

PLANNING ACT 2008 INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009 REGULATION 5 (2) (a)

PROPOSED PORT TERMINAL AT FORMER TILBURY POWER STATION

TILBURY2

TR030003

VOLUME 6 PART B

ES APPENDIX 15.F: HYDROGEOLOGY AND GROUND CONDITIONS CHAPTERS CSMS

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Appendix 15.F: Table 1: Land contamination CSM and risk assessment during the baseline, construction and operational phases for the proposed development

Source	Receptor	Pathway		Baseline		Constru	ction without mi	Mitigation measures	Construction with mitigation			Operation (assuming prior to a	dertaken			
			Probability	Consequence	Risk	Probability	Consequence	Risk		Probability	Consequence	Risk	Probability	Consequence	Risk	
On-site Historical operation and demolition of the former Tilbury A Power Station. This includes operation of the power	Human (on-site) Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil- derived dusts and water Inhalation of	Low likelihood	Medium	Moderate / low risk		not present at ction stage		Further ground investigation and risk assessment to define risks. Remediation /		ot present at ction stage			not present at ion stage		
station and potential spills / leaks from machinery, equipment, vehicles and underground cables.	Human (on-site) Railway maintenance workers	contaminants in soils/dust including asbestos fibres Inhalation of ground gases and/or vapours	soils/dust including asbestos fibres Inhalation of ground	Low likelihood	Medium	Moderate / low risk		not present at ction stage	-	removal of existing contamination if risk assessments deem necessary. Implementation of		ot present at ction stage	-	Unlikely	Medium	Low risk
Railway activities associated with the railway line including associated engine	Human (on-site) Workers at electricity substation		Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk	measures in the Construction Environmental Management Plan	Low likelihood	Medium	Moderate / low risk	Unlikely	Medium	Low risk	
sheds and trains / goods vehicles using the railway line. Made Ground associated with the	d trains / hicles using ly line. Human (on-site) Future workers at / users of the new port facilities			not present at ine stage	covered		(CEMP). Site will mostly be covered in hardstanding or compacted		ot present at ction stage		Unlikely	Medium	Low risk			
construction of the former Tilbury A Power Station, the railway line and all associated infrastructure e.g. roads. Activities relating to the former gas works located within the west of the development	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage				not present at ction stage		aggregate which will minimise dust, infiltration.		ot present at tion stage		Unlikely	Medium	Low risk	
Activities relating to the vehicle maintenance and storage yard to the south of railway line and west of Fort Road. Activities relating to the electricity substation including associated	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works	Dermal contact with and / or ingestion of contaminants in windblown soil-derived dusts and water which may have migrated offsite	Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk	Further ground investigation and risk assessment to define risks. Remediation / removal of existing contamination if risk	Low likelihood	Medium	Moderate / low risk	Unlikely	Medium	Low risk	
electricity lines and spills from vehicles. Historical tipping in the northern part of the power station area including ash, clinker, brick, concrete, wood, plastic, fabrics, car	Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors	Inhalation of contaminants in windblown dust including asbestos fibres Inhalation of ground gases and / or vapours which may have migrated off-site	Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk	assessments deem necessary. Implementation of measures in the CEMP. Site will mostly be covered in	Low likelihood	Medium	Moderate / low risk	Unlikely	Medium	Low risk	
tyres, metal and rope. (A range of inorganic and recalcitrant organic contaminants including heavy metals,	Human (off-site) Workers in adjacent commercial properties		Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk	hardstanding or compacted aggregate which will minimise dust, infiltration.	Low likelihood	Medium	Moderate / low risk	Unlikely	Medium	Low risk	

hydrocarbons, fuels / **Human (off-site)** Medium Moderate Likely Medium Moderate Medium Moderate Unlikely Medium Low risk Low Low oil, Polycyclic Aromatic likelihood / low risk risk likelihood / low risk Members of the Hydrocarbons (PAH), public accessing the Total Petroleum Hydrocarbons (TPH). surrounding area (including the Polychlorinated coastal path Biphenyls (PCBs), adjacent to the solvents, creosote, asbestos). proposal) **Human (off-site)** Low Medium Moderate Likely Medium Moderate Low Medium Moderate Unlikely Medium Low risk likelihood / low risk risk likelihood / low risk Farmers working on nearby agricultural land Moderate Moderate Low risk **Controlled Waters** Leaching and migration Low Medium Likely Medium Moderate Further ground Low Medium Unlikely Medium likelihood of contaminants (free likelihood / low risk investigation and risk / low risk Principal Bedrock and dissolved phase) assessment to define aguifer from soils in the risks. Secondary A Aquifer unsaturated zone into Remediation / groundwater in removal of existing underlying aquifers contamination if risk Unlikely Migration of Medium Moderate Likely Moderate assessments deem Low Medium Low Medium Moderate Medium Low risk contaminants via likelihood / low risk risk necessary. likelihood / low risk preferential pathways Piling risk such as via piles to assessment. deeper groundwater Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. **Controlled Waters** Discharge of Mild Low risk Likely Mild Mild Low risk Unlikely Mild Low Moderate Further ground Low Very low contaminants entrained likelihood / low risk investigation and risk likelihood risk River Thames, in surface water runoff assessment to define Thames Estuary, followed by overland flow risks. West Tilbury Main, and discharge Bill Meroy Creek, Remediation / various on-site and removal of existing Leaching and migration Mild Low risk Mild Moderate Mild Low risk Mild Low Likely Low Unlikely Very low off-site unnamed contamination if risk / low risk of contaminants (free likelihood likelihood risk streams and and dissolved phase) assessments deem drainage networks, from soils in the necessary. on-site and off-site unsaturated zone into Implementation of ponds groundwater in measures in the underlying aquifers CEMP such as good management of Migration of Mild Likely Mild Moderate Mild Unlikely Mild Low Low risk Low risk **Very low** Iow stockpiles in contaminants via likelihood / low risk likelihood risk accordance with EA preferential pathways PPG, implementation such as service runs to of pollution incident surface water control e.g. plant drip trays and spill kits. Mild Mild Further ground Mild Mild **Very low** Property (on-site) Direct contact of new Low Low risk Likely Moderate Low Low risk Unlikely likelihood and existing structures likelihood / low risk investigation and risk risk Existing structures assessment to define with contaminants in and services soils and/or groundwater risks.

		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Low likelihood	Mild	Low risk	Likely	Mild	Moderate / low risk	Remediation / removal of existing contamination if risk assessments deem necessary. Appropriate assessment and design of services resistant to chemical attack if risk	Low likelihood	Mild	Low risk	Unlikely	Mild	Very low risk
	Property (on-site) Future structures and services	Direct contact of new and existing structures with contaminants in groundwater		not present at ine stage		Likely	Mild	Moderate / low risk	assessments deem necessary. Additional monitoring risk assessment to determine mitigation	Low likelihood	Mild	Low risk	Unlikely	Mild	Very low risk
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points		not present at ine stage		Likely	Mild	Moderate / low risk	measures which may need to be incorporated into design of buildings and services if required.	Low likelihood	Mild	Low risk	Unlikely	Mild	Very low risk
	Property (off-site) Existing structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Low likelihood	Minor	Very low risk	Likely	Minor	Low risk	Remediation / removal of existing contamination if risk assessments deem	Low likelihood	Minor	Very low risk	Unlikely	Minor	Very low risk
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Low likelihood	Mild	Low risk	Likely	Mild	Moderate / low risk	necessary. Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. Additional monitoring risk assessment to	Low likelihood	Mild	Low risk	Unlikely	Mild	Very low risk
	Property (off-site) Tilbury Fort Scheduled Monument	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Unlikely	Minor	Very low risk	Low likelihood	Minor	Very low risk	determine mitigation measures which may need to be incorporated into design of buildings	Low likelihood	Minor	Very low risk	Unlikely	Minor	Very low risk
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Unlikely	Minor	Very low risk	Low likelihood	Minor	Very low risk	and services if required.	Low likelihood	Minor	Very low risk	Unlikely	Minor	Very low risk
On-site Ground gas associated with peat and organicrich alluvium underlying the site	Human (on-site) Current workers and visitors to former Tilbury A Power Station site	Inhalation of ground gases and vapours	Unlikely	Medium	Low risk		not present at ction stage	-	Additional ground gas and vapour monitoring and risk assessments to identify mitigation	Receptor not p construction		-	Receptor not p	resent at opera	ntion stage

Ground gas and									measures to be						
vapours from Made Ground associated with former Tilbury A Power Station	Human (on-site) Railway maintenance workers		Unlikely	Medium	Low risk		not present at ction stage	-	incorporated into design of buildings and services, if required.	Receptor not present at construction stage		-	Unlikely	Medium	Low risk
(Methane and carbon dioxide ground gas and vapours)	Human (on-site) Workers at electricity substation		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk		Unlikely	Medium	Low risk	Unlikely	Medium	Low risk
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage		-	Receptor not present at construction stage		•			ot present at tion stage	-	Unlikely	Medium	Low risk
	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor		Receptor not present at baseline stage		-	Receptor not present at construction stage		-		Receptor not present at construction stage		-	Unlikely	Medium	Low risk
	Human (off-site) Workers on-site at the adjacent former Tilbury B Power Station and adjacent sewage treatment works		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk	Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required.	Unlikely	Medium	Low risk	Unlikely	Medium	Low risk
	Human (off-site) Residents living adjacent to the proposed development, north of the development area and visitors		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk		Unlikely	Medium	Low risk	Unlikely	Medium	Low risk
	Human (off-site) Workers in adjacent commercial properties		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk		Unlikely	Medium	Low risk	Unlikely	Medium	Low risk
Hi M pu su (ir co ac pr	Human (off-site) Members of the public accessing the surrounding area (including the coastal path adjacent to the proposal)		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk		Unlikely	Medium	Low risk	Unlikely	Medium	Low risk
	Human (off-site) Farmers working on nearby agricultural land		Unlikely	Medium	Low risk	Low likelihood	Medium	Moderate/ low risk		Unlikely	Medium	Low risk	Unlikely	Medium	Low risk

	Property (on-site) Existing structures and services	Migration of ground gases along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Unlikely	Severe	Moderate / low risk	Low likelihood	Severe	Moderate risk	Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required.	Unlikely Severe	Moderate / low risk	Unlikely	Severe	Moderate / low risk
	Property (on-site) Future structures and services Migrigass path permiservices services accurates and services services accurates services servic	Migration of ground gases along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points		not present at ne stage	-	Low likelihood	Severe	Moderate risk		Unlikely Severe	Moderate / low risk	Unlikely	Severe	Moderate / low risk
	Property (off-site) Existing structures and services	Migration of ground gases along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Unlikely	Severe	Moderate / low risk	Unlikely	Severe	Moderate/ low risk	Additional ground gas and vapour monitoring and risk assessment to identify mitigation measures to be incorporated into design of buildings and services, if required.	Unlikely Severe	Moderate / low risk	Unlikely	Severe	Moderate / low risk
	Property (off-site) Tilbury Fort Scheduled Monument	Migration of ground gases along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Unlikely	Severe	Moderate / low risk	Low likelihood	Severe	Moderate risk		Unlikely Severe	Moderate / low risk	Unlikely	Severe	Moderate / low risk
Off-site Operation of the former Tilbury B Power Station. This includes potential spills / leaks	Human (on-site) Current workers at and visitors to former Tilbury A Power Station site	Dermal contact with and/or ingestion of contaminants in soil, soil-derived dusts and water Inhalation of	Low likelihood	Mild	Low risk		not present at ction stage		RAMS to be completed prior to construction and risks managed with appropriate personal protective equipment		ıt		ot present at on stage	
and underground cables. Activities relating to the sewage works adjacent west of the proposed development. This includes associated infrastructure such as tanks, filter beds and sludge beds Made Ground	Human (on-site) Railway maintenance workers		Low likelihood	Mild	Low risk		not present at ction stage	-	(PPE).	Receptor not present a construction stage	ut -	Unlikely	Mild	Very low risk
	Human (on-site) Workers at electricity substation		Low likelihood	Mild	Low risk	Likely	Mild	Moderate/ low risk		Low Mild likelihood	Low risk	Unlikely	Mild	Very low risk
	Human (on-site) Future workers at / users of the new port facilities		Receptor not present at baseline stage		-	Receptor not present at construction stage				Receptor not present a construction stage	ıt	Unlikely	Mild	Very low risk

construction of the former Tilbury B Power Station and earthworks adjacent to the eastern boundary of the development area Historical and authorised landfills within study area Agricultural activities within the study area	Human (on-site) Members of the public using public rights of way crossing the infrastructure corridor and public footpath/cycle track along the infrastructure corridor	Receptor not present a baseline stage					not present at ction stage				ot present at tion stage		Unlikely	Mild	Very low risk
(A range of inorganic and recalcitrant organic contaminants including heavy metals, hydrocarbons, fuels / oil, PAH, TPH, PCB, coal, asbestos,	Secondary A aquifer Secondary	Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk	investigation and risk assessment to define risks. Remediation / removal of existing contamination if risk assessments deem	Low likelihood	Medium	Moderate / low risk	Low likelihood	Medium	Moderate / low risk
leachate / sludge, nitrates, sulphates, ammoniacal nitrogen, biological contaminants		Migration of contaminants via preferential pathways	Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk		Low likelihood	Medium	Moderate / low risk	Low likelihood	Medium	Moderate / low risk
and the potential for ground gas generation (methane, carbon dioxide, hydrogen sulphide and carbon monoxide)).		Lateral migration of contaminants in groundwater.	Low likelihood	Medium	Moderate / low risk	Likely	Medium	Moderate risk		Low likelihood	Medium	Moderate / low risk	Low likelihood	Medium	Moderate / low risk
	Controlled Waters Various on-site unnamed streams and drainage networks.	Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge	Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk		Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk
		Leaching and migration of contaminants (free and dissolved phase) from soils in the unsaturated zone into groundwater in underlying aquifers	Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk		Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk
		Migration of contaminants via preferential pathways	Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk		Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk
		Lateral migration of contaminants in groundwater with discharge to surface water as base flow.	Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk		Unlikely	Mild	Very low risk	Unlikely	Mild	Very low risk
	Property (on-site) Existing structures and services	Direct contact of new and existing structures with contaminants in groundwater	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk	N/A	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk
		Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk		Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk

	buildings, service ducts or access points											
Property (on-site) Future structures and services	Direct contact of new and existing structures with contaminants in soils and/or groundwater	Receptor not present at baseline stage	-	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk
	Migration of ground gases or vapours along preferential pathways including permeable ground, service trenches and service entry points and accumulation in enclosed spaces such as buildings, service ducts or access points	Receptor not present at baseline stage		Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk	Unlikely	Minor	Very low risk