

HANDOUT 1

INVENTORY OF LNAPL SITE MANAGEMENT OPTIMIZATION TOOLS

TOOL USE MATRIX FOR LNAPL SITE MANAGEMENT

US Navy RITS, Spring 2009, "Strategies for Environmental Risk Management at LNAPL Sites"

Project Phase	RPO Opportunity Task/Activity	Applicable LNAPL Optimization Tool
Site Management Strategy	Consider new land use (e.g., redevelopment)	7, 8, 14, 15, 17
	Avoid an N.O.V. or complaint (e.g., adjacent waterways or vapor intrusion)	4, 5, 6, 7, 11
	Perform a life-cycle cost evaluation	8, 9, 10, 11, 17
	Proactively address regulatory requirements (e.g., vapor intrusion risk)	7, 8, 17, 18
Site Characterization/ Risk Assessment	Revisit the LNAPL conceptual site model (CSM)	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
	LNAPL natural attenuation evaluation	2, 4, 19, 20
	Characterize LNAPL for predesign purposes	4, 5, 8, 10, 11, 13, 14, 19, 20
	Execute a Triad project	1, 2, 3, 6, 16
	Perform a risk analysis of the LNAPL	7, 13, 14
Technology Evaluation	Screen treatment technology (i.e., treatment, recovery, containment, etc.)	4, 5, 6, 8, 10, 16
	Select technology (i.e., skimming, water-drawdown, air sparging, MNA, etc.)	5, 8, 10, 13, 14, 19, 20
Design	Optimize the size of LNAPL fluid recovery equipment	10, 11, 13, 17
	Optimize the recovery well layout	10, 11, 13, 16, 17
	Perform contingency planning	1, 7, 8, 10, 12, 13, 17
	Assign treatment objectives and milestones	4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 17, 18, 19, 20
	Develop firm endpoint criteria	5, 6, 7, 8, 9, 10, 13, 14, 17, 18, 19, 20
Operation	Optimize systems with asymptotic recovery	
	Remedy systems with ineffective mass recovery	
	Remedy inability to meet other treatment goals (e.g., recover to less than 1/4" in-well LNAPL thickness or mitigate seepage into surface water)	
	Expedite remediation	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
	Perform thorough optimization concurrent with significant equipment service cycle (e.g., major equipment replacements needed)	
	Reduce O&M costs	
	Optimize operation by focusing on liability/risk reduction	

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Number	Tool or Resource Name	Point of Contact or Location
1	LNAPL Conceptual Site Model (CSM) Certainty Screening Spreadsheet Tool	Individually developed for site-specific applications
2	Real-time LNAPL site characterization methods such as laser-induced fluorescence (LIF), electric resistivity imaging (ERI), coring and dye test kits, headspace, visual, etc.	LIF – UVOST™ Dakota Technologies, ROST™ Fugro Geosciences ERI – Aestus, others Dye test kits – Cherion Resources (http://www.cheiron-resources.com/) Petroleum On-site Testing – BEAM™ by Dakota Technologies, QED by QROS (http://www.qros.us/hydrocarbon_analysis.html) +, immunoassay by Strategic Diagnostics, Inc. (http://www.sdix.com/ProductSpecs.asp?nProductID=23)
3	Visualization techniques such as Mining Visualization System (MVS), Geographic Information System (GIS), vendor-supplied, other homegrown	MVS – C Tech Development (www.ctech.com) GIS – www.esri.com Vendor-supplied – John Sohl/Columbia
4	Intact coring and mobility evaluation	American Petroleum Institute (API)
5	Laboratory capillarity and free product mobility testing (centrifuge or water-drive methods)	PTS Laboratories (www.ptsgelabs.com) Core Laboratories (www.corelab.com)
6	LNAPL dye tracer testing	Tom Sale/Colorado State University
7	Hydrocarbon Risk Calculator	Larry Acomb/Geosphere, inc.
8	Screening-level LNAPL fate and transport modeling	Time to Clean Up Model – Geosphere, Inc. API (http://www.api.org/ehs/groundwater/lnapl/index.cfm)
9	Diminishing returns analysis	Answers to Frequently Asked Questions about Managing Risk at LNAPL Sites (API, 2003) http://www.api.org/ehs/groundwater/lnapl/index.cfm
10	LNAPL Distribution and Recovery Model (LDRM) by API	API http://www.api.org/ehs/groundwater/lnapl/index.cfm
11	Bail down testing	API Interactive LNAPL Guide http://www.api.org/ehs/groundwater/lnapl/lnapl-guide.cfm

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12	NAPLANAL software	http://www.vironex.com/pages/support_naplanal.html
13	API Interactive LNAPL Guide	http://www.api.org/ehs/groundwater/lnapl/lnapl-guide.cfm
14	Fractionation and fingerprinting methods (PIANO, TPHCWG, VPH/EPH, isotope analysis)	PIANO – SPL Laboratories, Texas Oil Tech TPHCWG – many labs VPH/EPH – many labs Isotope analysis – Microseeps, Inc., others
15	ASTM Standard Guide E 2531 – 06 – “Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous-Phase Liquids Released to the Subsurface”	ASTM (www.astm.org)
16	Continuous LNAPL and water level monitoring	Continuous Fluid Level Monitoring System (CFLMS) by EDS Group http://www.edsgroup.com/edsg/services_remediation.html
17	Numeric, multiphase transport modeling	UTCHEM – EPA, Feb 1999 http://www.epa.gov/ada/csamos/models/utchem.html NAPL Simulator – EPA, Oct 1997 LNASt – API, Sep 2002 Hydrocarbon Spill Screening Model (HSSM) – EPA, 1994
18	Industry Leading Research Experts	Tom Sale/Colorado State University Dave Huntley/San Diego State University, LNAPL expert Gary Beckett/AquiVer, Inc., teaches the API LNAPL courses
19	Source zone natural attenuation (SZNA) assessment approach	Source Zone Natural Attenuation at Petroleum Hydrocarbon Spill Sites—I: Site-Specific Assessment Approach and II: Application to a Former Oil Field (GWMMR, Fall 2006)
20	Fuel weathering data	AFCEE Light Nonaqueous-Phase Liquid Weathering at Various Fuel Release Sites, 2003 Update (August 2003)