MATRIX 1 - GUIDANCE FOR PRELIMINARY & EXPLORATORY INVESTIGATIONS FOR ALL UNREGULATED WASTE DISPOSAL SITES

IMPORTANT NOTE: THIS INITIAL PHASE OF WORK IS MANDATORY FOR ALL SITES AND SHOULD AIM TO COMPLETE A TIER 1, THE FINDING OF WHICH WILL BE CONFIRMED BY THE INITIAL TIER 2 WORKS. EACH PHASE OF ASSESSMENT WILL DEVELOP THE CONCEPTUAL SITE MODEL (CSM) AND SHOULD GUIDE THE DESIGN OF THE NEXT PHASE OF SITE INVESTIGATION (SI) . THE APPLICATION OF THE SI PROCESS AND METHODOLOGIES SHOULD BE COMPLETED IN ACCORDANCE WITH THE RELEVANT STANDARDS/EPA GUIDANCE DOCUMENTS AND UNDERTAKEN BY EXPERIENCED PRACTITIONERS.

				TIER 1: PRELIMINARY INVESTIGATION				**TIER 2: EXPLORATORY INVESTIGATION & SAMPLING**							
SPR LINKAGE	**SOURCE**	**PATHWAY**	**RECEPTOR**	**DESK STUDY**	**WALKOVER SURVEY**	**CONCEPTUAL SITE MODEL (CSM)**		**TRIAL PITS & TRENCHES**	**WASTE TYPE**	**WASTE SAMPLING**	**LEACHATE SAMPLING**	**SOIL SAMPLING**	**Surface or Groundwater Sampling**	**Topographic & GPS SURVEY**	
				Critical mandatory element of the SI process - includes gathering baseline site and local area data, history of landfill, waste types, volumes, age, presence and distance to potential receptors, etc	Very important element of the SI process. Confirms physical conditions on site, desk study findings and examines access issues, visual assessment of pathways/receptors allows initial SPR linkage potential.	The development of the CSM is a critical aspect of the risk assessment and defining SPR linkages and therefore SI requirements		JCB or tracked excavator - waste type assessment & classification - leachate/gas potential, limited depth, good bulk samples & visual assessment. Allows for sampling and possibly temporary standpipes (not best practice). Accurate logs and photographs important. Where cap exists plan for full re-instatement and on-site material management.	Assessment of waste type in terms of content and determining composition of C&D, Municipal, Industrial, Pre 1977 sites. Should confirm reported waste types deposited as identified in Tier 1.	Waste Sampling, typically of contaminated soil matrix that waste is contained in. Dry soils analysis to assess the potential impact on human health and to enable leachability testing if risk of leachate emanating from waste exists.	Liquid samples of leachate recovered for List 1 & List 2 substances contamination - Parameters to be considered as per Table C.2 of EPA Landfill Monitoring Manual 2003.	Principle purpose of soil sampling at this stage is to assess permeability potential of surrounding materials (pathway assessment), composition of any cap and potential for local material to be used for remediation/capping. In some cases contamination assessment may be required.	Any obvious receptors should be considered for initial indicator parameter screening. Surface waters and/or existing boreholes can be sampled at this stage. Gas monitoring with hand held equipment can be completed. Parameters to be considered as per Table C.2 of EPA Landfill Monitoring Manual 2003. No new boreholes are proposed at this stage.	Topographic survey of landfill area and immediate surrounds will enable assessment of waste extent & area calculations, location of sampling points, surface drains/features. Topographic data & Well datum for flow direction mapping. GPS system will determine grid ref for SI works. Could be important for remediation/capping design.	
SPR 1	LEACHATE	Vertical & Horizontal Groundwater to Surface Water Drainage/Runoff	Surface Water Body	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 2	LEACHATE	Vertical & Horizontal Groundwater to Surface Water Drainage/Runoff	Surface Water Body Protected Area (SWDTE)	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 3	LEACHATE	Vertical & Horizontal Groundwater Migration	Human Presence (Private Well)	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 4	LEACHATE	Vertical & Horizontal Groundwater Migration	Groundwater Protected area (GWDTE)	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 5	LEACHATE	Vertical & Horizontal Groundwater Migration	Aquifer Category	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 6	LEACHATE	Vertical & Horizontal Groundwater Migration	Public Supply (Well) (includes Group Water Schemes)	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 7	LEACHATE	Vertical & Horizontal Groundwater Migration	Surface Water Body	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 8	LEACHATE	Surface Water Drainage/Runoff	Surface Water Body	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 9	LEACHATE	Surface Water Drainage/Runoff	Surface Water Body Protected Area (SWDTE)	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 10	LANDFILL GAS	Lateral Migration (Subsoil)	Human Presence	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
SPR 11	LANDFILL GAS	Vertical Migration (Subsoil)	Human Presence	**M**	**M**	**M**		**M**	**M**	**R**	**R**	**R**	**R/S**	**R/S**	
Source & Pathway & Receptor Parameters Targeted for CSM & Risk Screening				Research of all available published site information - Site history, waste type, extent and volumes, possible historic sources, local receptors, infrastructure etc. Interviews with previous site staff should be considered.	Walkover should confirm desk study data and investigate Source Pathway Receptor scenarios being considered.	The CSM should graphically represent the relationship's between the waste body and potential receptor's developed on the basis of hazard identification and refined during subsequent phases of assessment.		Waste type/composition, footprint, volume, depth & groundwater vulnerability, leachate & gas source & migration potential. Should assess nature and depth of any cap or undersoils, if encountered.	waste type, general composition and extent within the landfill area, leachate and gas source & migration potential.	waste type, dry soils quality and leachate potential	waste type, leachate concentrations and leachate potential	ground vulnerability, horizontal or vertical pathway assessment & material use in remediation of site.	surface water or groundwater receptor and potential horizontal pathway information.	waste area & volume estimate using trial pit data, site topography, layout/setting, access roads, surface features, accurate SI points, levels for groundwater flow direction, etc	
General comments & COP Section Reference - Note: the development of the CSM and design of the site investigation should involve an experienced SI practitioner.				Critical first step in site and waste characterisation, all potential data sources should be considered. Note Section 3.2 of COP	allows visual assessment of site and local environs, important that walkover confirms findings of desk study and allows accurate CSM to be developed. Note Section 3.4 of COP	This is a fundamental part of the Risk Assessment exercise - the CSM information should be clearly documented and accessible in the form of text, figures and tables. Note section 3 of COP and reporting requirements in Chapter 8.		Trial pits and trenching is a very important phase of work to enable the potential sources and types of leachate & gas to be determined. Detailed logs and photographic records important. Note Section 5.5.2 of COP.	characterises waste type and contamination potential. Note Section 4.3.1 of COP & Table 1a & Table 1b of Scoring Matrix.	Characterises waste type, age and contamination potential. Note Section 4.3.1 of COP & Table 1a & Table 1b of Scoring Matrix. Dry soils analysis for comparison and screening against accepted Target Screening Values (TSVs) such as the UK CLEA model and compared to parameters in EPA Landfill Design Document 2000 - Sections 7.1 & 7.2	characterises waste type, age and contamination potential, samples can be acquired during trial pitting or from existing borehole infrastructure, if present. Leachate characteristics can be compared to parameters in EPA Landfill Design Document 2000 - Sections 7.1 & 7.2	Characterises geology type, material strength and permeability	Full suites should be completed at least once. Should be completed as per best practice and relevant guidelines. Refer to COP 5.3.2 and EPA Landfill Monitoring Guidelines, 2nd Edition 2003, especially Sections 4 and 5.	topographic surveys give base map for site layout, investigation points, sample and water level depths, groundwater flow direction etc. recommended.	
Provisional Guidance on Extent of Testing/Sampling - This will ultimately depend on the type of risk identified, size of site, extent & volume of waste, ground conditions, variability of the waste material, etc..				Office based assessment using all available existing site data that is vital in assessing the initial risk level and conceptual model for the site. Sites may have GIS data available. Note: Section E of EPA Certificate of Authorisation requires ecological Appropriate Assessment Habitat Screening to be completed for waste sites so any designated protection areas should be identified at this stage.	Locations and access issues for sampling and site suitability should be assessed at this stage. Presence of potential sensitive ecological habitats requiring Appropriate Assessment Screening to be noted.	A good conceptual site model will facilitate an initial risk classification for the site and guide future works.		Typically 7 to 10 trial pits are completed to 3 to 5m per day. Depending on size of site one to two days of trial pitting should be undertaken on and around the waste body to confirm extent and composition. Initial gas monitoring can be by hand held gas and volatile monitors & based on physical observations. Further Trial Pits & Trenching can be completed as part of the Main SI if required and boreholes may be necessary to achieve greater depths.	Each trial pit should be logged as per BS 5930:1999 or ISO 14688-2 (2006) and nature of waste and composition recorded. Photographic records important. Potential to cause source of contamination to be assessed. physical evidence of contamination such as visual discolouration, presence of leachate, odours etc to be recorded.	Leachability testing of waste should be completed to allow comparison to the European Waste Acceptance Criteria (WAC) analysis, as per the BS 12457 testing standard. A minimum of two samples should be acquired for the test for the trial pit phase of work. Results should be used as a preliminary screening tool to assess the potential level of contamination that the historical waste may pose.	Will depend on nature and composition of the waste and number of investigation points. Initially one to three samples should be taken with one full screen as per Table C.2 of EPA Landfill Monitoring Manual 2003, and at other locations to do indicator parameters such as pH Conductivity, Temp, BOD, Ammonia, Chloride, Sulphate, Sodium and Potassium.	Will depend on nature and variability of soil material around waste body and number of investigation points. Initially three disturbed samples should be taken and assessed for soil type, particle size analysis, and if possible permeability and strength, refer to BS 5930 standard.	Adjacent or nearest accessible down gradient locations should be considered for exploratory sampling. Survey of springs if required. Basic indicator parameters such as pH, Conductivity, Temp, BOD, Ammonia, Chloride, Sulphate, Sodium and Potassium should be completed as a minimum. All surface water bodies/drains/streams/ditches should be considered, as per Water Framework Directive.	A topographical survey should be considered for the site area and immediate environs of low risk sites and is recommended for all moderate and high risk sites. GPS survey locations as required.	

AFTER TIER 1 INVESTIGATION, DEVELOP CONCEPTUAL SITE MODEL, DETERMINE RISK CLASSIFICATION & SCOPE EXPLORATORY INVESTIGATION

AFTER TIER 2 EXPLORATORY INVESTIGATION, REFINE CONCEPTUAL SITE MODEL, CONFIRM RISK CLASSIFICATION & SCOPE MAIN SITE INVESTIGATION AS REQUIRED. IF SITE IS LOW RISK THEN NO FURTHER INVESTIGATION NEEDED - MOVE TO REMEDIATION PLAN.

M = Mandatory and should be completed as thoroughly as possible for each site.

R = Recommended technique assuming site conditions allow.

S = Should be considered but is dependent on site suitability for that methodology.

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