WEPA UK Ltd

Llangynwyd, Bridgend

Flood Risk Assessment

August 2019

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1. INTRODUCTION

This Flood Risk Assessment (FRA) has been prepared by Phoenix Design Partnership Limited on behalf of Quorum Consulting Engineers and BHM Ingenieure / WEPA UK Ltd to support a planning application for the new proposed paper machine, warehouse, dispatch area and ancillary infrastructure to be constructed at the existing WEPA UK Ltd site.

The Flood Risk Assessment is in accordance with current planning policy and complies with the requirements of Technical Advice Note 15: Development and Flood Risk (TAN 15). An assessment has been made of the risks posed to the new development from a range of sources such as fluvial, groundwater, surface water and sewers. All available information at the time of writing the report has been reviewed such as geology, topography and hydrology.

This scheme will need to comply with the Statutory Standards for Sustainable Drainage Systems produced by Welsh Government and the CIRIA SuDS Manual (C753).

1.1. *Location*

The WEPA UK Ltd site is located off the A4063 in Llangynwyd, Bridgend. A national grid reference for the site is SS 87755 87128 (287755mE ,187128mN).

The A4063 runs along the Southern and Western boundaries with existing fields to the North and the River Llynfi to the East.

A site location plan is included within Appendix A.

1.2. *Current Land Use*

The site is currently occupied by WEPA UK Ltd. The company produce hygiene paper products such as toilet paper, kitchen roll and napkins for the UK retail sector.

1.3. *Site Topography*

A topographical survey is currently being undertaken by Alpine Land Surveyors Ltd (August 2019). Although not fully complete the current survey information can be seen in Appendix B.

Access to the site is via a single access off the A4063 with a gradient of between 1 in 30-40.

Overall the site sits in a valley with levels falling into the site from the North, West and South. Levels range from approx. 105mAOD to 72.50mAOD at the Railway line. The levels continue to fall away to the East into the Llynfi River.

To the West of the site near the entrance there is a large area of parking, three bungalows and a security hut. The main building / series of buildings and plant sits in the centre of the site. The loading bays and storage yards are located along the South of the site. There is a wastewater treatment facility located over the rail line next to the river however this

is not being considered as part of this report as no works are located further than the railway line.

1.4. *Site Geology*

The site has had an array of ground investigation carried out both recently and historically with further information to be published shortly. Works have been carried out by Golder Associates, Ove Arup and Integral Geotechnique to name a few. A plan showing where boreholes and trial pits have been carried out can be seen in Appendix C along with samples of boreholes taken across the site to give an overall idea of the ground conditions.

The British Geology Survey maps indicate the bedrock across the site to be a sequence of sandstones, siltstones and mudstones. The superficial deposits comprise of alluvium where the valley was historically located (now culverted watercourse) and glacial till surrounding this to the North and South.

Groundwater has been recorded at varying depths across the site along with seepages at shallow depth. To the West Golder Associates recorded ground water at depths of 7-9m Bgl, Ove Arup recorded ground water at 4m Bgl in the same area. To the East Ove Arup have recorded ground water from approx. 3m Bgl which did rise in two of the boreholes. It has been noted by Quorum that during foundation installation for some of the existing buildings ground water was struck 1m down from surface level.

The bedrock is classified as a Secondary A aquifer and the overlying superficial soils are classified as either a Secondary A or a Secondary – undifferentiated aquifer.

The site is not underlain by a principle aquifer and is not located within a source protection zone.

1.5. *Existing Drainage*

Dwr Cymru Welsh Water (DCWW) plans were not available at the time of writing the report however it is not believed any of the onsite systems are adopted.

The site has an extensive network of existing foul and surface water drainage. Surface water flows are discharged un-attenuated into the culverted (1200dia) Nant Gwyn watercourse which is culverted throughout the site until it discharges into the Llynfi River. Foul flows are directed to the onsite treatment works before being discharged into the Llynfi River.

The existing 1200dia culverted watercourse also has a second inlet near the site entrance from an unnamed watercourse to the North West.

An existing on-site drainage plan can be seen in Appendix D.

2. FLOOD RISK ASSESSMENT REQUIREMENTS

2.1. *Requirements for a Flood Risk Assessment*

Flood Risk Assessments are required depending on the location of developments relative to Natural Resources Wales (NRW) flood mapping zones or where the development is more than 1 hectare.

The flood risk zones are normally classified as follows;

- Zone 1 – areas that have a low probability of flooding i.e. less than 1 in 1000 annual probability of river or sea flooding.
- Zone 2 – areas that have a medium probability of flooding i.e. between a 1 in 100 and 1 in 1000 annual probability of river flooding; or between a 1 in 200 and 1 in 1000 annual probability of sea flooding.
- Zone 3a – areas that have a high probability of flooding i.e. 1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding.
- Zone 3b – areas classed as functional flood plains where water has to flow or be stored in times of flood.

Although the NRW flood maps show the above flood zones for planning purposes TAN 15 which is still relevant in Wales classifies these zones slightly different to this with zones from A to C. These are explained below;

- Zone A – Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- Zone B – Areas known to have been flooded in the past evidenced by sedimentary deposits.
- Zone C – Based on the extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal).
    - Zone C1 – Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
    - Zone C2 – Areas of the floodplain without significant flood defence infrastructure.

3. FLOOD RISK ASSESSMENT

This section explores the potential flood risk from a range of sources.

3.1. *Fluvial Flooding*

The nearest main river to the application site is the Llynfi river located along the Eastern boundary of the site on the opposite side of the railway line.

The NRW flood map for planning below shows that the proposed development site is located mainly in Zone A but with a section through the centre of the site falling under Zone B. Ordinarily this zone would be assessed based on levels compared to flood level data for the river however as this zone is based on the underlying geology it is believed to no longer be relevant as the existing site has been developed, levels have been raised and the watercourse has been culverted, please refer to British Geology Survey Map in Appendix E which shows exactly the same shape for the superficial alluvium deposits as the NRW flood Zone B. It is recommended that this principle is agreed with the local drainage officer at detailed design stage.

The site is therefore considered at this stage to be at little or no risk of fluvial flooding.

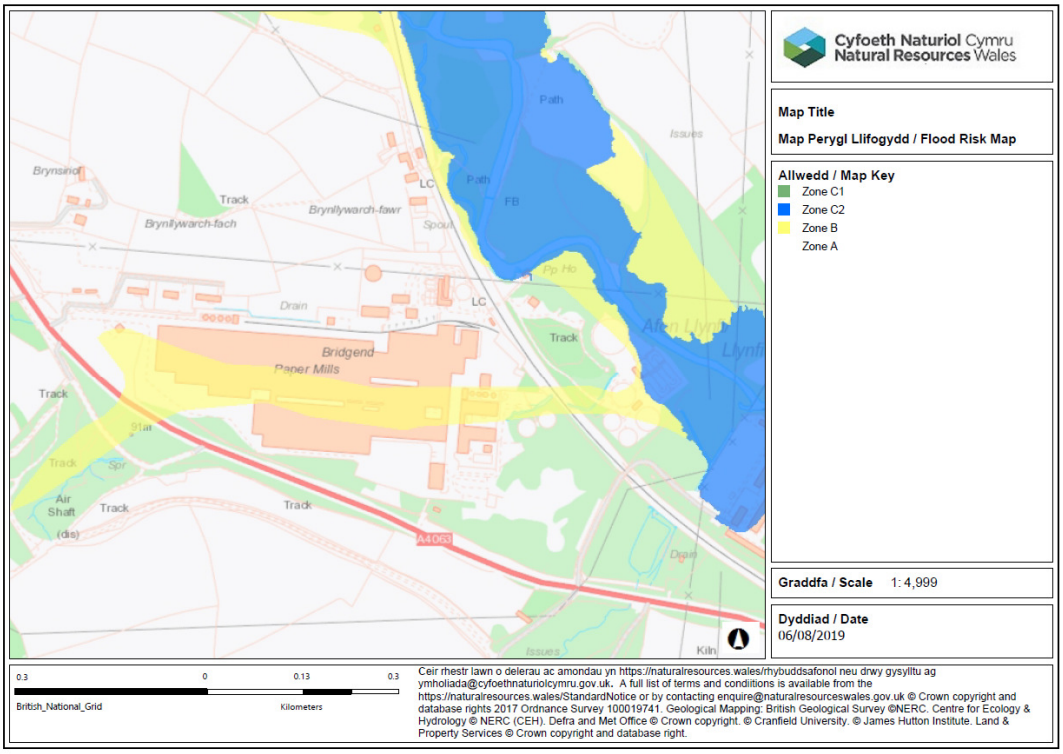


Figure 1 - NRW Flood map for planning

3.2. *Tidal Flooding*

The site is not influenced by Tidal flooding.

3.3. *Surface Water (Overland) Flooding*

Intense periods of rainfall over a short duration can often lead to overland flow and flooding as rainwater is unable to infiltrate into the ground or enter drainage systems. It is made worse when soils are saturated so that they cannot accept any more water.

The NRW surface water flood map below has been generated by simulating rainfall events over the site to determine where surface flows and collects based on Lidar survey information.

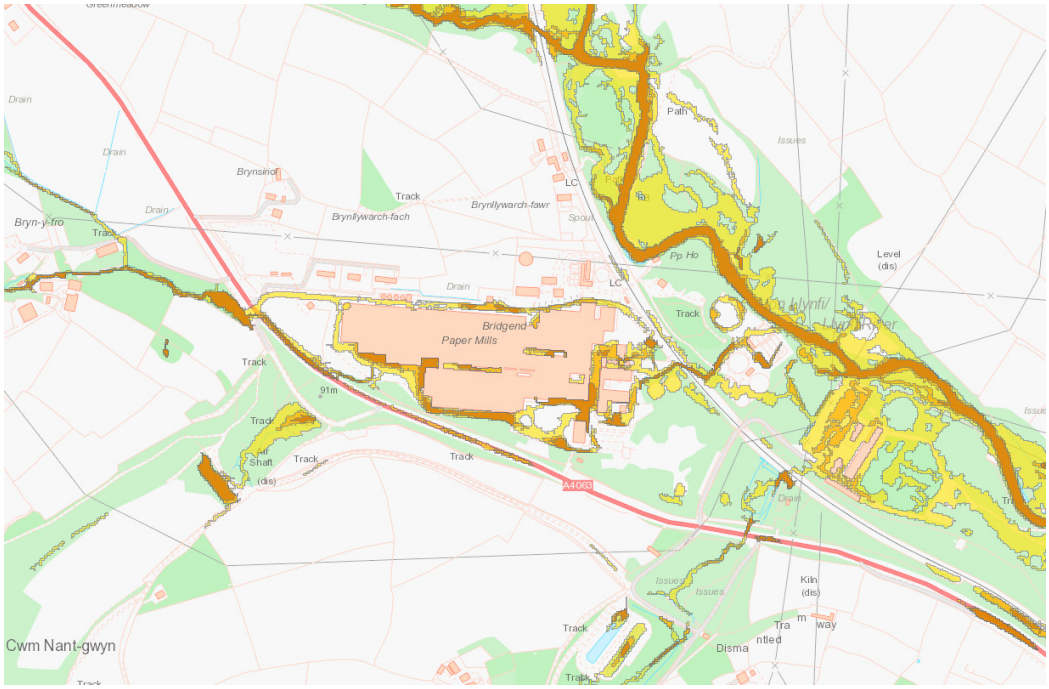


Figure 2 - NRW Surface water flood map

The map shows that the hardstanding areas surrounding the main buildings are at low to high risk from surface water flooding.

As mentioned much of this is based on rainfall simulation and lidar data which does not take into account the existing on-site drainage systems.

For the existing scenario there is a large system of gullies and drainage channels which intercept the surface water flows and therefore prevents surface water flooding to the buildings.

In the proposed scenario some of the areas of risk highlighted will now be replaced with additional buildings or external hardstanding and under Schedule 3 of the Flood and

Water Management Act 2010 these will be subject to having a sustainable drainage scheme designed and approved by the local Sustainable Drainage Approval Body (SAB).

It is considered that the existing site drainage plus the new sustainable drainage systems will mitigate the risks posed by surface water runoff.

3.4. *Flooding from Sewers*

There is no evidence to suggest there are any capacity issues with the onsite drainage systems. No CCTV reports of the condition of the on-site sewers were available at the time of writing the report.

The culverted watercourse has been noted as causing flooding on two occasions in the past. The most recent event which was approximately 2 years ago was caused by a partial collapse near the site entrance. The second event was approximately 10 years ago and was caused by a blockage of the culvert. In both scenarios remedial works were carried out.

There are no known issues with capacity in the culvert at the time of writing the report.

It is therefore considered at this time that there is little to no risk of flooding from sewer systems.

3.5. *Flooding from Groundwater*

There are no known springs within the site. As mentioned earlier in the report ground water has been encountered in boreholes across the site at varying depths but has not been recorded as rising to the surface or above, therefore it is considered that there is a low risk of flooding from groundwater which will need to be considered with any foundation design or design of the new sustainable drainage systems.

3.6. *Flooding from Artificial Sources*

There are no artificial bodies of water located within or near the proposed application area and as a result is is not considered that flooding from artificial sources is a risk to the development.

3.7. *Flooding from Construction Activities*

Construction activy is known to increase flow rates into drainage systems and off site usually through the stripping of surface vegetation. It is also known for clogging up existing systems through siltation and washing away of rubble etc. As part of the SAB approval process a detailed construction surface water management plan will be required to be submitted and approved highlighting how run off will be restricted and how contaminants will be prevent from entering the river. As it will be the SAB that approves these proposals the risk does not need to be considered as part of this report.

3.8. *Flooding from Operation of the site*

Operation and maintenance of the existing drainage systems will remain the responsibility of the site owners and regular maintenance and inspection regimes should be followed. In regard to the new proposed systems these will be approved by the council SAB team before construction can commence and then maintenance will again fall to the site owner. The risk from the future operation of the site is therefore considered to be low so long as maintenance and inspection regimes are followed.

Suitable flow restriction into the culverted watercourse will be required for any of the proposed systems so as not to increase flood risk on site or downstream, this will either follow greenfield rates for each rainfall event or be restricted to Qbar in line with the current Welsh Government guidance.

4. SCHEDULE 3 – SAB APPLICATION

Under Schedule 3 all developments in Wales over 100m² now require surface water drainage to be designed in accordance with the statutory standards for sustainable drainage systems produced by Welsh Government. It is the job of each councils SAB team to assess and approve the design proposals which are reviewed against these standards.

The standards aim to mimic the natural drainage characteristics of a site to help control the volume and rate of run off from the proposed development. This is achieved by managing the runoff at or close to the surface and as close to the sources as possible while also providing additional benefits such as biodiversity and amenity.

There are six standards that need to be met as follows;

- S1 – Surface Water runoff destination
- S2 – Surface Water runoff hydraulic control
- S3 – Water Quality
- S4 – Amenity
- S5 – Biodiversity
- S6 – Design of drainage for construction, operation and maintenance

It is recommended that a pre-application submission is made and conversations with the council begin early in order to avoid the full submissions being refused.

5. CONCLUSIONS / SUMMARY

- Majority of the site is located in Flood Zone A, and partially within Flood Zone B. Flood Zone B extent is likely in relation to the underlying geology as shown on the British Geology Survey Maps.
- Site lies in a valley with levels falling into the site from the West, North and South.
- The river Llynfi lies to the East of the site and the Nant Gwyn watercourse is culverted through the site before discharging into the river Llynfi.
- The site bedrock geology consists of sandstones, siltstones and mudstones. The superficial deposits comprise of alluvium and made ground.
- Groundwater has been encountered at a range of depths from 1mBgl.
- No Dwr Cymru Welsh Water assets are located with the site, all existing drainage is considered to be private.
- The development can be considered to be at low to no risk from the majority of sources. Surface water flooding mitigation will be provided by existing and proposed drainage systems.
- Under Schedule 3 of the Flood and Water Management Act 2010 the surface water proposals will need to be reviewed and approved by Bridgend County Borough Council SAB team.
- All systems need be designed for the 1 in 100 year + 30% climate change event.
- On the basis of the findings of this report there are no grounds for objecting to the proposed development due to flood risk.

Appendix A

Location Plan


Site Boundary
Site Boundary
Site Boundary
Overhead Electricity Cables
400Kv cables
Pylon
Pylon
400Kv cables
Water Tank
A4063
To Maesteg
Glan Nant
Cae Glas
Tir - iarll
Site Entrance
Bridgend Paper Mill
Site Boundary
Site Boundary
A4063
From Coytrahen
Site Boundary
North
A4063

Appendix B

Topographical Survey

TO MAESTEG

A4063

RAILWAY LINE

RAILWAY LINE

RAILWAY LINE

TO ELECTRICITY COMPOUND

RAILWAY LINE

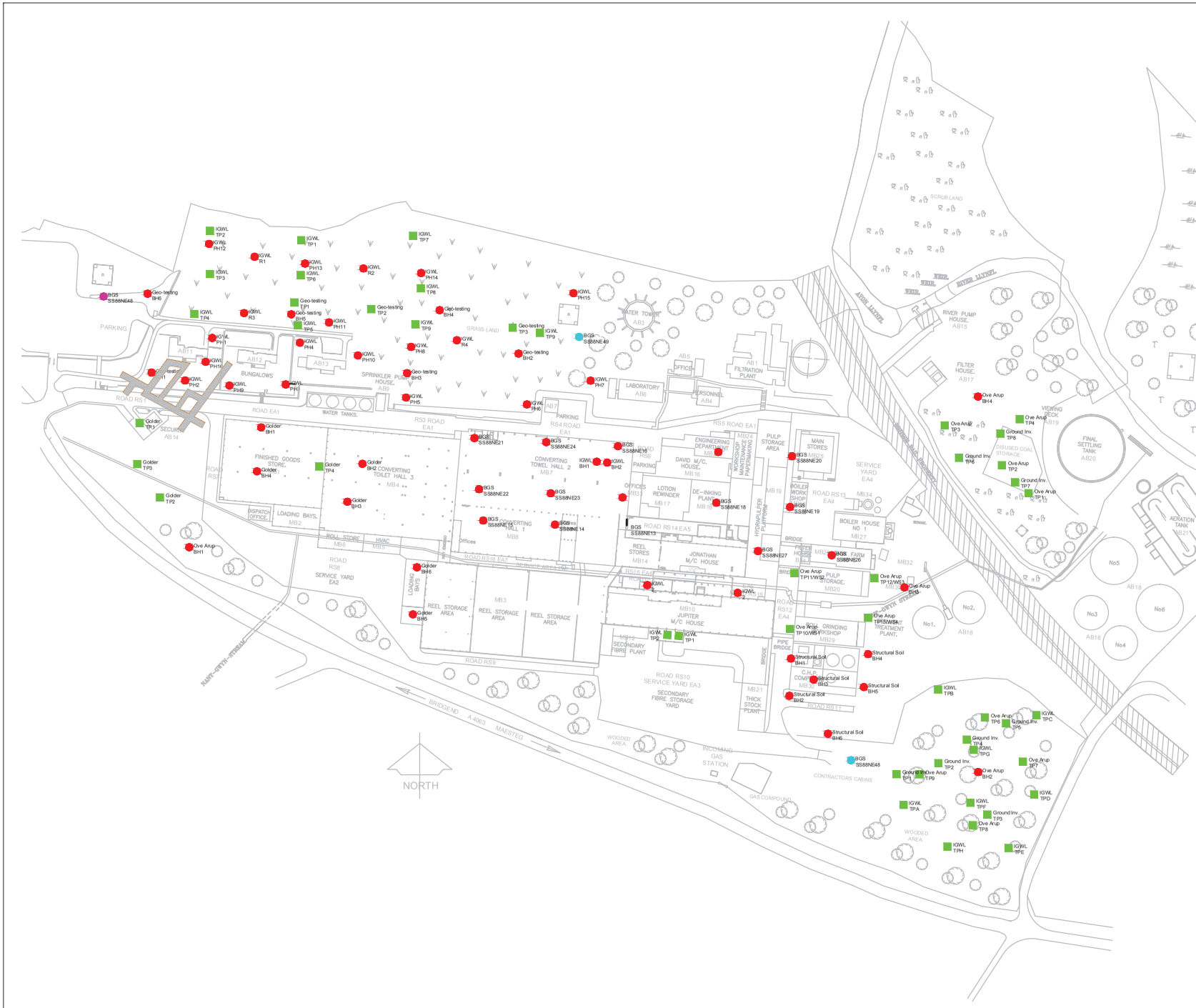
RAILWAY LINE

A4063

TO BRIDGEND

Appendix C

Borehole Logs



General Notes
Do not scale from this drawing
Dimensions must be checked on site
All works to comply with current Building Regulations
All site works must be to the current drawing revision
Drawing is copyright of Quorum Project Management Ltd

Al levels to be verified by contractor on site. Any concerns by the contractor to be raised with the engineer prior to any instillation/fabrication works.

The drawing information must be read in conjunction with all relevant scheme drawings, specification and/or schedules referred to or not. The contractor is responsible to insure that all work is in compliance with current Building Regulations and or other relevant legislation

Dimensions on this drawing are not to be used for Construction purposes

Rev	Date	Description
-	--.--.--	-

Project No. PM800/19

Project
WEPA BRIDGEND
PROJECT NEPTUNE

Drawing
BOREHOLES AND TRIAL PITS
PLAN

Drawing No.	Revision
QPM-DR-S-SK01	-

Scale	Date	Drawn by	Chkd by
1:2500 @ A3	JUN 2019	JM	

Quorum CONSULTING ENGINEERS
89, Eastgate, Cowbridge, Vale of Glamorgan CF71AA Tel. 01446 774493
2 Crown Road, St. Margaret's Middlesex, TW1 3EE Tel. 0208 892 9293

Drawing Status
PRELIMINARY

Sampling					Strata		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth	Level
			09.01.01		MADEGROUND: Dark grey silty fine sand sized pulverised fuel ash with occasional subrounded fine to medium gravel of sandstone.		
1.00	BD						
2.00	BD						
3.00	BD						
4.00	BD						
5.00	BD						
						5.60	
6.00	B				Stiff grey brown sandy silty CLAY with some subrounded to subangular fine to coarse gravel of sandstone, mudstone and occasional coal. Occasional cobbles. Mottled orange brown at top of stratum. (Glacial Till)		
7.00	B						
7.00							
		7.00	10.01.01				
					... continued from 10.00m on page 2 of 2.		

Equipment: Cable Tool Percussion	Groundwater:	Ground Level:	81.50 m OD
Borehole Dia (mm)	Possible seepage at 5.60m and below 8.50m,	Coordinates:	288083 mE
200 to 11.00m.	behaviour masked by added water.		186974 mN
		Logged by: D.M.	Checked by: D.M.

Remarks: Chiselled on hard srata 8.20 - 8.50m (0.75 hr), 9.20 - 9.40m (0.50 hr).
50 mm HDPE standpipe installed, slotted with pea gravel surround 8.50-11.00m, plain pipe with bentonite surround 0.00-8.50m.
Flush protective steel cover concreted over instrument.

BOREHOLE RECORD	Project: Fort James, Bridgend Paper Mills Ground Investigation	Contract:	SGT 609
SOUTHERN GROUND TESTING		Borehole:	2 (1 of 2)

Sampling					Strata		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth	Level
						10.40	
10.40 - 11.00	B				Grey flat angular coarse GRAVEL sized fragments of mudstone with a little stiff clay matrix.		
11.00		11.00			(Probable weathered mudstone)	11.00	
					End of borehole at 11.00m.		

Equipment: Cable Tool Percussion	Groundwater:	Ground Level:	81.50 m OD
Borehole Dia (mm)		Coordinates:	288083 mE
200 to 11.00m.			186974 mN
		Logged by: D.M.	Checked by: D.M.

Remarks:

BOREHOLE RECORD	Project: Fort James, Bridgend Paper Mills Ground Investigation	Contract:	SGT 609
SOUTHERN GROUND TESTING		Borehole:	2 (2 of 2)

Sampling					Strata		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth	Level
			10.01.01		MADEGROUND: Brick, concrete and masonry rubble with some brown sandy fine to coarse gravel of sandstone and burnt shale.		
0.50	BD						
1.00	BD					1.00	
					Brown slightly silty fine to coarse SAND with some pockets of dark brown fibrous peat. (Alluvium)		
2.00	BD						
						2.50	
					Grey and brown slighlty clayey silty sandy subrounded fine to coarse GRAVEL of sandstone. (Fluvoglacial)		
3.00	BD					3.00	
					Brown sandy subrounded fine to coarse GRAVEL of sandstone with some cobbles. (Fluvoglacial)		
4.00	BD						
						4.70	
5.00	BD				Stiff grey brown sandy silty CLAY with some subrounded to subangular fine to coarse gravel of sandstone, mudstone and occasional coal. Occasional cobbles. (Glacial Till)		
5.00						5.00	
					End of Borehole at 5.00m.		

Equipment: Cable Tool Percussion	Groundwater:	Ground Level:	75.03 m OD
Borehole Dia (mm)	Struck at 3.10m, rose to 2.80m in 20 mins	Coordinates:	288030 mE
200 to 5.00m.			187113 mN
		Logged by: D.M.	Checked by: D.M.

Remarks:

50 mm HDPE standpipe installed, slotted with pea gravel surround 2.50-5.00m, plain pipe with bentonite surround 0.00-2.50m. Flush protective steel cover concreted over instrument.

BOREHOLE RECORD	Project: Fort James, Bridgend Paper Mills Ground Investigation	Contract: SGT 609
SOUTHERN GROUND TESTING		Borehole: 3

MACHINE	DANDO 150	CLIENT	FERSON CONTRACTORS LTD	GROUND LEVEL	2
DIAMETER	200mm				SHEET 1 OF 1

PROGRESS	WATER	'N' VALUE	SAMPLE OR TEST TYPE	SAMPLE OR TEST DEPTH (M)	DESCRIPTION OF STRATA	THICKNESS (M)	DEPTH TO BASE (M)	SECTION OF STRATA	REDUCED LEVEL
			D	0.00	TOPSOIL	0.25	0.25		
				0.50					
			B	0.50	Friable brown and yellow becoming very sandy CLAY with sandstone fragments up to coarse gravel size fragments becoming larger and more frequent with depth.				
		50	B	1.00					
	for	200mm	Ic	1.00					
			B	1.50					
			B	2.00					
			B	2.50					
		50	Ic	3.00					
	for	160mm	B	3.10		3.55	3.80		
			D	4.00	Moderately strong grey SANDSTONE (possibly large boulders)	4.30	4.30		
					BOREHOLE TERMINATED				

KEY

● D	disturbed sample	Is	standard penetration test
● B	bulk sample	Ic	cone penetration test
U	undisturbed sample		water encountered
▲ W	water sample		water standing level
═	casing depth	—	borehole depth

REMARKS

No water encountered during boring.

B. H. LOGGED BY: GL/SJB

GEO-TESTING SERVICES LTD

SCALE : 1 : 50

MACHINE	DANDO 150	CLIENT	FERSON CONTRACTORS LTD	GROUND LEVEL	0
DIAMETER	200mm				SHEET 1 OF 1

PROGRESS	WATER	'N' VALUE	SAMPLE OR TEST TYPE	SAMPLE OR TEST DEPTH (M)	DESCRIPTION OF STRATA	THICKNESS (M)	DEPTH TO BASE (M)	SECTION OF STRATA	REDUCED LEVEL
	▼▼ 0.20		●D	0.00 - 0.40	Soft brown sandy TOPSOIL	0.40	0.40		
			●B ●B	0.40 1.00	Friable brown and yellow and brown very sandy CLAY with coarse gravel and cobble size fragments of grey sandstone	1.00	1.40		
			●D U ●D	1.40 1.60 2.10	Firm to stiff becoming stiff dark brown and grey CLAY with some medium to coarse gravel.	1.80	3.20		
		50 for 170mm 50 for 100mm 50 for 100mm	Ic ●D Ic ●D Ic ●D	3.00 3.20 4.00 4.10 5.00 5.20	Stiff to hard dark brown and grey CLAY with medium to coarse gravel	2.60	5.80		
			●D	5.90	Moderately strong grey SANDSTONE (probably boulder)	0.20	6.00		
					BOREHOLE TERMINATED				

KEY

- ● D disturbed sample
- ● B bulk sample
- U undisturbed sample
- ▲ W water sample
- casing depth
- Is standard penetration test
- Ic cone penetration test
- water encountered
- ▼ water standing level
- borehole depth

REMARKS

PROJECT: British Tissues, Maesteg

CLIENT: James & Nicholas

CONTRACTOR: W.J. and Sons

BOREHOLE No: 1

SHEET 1 OF 2

RIG TYPE: Dando 150
HOLE DIAMETER,mm: 200
CASING DEPTH,m: 10.00

LOCATION: See Site Plan
GROUND SURFACE ELEV,m:
FINAL DEPTH,m: 11.35

DRILLED BY: AJ
LOGGED BY: AWJ
DRAWN BY: AWJ

DATE STARTED: 30/1/92
DATE COMPLTD: 3/2/92

DOWNHOLE DEPTH m	BORING PROGRESS	DEPTH TO WATER m	SAMPLES/TESTS DEPTH,m FROM	TO	No	TYPE	SYMBOLIC LOG	ELEVATION m O D / DEPTH m	GEOLOGICAL DESCRIPTION	PIEZOMETER DETAILS
0	30/1		0.50	1.00	1	B		0.00	Medium dense dark greyish brown orange and red in places silty very clayey SAND with much fine to coarse subrounded and angular gravel (MADE GROUND)	
1			1.00	1.45	2	S(21)		1.00	Soft to firm greyish orange brown silty very sandy CLAY with much fine to medium subangular and angular gravel (MADE GROUND)	
			1.50	2.00	3	B				
2			2.00	2.45	4	S(16)				
			2.50	3.00	5	B				
			2.80		6	W		2.80	Medium dense greyish brown slightly coarse sandy fine to coarse subrounded to angular GRAVEL with occasional cobbles (ALLUVIUM)	
3	30/1 31/1	2.00 1.50	3.00	3.45	7	C(13)				
			3.50	4.00	8	B		3.20	Soft to firm dark greyish brown orange in places slightly sandy silty CLAY with much fine to coarse subangular and angular gravel with occasional cobbles and rare boulders (WEATHERED BOULDER CLAY)	
4			4.00	4.45	9	S(10)				
			4.50	5.00	10	B				
5			5.00	5.45	11	S(15)				
								5.35	Firm to stiff dark bluish grey slightly sandy very silty CLAY with some fine to coarse subangular and angular gravel and rare cobbles (BOULDER CLAY)	
6			6.00	6.50	12	B				
			6.50	7.10	13	U				
			6.80		14	W				
7			7.50	8.00	15	B				
8			8.00	8.45	16	S(50)*		8.00	Dense light and dark grey medium to coarse angular GRAVEL with rare cobbles with pockets of soft light blue very silty clay with much angular fine to medium gravel lithorelicts of mudstone	
9			9.00	9.50	17	B				
			9.50	9.55	18	S(50)*				
10	31/1	2.20								

REMARKS : Water strikes encountered at 2.80 and 6.80m.
Water level rising from 2.80 to 1.95 and from 6.80 to 5.80m in 20 mins.
First water strike cased off at 5.85m.

SCALE: 1 IN 50 | Golder Associates | BOREHOLE LOG | PROJECT No: 9253009

PROJECT: British Tissues, Maesteg		**BOREHOLE No: 1** SHEET 2 OF 2
CLIENT: James & Nicholas	CONTRACTOR: W.J. and Sons	
RIG TYPE: Dando 150 HOLE DIAMETER,mm: 200 CASING DEPTH,m: 10.00	LOCATION: See Site Plan GROUND SURFACE ELEV,m: FINAL DEPTH,m: 11.35	DRILLED BY: AJ LOGGED BY: AWJ DRAWN BY: AWJ DATE STARTED: 30/1/92 DATE COMPLTD: 3/2/92

DOWNHOLE DEPTH m	BORING PROGRESS	DEPTH TO WATER m	SAMPLES/TESTS DEPTH,m FROM	TO	No	TYPE	SYMBOLIC LOG	ELEVATION m O D / DEPTH m	GEOLOGICAL DESCRIPTION	PIEZOMETER DETAILS
10	31/1 3/2	2.20 0.6								
			10.50	11.00	19	B				
11			11.00	11.50	20	B(50)*				
								11.35		
12										
13										
14										
15										
16										
17										
18										
19										
20										

REMARKS : Water strikes encountered at 2.60 and 6.60m.
Water level rising from 2.60 to 1.95 and from 6.60 to 5.60m in 20 mins.
First water strike cased off at 5.85m.

SCALE: 1 IN 50	Golder Associates	BOREHOLE LOG	PROJECT No: 9253009

PROJECT: British Tissues, Maesteg

CLIENT: James & Nicholas

CONTRACTOR: W.J. and Sons

TRIAL PIT No: 1

SHEET 1 OF 1

MACHINE:
DIMENSION:
DATE:

LOCATION: See Site Plan
GROUND SURFACE ELEV,m:
FINAL DEPTH,m: 4.45

LOGGED BY: AWJ
DRAWN BY: AWJ

DOWNHOLE DEPTH m	SAMPLES/TESTS DEPTH,m FROM	SAMPLES/TESTS DEPTH,m TO	SAMPLES/TESTS No	SAMPLES/TESTS TYPE	SYMBOLIC LOG	ELEVATION m O D / DEPTH m	GEOLOGICAL DESCRIPTION
0						0.00	Dense to very dense brown slightly clayey silty sandy fine to coarse angular gravel with much fine to coarse angular cobbles (MADE GROUND)
	0.40	0.60	1	B		0.30	Firm soft in places greyish black yellow and red in places slightly sandy clayey SILT with much fine to coarse angular gravel and cobbles (MADE GROUND)
1							
2	2.00	2.20	2	B		2.00	Soft to firm light grey mottled orange very sandy CLAY with much subrounded to angular gravel and cobbles (ALLUVIUM)
						2.50	Firm to stiff dark greenish grey brown slightly sandy very silty clay with much subangular and angular fine to coarse gravel and cobbles (GLACIAL DRIFT)
3							
4						3.60	Firm dark grey mottled orange slightly sandy silty clay with much subangular and angular fine to coarse gravel and rare cobbles (GLACIAL DRIFT)
						4.60	Firm to stiff slightly sandy silty CLAY with much fine to medium subangular and angular gravels of core sandstone siltstone and mudstone (GLACIAL DRIFT)
5						4.95	
6							
7							
8							
9							
10							

REMARKS : No seepages recorded.
Pit walls stable.

SCALE: 1 IN 50 | Golder Associates | TRIAL PIT LOG | PROJECT No: 9253009

PROBEHOLE NO. 10

Site: Bridgend Paper Mills **Job No:** 7261/C

Depth (m)			Brief Stratum Description
GL	-	1.80	Clayey SAND
1.80	-	5.80	SAND with boulders
5.80	-	9.70	MUDSTONE
9.70	-	12.00	MUDSTONE with sandstone bands
12.00	-	17.00	SANDSTONE
17.00	-	21.50	MUDSTONE with sandstone bands
21.50	-	22.20	**COAL**
22.20	-	23.00	MUDSTONE
23.00	-	23.30	**COAL**
23.30	-	25.50	MUDSTONE
25.50	-	30.00	SANDSTONE

Notes:

1. **Equipment:** Gryphon rotary drilling rig
2. **Flushing Medium:** Compressed air
3. **Casing:** GL to 6.00m
4. **Probehole Diameter:** GL to 6.00m - 150mm
   6.00m to 30.00m - 119mm
5. **Groundwater:** Wet below 17.50m
6. Description of strata based on air flush returns and drillers logs.

Integral Geotechnique

RECORD OF BOREHOLE R2 (Sheet 1 of 2)

JOB NO.	7261/C
MADE BY	D.P.D.
DATE MADE	21.11.97

DAILY PROGRESS	DEPTH TO WATER m	DEPTH OF CASING m	SAMPLES DEPTH FROM m	SAMPLES DEPTH TO m	SAMPLES TYPE	TCR%	LEGEND	DEPTH m	REDUCED LEVEL m O.D.	DESCRIPTION OF STRATA
										GROUND LEVEL
										Sandy boulder CLAY (Driller's Description)
						O/H				
								3.10		Weathered SANDSTONE (Driller's Description)
			4.00					4.00		
			4.00	5.50		100				Pale grey fine to medium SANDSTONE, strong, weathered orange along bedding and joint fractures, generally closely spaced sub-horizontal fractures, moderately and widely spaced oblique and sub-vertical factures
			5.50	7.00		100				
			7.00	8.50		100				
			8.50	10.00		100				
			9.00					10.00		

REMARKS

1. Equipment: Gryphon rotary drilling rig
2. Core recoveries: See attached sheet
3. No groundwater encountered
4. Piezometer installed to 15.00m, response zone 10.00 to 15.00m

TYPE OF BORING

Rotary Drilling GL to 4.00m
Cored Drilling 4.00m - 10.00m
Rotary Drilling 10.00m to 15.00m

DIAMETER OF BORING

GL to 15.00m - 118mm

CASING TUBES

PROJECT: JAMONT

BOREHOLE R2

STRUCTURAL SOILS

BOREHOLE LOG

Contract	Client	Borehole No
Bridgend	National Power	4

Job No	Date	Ground Level (m AOD)	Co-Ordinates	Sheet
30604	22/04/93	26.32		1 of 2

Samples and In-situ Tests				Water	Instrumentation	Description of Strata	Depth (Thickness)	Legend
Depth	No	Type	Blows					
0.00-1.00	1	D				MADE GROUND: Loose to medium dense red brown sand and gravel of moderately strong laminated siltstone	(2.00)	
1.00-1.45	2	SPT	7					
1.45-2.00	3	D						
2.00-2.45	4	SPT	23				2.00	
2.45-3.00	5	B				Medium dense grey and yellow brown very silty clayey fine SAND with some gravel and clay pockets (Glacial Sand and Gravel)	(0.45) 2.45	
3.00-3.45	6	SPT	38			Dense yellow brown zoned grey silty SAND and GRAVEL with some gravel, clay pockets and fine coal fragments (Glacial Sand and Gravel)	(4.00)	
3.45-4.50	7	B						
4.00	19	W						
4.60-5.05	8	SPT	32					
5.05-5.80	9	B						
6.00-6.45	10	SPT	31				6.45	
6.45-7.60	11	D				Stiff grey/brown very silty sandy CLAY with occasional to some subrounded sandstone, coal, and shale gravel and cobbles with depth (Boulder Clay)		
7.60-8.05	12	SPT	30					
8.05-9.00	13	D					(3.45)	

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Casing Diameter	Water Depth
21.4.93		3.45	3.00	150	0.90
22.4.93		11.95	0.0	150	0.70

Chiselling

From	To	Hours
6.50	10.0	0.5

General Remarks

Hand dig service pit to 1.0m depth (1 hr). Methane monitoring standpipe installed to 7.5m depth. Water sample no. 19 collected above boulder clay. Water sample no. 20 collected from below boulder clay.

All dimensions in metres	Method	Logged By	Checked By
1:50	Cable Percussion	SJM	

Integral Geotechnique

RECORD OF BOREHOLE R2 (Sheet 2 of 2)

JOB NO.	7261/C
MADE BY	D.P.D.
DATE MADE	21.11.97

DAILY PROGRESS	DEPTH TO WATER m	DEPTH OF CASING m	SAMPLES DEPTH FROM m	SAMPLES DEPTH TO m	SAMPLES TYPE	TCR%	LEGEND	DEPTH m	REDUCED LEVEL m O.D.	DESCRIPTION OF STRATA
										GROUND LEVEL
						O/H				SANDSTONE (Driller's Description)
6.11.97								15.00		
										END OF BOREHOLE

REMARKS

See Sheet 1 of 2

TYPE OF BORING

See Sheet 1 of 2

DIAMETER OF BORING

See Sheet 1 of 2

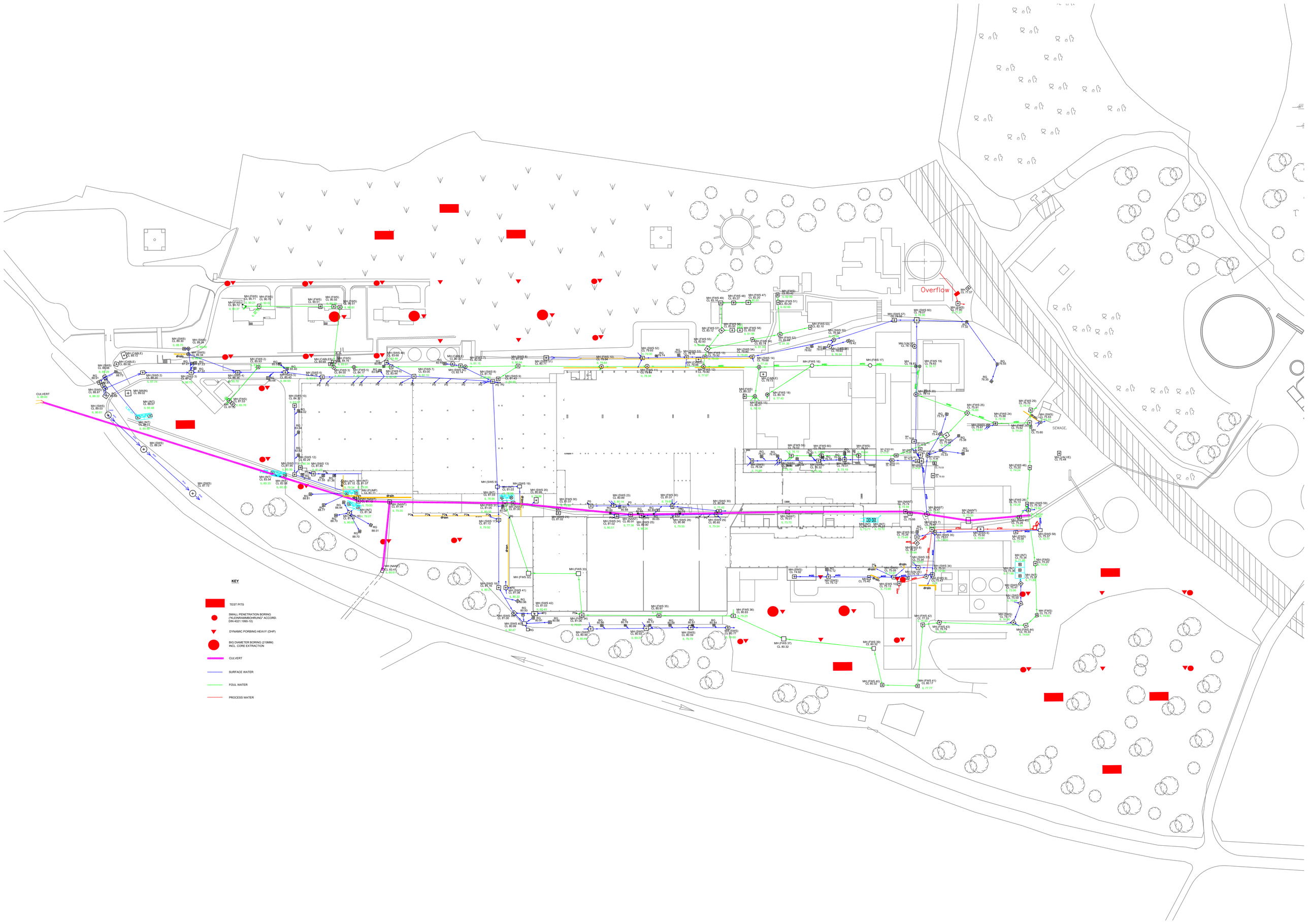
CASING TUBES

PROJECT: JAMONT

BOREHOLE **R2**

Appendix D

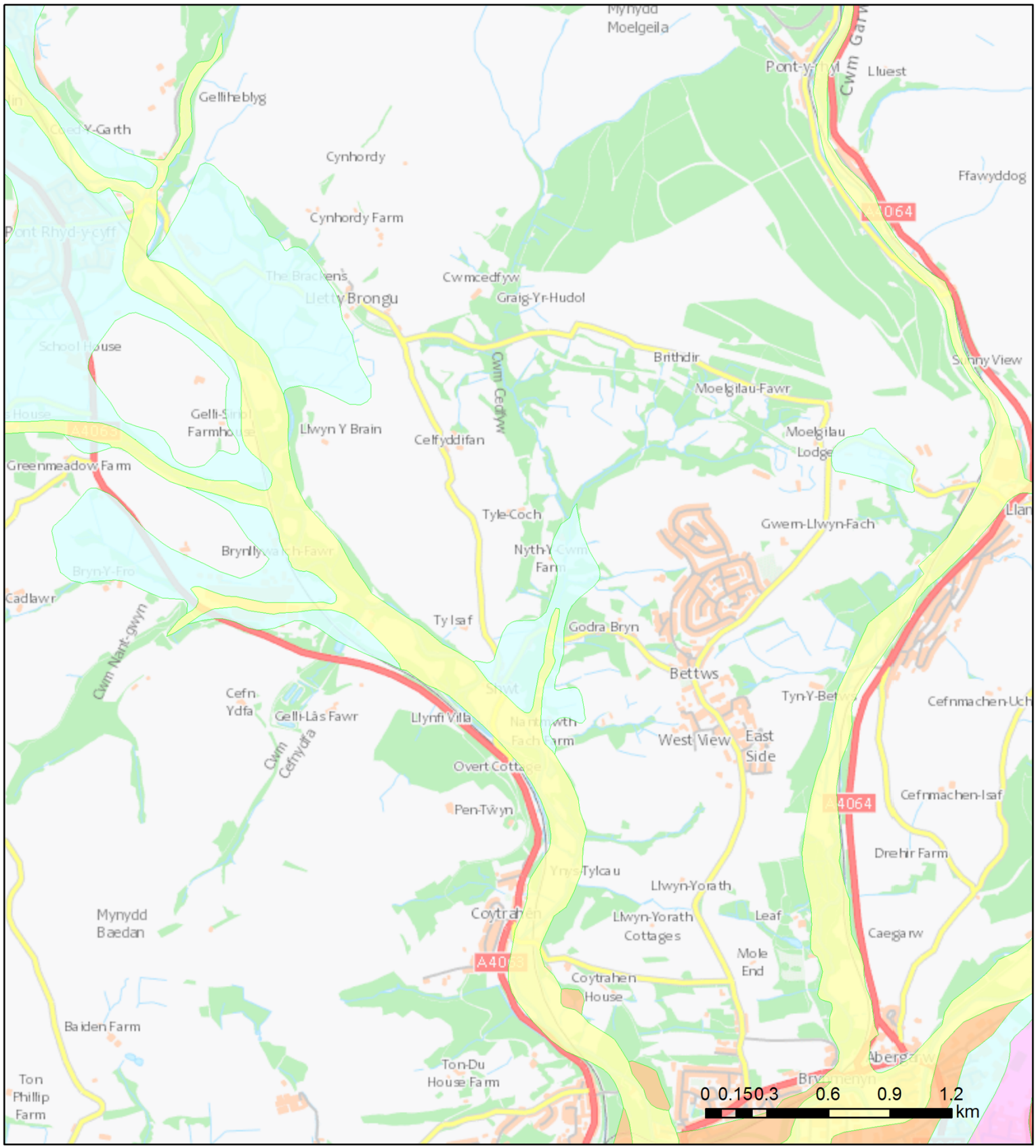
Existing Site Drainage Plan


Overflow
SEWAGE
CULVERT
KEY
TEST PITS
SMALL PENETRATION BORING ("KLEINRAMMBOHRUNG" ACCORD. DIN 4021:1990-10)
DYNAMIC PORBING HEAVY (DHP)
BIG DIAMETER BORING (219MM) INCL. CORE EXTRACTION
CULVERT
SURFACE WATER
FOUL WATER
PROCESS WATER

Appendix E

British Geology Survey Map

GeoIndex Report



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Superficial deposits 1:50,000 scale

- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- TILL, DEVENSIAN - DIAMICTON
- GLACIOLACUSTRINE DEPOSITS, DEVENSIAN - CLAY AND SILT
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- ALLUVIAL FAN DEPOSITS - SAND AND GRAVEL
- PEAT - PEAT