



SILVERTOWN TUNNEL

DOCUMENT TITLE:

Site Waste Management Plan

DOCUMENT NUMBER:

ST150030-RLC-ZZZ-XX-ZX-PLN-EN-0009

Asite Task ID: STT-DCO-0ZZ.12.1.44

PURPOSE OF ISSUE	For Acceptance	DOCUMENT SUITABILITY	S3 - For Review & Comment	TOTAL PAGES (Including this page)	17
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Prepared by	Checked by	Approved by	Date	Revision
[REDACTED]			10/02/2020	P01

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ST150030-RLC-ZZZ-XX-ZX-PLN-EN-0009

Revision P01

10/02/2020

Issue and Revision Control

Distribution and revision control is managed through the Electronic Document Management System – ASITE, with the latest revision displayed.

Document uncontrolled when printed.

Revision History			
Rev No	Date	Summary of Changes	Section & Number
P01	10/02/2020	First Issue	

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1. Overview

1.1 Introduction

The Silvertown Tunnel (STT) scheme involves the construction of a twin bore road tunnel providing a new connection between the A102 Blackwall Tunnel Approach on the Greenwich Peninsula (Royal Borough of Greenwich) and the Tidal Basin roundabout junction on the A1020 Lower Lea Crossing / Silvertown Way (London Borough of Newham). The project was formally granted planning permission through a Development Consent Order (DCO) issued by the Department of Transport in May 2018. STT will be approximately 1.4km long and able to accommodate large vehicles including double-decker buses. It will include a dedicated bus, coach and goods vehicle lane, enabling TfL to provide additional cross-river bus routes. The scheme also includes the introduction of free-flow user charging on both the Blackwall Tunnel (northern portal located in London Borough of Tower Hamlets) and the new Silvertown Tunnel.

Transport for London (TfL) have entered into a Project Agreement with the Project Company Riverlinx (Project Co) who are responsible for the detailed design, construction, financing and maintenance of the tunnel and supporting infrastructure. A 5 year period of design and construction will be followed by a further 25 years of operation and maintenance. The Project Co has appointed Riverlinx CJV as the Design and Construction (D&C) Contractor responsible for undertaking the detailed design and construction of the STT scheme all in accordance with the constraints and parameters of the Development Consent Order (DCO), TfL specifications and other commitments made by TfL to stakeholders. Riverlinx CJV is a joint venture formed between Ferrovial Agroman (UK) Ltd, BAM Nuttall and SK Engineering and Construction Co Ltd.

1.2 Purpose

The purpose of the Site Waste Management Plan (SWMP) is to detail how Riverlinx CJV will implement waste minimisation measures to each phase of the project, comply with all relevant waste legislation and promote strong performance in waste reuse and recycling. It will seek to promote good waste management practices on site. It will act as tool to establish estimates of how much waste is anticipated to be generated during the construction phase (covering construction, demolition and excavation (CD&E) waste) and provide an initial indication as to whether materials and waste streams have the potential to be reused, recycled, recovered or disposed of based on information available at this stage. The SWMP will be a live document that will be updated throughout the construction phase. The Waste and Resource Action Programme (WRAP) SWMP template will be utilised to record the following details:

- Record the Contractor's responsible personnel, where known, who will be involved in the project;
- Forecast waste that is anticipated to be produced during the project, recorded using the appropriate European List of Waste (ELoW) code and waste description;
- Supply details on waste minimisation actions, by both TfL and the Contractor; and
- Contain a register of waste carriers and their waste carrier registration number and details of the site the waste and/or material will be taken to.

Riverlinx CJV shall take all reasonable steps to ensure that:

- All waste from the site will be dealt with in accordance with the waste Duty of Care as set out in Section 34 of the Environmental Protection Act 19901 (as amended) and the Waste (England and Wales) Regulations 20112
- Emphasis is put on the waste hierarchy to ensure that waste is dealt with in the priority order of: prevention; preparing for re-use; recycling; other recovery (for example, energy recovery); disposal as per the Waste Regulations 20112; and
- Materials will be handled efficiently and waste managed appropriately.

1.3 Project Details

Figure 1 below shows the STT route, general layout, and construction typologies. The tunnel will cause changes to the existing road network on both sides of the River Thames. On the south side of the river, the following changes to the A102 Blackwall Tunnel approach will be needed; widening the A102 Blackwell Tunnel approach to create space for STT approach lanes, building a new flyover for the southbound traffic from the Blackwall Tunnel to cross above the Silvertown Tunnel approach lanes and introducing new signage to direct traffic. On the north side of the river, the following changes will occur; modification of the existing Tidal Basin Roundabout to connect the STT approach roads with Dock Road, realigning the Dock Road so that it links with the modified roundabout and introducing new pedestrian and cycle facilities within the modified roundabout.



Figure 1

2. Planning

2.1 Code of Construction Practice Requirements

The Code of Construction Practice (CoCP) requires Riverlinx CJV to update the SWMP that was produced during for the Development Consent Order (DCO) process as the design and construction progresses. All waste will be managed in accordance with the plan and all relevant waste legislation. The SWMP will be complemented by the Construction Materials Management Plan (CMMP) in establishing the protocols for minimising waste generation and maximising reuse and recycling. The CoCP describes several waste management measures that Riverlinx CJV will implement including;

- Appointing a Waste Manager or Champion to oversee the implementation of the waste control strategy, registry of the project/site for any applicable exemptions, permits or licences and the handling of any waste material, as set out in the SWMP.
- Consider setting off-cut/surplus targets for subcontractors with a positive incentive scheme for on-site waste champions.
- Establishing a waste management compound to handle waste designed to facilitate the segregation of key waste streams to maximise the opportunity to re-use, recycle and return wastes generated on site.
- Carefully storing and segregating excavated materials, such as soils, for subsequent reuse on the site, where possible. If the material is contaminated then it will be kept separate from clean material and sent for either treatment, recycling or recovery, where appropriate, or disposal at appropriately permitted facilities.
- Diversion of all vegetation waste from landfill, unless identified as an invasive species and no other options are available.
- Creating a specific area within the waste management compound to facilitate the separation of materials, where possible, for potential recycling, salvage, reuse and return.
- Keeping recycling and waste bins/skips clean and clearly marked/colour coded in order to avoid contamination of materials.
- Provide shelter to prevent materials such as cardboard and paper from deteriorating while being sorted or awaiting collection.
- Identifying whether waste exemptions or permits are required to enable for the storage and treatment of waste materials.
- Identification of appropriately permitted waste management and recycling facilities in close proximity to the site compound.

The CoCP describes how a Receptor Site Assessment (RSA) was developed to provide a transparent process and methodology for the evaluation of worksites that may receive excavated material, including material dredged from the River Thames to facilitate the construction and operation of the temporary jetty and NAABSA at the Silvertown site (if required). The final output from the RSA will be a preferred list of receptor sites as well as a reserve list and their scores against each of the assessment criteria. The assessment criteria consider environmental impacts, the operation of the facilities, the proximity principle, and the impact on the local area. Riverlinx CJV will be required to select receptor sites from the preferred list or reserve list of sites or to follow the RSA methodology to identify alternative sites. Some of the materials generated by excavation activities will be contaminated or hazardous. Riverlinx CJV will comply with all relevant legislation relating to protection of employees and others who may be affected from health risks within working environments, including COSHH regulations. The risk from release of asbestos during alteration, demolition and excavation works will be managed in accordance with The Control of Asbestos Regulations 2012 and associated codes of practice and guidance.

2.2 Environmental Statement

A sustainable design review workshop was held with TfL on 18 June 2015. The feasibility of setting up targets relevant to material resources and waste were discussed at the workshop and explored further during the PEIR consultation. Following consultation, the targets and commitments below were established;

- 50% of all CD&E materials and wastes by weight to be transported by river
- 100% of all suitable excavated material be transported by river
- diversion of 80% (by weight) of CD&E materials to schemes where the material can be used for beneficial use
- where specification allows, a portion of construction materials to include a reused and recycled content 10% recycled content (by value) in construction materials;
- use of primary aggregates will be minimised by the selection of secondary materials, where possible;
- materials specified will have low embodied carbon; and
- a score of Very Good and ideally Excellent using CEEQUAL, adherence to materials and waste elements.

The ES anticipated that the Scheme will produce an estimated total of 1,175,000 tonnes of CD&E waste, 890,800 tonnes of which will be classed as inert/non-hazardous soils and stones or non-hazardous dredgings. 195,000 tonnes of contaminated soils (hazardous waste) will be produced. The capacity of waste management infrastructure within the Greater London is estimated to be 77,732,000 tonnes (over the four year construction period 2019-2022). A worst-case scenario would be all CD&E waste generated by the Scheme being sent for recycling or for disposal. In this scenario, the waste generated would be equal to 1.5% of the current baseline capacity. The capacity of the waste management infrastructure within the study area for all waste arising is deemed adequate and this receptor is assessed as having low sensitivity. As the majority of waste generated will be predominantly segregated and sent for beneficial reuse or off-site treatment, the magnitude of the impact was assessed to be Minor Adverse. The significance of the effect was assessed to be Slight Adverse. The existing highways network and river have a high capacity to accommodate the increases in lorry and barge/ship movements associated with the transport of materials and waste, and as such have been assessed to have a low sensitivity. The magnitude of the impact on the highways network and river was assessed to be Minor Adverse due to the available capacity therefore the significance of effect was assessed to be Slight Adverse.

2.3 Legislation

Riverlinx CJV will comply with the requirements defined with the following;

- Clean Neighbourhoods and Environment Act 2005
- Environment Act 1995
- Environmental Civil Sanctions (England) Order 2010
- Environmental Protection Act 1990
- Environmental Protection (Duty of Care) Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- List of Wastes (England) Regulations 2005
- Packaging (Essential Requirements) Regulations 2003
- Producer Responsibility Obligations (Packaging Waste) Regulations 2007
- Site Waste Management Plans Regulations 2008
- Waste Batteries and Accumulators Regulations 2009
- Waste Electrical and Electronic Equipment Regulations 2006
- Waste Management (England and Wales) Regulations 2006
- Trade Effluent (Prescribed Processes and Substances) Regulations 1989
- Environmental Permitting (England and Wales) Regulations 2010
- Control of Pollution (Applications, Appeals and Registers) Regulations 1996
- Development Consent Order (DCO)
- Code of Construction Practice (CoCP)

- Appendix C. CD&E Materials Commitments
- Appendix D. Receptor Site Assessment
- Appendix E. Site Waste Management Plan

2.4 Roles and Responsibilities

Riverlinx CJV will provide the appropriate resources to deliver the requirements of this plan and ensure that the requirements are communicated and acted upon. Table 1 provides details of the personnel working on the project with specific responsibilities in relation to waste management.

Role Title	Responsibilities
Project Director	<ul style="list-style-type: none"> • Provide adequate environmental resources and support to effectively deliver the requirements of this plan
Environmental Manager	<ul style="list-style-type: none"> • Develop and implement the SWMP • Identify and maintain compliance with the requirements and principles of the SWMP during construction • Assist lead auditors in auditing the SWMP • Identify, develop and provide environmental training as required specific to the SWMP • Approve method statements and consider SWMP requirements • Advise and instruct construction teams in the event of incidents and complaints • Liaise/meet with external stakeholders
Environmental Advisors	<ul style="list-style-type: none"> • Inspections on compliance with the SWMP requirements including Duty of Care checks • Brief SWMP requirements to relevant teams • Advise and guide project team in the implementation of waste management practices • Identify ideas for improvement to environmental manager for consideration. • Report best practice across the project • Assist in incident investigations and reporting • Encourage near miss reporting and identify trends
Waste Manager / Waste Champion	<ul style="list-style-type: none"> • Provide technical support on waste management issues • Establish effective reporting and monitoring regime • Lead on the control and management of waste generated on site • Assist in the investigation of any complaints or incidents as required
Project Manager	<ul style="list-style-type: none"> • Ensure the requirements of the SWMP are implemented on site • Ensure the requirements of the SWMP are integrated into all aspects of the construction works and detailed in method statements. • Ensure compliance with all waste management related procedures. • Manage the investigation and response to complaints.
Community Construction Liaison Manager	<ul style="list-style-type: none"> • Liaise with the local community regarding any complaint or query. • Notify the Section Manager and environmental team of any complaints regarding waste management. • Manage investigations into the complaints and provide the main point of contact with the helpline.
All Personnel	<ul style="list-style-type: none"> • Carry out the works in accordance with agreed methods and briefings. • Report anything that deviates from agreed processes. • Report all waste management incidents and examples of best practice to section managers • Attend environmental training.

Table 1 CJV SWMP Roles and Responsibilities

2.5 Training and Awareness

The Riverlinx CJV Environmental Team will provide training to staff and operatives at all levels (and, when appropriate, to others involved in or affected by work activities) to achieve and maintain a high standard of environmental awareness and risk control. Riverlinx CJV will work collaboratively to develop the SWMP and embed the requirements for effective waste management into working practices. The established practices will be briefed to all those who work for or on behalf of Riverlinx CJV in order to best achieve compliance with the plan including the performance-based elements. Environmental information on waste management will be displayed in offices and site cabins to increase awareness of specific waste management matters. Such information will include details on the segregation of waste streams into colour coded receptacles on site, guidance on duty of care compliance and responsibilities in terms of hazardous waste handling and management. All those working for RiverlinxCJV or on behalf of Riverlinx CJV shall undertake an induction that includes an introduction to the key aspects of environmental management on the project including information on the SWMP. In addition, all Riverlinx CJV personnel will undertake the bespoke Environmental Awareness training session that will introduce personnel to how to manage site environment risks relevant to STT and provide practical guidance for specific topics including waste management. The Environmental Team, the Waste Champion and the Riverlinx CJV construction team will deliver waste management themed toolbox talks to site and office teams making use of best practice materials from parent companies and organisations such as CIRIA.

2.6 Communication

The Riverlinx CJV Environmental Manager, Consents Manager and members of the Environmental Team will meet regulators as required to discuss any waste management matters. Riverlinx CJV will consult relevant regulators before making formal applications for licences, consents and permits, to ensure all comments from the regulators can be addressed and incorporated as necessary. Meetings and consultations with other interested parties will be arranged as necessary. The Riverlinx CJV Community Relations representative will maintain dialogue with local communities and associations by various means including the Helpdesk. Should waste management issues arise due to construction activities, Riverlinx CJV will report details to relevant authorities. The Riverlinx CJV Environmental Manager will participate in monthly Environmental Review Meetings with Project Co and TfL counterparts to review progress during construction including compliance against the SWMP.

3. Waste Management Strategy

3.1 Overview

Riverlinx CJV will adopt a waste management strategy for STT that will follow the accepted waste hierarchy, in Figure 2 below, which is taken from the Waste Framework Directive (2008/98/EC). This shows the priority that must be applied when making decisions on reuse, recycling, recovery or disposal of each type of waste generated during the construction phase.

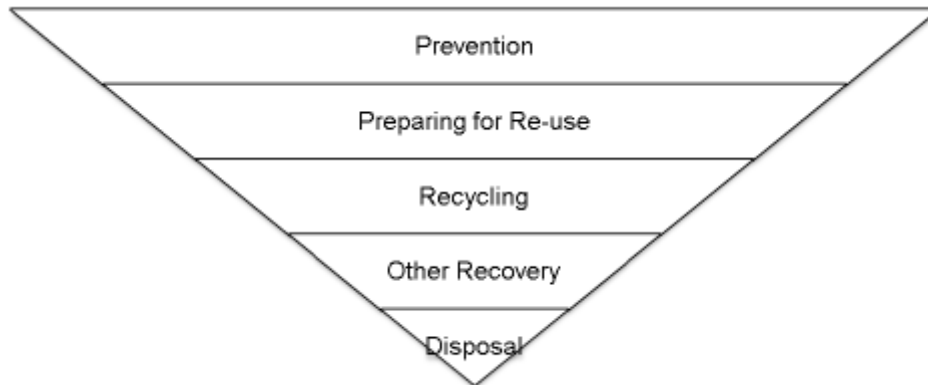


Figure 2 Waste Hierarchy

Riverlinx CJV through the design and construction of STT will encourage all parties to minimise the amount of waste produced at the work sites. All waste arisings shall be considered in terms of their suitability for the following;

- Reuse on site: as part of the works
- Reuse off site: materials of reusable value but for which there is not a demonstrable need on site
- Recycling off site: where materials are suitable for recycling/treatment at a permitted facility.

The SWMP will help to ensure best practice and sustainable waste management is considered throughout. The SWMP will be updated as the design of the scheme develops and include where waste prevention or minimisation principles have been considered and implemented where possible. Riverlinx CJV seek to achieve diversion of 80% (by weight) of Construction, Demolition and Excavation (CDE) materials to be re-used on site or removed from site for beneficial use with an aspiration to reach 95% (by weight), through successful implementing the measures covered below. The SWMP WRAP Excel template is a live working document that requires the relevant sections to be completed at different stages throughout the development of the Scheme. Final completion of the spreadsheet will not happen until the construction phase has finished. Therefore, at any point during the construction phase, sections of the spreadsheet will be incomplete, pending completion. Riverlinx CJV will take ownership of, and update the SWMP document, completing the various sections until it has reached the point of being finalised and signed off at the point of the overall completion. The SWMP will identify the types and quantities of waste that are produced throughout the construction phase and will identify management options for each type of waste, paying attention to the waste hierarchy. It shall also state stringent requirements for the control and disposal of hazardous wastes. The adoption of the SWMP will help to ensure the Scheme fulfils its legal obligations towards waste management and Duty of Care. The SWMP shall be communicated to employees and subcontractors. Riverlinx CJV shall adopt an extended Duty of Care i.e. ensuring that subcontractors and facility operators with a good and proven record of environmental performance and compliance are appointed to treat and/or receive materials from the site. Appropriately experienced staff, familiar with working on brownfield sites and with the contaminant groups anticipated will supervise the excavation works to manage the segregation of spoil materials.

3.2 Types of Waste

Construction and demolition wastes will largely consist of inert material; concrete (structural and pavement), bricks and glass. Construction waste figures were estimated in the CoCP SWMP. These approximate figures have been generated by calculating the percentage of imported material that will become a waste. These are calculated by using the WRAP industry standard wastage rates for imported material. The CoCP SWMP does not account for workforce waste streams e.g. Waste Electrical and Electronic Equipment (WEEE) and organic waste. Once details of workforce are known such waste streams will be incorporated into the SWMP. Demolition waste figures were also included within the CoCP SWMP. Demolition figures were calculated based on the assumption that all materials generated as a result of the demolition works will be waste. Demolition works are anticipated to consist of the removal of above ground buildings and structures.

Excavated materials will be generated through tunnel excavation, the construction of portal launch chamber and surrounding highways. In relation to materials removed from site it is anticipated the majority of the material would be excavated material, for which beneficial uses would be sought. The bored tunnel section is likely to be constructed using a segmental concrete lining, excavated through the use of a TBM, which will form the structural (or primary) lining. The type of TBM is envisaged to be a closed face earth pressure balance configuration. This machine works to balance the pressure of the excavation by controlling the rate of material excavation as opposed to the use of pressurised slurry. The condition of the excavated material will vary however it is anticipated that this method will not result in the production of slurry. Final TBM selection will be determined by the contractor based on the assessment of the construction risk with consideration for tunnel alignment depth, associated ground pressure, ground cover, anticipated geology and depth of the water table. The envisaged design has therefore ensured that sufficient temporary land is available for a slurry separation plant if this option is chosen. Due to the size of the tunnel bores the anticipated excavated spoil at any one time is likely to consist of more than one type of material (i.e. different strata). If the water content of the excavated material is considered too high for transport by barge it may be necessary to dry it out prior to transportation. The TBM will be maintained underground and by-products of this process will typically be oils and greases and will therefore require subsequent classification for inclusion within the SWMP.

Given the nature of the works and site history there is the potential for excavation works to give rise to potentially contaminated material that will require remediation and/or appropriate disposal. Site wide remediation was undertaken at Greenwich during the late 1990s. It is understood that notable sources of contamination, such as tar tanks and known contamination hot spots were removed, groundwater remediation was undertaken and near surface soils were removed or cleaned prior to landscaping. However, it is understood that contaminated materials remain at depth beneath much of the site. Allowance has been made in the forecasted waste for the removal of contaminated material that may be encountered. Hazardous waste including any contaminated excavated spoil will be kept separate and secure in receptacles in line with the Waste (England) Regulations 2012 in order to reduce cross contamination. The waste will then be removed from site and treated in accordance with all applicable legislation. Asbestos based materials may arise during the excavation of the ground for tunnels and portals especially in areas of previously high industrial use and the historic gas works. Asbestos fragments in soil and low levels of loose fibres in soils have been identified within some of the samples taken during the ground investigations. Therefore, waste streams containing asbestos have been estimated within the SWMP. The edge of one of the historic gas work buildings on Greenwich Peninsula is located above the proposed alignment. Therefore, there is the possibility that the foundations or items of infrastructure (including asbestos sheeting) remain underground. No records have been found detailing the demolition works associated with these features. Currently, the full extent of below ground structures (i.e. piles) and their interaction with the proposed tunnel alignment is not fully known.

During demolition and construction activities additional streams of hazardous waste are anticipated, including: oils and grease from equipment maintenance, batteries, waste paint and solvents and fluorescent tubes. Quantities of this waste stream have not been estimated at this stage, once plant set up is established this waste stream should be accounted for. In order for construction to take place, areas of vegetation, comprising mainly of grass and shrubs will require clearance in advance of general excavation works. If Japanese Knotweed, or any other invasive species, is located then special measures will be required to deal with this vegetation (such as classification and disposal of the waste as a 'controlled waste' under the Environmental Protection Act 1990 (c. 43) (as amended in 1996 and 1999). As a minimum all vegetation waste should be diverted from landfill, unless it has been identified

as an invasive species and no other options are available. The greatest opportunity for the sustainable management of vegetation waste is through recycling into compost. Imported materials for the final fit out of the tunnels and associated infrastructure will meet a pre-designed specification, which will have taken into consideration when designing out waste measures. Any WEEE waste generated should be reused or recycled. Where practicable this should be managed through a take-back or other local recycling schemes. A full audit trail should be kept for such WEEE compliant schemes (in accordance with regulations).

3.3 Reduction and Reuse

Riverlinx CJV will develop and implement the SWMP from the earliest part of the design stage after contract award in order to best explore the opportunities to reduce the amount of waste produced as part of the scheme. Riverlinx CJV will seek to maximise opportunities for the potential for reuse and recycling of all waste streams on site. Construction waste, or waste arising from imported material shall be minimised through careful product specification and use. Over-purchasing will be avoided by ensuring materials are ordered for delivery shortly before they are required to more accurate volumes can be ordered and minimise the potential for damage and wastage. Materials will be stored safely and securely to minimise the potential of damage or wastage. Measures will include off-ground storage e.g. on pallets, remaining in original packaging, protection from rain damage or collision by plant or vehicles. The materials storage area will be secured during out of hours to prevent unauthorised access. Riverlinx CJV will review any type of surplus material being generated on site to aid in identifying approaches to reduce the amount produced. Site will be set up to maximise reuse or recycling and minimise disposal to landfill. For any surplus material that may arise on site other options will be explored. These may include reuse on another site or take back options with the manufacturer. The use of precast concrete segments for the tunnel and other components will act to reduce the amount of concrete waste on site.

If applicable, surplus inert excavated materials with some engineering strength (e.g. stone, bricks, clay, rubble, rock) may be suitable for reuse in land reclamation schemes. The material could be reused in other schemes in the surrounding area, if such a scheme was proceeding at the same time, to avoid disposal at landfill and the associated impacts and costs. Such a reuse scheme will be in accordance with all applicable legislation. This will require compliance with the criteria and thresholds for an Environment Agency issued exemption (U1 or U11 may be applicable) or it may require a permit under the Environmental Permitting Regulations 20103 as amended or compliance with CL:AIRE DoW CoP by production of a materials management plan. Although onsite soil reuse options will be used where applicable, it is still likely that there will be a requirement for importation of additional fill materials with specific properties such as structural backfill and topsoil. If any materials, which are deemed acceptable, are produced from the enabling works (e.g. good quality topsoil), this will be stored for later use in the permanent works or if this is not possible it will be sent to a topsoil recycling facility. A major commitment for the project concerns the target of at least 80% of clean, excavated material being beneficially reused. The CMMP will go in to more detail with regard to the Receptor Site Assessment process which will be fundamental to determining where the material can be beneficially reused. For the project beneficial use is an activity that meets one of the following criteria;

- Ecological benefit or land reinstatement/landscaping: The activity will assist in ecological benefit and/or help to facilitate an approved change/alteration in land use or form.
- Works (linked to a consented planning activity or permit) that aims to restore, enhance or be part of a land management scheme i.e. landfill or quarry.
- Reduce the requirement for alternative material (waste or not) to be used for the purposes of any such scheme.

The following waste minimisation measures, in Table 2 below, were included in the CoCP SWMP and will implemented as far as possible and used as a basis for considering other suitable measures;

Table 2 Waste Minimisation Measures

Waste Minimisation Measures	
Excavation	Excavation will be for highways, tunnels and portals and foundations. It is anticipated that any waste produced through the construction of the tunnels will be cut and fill, it is anticipated that a small amount maybe reused elsewhere on site.
	Surplus excavated materials including soils, gravels and man-made fill can potentially generate the largest quantities of all the waste streams that will be removed off site. Preference for disposal should be given to off-site reuse following the waste hierarchy.
	Excavated material suitable for reuse, where appropriate, will be stored for reuse as landscaping material or infilling.
Minimisation of vegetation clearance at the design phase	The small amount of vegetation on site is predominantly grass with some shrubs; clearance of vegetation has the potential to be insignificant due to the nature of the area as former commercial and industrial/gasworks.
	Identify, during the design phase, ways to minimise the loss of vegetation on site. Where minimisation is not possible, composting or mulching the vegetation will be considered for reuse in landscaping within the Scheme.
Minimisation of impacted materials arisings	Where possible impacted material arisings will be treated and reused on site. This can act to minimise potential transport and disposal costs. This approach will be standard practice among designers and contractors.
Contractor targets	The Contractor will consider setting off-cut/surplus targets for sub-contractors with a positive incentive scheme for on-site waste champions.
	On site good practice construction wastage rates for the total amount of construction material handled on site should be achieved.
Imported material	Enabling the purchase of materials in shape/dimension and form that minimises the creation of off-cuts waste. Avoiding over-purchasing as this can lead to significant wastage and will be avoided in the first place. Ensuring materials are ordered for delivery shortly before they are used on the Scheme will also avoid possible damage and therefore wastage.
	Secure storage to prevent damaged materials/theft. Keeping deliveries packaged until they are ready to be used and the inspection of deliveries on arrival helps to reduce damage and wastage.
Use of take back schemes	Some suppliers offer a take back scheme, which will be utilised where practicable, particularly for packaging and pallets.
Monitoring and review	Data from waste removal and the periodic review process (required as part of the SWMP) used to assess whether the waste objectives are being met, and if not to review procedures to steer the Scheme towards achieving them. This will require clear responsibilities to be identified, supported with authority and incentives to act on any deviations from the SWMP.
Education and awareness	Site inductions are to include waste minimisation education and will be mandatory. Regular toolbox talks which all contractors and site workers will be expected to attend will also cover waste management education.
Consideration of end of life materials	Consideration will be given to what will happen to the materials specified when they reach the end of their useful life. Where possible, elements will be designed for repair, modular repair, recycling at the end of life or safe disposal. The use of hazardous materials will be minimised.

Table 2 Waste Minimisation Measures

3.4 Segregation of Non-excavation Waste

Riverlinx CJV will ensure space within compounds is made available for the segregation and storage of non-excavated waste to help promote recycling or reuse where applicable. A specific area will be laid out and labelled to facilitate the segregation of materials, where possible, for potential recycling, reuse and return. Enclosed and lockable skips prevent deterioration of waste and also stops unauthorised access to the skips. Recycling and waste receptacles (e.g. skips) will be kept clean and clearly marked in order to avoid contamination of materials. Different coloured skips or clear signage will be used to ensure that construction workers are clear about where to put each type of waste in order to reduce the levels of contamination in the skips and increase the likelihood that a load will not subsequently be rejected once the waste stream has been sent off-site for reprocessing. Skips will be monitored to ensure that contamination of segregated skips does not occur. The following waste streams are currently identified for segregation:

- Plastics;
- Mixed inert (e.g. concrete and rubble);
- Hazardous (e.g. asbestos, polychlorinated biphenyls);
- Mixed non-hazardous (welfare waste and general waste);
- Metal (e.g. copper and iron);
- Wood (e.g. fencing/hoarding);
- Food (canteen waste);
- Paper and cardboard (office waste);
- WEEE (e.g. cables, disused electrical appliances and equipment); and
- Oils and oily rags.

For all waste management options within the order limits, consideration will be given to identifying whether waste exemptions or permits are required to enable the storage and treatment of waste materials. Waste management options will be supported by the identification of appropriately permitted waste management and recycling facilities within an acceptable proximity to the site.

3.5 Contaminated Land and Hazardous Waste

Soils will be placed in clearly identified stockpiles and chemical testing undertaken to confirm the potential for reuse on site, or, if considered inappropriate for reuse (due to geotechnical or chemical properties or being surplus), to inform off site treatment and/or disposal routes. Where soil materials meet the geotechnical and chemical criteria for reuse given the proposed end use scenario, such materials may be reused on site, if required. Any surplus materials will be removed from site for either direct beneficial use elsewhere (such as land remediation schemes) or for recycling or recovery at an appropriately permitted off-site facility. Where excavated materials are affected by contamination, such materials will be separated and sent for either treatment, where appropriate, or disposal at appropriately permitted facilities. Riverlinx CJV will look to identify areas of contamination early on so that the layout and construction methods can be amended to minimise the handling of such materials, potentially reducing costs. Any soils removed from site during construction will be subject to appropriate chemical characterisation and Waste Acceptance Criteria (WAC) testing to determine their destination facility i.e. type of landfill etc. Hazardous waste cannot be re-used on site nor can it be mixed with non-hazardous or inert waste. There is a statutory requirement under the Landfill Directive to pre-treat any waste (including hazardous waste) at the point of origin or at an alternative suitable site prior to disposal. Pre-treatment may reduce the cost of disposal by rendering the waste non-hazardous. Where potentially hazardous materials are encountered, appropriate mitigation measures will be employed on site. The following measures shall be used as applicable;

- Prepare a 'quarantine' receiver location with a bunded perimeter to a suitable size compared to the assumed quantity of materials (a maximum height to be agreed);
- The storage area will have an impermeable base to prevent leachate escape to groundwater and will be protected against flood damage or inundation with any accumulated rainwater regularly emptied and managed appropriately. The area will be regularly checked and kept in a good condition, as well as being protected from vandalism;

- Appropriate spill kits will be available, located near to the hazardous waste storage area and checks carried out regularly to ensure they are adequately stocked.

Once appropriate analysis has been completed, treatment and/or disposal of materials/waste can be carried out. Where this waste needs to be removed from site, a suitable disposal facility will be sourced. Suitable facilities will be assessed as part of the RSA process. The suitable facility must have the relevant licenses and permissions to receive the waste. Completed waste transfer notes (or consignment notes for hazardous waste) detailing the relevant waste codes must be raised and the waste moved from site with a licensed waste carrier. Wastes shall be moved under the requirements of the Duty of Care. Responsibility for the basic characterisation of waste rests with the producer. When hazardous waste is generated all efforts will be made to ensure it is not stored on site for any longer than is necessary. It is likely asbestos will be encountered during the works. Riverlinx CJV will employ experienced and competent contractors to carry out the works and will develop a robust procedure for the management of asbestos from identification through to disposal. Suspect materials exposed will require sampling and analysis by an independent specialist consultant and pre-construction, historical information will be key to helping to avoid disturbing asbestos in areas outside of the permanent works. Subcontractors method statements for any works in the vicinity of asbestos-containing materials will be reviewed to ensure a best practice measures have been integrated in to it.

3.6 Disposal and Treatment Options

It is anticipated that the majority of excavated material from the works will be taken as “natural” material, the volume of which exceeds that for reuse on site. This material will therefore be transported to a suitable location such as a remediation scheme or another scheme. For excavated materials, suitable treatment, recycling and disposal facilities within a reasonable proximity of the Silvertown Tunnel site will be identified by using the RSA. The RSA uses pre-determined criteria to assess the suitability of receptor sites to receive and treat the excavated materials. Sites which are closer will score higher than those which are further away. For construction and demolition waste, suitable treatment, recycling and disposal facilities within a reasonable proximity of the Silvertown Tunnel site will be identified. The Landfill Directive requires that disposal sites are classified into one of three categories dependent on the chemical composition of the material; these are hazardous, non-hazardous or inert. The ability for waste to be deposited at these sites will be dependent on the available space and the conditions imposed on the sites through the relevant licence/permit. Such facility details have been assessed as part of the RSA process. For excavated materials that are confirmed to be non-hazardous or inert, by chemical screening and are below hazardous waste thresholds, there are a number of reuse and recycling options that could be explored, both on and off site. The excavated materials (excluding hazardous materials) could potentially be used as infill, bunding and/or landscaping. Further uses could include the construction or maintenance of pavements, footings for fencing etc. Materials produced could also be used in the laying of roads around the site or stored for later use, providing there are adequate storage areas and the materials are adequately managed to minimise dust and runoff. The use of these materials would need to be undertaken under the relevant regulatory controls and appropriate guidance. For any vegetation removed consideration will be given to mulching and/or composting. Reuse of such materials will be considered where possible i.e. mulch or compost to be reused for landscaping purposes.

3.7 Waste Forecast and Actuals

For the SWMP produced as part of the CoCP forecasts were made for CD&E waste from both the temporary and permanent works. The waste forecast tables set out the current estimates of waste types and quantities that are anticipated. CJV will review the list and add additional waste streams when they occur. The detail provides important information such as identifying the waste activity (either C,D or E), the waste stream, the material classification, the ELoW code, quantity and the management methods. Demolition waste and excavation materials quantities were calculated as a whole for an activity, i.e. assuming all of the material is classified as a waste and generally based on estimated volumes. Construction waste quantities were calculated using WRAP and industry standard wastage rates. The rates assume a certain percentage of the imported material will become a waste. CJV will record actual waste movements during construction, which will feed into the key performance indicators (KPIs)

tab to aid in monitoring performance. Information captured will include waste activity, ELoW code, method of management and where required the off-site carrier and destination and waste totals (amongst others). Maintaining these records will also help to identify which waste streams are not achieving anticipated recycling potentials so that alternative methods to handle that waste stream can be explored for the remainder of the Scheme.

3.8 SWMP Development

The SWMP will be reviewed on a regular basis, with waste data being entered frequently i.e. fortnightly or monthly. Further reviews shall take place where any significant changes occur. A log will be kept of when the plan has been reviewed and the outcomes. An appropriate monitoring regime of the waste objective and targets shall be put in place. Riverlinx CJV will be responsible for reviewing, revising and refining the SWMP as necessary, to ensure best practice and to identify if lessons could be learned for the next time a similar scheme is undertaken. An estimation of the cost savings (if any) that have been achieved through the measures undertaken to minimise, reuse, recycle or recover waste arisings rather than disposal to landfill will be recorded. The “reporting” tab of the SWMP summarises key performance indicators such as: diversion from landfill, cost of waste disposal and recovery of materials. This review will aim to identify and conclude the following:

- Confirmation that the SWMP has been monitored and updated within the defined timescales;
- An explanation of any deviation from the original plan;
- A comparison of the estimated quantities of each waste type against the actual quantities generated; and
- An action plan to address the lessons that have been learnt from the Scheme that could be implemented for the next scheme.

4. Checking

4.1 Compliance Checks

During the construction phase Riverlinx CJV will monitor the effectiveness of the SWMP. This will be undertaken by the Environmental Team, Waste Manager/Champion and Section Managers and will include inspections and audits to confirm compliance with the plan. Any non-conformances will be addressed, and further action will be taken where deemed appropriate. Under the Waste (England and Wales) Regulations 2012 and in line with Duty of Care, Riverlinx CJV must ensure that suitable storage is made available, perform checks for waste carriers' licences and retain Waste Transfer Notes / Consignment Notes for 2/3 years as appropriate. Riverlinx CJV will be responsible for all waste management however a number of subcontractors may manage their own waste when most appropriate and contractually agreed. Riverlinx CJV will still retain responsibilities under Duty of Care requirements in this scenario. Duty of Care details will be logged within the WRAP SWMP template under the appropriate tabs including waste management licenses, waste carrier licenses and exempt site licenses for waste management contractors used. All waste management contractors licences will be checked and verified before any waste movement occurs. All Waste Transfer Notes will be safely stored for two years. Consignment notes for the transport of hazardous waste will be held for three years. Riverlinx CJV will consider using electronic transfer notes rather than paper based e.g. Department for Environment Food & Rural Affairs' Electronic Duty of Care (Defra Edoc). In addition to monitoring and recording the performance, Riverlinx CJV will monitor the key waste management facilities periodically through the lifespan of the contract to ensure each facility is receiving only the waste it is licensed to receive and are achieving the recycling rates they claim. This will ensure that high standards of compliance and environmental performance are maintained throughout the supply chain, including accurate recording of waste types and the origin/destinations of wastes.

4.2 Reporting

Progress towards achieving the target of 80% of total CD&E waste reused on site or removed from site for beneficial will be reported as part of periodic reporting to Project Co and TfL. In addition, the report will include a brief summary of waste production, waste minimisation efforts and methods used for disposal or reuse. The reporting will also cover details on any inspections, audits or other waste related assurance activities completed during the period.

4.3 Management Review

The Environmental Manager will meet with senior team members, including the Project Director, Quality Manager, and Engineering Manager, at least annually for formal management reviews. The annual review will include specific focus on the SWMP. These reviews will not preclude more frequent intermediate reviews, as required. At the management reviews improvement plans and related actions will be developed if required. The Environmental Manager will issue all review attendees with a report including the following items before the meeting:

- Adequacy of environmental resourcing
- Training undertaken and planned
- Analysis of site inspections, audits, incidents and non-conformities
- Analysis of monitoring
- Recurring issues and time taken to complete actions
- Follow-up actions from previous management review
- Recommendations for improvement.