Competencies for Remediation and Reclamation Advisory Committee

Recommendations Report
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Advisory Committee
Recommendations Report

Prepared by:

Alberta Environment

February 2006
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Overview of this Report

The Competencies for Remediation and Reclamation Advisory Committee (CRRAC) initiated work in September, 2005. The Committee identified competencies required to conduct remediation and reclamation work, as a first step toward establishing a delegated “sign-off” process for site remediation and reclamation.

The Committee’s work addresses competencies for a full range of remediation and reclamation sites. It recommends competencies that have general application to all sites, and provides an additional description of related tasks often required for successful reclamation of upstream oil and gas sites.

Membership

The Committee consisted of the following representatives:

- Terry Forkheim  Alberta Institute of Agrologists
- Tim Waters  Alberta Society of Engineering Technologists
- Rob Staniland  Alberta Society of Professional Biologists
- John Banks  Association of the Chemical Profession of Alberta
- David Williams  Association of Professional Engineers, Geologists and Geophysicists of Alberta
- Calvin Leithead  College of Alberta Professional Foresters
- Chris Walsh  College of Alberta Professional Forest Technologists
- Adrian Pritchard  Alberta Human Resources and Employment
- John Begg  Alberta Sustainable Resource Development
- Greg Smith  Alberta Environment
- Don Watson  Alberta Environment
- Darlene Howat  Alberta Environment (chair).

Bill McMillan (Equus Consulting) acted as facilitator.

Future Requirements

Determining the academic and professional requirements necessary to “sign-off” a reclamation certificate will be reviewed by a committee, following acceptance of these recommendations.
Summary of Results

The Committee produced a table describing the tasks that must be completed in order to assure successful remediation and reclamation. As this report is submitted, this is the most comprehensive listing of tasks available.

In order to avoid repetition, the Committee identified the tasks and competencies required to ensure completion of the tasks listed in the table. They are organized into three categories: context, core knowledge and abilities, and quality assurance.

As the tasks were described, the Committee also identified any specific knowledge and experience required to ensure competent completion of the task.

Use of the Competency Tables

It is anticipated the competency tables will be used as a:

- Foundation for the development of a professional sign-off process and qualifications description;
- Basis for hiring staff for reclamation and remediation work;
- Basis for developing appropriate training and orientation for people doing reclamation and remediation work; and
- Checklist supporting a government audit of the remediation/reclamation work.

*Note: Auditors are still required to use judgment in determining which tasks are required, whether a task was appropriate and, if so, whether it was completed in an acceptable manner.*
INTRODUCTION

The following tables list the tasks and knowledge required for competent remediation and reclamation of sites in Alberta. The introductory sections—Context, Core Knowledge and Abilities, and Quality Assurance—are integral to the tables that follow and integrated with the competency listing.

CONTEXT

The list of competencies that follow must be interpreted within the following context:

- The process is multi-disciplinary and is usually carried out by a project team. This document addresses the competencies of the project team, which are the sum of the skills of the individual practitioners. Generally, one practitioner will not have all of the skills.
  - Many field practitioners are learning the work on the job and are paired with more experienced practitioners to aid the learning process.
- Remediation and reclamation tasks and competencies apply to activities on agricultural and natural lands, as well as residential, industrial and commercial sites (which are often in urban settings).
- The majority of sites can be addressed without specialized approaches. It is essential, however, that the team is able to recognize the minority of sites that do require specialized approaches. Unique biophysical, chemical, geotechnical or hydrologic circumstances may require the practitioners to use specialized knowledge and approaches.
- Conservation success is closely linked to initial construction and operation practices used on the site, especially when agricultural or natural land is converted to industrial use. Competencies associated with this are described in Attachment 1.
- Communication with the landowner/occupant, client and regulator during the entire process is very important to the success of the result (especially if there are special requirements on site, or adjacent land uses that require special consideration).
- Record keeping is important to support the accountability of the sign-off process.
- Professional organizations play a critical role in improving public acceptance of remediation and reclamation practices in Alberta.
- All practitioners working on remediation and reclamation must have appropriate safety training.
- The following tables recognize that remediation and reclamation activities focus on these primary media: soil, surface water, groundwater.
  - Reclamation objectives vary by site end use (addressed in the tables). Examples include revegetation and geotechnical considerations.
  - Air quality may also be a consideration (not addressed in the tables).
CORE KNOWLEDGE AND ABILITIES

The team of practitioners working on remediation and reclamation of a given site must have the following core knowledge and abilities, in addition to specific technical knowledge:

- Knowledge of the legislation, regulations and guidelines, or approval-specific requirements that apply to remediation and reclamation work.
- Knowledge of information sources relevant to the site that could affect remediation and reclamation success.
- Ability to prepare reports and documents as necessary, and review them to ensure accuracy, clarity and completeness.
- Knowledge of remediation/reclamation process and protocols.
- Ability to read and understand survey and map information.
- Communication skills (ability to communicate with landowner, client, contractors and regulators).
- Team skills (project management, shared goals, team make-up, team operations, shared knowledge of accountability of other team members, trust).
- Knowledge of physical, chemical and biological processes and their interaction.

QUALITY ASSURANCE

The following tables are based on the requirement that a practitioner leading remediation and reclamation must have acceptable education and experience relevant to the task. In some cases (where noted), specific professional qualifications will be required. Quality assurance is an important aspect of the work. The following quality assurance measures will be commonly employed:

- Advance training that alerts practitioners to the most common situations they will face during reclamation activities, and also to the situations that will most likely require reference to a specialist.
- Peer support and consultation: Less experienced practitioners will be given support such as on-site coaching, a “second opinion” or peer review by more qualified practitioners.
- Task-observed competency: Learning practitioners should be observed by a qualified practitioner (i.e. someone already accepted as having the necessary competency) and verified as having the skills to perform the reclamation/remediation task. It is assumed that verification would be applicable for each of the identified reclamation/remediation stages.
- Performance audit by supervisor: Sufficient review of work by supervising practitioner to determine whether the reclamation/remediation work has been adequately performed.
- Performance audit by government regulator: Government regulator review/audit of written reports is intended to assure that work has been adequately performed.
- Use of standard field tests and assessment protocols; use of standard tests by accredited laboratories to ensure that test results are accurate and repeatable. *Competencies required for analysis and reporting of laboratory data are largely addressed through laboratory accreditation (CAEL, SSC, AIHA).*
- Selection of appropriate practitioners for the task. Referral to specialists when the situation requires specialized knowledge.

Qualifications = Experience + Education + Training
# 1. REMEDIATION AND RECLAMATION COMPETENCIES

## PHASE I ENVIRONMENTAL SITE ASSESSMENT (ESA)

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain, review and interpret site history (must know infrastructure</td>
<td>Practitioner must have task-related knowledge and experience (or supervision)</td>
<td>Determining Phase II requirement requires a qualitative evaluation of</td>
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<tr>
<td>types and types of contamination that could result):</td>
<td>Knowledge and experience regarding risks associated with evidence of contamination</td>
<td>risk</td>
</tr>
<tr>
<td>Facilities and infrastructure</td>
<td>(particularly the equipment, infrastructure and practices associated with them)</td>
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<tr>
<td>Process flow diagrams</td>
<td>Familiarity with chemical fate and transport in soil and groundwater</td>
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<td>Chemicals handled and stored</td>
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<td>Waste streams (chemicals applicable)</td>
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<tr>
<td>Potential emission sources</td>
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<td>Research site operational records (include regulatory records)</td>
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<td>Research site historical information (e.g. air photos, maps, land</td>
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<td>titles, surveys, municipal records)</td>
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<tr>
<td>Interview practitioners with potential knowledge about site</td>
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<tr>
<td>Document adjacent land use: potential receptors, potential sources of</td>
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<td></td>
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<tr>
<td>contamination</td>
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<tr>
<td>Site reconnaissance must be undertaken to:</td>
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<tr>
<td>Identify any surficial evidence of contamination</td>
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<tr>
<td>Assess potential contamination risks on-site</td>
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<tr>
<td>Confirm status of any remaining equipment or infrastructure</td>
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<td></td>
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<tr>
<td>Identify potential receptors</td>
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<tr>
<td>Document adjacent land use: potential receptors, potential sources of</td>
<td></td>
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<tr>
<td>contamination</td>
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</tbody>
</table>

Determine whether a Phase II ESA is necessary

If remediation has occurred, then assess laboratory findings and confirm effectiveness of remediation
PHASE II ENVIRONMENTAL SITE ASSESSMENT (ESA) *(in addition to Phase I ESA competencies)*

<table>
<thead>
<tr>
<th>Tasks*</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Review and interpret Phase I ESA | ▪ Knowledge of distribution, fate and potential migration of contaminants in the environment  
▪ Ability to recognize potential for groundwater impact  
▪ Knowledge of tools, specialists available and data objectives  
▪ Knowledge of, and experience with, investigation and sampling methods  
▪ Ability to determine data quality objectives and assess whether they are met  
▪ Recognition of increased potential risk, liability and off-site considerations in urban areas | Team must include practitioners with an appropriate range of skills, matched to the site requirements.  
Certain tasks may require a higher degree of specialization.  
Practitioners will identify when additional specialized knowledge (not already included in the team) is required.  
There may be higher level data quality objectives in urban sites depending on site sensitivity. |
| Design a plan to locate, delineate and quantify contaminants on and off site  
▪ Soil and stratigraphy  
▪ Surface water  
▪ Shallow groundwater  
▪ Aquifer  
*All following tasks assume this full range has been addressed.* | | |
| Identify complex versus simple situations  
Involve appropriate specialists in the design and implementation of sampling if observations cannot be readily explained or bounded | | |
| Oversee implementation of sampling, maintenance of sample integrity, and testing of samples | | |
| Involve appropriate specialists in the interpretation of analytical data  
(This may include an assessment of laboratory analysis) | | |
| Interpret site conditions, results of chemical analyses, and fate and transport of chemicals | | |
| Risk and receptor evaluation to determine portion of site that:  
▪ Meets generic guidelines  
▪ Warrants site-specific objectives  
▪ Requires remediation | | |
| Risk and receptor evaluation to determine potential off-site effects | | |

* There are frequently two stages:  
(1) assessment or confirmation of contamination issues, and  
(2) complex delineation and supplemental work in support of a remediation plan (soil and/or ground water).  
The second stage requires more specialized competencies (see notes above).
## REMEDIATION

<table>
<thead>
<tr>
<th>Tasks*</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Address concerns related to:  
  - Soil and stratigraphy  
  - Surface water  
  - Shallow groundwater  
  - Aquifer  
| ▪ Knowledge and experience with fate and effects of contaminants  
▪ Know and understand scientific basis of remedial methods and suitability for contaminants present  
▪ Awareness of cost-effectiveness of technologies for specified applications  
▪ Ability to identify need for specialists  
| Team must include practitioners with an appropriate range of skills, matched to the site requirements.  
Certain tasks may require a higher degree of specialization.  
Practitioners will identify when additional specialized knowledge (not already included in the team) is required.  |
| Risk and receptor evaluation to determine portion of site (or environmental media) that:  
  - Meets generic guidelines  
  - Warrants site-specific objectives (risk assessment)  
  - Requires remediation  
  - Requires risk management (ongoing)  
| Conduct risk assessment if appropriate:  
  - Ecological  
  - Human health  
| ▪ Has experience with remediation technology and equipment  
▪ Has expertise in relevant waste management  
▪ Able to recognize potential changes in scope of remediation  |
| Determine suitable technologies for remediation (timeframe, cost, effectiveness, emissions, legislative requirements and authorizations)  
| Compose a remediation plan (define outcomes; identify and respond to stakeholder concerns; define sequence of activities for appropriate remediation; manage emissions; establish monitoring and confirmatory requirements)  
| Identify requirement for appropriate specialists  
| Develop a risk management plan where appropriate (not applicable for reclamation certificates)  
| Implementation of Remediation Measures:  
  - Interpret, and comply with, remediation plan  
  - Adapt plan if required (may include reporting back to remediation planner)  
  - Confirm results through sampling  
  - Keep written and photographic records of remediation activities  
| ▪ Has experience with remediation technology and equipment  
▪ Has expertise in relevant waste management  
▪ Able to recognize potential changes in scope of remediation  |
## RECLAMATION

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify end land use and stakeholder concerns</td>
<td>• Knowledge of, and experience with, equipment operations and limitations</td>
<td>• May have to segregate the qualifications and competencies as they are related to specific task/activity</td>
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<tr>
<td>Assess site and resources (e.g. salvaged reclamation materials) that affect reclamation options</td>
<td>• Knowledge of, and experience with, terrain, soil, drainage (soil water holding) and vegetation interaction</td>
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<tr>
<td>Interpret existing site information (e.g. pre-construction site assessment, existing environmental information, soil survey, etc.)</td>
<td>• Knowledge of, and experience with, land use issues (weed management, natural recovery, appropriate revegetation, etc.)</td>
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<tr>
<td>Create a reclamation plan (describe order of work and work options, treatment of soils, revegetation strategy, and contingencies for problem site conditions such as sub-surface and surface drainage)</td>
<td>• Knowledge of, and experience with, historic construction and operation practices</td>
<td></td>
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<tr>
<td>Supervise equipment operations where necessary</td>
<td>• Knowledge of current reclamation methods and ability to select appropriate method for environmental conditions and end land use</td>
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<tr>
<td>Assess adjacent topography, infrastructure and drainage in relation to site</td>
<td>• Able to identify issues that require specialist intervention</td>
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<td></td>
<td>• Knowledge of soil, water, vegetation, topography, and the interaction between these parameters, and the operational requirements to address them</td>
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</table>

Note:

Reclamation means:
- For “specified lands” (EPEA): returning the site to equivalent land capability, as referenced in current standards.
- For urban and industrial sites: putting the site into a state suitable for future redevelopment.
### POST-RECLAMATION SITE ASSESSMENT (where applicable)

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Determine if land use objectives and stakeholder concerns are addressed | ▪ Ability to interpret land use characteristics and limitations/ sensitivities relevant to the objectives  
▪ Ability to discriminate and describe soil, vegetation and terrain conditions  
▪ Knowledge of, and experience with, sampling protocols and statistics and medium  
▪ Knowledge of natural variability and the ability to determine third party impacts  
*An understanding of past, present and potential future objectives may be needed* | ▪ Objectives may be time-sensitive                                                    |
ATTACHMENT 1
UPSTREAM OIL AND GAS SITES—RELATED TASKS THAT MAY AFFECT RECLAMATION SUCCESS

Conservation success is closely linked to initial construction and operation practices used on the site. These practices are usually conducted by other parties long before reclamation and remediation takes place, and are not typically the responsibility of remediation and reclamation practitioners. The practices that are most likely to affect conservation success are included in the following tables, however, because they are relevant to reclamation and remediation process. Conservation practices listed below will not be “signed off” by professionals, as specific practices can rarely be confirmed after the fact.

Choice of site location prior to original construction can simplify the later success of reclamation and remediation by identifying and addressing sensitive landforms, soils, land uses, water bodies or habitat issues. Remediation and reclamation practitioners must be able to identify and deal with such complications, but there is no “sign off” on previous location planning.

Communication with the landowner/occupant, client, contractors and regulators during the entire process is very important to the success of the result (especially if there are special requirements on site, or adjacent land uses that require special consideration).

Core competencies for the following tasks are defined in Core Knowledge and Abilities (see main recommendations paper).

<table>
<thead>
<tr>
<th>SITE LOCATION</th>
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</thead>
<tbody>
<tr>
<td><strong>Tasks</strong></td>
</tr>
<tr>
<td>Identify restrictive landforms, water bodies or habitat issues, archaeology factors, etc. that affect site location</td>
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<tr>
<td>Create a plan to avoid these sensitive areas</td>
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<tr>
<td>Interpret environmental legal and regulatory requirements that affect site location</td>
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<tr>
<td>Consult landowner/occupant about appropriate locations</td>
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<tr>
<td>Create a site layout map</td>
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</tbody>
</table>
### PRE-CONSTRUCTION SITE ASSESSMENT

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Assess landscape and determine limitations for facility, access and activity locations (limitation includes legislative and physical concerns, including sensitive sites)</td>
<td>▪ Knowledge of the range of variance in soil characteristics in the region</td>
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<tr>
<td>▪ Assess landscape and soil conditions prior to disturbance (i.e. soil characteristics for construction handling and reclamation, drainage considerations for construction and reclamation)</td>
<td>▪ Experience with specialized soil handling and drainage requirements</td>
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<tr>
<td>▪ Choose or design soil handling procedure and grading plan (Note that design means a site-specific approach is needed, rather than a typical approach)</td>
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<td>▪ Determine whether specialized assessment is required</td>
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### CONSTRUCTION PLANNING AND SUPERVISION

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
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<tbody>
<tr>
<td>▪ Prepare/interpret a soil handling and site drainage plan</td>
<td>▪ Knowledge of soil, water, vegetation, topography, and the interaction between these parameters, and the operational requirements to address them</td>
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<tr>
<td>▪ Identify specialized requirements and equipment</td>
<td>▪ Understands environmental limitations and can direct best response to these limitations (soil type, soil moisture conditions at handling, winter soil)</td>
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<tr>
<td>▪ Determine best option to conserve soil and habitat/growing capability</td>
<td>▪ Understanding of capabilities and limitations of equipment</td>
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<tr>
<td>▪ Identify sump and deep subsoil issues and recommend ways to mitigate impacts</td>
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<td>▪ Determine need for, and direct implementation of, contingency plan</td>
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<td></td>
<td>▪ Training or on-site coaching in proper soil handling</td>
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<td></td>
<td>▪ Refer to best management practices</td>
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</table>
### DEVELOPMENT, OPERATIONS, ABANDONMENT ACTIVITIES

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Knowledge and Experience</th>
<th>Notes</th>
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<tbody>
<tr>
<td>▪ Direct activities to minimize site disturbance during abandonment</td>
<td>▪ Knowledge of, and experience with, identifying evidence of contamination (including the equipment, infrastructure and practices associated with them)</td>
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<tr>
<td>▪ Document evidence of potential contamination and hazards</td>
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<tr>
<td>▪ For upstream oil and gas sites: ensure soil reserve is protected (documentation, protective measures)</td>
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<tr>
<td>▪ Determine appropriate waste management and disposal</td>
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Notes:
- Environmental Impact Assessment (EIA) requirements must be addressed where applicable.
- The above tables have been constructed primarily to address upstream oil and gas activities where construction is provincially regulated. The tables may also be applied in part, or in whole, to urban and industrial areas where site development falls within local development approvals.