SURF Metrics Toolbox – Remedial Investigation

Parameter	Objective	Metrics	QN, QL	EN, S, EC	Data Source(s)*	Implementation Guidance and Comments	External Benefits	Challenges
Element: Sampling Plan								
Site and source characterization	Characterize site and source areas efficiently.	Number of samples collected, number of resampling events, and completion time	QN	EC	Sampling cost, project tracking sheet, and project schedule	Design sampling plan to ensure that appropriate media are addressed. Consider including field screening and step-out sampling. Select sampling equipment that facilitates sampling and analysis plan implementation. Consider future use to ensure that initial media and exposures are address and conceptual site model is confirmed.	--	Because the initial cost for sampling may be higher, a cost-benefit analysis may be required to show a reduction in overall project costs. Step out samples with single mobilization requires prior regulator buy-in.
		Regulatory stakeholder satisfaction	QL	EN	Stakeholder survey and number of regulatory orders, complaints, and correction letters	Review sampling logic and data quality objectives with regulators and stakeholders. Discuss future use with regulators and stakeholders.	--	Determining future land use may be an iterative process and, initially, longer if sampling is needed to determine the potential future use options. However, this effort may streamline future discussions.
Sampling event	Implement sampling event efficiently.	Energy use	QN	EC	Fuel cost accounting	Track energy costs for each field task.	--	Determining the degree of energy reduction requires baseline data which may be difficult to quantify.
		Environmental impacts**	QN	EN	Fuel use data, emissions estimate, and mass of waste	Track effect of scope change, if any.	--	The sampling plan must first meet data quality objectives and then the efficiencies of impacts can be explored.
		Reduced personnel exposure and costs	QN	S, EC	Project costs and exposure hours	--	--	--
Mobilization	Reduce number of mobilizations.	Air emissions	QN	EN	Project records, utility use, and fuel use	Use carbon / energy model to calculate carbon emissions. Consider the impacts of off-site stationary vs. mobile (with footprint) laboratory and impact on operational efficiency. Track mobilization impacts as sampling plan revisions evolve to quantify improvements from the initial (i.e., baseline) plan.	Increases operational efficiency (EC).	The sampling and analysis plan should identify opportunities for reduced mobilizations. However, it must first meet data quality objectives before the efficiencies of impacts can be explored.
		Cost of mobilizations	QN	EC	Cost accounting	--		

Notes:

* Data sources in this table support predictive sustainability analyses conducted before remedial implementation. SURF is developing guides for post-implementation assessments (www.sustainableremediation.org/library/guidance-tools-and-other-resources) to support evaluation of in-place remedies and scoping of bid documents, technical specifications, and operation and maintenance plans to ensure that necessary data are collected for future evaluation.

** Environmental impacts: air emissions (global warming potential, nitrogen oxides, sulfur oxides, particulate matter, toxics), water demand, and waste generation

QN = quantitative   S = social
QL = qualitative   EC = economic
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	Reduce travel footprint.	Automobile and airline miles	QN	EC	--	Balance operational efficiency and cost of using local contractor and staff.		
		Air emissions and energy use	QN	EN	Fuel use data emissions estimate	Consider the impact of vehicle choice on air emissions and energy. Use carbon/energy model.		
		Use of public transportation or carpool	QN	EN	Field staff survey	Reduce carbon footprint through use of alternative transportation. Minimize number of field staff.	Reduces greenhouse gas emissions (EN).	Determining the availability of public transportation or coordinating carpooling prior to mobilization requires time to inform field staff and resources.
		Travel and fuel costs	QN	EC	Costs associated with travel	Track cost as sampling plan revisions evolve to quantify improvements from the initial (i.e., baseline) plan.	--	--
Local labor pool	Increase use of local labor.	Number of staff and commuting mileage	QN	EC	Employee data and staff pay per diem	Increase local economy through additional jobs.	Reduces energy use (EN, EC) and per diem costs of industry service providers (EC). Minimize environmental impacts of field staff (EN).	Utilizing the local labor pool could be counter-productive (e.g., lack of necessary technical knowledge or health and safety capabilities).
			QL	S	Employee surveys	Increase community satisfaction	Increased awareness regarding safety due to employee getting more rest.	

Element: **Investigation-Derived Waste**

Parameter	Objective	Metrics	QN, QL	EN, S, EC	Data Source(s)*	Implementation Guidance and Comments	External Benefits	Challenges
Investigation-derived waste generation	Minimize waste generation.	Total waste mass	QN	EN	Manifest data and weight of solid nonhazardous wastes	Balance the costs of and time needed to weigh, segregate, and characterize nonhazardous waste with the impact on the total waste stream.	Reduces trucking emissions (EN), costs (EC), community traffic (S), local trucking labor (S), and amount of waste disposed of in landfill (EC). Increases landfill longevity (EN, S).	Small waste quantities (e.g., laboratory) may not be captured when considering waste mass only.
	Reduce off-site disposal of purge water.	Quantity of purge water disposed off-site	QN	EN	Purge water volume	Address the potential for the reinjection of purge water in the sampling plan if appropriate. Use no-purge (passive diffusion bag) or very low purge (BarCad-type) samplers.	Reduce time on-site and the use of pumps or bailers to purge wells.	Some regulations may not permit purge water reinjection without early consensus from regulators. Some regulatory agencies may require demonstration that equivalent samples can be obtained with alternative techniques. May require more mobilizations to the site.

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	Recycle waste.	Total recycle mass	QN	EN	Recycle receipt and collected data	Weigh recycled wastes.	Reduces waste disposed of in landfill (EC). Increases landfill longevity (EN, S). Mitigates use of raw materials for manufacturing (EN, S, EC).	--
	Reuse products and materials.	Use of reusable materials (e.g., reusable overalls)	QL	EN	Identification of items used	Consider maintaining an inventory of reusable products and materials in lieu of disposable items. Determine the energy used to produce disposable products and materials vs. the energy needed to clean reusable items.	Reduces trucking emissions (EN), costs (EC), community traffic (S), local trucking labor (S), waste disposed of in landfill (EC). Increases landfill longevity (EN, S). Mitigates the use of raw materials for manufacturing (EN, S, EC).	The benefits or "costs" of using disposable products and materials must be balanced those associated with reusable items.
			QN	EC	Purchase cost, disposal cost, and cleaning cost	Balance cost of cleaning used materials and products with cost of purchasing new materials and products and disposing of used items.		Decontamination (if necessary) may be difficult or costly. Simple cost comparisons may not include disposal costs.
Element: **Local Community Impacts and Community Involvement**								
Communication and outreach	Increase community involvement and knowledge.	Community contacts and/or meetings, publications, direct contacts, complaints, and community survey	QN, QL	S	Community survey results and communication logs	--	Increases community satisfaction through outreach and involvement (S).	Communication and outreach efforts may increase short-term schedule and costs; however, long-term benefits include early buy-in and/or consensus on future use and remedial action.
Public health	Reduce health concerns	Dust mitigation and air monitoring results	QN	EN	Field data	--	--	--
Physical disturbances and disruptions	Minimize road closures, noise, traffic, and light pollution.	Road closures, complaints, and noise mitigation measures	QN, QL	EN, S	Field data	Document number and length of road closures; number of complaints; and noise, monitoring, and mitigation measures employed.	Supports social/community values (S).	Noise and odor are difficult to quantify.

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