

Guidelines for Submission of a Predisturbance Assessment and Conservation & Reclamation Plan

**Under an *Environmental Protection
and Enhancement Act* Approval for
Enhanced Recovery In Situ Oil
Sands and Heavy Oil Processing
Plants and Oil Production Sites**

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Alberta Energy Regulator

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1 Overview

These guidelines standardize the collection and reporting of both predisturbance assessment (PDA) data and the conservation & reclamation (C&R) plans. The guidelines address methodology and content for PDA/C&R plans submitted to the Alberta Energy Regulator (AER). A checklist is also provided in appendix 2.

The goals of this document are to

- assist approval holders in planning, preparing, and submitting PDA/C&R plans;
- provide specific guidelines for data collection and reporting and conservation & reclamation strategies;
- facilitate AER's review of PDA/C&R plans.

The PDA/C&R plan is a document that is required under an *Environmental Protection and Enhancement Act (EPEA)* approval for enhanced recovery in situ oil sands and heavy oil processing plants and oil production sites. The PDA/C&R plan provides site-specific information regarding the construction, operation, and reclamation of specific footprint components of the overall project. The PDA/C&R plan also provides details regarding baseline biophysical conditions, the proposed disturbance footprints, and the steps that will be undertaken during the various phases of construction, operation, and reclamation to ensure that the disturbed areas will be reclaimed to an equivalent land capability as defined in the *Conservation & Reclamation Regulation*.

The AER expects approval holders to use the information in the PDA/C&R plan to govern construction operations. It is strongly recommended that this information be presented during the construction kick-off meeting and retained on site during construction.

2 Regulatory Requirement for the PDA/C&R Plan

The intent of the PDA/C&R plan is to ensure that predisturbance biophysical conditions are identified and documented prior to any land disturbance. It ensures that appropriate site-specific conservation and reclamation measures are planned and implemented. In essence, the PDA/C&R plan identifies

- any sensitive environmental conditions as they pertain to soil and vegetation,
- appropriate mitigation and conservation measures, and
- the necessary reclamation activities to be undertaken at the end of the facility life.

Where an *EPEA* approval has been issued for enhanced recovery in situ oil sands and heavy oil processing plants and oil production sites, PDA/C&R plans are required for land disturbances being developed pursuant to the *EPEA* approval and must be submitted to the AER before beginning construction. The approval holder is required to prepare the PDA/C&R plan in accordance with these

guidelines. The AER requires the *EPEA* approval holder to implement the PDA/C&R plan as submitted unless otherwise notified in writing by the AER.

Whenever possible, PDA/C&R plans should be submitted based on a phase of development, a time period of development (e.g., annual), or on groupings of land disturbances within a geographic area.

Some types of land disturbances that involve only minor surface disturbance do not need to be addressed by this *EPEA* approval condition unless they are included within an area of particular ecological sensitivity or significance. Examples of such exceptions may include the following:

- a single land disturbance requiring an area less than one hectare (but multiple small disturbance areas may be considered a project that requires a PDA);
- facilities requiring only vegetation removal;
- expansion or modification of existing roads, pipelines, or power lines within existing rights-of-way;
- test holes or pits for survey and investigation to determine location suitability (e.g., road alignments, water crossings, borrow pits, and facility siting);
- minor soil disturbances located in the immediate vicinity of a building to provide access and limited parking space for the users of the building;
- soil disturbance for the purpose of environmental monitoring and assessment (e.g., air monitoring station or groundwater monitoring wells);
- emergency response (e.g., grading for fire breaks, contaminant containments, monitoring wells for the purpose of assessing failures);
- soil disturbances with the objective of decreasing potential environmental impacts (e.g., groundwater remediation trench);
- mitigative measures against the impacts of facility operations on livestock or wildlife (e.g., fencing); and
- source water wells.

The PDA/C&R plan does not address requirements under any other legislation or *EPEA* approval condition. Any authorization sought from the AER under any other section of the *EPEA* approval must be addressed under separate cover.

3 Planning Considerations

3.1 Requirements for PDA/C&R Plan Assessors

All aspects of a PDA/C&R plan, including on-site data collection, analyses, and reporting of the data, and development of the C&R plan itself, should be completed by qualified personnel. The PDA/C&R plan should be signed by those professionals responsible for the report. Recommended qualifications of assessors are provided as a guide to assist in the selection of qualified individuals. The following are some of these recommendations. This list is not all-inclusive, and other qualifications could be considered:

- experience or education in earth, biological, or environmental sciences or related fields;
- experience working in the boreal region of Alberta and experience or education in that biophysical setting;
- experience or education in land conservation and reclamation or related fields;
- a related professional designation such as Professional Agrologist;
- experience in the surface construction industry in Alberta;
- knowledge and understanding of Alberta legislation as it applies to public land;
- knowledge and understanding of Alberta policies, land-use planning documents, and guidelines; and
- knowledge and understanding of federal legislation as it applies within Alberta.

3.2 Additional Background Information

There is additional background information that should also be used in the development of the on-site assessment and for developing the baseline biophysical setting of the PDA/C&R plan.

Such information may include the environmental impact assessment (EIA), the *EPEA* approval document, construction diagrams supplied by the company, rare plant occurrences (based on the Alberta Conservation Information Management System [ACIMS; [http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-\(acims\).aspx](http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx)]), soil survey information, aerial photographs, Alberta Vegetation Inventory (AVI) data, Alberta Wetlands Inventory (AWI) data, C&R plans from EIAs and *EPEA* applications, regional vegetation (or ecosite) surveys, information regarding existing disturbances or previously disturbed lands, and other relevant documents.

3.3 Planning for a Predisturbance Assessment

The objective of the planning phase is to provide a clear understanding of proposed land disturbances included in the assessment and where they will be located. Consideration of factors such as geotechnical design, resource identification, supporting infrastructure, and environmental constraints should be included during the initial planning for the PDA/C&R plan.

Detailed information and planning regarding disturbance footprint, timing, and construction should be completed before starting the PDA/C&R plan. Facility footprint and placement should be near its final stage of development in order to effectively complete the on-site field assessment.

Also during this phase, it is critical to develop the methodology to be used for the on-site assessment to ensure that all pertinent information is collected.

Unplanned changes to disturbance footprints following the completion of the field assessment may lead to gaps or errors in the detailed conservation & reclamation plans.

3.4 Submission of the PDA/C&R Plan

A completed PDA/C&R plan consists of a report specific to the proposed disturbance and includes all applicable plans and attachments (appendices). These items must be submitted for all proposed disturbances, and multiple disturbances should be combined under a single cover document, if possible. In fact, whenever possible, PDA/C&R plans should be conducted and submitted based on land disturbance groupings (stratification) by geographic area, phase of development, or period of development (e.g., annual).

When completing a PDA/C&R plan, the following must be considered to ensure thoroughness, completeness, and compliance with *EPEA* approval conditions:

- the approval holder must provide site-specific details regarding the environmental issues that need to be addressed during the construction, operation, and reclamation phases of the project; and
- the approval holder is required to submit a completed PDA/C&R plan before beginning construction, as outlined in the *EPEA* approval.

4 On-site Data collection Requirements and Methodology

4.1 The Soil Survey

The objective of a conventional soil survey is to assemble an inventory of the soil resources. Soil surveys are field investigations of soils within a landscape. This process includes the initial planning, field investigations, soil and terrain descriptions, sample collection and analysis, interpretation, and report preparation (Expert Committee on Soil Survey 1981). In a PDA/C&R plan, the objective of a soil survey is more restricted: to identify the terrain types (i.e., upland, transitional, and wetland) within the proposed development area to enable adequate conservation of reclamation materials within a defined reclamation plan.

A soil map is required to present the soil information for the purpose of site construction and development of the PDA/C&R plan. The recommended map scale is 1:5000 or greater, which corresponds to a minimum mappable unit of 0.125 ha (0.5 cm² on the map). *The Soil Mapping System for Canada* (Expert

Committee on Soil Survey 1981) provides further details on the procedures needed for the preparation of maps.

Soil inclusions within map units should be identified based on soil inspections and overall observations made by the surveyor. Soil inspections should be placed in locations that best describe the soil terrain unit and possible inclusions. Mapping of inclusions will follow the *Soil Mapping System for Canada* guidelines (Expert Committee on Soil Survey 1981).

The purpose of the baseline soil survey is to provide an accurate identification of soils and their characteristics in order to determine the most appropriate soil conservation and reclamation plan for the proposed disturbances.

4.1.1 Soil Inspection Density and Survey Intensity Level

Soil inspection density (SID) determines the survey level intensity, and hence the number of field observations that are required for a specified extent of proposed disturbance. Soil inspection density is expressed as the total number of hectares mapped divided by the number of site inspections. The appropriate SID will depend on the map scale, type of disturbance, landscape features, variability of soils, existing information, and the experience of the soil surveyor. The SID within the PDA/C&R plan must provide the level of detail needed to properly identify a target salvage depth of topsoil and subsoil (where present) from the proposed disturbance.

A minimum number of inspections are required, based on a target SID for footprints of specified extent (table 1). On relatively uniform landscapes, the density specified in table 1 will suffice. For variable landscapes, a higher density may be needed. An adequate SID can be determined through desktop exercises and in the field by a qualified soil surveyor.

In proposed linear rights-of-way, inspections are to be conducted at a minimum of one site per 100 metres (m). One site per 100 m is an average inspection density, and the actual spacing between inspections can vary. Inspection sites should be located along a linear development to adequately describe the variability of soil depths of both uniform and complex terrain.

Mapping must be completed at a soil series level using the *Alberta Soil Names File (Generation 3) User's Handbook* (Agriculture and Agri-Food Canada 2006) as a guide to determining and describing soil series names.

Table 1. Minimum Soil Inspection Density

Size of Disturbance* (ha)	Target Density (ha/inspection site)	Minimum Number of Inspections [†]
1–2	0.14	7
3–6	0.24	13
7–11	0.34	21
12–16	0.44	27
17–23	0.54	31
24–35	0.64	38
36–45	0.74	49
>45	1.00	>49
Linear Disturbance	100 m/site	

* Disturbance footprint sizes falling in between the presented hectare (ha) ranges should be rounded up to the nearest ha to determine the required density category (e.g., a 2.5 ha disturbance would be rounded to 3 ha and the corresponding density requirement would be 0.24 ha/inspection site).

† In some cases, additional inspection points may be required to adequately identify the soil depths and polygon boundaries due to landscape variability.

4.1.1 Soil Inspection Sites and Methods

It is recommended that stratified sampling (stratification) be conducted based on pretyping or delineation (subdivision) of the survey area using existing ecological components, such as surficial geology, parent material, topography, ecosite/vegetation, LiDAR information or previous soil surveys.

The following sampling strategy should be used to gather soil and terrain information for the PDA/C&R plan. Due to the poorly defined nature of vegetation boundaries, it is strongly recommended that ecosite/vegetation information only be used for stratification purposes in combination with other ecological components such as surficial geology and topography.

A combination of deep and shallow soil inspections should be used to identify the soil depths and polygon boundaries. Deep inspections allow the surveyor to describe profile attributes to a depth of approximately 100 cm in mineral soils and 160 cm in organic soils for the purposes of identifying and classifying soil. Deep inspections are especially useful in areas of high soil variability as well as where excavation to greater depths is likely to occur (i.e., central processing facility). Deep inspections may be required to verify depths of deep organics encountered in the proposed disturbance area. In areas with less soil variability, shallow inspections can be used to confirm topsoil and subsoil thicknesses. These shallow inspections may be completed to the total thickness of the subsoil or 30 cm of the subsoil, whichever is less. In organic soils, observations are made to mineral contact or a depth of greater than 160 cm. It is recommended that sandy soils be observed to a finer textured contact or a depth of 100 cm at all inspection sites; that is, shallow inspections should not be applied to sandy soils. In many regions of northern Alberta, sandy soils (generally Brunisols) overlie glacial till or other finer textured materials within 100 cm of the soil surface. All soil inspection sites should be recorded with a GPS device.

4.2 Soil Information

At each established inspection site, soil attributes will be recorded. Information to be captured at each *deep* inspection site includes

- soil classification according to the *Canadian System of Soil Classification* (Soil Classification Working Group 1998);
- organic horizons and thickness (L, F, H, and O layers);
- mineral horizon properties, including designation, sequence, thickness, depth, texture, structure, consistence (aggregate strength), depth to water table, and coarse fragment content or surface stoniness;
- colour contrast between horizons and colour codes using Munsell colour charts for all soil horizons (where required for classification);
- moisture and nutrient regimes (where required for ecosite classification);
- soil profile photographs (where applicable to assist soil classification); and
- surface and internal drainage characteristics, including class, seepage depth, mottle presence, size and contrast, and gleyed horizons.

Information to be captured at each *shallow* soil inspection site includes

- organic and mineral horizons (L, F, H, O, and A horizons) classification according to *The Canadian System of Soil Classification* (Soil Classification Working Group 1998);
- limited field verification of soil series and spatial distribution;
- thickness of the topsoil horizons, including the L, F, H, O, and A horizons; and
- thickness of the subsoil (B horizon) up to 30 cm.

4.3 Terrain information

At each established inspection location, attributes of the terrain must be recorded. Critical information to be captured at each site includes

- topography (slope class and aspect);
- surface and internal drainage;
- current land use of the site;
- type of parent material;
- presence of surface stones; and
- existing instability, erosion, or gully features.

The recommended inventory protocols for terrain and landscape descriptions are those in chapter 17 of *The Canadian System of Soil Classification* (Soil Classification Working Group 1998).

4.4 Vegetation Information

Background vegetation and ecosite map information is often available from a variety of sources, including the EIA and AVI for a project area. It is recommended that this information be used only to provide initial ecosite phase information for the proposed disturbance area as well as to define the vegetation and ecosite field sampling program to be conducted. The field sampling program should be conducted at an SIL that is adequate to confirm and further characterize the initial classifications derived from EIA and AVI information and should include a minimum of one sample location in each ecosite phase polygon.

Sample locations should be established in representative areas of an ecosite phase (Beckingham and Archibald 1996); these areas are typically homogeneous in slope, soil type, plant cover, and overstorey conditions. Sampling in areas that are located in transitional ecosite areas or that indicate signs of edge effects (i.e., close proximity to disturbances or cleared areas) should be avoided. The intent of the ecosite field survey is to confirm the local ecosites as derived from the EIA and AVI information and to provide more detailed, site-specific mapping at the scale of the predisturbance assessment.

The vegetation sampling program may be conducted in conjunction with either the rare plant or the soil surveys.

At each established sample location, vegetation attributes must be recorded. At a minimum, the following is essential information that must be recorded at each inspection site:

- ecosite phase classification (as per Beckingham and Archibald 1996);
- list of characteristic tree, shrub, and herb and nonvascular species (as per Beckingham and Archibald 1996) and their associated per cent plant cover or range of per cent plant cover;
- identification of vegetation types or conditions that may require special consideration;
- representative ecosite photos; and
- where applicable, occurrences of weed or invasive species including plant cover, infestation level, and phenology.

Information on weeds and invasive species should be documented in a weed survey form. The form and summary of regulations and guidelines are provided in ESRD's *R&R/03-04: Weeds on Industrial Development Sites* (Alberta Environment 2003).

4.5 Rare Plant Surveys

A rare plant survey must be included as part of a PDA/C&R plan to describe the presence, if any, of species listed on the ACIMS tracking list (or on Schedule 1 of the *Species at Risk Act*).

All identified species that are on the ACIMS rare element species list must also be recorded and submitted to the ACIMS.

For vascular plants, surveys should be conducted in accordance with the *Guidelines for Rare Vascular Plant Surveys in Alberta* (Alberta Native Plant Council 2012). For nonvascular plants, the *Recommended Documents for Botanical Survey in Areas of Proposed Disturbance* (Alberta Native Plant Council 2010) should be used.

5 Submitting a Predisturbance Assessment and Conservation & Reclamation Plan

5.1 Submission Form

The provided submission form (appendix 1) must be submitted with each PDA/C&R plan.

New PDA/C&R Plan:	Select this box if this is the first submission of a PDA/C&R plan for this proposed land disturbance.
Revision to PDA/C&R Plan:	Select this box if there have been any revisions to the original PDA/C&R plan submitted for this proposed land disturbance. This includes any documents supporting any supplemental information requests.
Date Submitted:	Enter the date on which the PDA/C&R plan was submitted to the AER. This date will change with each revised submission of the PDA/C&R plan.
Proposed Disturbance/PDA Name:	Enter the name of the proposed disturbance.
Legal Land Description:	Enter the legal land description(s) of the project.
EPEA Approval Number:	Enter the <i>EPEA</i> approval number as assigned by the AER from the original project application.
EPEA Approval Project Name:	Enter the <i>EPEA</i> approval project name from the original project application.
Name of Approval Holder:	Enter the name of the company that holds the above <i>EPEA</i> approval.

- Company Contact Person:** Provide the name of the person (and contact information) who can answer any questions regarding the information contained in the PDA/C&R plan.
- Individual/Company responsible for the PDA/C&R Plan on-site assessment and reporting:** Enter the names of the individuals or companies (including contact information) that completed the on-site and report assessment.
- Dates of Site Assessments:** Include the dates when the on-site assessments for the PDA/C&R plan were conducted.
- Dates of Planned Vegetation Clearing:** Include the proposed dates of vegetation clearing.
- Dates of Planned Soil Salvage Start:** Include the dates when soil salvage is to start.
- Content Requirements Checklist:** Attach the completed content requirements checklist (see appendix 2).

5.2 Executive Summary

An executive summary should highlight the key considerations of the baseline information, construction, operations, and reclamation phases for the proposed land disturbance. As well, this summary should highlight specific environmental issues and considerations associated with the development together with any specific mitigation techniques or variances.

5.3 Overview

This section provides an overview of the proposed disturbance in terms of its regional setting as part of a larger project, size of disturbance, associated infrastructure, and general timing of development. This section should include all of the following information:

- location of proposed disturbances, including legal land description, UTM corner locations (optional) of proposed nonlinear developments, and start/end and major inflections of linear developments;
- maps or airphotos of the proposed development presented in relation to other facilities and known environmental features (the location information indicated above can be provided on these maps at minimum scale of 1:30 000);
- a summary of the dimensions and area of proposed disturbance (in hectares) subdivided by the different components of the development (e.g., well pad, access road, storage areas, etc.);
- biophysical and physiographic overview (e.g., natural region, green/white area, etc.);

- a detailed development plan illustrating the locations of *all* facilities proposed for disturbance including, if applicable, central processing facilities, well pads, access roads, pipelines, borrow pits, and other infrastructure;
- a confirmation that the proposed disturbance is within the scope of the project as described in the *EPEA* application and the EIA and as approved by the *EPEA* approval;
- construction methodology (Construction methodologies tend to be quite standard over time. This information can, therefore, be provided for each PDA/C&R plan or can be submitted once annually and be referenced in subsequent submissions. If submitted once annually, the document should cover methodologies for all types of facilities [e.g., well pads, roads, pipelines, borrow pits, etc.] as well as different terrain types [i.e., upland and wetland]); and
- schedule for disturbance (including proposed completion dates).

5.4 Methods

A methods section is required. This section should detail the methods used in all aspects of the PDA/C&R plan development. This section should be subdivided based on the different aspects of the PDA/C&R plan. Method descriptions should include the following:

- collection of background information,
- field data collection and analysis,
- spatial analysis, and
- reporting.

For PDA/C&R plan submissions containing multiple land disturbances, it may be appropriate for a single methods section located near the beginning of the submission to cover all facilities proposed for disturbance. Similarly, if an approval holder submits numerous PDA/C&R plans each year, it may be appropriate to prepare and submit (annually) a separate methodology document to which reference is made in the individual PDA/C&R plan submissions. Such an approach should be discussed and confirmed with the AER.

5.5 Predisturbance Conditions

The purpose of this section is to capture the baseline conditions for a proposed site prior to land disturbance. These baseline conditions form the basis for the development of a site-specific conservation plan and for use as a guide in achieving successful reclamation upon facility closure.

The description of the predisturbance conditions is subdivided into the following categories, all of which must be addressed in order to complete the PDA/C&R plan requirements.

If a previously disturbed area exists within the new proposed land disturbance area, provide a description of the nature of the existing disturbance, the current status of the existing disturbance (cleared, soil salvaged, reclaimed with soil replacement, reclaimed with vegetation re-establishment), any available predisturbance information, locations and content of existing reclamation material stockpiles, and whether soils have not been salvaged from the area include current soil inspection information for this area.

5.5.1 Baseline Soils

The characterization of the baseline soil conditions, including identification and description of the different soil types found at the site, is a critical step in the development of the PDA/C&R plan. Characterization forms the basis for conservation plans and acts as a benchmark against which the final reclamation can be assessed.

The description of baseline soil conditions must be derived directly from the on-site assessment of the proposed land disturbance. Soil mapping is to be conducted for each land disturbance through the delineation of unique soil map units derived from the soil series found. The description of baseline soil conditions must include the following information:

- maps or airphotos showing labelled inspection locations, topsoil depths at each inspection point, and baseline soil map units by soil series;
- spatial extents of baseline soil map unit areas within and adjacent to the proposed land disturbance site;
- summary description of each mapped soil map unit including the soil series comprising each map unit, average topsoil depth, range of topsoil depth, colour contrast between topsoil and subsoil, variants present within mapped unit (if any), moisture regime, nutrient regime, slope range, and parent material;
- soil classification and soil horizons according to the *Canadian System of Soil Classification* (Soil Classification Working Group 1998);
- organic horizon and thickness (L, F, H, and O layers);
- soil horizon properties including designation, sequence, thickness, depth, texture, structure, consistence (aggregate strength), depth to water table, coarse fragment content or surface stoniness, and colour contrast between horizons and colour codes using Munsell colour charts for all soil horizons (where required for classification);
- surface and internal drainage characteristics including class, seepage depth, mottle presence, size and contrast, and gleyed horizons;

- range of topsoil depths for each baseline soil map unit, separated by proposed land disturbance (e.g., access road and well pad);
- soil profile photographs (where applicable, to assist soil classification); and
- thickness of B-horizon subsoil.

5.5.2 Terrain/Topography

A summary paragraph should be included describing the general predisturbance landscape conditions, including topography, relief, known parent materials, and drainage characteristics. A general description of terrain with slope classification (as identified in chapter 17 of the *Canadian System of Soil Classification* [Soil Classification Working Group 1998]) should be included. A baseline map or airphoto showing predisturbance topographic contours of 1 m both within and immediately adjacent to the proposed disturbance areas is required. Contours can be presented on the baseline soil map or on a separate map.

5.5.3 Ecosite Description

A description of baseline vegetation must be included. This description should characterize each ecological class, including ecosite phases, disturbance classes, and other natural vegetation classes (e.g., burned/regenerating forests). This baseline ecosystem must be classified to the ecosite phase level, based on Beckingham and Archibald (1996). The following information must be presented:

- labelled inspection locations displayed on a map;
- ecosite phase classes within and adjacent to the proposed disturbance areas displayed on a map (ecosite phase information should be provided for an area of 50–100 m adjacent to the proposed disturbance footprint and can be based on airphoto interpretation and extrapolation of inspection site data; no site inspections are required in these areas);
- area (in hectares) of each ecosite phase in table format;
- a list of characteristic species, site characteristics, and forest characteristics for each ecosite phase;
- identification of particular ecosite phases or site conditions that may require special consideration; and
- where appropriate, photographs of each ecosite phase from the on-site assessment.

As part of the baseline description, a discussion of wetland distribution must be included in the PDA/C&R plan. This description of wetlands should follow the ecosite phase classification of (Beckingham and Archibald 1996), the Alberta Wetland Inventory (AWI) classification system (Halsey and Vitt 1997), or as may be directed under the Alberta wetland policy. This description can be appended to the vegetation discussion and may occur as text or figures within the PDA/C&R plan document. At a minimum, each wetland class should be described in terms of the area (in hectares) of each wetland type

and mapped to show distribution in and adjacent to the proposed development area. Detailed description of wetlands is considered optional, but may include the following attributes:

- depth to water, for peatland classes, or mean water depth for open water classes;
- basic water chemistry, including pH and electrical conductivity;
- peat depth;
- depth to permafrost (if present);
- dominant vegetation structure (treed, shrubby, graminoid, or nonvegetated); and
- description of vegetation patterns (if present).

5.5.4 Rare Plant Documentation

A section discussing the rare plants identified at the site must be included. For vascular plants, this discussion should follow the direction of the *Guidelines for Rare Vascular Plant Surveys in Alberta* (Alberta Native Plant Council 2012). For nonvascular plants, the guide *Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance* (Alberta Native Plant Council 2010) should be used. All descriptions should detail:

- locations of observed individuals or populations;
- date of observations (including repeated observations, if applicable);
- details on specimens collected and storage location;
- on-site photographs of each species observed;
- number of individuals, estimated density (per square metre), or approximate coverage (in square metres) for colonial species;
- number of individuals at each phenological stage (growth/flowering/fruitletting) at each date observed;
- ecosite phase and microhabitat description of the observation site;
- associated species at the observation site; and
- site conditions (i.e., slope, aspect, site position, level of disturbance, moisture regime, shade level, soil/substrate condition, etc.) at the observation site.

An ACIMS Rare Native Plant Report Lichen and Fungi Data Submission Form (available from the Alberta Tourism, Parks, and Recreation website) must be appended to the report and should be submitted to ANPC. Confirmation of identification from ACIMS may be required for some species. If species are unconfirmed at the date of submission, this should be stated and a confirmation update provided as a follow-up letter.

5.5.5 Weed Identification

Occurrences of weed or invasive species and their locations must be provided (where applicable, including plant cover, infestation level, and phenology).

5.6 Conservation & Reclamation Plan

This section should outline a detailed, site-specific C&R plan based on current knowledge and best practices for achieving successful reclamation. This plan must use the site-specific information collected to develop recommendations for soil salvage and facility reclamation. It is important to accurately detail the construction methods and conservation plan to be employed at the proposed land disturbance and to provide the estimated volumes of salvageable soil. The site reclamation plan should detail all aspects of facility reclamation and identify the proposed reclamation strategy. Reference should be made to applicable *EPEA* approval conditions when completing this section of the PDA/C&R plan.

It is also strongly recommended that the C&R plan be developed in close consultation with the operator's construction and reclamation personnel and must comply with *all* applicable approval conditions.

An existing C&R business plan (usually filed in association with borrow pits requiring a surface materials license [SML] under the *Public Lands Act*) can be used to satisfy this requirement.

5.6.1 Construction Plan

As an introduction to the conservation & reclamation section, a summary of the proposed construction plan for the proposed land disturbance must be presented. This construction plan should include an overview of the proposed construction techniques, including a description of areas requiring geotextile or off-site fill materials, and a discussion of any constraints (e.g., salinity, sodicity, pH) of off-site fill materials and how such constraints will be managed during construction operations and final reclamation. The construction plan should be illustrated on a map or airphoto.

As well, this discussion should address proposed methods to mitigate impact on environmentally sensitive sites, including identified rare plant locations and existing weed infestations.

A brief discussion of surface water management should be included in this section and should include the following:

- an indication of any requirements under the *Water Act* (a separate approval may be required) and
- a drainage management plan (including culvert installations and removal).

5.6.2 Woody Material Handling Plan

Site-specific plans for handling of nonmerchantable timber and woody material must be provided. Include

- a description of species composition;
- approximate volume of woody material;
- how the material will be cleared, including a description of the methods that will be used to minimize the impact to the organic and A horizons; and
- how the material will be managed (i.e., mulched, retained for reclamation or erosion control, or disposed; ESRD directive SD 2009-01 must be consulted).

5.6.3 Rare Plant Mitigation Plan

Describe any proposed mitigation measures for rare plant species identified in the proposed development area. Include specific details of the mitigation plan including timing considerations and post-mitigation monitoring plans. For species identified in areas adjacent to but not directly affected by the proposed disturbances, discuss plans for monitoring to evaluate for secondary impacts, including those caused by erosion, sedimentation, or changes in hydrology.

5.6.4 Soil Salvage Plan

A critical part of the PDA/C&R plan is the site-specific soil salvage plan. The soil salvage plan for each proposed development area addresses the salvage of both topsoil and subsoil and must be based on the predisturbance baseline soil information gathered during the on-site assessment. The soil salvage plan must also include estimated soil salvage volumes that are calculated based on recorded soil depths across the site as well as proposed stockpile storage locations. The soil salvage plan must include the following:

- topsoil salvage depths and range of variability (minimum and maximum);
- detailed volume estimates of salvageable topsoil;
- topsoil storage location (illustrated on a map or airphoto);
- subsoil salvage depths (where required);
- detailed volume estimates of salvageable subsoil;
- subsoil storage location (illustrated on a plot plan);
- a clearly defined material balance discussion;
- volumes of reclamation material that is stockpiled offsite or at a central stockpile;
- soil conditions that may require special consideration or handling techniques as well as a proposed mitigation approach;

- proposed mitigation measures or special soil handling procedures that pertain to any weed issues identified in the proposed disturbance area;
- a description of the soils in any previously disturbed areas and a description of how soil salvage in these areas will be addressed; and
- a description of the potential for loss of topsoil and subsoil by wind or water erosion and a description of mitigative measures (refer to previous EIAs, *Soil Series Information for Reclamation Planning in Alberta* [Pedocan Land Evaluation Ltd. 1993] and *Revised Universal Soil Loss Equation for Application in Canada* [Wall, Coote, Pringle, and Shelton 2002]).

5.6.5 Operations Plan

A description of the proposed operations activities must be included. This discussion must include information regarding:

- proposed stockpile erosion and sediment control methodology,
- stockpile signage,
- potential temporary revegetation strategies,
- weed control,
- interim reclamation, and
- submission of annual conservation and reclamation report, including post-construction reporting.

5.6.6 Reclamation Plan

A detailed description of proposed reclamation activities must also be included. This should highlight the site-specific overview of the reclamation plan for each disturbance area, including an indication of how the pad fill materials and geotextile materials will be handled (recontoured, removed, etc.) and how salvaged reclamation materials will be replaced.

This section should also provide site-specific information with respect to reconstructed landforms, soil conditions, ecosite targets, and revegetation plans. This plan should indicate how the proposed reclamation objectives for this proposed disturbance relate to and fit with the project-level conservation, reclamation, and closure plans.

5.6.6.1 Post-Reclamation Topography

The development of the post-reclamation topography is important to the success of the reclaimed development. Information regarding the reclaimed topography must include:

- the identification of any topographic conditions that may require special consideration, as well as a proposed mitigation approach;

- post-reclamation goals for topography;
- how the pad fill materials and geotextile materials will be handled;
- description of reclaimed topography relative to surrounding topography;
- cross-sectional diagrams indicating expected post-reclamation topography;
- post-reclamation goals regarding drainage, including a discussion about wetland restoration (if applicable); and
- a plan outlining the re-establishment of local drainage patterns.

5.6.6.2 Reclamation Material Placement Plan

A detailed reclamation material placement plan is required. This plan must include detailed descriptions of the reclamation material placement strategies and tables indicating placement depths of different categories of reclamation material by proposed land disturbance. A discussion of material balance must be included with reference to any discrepancies in reclamation volumes with proposed mitigation documented. The discussion of reclamation material placement must include the following information:

- replacement depth targets for both topsoil and subsoil (including rationale);
- a reclamation material balance (estimated volumes of soil material required to achieve the reclamation objective for the site balanced against the estimated volumes of the material salvaged and stored);
- identification of any soil conditions that may require special consideration or handling techniques, as well as a proposed mitigation approach (including decompaction of subsoil, remediation of contaminants, organic soil handling, seasonal soil replacement, etc.);
- a discussion of any constraints (e.g., salinity, sodicity, pH) of pad fill materials and how such constraints will be managed during construction operations and final reclamation;
- a discussion of erosion potential and mitigative measures for disturbed areas;
- a discussion of the potential for loss of topsoil and degradation of topsoil quality;
- a discussion of soil replacement in relation to topography (especially for wet soils); and
- a discussion of woody material rollback.

5.6.6.3 Revegetation Plan

The post-reclamation vegetation plan is an important part of the PDA/C&R plan. This discussion of post-reclamation vegetation must be consistent with the revegetation plan as outlined in the *EPEA* approval (if required) and must include:

- identification of post-reclamation goals for ecosite phase establishment;

- a seeding plan (including native seed mix);
- a reforestation plan that includes information about areas where reforestation will occur, a list of species that will be used, justification for any areas where reforestation is not proposed, and a vegetation management plan (the reforestation plan must comply with the requirements of the *Alberta Forest Genetic Resource Management and Conservation Standards* [Alberta Sustainable Resource Development 2009] and any Government of Alberta policy related to the deployment of propagules for use in reclamation); and
- a weed control plan for the reclaimed site.

The revegetation plan must follow the *Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region* (Alberta Environment 2009).

If an approval holder submits numerous PDA/C&R plans each year, it may be appropriate to prepare and submit (annually) a separate revegetation plan document to which reference is made in the individual PDA/C&R plan submissions. Such an approach should be discussed and confirmed with AER.

6 Document References

External sources should be cited in the body of the text and details provided in this section.

7 Document Appendices

The following is a list of recommended appendices to be included in the PDA/C&R plan submission, as applicable to the site:

- soil inspection site data, including location and detailed profile and site information as outlined in sections 4.2, 4.3 and 5.5;
- ACIMS *Rare Native Plant, Lichen and Fungi Data Submission Form* (where applicable); and
- weed survey documentation as outlined in *R&R/03-4: Weeds on Industrial Development Sites* (Alberta Environment 2003).

8 Suggested Mapping Components of a PDA/C&R Plan Submission

Suggested mapping components of a PDA/C&R plan submission include the following:

- Overview map (appropriate regional scale of 1:30 000) of the area showing overall landscape and terrain, proximity to other developments and overall area features (lakes etc.), north arrow, and LSDs.
- Baseline soil and terrain map – Presentation of topsoil salvage depths, organic material depths, soil inspection locations (both shallow and deep), soil map unit delineations, scale, legend, contours (1 m intervals), labelling of proposed disturbance areas (pipeline/powerline, well site, borrow pit location,

etc.), north arrow, and LSDs. Suggested scale is 1:2500 to 1:5000, depending on size of the land disturbance.

- Baseline ecosite map – Presentation of ecosite polygon mapping, soil inspection locations (both shallow and deep), scale, legend, contours (1 m intervals), labelling of proposed disturbance areas (pipeline/powerline, well site, borrow pit location, etc.), north arrow, and LSDs. Suggested scale is 1:2500 to 1:5000, depending on size of the land disturbance.
- Construction and soil salvage maps – Indication of soil storage locations (topsoil and subsoil stockpiles), soil stripping depths based on soil map units, area to be stripped or prepared for construction (deep organic designated for no stripping but for cut and fill must be indicated), and areas to be disturbed for construction. Use the same scale as for the baseline soil and terrain map and include a legend of all features, line parameters, and north arrow (LSD not required).
- Reclamation map – indication of reclaimed topsoil depth targets per soil map unit, indication of target ecosite, and post-reclamation topographic condition. This figure should be a consistent scale with other figures in the document.

9 Literature Cited

Regardless of dates below, the most current version of a document must be used when preparing your submission.

- Agriculture and Agri-Food Canada. 2006. *Alberta Soil Names File (Generation 3) User's Handbook*. Edited by M.D. Bock, J.A. Brierley, B.D. Walker, C.J. Thomas, and P.E. Smith. <http://www.agric.gov.ab.ca/asic>.
- Alberta Environment. 2003. *R&R/03-4: Weeds on Industrial Development Sites; Regulations and Guidelines*. <http://environment.gov.ab.ca/info/library/5929.pdf>.
- Alberta Environment. 2009. *Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region*. Prepared by Terrestrial Subgroup Cumulative Environmental Management Association. <http://environment.gov.ab.ca/info/library/8269.pdf>.
- Alberta Sustainable Resource Development. 2009. *Alberta Forest Genetic Resource Management and Conservation Standards* (2nd revision). <http://esrd.alberta.ca/lands-forests/forest-management/documents/FGRMS-AlbertaForestGeneticResourceManagementAndConservationStandards-May2009.pdf>.
- Alberta Native Plant Council. 2010. *Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance*. http://www.anpc.ab.ca/assets/ANPC_Recommended_Documents_for_Botanical_Surveys.pdf.
- Alberta Native Plant Council. 2012. *Guidelines for Rare Vascular Plant Surveys in Alberta*. <http://www.anpc.ab.ca/assets/guidelines/Guidelines%20For%20Rare%20Plant%20Surveys%20in%20AB%202012%20Update.pdf>.
- Beckingham, J.D. and J.H. Archibald. 1996. *Field guide to ecosites of northern Alberta*. Special Report 5. Edmonton: Northern Forestry Centre, Forestry Canada, Northwest Region.
- Expert Committee on Soil Survey. 1981. *A Soil Mapping System for Canada: Revised*. Land Resource Research Institute Contribution No. 142. Ottawa: Research Branch, Agriculture Canada. <http://sis.agr.gc.ca/cansis/publications/manuals/1981-smisc/81-142-soil-mapping.pdf>.
- Halsey, L.A. and D.H. Vitt. 1997. Alberta Wetland Inventory. In *Alberta Vegetation Inventory Standards Manual*. Version 2.2. Alberta Environmental Protection.
- Pedocan Land Evaluation Ltd. 1993. *Soil Series Information for Reclamation Planning in Alberta*. Prepared for Alberta Conservation & Reclamation Council. Report No. RRTAC 93-7.

Soil Classification Working Group. 1998. *The Canadian System of Soil Classification* (3rd edition).

Ottawa: Agriculture and Agri-Food Canada. http://sis.agr.gc.ca/cansis/publications/manuals/1998-cssc-ed3/cssc3_manual.pdf.

Wall, G.J., D.R. Coote, E.A. Pringle and I.J. Shelton (editors). *2002 RUSLEFAC – Revised Universal Soil Loss Equation for Application in Canada: A Handbook for Estimating Soil Loss from Water Erosion in Canada*. Ottawa Contribution No. 02-92. Ottawa: Research Branch, Agriculture and Agri-Food Canada. <http://sis.agr.gc.ca/cansis/publications/manuals/2002-92/rusle-can.pdf>.

Appendix 1 Submission Form

Appendix 2 Content Requirements Checklist

Content Requirements Checklist

PDA/C&R Plan



General Information
<input type="checkbox"/> EPEA approval holder
<input type="checkbox"/> EPEA approval number
<input type="checkbox"/> proposed disturbance name and legal land description
<input type="checkbox"/> submission date

Executive Summary (section 5.2)
<input type="checkbox"/> presentation of major aspects of report

Overview (section 5.3)
<input type="checkbox"/> location of proposed disturbance, including legal land description
<input type="checkbox"/> maps or airphotos and descriptions of the proposed development, including legal land descriptions, and relation of access routes to other facilities and environmental features (minimum scale of 1:30 000)
<input type="checkbox"/> area and dimensions of proposed disturbance (hectares)
<input type="checkbox"/> biophysical overview (e.g., natural region, green/white area, etc.)
<input type="checkbox"/> detailed development plan illustrating the locations of <i>all</i> facilities proposed for disturbance, including the following, if applicable: <ul style="list-style-type: none"> <input type="checkbox"/> central processing facilities <input type="checkbox"/> well pads <input type="checkbox"/> access roads <input type="checkbox"/> pipelines <input type="checkbox"/> borrow pits <input type="checkbox"/> other infrastructure
<input type="checkbox"/> a confirmation that the proposed disturbance is within the scope of the project as described in the EPEA application and the EIA and as approved by the EPEA approval
<input type="checkbox"/> construction methodology
<input type="checkbox"/> schedule for disturbance (including completion dates)

Methods (section 5.4)
<input type="checkbox"/> description of the methods applied or reference to the methods if they are provided elsewhere

Predisturbance Conditions (section 5.5)
<input type="checkbox"/> if previously disturbed areas exist, provide descriptions of the nature of the disturbance, current status of the disturbed area, and available predisturbance information
<input type="checkbox"/> provide information about existing stockpiles of soil salvaged from these areas
Baseline Soils (section 5.5.1)
<input type="checkbox"/> soil survey based on sections 4.1 and 4.2 including soil inspection density as required in table 1
<input type="checkbox"/> maps or airphotos showing labelled inspection locations, topsoil depths at each inspection point, and baseline soil map units by soil series (1:5000 or larger)
<input type="checkbox"/> spatial extents of baseline soil map unit areas within and adjacent to the proposed land disturbance site
<input type="checkbox"/> summary description of each mapped soil map unit including the soil series comprising each map unit, average topsoil depth, range of topsoil depth, colour contrast between topsoil and subsoil, variants present within mapped unit (if any), moisture regime, nutrient regime, slope range, and parent material
<input type="checkbox"/> soil classification and soil horizons according to the <i>Canadian System of Soil Classification</i> (Soil Classification Working Group 1998)
<input type="checkbox"/> organic horizon and thickness (L, F, H, and O layers)
<input type="checkbox"/> soil horizon properties including designation, sequence, thickness, depth, texture, structure, consistence (aggregate strength), depth to water table, coarse fragment content or surface stoniness, and colour contrast between horizons and colour codes using Munsell colour charts for all soil horizons (where required for classification)
<input type="checkbox"/> surface and internal drainage characteristics including class, seepage depth, mottle presence, size and contrast, and gleyed horizons
<input type="checkbox"/> range of topsoil depths for each baseline soil map unit, separated by proposed land disturbance (e.g., access road and well pad)
<input type="checkbox"/> soil profile photographs (where applicable, to assist soil classification)
<input type="checkbox"/> thickness of B-horizon subsoil
Terrain/Topography (section 5.5.2)
<input type="checkbox"/> a general description of terrain with slope classification
<input type="checkbox"/> baseline map or airphoto showing predisturbance topographic contours of 1 m both within and immediately adjacent to the proposed disturbance areas
Ecosite Description (section 5.5.3)
<input type="checkbox"/> vegetation assessment of the ecosite phase level of classification (Beckingham and Archibald 1996)
<input type="checkbox"/> labelled inspection locations displayed on a map
<input type="checkbox"/> ecosite phase classes within and adjacent to the proposed disturbance areas displayed on a map (ecosite phase information should be provided for an area of 50–100 m adjacent to the proposed disturbance footprint and can be based on airphoto interpretation and extrapolation of inspection site data; no site inspections are required in these areas)
<input type="checkbox"/> area (in hectares) of each ecosite phase in table format
<input type="checkbox"/> a list of characteristic species, site characteristics, and forest characteristics for each ecosite phase
<input type="checkbox"/> identification of particular ecosite phases or site conditions that may require special consideration
<input type="checkbox"/> where appropriate, photographs of each ecosite phase from the on-site assessment
<input type="checkbox"/> a description of wetlands based on the ecosite phase classification (Beckingham and Archibald 1996) or the Alberta Wetland Inventory (AWI) classification system (Halsey and Vitt 1997)
<input type="checkbox"/> a description of each wetland class in terms of the area (in hectares) of each wetland type
<input type="checkbox"/> a map to show distribution of wetlands in and adjacent to the proposed development area

Rare Plant Documentation (section 5.5.4)

- survey results, conducted as per the *Guidelines for Rare Vascular Plant Surveys in Alberta* (Alberta Native Plant Council 2012) or *Recommended Documents for Botanical Surveys in Areas of Proposed Disturbance* (Alberta Native Plant Council 2010), as appropriate
- locations of observed individuals or populations
- date of observations (including repeated observations, if applicable)
- details on specimens collected and storage location
- on-site photographs of each species observed
- number of individuals, estimated density (per square metre), or approximate coverage (in square metres) for colonial species
- number of individuals at each phenological stage (growth/flowering/fruitlet) at each date observed
- ecosite phase and microhabitat description of the observation site
- associated species at the observation site
- site conditions (i.e., slope, aspect, site position, level of disturbance, moisture regime, shade level, soil/substrate condition, etc.) at the observation site

Weed Identification (section 5.5.5)

- occurrences of weed or invasive species and their locations (including plant cover, infestation level, and phenology)

Conservation & Reclamation Plan (section 5.6)**Construction Plan (section 5.6.1)**

- summary of the proposed construction plan for the proposed land disturbance
- overview of the proposed construction techniques, including a description of areas requiring geotextile or off-site fill materials and a discussion of any constraints of off-site fill materials and how such constraints will be managed during construction and final reclamation
- an illustration of the construction plan on a map or airphoto
- proposed methods to mitigate impact on environmentally sensitive sites, including identified rare plant locations and existing weed infestations
- a brief discussion of surface water management, including an indication of any requirements under the *Water Act* and a drainage management plan (including culvert installations and removal)

Woody Debris Handling Plan (section 5.6.2)

- site-specific plan for handling of nonmerchantable timber and woody debris including the following:
 - a description of species composition
 - approximate volume of woody material
 - how the material will be cleared, including a description of the methods that will be used to minimize the impact to the organic and A horizons
 - how the material will be managed (i.e., mulched, retained for reclamation or erosion control, or disposed; ESRD directive SD 2009-01 must be consulted)

Rare Plant Mitigation Plan (section 5.6.3)

- a description of any proposed mitigation measures for rare plant species identified in the proposed development area
- for species identified in areas adjacent to but not directly impacted by the proposed disturbances, a discussion of plans for monitoring to evaluate for secondary impacts such as impacts due to erosion, sedimentation, or changes in hydrology

Soil Salvage Plan (section 5.6.4)

- topsoil salvage depths and range of variability
- detailed volume estimates of salvageable topsoil
- topsoil storage location (illustrated on a map or airphoto)
- subsoil salvage depths (where required)
- detailed volume estimates of salvageable subsoil
- subsoil storage location (illustrated on a plot plan)
- a clearly defined material balance discussion
- volumes of reclamation material that is stockpiled offsite or at a central stockpile
- soil conditions that may require special consideration or handling techniques as well as a proposed mitigation approach
- proposed mitigation measures or special soil handling procedures that pertain to any weed issues identified in the proposed disturbance area
- a description of the soils in any previously disturbed areas and a description of how soil salvage in these areas will be addressed
- a description of the potential for loss of topsoil and subsoil by wind or water erosion and a description of mitigative measures (refer to previous EIAs, *Soil Series Information for Reclamation Planning in Alberta* [Pedocan Land Evaluation Ltd. 1993] and *Revised Universal Soil Loss Equation for Application in Canada* [Wall, Coote, Pringle, and Shelton 2002])

Operations Plan (section 5.6.5)

- proposed stockpile erosion and sediment control methodology
- stockpile signage
- potential temporary revegetation strategies
- weed control
- interim reclamation
- submission of annual conservation and reclamation report, including post-construction reporting

Reclamation Plan (section 5.6.6)

- a description of proposed reclamation, including a site-specific overview of the reclamation plan for each disturbance area, an indication of how the fill and geotextile materials will be handled (recontoured, removed, etc.), and how salvaged reclamation materials will be replaced
- site-specific information with respect to reconstructed landforms, soil conditions, ecosite targets, and revegetation plans
- a description of how the proposed reclamation objectives for this proposed disturbance relate to and fit with the project-level conservation, reclamation, and closure plans

Post Reclamation Topography (section 5.6.6.1)

- identification of any topographic conditions that may require special consideration, as well as a proposed mitigation approach
- post-reclamation goals for topography
- how the pad fill materials and geotextile materials will be handled
- a description of reclaimed topography relative to surrounding topography
- cross-sectional diagrams indicating conceptual post-reclamation topography
- post-reclamation goals regarding drainage, including a discussion about wetland restoration (if applicable)
- a plan outlining the re-establishment of local drainage patterns

Reclamation Material Placement Plan (section 5.6.6.2)

- replacement depth targets for *both* topsoil and subsoil (including rationale)
- a reclamation material balance (estimated volumes of soil material required to achieve the reclamation objective for the site balanced against the estimated volumes of the material salvaged and stored)
- identification of any soil conditions that may require special consideration or handling techniques, as well as a proposed mitigation approach (including decompaction of subsoil, remediation of contaminants, organic soil handling, seasonal soil replacement, etc.)
- a discussion of any constraints (e.g., salinity, sodicity, pH) of pad fill materials and how such constraints will be managed during construction operations and final reclamation
- a discussion of erosion potential and mitigative measures for disturbed areas
- a discussion of the potential for loss of topsoil and degradation of topsoil quality
- a discussion of soil replacement in relation to topography (especially for wet soils)
- a discussion of woody material rollback

Revegetation Plan (section 5.6.6.3)

- identification of post-reclamation goals for ecosite phase establishment
- a seeding plan (including native seed mix)
- a reforestation plan that includes information about areas where reforestation will occur, a list of species that will be used, justification for any areas where reforestation is not proposed
- a weed control plan for the reclaimed site

References (section 6)

- a list of external materials referenced in the plan

Appendices (section 7)

- soil inspection site data, including location and detailed profile and site information as outlined in sections 4.2, 4.3, and 5.5
- ACIMS *Rare Native Plant, Lichen and Fungi Data Submission Form* (where applicable)
- weed survey documentation as outlined in *R&R/03-4: Weeds on Industrial Development Sites* (Alberta Environment 2003)