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CLIMATE CHANGE

14.1 In December 2007, a supplement to Planning Policy Statement 1 (PPS1) 'Delivering Sustainable Development' was published. The supplement, 'Planning and Climate Change' sets out how planning should contribute to reducing emissions and stabilising climate change and also how new developments should be designed to reduce risk from climate change e.g. flooding. This Chapter considers the possible climate change impacts derived from the construction and operation of the SRRRC.

14.2 The potential impact on climate change, and the reduction of risk for the SRRRC from climate change have been considered throughout the design of the proposal, with particular regard to the following;

- Building Research Establishment Environmental Assessment Method (BREEAM);
- WRATE – Life cycle assessment of Energy from Waste technology;
- Heat Plan – potential for the use of heat generated by the EfW facility;
- Surface water management;
- Design and materials used to minimise energy consumption and carbon dioxide emissions; and
- Traffic – impact of emissions arising from traffic generation.

BREEAM Assessment

14.3 A BREEAM pre assessment has been undertaken by SLR Consulting. The outcome of this consultation will advise the developer on the potential environmental impacts of the development, and the mitigation measures which can be employed to reduce them. The developers have expressed their intention to achieve a 'good' or 'very good' BREEAM rating.

WRATE

14.4 SLR has completed a Life Cycle Assessment, using the Environment Agency's modelling tool 'Waste and Resource Assessment Tool for the Environment' (WRATE), to assess the environmental impacts, including global warming potential, of the proposed EfW facility compared to a number of other waste management technologies such as Mechanical Biological Treatment (MBT) with refuse derived fuel (RDF) or Advanced Thermal Treatment (ATT).

14.5 The Energy from Waste facility is designed to manage up to 350,000 tonnes per annum of municipal, and commercial and industrial waste that can not be recycled. The assessment concluded that the proposed EfW facility will result in a negative environmental footprint that is, an overall reduction in environmental impacts such as global CO2 emissions. The results for Global Warming Potential (carbon footprint), expressed as kg CO2 equivalent, are presented in Table 14-1.

Table 14-1: Global Warming Potential of Municipal Waste Treatment Technologies

Impact Assessment	Unit	Landfill	EfW	EfW with CHP	MBT with EfW	MBT with Landfill	ATT
global warming (GWP100)	kg CO2 eq.	69,319,234	-9,233,041	-50,406,802	13,312,611	44,756,947	12,346,576

Heat Plan

14.6 A Heat Plan has been prepared to support this planning application and is set out in Appendix 14.2. The application site at Avonmouth is ideally located for the integration of a CHP system. Avonmouth has attracted a number of industries and a large amount of commercial activity, as well as several large chemical manufacturing plants and a gas fired power station. There is also a significant residential area in Avonmouth between the industrialised zone and the M5 motorway.

14.7 The development of a metropolitan heating network for Avonmouth could represent a major advance in renewable energy generation to achieve the carbon emissions savings and assisting reaching the EU target of 20% of all energy from renewable sources by 2020[1].

Potential Power Output

14.8 The Severn Road EfW facility will produce circa 30 Mega Watts of electrical energy based on an input of up to 350,000 tonnes of residual waste per annum, which would be exported to the National Grid. This is enough to serve around 42,000 households[2].

14.9 The use of waste heat can further reduce the carbon footprint of the SRRRC. Most systems of energy generation in the UK produce greenhouse gases (GHGs). The quantity of GHGs generated per unit of energy depends both on the fuel used and the efficiency of the generation by the power stations used.

14.10 The most efficient EfW plants are those which use the waste heat from the high pressure steam, after it has been used to generate electricity. This waste heat can be harnessed by a Combined Heat and Power (CHP) facility to

[1] www.renewableenergyworld.net
[2] Ofgem average electricity use per household

transfer the heat to water. This heated water is then pumped through insulated pipes to nearby consumers.

14.11 The feasibility of CHP schemes relies on a consistent market for the heat supplied by the plant; the ideal consumer is located within 5km of the scheme and uses large amounts of heat e.g. hospitals, schools, hotels. Given the urban location of the SRRRC, it is considered that surrounding industries could be the main users of the heat and energy produced. In addition to being cost effective, the use of this energy would minimise carbon emissions by reducing the amount of fossil fuel energy used space and/or water heating.

14.12 Full details of the WRATE assessment can be found in Chapter 5 Need and Alternatives of Volume 2.

Surface water management – attenuation features to accommodate climate change and flood risk.

14.13 In addition to the potential impacts of the SRRRC on climate change, climate change also has impacts on the design and operation of the SRRRC. For example, increased incidences of heavy and prolonged rainfall could increase flood risk from surface water, groundwater and drainage systems. Consequently, new developments must ensure that they are designed to deal with higher than average rainfall.

The site is located within Flood Zone 3 i.e. 'high' risk, due to its proximity to the Severn Estuary.

14.14 As all developments have the potential to increase surface water runoff, a surface water management scheme has been developed which accounts for increased rainfall. The scheme has been designed in accordance with current best practice as outlined in the Sustainable Urban Drainage Systems (SUDS) Manual. SUDS aim to manage surface water runoff to ensure reduced flood risk and improved water quality.

14.15 A number of attenuation ponds are proposed to ensure surface water drainage does not exceed the greenfield rate, thereby mitigating any potential increase in downstream flooding.

14.16 Full details of the FRA and surface water management scheme can be found in Chapter 9 of the ES Technical Appendices.

Design and Materials

14.17 Viridor is committed to sustainable buildings and will ensure that the facility meets high standards. Planning Policy Statement 1 (PPS1) - Planning and Climate Change, was published in December 2007. It is centred around the objective of reducing carbon emissions from all new development as well as ensuring that new developments are tolerant of predicted climate change.

14.18 A primary objective of the development team has been to address sustainable building principles from the earliest concept stage. Viridor will ensure that this

objective is carried through to the detailed design and construction stages as a fundamental design requirement.

14.19 Key issues including those discussed previously in this statement are summarised as follows:

- The use of residual waste following re-cycling to generate steam and power;
- The use of ground granulated blast furnace slag as a replacement for Portland cement in the concrete mixes for the works;
- The collection of water in tanks and the water attenuation ponds and its re-use within the process equipment, the offices and ancillary accommodation;
- The principles of low energy design for the design of the offices and visitor centre;
- The use of natural light and ventilation in the MRF and EfW.

14.20 The main MRF and EfW plant areas will not be provided with space heating or cooling systems since this is not a requirement of their function. A sustainability statement has been prepared that will form part of the Employer's Requirements at tender. This statement sets out Viridor's aspirations for a sustainable solution, and sets standards that will have to be met by the contractor in order to achieve the credits necessary for a 'very good' BREEAM rating.

PRINCIPLES OF LOW ENERGY DESIGN

14.21 Established principles of low energy design have been used in the offices and Visitors Centre including the following:

- The depth of the office components are limited to 12m to maximise the potential for natural lighting;
- The perforated screen to the south of the EfW offices acts as a brise-soleil, shading the south facing windows and cooling incoming air
- Walkways are incorporated into the brise soleil at floor levels to enable safe and easy cleaning of the façade.
- To reduce cooling requirements, the structure will be of reinforced concrete with exposed concrete soffits to the floor slabs. These soffits will form the ceilings;
- The energy requirement of the offices is generated on site by the EfW;

- The construction methods and systems will reduce air leakage to a minimum. The building envelope will be to or in excess of the new airtight standards required by the building regulations;

BREEAM Assessment

14.22 The Employers Requirements of the Engineering Procurement Contract will require the detailed design to achieve a "very good" BREEAM"[3] rating. The scheme has been pre- assessed using the BREEAM industrial system.

Water harvesting and management

14.23 The SRRRC building is designed with a sustainable drainage management scheme. It re-uses rainwater following collection in tanks within the building envelope for use in the process plant. The ponds around the northeast boundary and around the ACC (a part of the pond is for use in the event of fire on site) form an integral part of the green infrastructure and have been designed as surface water attenuation facilities to protect the EfW facility for up to and including the 1 in 100 year storm event (incorporating an allowance for climate change), to allow controlled release of runoff into the local watercourses. Further SuDS provision may be provided as part of a holistic surface water and fluvial flood risk management strategy to be formulated in partnership with the Lower Severn Internal Drainage Board.

Sustainable Materials

14.24 Materials selection for the buildings has been informed by sustainability principles, in terms of the long-term performance of the materials and the integrated lifecycle management programmes of the manufacturers. Concrete, steel, aluminium, polycarbonate are the principle materials used and can all be recycled. Selection will avoid the use of construction materials which contain Chlorofluorocarbons (CFC) or which use CFCs in their manufacture.

14.25 Recycled aggregates or masonry will be used for structure and slabs where practicable including base material for the construction of the site access roads.

14.26 Ground Granulated Blast Furnace Slag (GGBS) will be considered for all concrete works during the detailed design stages as a replacement for Portland cement in concrete mixes to reduce carbon emissions. The decision on its use will be geared to the acceptability of the suppression of "strength gain" and programmatic issues such as whether the major concrete elements are to be constructed in summer or winter.

14.27 The Kalzip Aluminium standing seam roof is produced in a sustainable closed loop. Research shows that aluminium can be recycled infinitely with no loss in performance. The benefits of recycling aluminium lie with its high scrap value and low energy requirements in the recycling process, only 5% of the energy

[3] Building Research Establishment Assessment Method

required in the original primary process is required for repeated recycling. The material has a long life. The Kalzip system is demountable and at the end of the buildings life as it can be unzipped and recycled with no loss in volume or quality.

14.28 The main buildings have steel frames and steel cladding to the walls. Steel is produced in a "sustainable loop". It can be recycled again and again without degradation and it is probably the most widely recycled material in the world with over 354MT recycled annually through a well-established infrastructure.

14.29 The translucent polycarbonate panels have low maintenance characteristics and are virtually self-cleaning. The manufacturing companies have well founded recycling policies with both closed and open loop outcomes. The material provides the advantages of high quality diffused natural lighting for the benefit of the workforce.

14.30 The main façades can be dismantled, reused or recycled if required at the end of the useful life of the building.

Climate change impacts of traffic generation

14.31 Current expectations are that the SRRRC would import and process around 440,000 tonnes of waste material from Bristol and surrounds per annum. The incineration process would create around 90,000 tonnes of incinerator bottom ash (IBA), which would need to be exported for use in the construction industry.

14.32 The proposed SRRRC is designed to deal with around 500,000 tonnes of waste per annum. It is estimated that the operation of the EfW will generate 64 HGV trips a day (128 two way movements) and 26 RCV (52 two way movements) a day. This figure is based on an average of 8 tonne loads for RCVs, 20 tonne loads for bulk imports and a 5 and a half day working week. Waste is likely to be brought into the site consistently throughout the day and will not peak in line with traffic on the surrounding roads. The EfW facility would operate continuously on a 24-hour, seven days per week basis. However, it is anticipated that waste will mainly be delivered to the site between 6am and 8pm.

14.33 The MRF will generate a maximum of 142 RCV movements and 56 HGV movements per day daily vehicle trips with a similar pattern to the EfW. Of the 150,000 tonnes imported to the MRF, 60,000 tonnes of waste imported to the MRF will be transferred to the EfW and this accounts for the relatively low number of lorry movements to the EfW when compared to the MRF. In total, the SRRRC will generate an estimated 378 HGV and RCV movements per day.

14.34 The Transport Assessment undertaken, see Chapter 6 of the ES (Volume 2), concludes that following mitigation, the proposed development will not have significant impacts on the highway network. Mitigation is primarily provided by the proposed highway improvements and a Travel Plan, including a ban on all traffic associated with the development going through Hallen.

14.35 An assessment of traffic emissions arising from the development was undertaken. The emissions monitored were nitrogen dioxide (NO_2), which plays a role in the formation of tropospheric ozone (a greenhouse gas) and fine particles (PM_{10}).

14.36 The air quality assessment concluded that NO_2 emissions from vehicle movements associated with the EfW facility would result in a 'negligible' impact. The additional PM_{10} generated by the EfW facility was also calculated to have a 'negligible' impact.

14.37 Whilst the location of the site does not allow for waste to be imported by means other than road, the operators will endeavour to minimise vehicle movements generated by the site. To ensure vehicles bringing waste to the site are fully laden, it is proposed to make maximum use of waste transfer stations to bulk up waste from the surrounding area.

14.38 The applicants will develop a Staff Travel Plan to encourage car sharing, thereby reducing the number of private cars journeys generated by the development.

CONCLUSIONS

14.39 This Chapter has been prepared to assess the climate change impacts of the SRRRC and also the potential impact of climate change on the facility.

The findings are summarised as follows.

- The WRATE assessment concluded that the SRRRC will result in a negative environmental footprint that is, an overall reduction in environmental impacts such as global CO_2 emissions. This can be attributed to the generation of electricity from waste and the subsequent displacement of fossil fuel electricity generation;
- The SRRRC will produce carbon emissions but these are less harmful greenhouse gases than methane, which would be produced if the waste was landfilled;
- The MRF will provide 90,000 tonnes per annum of recyclable material, which can be used in the place of virgin materials (thus reducing carbon producing in the extraction of raw materials)
- The EfW and offices will be powered by energy produced on site and the surplus energy will be exported to the National Grid. Recovered energy avoids the need to produce electricity from non renewable (fossil) sources, which in turn reduces emissions associated with the extraction and combustion of fossil fuels;
- In accordance with the supplement to PPS1, the SRRRC has been designed to minimise energy use and carbon emissions during construction and operation;

- The site has been designed to attenuate surface water runoff and ensure that the SRRRC would not give rise to additional surface water runoff or down stream flooding;

- New development in the vicinity of the EfW facility could be future proofed by ensuring the infrastructure is in place to allow CHP system to be retro fitted.

14.40 Having regard to the above, it is considered that the EfW technology is not likely to have a significant impact on climate change and performs better than landfill and alternative waste treatment facilities such as Mechanical Biological Treatment (MBT). Bottom Ash recycling offsets the extraction of raw materials and the recovery (and eventual re use) of ferrous metal from the bottom ash reduces the need for iron ore extraction and processing.