FCSAP Guidance for the Management of Light Non-Aqueous Phase Liquid (LNAPL) Sites

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Goals of the Guidance

• Meant to be practical and succinct
  – does not presume a specialist knowledge (e.g. hydrogeology)
  – useful checklist
• Follows 10 step Decision Making Framework
• Complements FCSAP Monitored Natural Attenuation (MNA) guidance
• Assist custodians in understanding and managing LNAPL risks without being prescriptive
Scope of Guidance

• LCSM* addresses only LNAPL, more general CSM* required to address other contaminants
• Does not discuss non-technical risk management factors for LNAPL sites
• Deals only with legacy sites under FCSAP

*CSM – Conceptual Site Model
*LCSM – LNAPL Conceptual Site Model
Guiding Principles for the management of LNAPL sites under FCSAP

• Solutions driven by Canadian federal regulatory framework
• Solutions must respect Treasury Board and FCSAP goals and policies
• Solutions should be based in sound science
Highlights of LNAPL guidance

• Designed to be compatible with the 10-step process and the FCSAP Decision-Making Framework (DMF)
• Some discussion of risks associated with dissolved phase and vapour plumes; more thoroughly addressed in FCSAP’s *Guide to Monitored Natural Attenuation in Groundwater and Soil for Federal Contaminated Sites*
• Promotes a similar approach to all sites regardless of the size and complexity of the site or where it is located in Canada
• Much of the focus on this guidance is in section 3 (Step 5); (re)Building the LCSM
• This guidance makes no assumption about where custodians may be in the 10 step process.
• Does not prescribe passive over active approaches
## Checklist

### Table 3.1

**LNAPL Site Management Checklist**

**FCSAP Guide to LNAPL Site Management**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site Goals and Regulatory Framework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.A</td>
<td>Are site goals well-defined?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>Engage stakeholders and establish goals</td>
</tr>
<tr>
<td>1.B</td>
<td>Are regulatory requirements well understood?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>Determine appropriate requirements/criteria</td>
</tr>
<tr>
<td>2</td>
<td>LNAPL Release History and Properties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.A</td>
<td>Is the source of the LNAPL release known? (indicate if high volume and/or pressure release)</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2.B</td>
<td>Is there any possibility of an on-going release?</td>
<td></td>
<td>Yes</td>
<td>Take immediate steps to halt release</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2.C</td>
<td>Is there an imminent threat posed by the release that warrants immediate mitigation or emergency response?</td>
<td></td>
<td>Yes</td>
<td>Activate emergency response</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2.D</td>
<td>Is the LNAPL type or types known?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>See Table 3.2 for LCSM development options</td>
</tr>
<tr>
<td>2.E</td>
<td>Is the date of the LNAPL release/approximate age of the LNAPL known?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>See Table 3.2 for LCSM development options</td>
</tr>
<tr>
<td>2.F</td>
<td>Are the density/specific gravity and viscosity of the LNAPL known?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>See Table 3.2 for LCSM development options</td>
</tr>
<tr>
<td>3</td>
<td>LNAPL Body</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.A</td>
<td>Has the areal extent and vertical distribution of the LNAPL body been defined?</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>Indicate techniques used</td>
</tr>
</tbody>
</table>
Case Study 1
Case Study 2
LNAPL Site Management Process
Section 2.0 DMF Steps 1-4
(Site assessment/categorization)

*LOE – Line of Evidence
Section 3.0 DMF Step 3,5
((Re) Building the LCSM)

*R/RM – Remediation/Risk Management
Section 4.0 DMF Step 7
(Establishing Site Goals, Remedial/Risk Management Planning)
Section 5.0 DMF Step 8
(Remedial and/or Risk Management Plan implementation)
Section 6.0 DMF Step 9, 10
(Confirmatory, Long Term Monitoring)
Other Considerations/Precautions for Custodians

- Must be aware of regulatory requirements (Fisheries Act, Migratory Birds Convention Act, etc)
- Must consider source control requirements of FCSAP Eligible Cost Document
- Authority for groundwater use/protection may rest with other non-federal jurisdictions – should consult where appropriate
Summary of selected NAPL Guidance in Canada and elsewhere

- BC MOE NAPL Protocols
- CRA technical guidance (2010) prepared for Environment and Climate Change Canada
- ITRC – guidance docs, training courses
  - Evaluating Natural Source Zone Depletion at Sites with LNAPL (LNAPL-1),
  - Evaluating LNAPL Remedial Technologies for Achieving Project Goals (LNAPL-2)
- ASTM
  - E2531 – LCSMs,
  - E2856 - Transmissivity
- API LNAPL guide, models
- CRC CARE (Australia)
  - Selecting and assessing strategies for remediating LNAPL in soils and aquifers
  - Technical impracticability of further remediation for LNAPL-impacted soils and aquifers
Comparison to approaches from Other Jurisdictions

• Similarities
  – LNAPL Science
  – Approach to characterizing sites, evaluating risks

• Differences
  – Regulatory regime: Fisheries Act drivers vs Maximum Extent Practicable approaches
  – Transmissivity – useful (as indicator of mobility) but must recognize limitations (does not recognize risk associated with preferential pathways).
Case Study 1
Case Study 2
Conclusions

- FCSAP LNAPL guidance, in combination with FCSAP MNA guidance, can assist with consistent approaches and advice on all FCSAP LNAPL sites
Questions?