

Manitoba Hydro

Sutherland Avenue Former Manufactured Gas Plant

**Proposed Resolution for Comments by the Manitoba
Conservation Technical Advisory Committee**

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UMA Project No.: 0217 158 03 (4.6.1)

April 2007

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1.0 Document Objectives

The Technical Advisory Committee (**TAC**) has been convened by Manitoba Conservation (**MC**) to provide technical input into the draft contaminated sites Management Plan that has been developed by Manitoba Hydro (**MH**) for the former Manufactured Gas Plant (**MGP**) site at 35 Sutherland Avenue, Winnipeg. The TAC first met on December 14, 2006, and for a second time on March 1, 2007. A major objective of the March 1 meeting was to discuss comments from the TAC on the draft Management Plan as well as supporting technical documents provided to the TAC during the first meeting. Per meeting minutes distributed by Tracey Braun, MC, some of the outcomes of the March 1 meeting were as follows:

- Agencies who had not filed comments on the management plan and supporting documents agreed to file their comments with MC prior to March 22nd, 2007.
- MH agreed to prepare a work plan outlining how they plan to address the concerns raised by TAC members. They agreed this plan (scoping document) would be filed with MC by April 19th, 2007.
- MC will circulate the plan to TAC member for review and comment. Comments will be requested by May 3rd, 2007.

The intent of this document is not to address in detail the concerns of the TAC at this time; rather, the objective is to list issues raised by the TAC and indicate how MH intends to address such issues at a future date (see Section 4: Proposed Schedule). Manitoba Hydro and their consultants have attempted to capture the comments and concerns of the TAC as submitted, provide an indication about how these will be addressed, and provide timelines for follow-up activities. We encourage TAC members to ensure that their concerns have been adequately captured herein.

2.0 Issues Identified

The issues identified have been placed in the following categories to facilitate discussions:

- Site Assessment Studies/Environmental Risk Assessment (sub-section 2.1);
- Monitoring Arising from Risk Assessment and the Management Plan (sub-section 2.2); and
- Possible Alternative Remedial Options (sub-section 2.3).
- Miscellaneous (sub-section 2.4).

Based on the state of practice anywhere in North America, decisions about contaminant risks and site remediation are grounded firstly in the best available knowledge about physical and chemical site conditions, and secondly in how such conditions might influence the biosphere, including humans (i.e., possible ecological and human health risks). The order of listing herein of the issues identified by the TAC parallels this state of practice. Therefore, discussions in sub-section 2.3 are provided with an explicit understanding that any remedial option needs to be explicitly linked to the prior scientific/technical decision making process, as addressed in sub-sections 2.1 and 2.2. In particular, technical decisions around risk management as presented by MH have followed the logic that the need for risk reduction is very important for defining management objectives, and that any possible benefit of future actions is explicitly tied to expectations for a commensurate reduction in environmental risks.

2.1 Site Assessment Studies/Environmental Risk Assessment

The issues identified are divided into on-site and off-site issues to facilitate discussion. On-site issues are those that relate to characterization, prediction of contaminant fate, human health or ecological risks, and risk management strategies for the site proper. Off-site issues revolve around –

- (i) the potential for past-release contaminants to move toward and beneath adjacent uplands areas, including residential areas;
- (ii) the potential for past-release contaminants to move into the Red River, including the embankment and seasonally wetted areas; and
- (iii) the impact of past-release contaminants (coal tar) that have already been deposited on the river bed.

2.1.1 On-Site Contaminant Assessment and Environmental Risk Issues Identified

Major issues identified in this sub-area are tabulated below, along with the proposed resolution:

Issue	Proposed Resolution
There is some confusion surrounding statements about observations on NAPL presence in various boreholes and monitoring wells.	The issue arises from new information received from investigations undertaken since 2005. MH to provide updated site representations in plan view and cross-section, documenting observed NAPL occurrences.
No other substantive issues identified to date	

2.1.2 Off-Site Contaminant Assessment and Environmental Risk Issues Identified

Major issues identified in this sub-area are tabulated below, along with the proposed resolution:

Issue	Proposed Resolution
Delineation of contaminated sediment made reference to the Canadian Council of Ministers of the Environment (CCME) Probable Effects Level (PEL) guideline, but not the more sensitive Interim Sediment Quality Guideline (ISQG).	Additional clarification required about limitations of ISQG application. In addition, clarification required that Management Plan is based on site-specific studies that are more directly applicable than use of generic CCME sediment quality guidelines.
Naphthalene (and benzo[a]pyrene) was used as the surrogate PAH for delineation of contaminated sediment.	Further detail on underlying rationale and implications to be provided.
A 3-D visualization of the coal tar contaminated sediment plume in the Red River would assist with planning exercises.	MH will evaluate feasibility of developing such a visualization.
Explanation required of the annual naphthalene loading estimates via the groundwater (and associated uncertainty) as well as the term "significant" as it relates to potential aquatic impact.	Explanation, updated estimates and detailed examination of uncertainties to be provided.
There was concern that a single estimate of groundwater transport velocities and hydraulic conductivity was used to estimate rate of	Additional discussion required of subsurface soil conditions, including hydraulic conductivities, the assessment of groundwater

Issue	Proposed Resolution
transport of coal-tar derived contaminants from the site to the Red River, based on dissolved phase transport. The estimates may be unrealistic relative to variations in subsurface conditions along the larger implicated flow path.	flow and preferential pathways. MH to clarify that contaminant flux estimates were based on different observed groundwater concentrations and K values at different zones between the site and outflow face.
“The till is apparently being considered as an impermeable base and there would be minimal contamination below the top of the till. These tills can be relatively permeable. Any ideas on the hydraulic conductivity of the till and how it compares to the overlying materials? “	Additional clarification of the vertical extent of soil and groundwater contamination and the expected influence of various soil strata or channels, including deeper till, to be provided.
A flow path diagram has not been developed, based on the cross-sections or water table elevation maps as presented. Is groundwater movement through preferential pathways or units? There was reference to an older report that said groundwater wasn't able to transmit to the river through the sand layers since these layers are not aerially extensive. Is this the same conclusion that is reached after additional drilling has been done?	Additional discussion/evaluation of groundwater flow paths is merited.
The reports lack sufficient information on surface water chemistry (see also comments in Section 2.2)	MH will arrange for collection of additional Red River water samples to assess surface water chemistry, especially at the sediment surface.
The risk assessment report indicated that there was a significant difference in macroinvertebrate density between various station groupings, but did not indicate whether there was a significant difference in sediment PAH concentration between the five groups (low, medium, high PAH levels; up-river reference; down-river reference).	MH will elaborate on the basis of interpretation of the sediment risk assessment by providing additional detail to what was provided in the risk assessment.
There was an assertion that the benthos data clearly show a site-related impact.	<p>MH elaboration on risk assessment will expand on the original intent to develop a site-specific remedial objective based on concentration-response relationships. The clarification will further discuss the statistical evaluations, including their power to detect site related impacts if present.</p> <p>The response will discuss the role of bioavailability, and how this influences links between chemical concentration and biological response. The response will also provide a review of experiences about aquatic life risks and bioavailability at other North American MGP sites.</p>

Issue	Proposed Resolution
Sediment samples from downstream reference stations exhibited much lower PAH concentrations than sediments from the areas adjacent to the Sutherland Site, although these samples exhibited PAH concentrations that were more than two fold higher on average than the upstream stations. Are these differences in PAH contamination significant?	Evaluation of statistical significance of differences in PAH concentrations for various station groupings to be undertaken and provided to TAC.
The report suggests that there is a separate PAH source affecting the sediment samples at the downstream sites. Could flow and scouring perhaps have carried more contaminated sediment that was adjacent to the Sutherland Site further downstream? If this is not plausible, what would be the other potential sources of PAH downstream?	Response to provide additional discussion of major processes that have and will likely continue to affect fate within the river bed of PAH-contaminated sediments from coal tar and other sources, including deposition, burial, scouring, and downriver transport. The discussion will describe techniques for differentiating coal-tar derived from other PAH source types (or non-point source inputs, including CSOs and storm sewers).
Clarification required of the relative impacts of the PAH impacted sediment adjacent to the Sutherland site relative to the urban Red River aquatic environment (relationship to PAH concentrations in the sediment to macro-invertebrate population).	Benthic biota risk assessment to be further explained. Some discussion about other potential sources of contaminants to the Red River to be provided.
Have human health risks associated with exposures in or adjacent to the Red River been assessed?	MH to provide additional quantitative assessment of human health risks associated with possible exposures of humans from coal-tar contaminated soil, sediment and water associated with other than soil vapour intrusion into on-site or off-site buildings.

2.2 Monitoring

The proposed management plan includes an ongoing monitoring component, and might include specialized studies. In addition, it may be necessary to develop contingency strategies for either (i) the re-evaluation of degree of impact, or (ii) potential influence of other planned activities on the status of contaminant distribution and risks in the river bed. The following comments relate to the monitoring program as either inferred from or proposed in the draft management plan:

Issue	Proposed Resolution
There is very limited information on the concentrations of PAHs or other coal-tar related contaminants in the water of the Red River as opposed to sediments, and this in turn undermines confidence in predictions about either groundwater-related releases from the site or re-mobilization to the water column from coal tar contaminated sediments.	MH will arrange for collection of additional Red River water samples to assess surface water chemistry, especially at the sediment surface. A spatial sampling pattern is needed to characterize up-river water quality to compare with water quality adjacent to or down-river from the site.
There is only limited information on Red River	The proposed monitoring program will be

Issue	Proposed Resolution
<p>water quality or sediment-water fluxes of PAHs seasonally within a year, or between years.</p> <p>Annual monitoring of the spatial extent and concentration of PAH in the sediments and monitoring of the benthic community every five years is not sufficient to detect environmental changes.</p>	<p>updated to better address intra- and inter-annual variability in exposure concentrations in the water column and down river.</p>
<p>Some previous reports make reference to a “doubling in size” of the coal tar contaminated sediment plume between 1995 and 1997, and made references to other changes in spatial extent of river bed contamination.</p>	<p>MH to clarify the relationship between observational techniques used in previous studies and the various assertions about spatial and depth extent of coal tar contamination in the Red River sediments. This will also include discussions about future evaluations of riverbed distribution.</p>
<p>While the draft Management Plan and supporting documents make reference to other sources of contaminants, including PAHs, to the Red River, no specific information is available.</p>	<p>Assessment of other sources of PAHs to the Red River would be based on inclusion in future water and sediment sampling programs of an expanded number of both up-river and down-river reference sites.</p>
<p>The effectiveness of the monitoring program should be re-assessed by incorporating elements of Environmental Effects Monitoring (EEM) to better assess changes to the aquatic ecosystem including toxicity testing of other aquatic species and evaluation of toxicological thresholds of/effects of PAH metabolites.</p>	<p>The proposed monitoring program will be re-evaluated relative to the particulars of the metal mining and pulp and paper EEM programs..</p>
<p>Explanation required for the proposed frequency of monitoring sediments, groundwater, aquatic biota and soil vapours.</p>	<p>Additional details of the monitoring program to be developed.</p>
<p>Results from two rounds of groundwater laboratory toxicity testing have been provided to TAC. These apparently employed different methodologies.</p> <p>Use of larval fathead minnows may be preferable to use of larval trout in groundwater bioassays, since the former are endemic species to the Red River.</p>	<p>UMA has clarified that the methods used to sample groundwater and develop the piezometers were the same for both programs. This will be clarified in writing.</p> <p>Updated proposed monitoring program will re-evaluate toxicity test species and methods that will be used to assess ongoing risks from groundwater-mediated transport.</p>
<p>There is a need to establish response levels for various forms of future risk management action, and the type of response that would be implemented.</p>	<p>Agreed. This will be provided for evaluation by TAC.</p>
<p>No detailed assessment was provided on the possible characteristics of and effects of re-distribution of the sediment plume as a result of Red River currents and ice scouring based on PAH concentration and spatial distribution.</p>	<p>A desk-top evaluation to be completed and provided, based on the current state of predictive knowledge.</p>
<p>MH should develop a communication and reporting plan in addition to Manitoba</p>	<p>A section outlining reporting and communication responsibilities will be provided</p>

Issue	Proposed Resolution
Conservation's regulatory reporting requirements, to keep all stakeholders informed (<i>Based on acceptance of the management plan, Conservation would issue a Director's Order that would include reporting requirements</i>).	as an addendum to the Management Plan.
Other activities might occur in the future that would disturb coal-tar contaminated soils and sediment.	Provide a more detailed explanation of contingency plans to address changes in land use and construction activities along the river bank and the Disraeli Bridge that would result in potential exposure to PAHs. In particular, it is recognized that relevant site conditions will require documentation and communication to anyone who might encounter them in the future.

2.3 Alternative Remedial Options

Major issues identified in this sub-area are tabulated below, along with the proposed resolution:

Issue	Proposed Resolution
No assessment completed to date of natural attenuation/bioremediation/bioavailability and release of PAH from the sediment over time, including releases due to ice scouring and flooding.	A scientific literature review will be completed to assess (i) rates of coal tar and PAH biodegradation in freshwater riverine sediments, (ii) factors that enhance or retard contaminant degradation rates in freshwater sediments, and (iii) expected effects on benthic infaunal macroinvertebrates relative to the currently documented riverbed conditions.
The draft Management Plan does not evaluate the possible range of remedial options for the uplands portion of the contaminated site.	Pros and cons, and especially need for active remediation of impacted soils and groundwater, will also be examined in more detail.
The draft Management Plan does not evaluate the possible range of remedial options for coal-tar contaminated sediments in the Red River.	<p>MH will provide a high-level (conceptual) assessment of the alternative remedial options that might be considered. For each option, the possible benefits of each approach will be listed, along with potential issues and/or critical success factors, including estimation of PAHs released and their potential impact to the aquatic environment; requirements for management of PAH impacted sediments removed from the river by dredging option, regulatory approvals required and limitations of alternative remedial options.</p> <p>Assessment of alternatives to include (i) sediment removal by dredging in the wet, (ii) removal in the dry after re-routing or excluding river water, (iii) barriers, and other. Advantages and possible limitations of "Limnofix™" will be</p>

Issue	Proposed Resolution
	discussed, along with other experimental and proven technologies, including information from other jurisdictions. The overall analysis will be conceptual only.
The draft Management Plan does not evaluate the possible measures that might be taken to curtail or reduce the movement of coal-tar associated contaminants from the uplands site into the Red River, either in dissolved phase or the non-aqueous liquid phase (NAPL).	MH will provide an updated assessment of other alternative remedial technologies including pump-and-treat, cut-off barrier walls, etc. to address sub-surface transport pathway.
Overall -	MH will establish response levels that would require consideration of implementing an alternative remedial option.

2.4 Miscellaneous Issues

Major issues identified in this sub-area are tabulated below, along with the proposed resolution:

Issue	Proposed Resolution
The term “approved backfill” was used in some of the reports. What does this mean?	Meaning to be clarified for reader.

3.0 Proposed Methodology

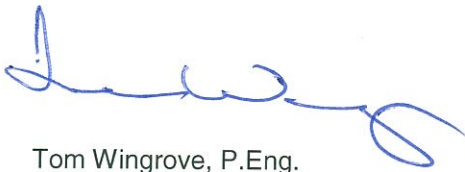
Some of the items proposed as resolutions to the larger TAC concerns have already been initiated. Collection of water samples at the sediment surface, for example, has been completed and will be provided to the TAC with other monitoring reports currently being completed. The proposed response to TAC comments respecting new data (i.e. EEM monitoring requirements, toxicity testing of other species, and metabolite analysis) will be addressed as potential modifications to the on-going remedial monitoring program. In accordance with the above work plan, the response to TAC comments will involve literature review and assessment of available information, interviews with technical experts and regulators, and preparation of figures and diagrams. Based on past and current monitoring data, the follow-up activities will include evaluation of groundwater flow direction, calculation of hydraulic gradients and estimation of groundwater flow velocities, and re-calculation of contaminant flux.

4.0 Proposed Schedule

An estimated 12 weeks will be required to review, assess and compile the response to the above-listed TAC concerns.

Respectfully Submitted,

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