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Phase II Assessments and Phase III Remediation: A Brief History

Abstract

In this paper, we review the development of Phase II Assessments and Phase III Remediation science over the last thirty years: what aspects have improved, and what aspects have not improved. A review of samples of recent work indicates that the application of sampling science is inconsistent at best. The paper suggests minimum scientific standards to which Phase II Assessments and Phase III Remediation should subscribe.

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Discussion

When looking at their first well site to clean up in 1980, the authors did not know exactly where to start. It bounded Waterton Park, and was a highly eroded sandy site, with a well head and a few surface facilities, and little else. At that time, we were not even sure what to sample for.

A few years later in 1984, we were only a bit more sophisticated. We knew we had problems, just not the scale of them. Mark remembers walking around Nevis Gas Plant with an old timer who had worked at the plant since its opening, as we carried out something quite new called a 'waste audit'. He pointed out all the places material had been buried in unlined, unmarked pits, because 'that is the way it was done'; and while we sensed there was a problem, the quantification of that problem was challenging. In those days, sampling would include tasting soil for hydrocarbons or salt.

We did not know what we were doing. Now we should. Specific degree and diploma courses are geared toward site assessment and remediation. Standards are in place. Yet the failures of our work are manifest. Let's review.

Phase II assessments and Phase III remediation have come a long way in Alberta since the 1980s in some areas:

- 1981: First site, not even knowing what to do
- 1985: Tasted dirt, to see if it was salty or oily
- 1993: Segregation in the Environmental Protection and Enhancement Act (EPEA) of remediation and reclamation

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- 2003: Professional sign off of upstream Oil & Gas (O&G) reclamation certificate applications
- 2008: Records of Site Conditions established
- 2009: Remediation Certificates established
- 2012: Phase II standards (though dated)
  - Good labs
  - Suite of disposal facilities
  - Specific post-secondary education programmes

In other areas, though, Phase II assessments and Phase III remediation have not progressed. In 2012, as part of a review of Phase II and III reports carried out on over 2,100 oil and gas sites, we witnessed a variety in the quality and approaches to the art of Phase II and Phase III science.

Our concerns are borne out by the following data from Alberta Environment and Sustainable Resource Development (AESRD). AESRD audits upstream oil and gas sites for which certificates have been granted following reclamation (surface) and remediation (contamination).

Table 1 Failure Rate of AESRD Surface and Contamination Audits (GoA, 2010)

Alberta Environment/SRD Surface Audits	2003 to 2011	9%
Alberta Environment/SRD Contamination Audits	2003 to 2011	28%

With this level of failure, consultants, especially those stamping remediation and reclamation certificate applications, are putting themselves at the risk of:

- Damaging their reputation and that of their professional organization
- Claims by upset clients
- Charges under EPEA
- Extended clean up costs through further damage to the environment

In the work we reviewed for this paper, much of the Phase II and III environmental assessments were well done.

We saw some outstanding work in the area of:

- 3D modelling
- Rigorous methods
- Good delineation and admission of incomplete delineation

- Remote assessment (Air & EM)

Other Phase II and III environmental assessments, however, were not well done. Our big concern was the inconsistency of basic scientific principles applied to the work, particularly in the area of Reproducibility (Precision).

For instance:

- Incomplete delineation yet volume estimates made anyway
  - No field screening
  - Insufficient analytical data
  - Poorly done field screening
- Poor reproducibility
  - No georeference or survey data
  - Poorly written methods

We do not disregard the challenges. The geographically disparate sites, each relatively small, their remote access, and a tendency to send out the most junior staff into the field might all contribute to the failure rate one sees. However, basic scientific method remains the same.

Let's make scientific rigour the standard. All stakeholders have a role in improving the scientific standards of Phase II and III environmental assessments. In this context, it would be helpful to make reports public where it does not compromise a client's confidential requirements.

Owners of contaminated sites should not put up with poor work. Wherever, possible should reject poor scientific performance by hiring internal personnel with enough knowledge of contaminant science to be able to assess Phase II and III environmental assessments. For larger clients, the clients themselves should establish strict sampling protocols, and very well defined terms of reference. Lastly, clients, along with other stakeholders, would benefit by assisting schools with environmental sampling programmes both financially and especially with curricula.

The Alberta Government should consider enhancing the audit programme reporting. Indeed, it would be helpful if the Alberta Government would parse the results of their audits to determine what is causing failure. Publications and workshops would spread the knowledge of their findings and recommendations for improvement. They should lead industry by updating and developing standards. We have found the Government of Alberta good at reaching consensus, and the ability to bring in the required expertise to help raise the standard.

Mandatory registration of Phase II and III environmental assessment reports on the Environment Site Assessment Registry should be considered. This will allow public and peer scrutiny of all work.

Consultants should continue to work on QMS and standardized procedures that are reproducible (more precise), and accurate. The methods must be clearly laid out in their reports. All sampling points must be georeferenced, and volume estimates should not be made unless the site is delineated. Every report needs to be written to bear the scrutiny of peer review. Consultants should demand field screening equipment that is both accurate and precise as well.

If one holds that the purpose of Phase II and III work is to assist the parties responsible for the contamination to make decisions that will limit the party's liability and protect the environment, then it is incumbent on consultants to provide them with the best scientific work so the responsible parties can make the best decisions. This commitment to scientific integrity will reduce the risks of claims and censure.

Professional and Technical Organizations have a critical role in the improvement of remediation science. They can provide guidelines on quality management, scientific rigour, cross-company technical review, standard operating procedures, and a forum to have annual reviews, reach consensus on key issues and work with educational institutions to improve programmes.

Lastly, a debate involving all stakeholders should ensue on the 'right' way to manage contaminated sites. We have heard a variety of arguments over the years related to responsibility, timing, location (off-site or not), level of clean up and cost (including the "time value of money" argument). This discussion is as much a philosophical and legal debate as a technical one. What does 'polluter pays' really mean? How long can owners of contamination wait to clean up sites? Is there a moral hierarchy in approaches to contaminated sites? Does complete cleanup trump 'dig and dump' (long term storage in landfills?), which trumps risk management? Are there exceptions? What are the triple bottom lines to each approach (social, environmental, and economic)? Who is best placed to judge the right triple bottom line balance? There is some urgency in this, as this issue often does come up in court and in acquisition assessments.

REFERENCES

Alberta Environment and Sustainable Resource Development. 2011. Environmental Site Assessment Registry (ESAR). Frequently Asked Questions. Environment.alberta.ca/01522.html accessed, 2012 October 7

Environmental Law Centre. 2004. A Review of Regulatory Approaches to Contaminated Site Management, prepared for Alberta Environment

Government of Alberta (GoA). 2010. Field Audit Results Table. 4/31/2010

Government of Alberta. 2011. Update Report On Alberta Environment and Water's Upstream Oil and Gas Reclamation Certificate Program March 31, 2011

Reclamation Criteria Advisory Group (RCAG). 2011. 2010 Reclamation Criteria for Wellsites and Associated Facilities for Cultivated lands (Updated June 2011) for Alberta Environment http://environment.gov.ab.ca/info/library/8362.pdf accessed, 2012 October 7