



BOS Plant Drainage Improvements

Drainage Strategy Report

Client: TATA Steel UK Limited

Project Ref: CC2080

Report status: S0

CAMBRIA

Report Control Sheet

Client	TATA Steel
Project	BOS Plant Drainage Improvements
Project ref	CC2080
Document title	Drainage Strategy Report
Document reference	CC2080-CAM-ZZ-XX-RP-C-0001
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Document naming protocol

Project Ref.	Originator	Vol.	Level	Type	Role	Number
CC2080	CAM	ZZ	XX	RP	C	0001

Current issue

Status	Date	Description	Prepared by	Authorised by
S0	05/06/20	First issue	B Whyman	W D W James

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1 Introduction

- 1.1.1 Cambria Consulting Ltd. have been appointed by TATA Steel UK Limited to provide a Drainage Strategy report in support of a SUDS application for surface water drainage improvement works around the BOS plant within the TATA Steel Works, Port Talbot. The works are not subject to a planning application and are being carried under permitted development rights. The scheme however will be subject to a Certificate of Lawfulness.
- 1.1.2 The Civil and Structural scheme design, including the drainage design, has been carried out internally by TATA Steels' Central Engineering (TCE) team.

2 Site Description

2.1 Site Location

- 2.1.1 The site is situated within around the BOS Plant which sits centrally within the TATA Steelworks in Port Talbot. The site is near OS Coordinates E: 277185, N: 1870541 and the nearest post code is SA13 2BZ. A site location plan is shown in Figure 1 below;



Figure 1 - Site location map

2.2 Proposed Development

- 2.2.1 The development is split into two discrete zones, Zones I & II. Zone I is to the north of the BOS plant adjacent the Clarifiers, Hot Metal tracks and encompasses the haul roads. Zone II is a smaller area, west of the BOS plant and adjacent the scrap handling unit. The Zone I & II areas are shown approximately in Figure 2 overleaf.
- 2.2.2 The objective of the proposed works are to address the lack of formal surface water drainage in the area to prevent areas ponding which creates problems logistically and also from an health safety perspective with hot metal being transported in close proximity to these areas.
- 2.2.3 Zone I includes approximately a 630m long, 12m wide concrete Kress car road and approximately a 400m long, 7.4m wide service road which is predominantly asphalt concrete.
- 2.2.4 Zone II incorporates new concrete slabs and cut off drains.
- 2.2.5 Copies of the general arrangements of the proposals are included in *Appendix A*.



Figure 2 – Zones I & II

2.3 Topography

- 2.3.1 In Zone I, levels are relatively flat east of the BOS plant, with levels around 8m AOD up to the railway level crossing to the north east. Ground levels then gradually rise along the existing Haul Road heading south west up to approximately 11.5m AOD. There are significant raised stockpiled areas adjacent the Haul Road, to the south the stockpile raises to approximately 14m AOD. To the north this raises to 32.5mAOD at the extent of the topographical survey information.
- 2.3.2 In Zone II, west of the BOS Plant levels fall from 10m AOD in a south and easterly direction, to between approximately 9-9.5mAOD in the area of the proposed works.

2.4 Ground Conditions

- 2.4.1 A Waste Characterisation and Plate Load/CBR Testing report has been produced by Geo Technology in December 2019. The site investigation included three trial pits and sampling for contamination testing. The trial pits show the site is generally underlain by made ground which generally comprised grey silty very sandy angular gravel with low cobble content, generally comprising of BOS slags.
- 2.4.2 The contamination testing indicates very high pH values, presumed to be associated with slag fines and high levels of Zinc and Chromium. In some cases, the presence of higher zinc and chromium has resulted in the material being classified as hazardous, if waste. Further sampling and testing has been recommended within the report.
- 2.4.3 Standing groundwater was encountered in one of three trial pts, at a depth of 2.8m below ground level.

2.5 Flood Risk

2.5.1 The Development Advice Maps (DAM) show the majority of the proposed site is in Flood zone A and therefore at little risk of flooding from fluvial or sea flooding. A small element of the Haul Road to the north east of the BOS plant is shown within Flood Zone B, which are areas known to have been flooded in the past evidence by sedimentary deposits. An extract of the DAM map is shown in Figure 3 below;



Figure 3 – DAM Map

- 2.5.2 The development type would be classified as less vulnerable and therefore there is no need to undertake the justification or acceptability criteria set out in TAN 15 planning policy.
- 2.5.3 NRW surface water flood risk maps, shown in Figure 4 overleaf show pockets of medium and low risk along the hot metal tracks and medium and high risk pockets directly within the Zone II site.
- 2.5.4 The proposed development works will look to significantly reduce the risk of surface water flooding in these areas.



Figure 4 – NRW Surface Water Flood Risk Map

3 Existing Drainage Network

3.1 Welsh Water Records

- 3.1.1 An extract from Welsh Water records is shown in figure 5 below shows there are no surface water sewers in the vicinity of the site. The nearest adopted sewer is the combined 500mm diameter rising main to the west of the BOS plant which runs to the Afan WwTW north west of the site.



Figure 5 – DCWW Record Map

3.2 NRW Discharge License (Swansea Bay)

- 3.2.1 Currently there is an extensive site wide treated effluent drainage system which collects and treats water on the steelworks site before discharging it via an outfall west of the works into Swansea Bay. A schematic of the existing treated effluent system together with the proposed BOS plant drainage lines is included in *Appendix B*.
- 3.2.2 The Water Quality and Flow parameters of the NRW discharge license are shown in Table 1 overleaf.

Table 1: NRW Discharge License Parameters

Parameter W1		Release Point Monitoring Frequency	
Suspended Solids	27,500 kg/day	150 mg/l (mm)	Daily
Oil and Grease	3,150 kg/day	25 mg/l (mm)	Daily
Free Cyanide	45 kg/day	0.2 mg/l (mm)	Daily
Ammoniacal nitrogen	4,000 kg/day	27.5 mg/l (mm)	Daily
Phenol	350 kg/day	2.0 mg/l (mm)	Daily
Soluble Zinc	2,100 kg/month	2.5 mg/l (mm)	Daily
Soluble Lead	300 kg/month	0.3 mg/l (mm)	Daily
Soluble Chromium	200 kg/month	0.2 mg/l (mm)	Daily
Soluble Iron	-	-	Daily
PAHS (as B[a]P)	250 kg/month	1.0 mg/l	Monthly
Flow	6,000 m ³ /hour		Continuous

4 Surface Water Drainage Strategy

4.1 National SuDS Standards

- 4.1.1 In October 2018, Welsh Government published the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining Surface Water Drainage Systems'. This standard is now mandatory for new developments with either a construction area greater than 100m² or more than 1 dwelling.
- 4.1.2 The principles which underpin the design of surface water management schemes to meet the Standards are as follows;
- SuDS schemes should aim to;
- ▶ Manage water on or close to the surface and as close to the source of the runoff as possible;
 - ▶ Treat rainfall as a valuable natural resource
 - ▶ Ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;
 - ▶ Manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;
 - ▶ Take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;
 - ▶ Use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development);
 - ▶ Maximise the delivery of benefits for amenity and biodiversity;
 - ▶ Seek to make the best use of available land through multifunctional usage of public spaces and the public realm;
 - ▶ Perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;
 - ▶ Avoid the need for pumping where possible;
 - ▶ Be affordable, taking into account both construction and long term maintenance costs and the additional environmental and social benefits afforded by the system
- 4.1.3 There are six mandatory standards to be achieved within the National SuDS standards, S1-S6. The following sections demonstrate compliance with each of these standards.

4.2 Standard S1 – Surface Water Run-off Destination

- 4.2.1 This standard reviews the disposal routes for surface water run-off. The destinations are split into 5 levels with level 1 being the most preferential and level 5 being the least preferred and only used in exceptional circumstances.

Priority Level 1: Surface water runoff is collected for use;

- 4.2.2 The feasibility of a rainwater harvesting system for the roof drainage of the electrical shed sited over Sump 4 has been appraised and deemed not feasible within the budgeted works. There are no known issues or stresses on the local Mains Water supply network with the Steelworks benefitting from an uninterrupted water supply during its operation.
- 4.2.3 There is no foreseeable demand for non-potable water within the project area. Significant investment would be required for this to be used elsewhere on the site. The potential for chloride contaminated waters to be introduced into the system is high given the coastal location of the plant, salt content would not be acceptable within the processes undertaken on site.
- 4.2.4 The development therefore meets the exception criteria within G1.4 of the SuDS standards.
- 4.2.5 Any rainwater harvesting system would be fitted with an overflow and therefore would not be classified as a true 'SuDS' feature if proposed in isolation.

Priority Level 2: Surface water runoff is infiltrated to ground;

- 4.2.6 There is high potential for ground contamination to be present beneath the site and in adjacent areas evidenced by historic ground investigations across the wider site. An infiltration system has been discounted based on the risk of mobilising contaminants and as such no infiltration testing has been carried out as part of the site investigation works.

Priority Level 3: Surface water runoff is discharged to a surface water body;

- 4.2.7 As discussed in Section 3 of this report, although there is a lack of existing drainage infrastructure in the proposed works area, the main treated effluent system nearby discharges via a licensed outfall into Swansea Bay.
- 4.2.8 It is proposed to connect into this system via the Works Reservoir to the south of the site. Zone I will drain via new sumps 1 and 2 and via the modified Gilly sump. Zone II will drain via the new sumps 4 & 5 and partially the modified Gilly Sump.

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain or other drainage;

- 4.2.9 There are no Welsh Water sewers or adopted highway drains near to the development works. A priority level 4 solution will not be pursued.

Priority Level 5: Discharge to a Combined Sewer

- 4.2.10 There are no combined Welsh Water sewers near to the development works. A priority level 5 solution will not be pursued.

4.3 Standard S2 – Surface Water Run-off Hydraulic Control

- 4.3.1 The system ultimately discharges to the sea under an approved NRW discharge license and as such the full application of Standard S2 is not required. The design however allows conveyance of the key storm events along the system towards the downstream infrastructure and ultimately the outfall which has a 6000m³/hr flow restriction.
- 4.3.2 The proposed drainage schemes for Zones I & II are included in *Appendix C*.
- 4.3.3 All flows are conveyed via precast concrete channels which have been sized for a 120mm/hr rainfall intensity with provision of a 150mm freeboard.
- 4.3.4 For comparison Table 2 below shows average and peak rainfall intensities based on the FSR data for the various design storm return periods in this particular catchment;

Table 2: Rainfall Intensities (m5-60) 17.9mm Ratio R 0.278 Winter

Return Period	Storm Duration	Average Rainfall Intensity	Peak Rainfall Intensity
1 in 1 year	15 mins	24.5	60.7
	30 mins	16.8	41.7
	60 mins	11.3	28.4
1 in 30 year	15 mins	59.8	148.3
	30 mins	41.3	102.5
	60 mins	27.5	69.2
1 in 100 year	15 mins	76.9	190
	30 mins	53.8	133.4
	60 mins	36.1	90.8

- 4.3.5 The drainage network is spit in to 13 no. discrete catchments as shown in Table 3 below;

Table 3: Catchment Area Distribution

Catchment	Catchment Area (Ha)
A1	2.381
A2	0.215
A3A	1.024
A3B	0.316
A4	0.483
A5	0.666
A6	0.308
A7	0.500
A8	0.893
A9	0.930
A10	0.422
A11	0.273
A12	0.064
A13	0.168
Total Catchment Area	8.644

- 4.3.6 Calculations for the drainage network have been undertaken by TCE and will be provided to accompany the pre app SAB application.

4.4 Standard S3 – Water Quality

- 4.4.1 The drainage network will discharge to a series of sumps prior to connecting into the wider trade effluent network on site. The sumps will assist in removing suspended solids from the surface water run-off. The sumps have been designed using the following design parameters;

- ▶ Minimum size particle to be entrapped in the sump = 0.1mm
- ▶ Density of the particle = 2,000 kg/m³
- ▶ Settling velocity has been calculated based on Stoke's Law
- ▶ The retention time ≥ 20mins

- 4.4.2 The above results in the following effective storage volumes; Gilly Sump (367m³), Sump 1 (964m³), Sump 2 (3,266m³), Sump 4 (462m³) and Sump 5 (194m³). In total approximately 5250m³ of storage is provided for settled solids / sludge. This forms the first treatment within the SUDS treatment train. Further treatment downstream of the network via regional controls including the works reservoir and final effluent water treatment tank.

- 4.4.3 The installation of the localised sump controls with significant storage provision together with the downstream regional controls ensures sufficient water quality treatment processes are provided to ensure the discharge from the site meets the requirements of the NRW discharge license agreement.

4.5 Standard S4 & S5 – Amenity & Biodiversity

- 4.5.1 Due to the heavy industrial nature of the site there is limited scope to create high quality amenity or biodiverse areas.
- 4.5.2 Open, above ground, SUDS features are not viable for this location of the site due to the constant levels of dust and debris that would enter the system. The long-term maintenance requirements to keep the SUD feature functioning would be more costly than utilising a traditional drainage method and associated uplift in capital costs. The cleaning operation would need to be undertaken potentially on a daily basis. The SUDs manual suggests a monthly frequency for litter & debris removal, grass cutting, inspections for a Swale feature for example.
- 4.5.3 Constant cleaning and disturbance of the SUDS system will prevent the feature establishing vegetation and becoming an attractive feature which offers amenity and biodiversity benefits.

4.6 Standard S6 – Construction, Operation, Maintenance & Structural Integrity

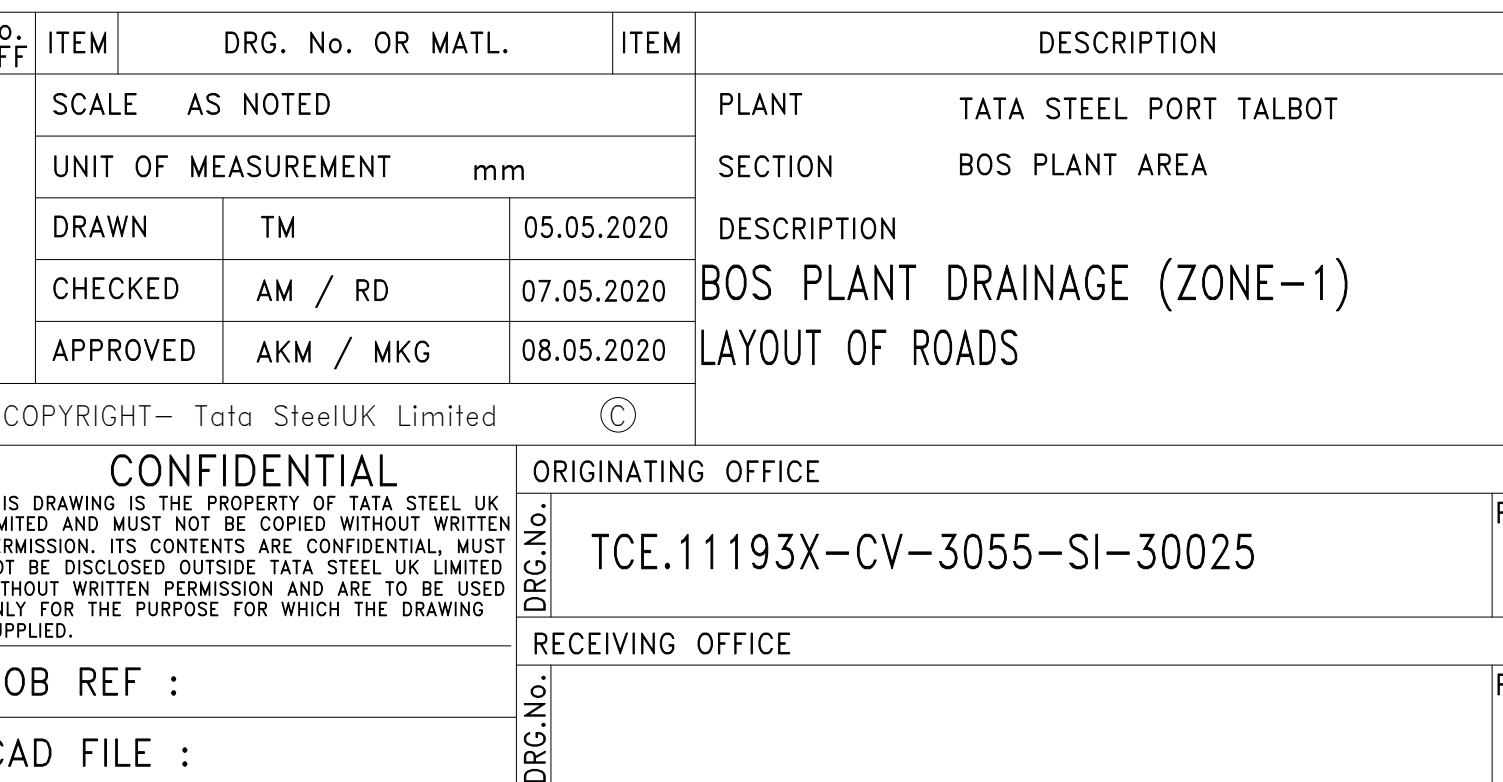
- 4.6.1 The proposals include standardised pre cast concrete drainage channels which can be produced offsite, this allows the works to be constructed more efficiently and keep the drainage infrastructure as shallow as possible, reducing potential deep excavations into potentially contaminated material.

- 4.6.2 TATA Steel will be responsible for the maintenance of the SUDS and drainage features on the site, as the Steelworks would be classified as one property. Maintenance plans are already in place to ensure the works meets the requirements of the discharge license agreement with NRW.

5 Conclusions

- 5.1.1 The site is primarily in flood zone A and at little risk of flooding from fluvial or sea sources. There are however pockets of low, medium and high risks of surface water flooding on site.
- 5.1.2 The aim of the proposals is to formalise the drainage of Zones I & II with the introduction of a positive drainage system including a series of PCC channels, substantial sumps and pumps. This infrastructure will ensure the risk of localised ponding and/or flooding is reduced sufficiently to assist the logistical operations on site and ensuring risks to health and safety are minimised.
- 5.1.3 It is proposed to connect the drainage system into the wider treated effluent network, with infiltration solutions being ruled out due to the risk of mobilising contaminants and there are no other water bodies or surface water sewerage systems adjacent to the site.
- 5.1.4 The drainage network will be designed to cater for storm events with a rainfall intensity up to 120mm/hr. The majority of flows will be conveyed via precast concrete channels.
- 5.1.5 The scheme includes approximately 5,250m³ of sump storage for the settlement of suspended solids. There are sufficient regional controls downstream of the new network to ensure the standard of water quality exiting the site meets the requirements of the current NRW discharge license into Swansea Bay.
- 5.1.6 Due to the setting of the development site it is no feasible to provide softer, above ground SUDs features that offer Biodiversity or Amenity benefits. Any such features would struggle to establish within the heavy industrial nature of the site and would also require more regular maintenance than a traditional below ground system.
- 5.1.7 The design of the system ensures the construction solution is cost effective with the utilisation of precast concrete channels which reduces the amount of on-site works whilst also keeping the drainage system shallower and reducing the potential for excavating into contaminated material. The drainage channels are easily maintainable whilst the sump systems are already used and maintained widely across the site.

Appendix A: Proposed Site Layouts



Appendix B: Existing Drainage System