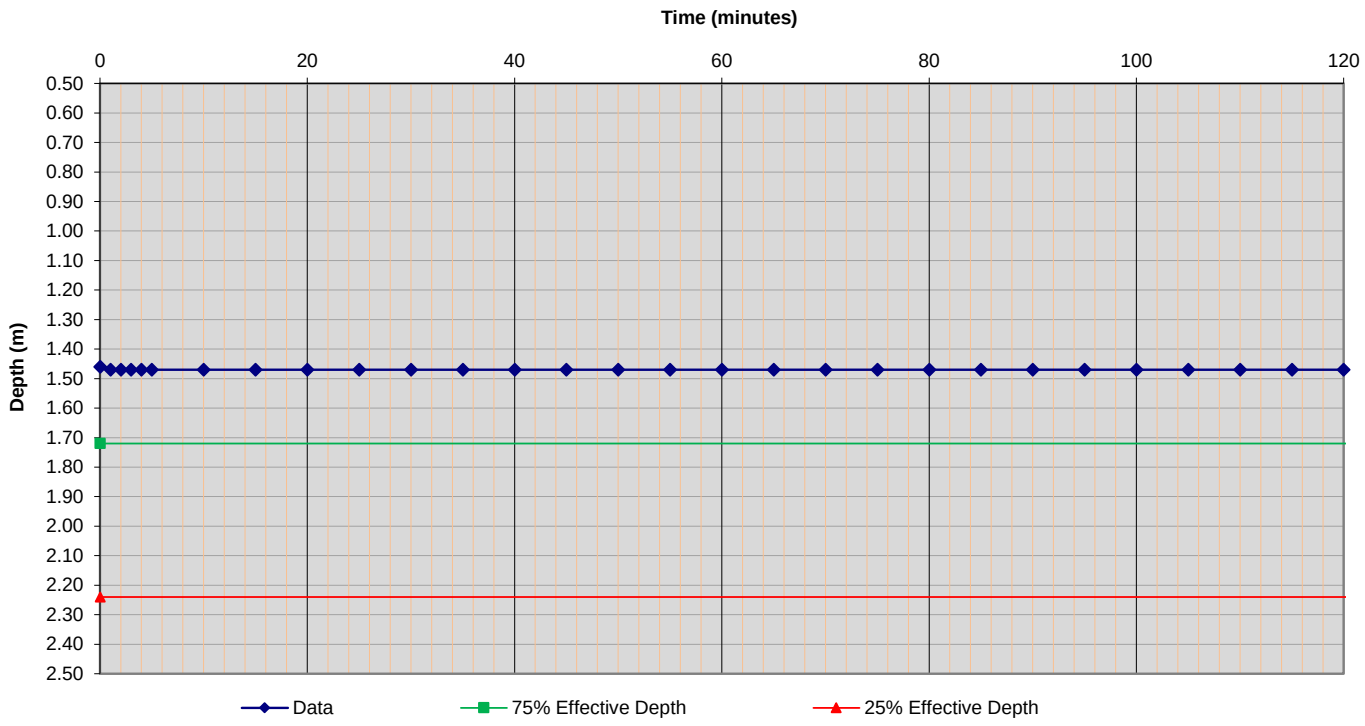
Elapsed time (mins):	Water depth (m below datum):	Elapsed time (mins):	Water depth (m below datum):
0	1.46	95	1.47
1	1.47	100	1.47
2	1.47	105	1.47
3	1.47	110	1.47
4	1.47	115	1.47
5	1.47	120	1.47
10	1.47		
15	1.47		
20	1.47		
25	1.47		
30	1.47		
35	1.47		
40	1.47		
45	1.47		
50	1.47		
55	1.47		
60	1.47		
65	1.47		
70	1.47		
75	1.47		
80	1.47		
85	1.47		
90	1.47		

Effective depth (m):		Elapsed time (mins) (from graph):	
75%	1.72	75%	12.00
50%	1.98	50%	40.00
25%	2.24	25%	75.00

Base area of pit	0.90	m^2
Mean surface area through which outflow occurs	3.08	m^2
Volume outflow between 75 and 25% effective depth	0.47	m^3

Soil infiltration rate, f	4.01E-05	$m^3/m^2/s$
Soil infiltration rate, f	1.45E-01	m/hr
Percolation Value, vp	7.27E+00	s/mm

Notes: Coordinates are approximate
Located at TP05



AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: FINAL

Project: WHALEY ROAD, BARUGH GREEN, BARNS
Proj. No: 14-K0030
Client: Melia Smith & Jones Limited

Test reference:

SA02