

---

# Parkland County

## Highvale End Land Use Area Structure Plan



**Keith Driver and Associates Ltd.**

with

**Gibbs & Brown Landscape Architects Ltd., Omni McCann Consultants Ltd.,  
D.I. Foster Associates Ltd., & Cochrane Engineering Ltd.**

---

**September, 1997**

**Last consolidation September 2016**

## CONSOLIDATION SUMMARY

Bylaw	Date	Subject
40-2006	09/01/2007	Multiple Changes to Figure 1 concerning the Keephills Power Plant Direct Control District
2014-25	12/09/2014	To change the wording in Section 1.3.1 Land Use and 1.4.1 Types of Land Use (Direct Control). To redesignate a portion of W5-04-52-10-NW and SW from Agriculture/Nature Conservation District to Direct Control District. Please note text has not been revised to reflect these changes. Figure 1 has been updated.

**BYLAW NO. 2014-25  
PARKLAND COUNTY**

**BEING A BYLAW OF PARKLAND COUNTY FOR THE PURPOSE OF  
AMENDING THE HIGHVALE END LAND USE AREA STRUCTURE PLAN (BYLAW NO. 28-97)**

---

**WHEREAS** the Council of Parkland County has passed a Bylaw pursuant to Part 17, Section 633 of the Municipal Government Act, R.S.A. 2000, Chapter M-26, known as the Highvale End Land Use Area Structure Plan Bylaw No. 28-97 for the purpose of providing policy direction for the end land uses in the Highvale Area;

**WHEREAS** and pursuant to Part 17, Section 692 of the Municipal Government Act, R.S.A. 2000, Chapter M-26, the Council of a municipality is authorized to amend an Area Structure Plan Bylaw;

**WHEREAS** Section 692 of the Municipal Government Act requires the Council of a municipality to hold a public hearing and advertise such a Bylaw in accordance with Sections 230 and Section 606 of the Act respectively;

**WHEREAS** the Council of Parkland County has received an application from the landowner of Linc Numbers 28449692 and 22690770 to consider an amendment to Figure 1, End Land Use Map within Bylaw No. 28-97 to redistrict all of W5-04-52-10-SW and a portion of W5-04-52-10-NW from Agriculture/Nature Conservation District to Direct Control District;

**NOW THEREFORE** the Council of Parkland County duly assembled and under the authority of the Municipal Government Act, as amended, hereby enacts the following:

1. Section 1.3.1 Land Use.  
(First Sentence, Last Paragraph)

By deleting the following in bold:

Finally, the only other major land use is the need to designate each of the **two** power plant areas as Direct Control **Districts**.

2. Section 1.4.1 Types of Land Use.

By deleting the following in bold:

Direct Control. (DC)

**Two Direct Control Districts shall be established one centered on the Sundance Thermal Plant (the Residential complex to be built to house employees for this plant), and the other around the Keephills Thermal Plant.** The primary purpose of these Direct Control Districts is to:

- (a) allow for the possible development of new commercial enterprises or other industries within the areas utilizing the existing infrastructure systems available, and
- (b) allow for a more concentrated development (cottage or recreation activities), that will utilize the existing infrastructure systems available. (See Policy dealing with development control).

By adding the following in bold:

Direct Control. (DC)

**Direct Control shall be established around each of the Power Plants. To date these include:**

- **Sundance Thermal (Coal-fired) Power Plant**
- **Keephills & Keephills 3 Thermal (Coal-fired) Power Plants**

**The Sundance 7 Thermal (Natural Gas-fired) Power Plant has been proposed and is pending necessary approvals.**

**Power Plants may include but are not limited to power generating facilities and infrastructure, attendant housing facilities, attendant workshops, attendant offices, and a tour centre(s).**

The primary purpose of these Direct Control Districts is to:

- (a) allow for the possible development of new commercial enterprises or other industries within the areas utilizing the existing infrastructure systems available, and
- (b) allow for a more concentrated development (cottage or recreation activities), that will utilize the existing infrastructure systems available. (See Policy dealing with development control).

3. That Figure 1, End Land Use Map of Bylaw No. 28-97, and amendments thereto, being the Highvale End Land Use Area Structure Plan, is removed from Bylaw No. 28-97 and replaced with Schedule "A" attached to and forming part of this Bylaw to reflect updated geographical information and the following amendment:

(a) redesignating approximately 120 ha (297 ac) of land within W5-04-52-10-NW & SW from the Agriculture/Nature Conservation District to the Direct Control District;

**AND THAT** this Bylaw shall come into force and have effect from and after the date of third reading and signing thereof.

**READ A FIRST TIME** this 26<sup>th</sup> day of **August, 2014**.

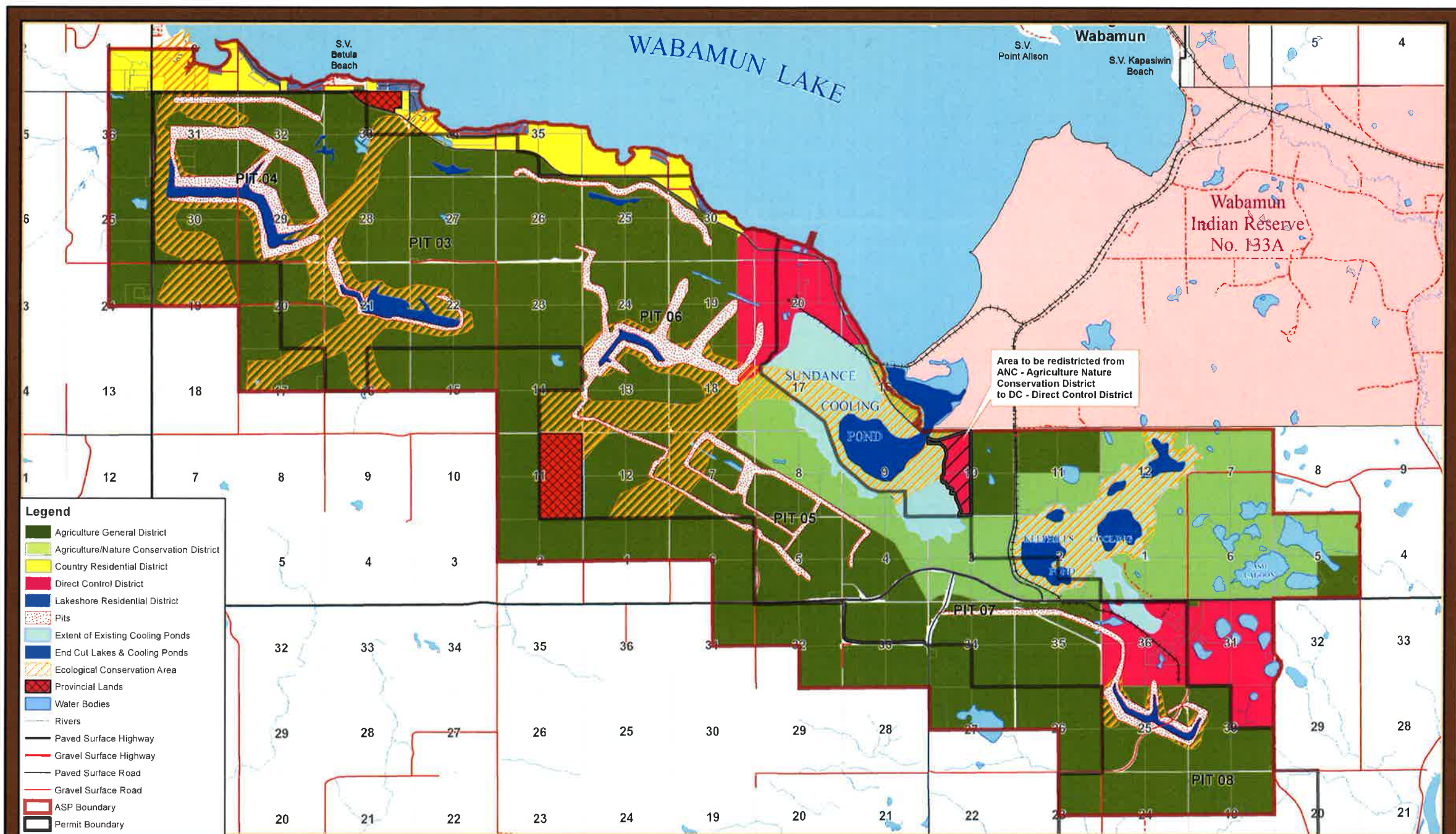
**PUBLIC HEARING** held this 23<sup>rd</sup> day of **September, 2014**.

**READ A SECOND TIME** this 23<sup>rd</sup> day of **September, 2014**.

**READ A THIRD TIME AND FINAL TIME** this 9<sup>th</sup> day of **December, 2014**.

  
\_\_\_\_\_  
Mayor  
\_\_\_\_\_  
Manager, Legislative & Administrative Services





# Schedule A to Bylaw 2014-25

Disclaimer:  
Parkland County offers this information in good faith, but makes no warranty with regard to correctness, and accuracy of the data.

Drawn By: M.Turner

Date: August 13, 2014

2013 Orthophotography

Scale: 1:65,000

Geopositional Accuracy (+/- 3-5m)

0 250 500 1000 1500 2000 Meters



**BYLAW NO. 40-2006  
PARKLAND COUNTY**

**BEING A BYLAW OF PARKLAND COUNTY FOR THE PURPOSES OF AMENDING THE  
HIGHVALE END LAND USE AREA STRUCTURE PLAN**

**WHEREAS** the Council of Parkland County has adopted the Highvale End Land Use Area Structure Plan by Bylaw No. 28-97; and

**WHEREAS** the Highvale End Land Use Area Structure Plan provides a framework for subsequent subdivision and development of lands within the Highvale area; and

**WHEREAS** the Council of Parkland County deems it appropriate to make an amendment to the Highvale End Land Use Area Structure Plan to allow for the consideration of the construction and operation of a power plant and any associated developments or uses on the NE 30-51-3-W5M, Section 31-51-3-W5M (excepting thereout all that portion of the North West quarter of Section 31-51-3-W5M described as follows: commencing at the intersection of the west boundary of the said quarter section with the south limit of Road Plan 3243RS, thence southerly along the west boundary 100 metres; thence easterly and at right angles thereto 200 metres; thence northerly and parallel with the west boundary to a point on the south limit; thence westerly along the south limit to the point of commencement containing 2 hectares (4.94 acres) more or less), and Section 36-51-4-W5M;

**NOW THEREFORE** the Council of Parkland County duly assembled and under the authority of the Municipal Government Act, Revised Statutes of Alberta, 2000, Chapter M-26 and amendments thereto, hereby enacts the following:

1. That Bylaw No. 28-97, being the Highvale End Land Use Area Structure Plan, is amended by the following:

The present direct control zoning shown on part of Section 36-51-4-W5M, part of Section 35-51-4-W5M and a small portion of land in the extreme north east corner of the NE 25-51-4-W5M, shall be changed to encompass all of Section 36-51-4-W5M, NE 30-51-3-W5M and Section 31-51-3-W5M excepting thereout all that portion of the North West quarter of Section 31-51-3-W5M described as follows: commencing at the intersection of the west boundary of the said quarter section with the south limit of Road Plan 3243RS, thence southerly along the west boundary 100 metres; thence easterly and at right angles thereto 200 metres; thence northerly and parallel with the west boundary to a point on the south limit; thence westerly along the south limit to the point of commencement containing 2 hectares (4.94 acres) more or less.

That the lands within Section 35-51-4-W5M and a small portion of land in the extreme north east corner of the NE 25-51-4-W5M shall be re-designated from Direct Control District to Agriculture.

The above is shown as Appendix "A" attached to and forming part of this Bylaw. This Direct Control district shall be referenced or known as the Keephills Power Plant Direct Control District.

READ A FIRST TIME this 12<sup>th</sup> day of December, 2006

READ A SECOND TIME this 9<sup>th</sup> day of January, 2007.

READ A THIRD TIME and finally passed this 9<sup>th</sup> day of January, 2007.

  
MAYOR

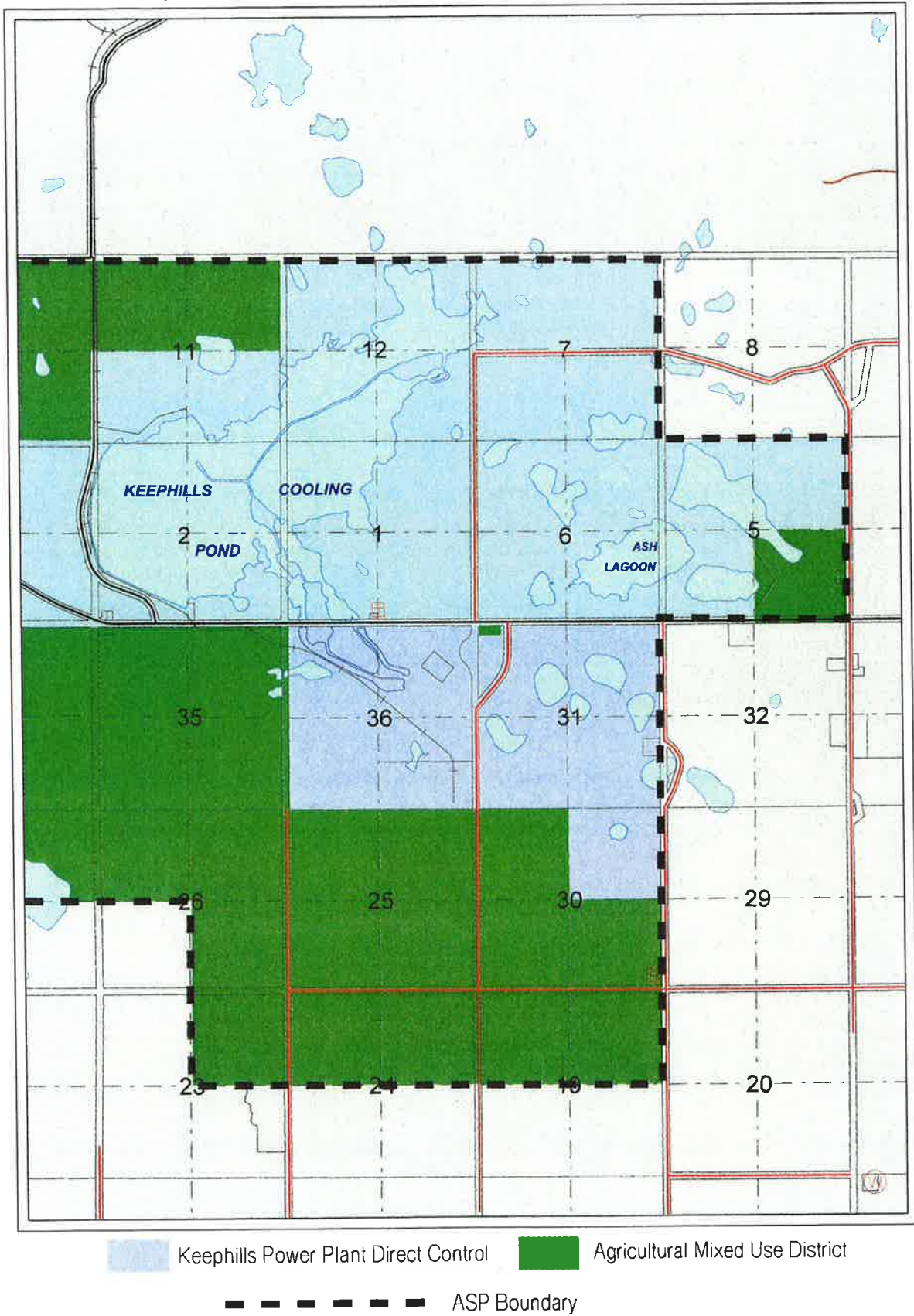
  
MANAGER,  
LEGISLATIVE & ADMINISTRATIVE SERVICES



# ByLaw 40-2006

Appendix 'A' to Figure 1

Highvale End Land Use ASP / Keephills Power Plant Direct Control District



**BY-LAW NO. 28-97  
PARKLAND COUNTY**

**BEING A BY-LAW OF PARKLAND COUNTY FOR THE PURPOSE OF ADOPTING  
THE HIGHVALE END LAND USE AREA STRUCTURE PLAN**

**WHEREAS** Section 633(1) of the Municipal Government Act RSA 1994 and amendments thereto authorize a council to adopt an Area Structure Plan for the purpose of providing a framework for subsequent development of an area of land within a municipality; and

**WHEREAS** the Council of Parkland County deems it appropriate and desirable to prepare and adopt an Area Structure Plan for the Highvale Area (a defined planning area within the County);

**NOW THEREFORE** the Council of Parkland County duly assembled and under the Municipal Government Act RSA 1994 and amendments thereto, hereby adopts the Highvale End Land Use Area Structure Plan.

READ A FIRST TIME THIS 1<sup>st</sup> DAY OF June, 1997

READ A SECOND TIME THIS 23<sup>rd</sup> DAY OF September, 1997

READ A THIRD TIME AND FINALLY PASSED THIS 23<sup>rd</sup> DAY OF September, 1997

  
REEVE

  
Manager, Administration Services

# **HIGHVALE MINE END LAND USE AREA STRUCTURE PLAN**

**BYLAW NO 28-97**

**Prepared for**

**Parkland County**

**September 1997**

**Prepared By**

Keith Driver and Associates Ltd. - Land Use Planners

Gibbs and Brown - Landscape Architects

Omni-McCann Consulting Limited - Geologists

Cochrane Engineering Limited - Municipal Engineers

D. I. Foster Associates Ltd - Transportation Engineers

# **HIGHVALE MINE END LAND USE AREA STRUCTURE PLAN**

## **BYLAW NO. 28-97**

### **CONTENTS of BYLAW NO 28-97**

	<b>Page No</b>
<b>1.0 The Highvale Mine End Land Use Area Structure Plan</b>	<b>1</b>
1.1 Introduction	1
1.2 Primary Goals and Objectives	1
1.3 Description of the Highvale Mine End Land Use Area Structure Plan	2
1.4 Policies	5
1.5 Development Phasing	11
1.6 Servicing and Transportation	12

### **APPENDICIES**

#### **Appendix A. Background and Planning Data Base for the Area Structure Plan**

*Executive Summary, Summary of Recommendations and Plan Reviews.* *i*

	<b>Appendix Page No</b>
<b>1.0 Introduction</b>	<b>1</b>
1.1 Background	1
1.2 Purpose of an Area Structure Plan	2
1.3 Plan Mission Statement	3
1.4 Study Area	3
1.5 Planning process	4
1.6 Public Consultation	4
<b>2.0 Planning Data Base</b>	<b>6</b>
2.1 Introduction	6
2.2 Highvale Mine and Plant Site	6
2.3 Natural Landscape	10
2.4 Existing Land Use	19
2.5 Existing Utility Servicing	22
2.6 Criteria for Re-use of Existing Services.	26
2.7 Existing Transportation Services	26
2.8 Economic Impacts	31

#### **Appendix B 1 and B 2. Comments by Public at Open Houses**

Questionnaire from First Public Open House	1
Questionnaire from Second Public Open House	12

#### **Appendix C. TransAlta Utilites License Obligations**

#### **Appendix D. References.**

## **LIST OF FIGURES, MAPS AND TABLES**

### **Figures for the Highvale Mine End Land Use Area Structure Plan Bylaw No 28-97**

Figure 1. - Highvale Mine End Land Use Area Structure Plan

Following Page  
2 of the Bylaw

### **MAPS for Background and Planning Data Base (Appendicies)**

Map 1. - Study Content	4 of Appx A
Map 2. - Study Area	4
Map 3. - Pre-Mine Air Photo Mosaic	6
Map 4. - Current Air Photo Mosaic	6
Map 5. - Site Photographs	6
Map 6. - Mine Reclamation Plan	8
Map 7. - Natural Features	10
Map 8. - Development Constraints	10
Map 9. - Land Capability	10
Map 10. - Existing Land Use	19
Map 11. - Major Utilities	22
Map 12. - Transportation Services	26

### **TABLES for Background and Planning Data Base.**

Table 1. - Pre-mine Topography.	Page No 12
Table 2. - Pre-mine and Post-mine Agricultural Capability	14
Table 3. - Vegetation Associates with Trembling Aspen	15
Table 4. - Vegetation associated with Balsam Poplar.	16
Table 5. - Conditions or Roads outside the Mine Area.	27
Table 6. - Summary of Traffic Counts	28
Table 7. - Economic Impacts	31

## **ACKNOWLEDGEMENTS**

The following persons should be acknowledged in helping in the development of this Area Structure Plan:

### **STEERING COMMITTEE**

Russell Dauk - Chairman, Parkland County, Manager of Planning Services.

Don Baker - Public Lands, Alberta Agriculture.

Cam Bateman, M.Sc. - TransAlta Utilities.

Dennis Bratton - Alberta Environmental Protection.

Kevin Cymbaluk - Parkland County, Transportation and Utilities Staff.

Bill Davies - South Wabamun Community Relations Committee.

Delmar Englehardt - - Committee On Keephills Environment.

Frank Florkewich - Parkland County Council.

Pat Harrington - Parkland County, Director of Public Services.

Doug Hughes - South Wabamun Community Relations Committee.

Dan Hungle - Parkland County, Transportation and Utilities Staff.

Daryl Mikalson, P.Eng- TransAlta Utilities.

Cindy Miller Reade / Sue Armstrong - Parkland County, Planning Services Staff.

Tony Smith,- TransAlta Utilities.

Erin White - Committee On Keephills Environment.

Members of TransAlta Utilities at the Keephills Plant, Sundance Plant, and Farm and Conference Centre.

The Public who attended and commented upon the planning ideas at all of the Public Open Houses.



# **THE HIGHVALE MINE END LAND USE AREA STRUCTURE PLAN**

## **BYLAW NO 28-97**

### **1.1 Introduction**

This section deals with the proposed Area Structure Plan and the goals and policies that will govern its implementation. For a graphic representation of this general approach see Map 1 - Highvale Mine End Land Use Area Structure Plan. Bylaw No. 28-97

### **1.2 Primary Goals and Objectives.**

The following goals were agreed upon by the Steering Committee as being the major directives for this Area Structure Plan and would govern the policies and the end land uses developed in the Highvale mine area.

#### **GOAL 1.**

**To provide a Land Use Plan and Policy Structure for future development that will allow Parkland County to manage the study area site in terms of sustainable land use, re-established drainage systems, transportation linkages, recreational opportunities and subdivision of land.**

This is an all embracing goal designed to identify the five major components of the Land Use pattern that will be established in the Highvale Mine area. The key observation and intent of the goal is to provide a sustainable land use system. That is one in which the future community is able to sustain itself given the nature of the land use activities that will take place in the area, access to roads, the provision of services and the subdivision of land provided.

#### **GOAL 2.**

**To establish policies that will control development on reclaimed lands.**

This establishes the need for policy controls rather than specific land use districts. While the overall end land use will in all probability be agriculture there are some opportunities that will allow other land uses to be established provided they meet the policies and development criteria established in this Area Structure Plan.

#### **GOAL 3.**

**To provide a frame for a transportation, public utility and infrastructure network that links into the surrounding systems existing within the County.**

This goal is intended to establish the primary framework for transportation and utility services within the area. It does not preclude extensions being made to these transportation

and service lines should it be necessary in the future or to provide linkages to specific parcels of land subdivided out at some later stage in the redevelopment of the area.

**GOAL 4.**

**To allocate different land uses within the study area that meets social, economic, environmental, engineering and public concerns and interests.**

This goal is intended to give general direction to the types of sustainable uses that can be accommodated within the area, given that there are some social, economic, engineering, environmental and public conditions to be met. It is broad enough to allow a wide variety of land uses provided they meet certain conditions and criteria set out in the policy section.

**GOAL 5.**

**To produce a flexible, relatively simple guide for development, that allows for ongoing change in the mine and reclamation plans.**

This goal recognizes that the mining operation is always changing and needs to be a flexible operation to accommodate future changes to mining technology and economics. Changes in the location of roads, end cut lakes, major power lines and other aspects of the mining operation will also change the end land use for the Area Structure Plan. It is of paramount importance that the plan be flexible and adaptable to the changes undertaken at the mine. Because of these changes the land uses, road and utility systems and time frame of the area structure plan needs to be adjustable.

**It is noted that nothing in this Plan absolves TransAlta Utilities from any previous agreement with the County unless explicitly agreed to by the County.**

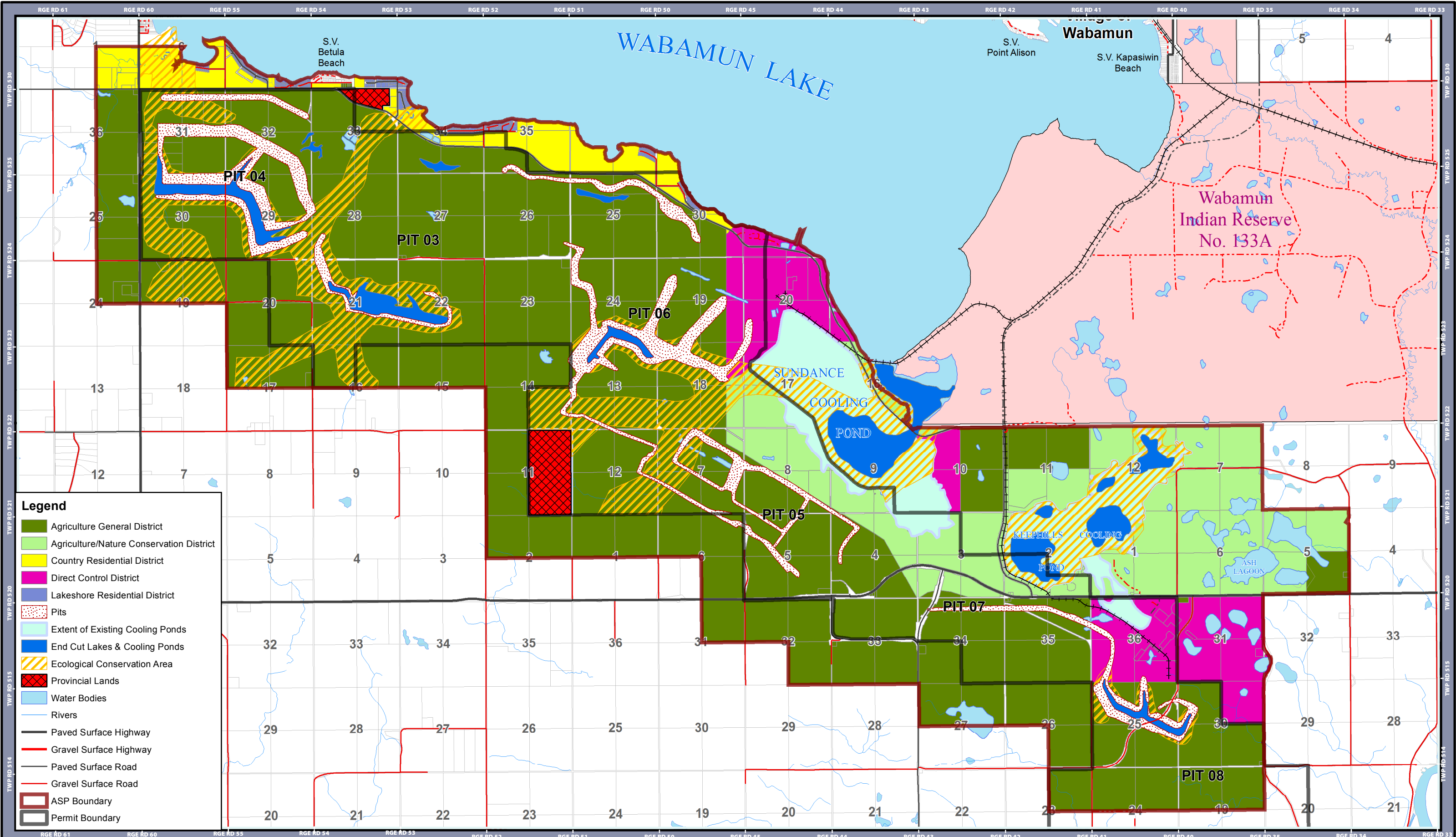
### ***1.3 Description of the Highvale Mine End Land Use Area Structure Plan.***

The plan in its simplest form is designed to restore the community, landscape and land uses of the area and to accommodate the changes caused by the mine and power plants. Because the mining operation is a continuing process, and because there will be some changes over time to both the surface (subsidence), and drainage patterns (re-establishment), this description of the Area Structure Plan has to remain flexible. This will allow for changes and adjustments made to the mine end land use plan but also allow for future developments to occur that are not currently envisioned. Proposals for land uses not currently proposed will have to be reviewed on their respective merits at the time they are proposed. Figure 1. Highvale Mine End Land Use Area Structure Plan, Bylaw No. 28-97, shows the application of land use districts, major transportation patterns and special features of the plan such as the Ecological Conservation Areas

#### **1.3.1 Land Use.**

Four main land uses are proposed for the mine and Power Plant areas. These are:

- an Agricultural Mixed Use District.(AMU),
- a Country Residential District. (CR),
- a Direct Control District (DC), and
- an Agriculture/Nature Conservation District (ANC).



**Figure 1 Highvale EndLand Use ASP**



Disclaimer:  
Parkland County offers this information in good faith, but makes no warranty with regard to correctness, and accuracy of the data.

Drawn By: D. Anderson  
Date: November 05, 2015

Scale: 1:65,000

Geopositional Accuracy (+/- 3-5m)



As most of the mined area will be subject to subsidence and re-contouring both as the land is reclaimed and as subsidence occurs over the next 20 to 30 years, it is proposed that reclaimed mine land be designated as an Agricultural Mixed Use District allowing a return to the agricultural activity.

The type of agriculture that will return is largely determined by the soil classification, land capability, and the topography of the reclaimed land. The purchaser should be advised as to the limits of development available, and as to the limitations of the land itself (land classification and other restraints). This should be done prior to purchase.

The Agriculture Mixed Use District applies to disturbed and undisturbed lands, is a wide designation and would permit a variety of land uses, each of which needs to be reviewed by Parkland County as to whether it is suitable for the area.

The Country Residential District has been confined to the Lake Wabamun Shoreline between the Sundance Road and the Lake. No mining has occurred in this area so the land is physically undisturbed. As this is the current designation in the existing Land Use Bylaw there is no change proposed for this area. The only exception may be the extension of this land use district to include the existing Sundance housing area and for a small distance further east, however as there are a number of alternative possibilities for the use of this housing complex this small area, for now, has been designated as a Direct Control District.

The Agriculture/Nature Conservation District has been applied to a number of specific areas, notable the Provincial Natural Area, the Sundance Cooling Pond and to the area east of Range Road 42 and north of Secondary Highway 627.

There is a need in the plan to promote the re-establishment of the natural ecology that existed prior to mining activity. This will be accomplished through special "Ecological Conservation Areas (ECA)", which overlay the other land use districts in areas of highest priority (see 1.4 Policies)

Finally, the only other major land use is the need to designate each of the two power plant areas as Direct Control Districts. The purpose behind this designation is that it is entirely possible that these areas could be used for a variety of land uses from heavy industry to a return to agricultural use. As there is significant work to be done to decommission and remove each of the plants, it would be appropriate to review or seek proposals for their conversion to some other use when the time comes for the plants to cease providing electrical power. The inclusion of the residential areas (Sundance housing area), allows for alternative proposals for the retention and/or redevelopment of this area for Country Residential or other recreation complex development consistent with the need to protect the shoreline of Lake Wabamun.

### **1.3.2 Transportation.**

The establishment of a transportation system within the framework of the land uses proposed, includes:

- the retention of Secondary Highways 759 and 627 and the Sundance Road;
- the establishment of a direct link from Highway 627 to the Sundance Road along Range Road 52;
- the development of a new section of the Sundance Road from the current mine housing complex directly to Highway 627 but utilizing the existing haul road for this purpose, or following an alignment closer to the south shore of the Sundance Cooling Pond. This raised the question as to the need for the existing road that



- runs between the Sundance Cooling Pond and the Lake. This road should be reviewed when the Cooling Pond is to be decommissioned;
- the retention of Range Road 42 after it has passed through the Paul First Nation Reserve to continue on down to Highway 627. Again with the changes likely due to the decommissioning of the Cooling Pond some adjustment to this road may be desirable;
- a short link from Secondary Highway 627 to the "haul road" link along Range Road 45;
- the retention of Township Road 524;
- where required and dependent upon future parcel designation and ownership, access roads to each of the End Cut Lakes, and
- additional roads to service specific quarter sections as the need arises

Where new roads are proposed they would have to built to Parkland County standards.

### **1.3.3 Utility Services.**

Utility services would follow the roads and be established to service the area as the need arises. Such extensions of utility services should be the responsibility of any developer seeking such use. The potential is here for the development of a main water and sewer service system to the cottage development along the lake front, although the cost for such a system might be prohibitive. As sewer lines should not be placed into the reclaimed mine area, it may be some time before any convenient full service system is proposed for this area.

The use of the existing water treatment and sewage treatment plants could assist in the establishment of a small housing or cottage development just northwest of the Sundance Plant.

### **1.3.4 Recreated Sustainable Natural Ecosystem**

The natural environment was an important constituent of the pre-mine landscape (approx. 50%) and still remains an important backdrop of the region's rural lifestyle. Favourable responses were received in the open house surveys to ideas such as establishing the main drainage courses as wildlife and wetland habitat and returning the cooling ponds to permanent water bodies and wetlands which support waterfowl and other wildlife. The Area Structure Plan needs to ensure a strategic investment in non-agricultural natural uses which complement and complete a sustainable rural community. The Area Structure Plan recognizes that a complete replication of natural conditions existing prior to mining is neither feasible nor necessarily desired. Priority must be placed on those parts of the recreated landscape which have the greatest benefit for:

- re-vegetation as per the mining and reclamation plan;
- protection of the watershed and water quality of drainage systems leading to Wabamun Lake;
- protection of key landscapes which are valued for their visual quality and recreational use; and
- reintegrating the surrounding regional natural features into continuous interconnected systems.

The drainage courses and water bodies are recognized as the critical pathways for the reintroduction of nature in a disturbed landscape. Drainage courses are linear features which become wildlife movement corridors when accompanied with natural plant communities which supply the essentials of life - thermal cover, protection from predators and a supply of food. The diversity of terrain, soil/moisture conditions, micro climate associated with drainage features produces a rich set of habitat niches for a corresponding diversity of life forms. The water bodies

and shorelines and back shores are equally important for a sustainable ecosystem. The future of the study area's naturally high capability for waterfowl habitat needs to be ensured in the policies of the plan.

The key initiative of the Area Structure Plan is to achieve a recreated sustainable natural ecosystem through the establishment of Ecological Conservation Areas outlined in the previous section.

The following set of policies are designed to ensure an equilibrium of nature with other sustainable uses including agriculture, tourism, recreation and industry.

## **1.4 Policies**

The policies of the Plan deal more with the specifics of how land will be developed, the types of land uses allowed, the criteria that will be used to assess developments when they are proposed on the reclaimed mine lands.

A phased system of Land Use Bylaw changes would have to be instituted that will allow for the staged program of land reclamation and its return to the public domain. The types of land use and how they will be considered under the Land Use Bylaw is set out in the following sub-section

### **1.4.1 Types of Land Use:**

The primary land use policy for the area will be:

#### **Agricultural Mixed Use District.(AMU)**

This land use would extend from south of the Sundance Shore Line Road to link to the same district to the south of the study area. (See Policy dealing with development control)

#### **Country Residential District. (CR)**

This land use would apply as currently applied across the lake shore up to the Sundance Shore Line Road. (See Policy dealing with development control)

#### **Direct Control. (DC)**

Two Direct Control Districts shall be established one centered on the Sundance Thermal Plant ( the residential complex built to house employees for this plant), and the other around the Keephills Thermal Plant. The primary purpose of these Direct Control Districts is to:

- a) allow for the possible development of new commercial enterprises or other industries within the areas utilizing the existing infrastructure systems available, and
- b) allow for a more concentrated development (cottage or recreation activities), that will utilize the existing infrastructure systems available. (See Policy dealing with development control).

#### **Agriculture/Nature Conservation District (ANC)**

This land use would apply to the Provincial Natural Conservation Area (E 1/2 Section 11 Twp 52 Rg 5 W5M), the Wabamun Lake Natural Area (Pt N1/2 Section 33-52-5-W5M), and the Wildlife and Habitat regeneration areas such as those around the decommissioned Sundance Cooling Pond, the area east of Range Road 42 and north of Secondary Highway 627, and/or the End Cut lakes in order to:

- protect the natural features of the topography, vegetation and wildlife in the area;
- provide wildlife and habitat corridors from the Wabamun Lake shore line to the hinterland; and
- to protect existing undisturbed and newly constituted drainage channels and water ways.

#### **Relation to Land Use Bylaw.**

All bylaw requirements shall apply in each of these districts except the Direct Control Districts which shall specifically explain how land uses and opportunities will be permitted within these districts.

#### **1.4.2 Recreation and New Recreation Opportunities.**

The policies related to recreation opportunities shall be determined in relation to:

- the shore line of Lake Wabamun;
- the End Cut Lakes;
- along both natural and reclaimed stream beds or drainage systems, and
- any re-established waterfowl and wildlife areas around re-established ponds (i.e. Goose Quill Bay).

While these areas have been designated as either Country Residential District, Agricultural/Natural Conservation District and/or Agricultural Mixed Use District for now, the potential for new recreation opportunities exists.

The following criteria shall apply when assessing potential applications:

- ownership of the land - this would determine responsibility for any built structures located on the lake shore of the End Cut Lakes and access roads;
- geological stability of the shore line from both erosion and from potential subsidence and slumping;
- the requirement to provide information and assurance that a potable water supply and proper sewage disposal methods can be provided without polluting the End Cut lakes or Wabamun Lake, and
- that services (telephone, power), can be economically extended to service the area.

The expansion of water and sewer services from a central water treatment plant and to an established sewage lagoon might also be considered provided that they meet the engineering and geotechnical criteria established for this area.

Natural gas services require the same assessment before being permitted in any area.

#### **1.4.3 Development on Reclaimed Mine Areas.**

The process establishing new land uses and development on reclaimed mine lands must occur in a manner to protect the interests of all parties - future land holders, mine operator, and responsible government jurisdictions. Future development needs to be selected for and adopted to the risks and limitations related to ground subsidence, ground and surface water, contaminants, and soil conditions of the post mine

landscape. The following policies are designed to minimize potential conflicts and problems in the transition to new land uses:

1) Development Approaches - when the existing or future owners of reclaimed mine lands wish to make improvements involving structures of infrastructure (roads, utilities, sewage disposal systems, etc.) an additional requirement to normal development/building permitting process would be required to ensure appropriateness of improvements and to limit liability with respect to the effects of mining. Additional submissions would be required for:

- geotechnical study for structures and infrastructure,
- the evaluation of the suitability for the development of intensive livestock operations shall be reviewed as a discretionary land use where details of ground water, manure management, and surface drainage information must be provided as part of the application,
- the provision of potable water supply and sewerage disposal systems for residential development which meets Parkland County standards.

#### **1.4.4 End Cut Lakes.**

The End Cut Lakes provide opportunities for both Recreation and for Country Residential development while at the same time recognizing, that dependent upon ownership and need, access to each lake should be open to the public at all times if desired.

The same criteria shall be considered in any proposal for alternative land uses surrounding these End Cut lakes. These criteria are:

- that ownership of the parcel be clearly established;
- that ownership establishes legal liability for management and construction of the lakes and structures on the lake;
- that public access to the lakes may be provided if desired unless the area is to be totally contained within private ownership (or joint ownership i.e., condominium title);
- that the geological stability of the shore line from both erosion and from potential subsidence and slumping be determined prior to development;
- that the requirement for information and assurance that a potable water supply and proper sewage disposal methods can be provided without polluting either the End Cut Lakes or Wabamun Lake, and
- that services (telephone, power etc.) can be economically extended to service the area.

#### **1.4.5 Reconstituted Streams and Creeks.**

All of the natural surface drainage of the pre-mine drainage basins is to be returned to Wabamun Lake via reconstructed drainage courses and existing streams that have natural characteristics and support a diversity of plant communities and wildlife.

The channels of drainage courses should exhibit the natural sinuosity, channel profile and cross-section and valley shape which is naturally stable and regionally prevalent.

The rate of surface runoff should be roughly equivalent to the pre-mine landscape. Drainage courses should incorporate water bodies, and wetlands which slow down and even out the release of surface drainage into Wabamun Lake. Wetlands serve valuable



ecological functions including the filtering of impurities and the creation of habitat diversity.

Where possible:

- drainage courses which rely on licensed drainage and drop structures should be redesigned using the above principles;
- economically feasible road crossings of natural drainage features should be designed to facilitate the movement of wildlife along the drainage course, and
- the terrain immediately beside new drainage course should be designed to discourage agricultural activity and encourage colonization by natural plant and animal communities.

Natural Streams that still exist after mining should be afforded the same protection as reconstituted streams.

#### **1.4.6 Ecological Conservation Areas (ECA)**

Landscape corridors along drainage courses and water bodies are to be designated as Ecological Conservation Areas and managed to promote natural ecosystem re-establishment and conservation. Designated ECA's will have special controls and development criteria designed to promote natural and partially assisted re-establishment:

- terrain which discourages other economic activities;
- re-vegetation with natural vegetation communities, and
- development and use restrictions which gives young plant communities time to establish

ECA's should be established :

- along existing undisturbed and reconstituted streams and creek banks;
- around End Cut Lakes;
- around wetlands that are to be retained, and
- around portions of the Wabamun Lake shoreline.

Landscape corridors need to be of sufficient width to permit cover establishment for wildlife movement corridors. A guideline setback is recommended of 50-150 meters from the shoreline of a water body or centre of a drainage course.

Methods of conserving environmentally significant areas and promoting natural establishment are set out in the Municipal Government Act of Alberta (1994). Two methods most applicable to this context are:

- Environmental Reserve: dedication and transfer of title to the County for the restricted purpose of a natural open space, managed by the County for the public benefit, and
- Environmental Reserve Easement: restriction of development rights without transfer of ownership where the land is left in a natural state.

The former method is applicable where public access is desired and Parkland County is willing to undertake the financial burden of ownership and management. The latter method is applicable where protection of a natural corridor's biological resources is the prime objective and public access is not a requirement.

Because the majority of the land is currently under a single owner (TransAlta Utilities), changes in ownership rights may be more easily implemented. Although it is recognized that Environmental Reserves or Environmental Reserve Easements may only be claimed by the County at the time of subdivision, it is hoped TransAlta Utilities would voluntarily undertake to establish the limits of environmental reserve, either by caveat or through manipulation of the topography in the area where environmental reserve might be best suited.

#### **1.4.7 Sundance Provincial Natural Area, and the Wabamun Lake Natural Area**

The natural areas (E1/2-S11-52-5-W5 and N1/2 S33-52-5-W5M) designated by the Province as a natural areas should be maintained in perpetuity as an ecological reserve and natural area. Management of the Provincial Natural Area and the Wabamun Lake Natural Area, should be reviewed periodically by the County in conjunction with Alberta Environmental Protection and local interest groups. Management objectives need to be established for conservation and low impact use of these sites.

#### **1.4.8 Waterfowl Habitat**

Land use and cooling pond reclamation in the eastern half of the Area Structure Plan Study area needs to support the habitat conditions for waterfowl use identified in the Canada Land Inventory. Policies include:

- supportive land-use districting (e.g. ANC - Agriculture/Nature Conservation District), and
- design of remnant cooling ponds for productive waterfowl habitat as a prime end use objective.

#### **1.4.9 Transportation Network.**

The primary policy for the redevelopment of roads and transportation systems shall be:

- to provide access to all legal land parcels (Access to all legal parcels is a requirement of the Municipal Government Act and through other Acts dealing with land, land ownership and land surveying);
- to reestablish the main collector road system, access to parcels, and as far as possible require the road system to follow the original range and township lines; and
- to uphold the requirements and obligations of TransAlta Utilities to replace roads as far as possible to the maximum extent of the original road system and as desired by Parkland County. (See Appendix C. TransAlta Utilities License Obligations). The system may be adjusted where the finished land configuration and economics of road construction permit an alternative system of road location and layout. Special prior agreement between TransAlta Utilities and Parkland County are not affected by this Area Structure Plan.

#### **1.4.10 Residential Development.**

Residential development will be permitted in the three primary Land Use Districts proposed for this area (Agricultural Mixed Land Use District, Agriculture/Nature Conservation District, and Country Residential Land Use District). These Districts have their own requirements and standards set out in the Land Use Bylaw. However, any development to be located on areas of disturbed soil shall provide

- geotechnical information on soil stability, ground water availability, and liability insurance before approval. including any other requirements under the Land Use Bylaw,
- conditions of development, and
- mitigation procedures to meet the requirements and controls under the Environmental Protection and Enhancement Act.

#### **1.4.11 Subdivision.**

It is the primary policy to re-establish the original section and quarter section system of survey and subdivision within the area.

To do this the existing quarter section system will be re-established. (This may not always be possible given the nature of the reclaimed land, its proposed topography and the eventual location of arterial and collector roads, drainage channels and facilities proposed for the area when reclamation is complete).

NOTE: The restoration of the original survey monuments is a legal requirement under the Surveys Act

#### **1.4.12 Intensive Livestock Development.**

Within the Agricultural Mixed Use District within the Area Structure Plan area, all proposed livestock developments shall be considered as Discretionary Uses. No intensive livestock development shall be approved unless detailed information is provided that will ensure availability of an adequate water supplies and that there is a capability to properly manage effluent runoff and manure waste.

#### **1.4.13 Links to the Lake Wabamun Management Plan.**

NOTE: The Lake Wabamun Management Plan is not a statutory document but is used as a guide only.

The area north of the Sundance Shore Line Road and the Wabamun Lake shore falls under this Management Plan. Reference should be made to this document and to the Land Use Bylaw for any new development within this area.

#### **1.4.14 Public Awareness.**

It is the policy of the County to keep the public within and surrounding the Area Structure Plan Area informed as to the changes that might be made to the Area Structure Plan.

Throughout the development of this Plan, and indeed the development of all plans for the Highvale and Keephills mines in the past, the general public has been kept informed and consulted as to their reactions and concerns with the mining process. This process should be continued. Information on changes in land use and development should continue to be advertised and presented to any concerned committees that have or will be formed.

#### **1.4.15 Obligation of Parties.**

There is an obligation for TransAlta Utilities, under the conditions of the approval to mine, to fulfill specific requirements regarding re-establishment of roads, survey lands,

habitat, and the method of disposing of reclaimed and/or surplus land within the mine and to keep the public informed of the reclamation process.

The Area Structure Plan and supporting documents do not affect any prior agreements, or create any agreements between Parkland County and TransAlta Utilities Corporation.

#### **1.4.16 Flexibility of the Area Structure Plan.**

It is important to recognize that due to the uncertainty of the mining process, features shown on the Mine Reclamation Plan may not be exactly as shown when finally developed. (e.g. End Cut Lakes may be both a different shape or in a new location, slopes and classified agricultural land may be different or in different proportions than intended, and facilities and infrastructure may be in locations not currently shown on the plan).

It is the policy of the County to ensure that policies regarding land use and development should therefore be flexible to accommodate these changes.

#### **1.4.17 Staging.**

Staging for the transfer on land to the End Land Uses approved under this Area Structure Plan is contingent upon TransAlta Utilities obtaining a Reclamation Certificate. The staging of transfer of lands would be based on TransAlta Utilities' mine plan (see Application for renewal of approval.)

#### **1.4.18 Implementation and Monitoring.**

The Plan shall be implemented and monitored in accordance with the provisions of the Municipal Government Act and County Policy. The use of existing committees to monitor plan implementation will be encouraged where possible.

#### **1.4.19 Legislative process.**

The process by which the Area Structure Plan is reviewed and approved, and by which it can be amended is set out in the Municipal Government Act. It is the policy of Parkland County to recognize the need for flexibility and adjustment due to the nature of the mining process.

### **1.5 Development Phasing.**

The development of the mine and the subsequent reclamation of the lands for agricultural purposes will occur in stages. It is important to understand that the mine development and subsequent reclamation of mined lands has to be:

- somewhat flexible to allow the mine operators to select the most suitable areas for mine operations,
- subject to change due to a number of factors related to the mining process, and
- the economics of mining for coal in this area at any point in time.

Each of these conditions could change the mine program and result in one or a number of Mine Pits becoming dormant until it becomes economically and engineeringly feasible to return to that Mine

Pit. In the past the mine face has in effect been one long pit face covering every pit within the mine and extending from west to east.

The second factor that affects phasing and reclamation is the settlement of the reclaimed land surface. Reference to the conditions identified earlier (see Section 2.3.8 Geotechnical Monitoring and Investigative Requirements) indicates that for simple agricultural development (i.e. crops and livestock), once the land has been reclaimed to its approximate finished contours and soil classification then these agricultural activities can begin. However if other forms of development are to occur (i.e. roads and possibly buildings or infrastructure), then the time for such development will be subject to development restrictions set out earlier.

The third factor is the influence of some mining infrastructure needed for the mine to operate that might affect the timing of reclamation and or staging of the reclaimed land for future sale and development. This refers to such facilities as the haul roads, power lines used to service the Power plants, and the local service lines used to provide services to the mine face.

To indicate how the haul road affects staging one has only to examine the development of Pit 4 at the west end of the cut face. The haul road is located closer to the north end of this Pit with the result that its maintenance as a haul road will be retained until the coal face is completely mined out. (dependent on the economics of mining in this location as compared to mining in other parts of the Highvale Mine area). The reclamation of land to the south of the haul road will not be complete and available for transfer until the haul road (when mining at the cut face is complete) is no longer needed. The operation of the mine and the need for the haul road go hand in hand. However, reclamation of land to the south of the haul road will be undertaken and the area made available for lease as agriculture land as reclaimed land becomes available. The final transfer of the land to private ownership would not take place until the mine is complete, the end cut lake established and the haul road no longer needed. This could be 20 to 25 years from now.

Using the same example, the area could be completely mined out in a much shorter time frame if the economics of the mine in this location becomes sufficiently better to complete than elsewhere in the Highvale Mine area. The area would then be mined out and the area reclaimed including the haul road.

Given these three variable factors that influence the rate of development,

- the location of mining,
- the location and nature of the reclaimed land, and
- the need to adjust or modify existing infrastructure,

the reclamation phasing has to be flexible and adjustable as the mining proceeds. It was therefore assumed that a staging plan while interesting and informative at this point in time, would be utterly useless because the plan may have changed within a short time frame.

## **1.6 Servicing and Transportation**

Utility servicing and the development of roads is dependent upon the reclamation process and the decommissioning of land for public use or sale. The primary connection along Range Road 52 should be the first major link to be established.

# **HIGHVALE MINE END LAND USE AREA STRUCTURE PLAN**

**BYLAW NO.28-97**

**Prepared for**

**Parkland County**

**June 1997**

**APPENDIX A. BACKGROUND AND PLANNING DATA BASE FOR  
AREA STRUCTURE PLAN**

## EXECUTIVE SUMMARY

### *General Background*

Coal mining in the Highvale area dates back to the early part of this century, but since 1960, first Calgary Power and then TransAlta Utilities have carried out exploration, power plant development and large scale open pit mining across a wide front to the south of Lake Wabamun. The mining is considered a temporary use and its current life expectancy, dependent upon economics, is 2019. As the inventory of reclaimed land is increased there will be a need to determine its end land use and how those uses will be implemented and monitored to ensure that the area of the open pit mine is returned to more or less its former land form and appearance.

The Area Structure Plan set as its vision and purpose:

**“...to provide a set of goals and policies that will allow Parkland County and TransAlta Utilities to establish a rational acceptable pattern of land use, transportation and service infrastructure, natural spaces and restored land quality for the area defined as the Highvale Mine located to the south of Lake Wabamun in Parkland County.”**

The planning process included research into biophysical and the altered content of the mine; land use and research into the nature of the area before the mine was begun; identification of development constraints and limitations that now exist and which might affect future reclamation and development, and the determination of an end land use, transportation and infrastructure plan. The process included consulting with the general public to determine their ideas and finally their general acceptance of the proposals being made. The information was translated into a series of proposals and defined as a Parkland County Bylaw to satisfy the requirements of the Municipal Government Act.

The mining operation altered many of the natural features of the original landscape (creeks and stream beds, wildlife corridors etc.), and in turn incorporated additional features (end cut lakes etc.) all of which have been considered in the End Land Use Plan for the future development of the area.

As coal was removed and the waste replaced, a set of variable conditions were created that have allowed TransAlta to re-establish areas suitable for agricultural development, incorporate topographic adjustments that will allow for future stream, creek and drainage systems and vegetative and wildlife corridors that will return the area to more or less its former appearance.

The land will however be susceptible to subsidence over the years and this pattern of adjustment had to be considered in all development applications and requests.

The Area Structure Plan established FIVE goals. They are:

1. to provide a land use plan and policy structure for future development that will allow Parkland County to manage the study area in terms of sustainable land use, re-established drainage systems, transportation linkages, recreation opportunities and the subdivision of land,
2. to establish policies that will control development on the land,
3. to provide a framework for a transportation, public utility and infrastructure network that links the surrounding systems existing within the County,



## Appendix A Executive Summary

4. to allocate different land uses within the study area that meets social, economic, environmental, engineering and public concerns and interests, and
5. to produce a flexible, relatively simple guide for development that allows for ongoing change in the mine and reclamation plans.

The plan established four main land uses. They are:

1. an agricultural mixed use district that covers most of the area permitting a general agricultural land use to be re-established in the area,
2. a Country Residential District that applies mainly to the shoreline of Lake Wabamun,
3. an Agricultural/Natural Conservation District that while allowing agricultural pursuits seeks also to protect the sensitive wildlife and natural vegetative areas from general development, and
4. two Direct Control Districts that incorporate the two power plant sites so that specific appropriate land uses can be examined on an as needed and definitive basis before being approved.

The Plan proposes a major transportation system that has retained the four surrounding roads, identified a new internal road from Secondary Highway 627 to the Sundance Shore line road along Range Road 52, and adjusted the road system south and southeast of the Sundance Plant to utilize the existing Haul road for a link to Highway 627 tying into Range Road 43.

The Plan also establishes policies related to recreational opportunities and seeks to re-establish critical sensitive wildlife areas where the existing cooling ponds now are located. These areas and protected corridors to the uplands will provide the needed corridors for future wildlife and restore the aesthetic characteristics of the area to that which existed prior to the mine operation.

The mining process results in the development of End Cut Lakes at the extreme limits of mining. These lakes are proposed to enhance the area by allowing either private development or public recreation to surround them. They are also linked to the wildlife and vegetative corridors that are established in concert with natural drainage features of the post mine landscape.

The Plan recognizes that the whole process must be flexible to accommodate changes in the mine due to economics and technical development in the mining process, but recommends that the reclaimed land be monitored and that a post mining care program be established to ensure that future residents and land owners are not encumbered with risk and liability in the future.

The general principle behind the plan is to re-establish the area in a manner consistent and compatible with the character of the land prior to mining.

### ***Summary of Recommendations***

The following is a summary of the recommendations set out in more detail in Appendix A:

#### **Land Use**

Generally the area will be returned to agricultural use with natural areas being left for protection.

#### **Recreation**

Opportunities for recreation developments exist along the Wabamun Lake Shoreline, on the south shores of the End Cut Lakes and for preservation around the Cooling Pond area.

#### **Development on Reclaimed Mine Areas**

Development control is established through the Land Use Bylaw and for development within the reclaimed mine area, appropriate, adequate and acceptable technical studies need

## Appendix A Executive Summary

to accompany each proposal prior to that development being approved. The purpose is to protect the interests of all parties - future land owners, mine operator and responsible government jurisdictions. Policies should cover: post mine closure care, transfer of ownership and development control.

### **End Cut Lakes.**

The End Cut Lakes provide opportunities for innovative ideas in development ranging from individual control to maintenance to public use.

### **Reconstituted Streams and Creeks**

Natural drainage systems must be re-established across the mined areas. These provide natural corridors for wildlife and natural vegetation that will help return the area to its former appearance and function.

### **Ecological Conservation Areas**

These are landscape corridors along drainage courses and water bodies designated as Ecological Conservation Areas and managed to promote natural ecosystem re-establishment and conservation.

### **Sundance Provincial Natural Area and the Wabamun Lake Natural Area**

These natural areas (E1/2-S11-52-5-W5 and Pt1/2 S33-52-5-W5M) designated by the Province and should be maintained in perpetuity as an ecological reserve and natural area.

### **Waterfowl Habitat.**

The design of the remnant cooling ponds for productive waterfowl habitat is a prime end use objective. The habitat conditions for prime waterfowl use identified in the Canada Land Inventory should be supported and maintained in these areas.

### **Transportation network**

The primary focus of the Transportation network is to provide access to all legal land parcels; to reestablish the main collector road system, access to parcels; as far as possible to require the road system to follow the original range and township lines; and to uphold the requirements and obligations of TransAlta Utilities to replace roads as far as possible to the maximum extent of the original road system.

### **Residential Development.**

Residential development will be permitted through the Land Use Bylaw, any development located on areas of disturbed soil shall provide appropriate geotechnical information on soil stability, ground water availability, and liability insurance, conditions of development, and mitigation procedures to meet the requirements and controls under the Environment Protection Act. before approval.

### **Subdivision.**

It is the primary policy to re-establish the original section and quarter section system of survey and subdivision within the area.

### **Links to the Lake Wabamun Management Plan.**

Reference should be made to this non-statutory document and to the Land Use Bylaw for any new development within this area.

### **Public Awareness.**

It is the policy of the County to keep the public within, and surrounding the Area Structure Plan Area, informed as to the changes that might be made to the Area Structure Plan.

### **Obligations of Parties**

There is an obligation for TransAlta Utilities, under the conditions of the approval to mine, to fulfill specific requirements regarding re-establishment of roads, survey lands, habitat, and to keep the local area public notified of the reclamation process and the final end land use.

## Appendix A Executive Summary

### **Flexibility of the Area Structure Plan.**

Due to the uncertainty of the mining process, it is the policy of the County to ensure that policies of this Area Structure Plan regarding land use and development should be flexible to accommodate changes as they may occur over time.

### **Staging.**

The staging of transfer of lands would be based on TransAlta Utilities' mine plan and their obtaining a Reclamation Certificate. (see Application for renewal of approval.)

### **Implementation and Monitoring**

This will be done through existing organizations and in accordance with the provisions of the Municipal Government Act and County Policy.

### **Legislative Process**

The Municipal Government Act requires periodic review of the Plan.

# **HIGHVALE MINE END LAND USE AREA STRUCTURE PLAN**

## **BACKGROUND REPORT**

### **1.0 Introduction**

#### **1.1 Background**

Coal mining in the Highvale area dates back to the early part of this century. A summary of coal mining activity is documented in "History of the Highvale Mine" (TransAlta Utilities Corporation, 1996). Small-scale underground mining operations began in 1911, carried out by the Lake View Coal Company. In 1913 the mine was taken over by the Mullen Coal Company, which transported the coal by barge across Wabamun Lake to the Grand Trunk Railway. The Consumer Coal Co. Ltd. took over the mine in 1916 but closed it down in 1917. Total coal production to 1917 was about 12,000 tons. Larger-scale surface mining operations began in 1943. Various companies owned and operated the mine between 1943 and 1964. Calgary Power Ltd. purchased the mine from the Mount Royal Collieries in 1964.

In 1948, Donvie Collieries started a second mining operation at the western end of the Highvale Mine area. This operation was sold to Continental Collieries and purchased by Calgary Power Ltd. in 1965.

Between 1960 and 1963, Calgary Power Ltd. carried out exploratory field drilling throughout the Highvale mine area. Exploratory drilling was followed by more extensive investigations and a larger-scale drilling program beginning in the fall of 1965. Based on the results of Calgary Power's investigations, construction of the Sundance Thermal Plant began in 1967. In 1970, Calgary Power Ltd. completed a contract for stripping of the overburden, mining of the coal, and delivery of the coal to the Sundance Thermal Plant with Manalta Coal Ltd. In 1982, Calgary Power Ltd. changed its name to TransAlta Utilities Corporation

Current coal mining operations in the Highvale area use a strip mine excavation technique to extract coal from shallow deposits in a 15-kilometre-long area between the south shore of Wabamun Lake and an escarpment that parallels the southern boundary of the mine area. TransAlta Utilities Corporation uses the coal from Highvale as an energy source to operate two thermal-electric generating plants: Sundance and Keephills.

Since 1972, mining operations have gradually been extended to a series of pits which align with the coal seams. Ultimately some 4500 hectares of land will be disturbed by mining activities. During the early stages of mine development, TransAlta Utilities Corporation prepared a reclamation plan for the mined area. This plan was approved by the regulatory authorities of the Province of Alberta. TransAlta's reclamation program has been phased with other mining operations. Some previously-mined areas have already been reclaimed for productive farming and leased out to local farmers to plant and harvest both cereal crops and hay.

The Highvale mine is a temporary use of the land. The currently approved mine plan forecasts an end to mining activity by the year 2019, but this date is dependant upon the economic life of the two power plants. As the inventory of reclaimed mine lands increases and the end of the life of the

mine approaches, an orderly plan for transferring mine lands to future land uses is increasingly needed.

## **1.2 Purpose of an Area Structure Plan.**

The purpose of this Area Structure Plan is to provide direction to both TransAlta Utilities Corporation and Parkland County for the re-establishment of land uses within the area of the Highvale mine and the Sundance and Keepphills plant sites.

An Area Structure Plan<sup>1</sup> lays the ground rules amongst other things for the staging and sequence of development, for future land use, and identifies the expected density of development proposed for the area. In addition the Area Structure Plan will show the transportation network and how it will link back into the existing surrounding road system and the general location and routing of any utilities required to service the area.

In the case of the Highvale End Land Use Area Structure Plan, additional matters were considered and information provided as a guide to the general development of the area. These matters cover the physical potential of the reclaimed mine lands, that is, when and how development can occur and the constraints that might have to be imposed to allow such development on disturbed unstable land that is subject to further subsidence. Because of the need to relocate original drainage courses, the Plan will identify where and to some extent how these new re-established drainage courses will be established, maintained and protected. This includes restored vegetation and habitat areas.

The best uses for the existing plant sites and cooling ponds were examined along with the related housing and utilities, and potential recreational opportunities that might be available within the area particularly the areas surrounding the proposed End Cut Lakes and along the re-established creek and drainage courses.

The Area Structure Plan takes into account public and stakeholder opinion and concerns through a series of Public Open Houses and meetings. Links to the Lake Wabamun Management Plan, and the obligations established between the County and TransAlta Utilities before the mine was started were examined and also incorporated into the Plan.

The final stage of an Area Structure Plan is its formal approval through the County Council following a legislative process that turns the recommendations of the Plan into a Bylaw of Parkland County. This Bylaw has established a flexible set of rules that will accommodate changes made during the mining and reclamation process, and the existing end-of-life reclamation plans currently laid out for the mine.

---

<sup>1</sup> Municipal Government Act 1994 Chapter M-26.1 with amendments in force as of March 21, 1996.

Section 633(1) For the purpose of providing a framework for subsequent subdivision and development of an area of land, a council may, by bylaw, adopt an area structure plan.

(2) An Area Structure Plan

(a) must describe

- (i) the sequence of development proposed for the area,
- (ii) the land uses proposed for the area, either generally or with respect to specific parts of the area,
- (iii) the density of the population proposed for the area either generally or with respect to specific parts of the area, and
- (iv) the general location of major transportation routes and public utilities, and

(b) may contain any other matters the council considers necessary.

## Appendix A

The Area Structure Plan for the Highvale mine must be cognizant that future land use must be compatible with the recreated landscape which follows the mining and reclamation process. Reclamation in effect re-establishes a topographic earth surface. This surface is neither the same as, nor has the same qualities as the topographic surface that existed before mining took place.

The re-established surface has some limitations in that the land has now been disturbed; has varying depths of un-consolidated soil; has defined land capabilities (in general the percentages of land capability existing before mining took place, has been returned in approximately the same percent ratio but not necessarily in the same locations); has different drainage channels and surface drainage properties, and includes new lakes and water bodies that were not there before the mine was started. In addition, the Mine Operators have agreed to restore components of the existing roads, either where they were originally located or in new locations determined in time and consistent with the new topography and features of the reclaimed land. This process will be explained more fully later.

The Area Structure Plan is based on the provincially approved reclamation plan and the very nature of the mining process, mining economics and the changes that occur in these systems requires that the Area Structure Plan:

- be flexible and designed to accommodate change during the life of the mine,
- utilize the new topography, its features, and soil classifications in determining the most appropriate land uses, subdivision, transportation and infrastructure systems, and
- identify the best manner in which to sequence development of the land as it comes available for its projected new use.

Thus it will be found that this Area Structure Plan presents broad general land uses, provides a general direction for a transportation system, sets some specific development controls, utilizes and extends utilities when land uses have been determined and allows for the staging of development to be tied to mine reclamation and the de-commissioning process.

### **1.3 Plan Mission Statement**

The Vision of this plan as developed by the Steering Committee and Planning Team is:

**“..to provide a set of goals and policies that will allow Parkland County and TransAlta Utilities, to establish a rational and acceptable pattern of land use, transportation and service infrastructure, natural spaces and restored land quality for the area defined as the Highvale Mine located to the south of Lake Wabamun in Parkland County”.**

### **1.4 Study Area.**

The Highvale Mine operation is currently being carried out to the south of Wabamun Lake within Townships 51 and 52, and ranges from Range Road 35 in the east to Range Road 60 (Highway 759) in the west. Included in this area are two Power Plants (Sundance and Keephills) together

with their cooling ponds, ash dumps and other accessory land uses. (Map 1 - Study Context, and Map 2 - Study Area).

### **1.5 Planning Process**

The Planning Process has included:

- background research into the biophysical and altered content of the mine, the mining process, the location of existing land uses, and research into the nature of the area before the mine was begun;
- identification of the development constraints and limitations that now exist within the area in order to establish possible limits on and for future development;
- the development of an "end land use" plan consistent with the mine reclamation plan;
- a public consultation process that reviewed the background and the plans and policies with both selected stakeholder groups and the public at large;
- the development of an Area Structure Plan that consists of goals and objectives and policies that relate to a variety of potential land uses, transportation and utility infrastructure and land conditions; and
- the translation of this plan into a Parkland County Bylaw that can be used as a guide for future development

The process of planning was overseen by a Steering Committee that consisted of representatives from the County, TransAlta Utilities, and from interest groups surrounding the mine.

### **1.6 Public Consultation**

The Public Consultation program was conducted during the development of the Area Structure Plan including the holding of public open houses, and meeting with stakeholder groups.. Exit questionnaires were distributed at all public open houses and the results of these questionnaires has been included in Appendices B1 and B2 - Comments by Public at Open Houses.

It is important to note that the first series of Open Houses identified that, in general, the public wished:

- to return the land to its agricultural base;
- to try if at all possible to establish some form of industrial or economic activity in the area that would minimize the loss of tax revenue currently derived from the mine and power plants;
- to restore where practicable the original road system although recognizing that the new topography may not permit this entirely;
- to provide for the re-establishment of some natural areas between the shore line and escarpment as natural habitat systems, wildlife corridors and aesthetic contributions to the landscape;
- to maintain the current quarter section subdivision system recognizing that in some instances a number of parts of existing quarter sections might have to be consolidated to form a reasonable parcel configuration;

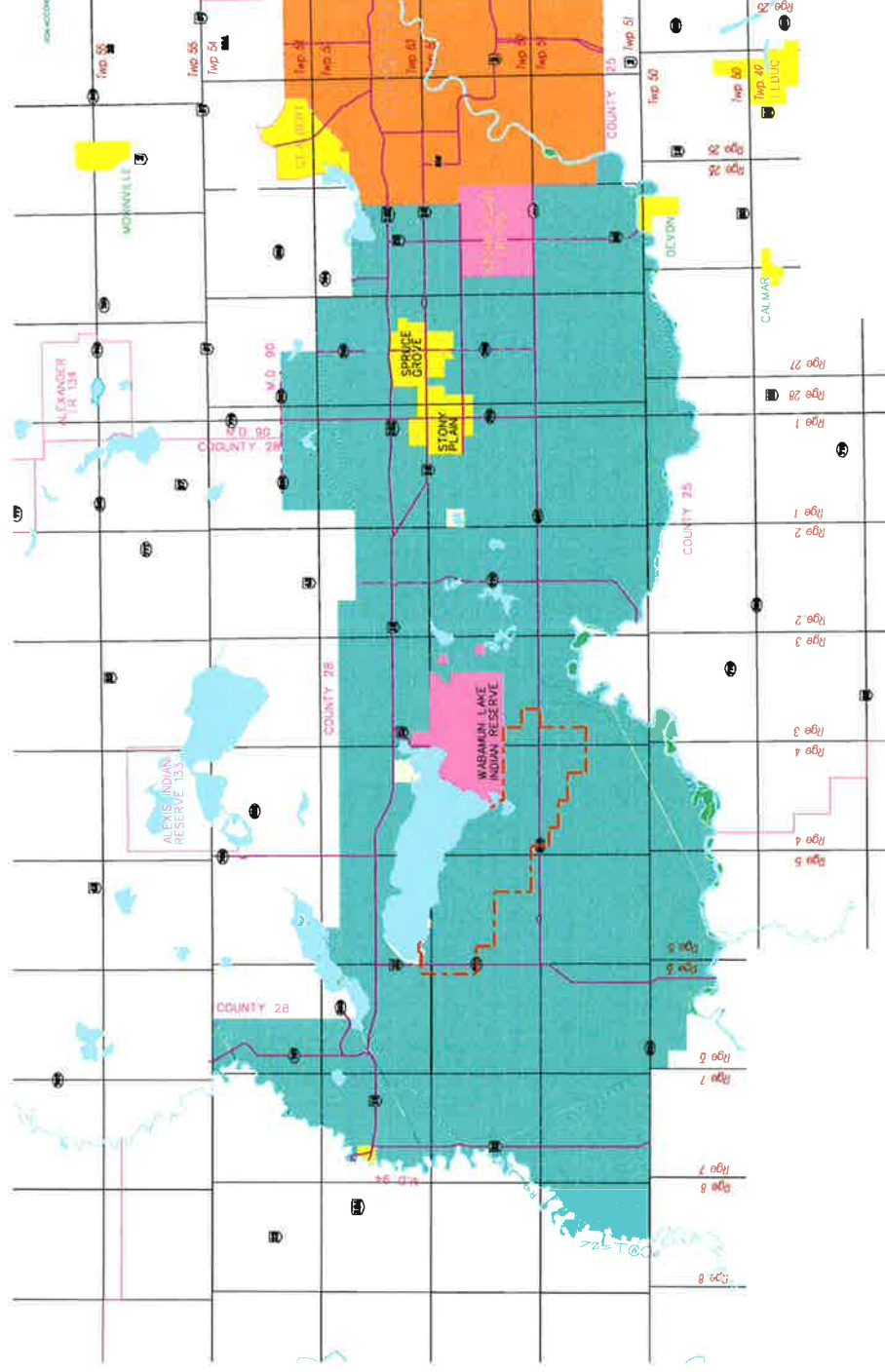


Highvale End Land Use  
Area Structure Plan  
Parkland County TransAlta Utilities

Map 1  
STUDY  
CONTEXT

LEGEND

- Study Area
- Parkland County



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Ornd-McCann Consultants Ltd.  
D.L. Foster Associates Ltd.  
Cottman Engineering Inc.



# Highvale End Land Use Area Structure Plan

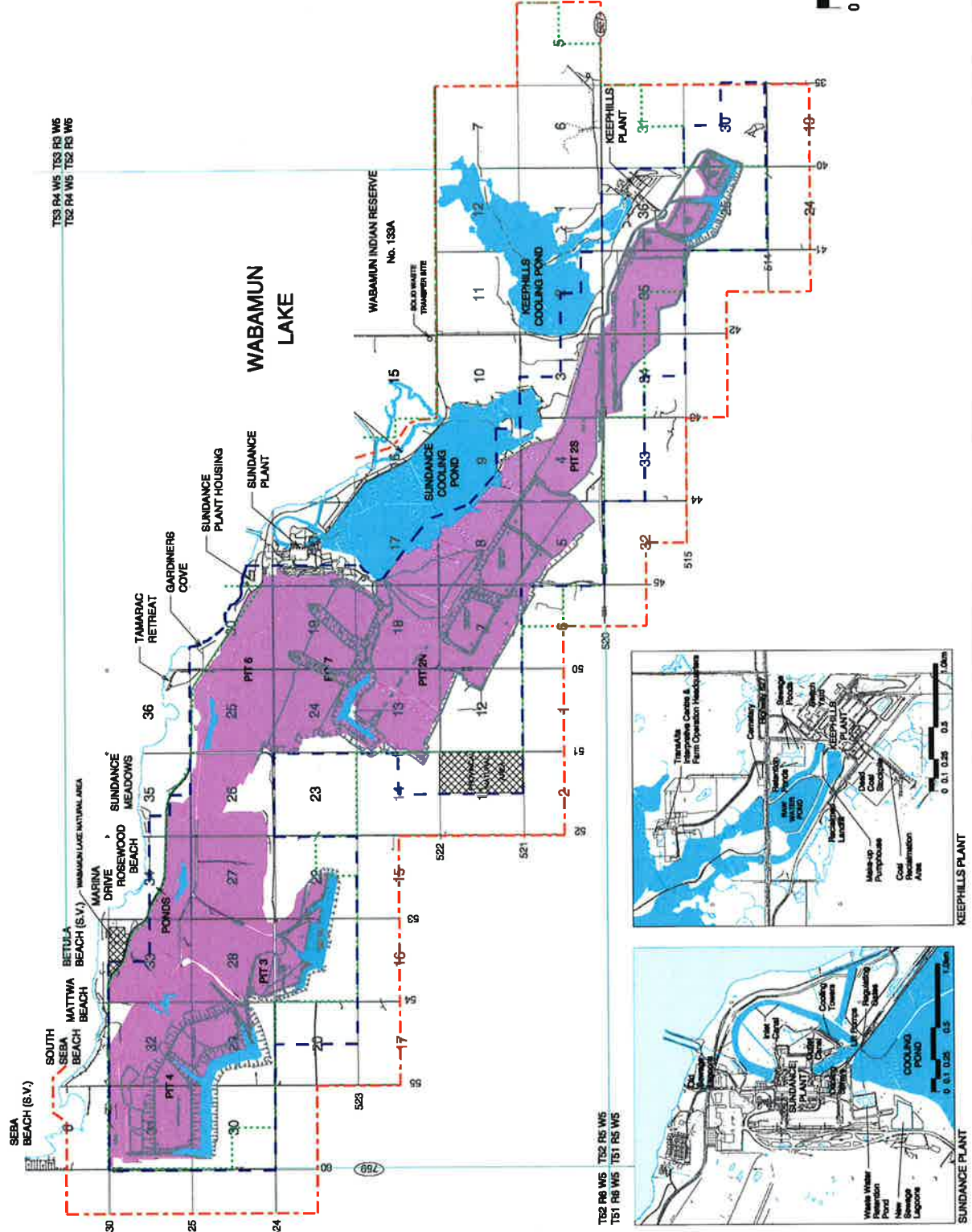
Parkland County TransAlta Utilities

## Map 2

## STUDY AREA

### LEGEND

- Study Area
- Mine Permit Boundary
- TransAlta Utilities Holdings
- Mining Extent
- Water Features



Keith Driver & Associates Ltd.

with  
Gibbs & Brown Landscape Architects Ltd.  
Orr-MacLean Consultants Ltd.  
D.J. Foster Associates Ltd.  
Cochrane Engineering Inc.

## Appendix A

- to leave the Sundance Road in its present re-aligned location west of the Sundance Plant;
- to provide a link between Highway 627 and the Sundance Road; and
- to permit, if feasible, the development of smaller lots along the south shores of the End Cut Lakes.

The second series of Open Houses the public that attended commented upon a draft plan. In general their comments were favourable to the ideas shown on the plan. However a number of ideas were presented that resulted in minor adjustments to the final plan. These are:

- qualified the idea that alternative industrial development might replace the Power Plants when they are decommissioned,
- qualified the idea that cottage development would occur on the south sides of the End Cut lakes,
- qualified public access to the End Cut Lakes, and
- maintaining the shore line road from Range Road 42 to the Sundance Plant until a further review at the time the ponds are decommissioned.

On the other hand the public supported:

- a return to agricultural activity
- the traditional section subdivision system as the system for future subdivision
- restoring the cooling ponds and other wetlands to their original wild life habitat, and
- the main elements of the proposed road system.

A brief review of the Public Open Houses attendance lists also showed that most of those interested in the reclamation of the mine site and the proposals made for its future land use came from surrounding areas and had lived in the area for some considerable time. Most of the public attending had lived in the area long enough to remember how the area looked before the mine was begun in earnest.

A Public Hearing held by Parkland County Council also gave the public an opportunity to voice their concerns and support for the Plan directly to Council.

## **2.0 PLANNING DATA BASE**

### **2.1 Introduction**

This section deals with both the natural and cultural landscapes of the Highvale mine site and includes the back ground material related to the objectives and regulatory requirements which TransAlta Utilities Corporation is committed to as part of the approvals to mine the area.

Pre and post mine appearance of the area will be different. Prior to the mine being undertaken (there was some small amount of coal mining in the area dating back to 1911 but the main mining operation was not begun until 1970), most of the area was under agricultural usage, either crops or for grazing. Some parts of the area were left as natural landscape, and at the eastern end of the study area there were a number of small kettle ponds creating an varied terrain. (Map 3 - Pre-mine air photo mosaic). Comparison with the current air photos show the many changes that have occurred due to the mining operation (Map 4 - Current air photo mosaic). The strip mine stretches from Secondary Highway 759 on the west to Range Road 35 in the east, a distance of some 21 km (13 miles) and from the lake shore in the north to south of Secondary Highway 627. Power plants have been constructed at both Sundance and Keephills, and two large cooling ponds dominate the eastern part of the mining area. In addition to these major features, there are haul roads, ash and waste dumps, power lines, sewage lagoons, sight and sound barriers along Sundance Road and railroads. A small housing development, attendant infrastructure and workshops and offices have been built for the power plants and a reclamation and tour centre has been established just north of the Keephills power plant. Map 5 - Site Photos show various aspects of the study area as it currently exists.

### **2.2 Highvale Mine And Plant Site**

#### **2.2.1 Reclamation Objectives and Regulatory Requirements**

The main objective of the final reclamation of the Highvale mine site is, "to provide a landscape with equivalent agricultural capability to that which existed prior to mining". In addition, the objectives of the reclamation process are to re-establish the surface water resources (i.e. the creeks and drainage channels), to decommission the temporary diversions that have to have been put in place to accommodate the normal surface run off from areas to the south of the mine, and to remove and decommission all mine infrastructure that would not be needed for the future end land use. Thus, all reclaimed lands would be generally free of constructed features (i.e. haul roads, pipelines, structures, etc.) that would impose upon the future use of the reclaimed land.

To meet the first objective, the pre-mine agricultural capability was assessed (this was not required for areas mined prior to 1983 but is required for areas mined since 1983. Pre-mined land ranged in classification from Class 3 (moderate limitations for agriculture), to Class 7 (no agricultural capability) - See Table 2 - Pre-mine and Post-mine Agricultural Capability.

In addition to the percentage reclaimed of each class of soil, additional criteria as part of the reclamation process were added. In general these were:

- Class 3 soils will be nearly level with reclaimed slopes no greater than 9%, subsoil material will be 1.0 m thick with top soil thickness of 0.2 m;

# Highvale End Land Use

## Area Structure Plan

Parkland County TransAlta Utilities

### Map 3

## PRE-MINE (1970)

## AIRPHOTO

## MOSAIC

### LEGEND

--- Study Area



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Orin McCann Consultants Ltd.  
J. Peter Associates Ltd.  
Cochrane Engineering Inc.



Highvale End Land Use  
Area Structure Plan  
Parkland County TransAlta Utilities

Map 4

CURRENT (1995)  
AIRPHOTO  
MOSAIC

LEGEND

Study Area



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Ornt & Co. Architects Ltd.  
Ornt & Co. Engineers Ltd.  
Ornt & Co. Engineers Ltd.  
Ornt & Co. Engineers Ltd.

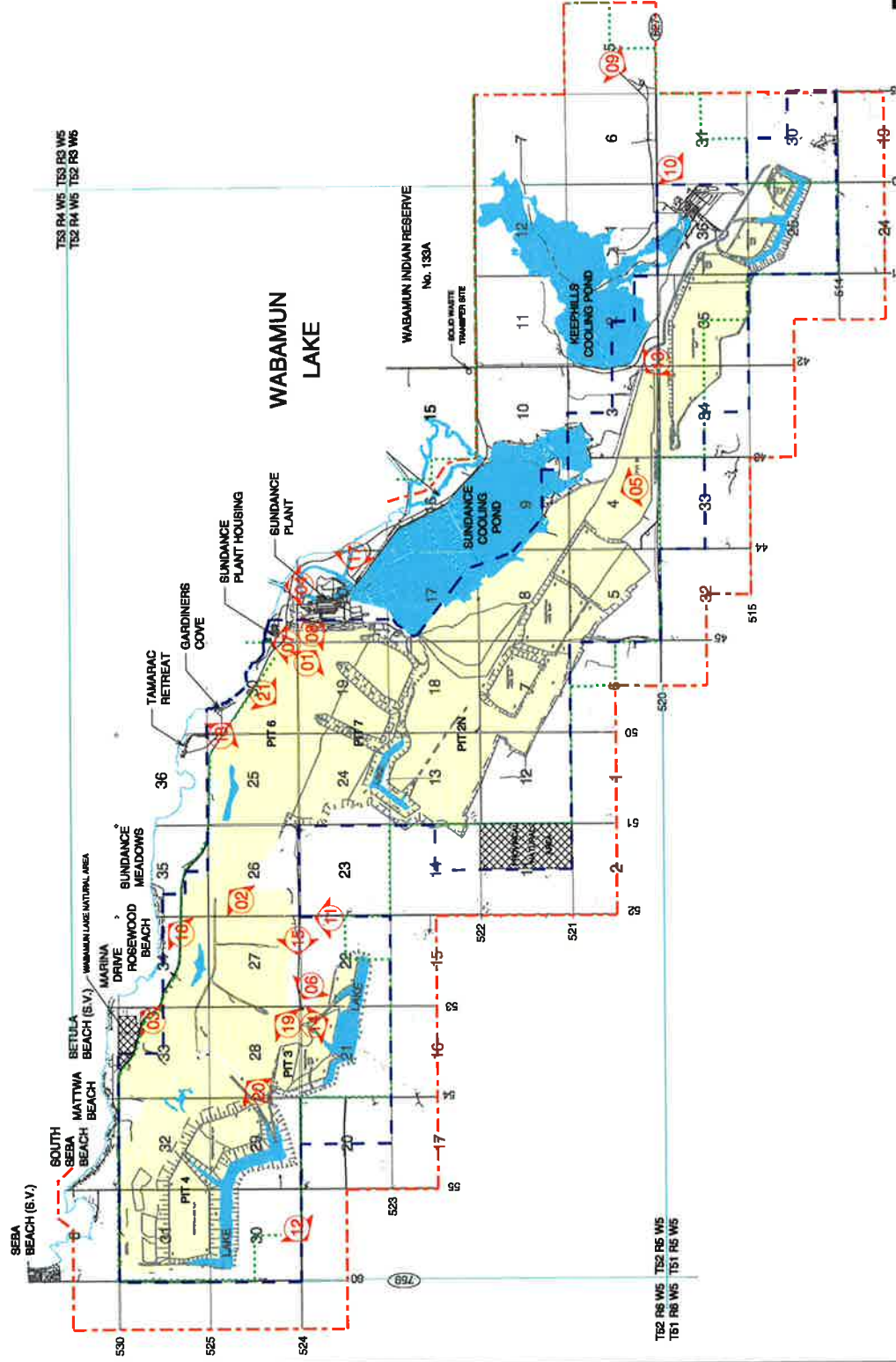
# Highvale End Land Use Area Structure Plan Parkland County TransAlta Utilities

## Map 5

## SITE PHOTOS

### LEGEND

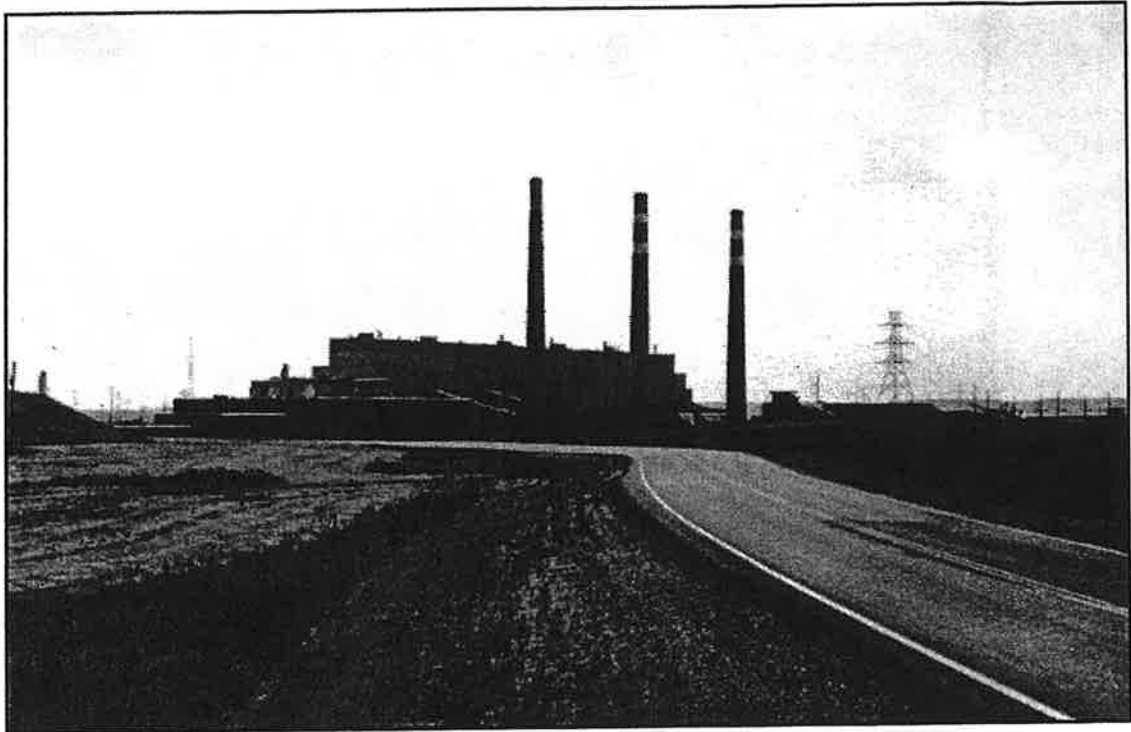
- Study Area
- Mine Permit Boundary
- TransAlta Utilities Holdings
- Mining Extant
- Water Features
- Photo Location



Keith Driver & Associates Ltd.

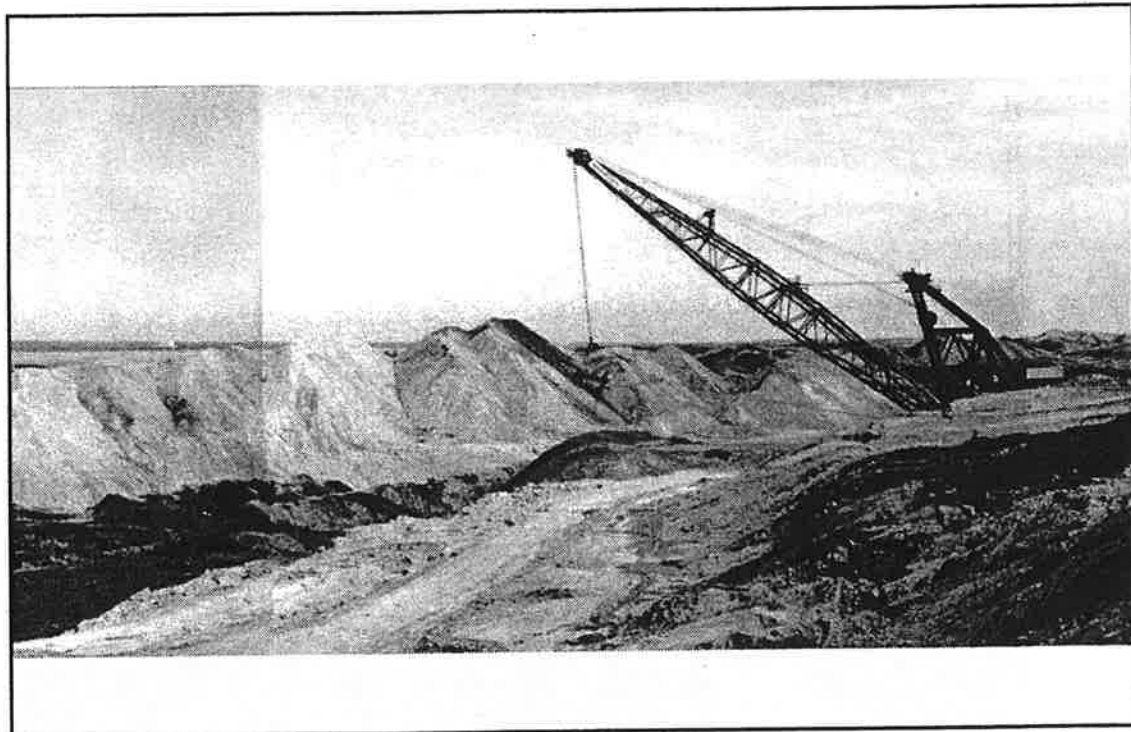
with  
Gibbs & Brown Landscape Architects Ltd.  
Ornt-McCann Consultants Ltd.  
D.J. Foster Associates Ltd.  
Cochran Engineering Inc.





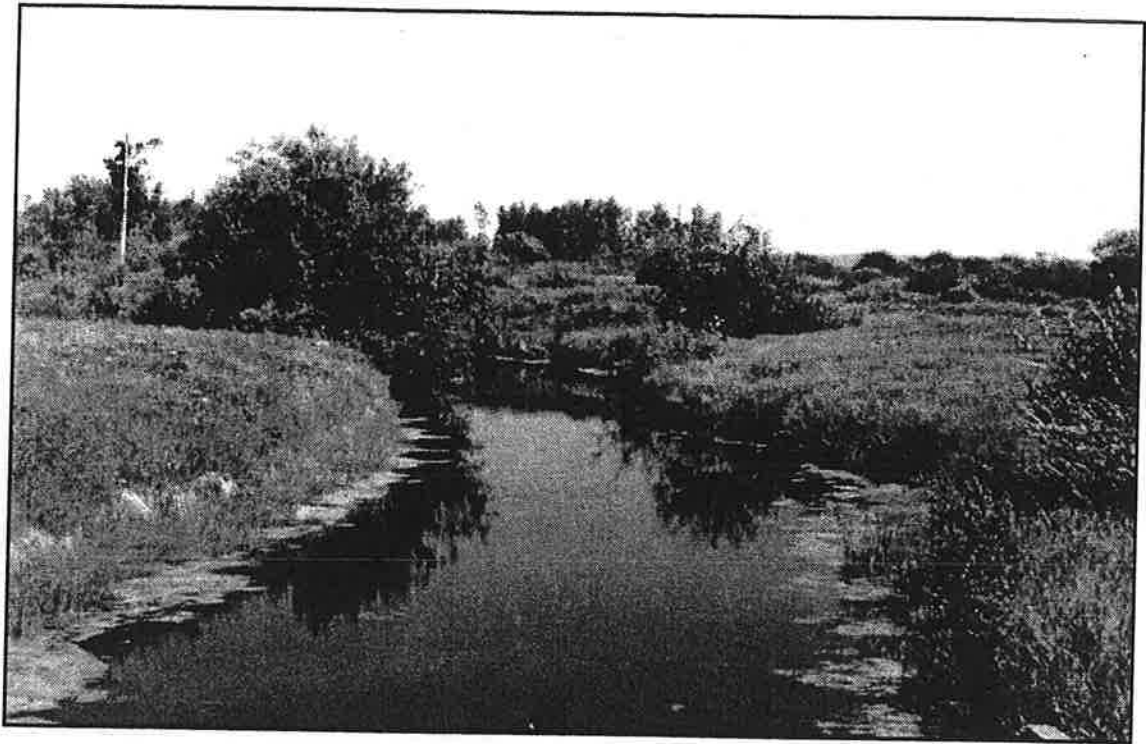
**Photo 1**

**Sundance Power Plant**



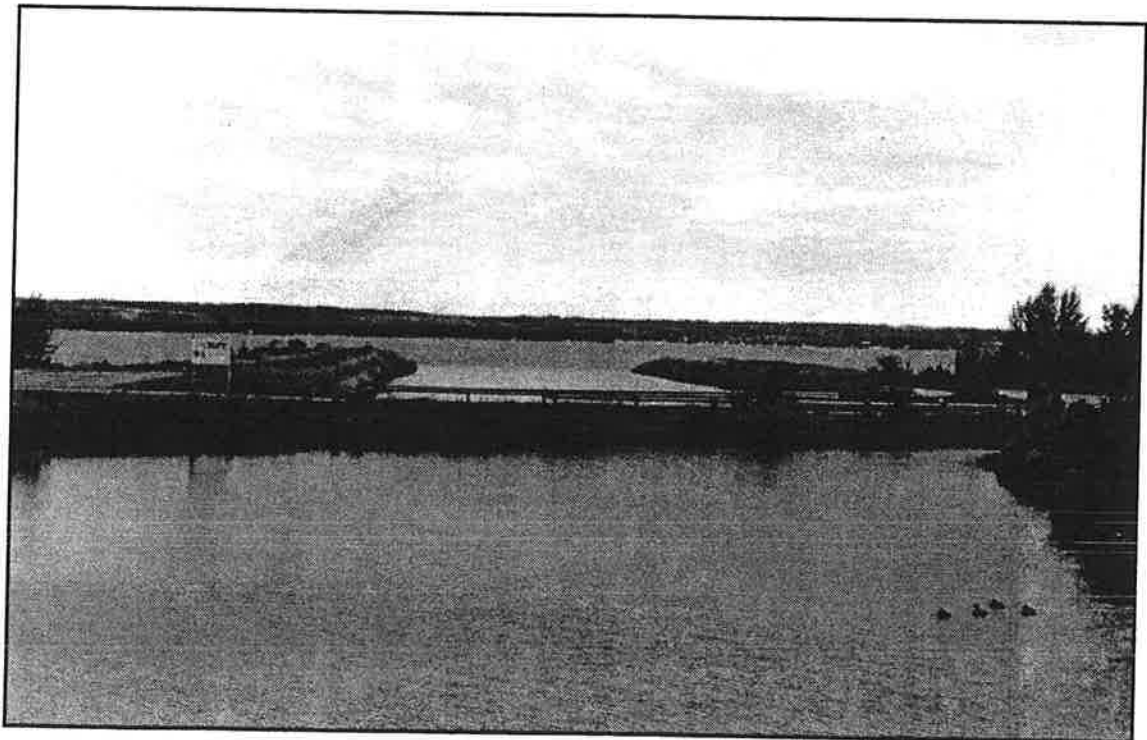
**Photo 2**

**Active Mine Pit**



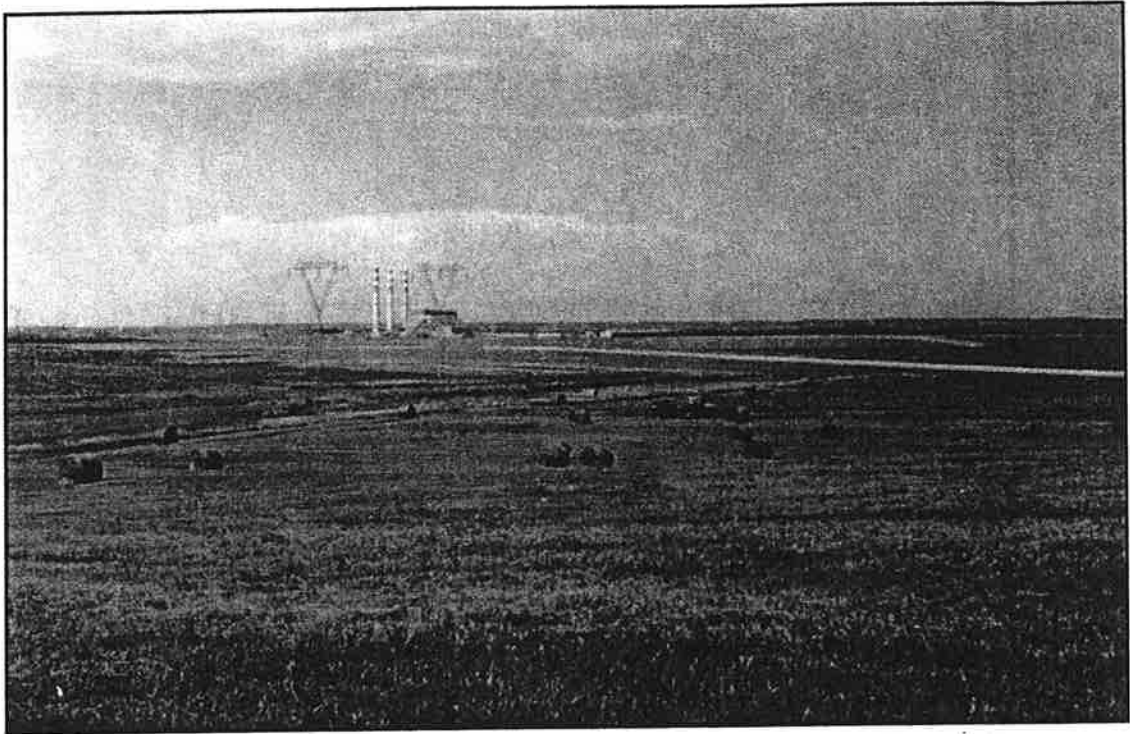
**Photo 3**

**Beaver Creek**



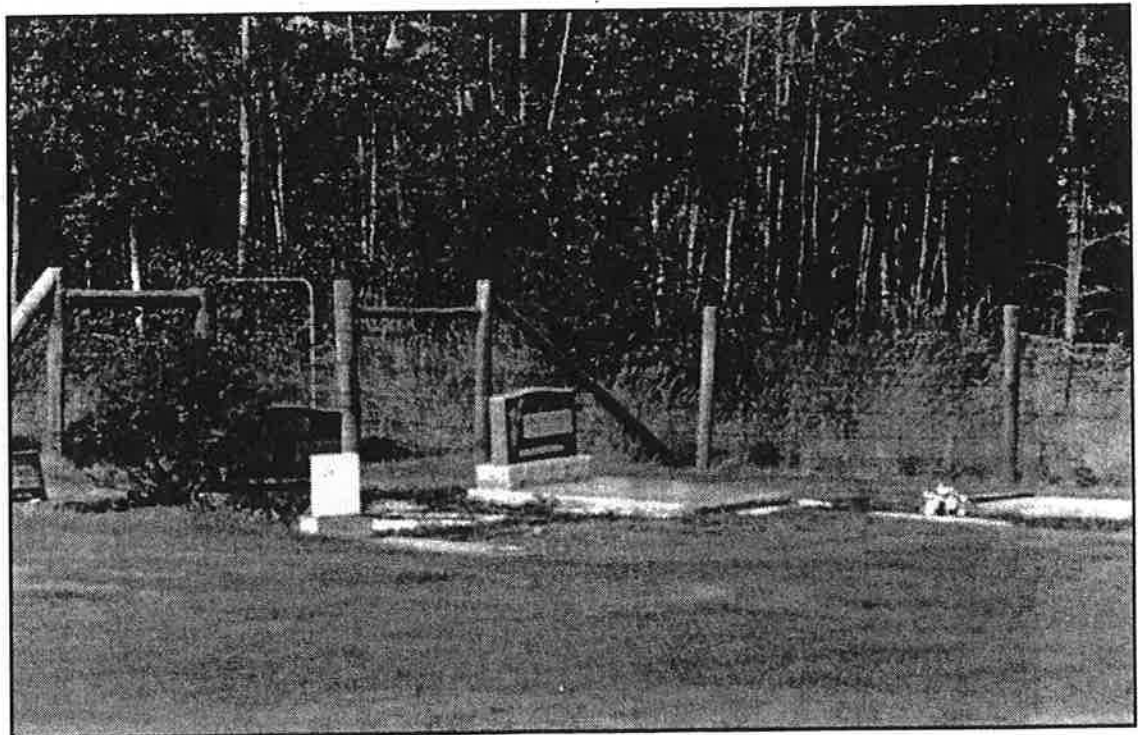
**Photo 4**

**Dyke - Sundance Cooling Pond/Wabamun Lake**



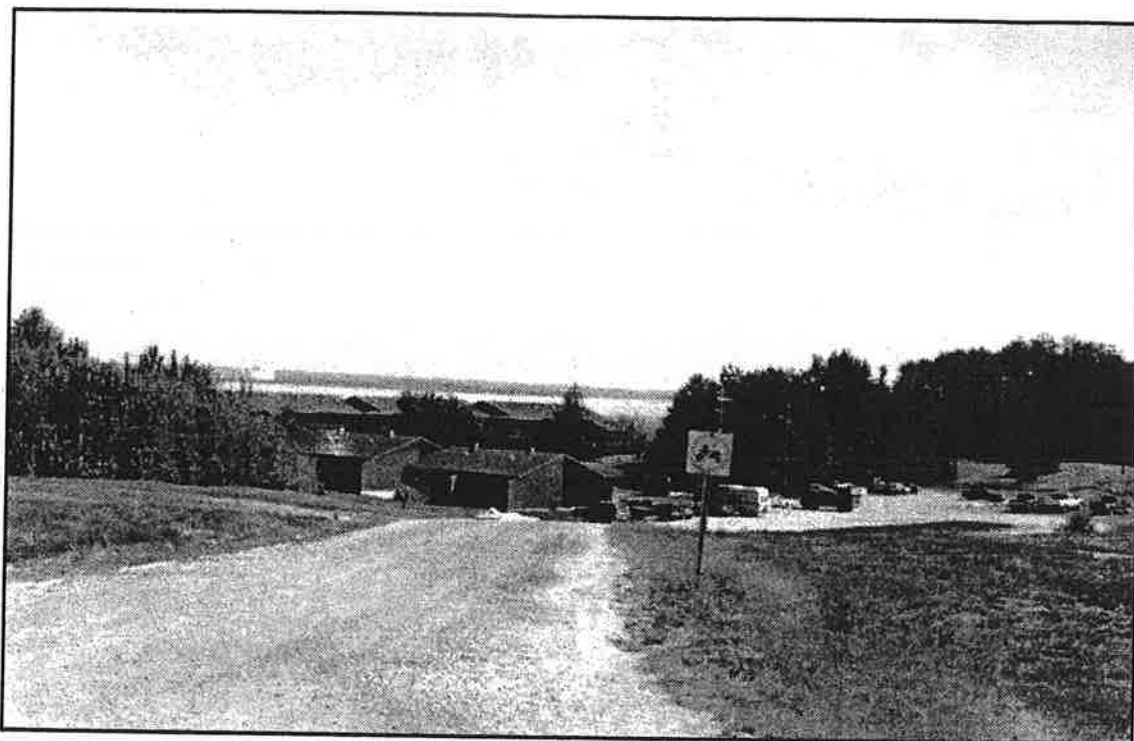
**Photo 5**

**Reclaimed Farmland  
on previously disturbed mine**



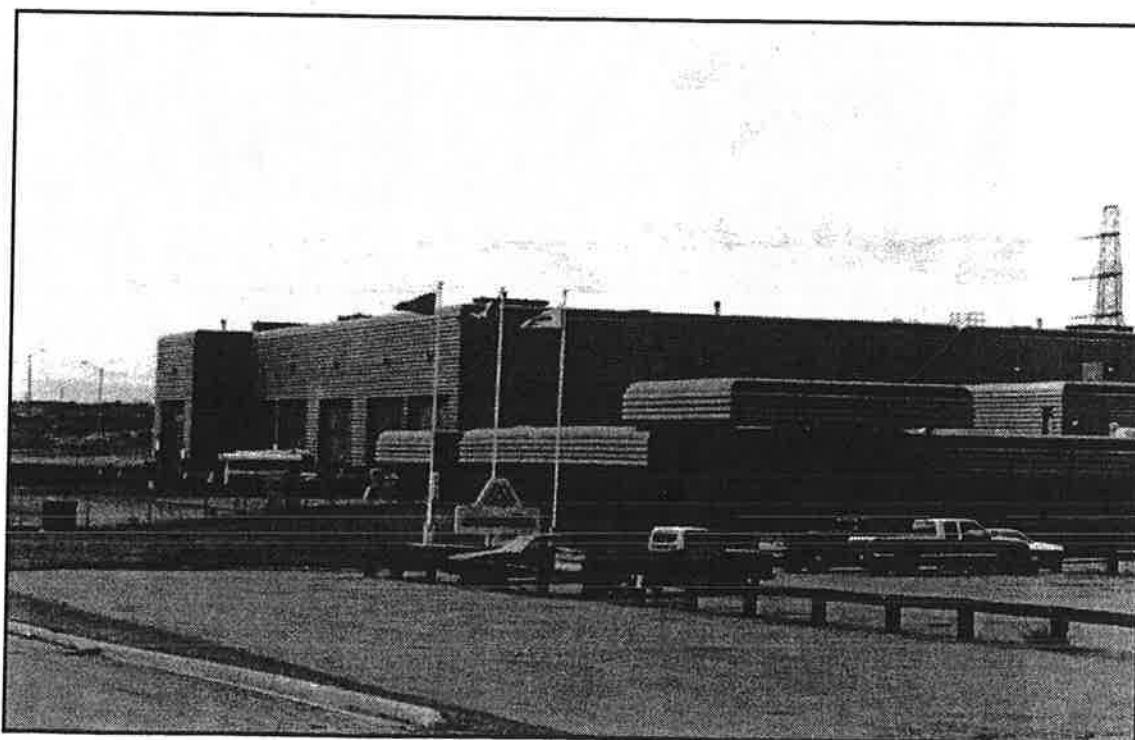
**Photo 6**

**Cemetery  
to be left undisturbed by mining**



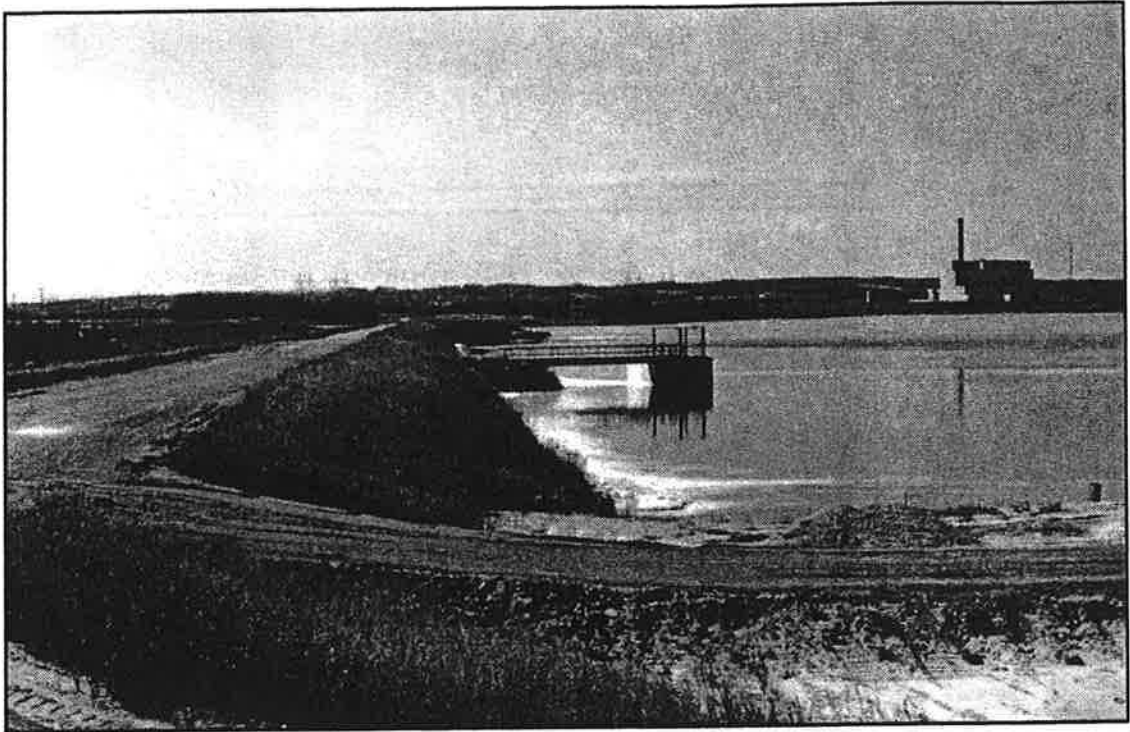
**Photo 7**

**Staff Housing Area**



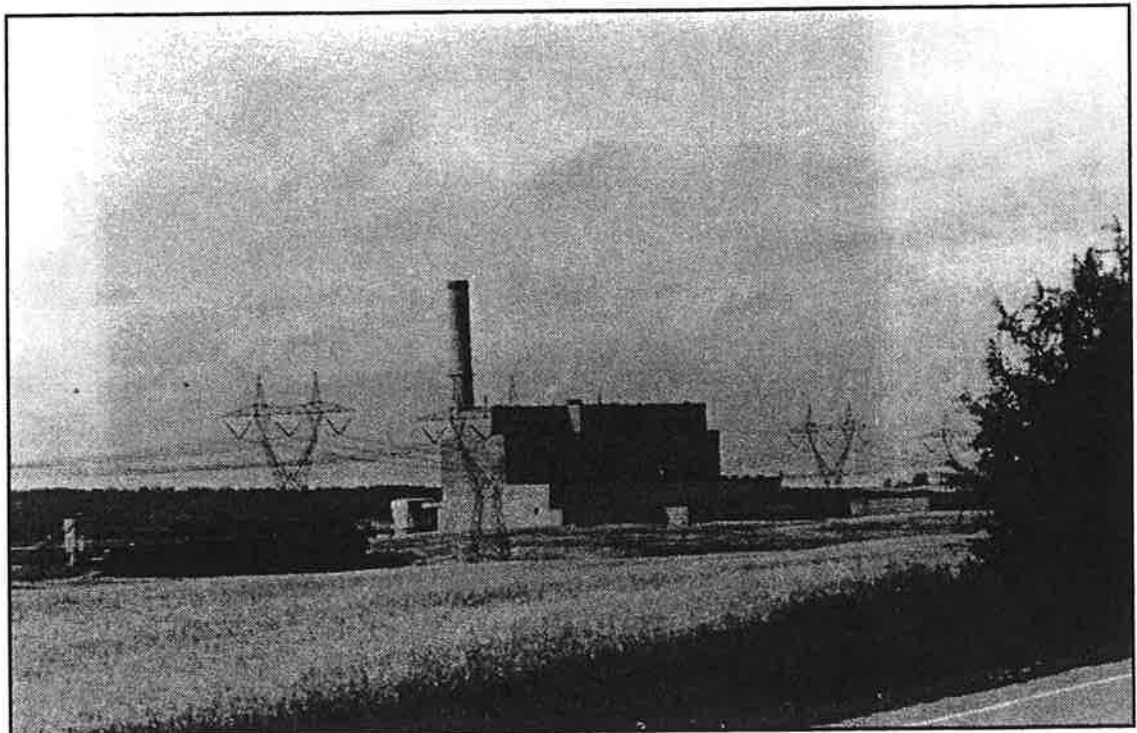
**Photo 8**

**Sundance Maintenance Building**



**Photo 9**

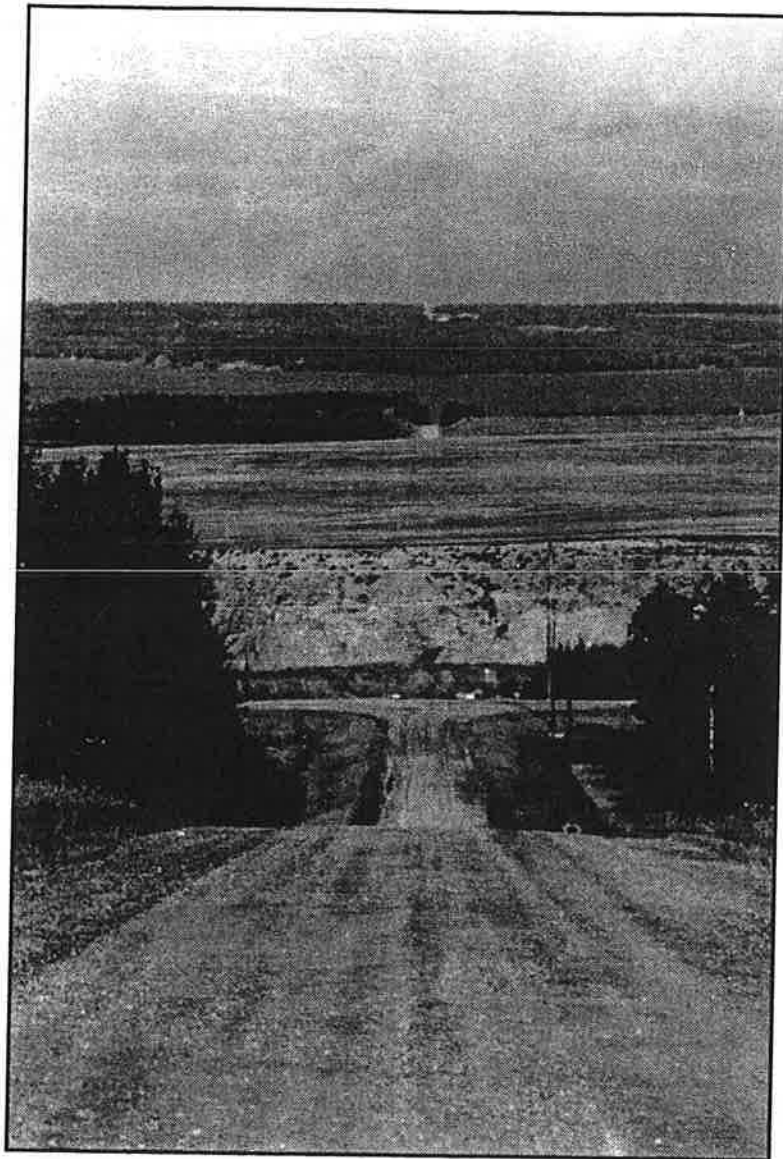
**Keephills Fly Ash Pond**



**Photo 10**

**Keephills Power Plant**





**Photo 11**

**RR52 • View Northward**





**Photo 12**

**Local Drainage Area**



**Photo 13**

**Mine Haul Road**



**Photo 14**

**Potholes & Wetlands**



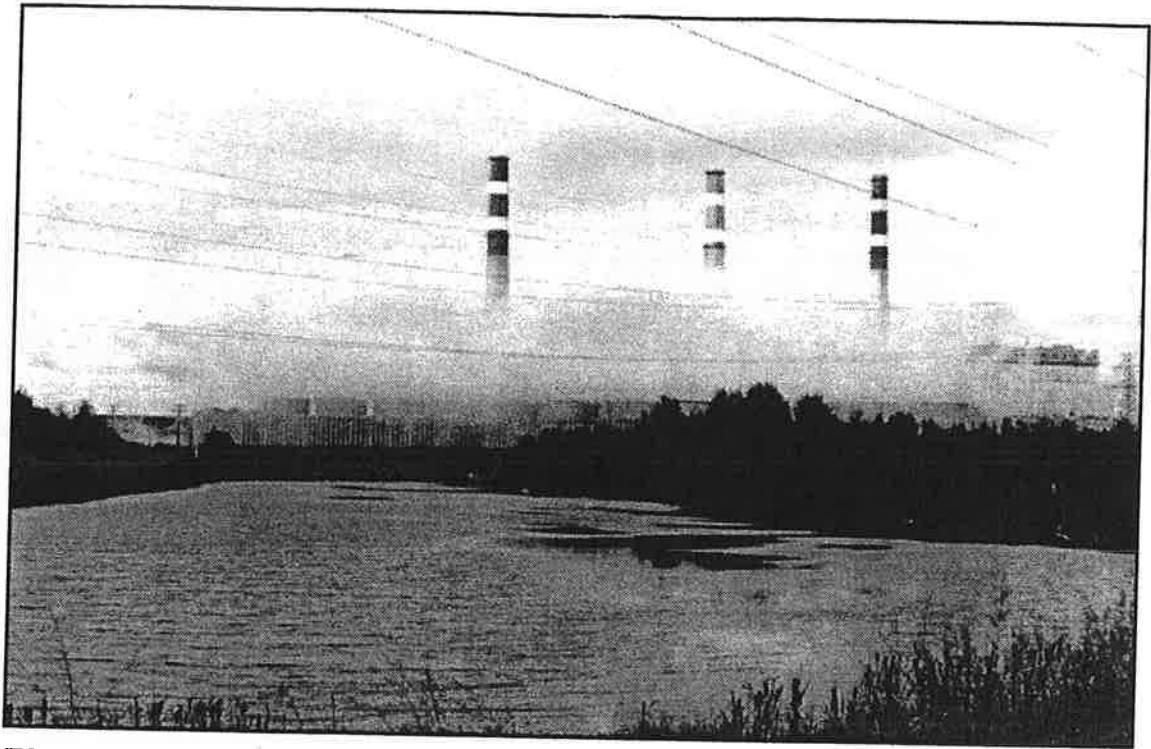
**Photo 15**

**Local Road - TP 524  
looking Westward**



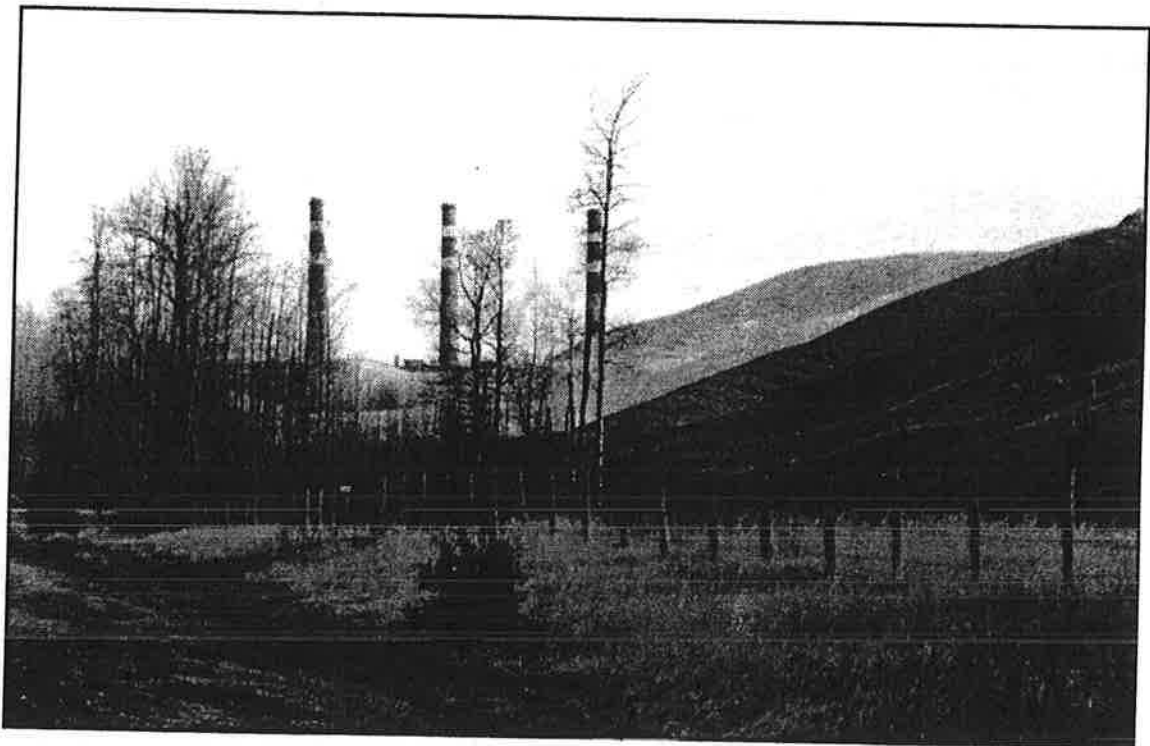
**Photo 16**

**Sewage Lagoon**

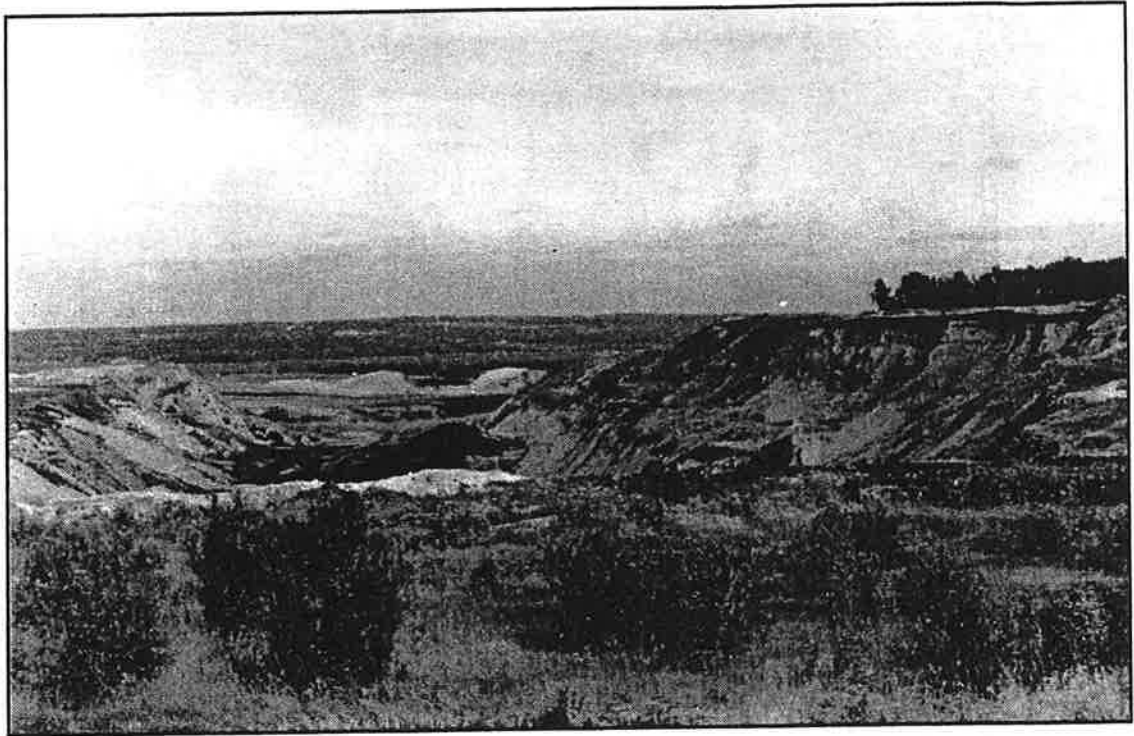


**Photo 17**

**Sundance Power Plant**

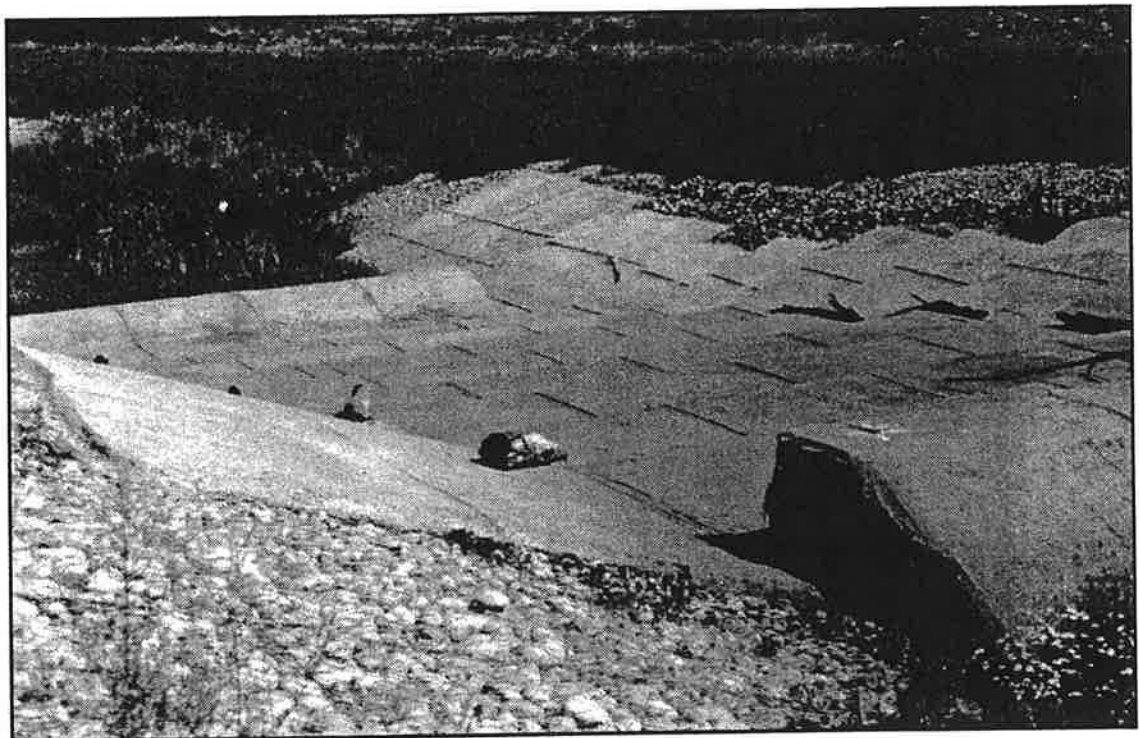


**Site & Sound Berm**



**Photo 19**

**Mine Pit Face**



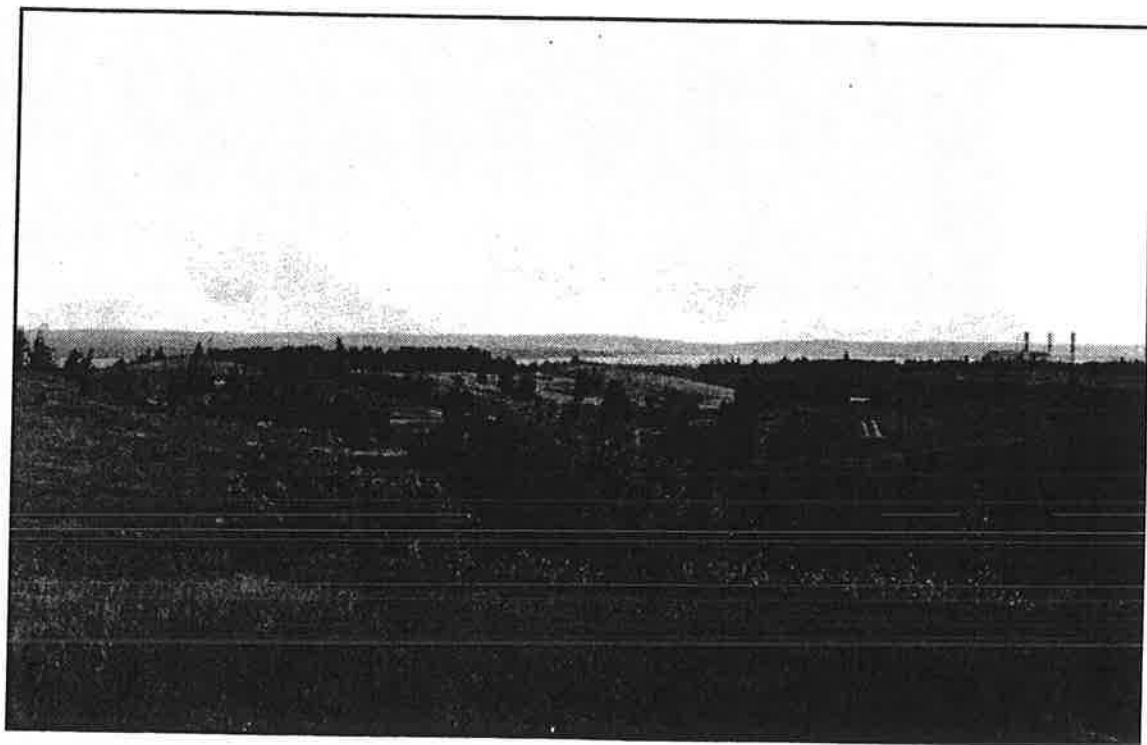
**Photo 20**

**Beaver Creek Drop Structure**



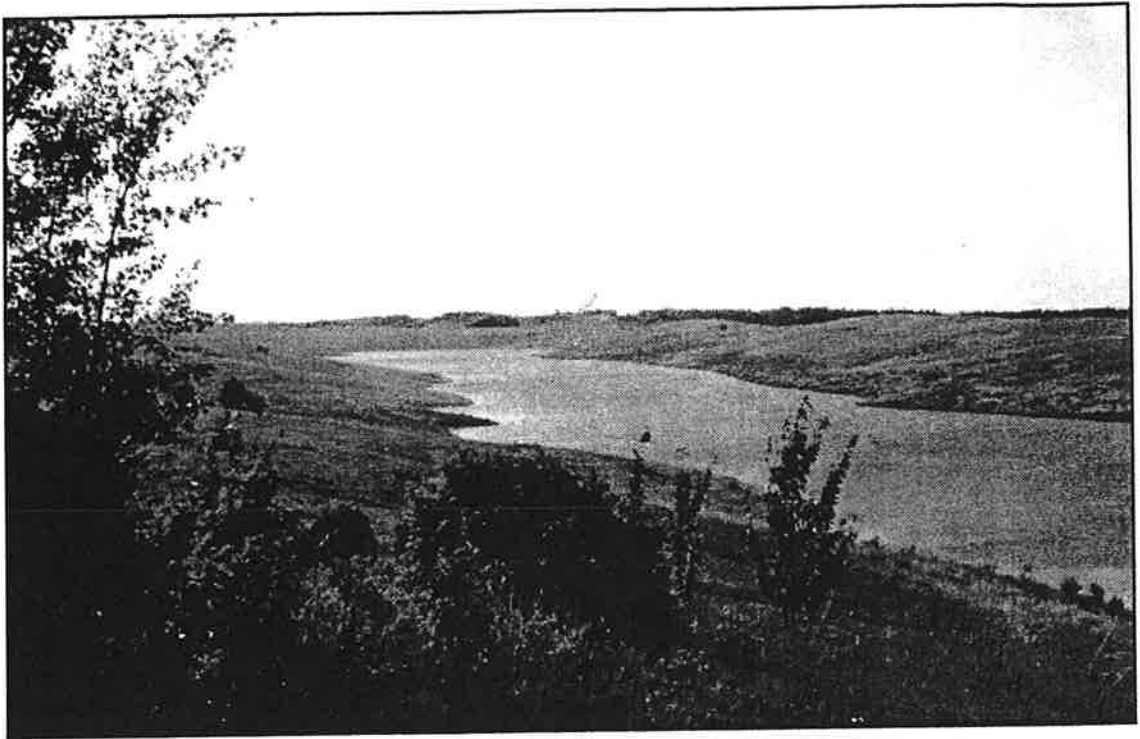
**Photo 21**

**Recontoured Slopes**



**Whitewood Mine Natural Area**





**Whitewood Mine Reclamation • Endcut Lake**

## Appendix A

- Class 4 soils will be reclaimed to a maximum of 15% slope with 0.35 m subsoil and 0.2 top soil;
- Class 5 soil will allow for land to have severe slopes of up to 33%, with 0.35 m subsoil and 0.2 m top soils;
- Class 6 soils will allow slopes up to 50% with similar soil structure, and
- Class 7 will not be considered suitable for any form of agricultural activity so no constraints are being imposed upon this classification of soil in the reclaimed areas. In general these will apply to land around water bodies such as the End Cut Lakes.

The net result of these divisions will allow for the creation of areas for crop production (Class 3 and 4), grazing areas (Class 5 and 6), and for natural areas, and wildlife regeneration or natural corridors, including the end cut lakes (Class 7). As will be seen later, the divisions into different class soils will allow for the development and recognition of potential habitat redevelopment areas that will assist in restoring the visual aspects of the landscape while at the same time providing areas for vegetative and wildlife regeneration - all an essential part of the restoration of the community to its original form and appearance.

It is important to consider these agricultural classifications in light of what they can provide in the way of workable agricultural land. The area was originally an agricultural area with some 60% of the area devoted to crop production, the remainder being for stock grazing and retention of natural habitat. The approval requires that the land base be returned to the same proportion of soil classifications found prior to mining. The main difference being that re-contouring the land following mining may not be exactly the same and certain features will be left that need to be accommodated in the final land use plan. These features consist of:

- the End Cut Lakes brought about by the redistribution of returned overburden and the removal of the coal seam;
- reconstituted creek and stream beds along more or less the same general routes as prior to mining;
- the retention of the "sight and sound" barriers along the Sundance Road
- embankments and cuts that result from the haul roads dipping down into the cut areas during the mining operation, and
- some specific areas where ash or other waste materials have been stockpiled or dumped.

TransAlta Utilities has an obligation to deal with certain features and facilities as a part of their license and agreements. These are summarized below. (see Appendix B for a more detailed description of TransAlta Utilities obligations and commitments in this regard).

- In advance of mining south of Highway 627 to develop a land use plan for the existing mine (the Area Structure Plan and the End Land Use Mine Plan fulfills this obligation).
- These two documents (the Area Structure Plan and the AEP Approved Mining and Reclamation Plan) should complement, not conflict with each other.
- TransAlta Utilities can sell the land reclaimed in order to recover some of the cost to purchase it prior to mining.

In addition to those conditions mentioned above (soils and soil classifications, surface water systems, and the decommissioning of built structures), TransAlta Utilities will replace rural roads consistent with a predetermined end land use and reclamation program and to the County standards, maintain access to the cemetery, return the Sundance Road around Beaver Creek to its original alignment (if desired), and provide a public roadway link to the road through the Paul First Nation.

(It should be noted that while these conditions were agreed upon at the time of the license being granted, subsequent information derived from the various Public Open Houses as a part of the preparation of the Area Structure Plan would suggest that more suitable alternatives exist to meet the conditions agreed upon earlier. For instance, the restoration of parts of Sundance Road were not considered important at the Public Open Houses. The acceptance of alternatives to past obligations does not relieve TransAlta Utilities of fulfilling their obligations even though the obligation may be fulfilled in the alternative manner).

### **2.2.2 End Land Use Plan**

The End Land Use Plan proposed by TransAlta Utilities in their recent application for approval under the Environmental Protection and Enhancement Act, indicates that the entire mine area will be re-contoured leaving four End Cut Lakes located at the south ends of Pits 3, 4, 6 and 7. To meet reclamation objectives, the end land form will include the re-establishment of drainage patterns that will link back to their existing upper escarpment drainage sources. The drainage systems will include small ponds, end cut lakes and constructed channels. The intent is to return the landscape to its pre-mine capability, which includes the restoration of vegetation areas and small drainage basins.

As described earlier, the various classes of soils that existed prior to mining will be replaced with equivalent areas of similar class soils. Reference to Map 6 - Mine Reclamation Plan, indicates both the proposed contours and areas where the different classifications of soil types will be located. In addition, the map shows the location of special features and cells where ash and other waste materials will be deposited.

The final plan shows the location of the two power plants and their attendant infrastructure that could be used for future development in these areas.

### **2.2.3 Current Status and Close Out Sequence**

The current status of the mine (1996-97) is that all pits have some considerable area still to be mined, yet at the same time the earlier mined areas are now being reclaimed and returned to active agricultural usage. The haul roads are still in place and tend to cut across the reclaimed areas. This condition will continue until the mine is completed and closed, and the mined areas reclaimed. The current plan for mining and therefore eventual close out indicated that long strips of the mine have various close out time schedules.

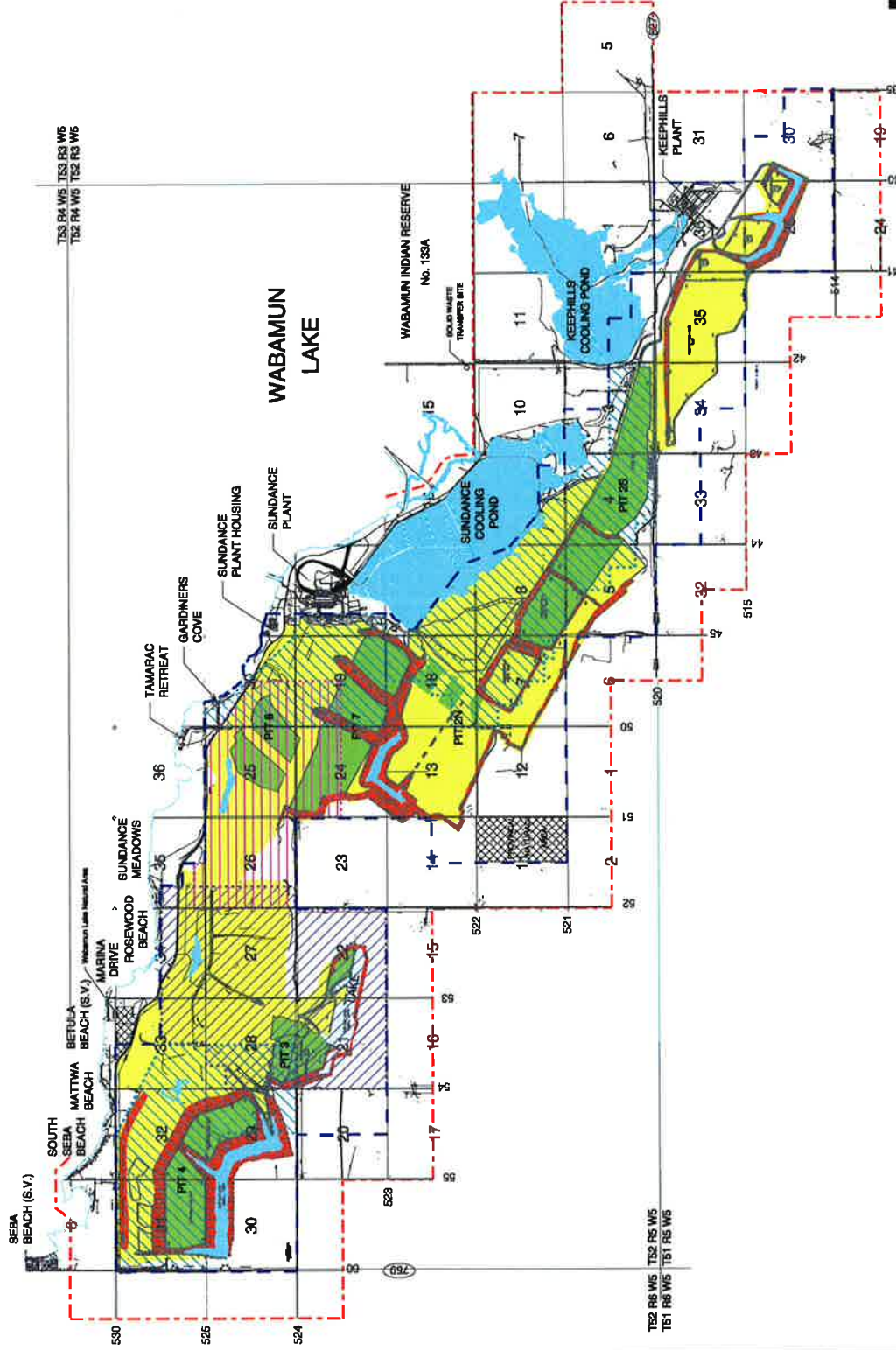
The majority of the mining close out in the early years are in Pit 1 and Pit 6. These will be followed in the next five year period (2000 to 2005) with Pits 2, 3, 4 and 6. During the 2005 to 2010 period mining will be in these same four pits leaving the final mining period (2010 to 2015 and beyond) to allow concentration on completing Pit 4 and Pit 7. (Figure 6.1 in the Highvale Long Range Plan and Operating Schedule by Pits.) This is an over simplification of the mining schedule and detailed maps are provided in the Application for Renewal of Licenses No C91-19, C92-14A, C93-5, and C93-28.

### **2.2.4 Issues for Future Redevelopment**

The main issues for future redevelopment will be:

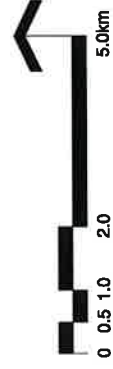
- the decommissioning of the Power Plants and their removal;

# MINE RECLAMATION



## LEGEND

- Study Area
- Mine Permit Boundary
- Mine Licence Boundary (PT 01, 02, 04)
- Mine Licence Boundary (PT 03)
- Mine Licence Boundary (PT 06)
- Mixed Agricultural Lands
- Agricultural Class 4 and 5
- Prime Agricultural Lands
- Agricultural Class 3
- Wildlife Habitat/Rough Grazing
- Agricultural Class 6
- Waterfowl Habitat/Recreation
- Agricultural Class 7



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Omni-McCann Consultants Ltd.  
D.J. Foster Associates Ltd.  
Cochrane Engineering Inc.

## Appendix A

- the continued monitoring of subsidence in soils over the mined areas;
- the restoration of the natural creek areas;
- the return to active farming in the area;
- the replacement of employment and assessment at least to that found prior to the mine;
- the reclamation of the Sundance cooling ponds to its former Goose Quill Bay format and the restoration of the area as a prime waterfowl and wildlife habitat;
- the re-use of the housing area for some other appropriate use;
- the reclamation of the Keephills Cooling Pond to the original form of terrain found in that area with the numerous small ponds and undulating terrain;
- the establishment of the end cut lakes as stable and dependable water bodies suitable for recreation and or other activities and uses;
- the road structure that can be link into the surrounding road system and at the same time provide access to all parts of the mined area. (The road system could be adjusted over the life of the mine as not all of the areas will require access.);
- the use of existing infrastructure and services and their potential for extension to other areas within the Study area;
- the system that can be adopted for the subdivision of land that will be consistent with the existing section survey system current in the surrounding land. Some areas notably at the south end of Pit 6 and the west end of Pit 2, present different problems for a subdivision system that might be implemented in this area; and,
- the fulfillment of the obligations relating to the mine development and license.

How these issues will be dealt with is described later in this document and in particular, the policies of the Area Structure Plan will establish how each issue will be treated as requests are made to implement land uses in any area.

There are two main areas where consideration has to be given to future land use . These are:

1) Land Management and Reclamation Certification - transfer of lands to new owners and land uses should occur after a preiod of land management and reclamation certification, during which period the mine operator will:

- manage and maintain soil quality of lands for agricultural use,
- repair severe ground settlement or erosion which would represent a liability for future owners, and
- re-establish/maintain natural water courses, and natural landscape corridors (Ecological Conservation Areas).

2) Transfer of Ownership. - The legalities involved in the transfer of reclaimed mine land will be matters agreed between the mine owner and the prospective purchaser regarding:

- responsibilities for disclosure of mine activities and limitations for first and subsequent land ownership transfers,
- liability reposnsibility or restrictions for continued change to post mine landscapes on part of the purchasers, subsequent purchasers and mine operators, and
- title caveats - if any.



## **2.3 Natural Landscape**

Mining operations have altered many of the natural features in the Highvale Mine area. An understanding of pre-mine conditions as well as the impacts of mining operations is necessary in order to identify implications for end land uses following mine reclamation. The landscape surrounding the mine area must also be considered in order to identify opportunities to complement and enhance existing and future land uses.

The Highvale Mine area is characterized by a strongly continental climate with short, hot summers and long, cold winters. Average annual precipitation is 501 mm of which 135 mm (27%) falls as snowfall. The heaviest rainfall occurs during June, July and August, which are also the hottest months. The growing season is 75 to 90 days with a moisture deficit of about 150 mm (see TransAlta Utilities, 1996). Winds from the northwest and west predominate and mean wind speeds are 10 to 15 km/hr.

There is a sharp physiographic break in the mine area between two distinct physiographic regions: the Eastern Alberta Plains and the Western Alberta Plains. The northern part of the mine area (north of the escarpment) is in physiographic district F15.3 Glory Hills. This district is characterized by glaciofluvial delta and hummocky morainal land forms. The remainder of the mine area is in physiographic district G1.3 Drayton Valley Plain. This district is characterized by undulating morainal and glaciolacustrine dissected land forms (Agriculture Canada, 1986).

The ecosystem of the mine area is typical of Alberta's Boreal Mixed wood ecoregion and is transitional between aspen parkland and mixed conifer-deciduous ecoregions. Specifically, the area is within the mid boreal mixed wood sub-region (Strong & Leggat, 1992). Aspen and balsam poplars are the dominant tree species on well drained soils - Gray Luvisols and Eutric Brunisols. Bluejoint, wild sarsaparilla, prickly rose, fireweed, bunchberry and dew berry are typical understory species. White spruce and balsam fir are the climax vegetation species. Jack pine occurs on sandy parent material with an understory of ericaceous shrubs and lichens. On poorly drained sites the dominant tree species is black spruce with an understory of labrador tea, crowberry and mosses. (Map 7 - Natural Features).

### **2.3.1 Geology and Geohydrology**

The Highvale Mine Area is underlain at increasing depths by variable thickness of the following formations:

- glaciolacustrine silty clay deposits;
- glacial silty clay till that may contain ice-thrusted bedrock blocks and sand lenses;
- Paskapoo Formation sandstone, siltstone and mudstone deposits;
- Paskapoo Formation Ardley Coal Zone deposits that generally include six laterally continuous coal seams;
- Paskapoo Formation basal sandstone/siltstone sequence;
- Battle Formation mudstone unit; and
- Horseshoe Canyon Formation siltstone and shale deposits with laterally discontinuous channel sandstone units in places.

The mining process removes or displaces the shallower deposits overlying the Ardley Coal Zone. These shallower deposits are collectively termed the "overburden" or "mine waste". The overburden is stripped by dragline and the coal removed in a series of cuts that began near the north side of the mine area. Waste from each cut is dumped into adjacent mined-out cuts and

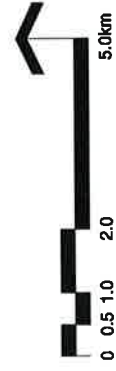
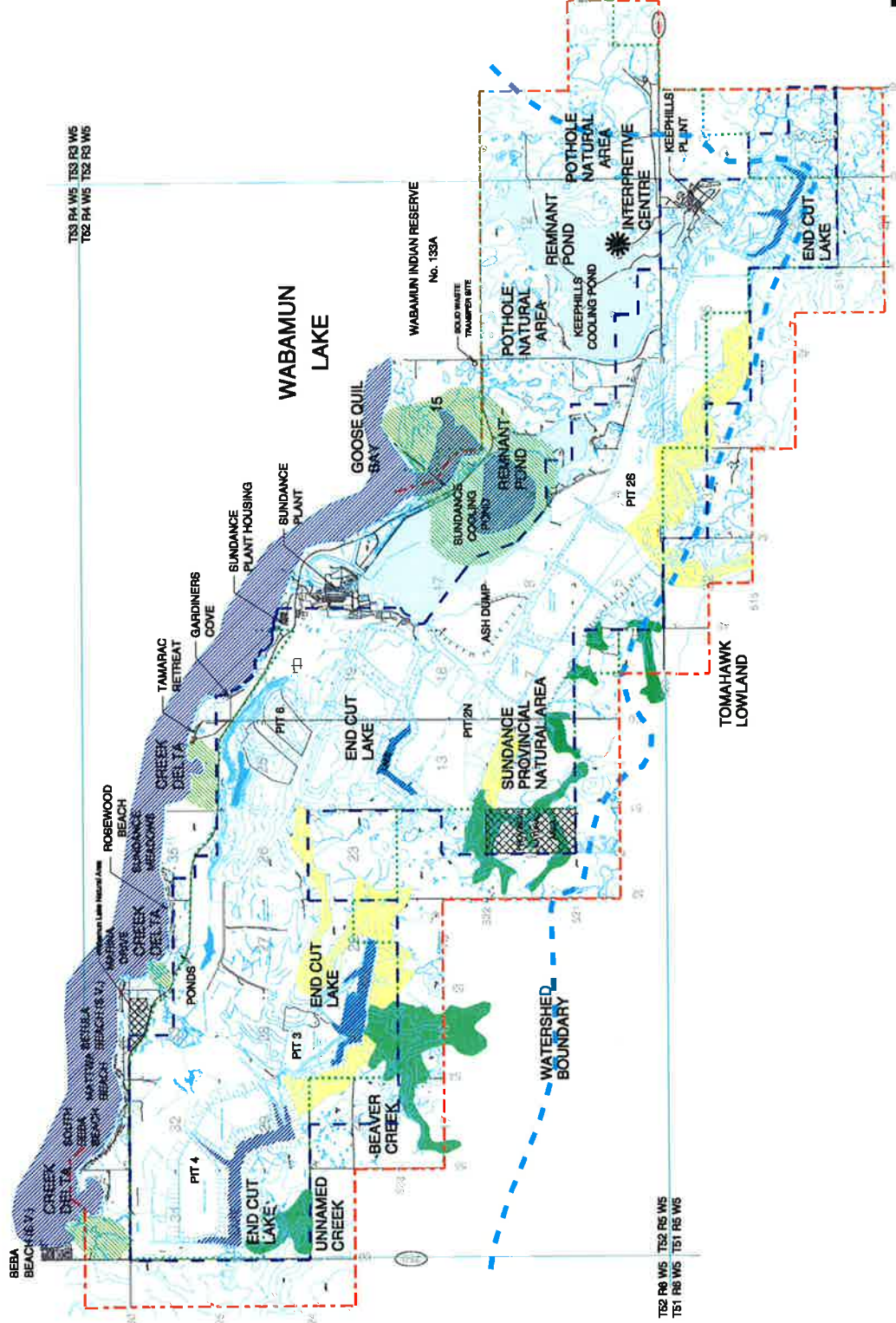


# Map 7

## NATURAL FEATURES

### LEGEND

- Study Area
- Mine Permit Boundary
- TransAlta Utilities Holdings
- Ravine & Creek Systems
- Water Features
- Major Water Body
- Watershed Boundary
- Drainage Course
- Productive Wetlands
- Provincial Natural Area
- Prominent Escarpment



Keith Driver & Associates Ltd.

with

Globe & Brown Landscape Architects Ltd.  
Omni-McCann Consultants Ltd.  
D.L. Foster Associates Ltd.  
Cochrane Engineering Inc.

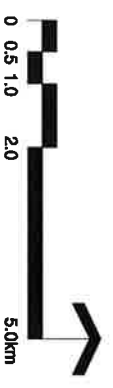
Highvale End Land Use  
Area Structure Plan  
Parkland County Transalta Utilities

Map 8

DEVELOPMENT  
CONSTRAINTS

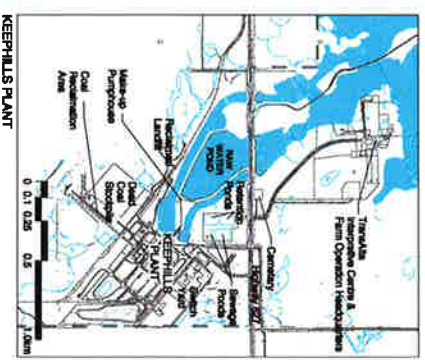
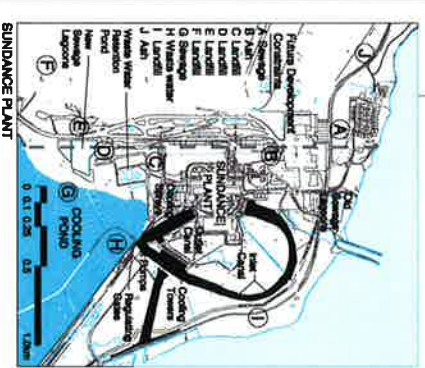
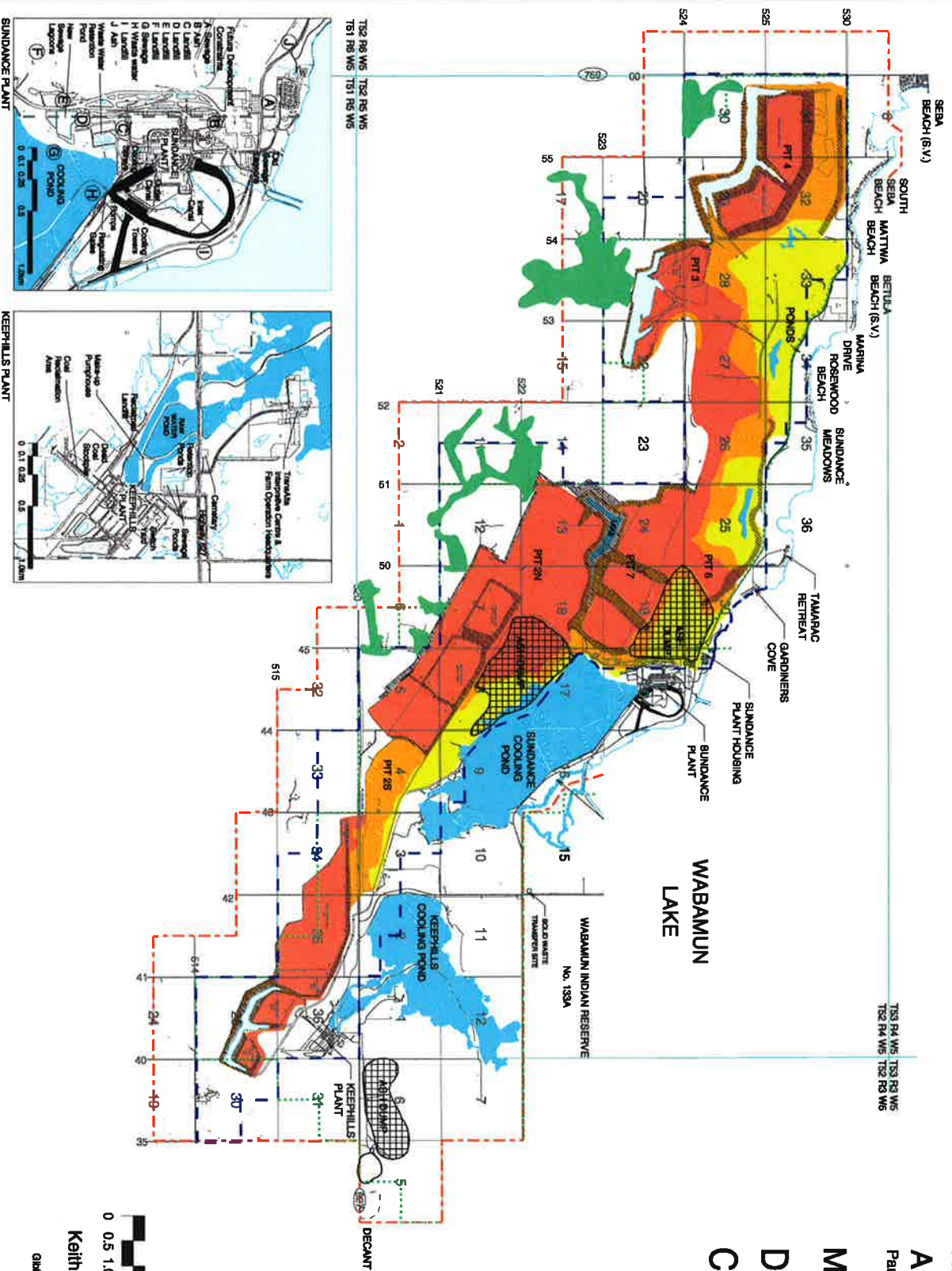
LEGEND

- Study Area
- Mine Permit Boundary
- Transalta Utilities Holdings
- Mine Topographic Features
- Recreation & Creek Systems
- Water Features
- Depth of Mixed Fill
- 28-40m
- 5-25m
- 41-60m



Keith Driver & Associates Ltd.

with  
Gibbs & Brown Landscape Architects Ltd.  
Omni-Site Consulting Ltd.  
Cochrane Engineering Inc.





Gibbs & Brown Landscape Architects Ltd.  
 Omni-McCam Consultants Ltd.  
 D.I. Foster Associates Ltd.  
 Cochran Engineering Inc.

## Appendix A

forms a windrow or ridge near the middle of each cut. This process results in a landscape of ridges separated by valleys parallel to each cut. The configuration of the ridge and valley land forms is dependent on thickness of the overburden and reach of the dragline. Map 8 illustrates overburden thickness and indicates that mining will be carried out in areas where overburden thickness reaches 60 meters. (Map 8. Development Constraints showing depth of overburden)

As coal is removed, coal haul roads are extended across the mine landscape. Waste ridges are subsequently leveled into adjacent valleys as outlined in the post-mining surface grading/drainage plan. The end result of the mining process is a heterogeneous mixture of low to high plastic clays, silts and sands with solid lumps of shale, siltstone, sandstone and coal. The mine waste appears to be in relatively loose condition, with soft zones or voids between harder residual lumps.

The composition and behavior of the mine waste across the mine area are highly variable. This variability is due partly to geological variability of the overburden but is also caused by the following mining practices:

- Variable waste placement — ridge materials may have some measure of compaction while valley materials may be uncompacted. Larger waste particles may be segregated during dumping by rolling into the valleys. Waste valley areas may therefore be more susceptible to collapse settlement.
- Development of haul roads — road development results in well compacted and less permeable layers within or on the waste material. These layers increase the possibility of differential settlement and/or delay the effects of deeper collapse settlements from reaching the ground surface.

Based on the above factors, and considering the time of landscape regrading and prevailing moisture condition factors, settlement of the mine waste is expected to be highly variable.

Recent investigations into mine waste settlement at the Highvale Mine Services Building and the Beaver Creek diversion revealed that mine waste appears to undergo collapse settlement induced by gradual saturation by groundwater (Peterson & Wade, 1996). Saturation and collapse settlement are associated with re-establishment of the groundwater regime. The duration of re-saturation is a function of hydraulic conductivity (permeability), thickness/extent of mine waste and availability of water. Because these factors are all variable, the re-saturation time interval is not predictable.

Collapse settlement due to saturation can approach 5% of the wetted waste thickness. Based on information from an area underlain by 12 to 15 meters of waste, the groundwater regime appears to stabilize about 20 or more years after mining. During the stabilization period, collapse settlement occurs at depth in the zone of saturation. Maximum collapse settlement effects will be manifested at ground surface over an additional time period dependent on the rate of upward propagation of settlement through the waste located above the water table. The impact of deeper collapse settlement on the surficial soil zone may be retarded in haul road areas. Additional, shallower collapse settlement may also occur if the zone of saturation is raised by increased groundwater movement from upgradient parts of the flow system and/or by recharge from surface water infiltration.

The mine waste can also be expected to undergo compression settlement under its own weight. The extent of expected compression settlement will vary depending on the thickness and composition of the mine waste and will likely occur over a shorter time period than collapse settlement. Collapse settlement is therefore a greater concern with respect to future land uses in the mine area.

Prior to development of the Highvale Mine, the main aquifers underlying the area were the Paskapoo Formation sandstone unit and the Paskapoo Formation Ardley Coal Zone. Movement of

groundwater in the shallow aquifers was controlled by topography and by the outcrop/subcrop pattern of the units. Movement was generally from the uplands south of Lake Wabamun, in a north or northeasterly direction, toward the lake. Mining operations have disrupted the main aquifers beneath the mine area. It is doubtful that groundwater supplies will be available from the mine waste because of poor water quality and highly variable permeability. The deeper sandstone formations that have not been disturbed by mining are of limited lateral extent and form a very poor aquifer. It is therefore unlikely that reliable groundwater supplies will be available in the reclaimed Highvale Mine area.

### **2.3.2 Terrain**

The terrain in the Highvale Mine area is dominated by a northwest-trending escarpment running parallel to the southwest shore of Wabamun Lake. The escarpment separates the lowland areas in the Glory Hills physiographic district from the upland areas in the Drayton Valley Plain physiographic district.

Prior to development of the Highvale Mine, the landscape included rolling agricultural land as well as areas of steep terrain and wetlands (see Map 3 - 1970 Air Photo Mosaic).

The terrain in the mine area was complex and was influenced by discontinuous morainal deposits of varying depths. Before mining operations, the topography of the mine area was classified according to the four slope gradients outlined in Table 1.

\* **Table 1 - Pre-Mine Topography**

Slope Class	Gradient	Area (ha)	% of mine area
Level to gently undulating	0 - 5%	729	22
Undulating	5 - 9 %	1,960	59
Rolling	9 - 15%	389	12
Hilly	> 15%	226	7
Total	--	3,304	100

Source: Montreal Engineering, 1977, Table 1-1.

The mine area included numerous depressions that collected runoff, forming ponds and small sloughs. Stream channels were well-defined on the steep upper slopes of the escarpment, but became less well-defined and in some cases disappeared on the more gentle lower slopes (Montreal Engineering, 1980).

Mining operations have altered the area's original terrain. Lowland topography is currently described as "gently undulating with slopes of 0 to 9% and elevations of 730 to 760 meters" (TransAlta Utilities, 1996). Existing terrain includes lowland ridges with elevations of 750 to 780 meters as well as small hills of bedrock with slopes of up to 30%.

Topography of the escarpment is extremely complex, due in part to slope failures in some areas. Slope gradients are up to 30% and steeper in deeply incised stream channels. Surface elevations on the escarpment vary from 760 to 810 meters. The upland areas south of the escarpment are also complex and include outcrops of bedrock interspersed with discontinuous glacial till (Marshall Macklin Monaghan, 1984).



### **2.3.3 Surface Drainage**

The Highvale Mine area is within the Wabamun Lake watershed. The watershed area is approximately 355 km<sup>2</sup> and includes 35 natural drainage courses that convey surface runoff to the lake (Reid Crowther, 1995). Prior to development of the mine, there were eight distinct drainage basins in the mine area (Montreal Engineering, 1977 Pre-mine drainage systems; plate 2-5). A small part of the mine (and the future mine), lies south of this watershed and includes the Keephills Power Plant. This section of the watershed flows into the North Saskatchewan River

The mine area was drained by ten streams and associated tributaries. Streams in the western part of the mine area drained wetlands on top of the escarpment. In the eastern part of the mine area, the streams originated on or just below the steep escarpment slope (Montreal Engineering, 1980). Many streams were intermittent, flowing only during spring runoff or after major rainfalls.

Stream channels were deeply incised and well-defined on the upper slopes of the escarpment. Stream channels became less well-defined in the lower areas north of the escarpment. There were numerous wetland marshes and bogs in shallow depressions in the mine area. These wetland areas slowed the rate of runoff and absorbed contaminants, contributing to improved water quality in the shoreline areas and Lake Wabamun itself. Wetland areas also increased the complexity of drainage channel topography. The Lake Wabamun shoreline immediately north of the mine area is characterized by creek deltas and wetlands.

Mining operations have altered the area's natural drainage systems. Most clean surface runoff is diverted around mining operations and discharged to Wabamun Lake. Some clean surface runoff flows to the Sundance Cooling Pond (TransAlta Utilities, 1996). Surface runoff from mined lands is generally treated as mine effluent and flows to the Sundance Cooling Pond for settling to remove sediment. In several small areas surface runoff from reclaimed land flows directly into Beaver Creek or Lake Wabamun. Water from the Sundance Cooling Pond is discharged to the North Saskatchewan River as required.

Two adjoining sections of Beaver Creek, the major stream in the western part of the mine area, have been relocated into mined out areas. An unnamed intermittent stream draining the eastern part of the mine area has been diverted around mining operations and currently drains into the Sundance Cooling Pond. Approximately 8% of this drainage is being directed to Lake Wabamun via pipeline to Pit interceptor ditch. Mining operations have diverted natural drainage systems and have also removed natural storage areas and decreased the complexity of the terrain. This has resulted in an increased rate of runoff compared to the pre-mining landscape (Reid Crowther, 1996).

The area of the end cut lakes and permanent ponds proposed for the post-mine landscape (Map 6), will not fully replace the area of ponds, marshes and wetlands that existed in the pre-mining landscape (TransAlta Utilities 1996, p. 57).

The rate of runoff is expected to increase because of increases in slope of the land compared to pre-mine conditions. The re-establishment of natural drainage patterns in the Highvale Mine area represents an opportunity to integrate wetlands and other drainage characteristics that existed in the pre-mining landscape. These characteristics are also attractive to wildlife and contribute to the re-establishment of natural systems and wildlife corridors. The re-establishment of natural systems including wildlife corridors was identified as desirable during the public consultation program associated with development of this plan (see Section 1.6).



### 2.3.4 Soils

The Highvale Mine area is within the Gray Wooded soil zone. Soils within this zone have developed under humid soil moisture conditions and are usually subject to leaching. Soils in the Gray Wooded zone are relatively less fertile due to deficiencies of nitrogen, phosphorus, organic matter, and sometimes sulphur (Research Council of Alberta, 1962). Soils in the Highvale Mine area developed from a variety of parent materials including weathered bedrock, glacial till and glacial lacustrine deposits. For soils that developed on Horseshoe Canyon formation the parent materials tend to be moderately saline (Marshall Macklin Monaghan, 1984).

The soils in the Highvale Mine area have been studied in detail (see TransAlta Utilities, 1996; Montreal Engineering, 1977). Most soils in the mine area belong to the following soil orders:

- Solonetzic;
- Luvisolic;
- Gleysolic.

Solonetzic soils are "prevalent" throughout the northern section of the mine area (Montreal Engineering, 1980). Solonetzic soils developed in sodic bedrock and are characterized by leaching of organic matter and clay from the topsoil to the subsoil. Solonetzic subsoils restrict internal drainage and root penetration and are poorly suited for cultivation.

Luvisolic soils are found primarily south of Secondary route No. 627 (Montreal Engineering, 1980). Luvisolic soils are also characterized by leaching of organic matter and clay, but the subsoil is not as restrictive to drainage and root penetration. Luvisolic soils are therefore more suitable for agricultural use.

Gleysolic soils developed in depressions and next to drainage channels throughout the mine areas and are characterized by poor drainage and may be flooded for part of the year. Gleysolic soils usually support riparian vegetation and are unsuitable for agricultural use.

Agricultural capability of the soils in the mine area, as defined by the Canada Land Inventory, ranges from Class 3 (moderately severe limitations) to Class 7 (no capability for arable culture or permanent pasture) (Dept. Of Regional Economic Expansion, 1970). The mine area's original soil cover has been removed and replaced on a disturbed surface with varying depths of unconsolidated soil and varying soil quality. Reclamation objectives are to restore the area's soils to provide agricultural capability equivalent to that which existed before the mine (see Table 2).

**Table 2 - Pre-Mine and Post-Mine Agricultural Capability**

Capability Class	Class 3	Class 4	Class 5	Class 6	Class 7	TOTAL
Pre-mine area (ha)	1149	1737	1179	296	151	4512
Long range reclamation plan (ha)	1200	1708	1139	257	208	4512

Source: TransAlta Utilities, 1996, Table 5.2

### **2.3.5 Vegetation & Wildlife**

The Highvale Mine area is in a transition ecoregion between aspen parkland and boreal forest. Before establishment of the mine, 47% of the area was "unmanaged pasture and wildland" (TransAlta Utilities, 1996). The area's location in a transition ecoregion combined with its varied topography contributed to a diverse array of natural vegetation.

The Highvale Mine area is located within the Aspen Grove forest section (B.17) of the Boreal Forest region (Rowe, 1972). The Aspen Grove forest section marks a transition between forest and grassland and is characterized by abundant trembling aspen. Balsam poplar is frequently found on moist lowlands, or on uplands following fire. White birch is sporadically present on rough, broken land. Prairie and meadow patches were interspersed with aspen in the original landscape but these patches have largely disappeared with the advance of agriculture.

In areas where poplars are the dominant tree species, the undergrowth is "very lush" and "rich in species of plants and animals" (La Roi and others, 1967). Poorly drained areas are covered with black spruce muskeg and larch swamp, while very wet areas are characterized by willow swamps and reed marshes.

Moss (1955) described the "poplar (*populus*) association" as typically consisting of five strata:

- taller trees forming a nearly continuous canopy;
- an intermittent layer of smaller trees and larger shrubs, usually poorly developed in association with aspens;
- a lower shrub layer more or less obscured in summer by herbs;
- taller herbs, often almost continuous and prominent in the late part of the growing season;
- lower herbs including mosses and lichens, forming a continuous carpet especially in association with balsam poplars.

Tables 3 and 4 list dominant plant species associated with trembling aspen and balsam poplar. Roses, willows, raspberries and cranberries are prominent as small trees or shrubs in both associations. Herbs common to both associations include asters, vetch, pea vine, wintergreen, strawberry and bedstraw.

**Table 3 - Vegetation Associated with Trembling Aspen**

Stratum	Dominant Species
Trees	Trembling Aspen ( <i>Populus tremuloides</i> )
Shrubs	Snowberry ( <i>Symphoricarpos albus</i> ) Saskatoon berry ( <i>Amelanchier alnifolia</i> ) Buffalo berry ( <i>Shepherdia canadensis</i> )
Herbs	Dogwood ( <i>Cornus canadensis</i> ) Lily of the Valley ( <i>Maianthemum canadense</i> )

Source: Moss, 1955.

**Table 4 - Vegetation Associated with Balsam Poplar**

Stratum	Dominant Species
Trees	Balsam poplar ( <i>Populus balsamifera</i> )
Shrubs	Dogwood ( <i>Cornus stolonifera</i> ) Currants & gooseberries ( <i>Ribes</i> spp.) Honeysuckle ( <i>Lonicera involucrata</i> )
Herbs	<i>Merlensia paniculata</i> Horsetails ( <i>Equisetum</i> spp.) Coltsfoot ( <i>Petasites palmatus</i> )
Mosses	<i>Hylocomium splendens</i> <i>Aulacomnium palustre</i>

Source: Moss, 1955.

With respect to wildlife habitat, the Highvale Mine area is within the North Saskatchewan River Valley habitat subregion (8.77) of the Boreal Mixed wood region (Pedocan Land Evaluation, 1984a). This subregion is described as having no significant land disturbance, but there were no data on current vegetation cover (Pedocan Land Evaluation, 1984b). The land forms are described recent valley with high relief (30 to 70%) slopes. The ecological moisture regime is described as variable. The general area around the mine is known to provide habitat for numerous species of wildlife because of its diverse topography and vegetation.

The Province of Alberta recognized the importance of wildlife habitat in this area and in 1972 established the Sundance Natural Area in the eastern half of Section 11, Tp52, R5, W5M. This Natural Area was established under the *Wilderness Areas, Ecological Reserves and Natural Areas Act* and was intended to be maintained in its natural state. No regulations have been developed concerning land use in this area, but the area, occupying two quarter sections, has remained undisturbed by agriculture or other land uses.

The Province of Alberta has also established the Wabamun Lake Natural Area in Pt N1/2, Sec 33-52-5-W5M. While the designation is different from the Sundance Natural Area, the intent to protect this area is the same. The area lies to the north of the Sundance Road and more or less at the end of Range Road 52.

Prior to mine development, the mine area supported a diverse variety of wildlife species including ungulates, small mammals, furbearers, upland game birds and raptors (Montreal Engineering, 1977). Ruffed and sharp-tailed grouse as well white-tailed deer were abundant in the area and were hunted by local residents. Several species of raptors, including great horned owls, great gray owls and snowy owls, inhabited the area. Although the south shore of Wabamun Lake was known as an important waterfowl breeding and staging area, the mine area itself contained little waterfowl habitat (Montreal Engineering, 1977). The lower reaches of Beaver Creek in the western part of the mine area provided spawning habitat for northern pike from Wabamun Lake (TransAlta Utilities, 1996).

Mining operations have removed the area's natural vegetation and displaced most of its wildlife, but have increased the area's importance to waterfowl compared to the pre-mine landscape. The east end of Wabamun Lake and the Sundance Cooling Pond remain ice-free as a result of power plant thermal effluent. Because of the warm, ice free water these areas now support a large number of overwintering ducks (mallards and common goldeneyes) as well as a large number and variety of water birds (including grebes, loons, gulls, terns and herons). Once the power plants are decommissioned the cooling ponds are expected to change and revert back to their former wetland system that will freeze and not be used by waterfowl in the winter.

## Appendix A

The area surrounding the Highvale Mine continues to provide habitat for a variety of wildlife species. White-tailed deer, mule deer and moose are found south of the mine area along the North Saskatchewan River valley. Upland game birds include ruffed, sharptailed, and spruce grouse, hungarian partridge and ringed-neck pheasant. Ospreys are known to nest in the area and beaver and muskrat are common around Wabamun Lake. Bald eagles and gyrfalcons have been observed during spring and fall migrations (see Marshall Macklin Monaghan, 1984).

Re-establishment of natural vegetation in the Highvale Mine area represents an opportunity to restore habitat for numerous wildlife species that previously inhabited the area. Habitats in the mine area could be linked with existing corridors and habitats including the Sundance Natural Area. This process would contribute to the re-establishment of natural systems and wildlife corridors that was identified as desirable during the public consultation program associated with development of this plan (see Section 1.6).

### **2.3.6 Land Use Capability**

Prior to mining operations, 53% of the mine area was cultivated for production of annual grains, forage and pasture (TransAlta Utilities, 1996). Capability of the mine area to support agriculture was rated between Class 3 and Class 7, as explained in Section 2.2.4. The objective of the TransAlta Utilities Reclamation Plan is to restore the mined land to its previous agricultural capability.

Capability of the land to support land uses other than agriculture is identified in Map 9. Areas with lower agricultural capability are identified as having higher capability for recreation, wildlife habitat and natural areas. The southwestern part of the mine area, for example, has high capability as habitat for ungulates. Shoreline areas and the proposed end cut lakes are identified as having high capability for recreation. (Map 9 - Land Capability).

Capability of the land to support uses other than agriculture is an important factor in the determination of end uses for the mine area. The identification and establishment of areas for recreation, wildlife habitat and natural areas could result in long-term maintenance of the area's ecosystems as well as employment opportunities related to recreation and tourism.

### **2.3.7 Summary of Issues and Implications for Land Use Policies**

**Geology/Geohydrology** — The reclaimed mine waste may be subject to erratic, longer-term, and, in places, potentially extreme ground movement due mainly to collapse settlement. The magnitude of collapse settlement is potentially greatest and expected to persist for longer time periods in areas underlain by greater depths of mine waste (Map 9 - Development Constraints). Local experience suggests that collapse settlement can approach 5% of the wetted mine waste thickness and that the settlement interval can be in excess of 20 years. The extent of collapse settlement is expected to be non-uniform across the mine area, based on variable geological factors and mining practices.

Because of variability in the amount and duration of settlement in the mine area, structures, including roads and underground utilities, should not be located on the mine area unless geotechnical investigation confirms that it is feasible to support the structure and its ground floor placed on pile foundations bearing on undisturbed bedrock below the mine waste or that all natural settlement is effectively complete.

## Appendix A

Mining operations have disrupted the area's natural aquifers and undisturbed aquifers are not expected to be able to provide reliable groundwater supplies. Post-mining land uses will therefore have to consider alternative water supply sources.

**Terrain** - Before mining operations commenced, the topography of the area was complex and included numerous wetland areas. The post-mining topography is likely to be less varied, which would increase its agricultural suitability but may also decrease its attractiveness as wildlife habitat. In some areas, post-mining land uses may be constrained by the complexity of the terrain as well as by slope instability along the escarpment.

**Surface Drainage** - Surface drainage will be an important consideration in determining future land uses in the mine area. Mining operations have disrupted the area's natural drainage systems, increased the rate of runoff and decreased the complexity of drainage channel topography. Post-mining land uses could consider restoration of the natural drainage systems and incorporating characteristics that made these systems attractive to wildlife.

**Soils** - Of the three major soil types in the mine area, the luvisols south of Secondary Route No. 627 are most suitable for agriculture. Soils of the post mine landscape are redeposited based on the agricultural capability objectives of the reclamation plan.

**Vegetation & Wildlife** - The Highvale mine is located in a transition ecoregion with varied topography which contributed to a diverse array of natural vegetation and wildlife in the pre-mine landscape. Re-vegetation of the mine area should consider restoration of native plant associations and linkages with natural areas and other habitats outside the mine area. Other habitats include ravines, stream valleys, hedgerows and remnant woodlots.

A large variety of wildlife species inhabits the area surrounding the mine. The creation of habitat corridors would improve the ecological health of the area and encourage wildlife to repopulate the mine area. Habitat corridors could also be used for recreation and contribute to increased enjoyment of the area by both residents and visitors. The high capability for waterfowl in the eastern portion of the study area is a significant natural capability that needs to be reinforced in the Area Structure Plan.

**Land Use Capability** - Lands with lower agricultural capability have higher capability for other land uses, particularly recreation and wildlife habitat. Post-mining land uses should consider the capability of the land to support activities other than agriculture.

**Land Use Constraints** - The capability of the reclaimed land to support structures/roads/utilities is questionable given the potential for subsidence in the reclaimed area.

**Structures.** Due to variability in the amount of settlement and in the length of time during which settlement related ground displacements may take place, it is generally recommended that structures should not be located on mine waste in the Highvale Mine area, unless, the results of geological investigation confirm that it is feasible to support the structure or its ground floor is on pile foundations bearing on the undisturbed bedrock below the mine waste or, the results of geotechnical monitoring confirm that all natural settlement is effectively complete within the saturated soil zone (probably 30 years or more after reclamation).

**Roads.** A road network can be re-established within the Highvale Mine area, however, roads should not be paved until geotechnical monitoring investigation has confirmed that all natural settlement is effectively complete; road drainage is diverted out of the road right-of-way and before drainage through the mine waste area occurs and surface water ponding is reduced to the minimum.



**Utilities.** It would be preferable that underground utilities not be provided in the reclaimed mine area until geotechnical monitoring has confirmed that all natural settlement is effectively complete or methods employed which will withstand future long term ground settlements.

### **2.3.8 Geotechnical Monitoring and Investigation Requirements**

An ongoing geotechnical monitoring and investigation program needs to be undertaken within the mine area. Consideration should be given to establishing a number of control sites across the mine waste area where information about the waste re-saturation process and related settlements could be documented. This information could be used to assist with the timing of future land development possibilities in the mine area.

## ***2.4. Existing Land Use***

A review of existing land uses was undertaken during the summer of 1996. Map 10 - Existing Land Use, identifies those uses that currently exist within the study area as well as on adjacent land surrounding the study area.

### **2.4.1. Strip Mining Land Use**

The majority of the area has been subjected to or will be subjected to the strip mining operation. Mining is a temporary use of the land and will be replaced by other uses.

Included in this mining operation are the two Power Plant (Sundance and Keephills), and attendant buildings related to serving each of the Power Plants. In addition, the adjacent buildings also serve as maintenance buildings yards for the major equipment or haul trucks.

As part of the total mine and plant operations additional land uses associated with their development and operation result. These land uses consist of ash dumps, acid cells and solid waste products. The maps showing the plant sites in detail identify these various uses and their locations. A full listing of waste products is provided in the "Application for Renewal of Mining License...."

The mine operation is discussed in more detail below.

### **2.4.2 Agricultural Land Use.**

In very general terms, most of the adjacent area is either under agricultural crop or hay production or is being used as grazing land for cattle. Some of the area is still heavily covered with deciduous vegetation and in some cases (particularly the ravines and creek areas), with thick forests of spruce.

Included in the area are numerous farm developments with residential homes and farm buildings. Reference to earlier air photographs shows that the predominant land use has continued as an agricultural land use for many years, even prior to the Highvale mine being established.

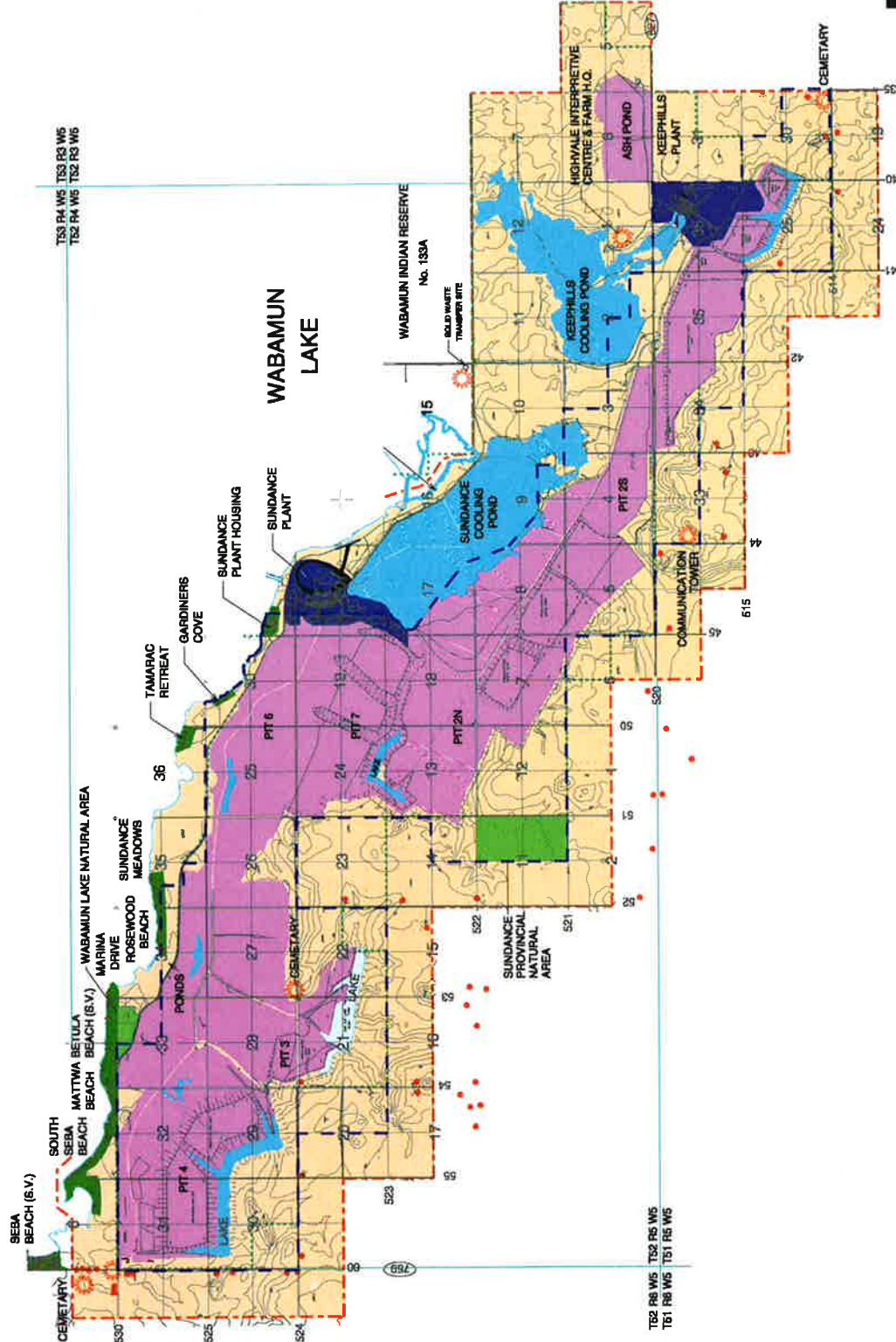


# Highvale End Land Use Area Structure Plan

Parkland County TransAlta Utilities

## Map 10

## LAND USE



### LEGEND

- Study Area
- Mine Permit Boundary
- TransAlta Utilities Holdings
- Agriculture
- Cottage/Summer Village
- Industrial/Else
- Mining Area & Cooling Ponds
- Provincial Natural Area
- Land Use Features
- Farmstead / House
- Water Features

Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Omni-McCann Consultants Ltd.  
D.L. Foster Associates Ltd.  
Cochrane Engineering Inc.

## Appendix A

Within the mine site boundary there has been some reclamation of land which has been returned to pasture land, hay fields or crop land. This has occurred mostly at the eastern and western ends of the mine site and along the Sundance Road.

TransAlta Utilities also maintains a reclamation and tour center in the eastern end of the mining leased area.

### **2.4.3 Cottage and Acreage Development**

The only real exception to this agricultural land use has been the higher density land use of cottage subdivisions along the shore line of the lake. This latter development has not been included in the mine site but is an integral part of the study area.

Residential subdivisions exist from Sunshine Bay at the western end of Lake Wabamun to the Sundance Power Plant. Some gaps in this development have occurred because of unusable and swampy land that is found along this shore line. Most, if not all available developable land along the shore of the Lake has now been subdivided and developed for cottage and acreage ownership. Included in these developments are:

- Sunshine Bay
- South Seba Beach
- Mattwa Beach
- Betula Beach Summer Village
- Marina Drive Subdivision
- Rosewood Beach
- Sundance Meadows
- Tamarac Retreat, and
- Gardiners Cove.

Scattered between some of these developments are small farms and acreage developments that do not have any subdivision name.

In addition, the Sundance Plant has attached to it a significant residential area including a large apartment complex and a housing development located immediately north of the Sundance Plant on the shore line of Lake Wabamun.

The Sundance Road along the south shore of Wabamun Lake links all of these subdivisions. This road has been maintained primarily for access to the cottage subdivisions and to provide a link between Range Road 42 on the east and Highway 759 (Range Road 60) on the west.

### **2.4.4 Other Land uses**

Located at the highest point of the area is a radio transmission tower

A number of small cemeteries exist within the study area. These have been carefully protected and preserved, by both TransAlta Utilities and the surrounding residents. They are to be found at:

- SW Quarter Sec 1, Twp 52, Rg 4, W5M
- SE Quarter Sec 30, Twp 52, Rg 3, W5M
- SE Quarter Sec 28, Twp 52, Rg 5, W5M and
- Near Seba Beach, west of the Highway 759.

## Appendix A

The Government of Alberta has ownership of two quarter sections of land (East Half of Section 11, Township 52, Range 5, W5M), and a smaller area Pt N1/2 Section 33-52-5-W5M as a natural reserves. Access to the first parcel is currently limited but they straddle a small creek system that feeds into the mine site approximately due south of the Sundance Plant. The second site lies on the Sundance Road between the road and the lake shore.

### Oil Wells

There are a significant number of Oil Wells throughout the study area.

#### **2.4.5. Highvale Mine Site**

Within the mine site boundary there are numerous land uses related specifically to the mine and plant operations.

The two plants are located - one on the shore line of Wabamun Lake (Sundance) and the other (Keephills), south of Highway 627 in Section 36, Township 51 Range 4 W5M. The Cooling ponds for both of these plants are located adjacent to each plant and form significant developments that could have some future use following their closing and reclamation.

Each of these plants have large ash deposit lagoons and subsequent ash deposit areas. The Sundance ash lagoon is flooded by the cooling pond. TransAlta Utilities also has a large farming operation that acts as both a Tour centre and Reclamation Headquarters. The Tour Center provides information on the mine and its staff conduct tours of the mine site and provide interested observers with a detailed explanation of the mining operation and how the company is reclaiming the land following mining.

The mine itself consists of a series of open cut pits:

- Pit 4 is located at the extreme west end of the Study area adjacent to Highway 759;
- Pit 3 lies east of Pit 4;
- Pit 6 is adjacent to, and directly west of the Sundance Power Plant;
- Pit 1 immediately to its south;
- Pit 2 N and Pit 2 S form one long pit operation stretching from South of the Sundance Plant to the Keephills Plant, and
- The major ash pit is located between Pit N and Pit 2S.

Each pit was generally started at its northern end and, depending upon the economics of mining of any particular time period, moved southward towards the escarpment. (Pit 2 N is progressing northward). The escarpment is a high relatively steep sloping area of land that forms the transition between the flat low or lake lands, and the undulating but generally flat uplands found to the south of the mine area.

Open Cut mining consists of removal of the overburden to the coal seam. The coal seam is then removed and transported to the Power Plants for conversion into energy. The overburden material from the first cut is dumped, initially on existing ground forming the site and sound barriers located parallel to the Sundance Road. These were to protect the existing residents from the noise and clatter of the mining operations. Material from subsequent cuts are used to close the previously dug out mined area. This allows the extraction of the coal seam to be advanced step by step in a southerly direction up to the point where the depth of the overburden becomes uneconomic to remove. In the case of the Highvale mine this line is governed by the escarpment that exists some 3 to 8 kilometers (2 to 5 miles) south of the lake shore. Ultimately the last seam to be removed will

## Appendix A

leave a large and very deep hole in the ground as there is no more overburden to provide the fill. These deep cut areas, known as the "end cuts", have the potential of being used as future lakes. (End Cut Lakes)

### **2.4.6. Land uses adjacent to the Study Area.**

One significant land use located adjacent to the study area is the Wabamun Indian Reserve #133A of the Paul First Nation. This Reserve forms the northern boundary of the study area along the eastern edge of the site. Discussion with the Paul First Nation have indicated that their Reserve might be expanded to include parts of the study area. This is currently under discussion with the Federal Government through the Land Claims process.

### **2.4.7 Issues related to Land Use**

The main issues are:

- that the road system be re-established in a form that resembles the original grid pattern. This can not be achieved completely because of the location of the End Cut Lakes that will be established at the end of each pit, but as far as is possible within practical ability, the original road system will form the basis for linking the two, north (shore line road) and south (Highway 627), east-west access roads,
- that the natural configuration of land that existed before the mining operation began should be restored as close as possible to its original form. This would require the original creeks and streams to be relocated along more or less their original paths,
- that the percentage of differing soil capability class lands in the area be restored in a similar percentage during the reclamation process,
- that the relationship between residential subdivisions along the shore line and the hinterland be restored. This will include the retention of some berms in some areas. In particular, the berm along Sundance Road would stay, but the berm along Highway 759 would eventually be removed. This latter berm is mostly top soil that would be needed as soil cover on reclaimed land, and
- that the necessary steps be taken to ensure that the reclaimed and surrounding lands, future ground water sources, as well as Lake Wabamun be protected from any harmful effects as a result of the presence of waste storage areas associated with ash and other waste materials associated with the plants and mine.

## **2.5 Existing Utility Servicing**

Generally there are two areas where significant infrastructure exists that could be incorporated into future land uses within the study boundary. One area is the Keephills Plant site, which is located at the southeast corner of the study area, south of Highway 627. The other area is the Sundance Plant site which is south of Wabamun Lake shore and north of the Sundance Cooling Pond. (Map 11 - Major Utilities).

The other areas within the study boundary are the reclaimed mine areas, future mine areas, and the cottages along the shore of Wabamun Lake. These areas have services typical of cottage development and rural residences.



# Highvale End Land Use Area Structure Plan

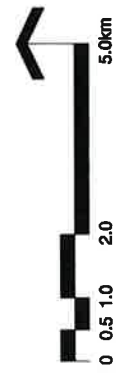
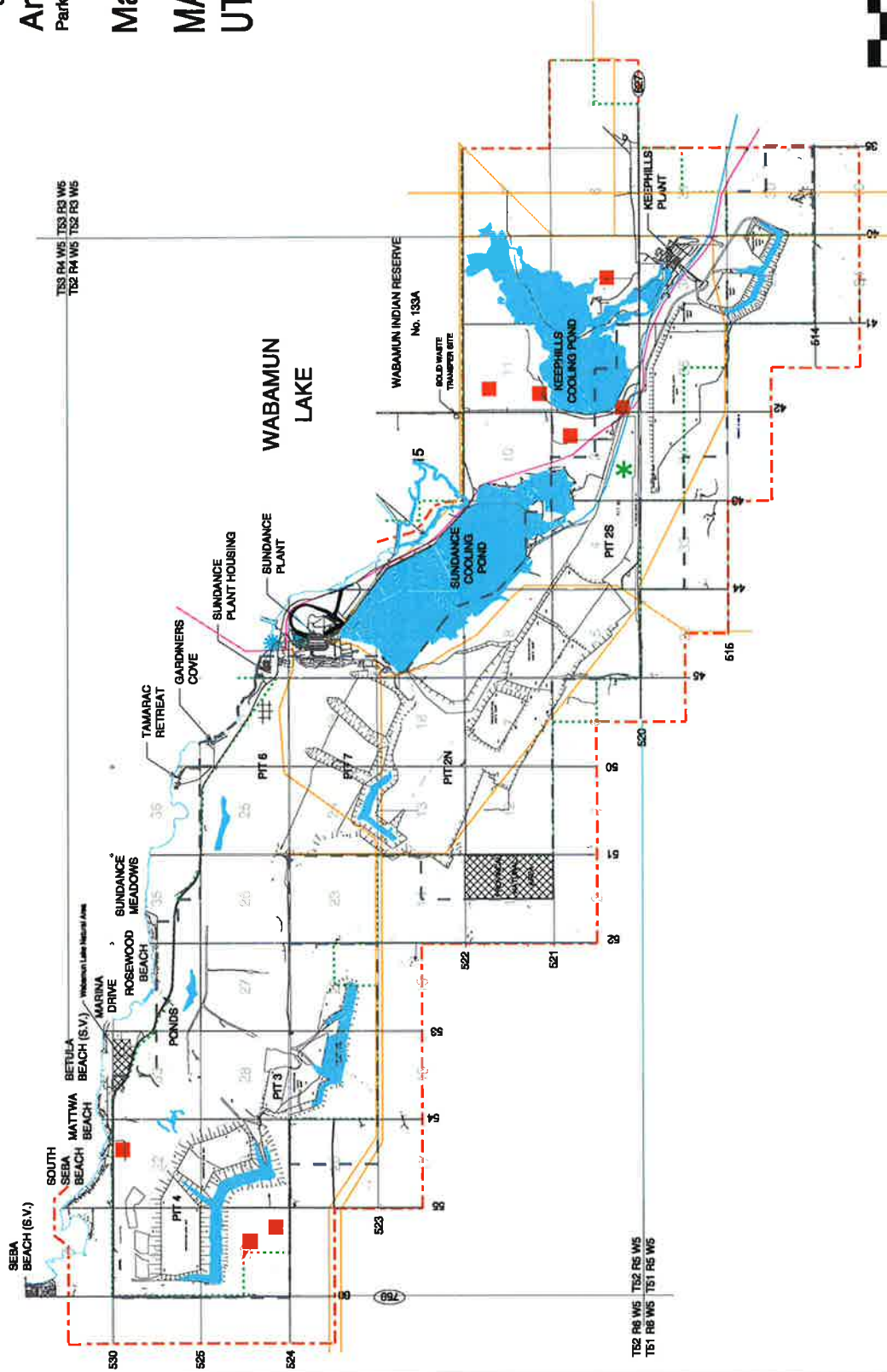
Parkland County TransAlta Utilities

## Map 11

## MAJOR UTILITIES

### LEGEND

- Study Area
- Mine Permit Boundary
- TransAlta Utilities Holdings
- Power Transformer Lines
- Major Gas Trunk Line (NULL)
- Major Plant Water Supply & Blowdown
- Water Treatment Plant
- Closed Landfill Site
- Well Site (Gas/Oil)
- Water Features



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Omni-McCann Consultants Ltd.  
D.J. Foster Associates Ltd.  
Cochrane Engineering Inc.



## Appendix A

### **2.5.1 Sanitary Sewer**

#### **2.5.1.1 Keephills Plant Site**

The Keephills Power Generating site is the newest in the area. Power generation began and infrastructure completion was in 1983.

The Keephills Plant site has sanitary lagoons located northwest of the plant. Sewage is pumped from a lift station outside of the plant to the lagoons. Final effluent is discharged into the Keephills Cooling Pond in the spring.

#### **2.5.1.2 Sundance Plant Site**

The Sundance Power Generating site began operation in 1970, with the associated utility infrastructure also complete at this time.

Directly north of the plant is a housing site containing 35 single family dwellings and a 30 unit apartment complex. Also north of the plant are the mine services buildings. Sanitary sewerage for these areas, including the plant, is provided by a new two cell lagoon constructed in 1993. Sewage flows by gravity to a lift station along the highway and is pumped by a force main to the lagoons. The final effluent is discharged into the Sundance Cooling Pond in the spring. The majority of the gravity sewers were constructed prior to 1970.

#### **2.5.1.3 Other Areas**

The cottage residences along the lake shore are served by individual septic systems. These are either septic fields or pump out tanks.

Discussions with the maintenance staff at TransAlta Utilities indicate that the sanitary infrastructure is generally in good condition throughout both plant sites. TransAlta Utilities maintains and upgrades the system regularly. It could be possible to use or expand the existing treatment facilities at both plant sites if future development occurs close to these sites.

The sanitary utilities around the Sundance site are over 25 years old except for the new lift station, force main and lagoons. The gravity sewers could require replacement prior to the closing of the plant.

### **2.5.2 Storm Drainage**

Storm drainage for the plant site parking areas is accomplished by a series of catch basins and outfalls to the cooling ponds. Most of the ditches and culverts surrounding the plants also discharge into either the Keephills or Sundance Cooling Ponds. The Keephills site uses a settling pond to collect storm runoff from around the plant site. Storm water is then pumped into the cooling pond.

The other developed areas, including the Sundance housing site along the lake, use culverts and ditches which eventually discharge into Wabamun Lake.

## Appendix A

The storm sewers in the plant sites are maintained by TransAlta Utilities and are in good condition according to discussions with TransAlta Utilities staff. The Cooling ponds capture most of the flow from the developed areas and act as storm water management facilities. Future developments could utilize the same concepts for storm water management and possibly use some of the existing drainage courses.

### **2.5.3 Water Supply and Treatment**

#### **2.5.3.1 Keephills Plant Site**

A water treatment facility within the Keephills Power Generating Plant provides potable water for use in the plant. Another water treatment facility is located south of the raw water pond. This facility provides treated industrial water for power generation at Keephills. Both water treatment facilities obtain their water source from the raw water pond that is located south of Highway 627 between the cooling pond channels. Fire protection is provided by fire pumps located beside the cooling pond.

The potable water treatment facility would be difficult to re-use after Keephills is decommissioned. The other treatment and pump house could be incorporated into a future industrial or possible residential development, if modified.

#### **2.5.3.2 Sundance Plant Site**

Domestic water supply for this area is provided by a water treatment facility located east of the housing site. This treatment facility was constructed in 1970 and has had some upgrading completed on an as required basis. The treatment facility obtains its raw water from Wabamun Lake and has a capacity of 200,000 m<sup>3</sup>/year. Another water treatment facility located to the northeast of the plant site provides treated water to the Sundance Plant for cooling purposes. This facility obtains its water supply from the Sundance Cooling Pond and has a capacity of 900,000 m<sup>3</sup>/year.

Some degree of fire protection is provided to the site surrounding the Sundance Generating Plant. Both water treatment facilities could be used for additional domestic or industrial water supplies in future developments near the plants. The distribution lines are primarily cast iron and could require replacement in the near future.

#### **2.5.3.3 TransAlta Utilities Water Use Replacement Treatment Plant**

A new water treatment plant is under construction and scheduled to begin operation in the middle of 1997. This plant will replenish the water level in Lake Wabamun as long as the Power Generating Plants operate in the area. This plant will have an option to provide a limited amount of treated domestic water. The plant will draw water from the Sundance Cooling Pond and discharge treated water directly to Lake Wabamun. Approximate capacity will be 15,000,000 m<sup>3</sup>/year and is scheduled to operate more or less continuously for a number of years.

This will be a large capacity municipal treatment plant that could provide a significant potable water supply in the future.

## Appendix A

### **2.5.3.4 Cooling Pond Water Supply Lines (Make Up and Blow Down Lines)**

Large diameter concrete pipes supply water to both the Sundance and Keephills Cooling Ponds. These lines are in a right-of-way which link the North Saskatchewan River and the cooling ponds. Water is pumped from the river to each of the ponds. Another pair of concrete pipes called the blow down lines provide a discharge to the river. The sole use for these pipes are for the power generating plants.

Future uses for the make up and blow down lines are uncertain. They would likely be abandoned unless the new lake stabilization plant would continue to operate and supply treated potable water to the surrounding areas.

### **2.5.3.5 Other Areas**

The existing residences and cottages outside of the plant sites are served by individual wells or have water trucked in. Future developments near the plant sites could possibly connect to the water distribution from the existing water treatment facilities. Specific assessment of water supply should be made at the subdivision stage to ensure that an adequate supply of quality potable water is available.

### **2.5.4. Natural Gas Line**

A 200 mm diameter natural gas line owned by Northwestern Utilities is located along this east side of the Sundance Cooling Pond. It crosses Wabamun Lake and runs diagonal to the southeast. It's primary purpose is to "start up" the Sundance and Keephills Power Generating Plants and provide an emergency fuel supply.

Parkland Gas Co-op has a distribution system for natural gas surrounding this study boundary. This system is for the cottages and farms in the area.

Extension of these gas systems would be possible to provide gas service to additional farms, cottages or industrial development proposed for the future in this area.

### **2.5.5 Power Transmission Lines**

A number of significant power transmissions lines originate from the study area. The Keephills and Sundance Plants generate approximately 60% of Alberta's power. When the Highvale area coal supply has been depleted, or the economical plant life reached, a number of the existing transmission lines may not be required. Some of these power lines would form a portion of Alberta's integrated systems power grid and also supply power to industrial, commercial and residential customers in the area. Considerable alterations to the power facilities and possible realignment and removal of the existing transmission lines and right-of-ways may be possible when Sundance and Keephills no longer generate power.

### **2.5.6 Power and Telephone**

Power and telephone services exist in the study area including the Keephills and Sundance Plant sites. These services could be extended into the future land uses as required.

## **2.6 Criteria For Re-Use Of Existing Services**

The important governing criteria that must control development following the decommissioning of the mine and power plants is that it will be up to the proponent proposing to undertake development who will be responsible for ensuring that all or most of the following are undertaken in so far as it affect their proposed development. However it should also be the responsibility of Parkland County to obtain the necessary information on existing infrastructure from TransAlta Utilities before the areas are decommissioned. It should be noted that it will be some time before the power plants are decommissioned thus development surrounding these plants may not be in a position to use existing infrastructure unless it is with the approval of TransAlta Utilities.

- Detailed study of the existing infrastructure primarily around the Sundance and Keephills Generating Plant sites should be completed prior to decommissioning.
- Determine if any of the infrastructure could be incorporated into proposed land use.
- Visual and camera inspection of the storm and sanitary sewers, including the lift stations, lagoons, manholes and outlets. Review of the capacities.
- Review of current storm water management facilities and outfall requirements with Alberta Environmental Protection and the Municipality. It is likely that detailed drainage studies would be required for future subdivisions and/or development proposals.
- Review of the existing water treatment systems and ensuring the existing systems meet the current minimum treatment requirements for filtration and disinfection.
- Review of the existing water transmission mains and associated valves, hydrants, etc. to ensure compliance to municipal and provincial standards. It would have to be ascertained if the existing mains could provide minimum pressures for peak flows or possible fire flow demand.

## **2.7 Existing Transportation Systems**

### **2.7.1 Introduction**

An investigation was undertaken of the road network within, and surrounding the Highvale mine area. This included:

- the examination of where roads were located prior to the mine commencing;
- the measuring of traffic volumes at various points on the main roads surrounding and leading into the mine area; and,
- an examination of the nature and quality of existing roads both as to their importance to the County Transportation system and their construction and quality.

### **2.7.2. Road Network Prior to 1969.**

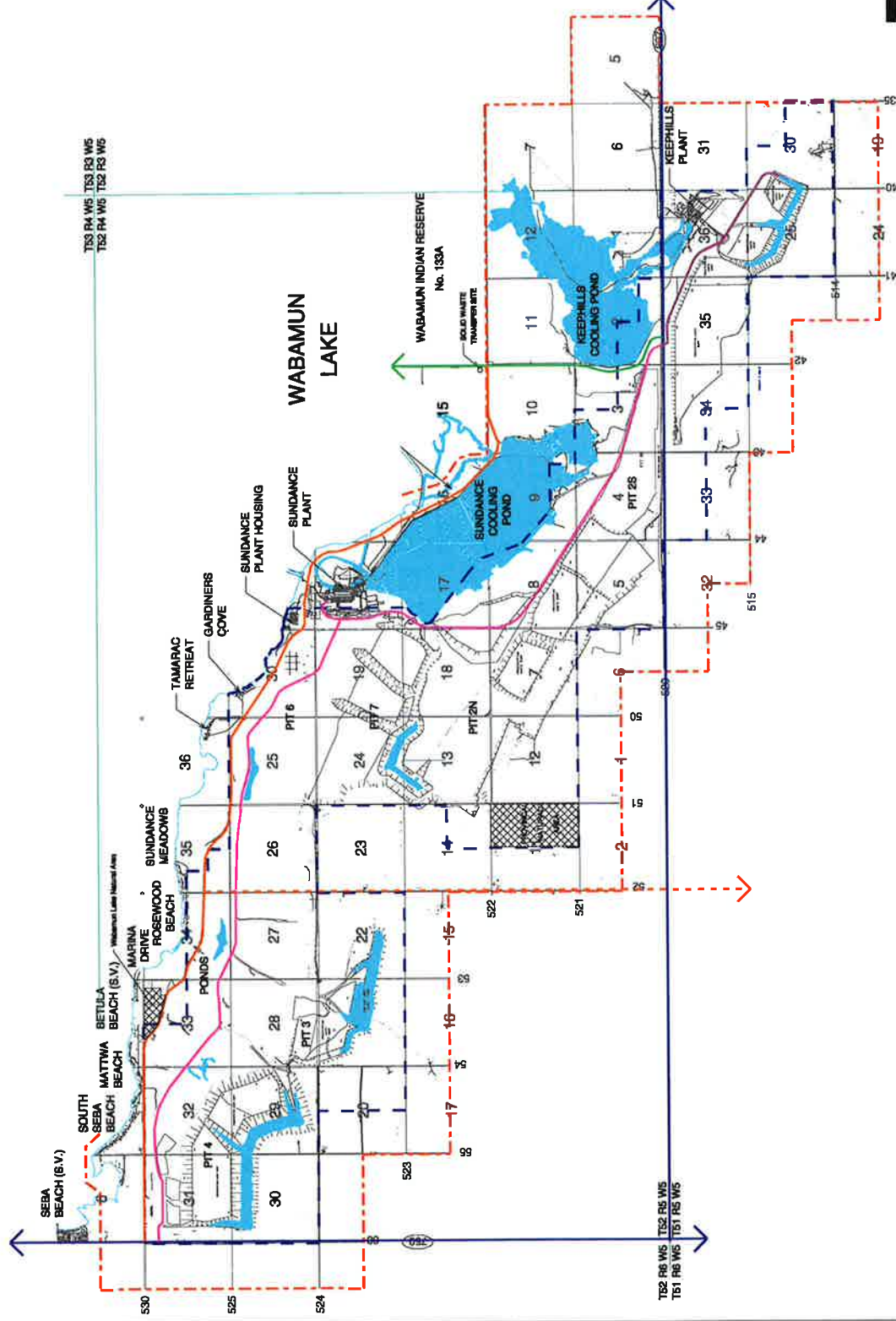
The road network prior to 1969 is illustrated on Map 3 - Pre Mine Air Photo Mosaic. At that time continuous north south connections were provided through the study area at Secondary Highway

# Highvale End Land Use Area Structure Plan

Parkland County TransAlta Utilities

## Map 12

## TRANSPORTATION



Keith Driver & Associates Ltd.

with

Gibbs & Brown Landscape Architects Ltd.  
Ornd-McCann Consultants Ltd.  
D.I. Foster Associates Ltd.  
Cochrane Engineering Inc.



## Appendix A

759, Range Road 55, Range Road 52, and Range Road 42. The East-West routes were provided by Sundance Road and Secondary Highway 627/Township Road 522 (connecting via Range Road 52).

### **2.7.3 Existing Road Network**

The existing road system which is illustrated on Map 11 - Transportation, comprises roads which are:

- under the jurisdiction of the County,
- under the jurisdiction of TransAlta Utilities which are also used by general traffic, and
- roads, primary haul roads, which are within the mined area.

Upon reclamation of the mine lands and after suitable modifications have been carried out, some of the existing haul roads may be used to form part of the County Road Network. It should be recognized that because of the size of the trucks which use the haul roads, the road cross section is very wide and will require significant modifications to comply with the narrower recommended cross section for a minor collector or local road.

Table 5. Condition of Roads outside the Mine Area, identifies the roads not within the mining area and their width, condition and other comments.

In the western half of the study area where the impact of the mining operation does not impact the total area, access to the existing properties is provided from Secondary Highways 627 and 759 by Range Road 52 and Township Road 524.

**Table 5. Condition of Roads outside the Mine Area**

Road	Width	Condition	Start	End	Comments
SH 627	8	P. Good	RR 35	E. RR 42	Road changes to gravel to the west.
SH 627	9	Gr. Good	e. RR 42	SH 759	Road being graded during site review
RR 35	6.5	Gr. Adequate	SH 627	South TP 514	
RR 40	6	Gr. Adequate	SH 627	South TP 514	
RR 40	6	Gr. Adequate	SH 627	North TP 521	Road Closed to north
RR 41	5.5	Gr. Adequate	SH 627	South TP 515	Road Connects to SH 627 via RR 42
RR 42	5.5	Gr. Adequate	SH 627	South TP 515	
RR 42	8	P. Good	SH 627	North TP 522	Ties to Sundance Road and Paul Band Road, starts east of RR 42
RR 43	7	Gr. Adequate	SH 627	South TP 515	North of SH 627 does not exist
RR 44	5	Gr. Adequate	SH 627	South TP 515	North of SH 627 does not exist.
RR 45	5	Gr. Adequate	SH 627	South TP 515	

## Appendix A

RR 45	5	Gr. Adequate	SH 627	North SH 627	Extends for approx. 0.8 km
RR 50	4	Dirt Road	SH 627	North SH 627	Extends for approx. 0.8 km
RR 51	4	Gr.P/Dirt Rd	SH 627	TP 522	Needs rebuilding
RR 52	6/7	Gr. Adequate	N SH 627	TP 524	Higher standard south of TP 522
TP 524	6	Gr. Adequate	RR 51	SH 759	Provides east/west collector
RR 55	5.5	Gr. Adequate	TP 525	TP 522	
TP 523A	4.5	Gr. Poor	RR 55	RR 54	Ties into RR 54 for access
RR 54	4.5	Gr. Poor	TP 523A	S.TP 523A	Extends 0.5 km S TP 523A
RR 54	4.5	Gr. Poor	TP 522	N. TP 522	Extends 1.1 km N of TP 522
SH 759	8	P. Good			
P Band	7	P. Good			
Sun R.	7	P. Good			

### 2.7.4 Existing Traffic Volumes

Table 6. Summary of Traffic Counts, summarizes traffic counts taken during September and October 1996 and the count locations are illustrated in Map 12 - Transportation. Sundance Road carries the heaviest traffic (1080 vehicles/day) adjacent to the plant which illustrates that the majority of the plant bound traffic accesses from the east and has minimal impact on the residential development further to the west.

**Table 6. Summary of Traffic Counts**

Road	Location	Average Daily Volume
SH 759	South of TWP Rd 530	1050
SH 759	North of TWP Rd 530	1499
TWP Rd 530 (Sundance Rd)	Between SH 759 and RR 55	500
TWP Rd 530 (Sundance Rd)	Between RR 55 and RR54	304
RR 42	350 m North of SH 627	430
RR 42	150 m South of Plant Turnoff	412
TWP Rd 522	100 m West of RR 42	1077
RR 52	810 m South of SH 627	55
SH 627	East of SH 759	160
SH 627	West of RR 42	313
SH 627	West of Keephills Plant entrance	538
SH 627	East of Keephills Plant Entrance	578
RR 40	100 m South of SH 627	30