Six ◆ The design of the Peacehaven wastewater treatment works and sludge recycling centre

DESIGN PRINCIPLES AND OBJECTIVES

6.1 The general guiding principles and objectives underpinning the project as a whole are identified at the beginning of chapter three of this design and access statement. For the wastewater treatment works and sludge recycling works at Peacehaven specifically, the principles and objectives have been applied in the following way.

a). From an operational perspective, it is essential that the proposals can meet Southern Water's obligations as the statutory sewerage undertaker in a reliable and cost-effective way, whilst being able to accommodate potential future modifications to wastewater transfer, treatment and discharge.

6.2 To these ends, the treatment works incorporates proven process technologies, and incorporates space for future expansion, including the potential future provision of ultraviolet treatment and nutrient removal processes. Associated landscape works likewise anticipate these requirements so that future works expansion can take place without major disruption to earthworks, planting of wildlife habitats.

b). The effective use of physical resources was enshrined in a wider concern to achieve a sustainable form of development. The project design should thus make effective use of established infrastructure, including the existing sewerage network and operational sites, and promote the recycling of waste and the recovery of energy.

6.3 The required wastewater treatment enhancements can be delivered without any major resewering works in the drainage catchment. The treatment works would incorporate a sewage sludge recycling centre that will convert sludge into a more environmentally benign granular 'bioproduct' for use as an agricultural soil conditioner, in substitution for less sustainable chemical fertilisers. Methane captured during the anaerobic digestion of the sewage sludge will fuel an on-site combined heat and power plant, meeting approximately a quarter of the treatment works' energy demand from a renewable energy source in substitution for fossil fuels.

c). Where possible, the project design and arrangements for access should work in harmony with established land use planning provisions for sites and their surroundings.

d). Similarly, the project design and arrangements for access should demonstrate sensitivity to the local environment and amenity, avoid harm to environmental features of known sensitivity and, where possible, deliver environmental enhancements.

6.4 In pursuit of these principles, the proposals for the areas of the application site around the inner treatment works compound incorporate provisions for open space, wildlife habitat enhancement and an improved landscape transition between Peacehaven and the rural areas to the north.

e). To these ends, the project should make proactive use of available design and environmental management methods to deliver an acceptable planning solution, in consultation with representative stakeholder interests.

6.5 As this chapter will explain, the treatment works design incorporates a range of measures to fulfil this objective, including advanced odour control, a comprehensive landscape and habitat creation strategy to respond to landscape, visual and ecological considerations, and an innovative green roof on the main treatment works building to further integrate the development into its setting. These design and environmental management measures respond to feedback from stakeholder consultations and the guidance contained in the 2007 planning appeal decision for the previous proposals for the site.

THE AMOUNT, SCALE AND LAYOUT OF DEVELOPMENT

6.6 The treatment works site, including the access road to Hoyle Road, is 39.879 ha in area. The proposed site plan is shown in figure 6.1. After construction, the majority of this area will be employed as follows:

Wastewater treatment works secure compound and access road (of which 1.7 ha would be under a green roof)	4.9 ha
Existing reservoir and soakaway	1.1 ha
Grassland and scrub between the inner and outer site fences	9.4 ha
Land returned to agriculture	10 ha
Public amenity space, including footpaths and bridleways	13.7 ha

New buildings will have a total floor area of 10,136 m^2.

6.7 From an excavated ground level of 29.5 metres AOD at the western end of the site and 23 metres AOD at the eastern end, the main building will rise to a maximum height of 43.1 metres AOD, and the vent stack will rise to 51.1 metres AOD. Digester tanks and the gas holder will not exceed 37 metres AOD in height or 13 metres above the local ground level. Most tanks will be set partly into the ground to reduce their overall height.

6.8 The proposed layout of the proposed wastewater treatment works and sludge recycling centre and surrounding land is shown diagrammatically in figure 6.2. The layout reflects a balance between the following contextual influences:

i). *the physical and landscape setting of the site* – particularly the need to accommodate the treatment works on a site excavated within an existing dry valley, and the associated desire to set the development into the terrain so as to reduce its visual prominence in the local landscape;

ii). *the local land use and social context* - which includes the local presence of existing and proposed residential neighbourhoods, a school and existing and proposed playing fields and amenity areas. In response, Southern Water is proposing a compact treatment works layout with a high degree of odour and noise control, achieved in part by grouping processes and activities with potential to give rise to odour or noise into buildings with appropriate environmental controls;

iii). *the ecological context* – including communities of protected wildlife species centred on the existing reservoir and soakaway features near the centre of the site;

iv). *the archaeological context* – there being evidence of archaeological interest on parts of the wider site;

v). *the operational context* – Southern Water's obligation, as the statutory sewerage undertaker, to provide wastewater treatment to secondary standard for the drainage catchment, and to provide for the effective recycling and disposal of the solid and liquid by-products of wastewater treatment.

6.9 The proposed layout and design responds to these contextual influences in an integrated matter. Thus, the sludge recycling centre building at the eastern end of the works is scaled to enclose the delivery bays for imported sludge and cess, facilitating noise attenuation and the retention of odours. The building also incorporates the odour control plant, which includes tall structures. This arrangement is compact, thus reducing the land-take of the development and its potential effects on land use, ecology and archaeology. At the same time, the physical mass of the sludge recycling centre would be employed to screen views of external tanks in views from the east. The green roof reinforces this benefit by giving the building the appearance of sloping downland in views across the local landscape.

6.10 The treatment works layout also reflects the sequence of treatment, with preliminary, primary and secondary processes close together, and with adjacent space for potential future expansion. The layout, and the height of process tanks within it, exploits the general fall in modified ground levels on the site from west to east to enable wastewater to flow around the site under the influence of gravity where possible, thus reducing the need for pumping and its associated energy demand.

6.11 The layout of the proposed wastewater treatment works and sludge recycling centre is best explained from engineering/operational and landscape/architectural perspectives.

The operational layout

6.12 Figures 6.1-6.3 show the proposed site layout. The treatment processes are briefly described below. A simplified process flow diagram explaining how the Peacehaven wastewater treatment works and sludge recycling centre would operate is provided in figure 6.4. All processes have been scaled with reference to predicted future demand for wastewater treatment in the Brighton and Hove drainage catchment at a design horizon of 2025.

Inlet pumping station

6.13 Wastewater from the drainage catchment would flow from the Portobello pumping station at a works inlet pumping station in an underground tunnel, and would be lifted approximately 30 metres to the preliminary treatment facilities. The inlet pumping station would be 21 metres square in plan and housed in the same building as the preliminary treatment works sludge thickening building, motor control centre and site offices, beneath a green roof with a maximum ridge height of 42.8 metres AOD, and a maximum 16.2 metres above excavated ground level at its eastern end.

Preliminary treatment works

6.14 The preliminary treatment stage involves mechanical screening of the wastewater to remove coarse solids, rags and detritus, followed by a process to remove grit and grease. The screening and grit waste would be cleaned and packed into skips for disposal off-site. These processes are covered and enclosed within a building to capture odorous air for treatment. The preliminary treatment works would be in the optimum position on the site, adjoining the inlet pumping station from where the wastewater enters the works. Grit and grease removal would take place in a hall measuring 45 x 21 metres, and screenings, grit washing and discharge to skips will be accommodated in an adjoining hall measuring 35 x 13 metres. This includes the eight skip bays, which would be sealed with roller-shutter doors. The whole of the preliminary treatment works would be accommodated in the same green roof building described in the previous paragraph.

Primary settlement: lamella separators

6.15 The lamella separators remove 'settleable solids' and any remaining floating material from the wastewater. These would be housed in a large concrete box approximately 36 x 36 metres in plan, sunk partly into the ground, and covered to capture odorous air for treatment. The height of the structure is influenced principally by the desire to achieve flows of wastewater to and from the lamella separators under the influence of gravity.

Secondary biological treatment: biological aerated flooded filters (BAFF)

6.16 The BAFF process provides secondary treatment through a combination of biological treatment and filtration. The process would be housed in a large concrete box measuring approximately 110 x 50 metres, which would be sunk into the ground to enable the flow of wastewater by gravity and fitted with covers to capture odorous air for treatment. The sludge generated by this process is returned to the lamella separators for co-settlement and as a result, no supplementary clarification is required.

Liquid sludge screening

6.17 The settled solids or 'sludge' removed during the primary stage of treatment would be pumped to sludge screens, located within an odour controlled building, which would remove residual detritus. The sludge would then be forwarded to sludge storage tanks.

Sludge storage

6.18 Sludge storage is provided between each of the main processing stages by means of metal-clad cylindrical storage tanks. These tanks typically measure 17 metres in diameter and 12 metres in height, their scale being determined by reference to their predicted sludge throughput and the need for additional storage capacity during maintenance periods or emergencies. Sludge would first be stored in *co-settled sludge tanks* after being produced by the primary settlement stage, and screened. It would then be stored in *thickened sludge tanks* after being thickened. After the digestion process, the solid residues would be stored in *post-digestion degassing tanks*. All of these tanks would be enclosed to capture odorous air for treatment.

Thickening of liquid sludges

6.19 Thickening increases the solids content of the sludge by effectively squeezing water out of it. This process reduces the volume of sludge significantly, helps to reduce the size of subsequent tanks and reduces the amount of heat energy needed for sludge digestion. Thickening is achieved by means of mechanical equipment, housed within a building to contain noise and odour. Sludge thickening would take place in an enclosed space measuring approximately 19 x 44 metres, located at the eastern end of the preliminary treatment works building described above, beneath the green roof.

Sludge digestion

6.20 Anaerobic digestion accelerates the natural processes of decomposition by mixing raw sludge in large closed tanks, heating it to approximately 35°C, and excluding oxygen from the system. This process breaks down organic matter into simpler compounds, producing a stable sludge that ceases to decompose or react further - therefore generating little odour - and which is suitable for disposal to land. Anaerobic digestion also reduces the dry solids content by approximately 30% and generates a methane-rich biogas that would collected and used as a renewable fuel source in the on-site CHP plant.

6.21 Digestion is achieved within three sealed metal cylindrical tanks, approximately 16 metres in diameter and 16 metres in internal depth and topped with an access gantry. The digesters would be located between the preliminary treatment and SRC buildings and set partly into the ground to assist their concealment in external views of the works. With a maximum height of 40 metres AOD, the digesters would be lower than the adjacent green roof, which would have a maximum ridge height of 43.1 metres on the SRC building to the east, 42.8 metres on the preliminary treatment works building to the west and 40.5 metres AOD on the linking green roof canopy between the two buildings, which would screen the digester tanks in views from the south.

The SRC building

6.22 The SRC building would be a fully enclosed structure, housing the sludge dewatering, sludge cake storage, sludge and cess waste import bays and associated vehicular manoeuvring areas, and the odour control plant, each of which is described individually below. This building would ensure that odorous air from the enclosed processes can be captured effectively for treatment.

6.23 A roof structure would link the preliminary treatment and SRC buildings to unify the site layout and provide additional screening of the treatment works infrastructure in the landscape. The large curvaceous grass roof, rising to just over 43m AOD, has been designed to reflect the surrounding downland forms and would cover, contain and screen the taller elements of the SRC and WTW development. The building would be 5,690 square metres in plan. The western elevation, facing into the works site, would be approximately 110 metres in length at ground level.

Sludge dewatering and drying

6.24 Dewatering further reduces the volume of the sludge. This makes it less bulky to handle, and prepares the sludge for the drying process. Dewatering would be achieved by mechanical plant that would be located with the thermal dryer. The water extracted would be returned to the main wastewater treatment stream. Thermal drying removes almost all the moisture from the sludge to produce a final product in the form of a granular pellet, which is easily stored and transported. The pellets would be utilised in agriculture as a soil conditioner.

6.25 The sludge dewatering and drying would take place in an enclosed hall measuring approximately 19 x 31 metres, set within the main SRC building at the eastern end of the works. This location is conveniently close to the digesters from where sludge would be pumped, and the odour control plant in which odorous air from the dewatering and drying processes would be scrubbed. The dried sludge granules would be stored temporarily in a silo outside the SRC building before being bagged for storage.

Reception and blending of imported raw sludge cake

6.26 The proposed treatment works would receive imports of raw sludge cake from the nearby Newhaven wastewater treatment works, which does not have the capacity to digest or dry sludge. This reception facility would be enclosed within the SRC building to facilitate the capture of odorous air for treatment. The proposed SRC building would contain two lorry bays for raw sludge cake import.

Reception and screening of imported liquid sludge and cess

6.27 Cess collected from private septic tanks that are not connected to mains sewerage would be received at the treatment works for screening and treatment within the main process flow. In addition, the facility would exist for liquid sludge to be received during times of operational difficulties at other nearby wastewater treatment works. There would be two import bays for each waste stream, all enclosed within the SRC building to assist the capture of odorous air for treatment.

Odour control

6.28 The odour control system would withdraw air from all parts of the treatment works that potentially generate odour and provide scrubbing to remove odorous compounds prior to discharge to the atmosphere. The odour control plant would be located inside the SRC building. An odour treatment exhaust stack would be located adjacent to the western face of the SRC building. It would have a top height of approximately eight metres above the roofline of the building (approximately 51 metres AOD) and have an external diameter of

approximately 2.5 metres.

Combined heat and power

6.29 A combined heat and power (CHP) plant is proposed to utilise the biogas generated by the digestion process as its fuel. The CHP plant would generate electricity which would either be utilised on site or exported to the local electricity distribution network. Heat would be recovered by heat exchangers and used to heat the digesters. The exhaust gasses from the CHP and standby boiler would be vented to atmosphere via twin walled insulated stainless steel flues. The pair of exhaust flues from the CHP and boiler would be supported by a column independent of the building. The top height of the flues would be approximately three metres above the ridge of the SRC building to a height of 46.1 metres AOD. The CHP building itself would be 31 x 13 metres in plan and seven metres in maximum height. It would thus by appreciably lower than adjacent buildings and landforms, which would thus help to screen the CHP plant in views from outside the treatment works site.

Administration and control

6.30 The administration and control area would form a part of a larger building encompassing the works inlet pumping station, preliminary treatment, BAFF blowers and the sludge thickeners. The administration and control area would include the main control room, data storage, offices, a conference room, and toilets, with a total floor area of 1.320 square metres.

Access road

6.31 The access road would enter the site from the Meridian industrial estate to the south-west, following the contours of the existing dry valley to enter the treatment works site at the south-western corner. This access arrangement is intended both for temporary construction traffic and for operational traffic. Proposed access arrangements are considered in detail in the following chapter.

Architectural and landscape influences on the works layout

6.32 The design evolution section of the previous chapter explains how the objective of fitting the development into the landscape influenced the layout of the works. In the submitted scheme, the SRC building would thus be located at the eastern end of the treatment works so that its mass can conceal external tanks and structures behind. For similar reasons, the preliminary treatment and administration building would stand on the southern side of the site. The relative and absolute height of structures was determined both with reference to the local landscape context and the desire to achieve a cut-fill balance in the management of construction spoil on the site, obviating the need for spoil to be imported to or exported from the site.

APPEARANCE OF THE BUILDINGS

6.33 In the previous planning submission, the principal driver in developing an architectural design for the scheme had been to assimilate the proposal within its landscape and other contexts. To this end the solution was two-fold and combined the careful siting of the works within the natural, dry valley along with a gentle raising of surrounding land, thus ensuring that the works would be substantially concealed in from views from the south, north and west. The standing seam metal cladding proposed on the exterior was used to express the man-made quality of that proposal. A clear visual distinction was thus made between the building and its setting, with the building intended to be seen as an object in the landscape in views from the east.

6.34 In response to the 2007 appeal decision, the appropriateness of this man-made expression in the existing landscape has been reviewed and the new design concept, whilst retaining the positive aspects of the previous scheme, has become a proposal that is well integrated into the landscape. From an architectural perspective, the buildings are thus entirely subsidiary to the landscape.

6.35 In the current proposal the design seeks to revise the concept from that of an object in the landscape to a proposal in which it becomes a part of the landscape. To achieve this, a green roof of natural grass is cantilevered outwards from the face of the building towards the landscape. The outer edge of the roof has also been gently lowered to screen views along the sides of the building and thus to visually link the building and surrounding terrain. This alteration to the form and material of the roof together with the modifications to the landscape contours, ensure that an intimate relationship would be created between the proposal and the landscape, as can be seen from the photomontage views in figure 6.5.

6.36 Great care has been taken in both the design of the roof and the specification of the plants to ensure it achieves a natural appearance in form, colour and texture and will fit well within the adjacent landscape throughout the life of the project. A simple roof edge detailing, combining a gutter and safety fence, adds fine detail to the design when viewed at close quarters.

6.37 Whilst the walls of the main buildings are screened from view by the cantilevered roof, the ribbed metal cladding would be green in colour to blend in with the adjacent landscape. This material would be long-lasting and require only low maintenance.

6.38 The main vent stack would stand approximately eight metres above the crest of the adjacent SRC building. A simple cylindrical form would be retained so that the stack does not become a strong visual feature in its own right, and would be viewed against a backcloth of surrounding landscape and the urban edge of Peacehaven in views from elevated downland to the east and north-east. Two smaller pipe vents, measuring 200 mm in diameter and standing 3.4 metres above the adjacent roof level, would only be a perceptible feature in close-up views of the building.

6.39 In summary, whilst the new proposal retains the positive aspects of the previous project, it would be well integrated into its landscape setting and indeed, seen as contiguous with the landscape in most views.

LANDSCAPE DESIGN

6.40 The landscape proposals for the land around the wastewater treatment works are shown in figure 6.6 (indicative planting plan) and figure 6.7 (indicative landscape details), and would be integral to the overall proposals for the site.

6.41 The wastewater treatment works and access route would be set into the base of a dry valley feature to take advantage of the natural landform of the location. Local references for the landscape design include the existing downland, the topography, the grassland and native scrub vegetation.

6.42 The wastewater treatment works would be contained in views to the north and west by reducing the ground level on which the treatment works would stand to approximately 23 metres AOD, and by new landscape mounding rising to approximately 44.5 metres AOD. Additional earth shaping would be used to the north and north-west to blend the proposed development into the wider rolling chalk downland setting and to screen the works in more distant views from the north east. This land would be returned to agriculture following a period of aftercare.

6.43 To the east, views of the SRC building would be contained behind a newly formed mound of up to 36.5 metres AOD, reflecting the guidance contained in the 2007 planning inquiry decision. The mound would be planted with areas of scrub planting, planted to appear as naturally-occurring downland vegetation. This planting would provide an additional level of screening and would reflect the character of Bollen's Bush, which overlooks the site to the east. To the south, the treatment works would be contained by a combination of mounding up to 40 metres AOD, complemented with areas of scrub planting.

6.44 These landscape works have been designed to contain and harmonise with the treatment works building design, described in the preceding section.

6.45 The access road into the site would reach the treatment works through interlocking landforms to the west of the works, which would provide screening for views along the lane from the edge of Peacehaven. The access road design would be sensitive to its setting, with no lighting and with minimal use of lines and signs.

6.46 Bridleway no.7a crosses the proposed development area from north to south. During operation, a permanent diversion of this route would be provided to the west of its existing alignment in order to avoid the treatment works. Where this meets the treatment works access road, a Pegasus crossing, essentially comprising a fenced area to promote the safe interaction of equestrian and vehicular traffic, would be provided.

6.47 The embankments and mounding immediately around the treatment works would be established as a chalk grassland and would be defined by a timber post and wire fence, inside of which there would be no public access.

6.48 Native tree and shrub planting would form large areas of dense scrub, woodland copses and hedgerows typical of the local landscape character. Planting zones have been designed to screen the development in certain views,

maintain opportunities to view the wider downland landscape and to soften the appearance of existing and proposed residential development on the edge of Peacehaven in views from the downs to the north.

6.49 A further objective of this planting strategy is to enhance the size and biodiversity of wildlife habitats on the site, which are currently restricted by arable farming and urban fringe activities such as dog-walking. It is thus proposed that the existing vegetated area around the balancing pond and reservoir features to the south of the treatment works would be maintained within the outer works fence to limit access, and extended considerably in area through complementary tree planting. As noted, the adjacent green roof of the main treatment works buildings would offer complementary biodiversity benefits, providing a secure grassland habitat for ground-nesting birds, free from pets and natural ground-based predators. Downland plant species will also be encouraged through appropriate specification of the seed mix for new planted areas.

6.50 Amenity grassland would be established on land to the south and south-west of the works, beyond the outer site fence. A new surfaced footway/cycleway would provide access from east to west across this space, linking the residential communities with the local education and recreation facilities on the northern edge of Peacehaven.

6.51 A plateau of level and partially raised land would be formed to the south of the treatment works and its access road. This would provide a level surface suitable for the future provision of public sports pitches by others, in keeping with the intentions of policy PT16 of the Lewes District Local Plan.

6.52 All of the landscape earthworks proposed at the Peacehaven treatment works site have been modelled to ensure that a 'cut-fill' balance is retained, thus obviating the need to import spoil or transport it off-site for disposal. The cut-fill balance takes into account the spoil brought to the surface at the site from associated tunnelling works.

6.53 The perimeter of the main buildings would require lighting with low intensity, low level light sources. Lighting would be of the full cut-off flat glass downlighter type to provide control of the light sources. Lighting along the sides of the main buildings will be located on the underneath of the overhanging roof canopy, to further reduce their prominence. Specific task based lighting would be down focussed and located at strategic points outside of buildings.

SUSTAINABLE DEVELOPMENT CONSIDERATIONS

6.54 The sustainable development approach for the proposed wastewater treatment works embraces several distinct facets, which will be described under the following headings.

i). Intrinsic value of the project
ii). Sustainable design and construction
iii). Renewable energy and energy efficiency
iv). Transport
v). Biodiversity

i). Intrinsic value of the project

6.55 The core purpose of the project is to end the disposal of preliminary-treated wastewater to the sea off Peacehaven, and thus to ensure a cleaner marine and coastal environment. The sewage sludge that results from this enhanced standard of wastewater treatment will be beneficially recycled in a manner consistent with the waste hierarchy. These are inherent sustainable development benefits.

ii). Sustainable design and construction

6.56 The green roof proposed for the main treatment works buildings will offer several sustainability benefits associated with biodiversity, site drainage, thermal insulation and sympathetic landscape integration.

6.57 As noted earlier in this chapter, of the landscape earthworks proposed at the Peacehaven treatment works site have a 'cut-fill' balance, thus obviating the need to import spoil or transport it off-site for disposal.

iii) Renewable energy and energy efficiency

6.58 The proposed sludge recycling centre includes a combined heat and power plant to produce power and heat from the methane-rich biogas liberated during the sludge digestion process. The CHP engine would have an electricity generating capacity of c. 1 MW and would utilise all the biogas produced by the digesters. The low voltage electrical output would be stepped up to high voltage and fed into the high voltage circuit feeding the treatment works site. This would allow any excess electricity to be exported from the site to the local electricity distribution network. Waste heat from the CHP would be captured and used in the digesters.

6.59 The likely energy consumption and generation within the planning application design has been assessed and is presented in table 6.1 overleaf. The table indicates that 26% of the treatment works' power requirements can be met on-site by the CHP plant. The data provided in the table do not include the additional heat produced by the CHP engine, which would be utilised in the digesters.

6.60 Throughout the treatment works, the layout and design of processes and the specification of pumps and other machinery has taken account of the desire to achieve energy efficiency and, where possible, to facilitate the flow of wastewater through the works under the influence of gravity.

Table 6.1: anticipated power demand for the treatment works and the Portobello pumping station

	Power demand (kWh/day)
Electrical power demand	
Portobello pumping station	4,305
WTW & SRC (including inlet pumping station)	70,083
Natural Gas Demand	
WTW & SRC (dryer)	38,320
Total Power Demand	**112,707**
Electricity generated by CHP	**28,680**
Proportion of energy provided by CHP (WTW & SRC only)	26%
Proportion of energy provided by CHP (Whole planning application)	25%

iv). Transport

6.61 Wastewater will be brought to the treatment works from across the drainage catchment by sewerage acting were possible under the influence of gravity. Cess deliveries will be made by tanker, but this is the only practical arrangement available. At present, local cess has to be transported by road over considerable distances to cess reception centres elsewhere in East Sussex. By providing a local treatment centre for cess waste, road transport requirements thus would be reduced.

6.62 As explained in the following chapter, the treatment works site is a short walk from local public transport services. The works administration building will incorporate shower and changing facilities for staff wishing to cycle to work, and there will also be secure cycle parking.

v). Biodiversity

6.63 As noted, the proposed landscape scheme will promote biodiversity by providing new and enlarged areas of wildlife habitat. The proposed green roof will promote biodiversity by providing a secure habitat for ground-nesting birds. Downland plant species will also be encouraged in the planting specification.

SAFETY AND SECURITY

6.64 Consideration of safety has been integral to development of the engineering design for planning as is required by UK legislation. Critically it was recognised from the start of the project that the sludge digestion process could not be enclosed due to the risk of biogas release. On this basis the digesters, post-digestion de-gassing tanks, gas holder and excess gas burner are all located outside of building enclosures and incorporate an emergency gas release system to prevent any potentially explosive build up of pressure.

6.65 The treatment works site generally incorporates two-way roads to reduce

potential for traffic incidents. Delivery vehicles will pass through the SRC building in a one way system, with delivery bays located away from the main route through the building to reduce conflict between moving vehicles, stationary vehicles and pedestrians. The site roads will provide appropriate access for emergency services.

6.66 Emergency egress from buildings on the site has been considered and assessed against current construction industry guidance. Emergency exit points have been provided to the rear of the SRC building to allow pedestrians to exit the vehicle bay and safely move to other parts of the site.

6.67 A large green roof is proposed over the main buildings to integrate the structure into the local landscape. The roof covers both the administration and preliminary treatment building and the SRC building with a bridge link between the two. The size of the roof is approximately 17,000 m^2. It is anticipated that the roof would require regular maintenance with the grass being cut between once and twice a year to ensure continued biodiversity of the planted grassland. On this basis the safety of maintenance staff on the roof must be secured as part of the roof design. Due to the regularity of roof maintenance it is considered that permanent hand railings are required around the roof edge to provide collective protection to workers. This feature has been incorporated in the design.

6.68 A 2.4 metre high palisade fence will define the perimeter of the operational WTW treatment works site. An automatic sliding gate operated by a swipe card, PIN system and intercom will be provided at the entrance to the secure area. CCTV will operate on the gate and secure site perimeter and infra-red sensitive CCTV surveillance with movement-sensitive activation will operate within the treatment works site. A post and wire fence will be provided outside the secure site to delineate the extent of land that will remain in Southern Water's ownership. There will be card-operated barriers at the post and wire fence boundary, as well as the Bolney Avenue junction with the access road, to prevent unauthorised vehicular access.

6.69 There are other safety considerations that affect the construction and operation of a treatment works, including but not limited to working with wastewater, working at height and working with electrical and mechanical equipment. These have been considered in the design submitted for planning permission and will continue to form an integral part of the detailed engineering design process.