Stantec

Avonmouth Bioresources Centre

Site ID: 11800

SITE CONDITION REPORT – H5

September 2022

Revision	Date	Description	Author	Checked by	Reviewed by
01	September 2022	H5 SCR	E.Wilson	Rob Gordon	Peter Duncan

1.0 SITE DETAILS

Name of the applicant	Wessex Water Services Limited
Activity address	Avonmouth Water Recycling Centre Kings Weston Lane Avonmouth Bristol BS11 0YS United Kingdom
National grid reference	Approximate Bioresources Centre: ST533793 (coordinates: 353358, 179392)

Document reference and dates for Site Condition Report at permit application and surrender	Reference: Site Condition Report H5 September 2022 Application Date: September 2022

Document references for site plans (including location and boundaries)	Stantec Industrial Emissions Directive Compliance Action Plan, Environmental Qualitative Risk Assessment, Avonmouth Bioresources Centre, Report Reference: 11800, version 0.1, September 2022. Figure 2.1 Site Setting – Regional Figure 2.2 Site Setting – Local Figure 3.1 Sludge Treatment Process Flow Diagram Figure 3.2 Plan of Current Water Recycling Assets (& shows site surfacing) Figure 4.1 Site investigation borehole locations Figure 4.2 Surface Water Features

2.0 Condition of the land at permit issue

Environmental setting including: • geology • hydrogeology • surface waters	The environmental setting of the WRC has been detailed in the Environmental Quantitative Risk Assessment (EQRA) completed for the site (Stantec, 2022). The Avonmouth site is located in the north of Avonmouth which is a suburb of Bristol, at approximately 8 km northwest of Bristol city centre (NGR: 353358, 179392). The Bioresources Centre covers an area of approximately 3.6 ha which includes the main sludge assets at the WRC. The Bioresources Centre is comprised of both the anaerobic digestion and associated activities (as operated by Wessex Water Services Limited (WWSL) and which are within the 'installation boundary') as shown on Figure 3.2. Geological, hydrogeological and hydrological information detailed within the EQRA is based upon previous Site Investigation (SI) reports completed for various developments across the WRC.

	Locations of the previous SI and available British Geological Survey (BGS) borehole logs are presented on Figure 4.1. Site Investigation Locations are as follows: C.J. associates (2001) - 14 boreholes (BH No: 1 – 14) - 12 trial pits (TP No 1 – 12) No location plans were provided. C.J. associates (2002) - 5 boreholes (BH No: 1 – 5) - 11 window samples - 11 trial pits (TP No 1 – 11) - 1 hand auger pit Located around the storm tanks and new digester [37]. Foundation Engineering Ltd (1980) - Four boreholes (BH1 to BH4) Located beneath the sludge consolidation tanks [22 and 23] and to the north of the blending tank [E] and centrifuges [G]. Norwest Holst (2007) - Two trial pits Located to the east and west of the digesters [P]. Quantum Geotech (2021) - 13 boreholes (BH101 – BH113) - 8 trial pits (MDTP101 – MDTP108) Located within the field to the south of the Site, around the new PST sludge buffer tank [35]. Quantum Geotech (2021) - 5 trial pits (TPE01 – TPE05) No location plans were provided. The logs are titled ‘Avonmouth Cake Slab’ and therefore it is assumed these are located near to the new cake pad [36]. Structural Soils Limited (1991) - Two boreholes (BH1 – BH2) Located to the east of the sludge consolidation tanks [22 and 23]. Soil Mechanics (1978) - Four boreholes (BH1 – BH4) Located within the wider WRC, 45 m to the northeast of the new PST sludge buffer tank [35].

	BGS Borehole Logs - Two boreholes (ST57NW28 and ST57NW357) - One trial pit (ST57NW510) Located within the WRC along the Mere Bank Rhine and the road from the east. **Geology** *Made Ground* Made Ground at the Site was encountered in the majority of locations and was generally described as firm to stiff, brown silty clay, with some fine to coarse subangular gravel. Where identified, the Made Ground is present at a thickness of between 0.4 m to 4.2 m across the Site but is generally 1 m to 2 m thick. Made Ground was sparsely recorded by Quantum Geotech (2021) to the south of the Site in the field that the new PST sludge buffer tank [35] is located in which is consistent with regional mapping which displays the Site being underlain by Made Ground but not the land to the south. *Superficial Quaternary Deposits: Tidal Flat Deposits* Superficial deposits were recorded in all boreholes either underlying the Made Ground, where present, or directly beneath the topsoil. The Tidal Flat Deposits are comprised of interbedded layers of clay and silt at a confirmed thickness of between 13.7 m and 20.3 m across the Site. This ranges from firm grey-brown mottled orange slightly sandy slightly gravelly clay to very soft to soft, brown-blue-grey slightly sandy silt and clay. Intermittent thin layers of peat were recorded in numerous boreholes at thicknesses of approximately 0.15 m within the Tidal Flat Deposits. Soil Mechanics described units within the Tidal Flat Deposits as 'probably sand' in BH1 and BH3 at depths of around 8 to 16 mbgl. *Mercia Mudstone Group* Bedrock at the Site is the Mercia Mudstone Group. This transitions through a weathered zone between the Tidal Flat Deposits and the mudstone/siltstone however the zone is not well defined. It is generally described as very stiff red-brown silty clay with gravel sized lithorelicts. This then transitions into very weak thinly laminated reddish brown mudstone and strong, red-brown occasionally grey-green mottled thinly bedded siltstone. Only two BGS boreholes are available to a depth of 56 m located adjacent to Mere Bank Rhine. These are broadly in agreement with

	the site investigation locations and confirm around 15 m of clay and silt underlain by sandy marl and mudstone with thin bands of gypsum and selenite. These deeper BGS boreholes record that Coal Measures were identified from around 52 mbgl. **Hydrogeology** *Aquifer Designations* The superficial deposits present at and within the vicinity of the Site are classified as unproductive aquifers. Unproductive aquifers are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The Mercia Mudstone bedrock beneath the Site is classified as a Secondary B aquifer. Secondary B aquifers are predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. *Aquifer Testing* No aquifer testing has been recorded in the site investigation reports at the Site. *Source Protection Zones* There are no Source Protection Zones within 5 km of the Site. *Licenced Groundwater Abstractions* The EQRA reports that there are five licenced groundwater abstraction points within 4 km of the Site. The closest active groundwater abstraction (SW/054/0020/005/1) is located 1.2 km west of the Site for dust suppression. Appendix A of the EQRA details a historical groundwater abstraction located at the Site along the southern boundary which was held by Rhodia UK Limited for process water and non-evaporative cooling. Further information is provided within the EQRA (Stantec, 2022). *Groundwater Observations* Groundwater strikes were encountered in most boreholes at the Site, however the majority of trial pit locations were recorded as dry. Based on the groundwater strike information there appears to be some groundwater present within the Made Ground and Tidal Flat Deposits above the weathered bedrock at between 4 to 5 mAOD in Quantum Geotech (2021) boreholes and -2 to 5 mAOD in CJ Associates (2002) boreholes and 5.6 to 6.2 mAOD in Woods (2019, 2020 and 2021) (see Appendix E, F & G). Therefore, it is likely that it is a shallow groundwater table above the lower permeability materials of the Mercia

	Mudstone Group. Groundwater strikes were also recorded within the underlying bedrock at between -13 mAOD and -23 mAOD in the east of the Site. The CJ Associates (2002) boreholes were the only locations to be screened across the Mercia Mudstone Group and therefore there is no data to the west of the Site for comparison. Halcrow (1998) (See Appendix D) did not provide any borehole logs or monitoring data however it outlines that water levels in the Made Ground and Alluvium (which we have classified as Tidal Flat Deposits) varied between 0.45 m to 5.7 mbgl and 2 to 3.5 mbgl respectively. It also notes that six piezometers were installed in the Mercia Mudstone and water levels in these ranged between 12.8 and 15.5 mbgl and were typically some 14 mbgl. A further two piezometers were installed at depth in BH4 (to 55m) and BH17 (to 49m) which recorded water levels between 15.01 and 15.34 mbgl in BH4 (averaged 15.3 mbgl) and 9.4 to 15.1 mbgl in BH17 (averaged 13.4 mbgl). Due to the low permeability nature of the Tidal Flat Deposits and Mercia Mudstone Group, there is unlikely to be significant groundwater flow, however this is uncertain due to the lack of data within the bedrock. Similarly, there is unlikely to be appreciable lateral movement of groundwater within the Made Ground. Based on LiDAR data, the Severn Estuary which is located 1.8 km west of the Site lies at an elevation of -5 mAOD which suggests it could be in hydraulic continuity with the shallow groundwater at the Site within the Tidal Flat Deposits. However, as detailed above it is unlikely there is significant flow within this unit due to its low permeability nature. Based on LiDAR data, Mere Bank Rhine and the drain to the east of the Site are at approximate elevations of 5.5 mAOD and the northern drain is c. 6 mAOD. However, it is unclear to what degree the northern and eastern drains may be groundwater fed due to the lack of data. The LiDAR elevation of Mere Bank Rhine (5.5 mAOD) is similar to the shallow groundwater elevation recorded in nearby boreholes and trial pits by Quantum Geotech (2021) which recorded groundwater at around 4 to 5 mAOD and therefore these could be in hydraulic continuity. Further information on groundwater is included in the EQRA (Stantec, 2022). **Surface Waters (Hydrology)** The Mouth of the Severn lies approximately 1.8 km west of the Site and flows southwards towards Bristol Channel and the Sea. The

	River Avon lies approximately 2.5 km to the south of the Site which flows to the west towards the Severn Estuary. Two drains lie along the southern boundary of the Site, which are separated by the monument 'Mere Bank' which is a historic linear flood deference (Figure 4.2). The most northern of these two channels is named 'Mere Bank Rhine'. These were observed during the site visit however only one drain was visible which contained stagnant water. A drain runs parallel to the eastern boundary of the Site at approximately 40 m to the east of the Site. This drain was not visible during the site visit; however, it was noted a small watercourse is present immediately along the eastern boundary. All these drains are interconnected across the adjacent fields. A drain is present along the northern boundary of the WRC and within the Site in the northern centre next to Katherine Farm. The topography of the land in the northern centre of the Site falls down towards this drain. Three surface water bodies lie approximately 40 m to the west of the Site on Wessex Water owned land. The southern-most square-shaped lagoon is used for settling of sewage treatment. The northern two lagoons are nature reserves and used for fishing. It is understood from site staff that all three lagoons are lined. The lagoons lie at the same elevation as the sludge assets within the west of the Site. Historically there were further surface water lagoons in the northeast corner of the Site. These were dewatered over time and became compost heaps, however the northern most lagoon has been left to refill naturally (rainfall). Operators do not think this lagoon is lined. Surface water in the regional area is expected to generally drain to the west towards the Severn Estuary from the higher ground. However, local to the Site, surface water is expected to drain towards the southwest towards Mere Bank Rhine and then the Severn Estuary. Surface water at the Site will be captured by the engineered surface drainage system.
Pollution history including: • pollution incidents that may have affected land • historical land-uses and associated contaminants • any visual/olfactory evidence of existing contamination • evidence of damage to pollution prevention measures	**Pollution Incidents** There are five historic pollution incidents recorded with the EA at the Site and relate to pollution by oils and fuel, sewage materials and general biodegradable materials and wastes. Four of these incidents had no impact on water, land or air, however the incident from 18/09/2001 on the southern boundary of the Site to Mere Bank recorded a minor impact to water from sewage materials (sludge). The incident in September 2001 was because a

	pump burned out and the sump overflowed and hence sludge dewatering effluent discharged to Mere Bank Rhine, however the problem was noticed quite early on. This asset is no longer thought to exist due to its close proximity to the current APDs [A1-A6]. Records of pollution incidents are provided within the Groundsure Environmental Data Report included in the EQRA (Stantec, 2022) Appendix A. **Historical land-uses & associated contaminants** Historical mapping is provided in Appendix B and Appendix C of the EQRA (Stantec, 2022). Potentially contaminative activities / features are listed in the Groundsure Environmental Data Report provided in Appendix A of the EQRA. *Sewage Works* Sewage Works was constructed at the Site some point between either 1914-1915 and 1970 or between 1970 and 1979 in what is currently the southern half of the Site plus a settling bed (water feature) to the west of the current Bioresources Centre. Tanks are listed as potentially contaminative land-use on site from 1970-1992. The land to the northeast of the site boundary was built up during this time, as displayed by earthwork markings on the maps alongside the tanks. Prior to this, the land was farmland with numerous drains crossing over the Site. Between 1979 and 1991 an additional lagoon became present to the west of the Site which is indicated with earthwork markings on the maps. Between 1991 and 2001, this lagoon split into two smaller water bodies, and it appears the tanks into the northeast corner of the Site have been built over. Throughout this time the surrounding land has been built up with industrial works to the southwest. *Drainage Network* Mere Bank Rhine that lies along the southern boundary of the Site has been identified on the historic maps since the first provided in 1880-1883. The drain that lies to the east of the eastern boundary is first identified when the Site was constructed between 1914-1915 and 1970 / 1970 and 1979. Prior to the Site construction there were numerous drains crossing over the Site and it is not clear what happened to these when the Site was built. The northern drain has been identified on all historic maps provided since 1880-1883, however the length has reduced when the Site was constructed. Prior to the Sites construction, the northern drain was interconnected with multiple other drains

	across the Site however it is not clear whether these connections still exist. Of the three lagoons that are currently located to the west of the Site, the first was initially constructed between 1970 and 1979, however a second was constructed between 1979 and 1991 which then altered into two ponds between 1991 and 2001. *Waste Management Licences/Landfills* There are three active/recent landfill sites within 500 m of the Site and the closest is 10 m to the west of the Site. There are nine historic landfills within 500 m of the Site and the closest overlaps with the land in the south of the wider WRC land. There are 23 licensed waste management facilities located within 500 m of the WRC. The seven closest are located on site for the waste transfer station, CHP, sludge drying and food waste treatment facility, sewage sludge treatment and composting facility. These are operated by Wessex Water Services and Enterprises Limited. There are two licensed waste sites adjacent to the Site in the west associated with the household waste recycling centre. *Potential Contaminants* Potential contaminants associated with the identified potential sources of contamination on site and in the surrounding area include: Metals, petroleum hydrocarbons - associated with fuel tank(s) and pumping stations; PAHs, polychlorinated biphenyls (PCBs) (associated with generators and electricity substations), Metals, asbestos and ground gas (carbon dioxide, carbon monoxide) - from areas of infilling and sewage treatment. Further detail on the potential sources of contamination (PSC) and contaminants associated with current and historical use of the site and other potential sources of contamination (PSC) identified within 50m of the site (250m for infilled ground/ landfill) with an accompanying PSC Plan is included in the memorandum titled, *Potential Sources of Contamination Avonmouth Water Recycling Centre, Bioresources Centre – Supporting Information for H5 Site Condition Report* (Stantec, 2022) presented as Appendix A of this document. **Visual / Olfactory Evidence of Contamination** No olfactory or visual evidence of contamination was identified during the December 2020 and February 2022 site visit.

	Made Ground including ash was identified in BH1 and BH2 during the Structural Soils 1991 ground investigation (GI) between 0.05 and 2.8m below ground level (bgl) and 0 and 2.3m bgl respectively. Ash was not recorded in any other GI however occasional coal fragments were noted in BH3 and BH4 in Foundation Engineering 1980 which are located in the same area as the borehole recording the ash above. Norwest Holst 2007 noted in TP2 from 0 to 1m bgl that slag and clinker were present and this location is in the same area as the boreholes above recording ash and coal which is in the west of the Site. **Evidence of Damage to Pollution Prevention Measures** Within the EQRA, Table 3.1 Main Assets Associated with Sludge Treatment (collected during site visit) indicates that some failure has occurred at the BC. This included the APD Feed Tank [B] and Digester [P].
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	Out of the 8 previous GI reports existing for the Site, the following include geo-environmental chemical testing: - Halcrow (1998). - Aecom (2021). - Quantum Geotech (2021). Wood (2019, 2020 and 2021) also include groundwater chemical testing at the Site. Detectable concentrations of metals, Total Petroleum Hydrocarbons and polycyclic aromatic hydrocarbons (PAH) were observed in these investigations. For detail on contamination encountered during previous GI at the site see the *Potential Sources of Contamination Avonmouth Water Recycling Centre, Bioresources Centre – Supporting Information for H5 Site Condition Report (Stantec, 2022)* presented in Appendix A of this document.
Baseline soil and groundwater reference data	For detail of the soil and groundwater reference data at the Site see the *Potential Sources of Contamination Avonmouth Water Recycling Centre, Bioresources Centre – Supporting Information for H5 Site Condition Report (Stantec, 2022)* presented in Appendix A of this document. As presented in Table 1.7 of the report in Appendix A there are potential contaminants (predominantly metals, PAHs and TPHs) associated with both the Bioresources Centre activities, at the Site and the wider WRC.

		There is not sufficient data for soil and groundwater within the wider WRC to determine baseline data of the Site and therefore it is recommended that further site investigation is undertaken to provide a more comprehensive baseline.
Supporting information	• Source information identifying environmental setting and pollution incidents • Historical Ordnance Survey plans • Site reconnaissance • Historical investigation / assessment / remediation / verification reports • Baseline soil and groundwater reference data	

3.0 Permitted activities

Permitted activities	WRC comprising Sludge Treatment Process outlined in the EQRA Section 3.1 Figure 3.1 Sludge Treatment Process Flow Diagram (Stantec, 2022).
Non-permitted activities undertaken	Not Applicable
Document references for: • plan showing activity layout; and • environmental risk assessment.	Stantec Industrial Emissions Directive Compliance Action Plan Environmental Qualitative Risk Assessment, Avonmouth Sludge Treatment Centre, Report Reference: 11800, version 0.1, September 2022. Figure 2.1 Site Setting – Regional Figure 2.2 Site Setting – Local Figure 3.1 Sludge Treatment Process Flow Diagram Figure 3.2 Plan of Current Water Recycling Centre Assets Table 3.1 Main assets associated with Sludge Treatment Section 6.0 EQRA.

Note:

In Part B of the application form you must tell us about the activities that you will undertake at the site. You must also give us an environmental risk assessment. This risk assessment must be based on our guidance (*Environmental Risk Assessment - EPR H1*) or use an equivalent approach.

It is essential that you identify in your environmental risk assessment all the substances used and produced that could pollute the soil or groundwater if there were an accident, or if measures to protect land fail.

These include substances that would be classified as ‘dangerous’ under the Control of Major Accident Hazards (COMAH) regulations and also raw materials, fuels, intermediates, products, wastes and effluents.

If your submitted environmental risk assessment does not adequately address the risks to soil and groundwater we may need to request further information from you or even refuse your permit application.

4.0 Changes to the activity	
Have there been any changes to the activity boundary?	This application is for a new installation comprising existing activities.
Have there been any changes to the permitted activities?	If yes, provide a description of the changes to the permitted activities
Have any 'dangerous substances' not identified in the Application Site Condition Report been used or produced as a result of the permitted activities?	If yes, list of them
Checklist of supporting information	• Plan showing any changes to the boundary (where relevant) • Description of the changes to the permitted activities (where relevant) • List of 'dangerous substances' used/produced by the permitted activities that were not identified in the Application Site Condition Report (where relevant)

5.0 Measures taken to protect land	
Use records that you collected during the life of the permit to summarise whether pollution prevention measures worked. If you can't, you need to collect land and/or groundwater data to assess whether the land has deteriorated.	
Checklist of supporting information	• Inspection records and summary of findings of inspections for all pollution prevention measures • Records of maintenance, repair and replacement of pollution prevention measures

6.0 Pollution incidents that may have had an impact on land, and their remediation	
Summarise any pollution incidents that may have damaged the land. Describe how you investigated and remedied each one. If you can't, you need to collect land and /or groundwater reference data to assess whether the land has deteriorated while you've been there.	
Checklist of supporting information	• Records of pollution incidents that may have impacted on land • Records of their investigation and remediation

7.0 Soil gas and water quality monitoring (where undertaken)	
Provide details of any soil gas and/or water monitoring you did. Include a summary of the findings. Say whether it shows that the land deteriorated as a result of the permitted activities. If it did, outline how you investigated and remedied this.	
Checklist of supporting information	• Description of soil gas and/or water monitoring undertaken • Monitoring results (including graphs)

8.0 Decommissioning and removal of pollution risk	
Describe how the site was decommissioned. Demonstrate that all sources of pollution risk have been removed. Describe whether the decommissioning had any impact on the land. Outline how you investigated and remedied this.	
Checklist of supporting information	• Site closure plan • List of potential sources of pollution risk • Investigation and remediation reports (where relevant)

9.0 Reference data and remediation (where relevant)	
Say whether you had to collect land and/or groundwater data. Or say that you didn't need to because the information from sections 3, 4, 5 and 6 of the Surrender Site Condition Report shows that the land has not deteriorated. If you did collect land and/or groundwater reference data, summarise what this entailed, and what your data found. Say whether the data shows that the condition of the land has deteriorated, or whether the land at the site is in a "satisfactory state". If it isn't, summarise what you did to remedy this. Confirm that the land is now in a "satisfactory state" at surrender.	
Checklist of supporting information	• Land and/or groundwater data collected at application (if collected) • Land and/or groundwater data collected at surrender (where needed) • Assessment of satisfactory state • Remediation and verification reports (where undertaken)

10.0 Statement of site condition
Using the information from sections 3 to 7, give a statement about the condition of the land at the site. This should confirm that: • the permitted activities have stopped • decommissioning is complete, and the pollution risk has been removed • the land is in a satisfactory condition.

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

Appendix F

Appendix G