



Stream G: Managing Environmental Projects

Environmental Remediation Projects, Common Elements for Successful Clean Up

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Experience with numerous contaminated sites has demonstrated the effectiveness of a fundamental system for employing the basic elements of environmental remediation. These components of site remediation have been known and understood for many years, but are often not followed, resulting in numerous projects that do not meet their remediation objectives.

Successful remediation depends first on adequate delineation of the site, characterizing both the extent of contamination as well as the structural and hydrogeologic features of the subsurface. Where possible, the history of contaminant occurrence needs to be evaluated to gain an understanding of contaminant mass loading and transport. Once these preliminary data are gathered for a particular site and contaminant occurrence, the remediation program can be appropriately designed for optimum effect.

Following site and contaminant characterization, the remediation manager's objective is to undertake the most efficient program of removing the greatest mass of contaminant with the least expense and effort. A flow chart has been developed to illustrate the prioritization and sequencing of remediation activities. This flow chart can be used by remediation managers to guide them through the sequencing of primary and secondary source removal; removal/degradation/fixation of dissolved phase contaminants; and, meeting compliance criteria for the site.

INAC's Revised Abandoned Military Site Remediation Protocol

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In March 2009 Indian and Northern Affairs Canada (INAC) finalized a revised protocol for the assessment and remediation of the abandoned military sites under its jurisdiction in the north. The Abandoned Military Site Remediation Protocol represents a significant update to INAC's previous approach for these sites. To develop the protocol INAC convened a Working Group to collaboratively review the current state of practice. The resulting document blends aspects of the Department of National Defence's DEW Line Cleanup protocol with the latest state-of-the-art knowledge on contaminants in arctic ecosystems and climate change. This paper will highlight the scientific approaches taken in developing key elements of the protocol. The discussion will also present the quality assurance approach INAC intends to take in monitoring the implementation of the protocol as part of the program's commitment to continual improvement.

Drivers for Site Remediation Illustrated by Examples

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The remediation of environmentally impacted sites is driven by unacceptable risks to human and ecological receptors and involves removing the sources of contamination and/or severing the exposure pathways that lead to unacceptable risk. However remediation programs on their own do not necessarily lead to properties that are amenable to future use. Remediation and future site use plans are best developed concurrently, in a symbiotic relationship in which both benefit from the drivers of the other. The development of future site use plans are influenced by the following factors:

- Future needs and planning of the property owner;
- Relationship between responsible party and property owner;
- The needs of the community and local government's planning strategies;
- The technical restrictions for remediation; and,
- Finances available for remediation and development.

The presentation will examine the site background and the remediation programs for five sites to identify the drivers for the remediation and future site use. The sites include the Love Canal in New York, the Willow Run Creek site in Michigan, a Former Manufactured Gas Plant site in Minnesota, the Centre Point site in Michigan and SYSCO Steel Plant Property in Nova Scotia.

Making Risk Based Decisions to Address Federal Liabilities Related to Contaminated Sites in the Northwest Territories

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In the Northwest Territories, Indian and Northern Affairs Canada has an approximate environmental liability of 600 million. The liability is the sum of the likely costs for remediating all known contaminated sites that are under federal responsibility. At these sites remedial methods are selected by using a risk-based decision process. For example, the remediation of Port Radium focused on reducing and in some cases eliminating physical and environmental risks. Physical risks consisted of public access to dilapidated infrastructure such as buildings and a headframe, and unmaintained heavy equipment; potential falls into open shafts or unstable crown pillars; and, access to unmaintained open adits. All physical risks were eliminated by the removal of infrastructure and equipment, capping shafts, backfilling or fencing crown pillars, and backfilling adits. Environmental risks consisted of ecological or human exposure to uranium rich tailings and contaminated water which pooled on top of the tailings and waste rock, exposure to the gamma associated with the waste rock and tailings, and exposure to asbestos particles associated with the former buildings which were burnt on site and remaining infrastructure building materials. Environmental risks were reduced through capping and engineered drainage improvements of tailings areas, capping of elevated gamma waste rock areas, and asbestos removal. Contaminant transport offsite consisted mainly of site drainage through the waste rock and tailings areas. These risks to the nearby environment were reduced through engineered capping of shoreline tailings area and drainage improvements throughout the site. The complete remediation and liability reduction at Port Radium was \$6.8 million. Remediation at other sites resulted in a similar change in physical and environmental risk and liability reduction.

Project Closure Procedure for Site Remediation and Risk Management Projects

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Indian and Northern Affairs Canada (INAC) manages the environmental remediation and risk management of a large number of contaminated sites, located in the Canadian North, that are funded under the Federal Contaminated Sites Action Plan (FCSAP). As the remediation of several of the sites under its management was nearing completion, it was recognised that a procedure for Contaminated Site Remediation Project Closure needed to be developed for INAC's use. Realising that a process for project closure has already been developed by Public Works

and Government Services Canada on behalf of FCSAP as part of the overall project management tool set for contaminated sites, INAC and CLAW/Golder Associates Ltd. set out to apply this procedure and adapt it as necessary to suit the needs of the department.

Based on discussions with stakeholders within the department, it was apparent that project closure documentation would have to focus on two distinct audiences, one comprised of external stakeholders such as the local community, aboriginal groups and licensing boards, and the other comprised of internal stakeholders including INAC and the Treasury Board of Canada, Secretariat.

The procedure focuses on the creation of a Project Closure Report that meets the needs of both sets of stakeholders. The aim of this Project Closure Report is to document the history of the remediation project that was undertaken and completed at a site by describing what was planned, what was actually completed at the site and what remains outstanding. The Closure Report focuses on remediation activities completed under the FCSAP program. It provides a 'snap shot' of the physical condition of the site at the time this report is produced (i.e., the end of the project).

The Closure Report also outlines the on-going monitoring and/or maintenance requirements for the site that need to be carried out after the remediation project is completed. It identifies internal INAC divisions or branches and/or external organisations that are intended to assume responsibility for these on-going requirements. It also clearly identifies permanent site features such as tailings caps or solid waste landfills that will remain on the site post-remediation that will require protection in the future in order to safeguard the Crown's investment.

Finally, another aim of the Project Closure Report is to evaluate the overall performance of the project at a high level such that best practices and lessons learned can be identified, documented and ultimately put in practice by the organization on other projects.

Document Management in the 21st Century

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The role of the Independent Engineer (IE) for the Sydney Tar Ponds Cleanup is generally to protect the interests of the federal government and Nova Scotia provincial government as well as the people of Canada and Nova Scotia, by performing third party due diligence with respect to health and safety, quality, financial, and schedule for the Tar Ponds and Coke Ovens Remediation Project (Project). This role requires the exchange of thousands of emails, letters, and reports. To date, half way through the Project the Independent Engineer has on file approximately 10,000 records. This number should more than double by the end of the Project.

To maximize the efficiency of the IE review role through the life of the Project, the IE has developed systems of libraries and databases to manage the exchange of correspondence (such as letters, e-mails, and memorandums) and documents (such as design reports, tender documents, and RFP's). Furthermore, the IE maintains a detailed "Comment Database" which enables them to track the status (open, closed, deferred) of individual Independent Engineer questions and responses to these questions that the Independent Engineer generates as part of its ongoing role. This database contains over 3,000 comments with the associated responses. A third database tracks the Independent Engineer's observations of construction activities. As well, customized spreadsheets facilitate effective change management tracking, enabling contract managers a direct link to change order documents and current contract commitment information. Tracking project data in electronic format requires foresight and planning but can save much time and money through the life of a Project.

The presentation will review the evolution of document management – from filing cabinets to detailed spreadsheets and relational databases, with emphasis on a description of the IE tools used.

Project Planning and Quarterly Progress Reporting Against Plan

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Indian and Northern Affairs Canada (INAC) manages the environmental remediation and risk management of a large number of contaminated sites, located in the Canadian North, that are funded under the Federal Contaminated Sites Action Plan (FCSAP). As FCSAP was approved in 2005 and INAC's Northern Contaminated Sites Program (NCSP) was expanded, more formal project management processes were introduced to enhance and standardize the planning and execution of projects. Two of these processes involve the development of project detailed work plans and quarterly reporting against plan.

An initial detailed work plan (DWP) is prepared for newly approved projects that are estimated to cost over \$250K (i.e., most of NCSP's projects). The DWP documents the site issues to be addressed by the project, and then sets out to describe the objectives, scope, risks, plan, team, delivery strategy, controls, schedule and resource requirements for the project. The plan is peer reviewed before being finalized and approved by Senior Management. Once approved, the DWP becomes both a plan for executing the project and a project charter between the Project Manager and NCSP Management. The DWP is updated annually (or more frequently if planning assumptions change significantly during the year). The annual update provides an opportunity: to add more detailed information on risk, plan, cost, schedule, etc. that may have become available (i.e., as the project progresses from remediation strategy development to design, procurement and implementation); to reconcile plan vs. actual achievements for the previous year; and, to document lessons learned.

Quarterly Reports (QRs) are produced to document and communicate progress during the quarter. QRs track the progress of the work, using a standardized work breakdown structure, against planned schedule and cost. The reports also document performance against a number of performance indicators (i.e., environment, health and safety, socio-economic benefits, stakeholder engagement). An executive summary allows the Project Manager to summarize, at a high level: the progress being made; any deviations from plan and the reasons and measures planned to address these deviations; and, any significant concerns that threaten the achievement of project objectives. QRs are addressed to and for the information of NCSP management; a high-level summary (i.e., dashboard) is prepared at the program level to facilitate review and action by management.

Innovative Uses of GIS as a Project Management Tool

Belinda Campbell, Public Works and Government Services Canada

Public Works and Government Services Canada (PWGSC) Atlantic has been developing innovative ways of using web-based GIS management tools since 1994. From major crown construct projects, to complex remediation programs and nation-wide business programs, web-based GIS software has provided PWGSC with an efficient and remote access based system that provides a single, secure, audit ready, repository of geographic and textual data with direct remote population, query, analysis, reporting and dissemination capabilities. The innovated use of this application with other off the shelf applications has enabled multiple levels of government and private industry to exchange information quickly and efficiently in a safe and secure web-based environment using Autodesk MapGuide, ESRI ARcServer, SQL Enterprise and Oracle database technologies. Linked with other software such as MS Share Point, PWGSC has managed projects of complexity such as the Confederation Bridge construction project, remediation projects such as the Sydney Tar Ponds and Coke Ovens Project, DEVCO mine closure and Argentia naval base closure, to the national business structure of the Accelerated Infrastructure Program. The approach provides an ongoing project management tool in spatial organization and presentation that is efficient and easy for multi-level usage.

Enabling Remedial Solutions through Innovative Procurement

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Quantum Murray LP was awarded a contract by Public Works and Government Services Canada (PWGSC) on behalf of Transport Canada in October 2008 to remediate a five hectare surplus seaway property in St. Catharines

with approximately 26,000 tonnes of near surface soil impacted by hazardous concentrations of lead as well as polycyclic aromatic hydrocarbons (PAHs) deriving from the historical operations of a skeet shooting range. The surplus property is to be divested for redevelopment purposes. Procurement used a Request for Proposal with evaluation criteria that was utilized by PWGSC and Transport Canada to choose the remediation approach from the environmental contracting community and to maximize the benefits of the treatment methods available. Details of the stabilization remediation approach utilized at the St. Catharines project will be provided along with a description of how Quantum's remedial solution proposed a 35% savings while also satisfying the schedule requirements and stakeholder objectives for the tendered project scope.

Putting the VALUE in Value for Money

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An underlying objective of government spending is often described as the desire to receive value for money. Value is difficult to measure and is frequently a matter of perception. Value does not have a unique metric that can be measured and reported. There are at least two major components of value that are related to government spending. The first opportunity to create value is strategic. Strategic value arises from the selection of projects that get funding and their order of priority. Strategic value reflects the implementation of government policy. The second opportunity to create value for money comes at the implementation stage. Implementation value is created by ensuring that the funded project is efficiently completed. As managers and overseers of funded projects it is our collective responsibility to ensure that implementation value is realized. This paper will focus on achieving implementation value.

Implementation value for an environmental remediation project is a function of cost, schedule, and quality of the end product. When a scope of work is defined and the desired quality is specified the schedule and cost can be calculated. In most cases the specified quality with the calculated cost and schedule defines the balance between these inputs with the highest implementation value for a given scope of work. In a few special cases budget and or schedule may be fixed and quality must be adjusted to achieve the desired implementation value. In every case, quality is the key input to defining and demonstrating implementation value and in most cases quality is the value input function that does not receive the appropriate level of attention from implementers. This paper will define the importance of quality in achieving value for money and describe how quality measurement and reporting can be built into an environmental remedial action at the program level and at the design, specification and construction implementation level. The role of quality in support of the principle of transparent accountability will also be discussed. Measurement and reporting of value for money will be supported with examples.

Getting on the Same Page: A Practical Tool for Inter-Agency Collaboration in Risk Communication

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Government agencies often face the difficult task of communicating risk-based information to concerned stakeholders. As public awareness of environmental risk increases, so does the need for effective risk communication. Establishing and building credibility is critical to ensure successful communication with a concerned public.

Risk communication can be significantly more challenging when two or more departments within an organization (for example, the Government of Canada) are jointly involved in responding to stakeholder concerns. Involved departments or programs are often responsible only for limited aspects of an issue, or differ in their priorities, goals, policies or precedents. Therefore, responses must be co-ordinated in order to avoid inconsistent messages being delivered to external stakeholders. A successful multi-agency risk communication program will reduce the likelihood of stakeholder confusion and project delays, and promote credibility for the process and the organizations involved.

This paper describes a simple tool and process that multi-agency groups can use to identify their stakeholders' concerns and prepare co-ordinated responses. This tool, the Response Matrix, has been used effectively by the authors to assist clients in recent national risk controversies in Canada.

Guidance and Orientation for the Selection of Technologies (GOST)

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A new web based tool is available to assist project managers in selecting potential remediation technologies for their sites. The **Guidance and Orientation for the Selection of Technologies (GOST)** site can provide a list of site and contaminant appropriate technologies based on user supplied data (Technology Selection Tool), detailed Fact Sheets covering over 60 remediation technologies and links to additional resources.

The Technology Selection Tool will provide a list of technologies appropriate to the specific site based on a questionnaire completed by the site manager. Information such as contaminant type, concentration and depth, hydrogeology, environmental matrix, etc. is entered and a customized list of appropriate technologies is created. Details regarding each technology can then be accessed through individual Fact Sheets, currently numbering over 60, which provide information on technology application and limitations, target contaminants, complementary technologies, analyses required for detailed site characterization, case studies and references for that technology. GOST is the Canadian reference tool for project managers involved in site rehabilitation and remediation, providing invaluable information on technologies targeting contaminated site cleanup in Canada.

The online tool was developed for Public Works and Government Services Canada (PWGSC) by a multi-disciplinary team composed of experts from the Biotechnology Research Institute of the National Research Council of Canada, the Montreal Centre of Excellence in Brownfields Rehabilitation and the private sector.