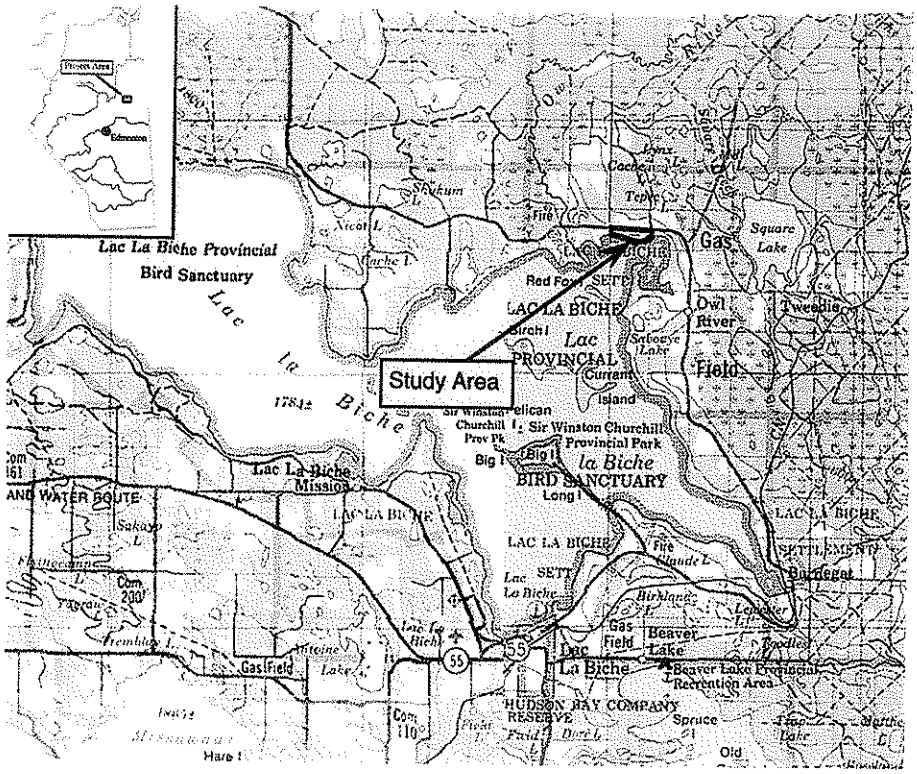
Area Structure Plan

ISLAND VIEW BAY
MOONLIGHT COVE

Proposed Country Residential Subdivision
Pt. S 1/2 28 - 68 - 13 - W4M
Lakeland County

June 07, 2004
Final Draft



DONATBERRY DESIGN LTD.

06/09/04

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Attachments

Altamira Consulting Ltd. - archaeological study

Alberta Community Development - approval letter

Soil- Info Ltd. - Agricultural soils report

MPI Engineering - Transportation Impact Analysis

Alberta Transportation - Hwy 858 access approval letter

Kenton Environmental Inc. - Shallow Soils Report

Western Pump Ltd. - Wastewater Treatment System

Shelby Engineering Geotechnical Report

1.0 Introduction

1. Smith Cosmopolitan Enterprises and K.G.B. & M. Holdings , owners of Pt. S 1/2 28 - 68 - 13 - W4M have requested the residential subdivision and therefore the rezoning of the above parcel.

2. This Area Structure Plan has been prepared as an integral requirement for rezoning within Lakeland County.

3. The Lakeland County Municipal Planning Commission along with Lakeland County advisor, Lovatt Planning Consultants Inc., have recommended Country Residential Rezoning and therefore 1st reading was given by Lakeland County Council to the proposed bylaw 04-001 on Feb. 25/04, for that purpose.

4. The proposed subdivision includes a total between 70 and 77 country residential parcels. Alberta Transportation and transportation consultant MPI Engineering were concerned with the impact of 77 lots predominantly utilizing the easterly proposed approach with its proximity to the Town of Lac La Biche and Hwy 881 intersection with Hwy 858. We therefore designed the proposal into two areas, Island View Bay, and Moonlight Cove. This design divides and directs traffic to the two Lakeland County road allowances while providing quieter no thru traffic flows with cull de sacs. Emergency access between the two areas will be provided via a 10 m wide gated lane/walking trail. This layout has preliminary approval from Alberta Transportation as per MPI Engineering recommendations.

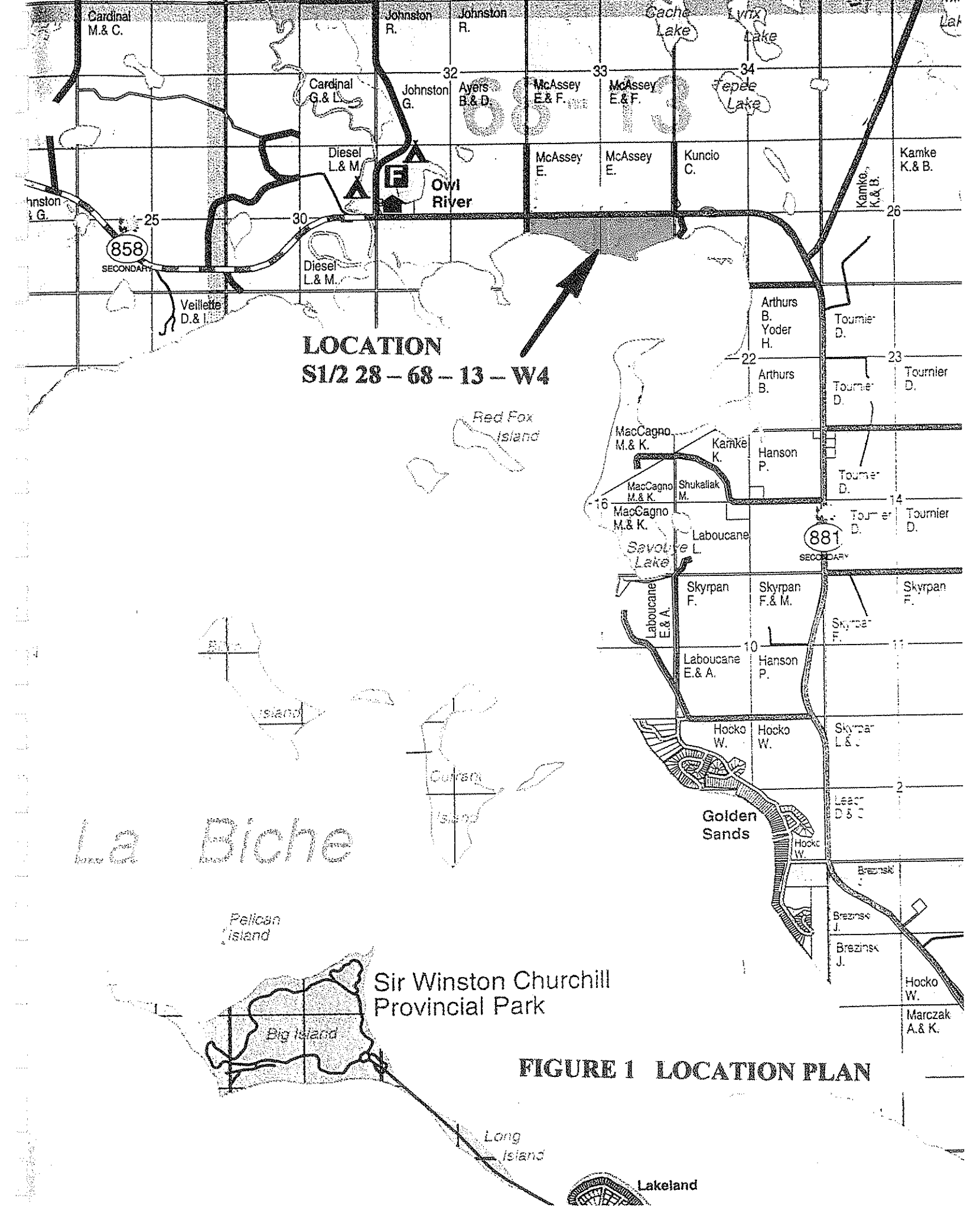


FIGURE 1 LOCATION PLAN

2.0 Existing Land

1. The existing parcels consist of 51.38 ha (126.96 ac.) as described within the Certificates of Title.

2. Highway 858 (plan # 812 0430) borders the proposed subdivision to the north with Lac La Biche lake on the south boundary. Existing Lakeland County road allowances border the east and west sides of the proposal.

3. Land to the east and west of the Lakeland County road allowances consist of Crown land.

4. An existing shop within the proposed subdivision will remain in its present location and will be accommodated within proposed Lot 9 - Island View Bay.

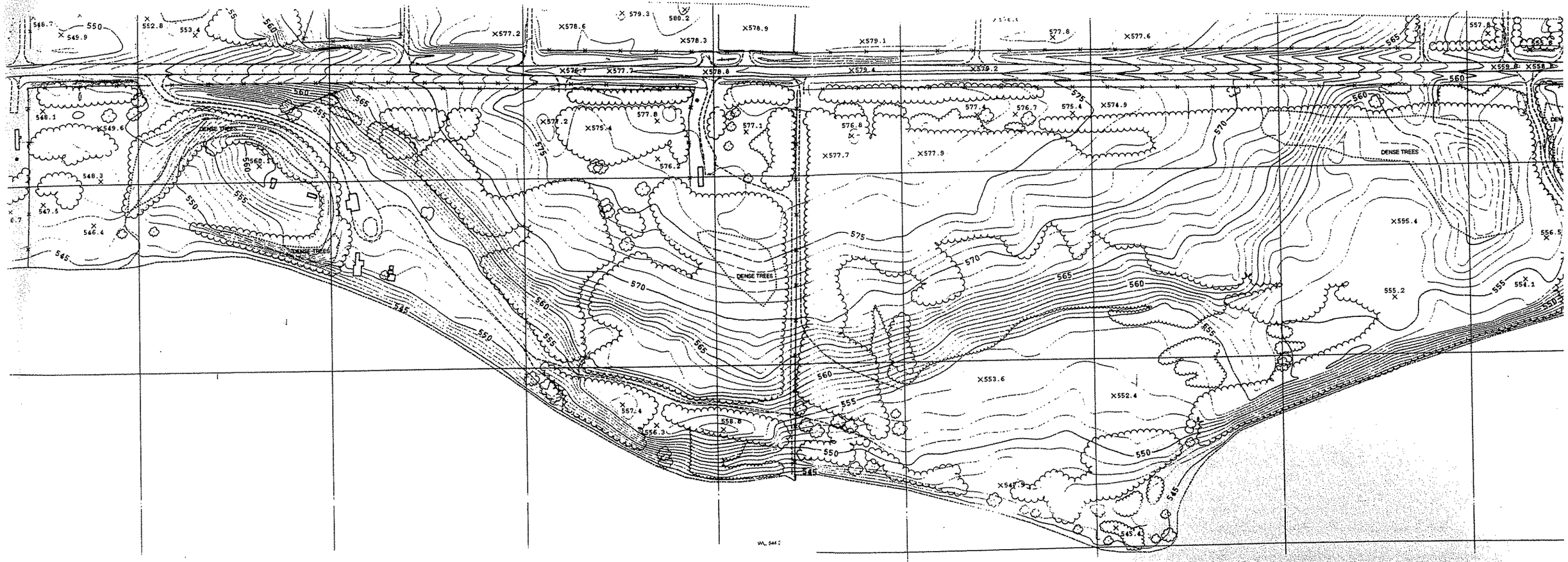
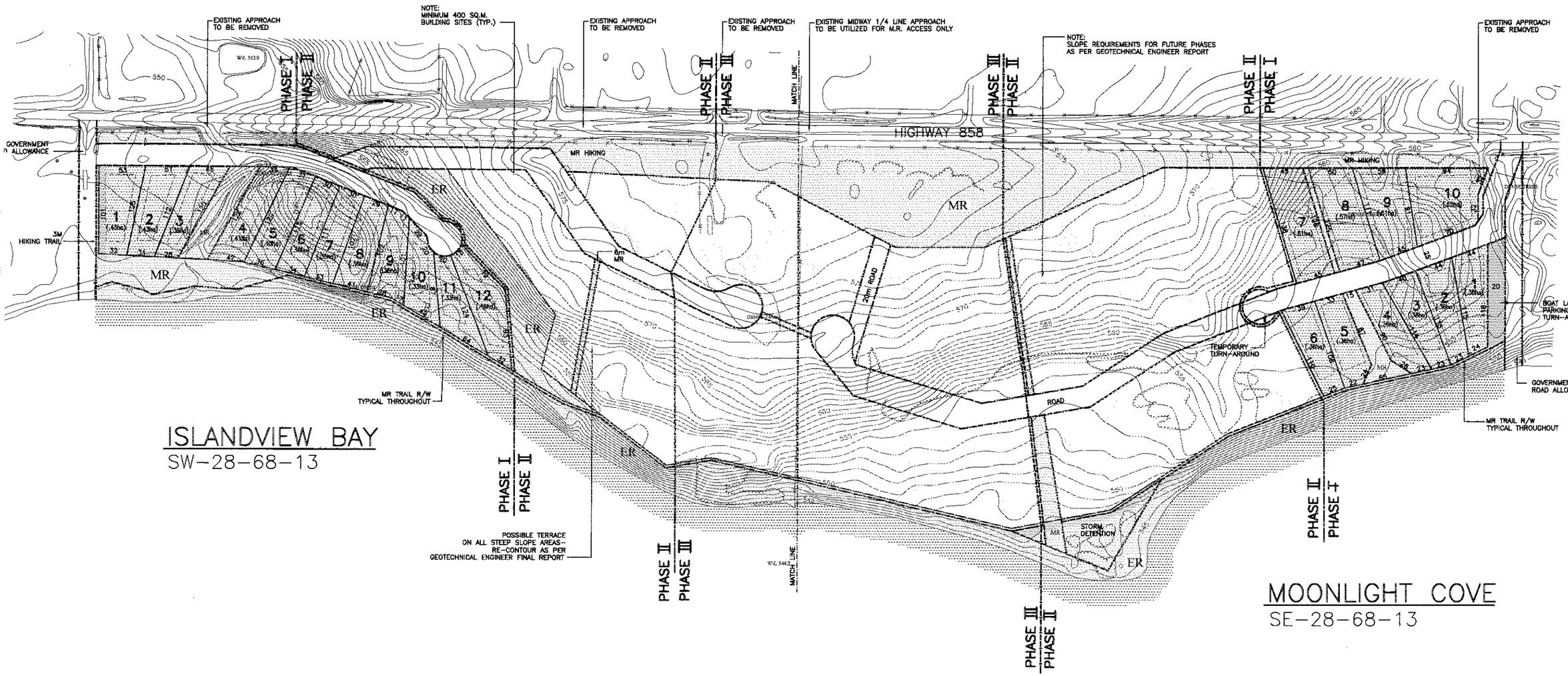


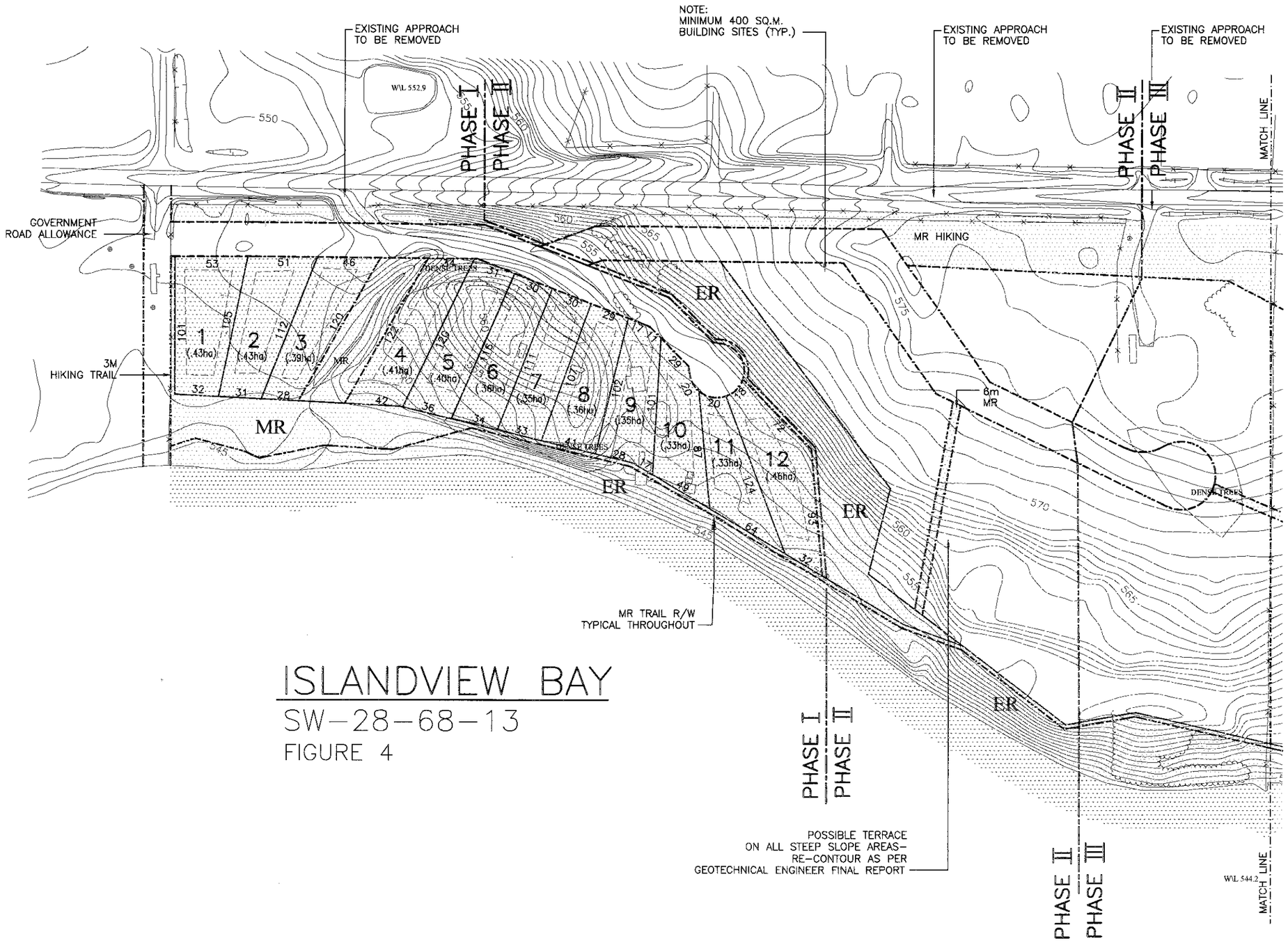
FIGURE 2 EXISTING CONDITIONS



NOTE:
FINAL BUILDING SITE SETBACKS
TO BE DETERMINED BY GEOTECHNICAL ENGINEER
BEFORE ADOPTION OF TENTATIVE PLAN

OVERALL DEVELOPMENT CONCEPT

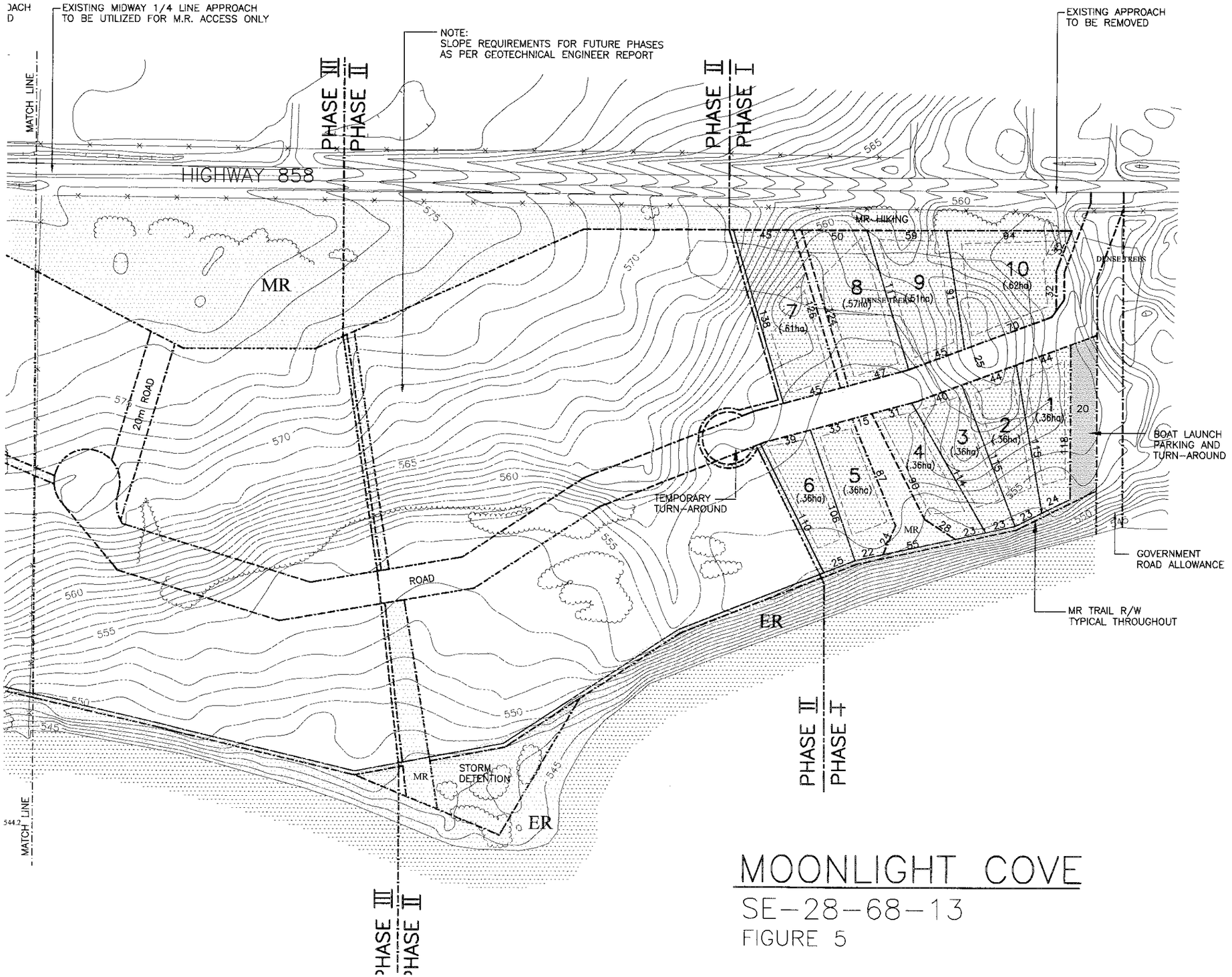
FIGURE 3



ISLANDVIEW BAY

SW–28–68–13

FIGURE 4



MOONLIGHT COVE

SE-28-68-13

FIGURE 5

3.0 Physical Conditions

1. **Topography :** The topography consists of south facing terraces with predominantly gentle slopes and some steep banks to the shoreline. Steep bank areas as confirmed in the geotechnical report attached will be dedicated as Environmental Reserve.

2. **Low land :** There are no low areas, with 2 flat areas near the beachhead which will act as possible storm water detention and Municipal day use Reserve.

3. **Beach:** The natural beach area with a gentle slope, natural rock shield and sand, will be dedicated as environmental reserve and protected in its natural state along with the 2 day use areas mentioned above.

4. **Drainage:** The drainage patterns consist of south terraced areas and slopes to the lakeshore. The drainage concept Figure 4 shows the proposed layout, which will be further developed and professionally engineered for Alberta Sustainable Development licensing.

5. **Ground water:** Shallow groundwater was not encountered within the proposed development site, Refer to the Kenton Environmental Inc. Report attached. Cisterns will provide domestic water. Municipal and private truck fill stations will provide treated water for homeowners. Our research indicates low flow rates are anticipated for water wells, therefore dole valves and cisterns would be required if a well is desired. Canadian Drinking Water Guideline criteria will be provided. The existing well on site was originally tested by the well driller and pumped at 5 gpm with a recommended pumping rate of 3 gpm. Kenton Environment pump tested the same well under frozen conditions with similar slow rates. The well drillers report and Kenton Environmental test is attached.

6. **Soils and Agricultural Capability:** Soils were studied and a report attached which concludes that the site has severe limitations for agricultural use.

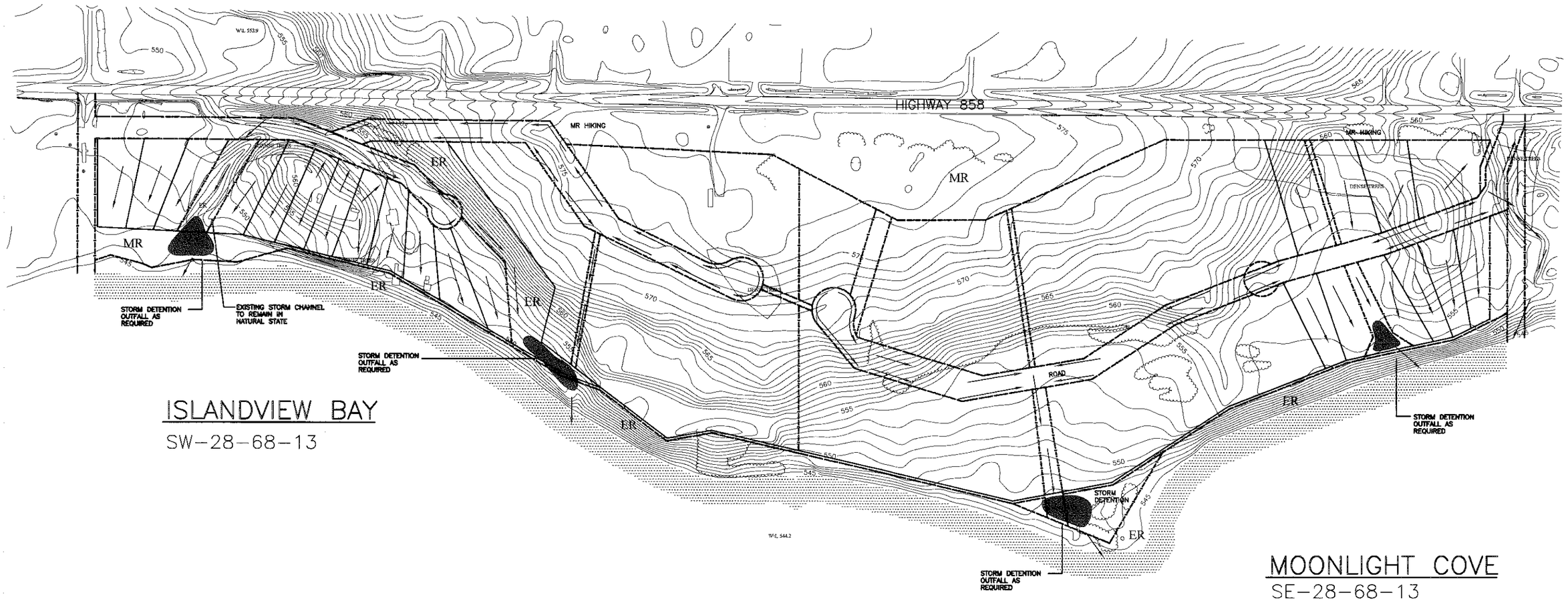
7. **Subsurface geology:** Subsurface sandy clay based soils are expected to have excellent bearing capacity for foundations. Percolation tests have been carried out, please refer to the Kenton Environmental Inc. Report attached. Effluent will be treated with individual biological filter facilities at each residence. Subsequent treated clear water with nutrient levels of 10 parts per million or lower will be disbursed to individual treated clear water fields for finishing as per Alberta Government guidelines.

8. **Natural resources:** There were no natural resources such as gravel or sand found on the site. There are tree stands within the development area, mainly aspen poplar, which will be selectively cleared for building sites.

9. **Manmade Constraints:** The only significant manmade constraint is Highway 858 which borders the north edge of the existing parcels. The proposed subdivision will not significantly effect the highway as traffic flows are divided with two approaches and 4 existing approaches will be removed. Alberta Transportation has approved this layout as per MPI Engineering recommendations.

10. **Archaeology:** An archaeological study has been undertaken and is attached. Alberta Community Development - Cultural Facilities and Historical Resources Division has reviewed the study and has recommended the development proceed. Investigation of a possible single grave site in phase 3 of Island View Bay is ongoing with a reserve and buffer proposed around the site if confirmed.

11. **Access:** The existing plan area has approaches from existing Lakeland County road allowances. These existing Lakeland County roads have approaches onto Highway 858. The 4 existing single residential approaches onto Hwy 858 will be removed. Please find the MPI Engineering report attached for further clarification.



ISLANDVIEW BAY
SW-28-68-13

MOONLIGHT COVE
SE-28-68-13

PROPOSED DRAINAGE CONCEPT
FIGURE 6

4.0 Public Services

1. Domestic Water will be accessed from cisterns as previously mentioned, by each homeowner to Canadian Drinking Water Guideline criteria. Due to low flow rates from well driller reports in the area, and our own on site testing, wells will pump at low flow rates via dole valve restriction into cisterns and/or truck fill into cisterns.

2. Sanity Sewage Treatment will be based on Alberta Government Guidelines and approved systems. Septic Tank and Blackwater Field method is not proposed for the site. Biological filter and Clearwater Field evaporation will be designed for the development. (See appendix)

3. Stormwater will be handled as per the attached Figure 4. The drainage patterns of the area shall be maintained.

4. The proposed development is within the Lac La Biche School area in the Northern Lights School Division. There are school facilities in Lac La Biche which would be enhanced by added enrollment. Busing is also available within the existing school system. Approx. 60% of the development may become full time residences, and 40% weekend users. 1/2 of full time residents may have school aged children.

5. Existing policing and fire protection services will be utilized for the proposed development.

6. Utilities as outlined in Lakeland County Standards will be provided. Existing power, phone, and gas infrastructure is within viable distance to the area plan.

6. Municipal Reserve will be dedicated north of the proposed residential lots with a 20m wide MR which can be utilized for vehicular access from the internal road system. Integral Municipal Reserve access trail right of ways to the beach as well as a continuous 3m municipal trail reserve along the lake above the Environmental Reserve 'top of bank' will be dedicated . The lakeshore will be dedicated as Municipal Reserve for 2 sections as day use areas as well as storm detention outfalls. Environmental Reserves are dedicated for all steep slopes shorelines and flood zones

5.0 Impact Assessment

1.0 The proposed development provides a moderate density for the residential component within the ½ to 3 acre guideline. The dedication of Environmental Reserve, Lake Access Reserve, and Municipal Reserve totaling approx. 25% of the plan area.

2.0 The proximity to the lakeshore has moved the Owner to suggest an increased level of sewage treatment and the elimination of septic field (blackwater) contamination.

3.0 The establishment of a Landowner Association to oversee the conservation of the natural areas will be promoted. 'Green' landscaping will be encouraged to eliminate toxic herbicides, pesticides and fertilizers. Green products will be promoted along with tree planting and natural area rejuvenation. This will be an education package and restrictive covenants will be considered for each parcel at Lakeland County's direction.

4.0 Utilization of the existing approaches, upgraded Lakeland County roadway and existing Provincial Highway access, and the relative low impact of additional traffic volumes from phase I & II will not significantly impact existing infrastructure. The traffic volumes will be reassessed at Phase III for access requirements onto Hwy 858.

5.0 The proposal fits in well with the surrounding land uses of public land to the east and west.

6.0 The additional residences will contribute to the viability of local schools, community halls, hospitals, municipal governments, and businesses in the surrounding area.

Final Report

HISTORICAL RESOURCES IMPACT ASSESSMENT
PROPOSED SUBDIVISION
S1/2 SECTION 28-68-13-W4M, LAKELAND COUNTY, ALBERTA

ARCHAEOLOGY PERMIT 2002-314

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March, 2003

REPORT ABSTRACT

At the request of Mr. Wayne Duplessis of Donatberry Design Ltd., on behalf of KGB & M Holdings, an Historical Resources Impact Assessment (HRIA) was conducted for a proposed subdivision in the south half of Section 28-68-13-W4M, in Lakeland County, Alberta. The fieldwork for this project was undertaken on December 31, 2002 by Walt Kowal, John Albanese, and Ryan Spady of Altamira Consulting Ltd.

In-field investigations consisted of backhoe testing of select parts of the proposed development area. A total of 94 shovel tests were excavated during the survey.

Three new sites (GfOx-47, GfOx-48, and GfOx-49) were found, and one previously recorded site (GfOx-14) was revisited during the survey of the proposed development (Figure 10). Management recommendations are provided in the following.

1) GfOx-49 consists of an isolated find (a quartzite core), which was found on the side bank of a drop-off to Lac La Biche. No additional cultural materials were found to be present in the undisturbed sediments in backhoe tests above the findspot, or in, or on, the side bank. Beyond the presence of the one located artifact, the information potential offered by this site is considered to be minimal. Further assessment work is not recommended for GfOx-49.

2) GfOx-47 consists of a buried lithic scatter (6 quartzite flakes) that was found in two backhoe tests near the edge of a field near the drop-off to Lac La Biche. No cultural materials were found to be present in four additional backhoe tests by the two positive tests. Beyond the presence of the located artifacts, the information potential offered by this site is considered to be minimal. Further assessment work is not recommended for GfOx-47.

3) GfOx-48 consists of a buried lithic scatter (one piece of quartzite shatter, 16 quartzite flakes, and one chert flake) that was found in three backhoe tests

in a low, flat area Lac La Biche. No cultural materials were found to be present in three additional backhoe tests by the three positive tests. Beyond the presence of the located artifacts, the information potential offered by this site is considered to be minimal. Further assessment work is not recommended for this site area.

4) GfOx-14 was described as consisting of a lithic scatter which was found on the shore of Lac La Biche. Backhoe tests on the top of the bank above the site did not produce any cultural materials, which suggests that the site was restricted to the materials collected during the original 1975 assessment. Further assessment work is not recommended for this site area.

The recommendations resulting from this report are that No Further Historical Resources Impact Assessment or Mitigation work is warranted for the proposed subdivision in the south half of Section 28-68-13-W4M, in Lakeland County, Alberta.

The recommendations resulting from this report are that No Further Historical Resources Impact Assessment or Mitigation work is warranted for a proposed subdivision in the south half of Section 28-68-13-W4M, in Lakeland County, Alberta, and the development should proceed as planned. However, should any fossils be discovered during development, staff at the Royal Tyrrell Museum should be contacted immediately.

This recommendation is subject to approval of the Heritage Resource Management Section of the Historic Sites Service, Alberta Community Development.

PROJECT PERSONNEL

Project Manager & Permit Holder
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1.0 INTRODUCTION

1.1 SCOPE AND OBJECTIVES

At the request of Mr. Wayne Duplessis of Donatberry Design Ltd., on behalf of KGB & M Holdings, an Historical Resources Impact Assessment (HRIA) was conducted for a proposed subdivision in the south half of Section 28-68-13-W4M, in Lakeland County, Alberta (Figures 1 and 2).

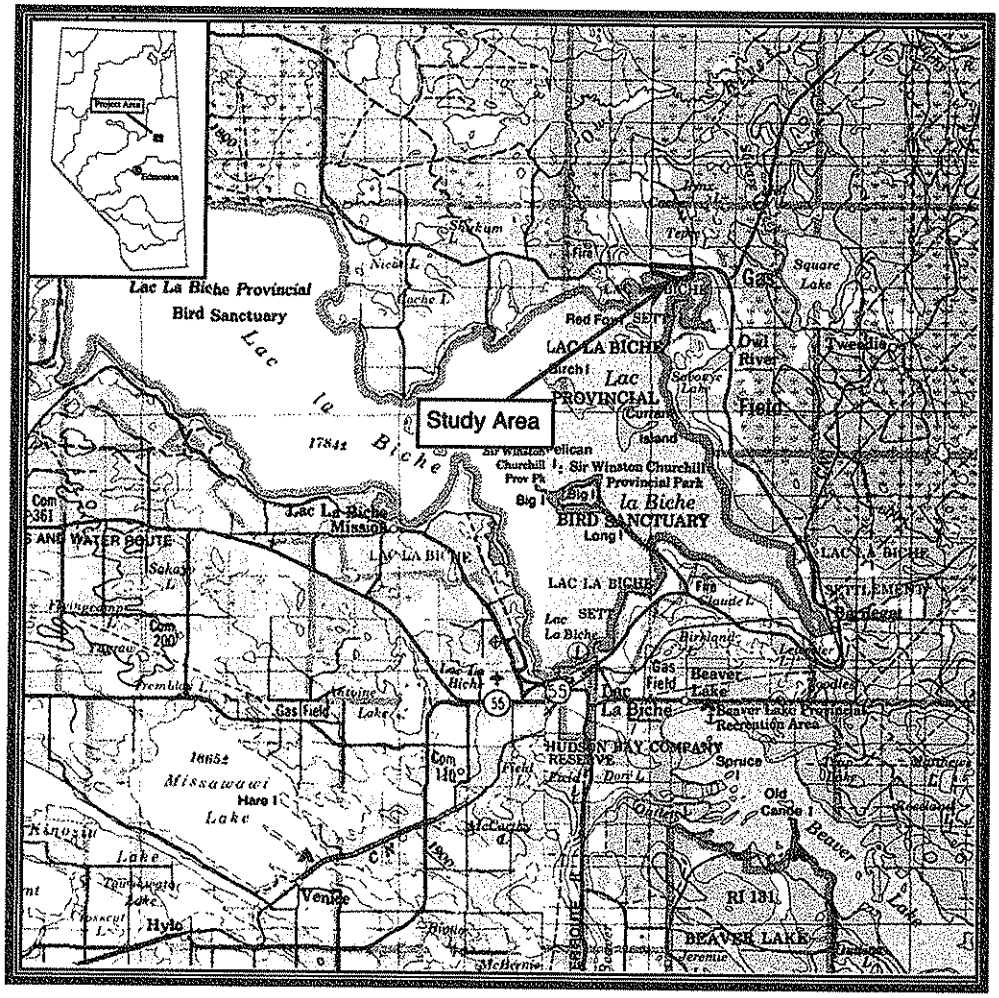


Figure 1. Location of the study area within Alberta (after 1:250,000 NTS Map 73L – Sand River and 83I - Tawatinaw).

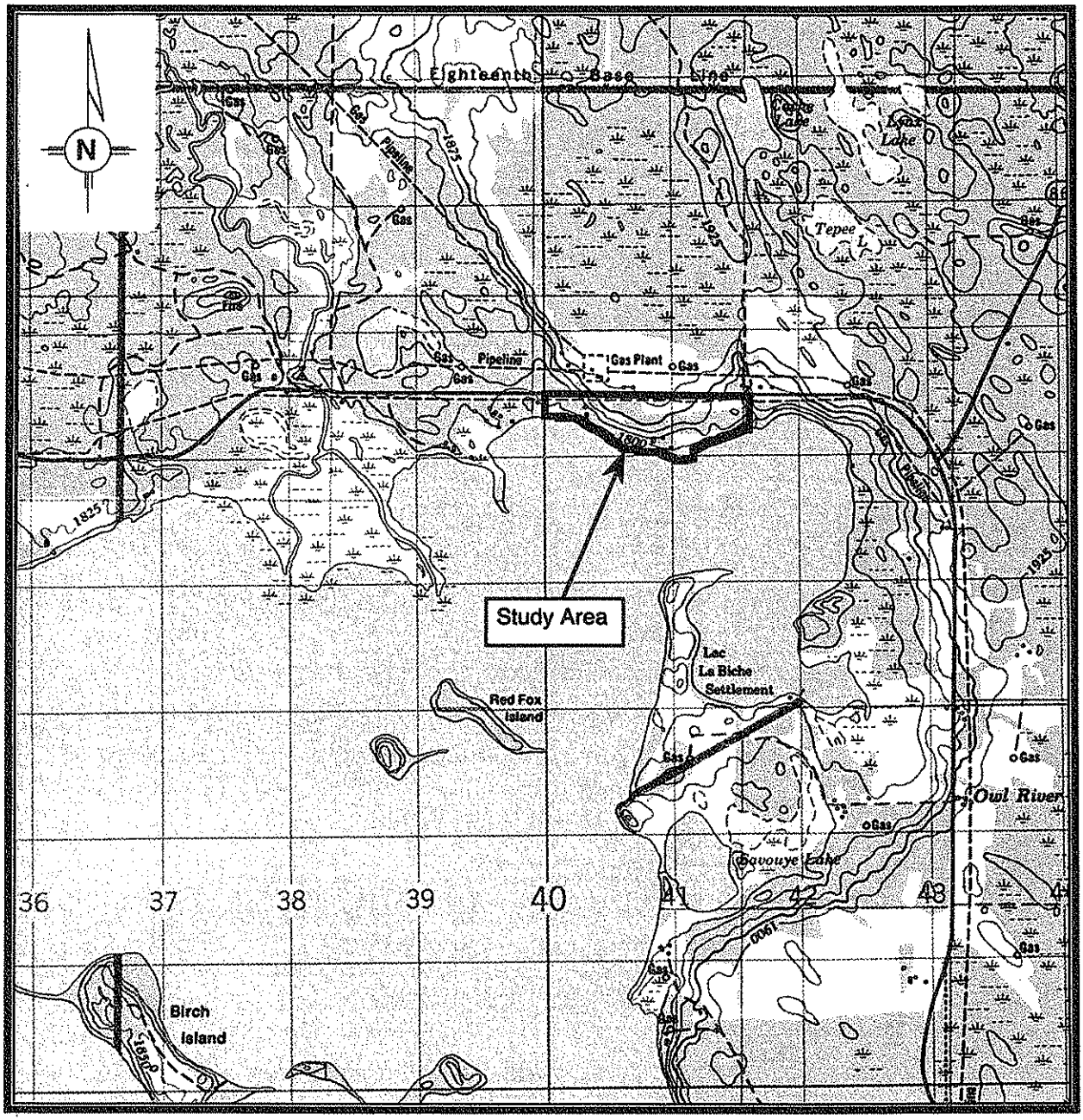


Figure 2. Map showing the location of the subdivision project (after 1:50,000 NTS Map 73 L/13 - Lac La Biche).

The fieldwork for this project was undertaken on December 31, 2002 by Walt Kowal, John Albanese, and Ryan Spady of Altamira Consulting Ltd.

This is the final report of the HRIA carried out for the proposed project in accordance with the HISTORICAL RESOURCES ACT (1987) and its respective regulations; and the Guidelines for Archaeological Permit Holders in Alberta (Archaeological Survey of Alberta 1989). This report provides relevant background material for the project and the HRIA. It describes the methods and results of the study and provides recommendations regarding further Historical Resource concerns in regard to the development proposal.

1.2 PROJECT DESCRIPTION AND CONCERNS

The project consists of approximately 60 hectares of land. The project lands are on the northeast shore of Lac La Biche and one archaeological site GfOx-14 was found on the beach (McCullough 1975). The site area will not be impacted by the proposed subdivision because the beach area is part of an environmental reserve, but disturbance in the study area will result from clearing, grading, trenching, and excavation associated with construction and infrastructure improvements within the development area, and any archaeological sites within the development area could be destroyed.

Historical Resources are recognized in the Province of Alberta as nonrenewable resources, subject to protective measures and defined under the Historical Resources Act (Province of Alberta 1987)[1].

1 The Province of Alberta Historical Resources Act defines "historical resource" as ". . . any work of nature or of man that is primarily of value for its palaeontological, archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest including but not limited to, a palaeontological, archaeological, prehistoric, historic, or natural site, structure or object . . . ".

Historical resource sites are fragile and precious and easily suffer damage or destruction from such activities as road and pipeline construction, route realignments, construction activities, landscaping, soil and gravel removal, recreational activities, and landfill development. Once the context is disturbed or destroyed, the informational and interpretive value of historical resources are seriously affected and in some cases lost forever. The purpose of a Historical Resources Impact Assessment is to locate and evaluate the significance of all historical resource sites within a defined development area and to formulate recommendations regarding the importance of sites discovered and the necessity for mitigative action. Mitigation may involve avoidance or further study.

Management and protection of Historical Resources is the responsibility of *Alberta Community Development*. While all observations, conclusions and recommendations made in this report are the result of research undertaken by the permit holder, this work is subject to the review and acceptance or modification by the *Cultural Facilities and Historical Resources Division, Alberta Community Development*. All recommendations regarding either the need for further work or that no further work is necessary must be ratified, in writing, by *Alberta Community Development* before they can be considered acceptable in terms of the requirements of the development.

2.0 BACKGROUND

2.1 ENVIRONMENTAL SETTING

The physical environment, including geomorphological features, and resource availability, plays a role in the selection of areas that are used by animals and humans. The distribution of the remnants of the cultural and natural past follow relatively specific patterning. As environmental settings changed through time, the cultural, floral and faunal landscape also changed. An understanding of the environmental settings and changes through time allow us to predict in part where archaeological, historic and palaeontological sites are most likely to be found.

Certain landforms and geomorphological features are commonly found in association with prehistoric, historic and palaeontological sites. For example, archaeological sites are frequently found along streams and near lakes. During prehistoric times these locations provided fresh water and transportation, were focal points for wildlife, and were the source of other food resources. The beneficial attributes of these areas would be just as attractive in the past as they are today. In the same manner, flat well-drained terrain, and sunny, warm southern exposures would also be considered important criteria for the location of camping or habitation sites.

Alberta displays a wide variety of geography and one of the ways that such diversity can be described is through the use of a Land Classification system. Such systems are designed to organize and simplify the landscape so that the resulting units of description can be used for planning and management purposes. In Alberta there are two ecologically-based land classification systems that are commonly used by government and private industry: the

Natural Regions and Subregions classification (Achuff 1994) and the Ecoregions of Alberta classification (Strong and Leggat 1981; Strong 1992). There are many similarities between the two systems however, the primary difference lies in the emphasis give to climate in the latter. The Natural Regions classification " . . . emphasizes overall landscape pattern which, in some cases, reflects climate but in others, reflects the predominance of geological or soil factors" Achuff 1994:5). Achuff goes on to note that the differences are largely a reflection of purpose. The former is used primarily in studies of agriculture, forestry and wildlife production whereas the Natural Region system is utilized more in ecosystem and biodiversity modeling. The land classification system used here to describe the physical landscape is entitled '*Natural Regions, Subregions and Natural History Themes of Alberta: a Classification For Protected Areas Management*' prepared for Park Services, Alberta Environmental Protection by Peter Achuff in 1992 and updated and revised in 1994.

> Natural Regions are recognized on the basis of broad differences in landscape patterns, especially the broad vegetational, soil and physiographic features, for example grassland vs. parkland vs. forest, Chernozemic soils vs. Luvisolic soils, or mountains vs. foothills vs. plains. These features also reflect broad patterns of climate and geology. To a lesser extent, wildlife features are used, although wildlife occurrence patterns are usually not as distinctive or useful as soil, physiographic and vegetation patterns (Achuff 1994:5).

In Alberta, six Natural Regions are currently recognized (Achuff 1994): Grassland, Parkland, Foothills, Rocky Mountain, Boreal Forest, and Canadian Shield. The six Natural Regions are divided into 20 Subregions based on recurring landscape patterns relative to other parts of the Natural Region. One of the 20 Subregions is present in the study area. This is the Dry Mixedwood Subregion of the Boreal Forest Natural Region (Figure 3). The following outline of the Dry Mixedwood Subregion is from Achuff (1992).

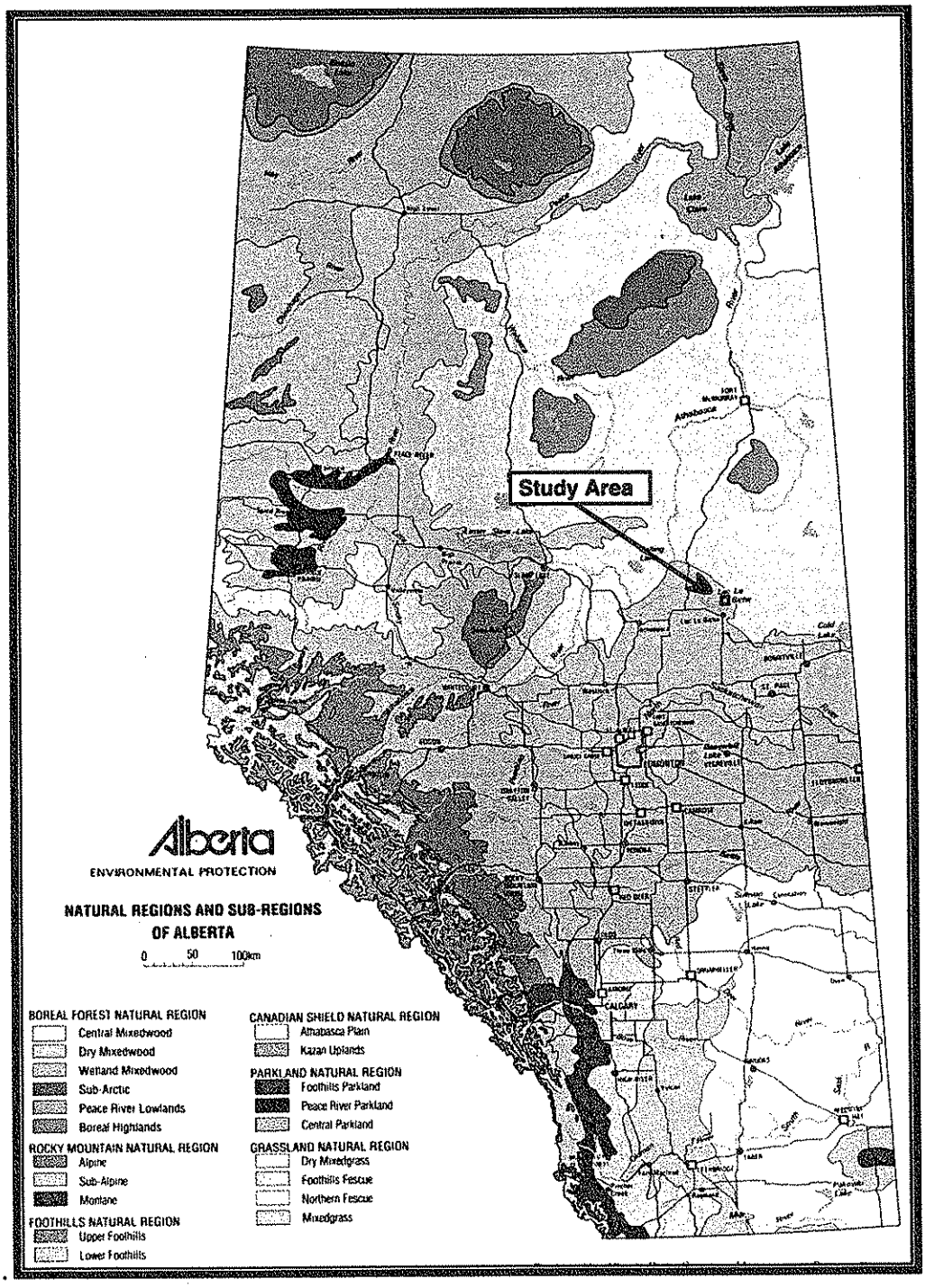


Figure 3. Map showing the location of the study area within the Dry Mixedwood Sub-region of the Boreal Forest Natural Region in the province of Alberta (Achuff 1992:11).

2.1.1 Dry Mixedwood Subregion

2.1.1.1 Geology And Landforms

The Dry Mixedwood Subregion is characterized by low relief and level to undulating terrain. Surficial materials are mostly till as ground moraine and hummocky moraine landforms with some areas of aeolian dunes and sandy outwash plain. The Subregion includes two main areas: the southern edge of the Boreal Forest Natural Region from Cold Lake west to about Barrhead and south along the western edge of the Central Parkland Subregion to about Gull Lake and a broad land from Lesser Slave Lake to Grande Prairie then north along the Peace River to Fort Vermilion. The Cooking Lake moraine east of Edmonton is a disjunct portion of this Subregion.

Drainage is to both the Saskatchewan and Mackenzie river systems via numerous rivers and small streams.

2.1.1.2 Climate

The climate of this Subregion is subhumid, continental with short, cool summers and long, cold winters. The mean May - September temperature is about 13C and the growing period is about 90 days. Annual precipitation averages about 350 mm with June and July the wettest months. Winters are relatively dry with about 60 mm of precipitation. Overall, the climate is somewhat drier and warmer than the Central Mixedwood Subregion with somewhat higher moisture deficits.

2.1.1.3 Soils

Soils are typically Gray Luvisols in well-drained, upland till sites and Eutric Brunisols in coarse-textured sandy uplands. Organics and Gleysolics occur on wet depressional sites.

2.1.1.4 Vegetation

The vegetation of the Dry Mixedwood Subregion is transitional between the Central Parkland and Central Mixedwood Subregions and there are community types common to all three. The differences are largely in the proportion of various vegetation types and other landscape features. Populus tremuloides (aspen) is an important species in all three Subregions, occurring in both pure and mixed stands. Populus balsamifera (balsam poplar) frequently occurs with aspen especially on moister sites in depressions and along streams.

Successionally, Picea glauca (white spruce) and, eventually in some areas, Abies balsamea (balsam fir) can be expected to increase or replace aspen and balsam poplar as stand dominants. However, frequent fire seldom permits this to occur and pure deciduous stands are common in the southern part of the Dry Mixedwood Subregion. Coniferous species are more common further north in the Dry Mixedwood Subregion with mixed stands of aspen and white spruce being widespread. Older stands in protected sites, such as islands, may have significant amounts of balsam fir.

Upland aspen forests contain a diverse understory that may include Viburnum edule (low-bush cranberry), Corylus cornuta (beaked hazel), Rosa acicularis (prickly rose), Cornus stolonifera (red-osier dogwood), Calamagrostis canadensis (marsh reed grass), Aralia nudicaulis (sarsaparilla), Rubus pubescens (dewberry), Lathyrus ochroleucus (cream-coloured peavine), Pyrola asarifolia (pink wintergreen) and Linnaea borealis (twinflower). Both balsam poplar and Betula papyrifera (paper birch) may occur in these forests as well.

Coniferous, spruce or spruce-fir forests are not common but generally have a less diverse understory with greater moss cover especially of the feathermosses (Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis).

Mixedwood forests generally contain a mosaic of deciduous and coniferous patches with species typical of each occurring through the stand.

Dry, sandy upland sites are usually occupied by Pinus banksiana (jack pine) forests. These may be quite open and have a prominent ground cover of lichens. Other understory species may include Arctostaphylos uva-ursi (bearberry), Vaccinium myrtilloides (low bilberry), Vaccinium vitis-idaea (bog cranberry) and Rosa acicularis (prickly rose).

Peatlands are common throughout the Subregion and are extensive in some areas, e.g. south of Athabasca, but are not as prevalent as in other Boreal Forest Subregions. Peatland complexes typically contain both nutrient-poor, acidic bog portions, dominated by Picea mariana (black spruce), Ledum groenlandicum (Labrador tea), and Sphagnum spp. (peatmosses) and more nutrient-rich fens, containing Larix laricina (tamarack), Betula spp. (dwarf birches), Carex spp. (sedges), and brown mosses (Aulacomnium palustre, Tomenthypnum nitens, Drepanocladus spp.). Patterned peatlands occur in several areas.

2.1.1.5 Wildlife

Characteristic species of deciduous forests in the Dry Mixedwood Subregion include least flycatcher, house wren, ovenbird, red-eyed and warbling vireos, Baltimore oriole and rose-breasted grosbeak. Species of mixedwood forests include yellow-bellied sapsucker, Swainson's thrush, solitary vireo, magnolia warbler, white-throated sparrow, pileated woodpecker and northern goshawk.

A few species are restricted to the Cold Lake area and represent an eastern faunal element. These include yellow rail, sedge wren, great-crested flycatcher, chestnut-sided warbler and blackburnian warbler. Typical mammals include beaver, moose, varying hare, black bear, wolf, lynx and ermine.

2.2 CULTURAL SETTING

The earliest evidence for human occupation in Alberta dates to the end of the last glaciation (approximately 12,000 years BP). The Prehistoric Period spans the time from the earliest occupations up to the arrival of the first Europeans. The Prehistoric Period includes the period of time before direct contact occurred between Europeans and native peoples. That is, the time period when European culture modified native culture through trade and the introduction of new ideas, well before the first Europeans even set foot in the region.

Site classification, the general chronology of the prehistoric period, and the distribution of known archaeological sites are described below. This prehistorical overview will be used to establish a chronology and distribution pattern for archaeological sites.

Prehistoric sites in the province of Alberta are divided into various categories that reflect site function.

The categories include:

1) isolated finds (generally a single artifact not found in association with any other archaeological materials or features);
2) scatters (usually small assemblages of lithic material from which it is difficult to draw conclusions about the site's original function);
3) campsites (which contain a variety of materials and possibly features);
4) stone features (without artifacts);
5) workstations (where a specific task such as butchering, plant processing, or stone tool manufacture took place);
6) kill sites;
7) quarries (where lithic material for stone tool manufacture was mined);
8) rock art;
9) human burials; and
10) ceremonial sites.

The importance of defining site type has been previously noted by Ball:

> .....identification and classification of site types are considered to be the key to the definition of prehistoric settlement patterns and are almost totally dependent upon a detailed analysis and classification of the artifacts which comprise the site (Ball 1986: 139).

Ball (1986:151) goes on to note that it is extremely difficult to interpret site types from the small, predominantly lithic artifact assemblages.

A further complication in interpreting the prehistory of northwestern Alberta is that the many of projectile points collected have not yet been typologically classified (Brink and Dawe 1986: 241). The typology of projectile point sequences known for the Northern Plains is generally applied, rightly or wrongly, to the northwestern materials when strong similarities are present. These typological classifications are commonly used by archaeologists to develop chronological understandings and sometimes even movements of ideas, materials, and peoples in prehistoric times. In addition to the small size of many of the archaeological assemblages, artifact collections are often poorly preserved, or are from poorly understood contexts which further limit the information that can be gleaned from these collections. Many of the known projectile points for instance, were discovered by farmers plowing their fields earlier this century (Wormington and Forbis 1965; LeBlanc and Wright 1990).

These difficulties have resulted in vague and often inconclusive interpretations of sites and site types. Research to date has produced some useful information about the distribution of archaeological sites on the landscape, but there remains much to be learned about the prehistory of northwestern Alberta.

2.2.1 Classification of Prehistoric Cultures

In order to provide a chronological framework for the interpretation of the prehistory of a region, prehistoric time is commonly divided into a sequence of

periods. This is referred to as the culture history of an area. In Alberta, culture history is generally divided into four major time periods (Figure 4).

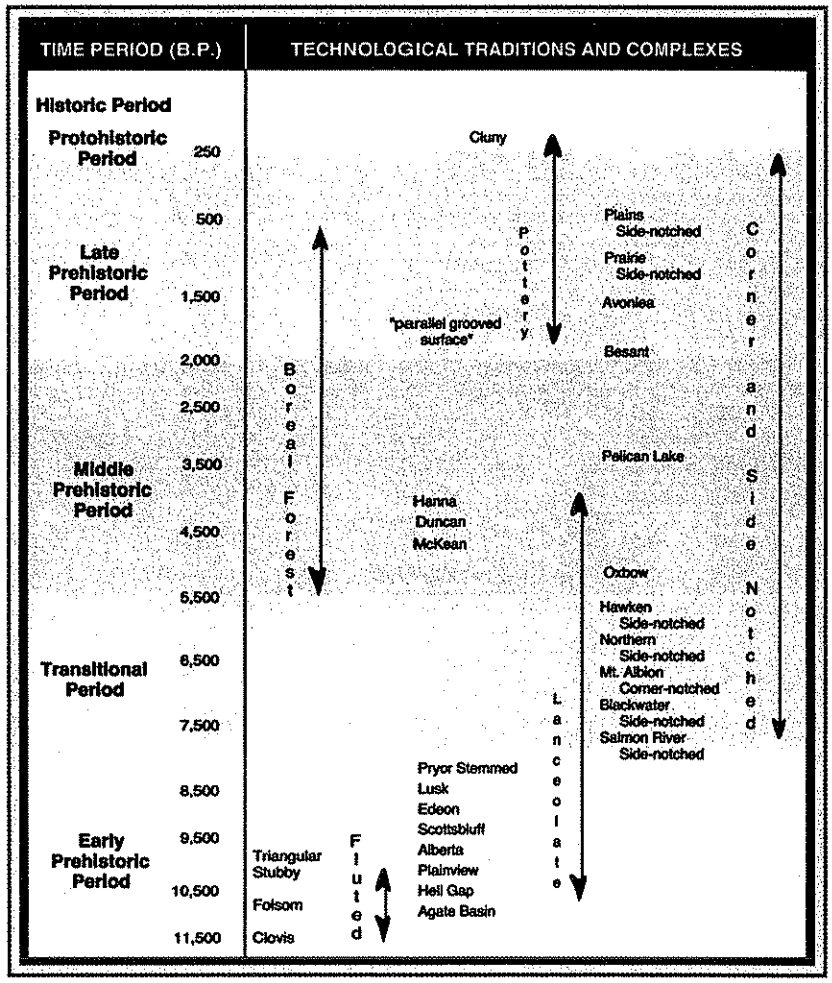


Figure 4. Culture History sequence for Alberta

These are:

1) **The Early Prehistoric Period** spans from the end of the last ice age until approximately 8,000 years BP;
2) **The Transitional Period** begins around 8,000 years BP and ends around 5,500 years BP;
3) **The Middle Prehistoric Period** dates from 5,500 years BP to roughly 2,000 years BP; and
4) **The Late Prehistoric Period** continues from approximately 2,000 years BP to the onset of the historic period which begins in 1753 when the first white man (Anthony Henday) arrived in Alberta.

Each of these periods displays a relatively different archaeological landscape. The periods are, for the most part, defined on the basis of environmental change, resource use, settlement patterns and artifact styles. In general, this sequence may be applied to the province as a whole, since similar artifact styles have been found in almost all areas of Alberta. Regional differences and the clarity of the definitions remains somewhat cloudy largely due to a lack of consistent research in all areas. The theory is that each of these periods can be further divided into ever decreasing subsets of more specific groups or cultural manifestations. These cultural manifestations or theoretical archaeological constructs are known as Traditions and Complexes. Depending upon the evidence at hand these may be further divided into subsets of more specific archaeological culture types, such as "Phases".

2.2.2 Early Prehistoric Period

The Early Prehistoric Period, dating from 11,000 to 8,000 years BP, is the first time period for which there exists material evidence of people living in Alberta. The Early Prehistoric Period is sometimes referred to as the Paleo-Indian Period (Ellis and Deller 1990). It is possible that people may have entered Alberta earlier than 11,000 years ago, and there are researchers who have advanced such speculation, but as of yet no compelling evidence of pre-11,000 year occupation exists (cf. Beaudoin et al. 1996; Forbis 1982; and Vickers 1986).

The Early Prehistoric peoples are known primarily for their use of large spear points and an associated emphasis on big game hunting. In Alberta this coincides with the occurrence of large game such as the bison, camel, elk, horse and woolly mammoth. This period includes several different cultural traditions (based on characteristic projectile point styles including Clovis, Folsom, Agate Basin, Cody, Lusk, Alberta, and Frederick (Figure 5). These point types have

slightly different spatial and temporal distributions over the Northern Plains, but generally evidence exists for these types occurring in all areas of Alberta.

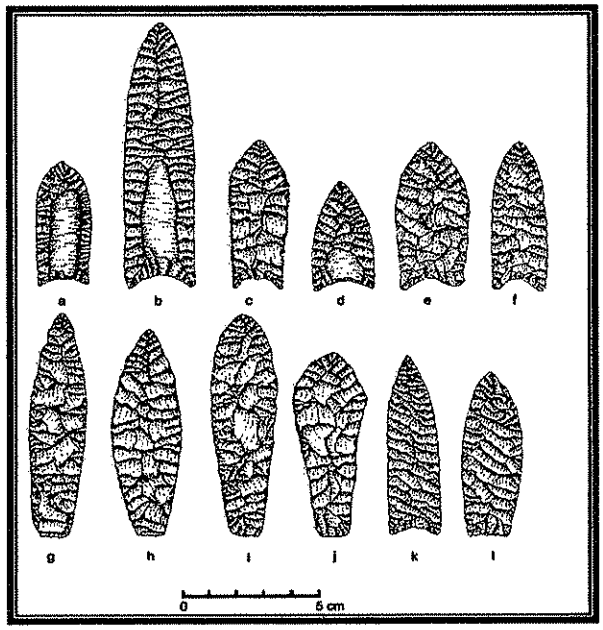


Figure 5. Examples of Early Prehistoric Period Plains projectile point styles: a & b - Clovis; c - Midland; d - "Stubby" or Basally-thinned Triangular; e – Plainview; f – Milnesand; g, h & i – Agate Basin; j – Hell Gap; k – Frederick; and l – Lusk.

2.2.3 The Transitional Period

By 8,000 years BP there is a change in the archaeological record, and side-notched and corner-notched points begin to appear, and become prominent in the archaeological record. These new point styles mark the beginning of a new technological tradition that we refer to here as the Transitional Period (Boag 1989). The Transitional Period extends from approximately 8,000 years BP to 5,500 years BP. It is in this period that we begin to see an increase in the number of archaeological sites. It correlates to changes in vegetation, fauna, and the disappearance of all remnants of glacial ice.

The inference is that for much of Alberta there occurred a change in subsistence and settlement patterns and an increase in population. There was also a change

toward a more regionalized - settled - lifestyle after 8,000 BP. It may be that sites of this period are simply more visible. Bison and other large mammals continue to be an important resource, but the archaeological evidence shows that other animals became increasingly important.

The major projectile point styles of the Transitional Period are known as Salmon River Side-notched (also called Gowen), Mt. Albion Corner-notched, Hawken Side-notched, Blackwater Side-notched, and Northern Side-notched (Figure 6).

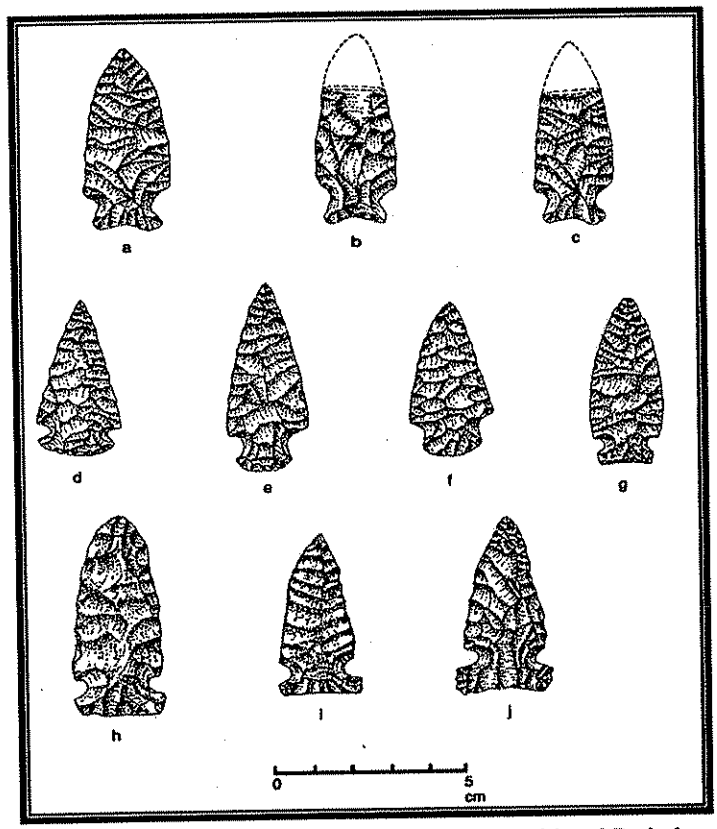


Figure 6. Examples of Plains projectile point styles from the Transitional Period: a, b & c –Salmon River Side-notch; d – Blackwater Side-notch; e & f – Mt. Albion Corner-notch; g – Hawkin Side-notch; h, I & j – Northern Side-notch also known as Bitterroot.

The size of these points indicates that they were probably used for spears and darts. Salmon River points have been recovered from the Hawkwood Site (Van

Dyke and Stewart 1985) in southern Alberta, and dated at 8,200 years BP. Similar points recovered from the Gowen site (Walker 1980 and 1987) in Saskatchewan were dated from 6,000 to 5,100 years BP.

2.2.4 The Middle Prehistoric Period

The Middle Prehistoric Period in Alberta (ca. 5,500 - 2,000 years BP) is characterized by a shift to smaller sized notched projectile points and continues the shift in emphasis from big game hunting to a wider exploitation of the available resources including a wide variety of plants and smaller game animals. This period includes several different cultural types characterized by different projectile point styles (e.g., Oxbow, McKean, Duncan, and Hanna styles) (Figure 7). The spear thrower (atlatl), bison traps, and conical tipis are features associated with this occupation period.

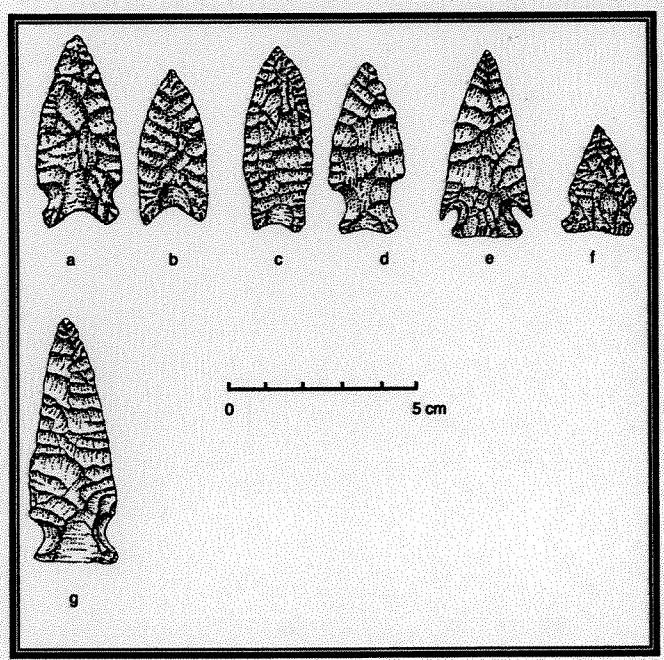


Figure 7. Examples of Middle Prehistoric Period Plains projectile point styles: a & b - Oxbow; c – Duncan; d – Hanna; e –Pelican Lake; f – Sandy Creek; g - Besant.

Like other point types in the Northwestern Plains typology, Oxbow points are

also common to parts of northern Alberta. Like other styles, they too appear to date later in northern Alberta than they do in sites found farther to the south (Spurling and Ball 1981). Generally, Oxbow points seem to appear in the north after 4,000 years BP.

For the Middle Prehistoric Period, as for the Early Prehistoric Period, there is evidence of intensive lakeshore occupation. However, it should be noted that it is likely the repeated, long-term use of these lacustrine locations, that make them so prevalent in the archaeological record. While it seems likely that sites were occupied in other geographical situations, they were probably occupied for shorter periods of time, and were not revisited on a yearly basis. Such sites would not be as easy to find as sites that were occupied over a greater time span. And these sites could be expected to be smaller, have lower numbers and types of artifacts, be less well-preserved, and not have dateable materials. Therefore, the lakeshore adaptation, as well as the glacial lake occupations, must be seen as only one element of a more complex settlement pattern.

2.2.5 The Late Prehistoric Period

The Late Prehistoric Period in Alberta dates from approximately 2,000 to 250 years BP, and is characterized by the appearance of a variety of smaller projectile point styles. This change in projectile point size is believed to represent a shift in weaponry from the atlatl to the bow and arrow. The occurrence of ceramics in Late Prehistoric sites is another trait distinguishing this period from those of earlier periods. The grooved maul may be another diagnostic artifact of the Late Prehistoric Period, and grooved mauls are fairly common in the private collections found throughout the agricultural communities in Alberta. A grooved maul has never been found in an excavated context in Alberta.

Like the previous stages, cultural complexes of the Late Prehistoric Period are, for the most part, discriminated largely on the basis of projectile point styles. Some of the salient point types of the Late Period include Avonlea (Kehoe 1966 and 1973; and Kehoe and McCorquodale 1961) as well as a variety of other small points which are termed variously as Plains Side-notched, Prairie Side-notched, Late Prehistoric Side-notched, and Corner-notched (Figure 8).

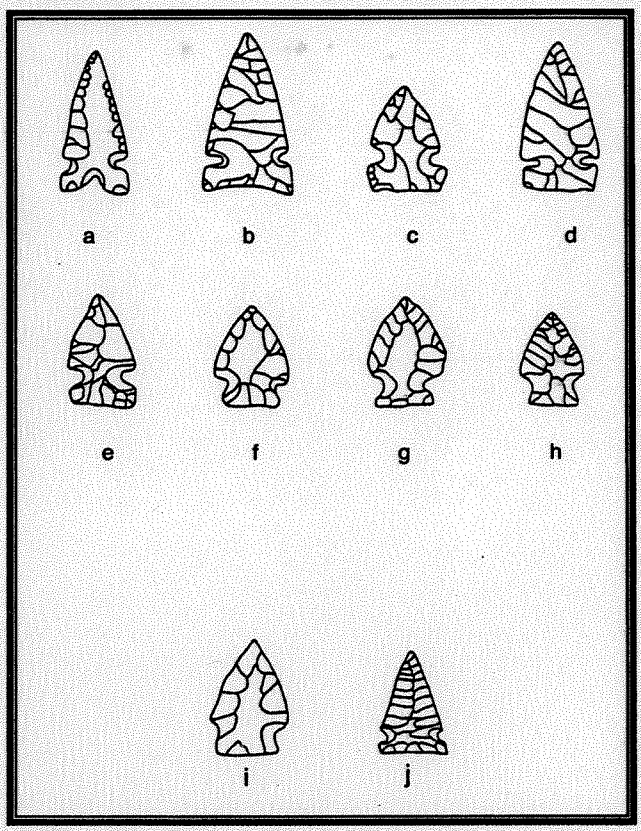


Figure 8. Examples of Late Prehistoric Period Plains projectile point styles from Vickers 1986: a, b, c & d are Plains Side-notch (Trinotch, Washita, Pekisko and Paskapoo respectively); e, f, g & h are Priarie Side-notch types (Nanton, Lewis, Irvine and High River styles); i – Samantha (Besant); and j – Timber Ridge (Avonlea).

Like the other major time periods, the Late Prehistoric Period is poorly understood in northern Alberta. It is perhaps complicated by the apparent existence of artifact styles that are different from those which occur in neighboring regions. However, this latter manifestation is likely the result of

data gaps and the establishment of a different subsistence and settlement pattern than is present in neighboring areas. Moreover, the information discontinuities are largely due to a lack of well organized, problem-oriented research in the region. In general, it can be said that there has been less archaeology carried out in the north than in other regions of the province.

2.3 PREVIOUSLY RECORDED RESOURCES

2.3.1 Archaeological Sites

Archaeological sites in the Province of Alberta are recorded in the Archaeological Site Inventory Data files of the *Cultural Facilities and Historical Resources Division.* Site location information is maintained using a geographical system known as the Borden System[2]. All previously identified archaeological sites are geographically recorded using a numbered alphabetical system called the Borden System. Each site found within an area keyed to longitude and latitudinal zones is given an identification number, called a Borden number. All sites of historic significance are also inventoried by the Historic Sites Section of the Historic Resources Division.

The project lands are located within Borden Block GfOx. A total of 46 Historical Resources sites have been recorded previously in Borden Block GfOx (Table 1 and Figure 9).

[2]The Borden System relies on existing zones of longitude and latitude. Each longitude and latitudinal zone is divided into smaller areas each of which is identified by a number, called a Borden Block (e.g. GbQh). The capital letters refer to units which are two degrees of latitude by four degrees of longitude in size. These units are further divided into units which are ten minutes on a site, identified by the lower case letters. Sites found within these Block areas are given sequential numbers, such as GbQh-1, GbQh-2 and so on.

Table 1. Previously recorded Historical Resources Sites in Borden Block GfOx.

Site No.	Site Type	Artifact Assemblage	Environmental Setting
GfOx-1	Historic	1940's cabin	
GfOx-2	Surface Scatter	On beach at Lac La Biche	Flakes and cores
GfOx-3	Surface Scatter	On beach at Lac La Biche	Flakes
GfOx-4	Surface Scatter	On beach at Lac La Biche	35 Flakes
GfOx-5	Surface Scatter	Natural clearing by lake	5 Flakes
GfOx-6	Surface Scatter	High bluff by Lac La Biche	4 Flakes
GfOx-7	Surface Scatter	Near shore of Lac La Biche	14 Flakes, 5 cores
GfOx-8	Surface Scatter	Garden near Lac La Biche	2 Flakes, 1 spall, 1 core
GfOx-9	Historic	1 Cabin	
GfOx-10	Surface Scatter	Spit in Lac La Biche	3 Flakes
GfOx-11	Historic	Cabin	
GfOx-12	Historic	Cabin	
GfOx-13	Campsite	Cultivated field by Lac La Biche	7 Flakes, FBR
GfOx-14	Surface Scatter	Beach on Lac La Biche	11 Flakes, 2 cores, 1 biface
GfOx-15	Historic	3 Cabins	
GfOx-16	Surface Scatter	Bluff overlooking Lac La Biche	22 Flakes, 1 biface
GfOx-17	Historic	Cabin	
GfOx-18	Surface Scatter	Knoll overlooking Owl River	7 Flakes, 1 biface
GfOx-19	Surface Scatter	Beach on Lac La Biche	2 Flakes
GfOx-20	Surface Scatter	Beach on Lac La Biche	8 Flakes, 1 biface
GfOx-21	Surface Scatter	Beach on Lac La Biche	5 Flakes, 1 biface
GfOx-22	Surface Scatter	High bluff overlooking Lac La Biche	10 Flakes, 1 biface
GfOx-23	Campsite	Cultivated field by Lac La Biche	Pelican Lake, McKean, Duncan projectile points, flakes, tools
GfOx-24	Surface Scatter	Cultivated field by Lac La Biche	4 Flakes
GfOx-25	Historic	Cabin	
GfOx-26	Historic	Cabin	
GfOx-27	Historic	Cabin	
GfOx-28	Historic	Cabin	
GfOx-29	Historic	Cabin	
GfOx-30	Surface Scatter	High bluff by Lac La Biche	8 Flakes, 1 projectile point, shatter
GfOx-31	Surface Scatter	Terrace by Lac La Biche	22 Flakes, 1 biface, shatter
GfOx-32	Historic	2 Cabins	
GfOx-33	Surface Scatter	High bluff overlooking Lac La Biche	12 Flakes, 1 core, shatter
GfOx-34	Surface Scatter	Beach on island in Lac La Biche	1 Core
GfOx-35	Surface Scatter	Beach on island in Lac La Biche	1 Core, 2 flakes, shatter
GfOx-36	Surface Scatter	Beach on island in Lac La Biche	2 Flakes, 1 biface, 1 core, shatter
GfOx-37	Surface Scatter	Beach on island in Lac La Biche	1 Flake
GfOx-38	Surface Scatter	Bluff on island in Lac La Biche	3 Flakes, 1 biface,

Site No.	Site Type	Artifact Assemblage	Environmental Setting
			shatter
GfOx-39	Surface Scatter	Bluff on island in Lac La Biche	1 Flake
GfOx-40	Historic	3 Graves	
GfOx-41	Surface Scatter	High bluff overlooking Lac La Biche	6 Flakes, 1 biface, 1 core
GfOx-42	Surface Scatter	Beach on Lac La Biche	2 Flakes, 4 bifaces, 2 unifaces, shatter
GfOx-43	Surface Scatter	Beach on Lac La Biche	Flakes
GfOx-44	Campsite	Island beach ridge	Flakes, core, FBR
GfOx-45	Campsite	Roadcut through dune	2 Flakes, bone
GfOx-46	Historic, Surface Scatter	Knoll near beach of Lac La Biche	Modern garbage, flakes

Of the 46 known historical resources sites in this Borden Block GfOx-14 lies within the development area and GfOx-15 lies within 500 meters of the development. It should be noted that almost all of the sites in Borden Block GfOx have been located near lake margins (see Figure 9). GfOx-14 was recorded by McCullough in 1975 and consisted of eleven flakes, one piece of shatter, two cores, one biface, and some fire-broken-rock (FBR). The site was found on the beach and it was suspected that the site was eroding from the bank. The site extended approximately 20 meters along the beach and approximately 5 meters into the water. McCullough recommended that the area above the water's edge should be tested in order to determine if the site was in fact eroding from the bank. GfOx-15 was recorded by B. Dau and consisted of three occupied log cabins for which no further work was recommended (Dau 1975).

Previous archaeological investigation in the general study area has not been comprehensive, and the scarcity of located sites near the project lands could be attributed to this fact.

Since few archaeological surveys have been conducted in the general area site density is largely unknown, but similar geographic and topographic situations in Alberta have yielded archaeological sites, so archaeological potential for this area can be considered to be moderate.

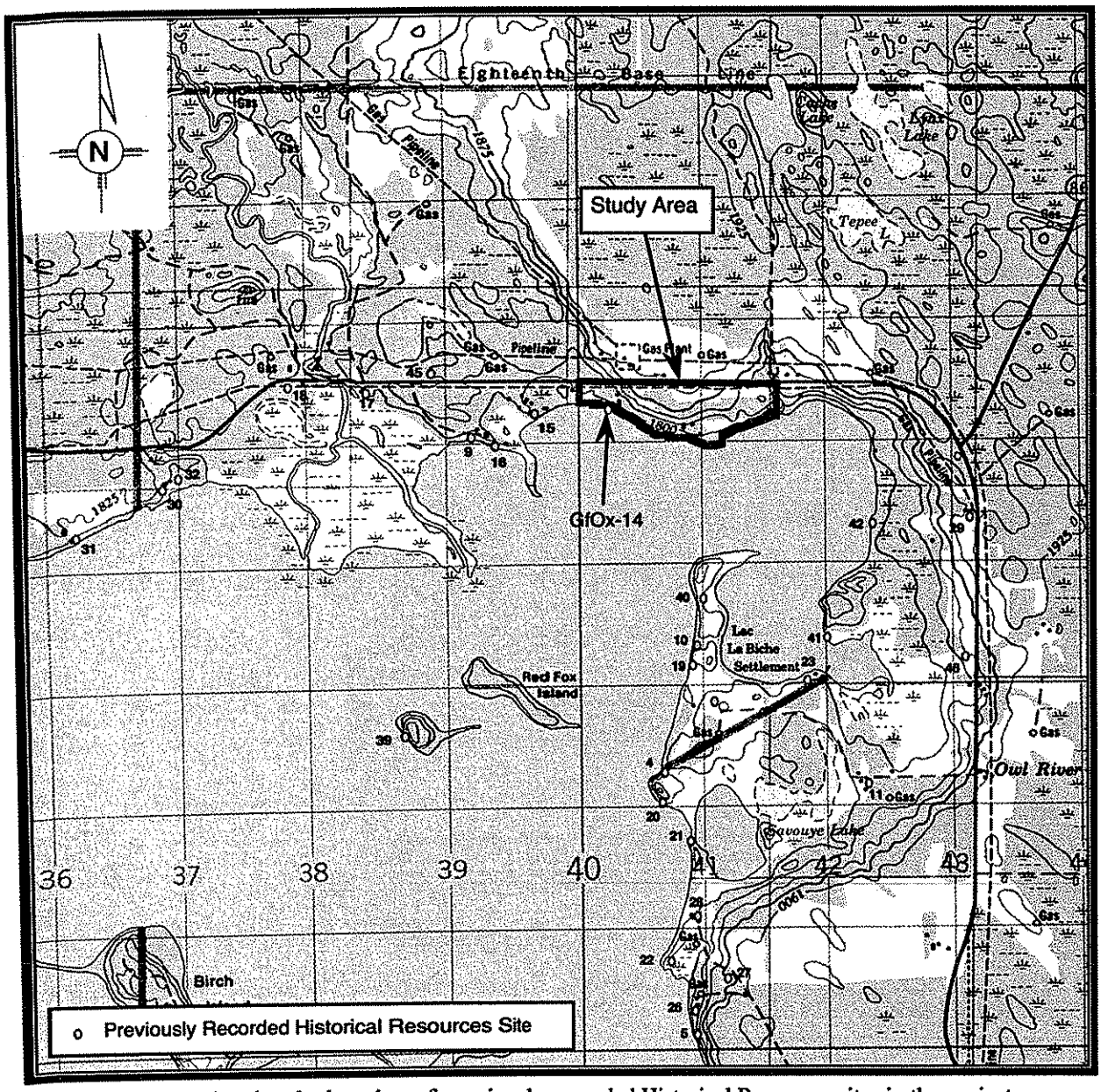


Figure 9. Map showing the location of previously recorded Historical Resources sites in the project vicinity (after 1:50,000 NTS Map 73 L/13 - Lac La Biche).

2.3.2 Palaeontological Sites

The Project area is categorized on the Palaeontological Resources Sensitivity Map as having Unknown potential (Tyrrell Museum of Palaeontology 1984).

3.0 METHODOLOGY

3.1 HISTORICAL RESOURCES POTENTIAL

Searches of the Palaeontological Resources Sensitivity Zones map (Tyrrell Museum of Palaeontology 1984), the Archaeological Site Inventory Data files, and the Historic Sites Service files maintained by the *Cultural Facilities and Historical Resources Division, Alberta Community Development,* were undertaken to determine the potential for historical resources in the Project area.

3.2 SURVEY METHODS

Field survey of the area associated with the proposed project was carried out on December 31, 2002. In-field investigations consisted of monitoring backhoe excavations throughout the development lands.

Areas for backhoe testing were selected judgmentally and systematically. Subsurface examinations consisted of backhoe tests ranging in size from 1 to 3.75 meters long and from 30 to 90 centimeters wide excavated to a depth of between 30 - 100 cm below surface. A sample of the matrix from each of the backhoe tests was screened through 6 mm wire mesh.

4.0 RESULTS

4.1 SURVEY OBSERVATIONS AND RESULTS

The KGB & M Holdings subdivision is located between the Lac La Biche shoreline and Highway 858. The subdivision lands drop from Highway 858 approximately 30 meters down to the lake level. The lands closest to the lake are generally flat to mildly undulating, while the land farther from the shoreline is generally sloped and hilly. All flat areas within the development were considered to have archaeological potential. A total of 94 backhoe tests were excavated during the survey (Figure 10).

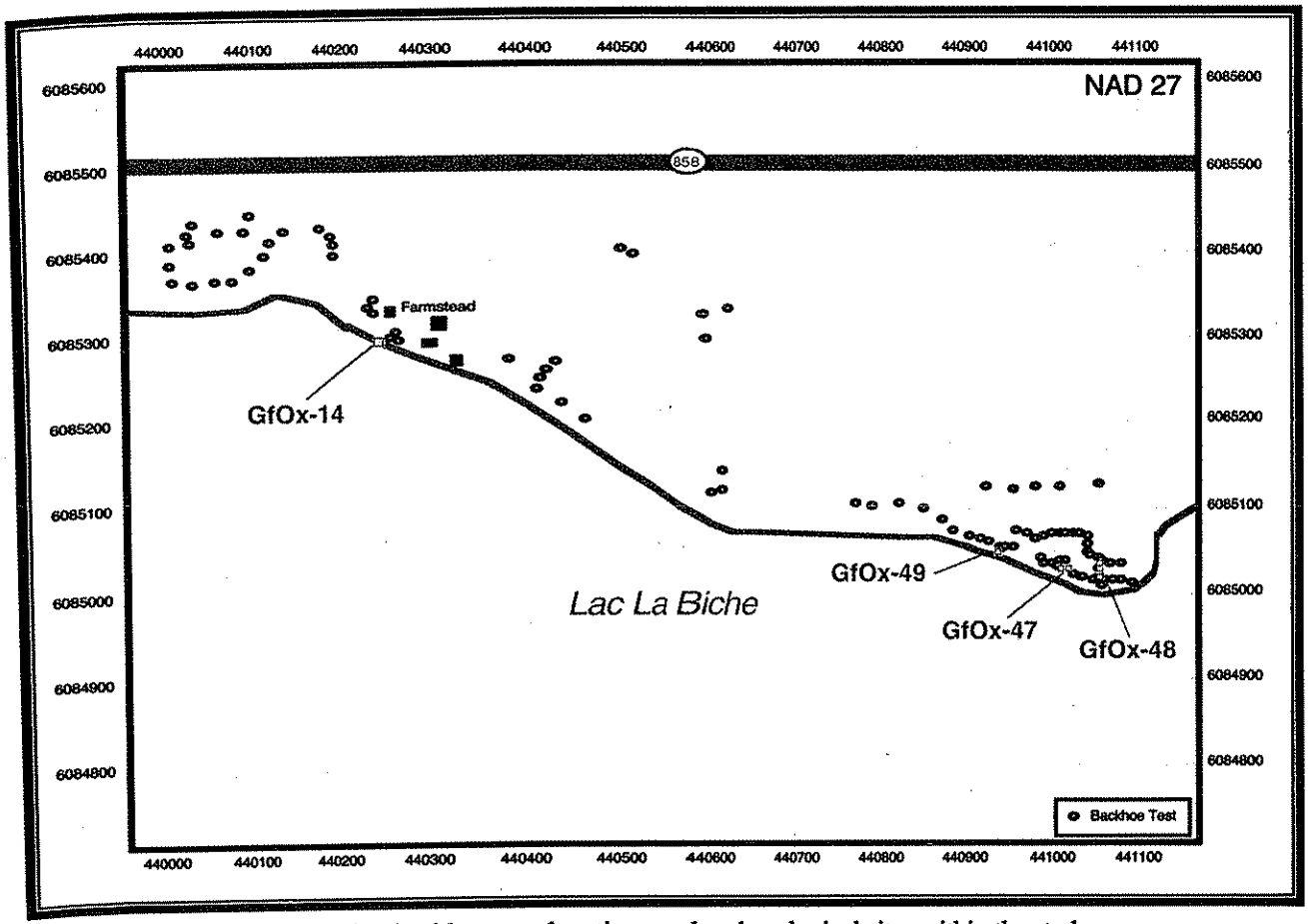


Figure 10. Map showing backhoe test locations and archaeological sites within the study area.

Snow cover precluded visual assessment of the ground surface, and a thin frozen ground surface layer prevented shovel testing in the area, so the assessment of the subdivision lands was based solely on backhoe testing.

Three new archeological sites (GfOx-47, GfOx-48, and GfOx-49; see Figure 10; and Site Forms in Appendix I) were found, and one previously recorded site (GfOx-14) was revisited (see (Figure 10; and Site Form Update in Appendix I) during the survey of the proposed development.

Backhoe testing began in the southeast part of the subdivision near the edge of the lake. This area is approximately 2 meters above the lake level and is flat to mildly undulating. The first backhoe test was approximately 3.75 meters long and approximately 1 meter deep and was excavated approximately 5 meters from the drop-off to the lake (Photographs 1 and 2).

The test revealed a dark brown humic layer approximately 10 centimeters thick overlying silty sand to approximately 95 centimeters, which is underlain by hard clay.

Photograph 1. View to the north showing the first backhoe test in the large field in the eastern part of the development.

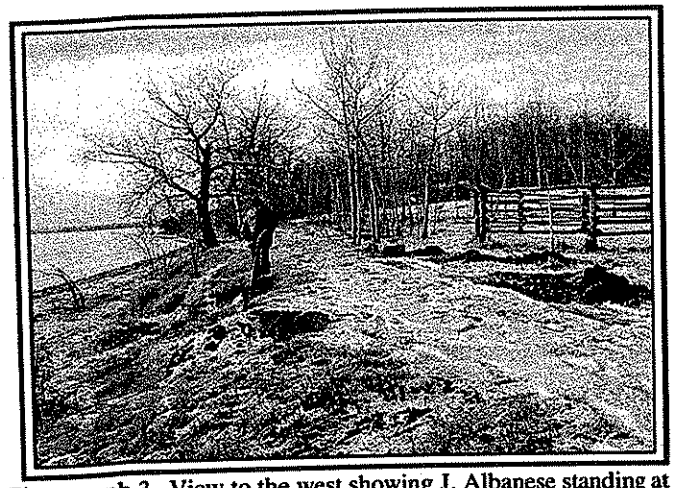
Photograph 2. View to the east showing the length of the first backhoe test.

GfOx-49

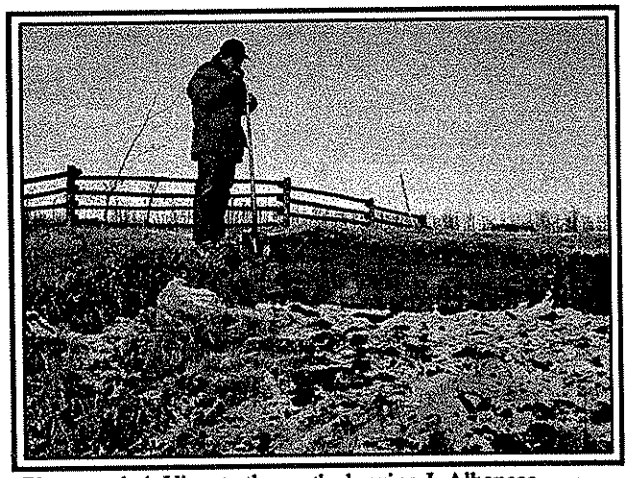
One quartzite core (GfOx-49) was found on the side of the bank at the drop-off to the lake, south of the first backhoe test (Figure 10 and Photographs 3 and 4; and Site Form in Appendix I). No other cultural materials were found in, or on, the bank or in any of the backhoe tests in this area. The found artifact could not be ascribed to any particular cultural group, or specific chronological period.

GfOx-49 did not yield any diagnostic archaeological materials. GfOx-49 is not considered to be significant since the artifact found there offers little information beyond the presence of the artifact itself.

No further archaeological investigation or assessment is warranted for GfOx-49.



Photograph 3. View to the west showing J. Albanese standing at the location of GfOx-49.



Photograph 4. View to the north showing J. Albanese standing at the location of GfOx-49.

A row of backhoe tests were excavated eastward from this first test and GfOx-49 (Photographs 5, 6, 7, 8, and 9). The tests were generally 25 meters apart, with all of the tests positioned approximately 5 to 7 meters from the drop-off to the lake. The tests in this row varied in length from 1.25 meters to 3 meters, and were excavated to a depth of between 0.5 meters and 1 meter. The tests revealed a dark brown humic layer approximately 10 centimeters thick overlying silty sand to approximately 95 centimeters, which is underlain by hard clay.

GfOx-47

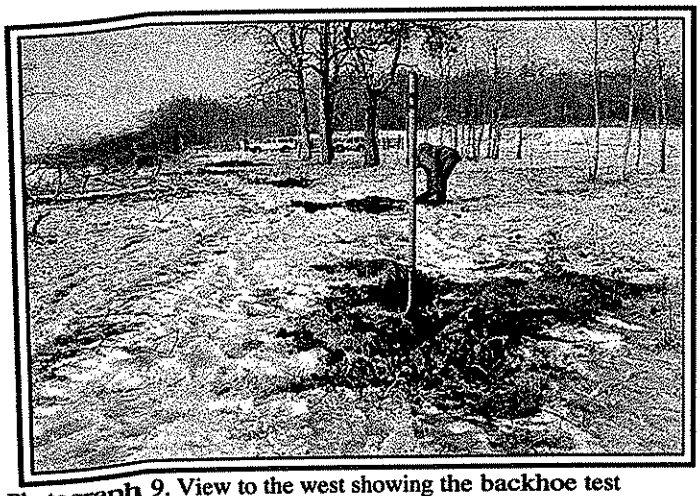
Lithic materials were found in two backhoe tests approximately 100 meters east of the first backhoe test (GfOx-47 on Figure 10 and Photograph 10; and Site Form in Appendix I). The lithic material consisted of 6 quartzite flakes, with 3 flakes being found in each of these two backhoe tests. No diagnostic artifacts were found. All of the matrix excavated from these tests was screened. Four additional backhoe tests were excavated by these two positive findspots, but no additional lithic materials were found. The tests at this site revealed a stratigraphy similar to that seen in the first backhoe test.

Photograph 5. View to the south showing one of the wider backhoe tests excavated.

Photograph 6. View of the wall profile of the backhoe test shown in Photograph 3.

Photograph 7. Photograph showing the size of the majority of the backhoe tests.

Photograph 8. View to the north showing John Albanese screening matrix from one of the tests.



Photograph 9. View to the west showing the backhoe test spacing proceeding east from the vehicles in the background.

Photograph 10. View to the west showing the location of GfOx-47.

The found artifacts could not be ascribed to any particular cultural group, or specific chronological period. GfOx-47 did not yield any diagnostic archaeological materials. GfOx-47 is not considered to be significant since the artifacts found there offers little information beyond the presence of the artifacts themselves. No further archaeological investigation or assessment is warranted for GfOx-47.

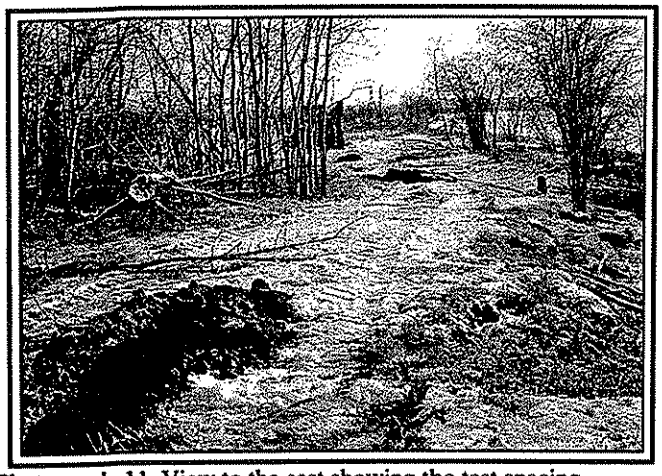
GfOx-48

Approximately 50 meters east of GfOx-47 is an area which is only slightly higher than the lake level, and this area may be seasonally or occasionally inundated by the lake (Photographs 11 and 12). Three backhoe tests in this area produced lithic material (GfOx-48 on Figure 10 and Photographs 13 and 14; and Site Form in Appendix I).

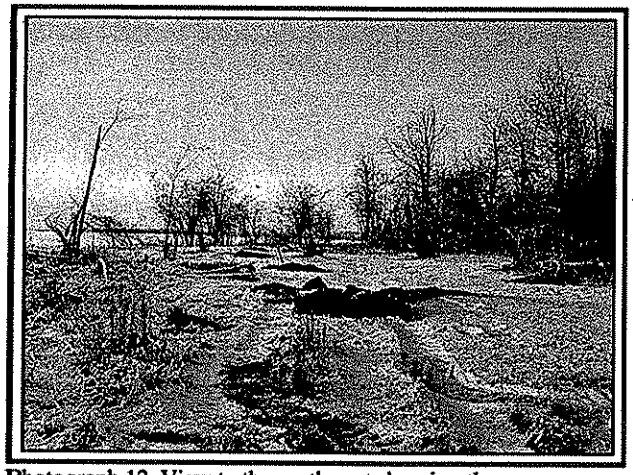
The lithic material consisted of one piece of quartzite shatter, 16 quartzite flakes, and one chert flake. Three additional backhoe tests were excavated by these two positive findspots, but no additional lithic materials were found. No diagnostic artifacts were found. The stratigraphy in this area consisted of a thin

(2-5 centimeter) brown topsoil overlying silty clay. The found artifacts could not be ascribed to any particular cultural group, or specific chronological period. GfOx-48 did not yield any diagnostic archaeological materials. GfOx-48 is not considered to be significant since the artifacts found there offers little information beyond the presence of the artifacts themselves.

No further archaeological investigation or assessment is warranted for GfOx-48.



Photograph 11. View to the east showing the test spacing eastward from GfOx-47.

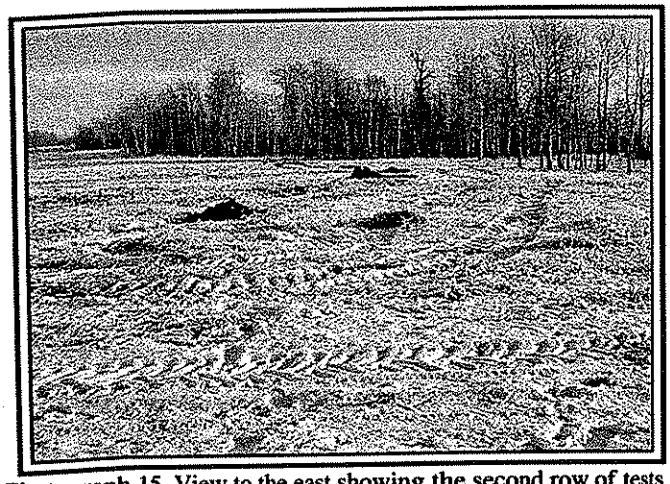


Photograph 12. View to the southwest showing the easternmost backhoe tests

Photograph 13. View to the west showing the location of GfOx-48 by the person in the background.

Photograph 14. View to the northwest showing the location of GfOx-48.

From GfOx-48 another row of backhoe tests was excavated toward the west through a lightly treed area (Photographs 14 and 15). This row of tests averaged approximately 50 to 75 meters from the edge of the lake. None of these tests produced any cultural material. Another row of backhoe tests was excavated east-west roughly parallel (north of) to the first rows of tests through the middle of the field in this part of the development (Photograph 16).



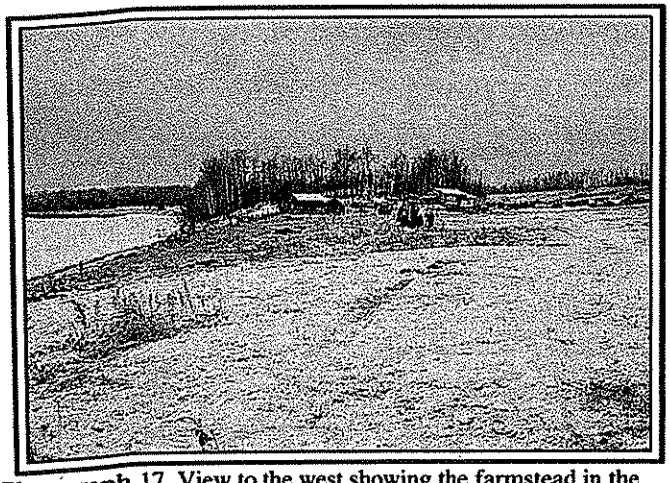
Photograph 15. View to the east showing the second row of tests in the southeast part of the development.

Photograph 16. View to the west showing second row of backhoe tests north of GfOx-49.

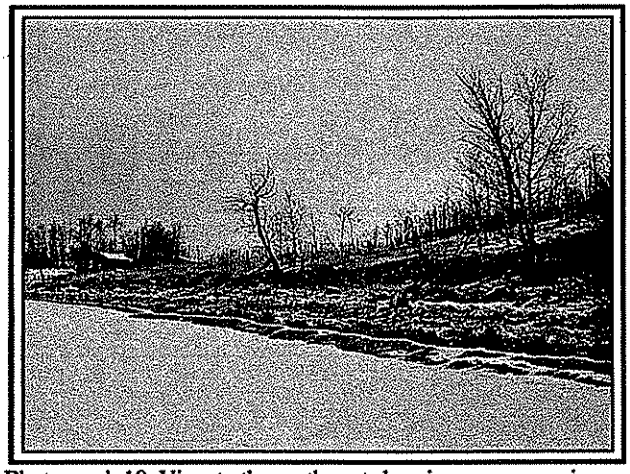
This row of tests was approximately 75 to 125 meters from the lakeshore. No cultural materials were found in these tests. From the location of GfOx-49 (by the very first backhoe test) another row of tests was excavated near the edge of the drop-off to the lake. No cultural materials were found in any of these tests.

A farmstead is located in the western half of the development, and backhoe tests were excavated on all the flat areas considered to have archaeological potential (Photograph 17). By the lakeshore southeast of the farm buildings there is a well-developed erosional bank with great exposures (Photographs 18 and 19). No cultural materials were found in any of the backhoe tests around the farmstead or in the side bank by the lake.

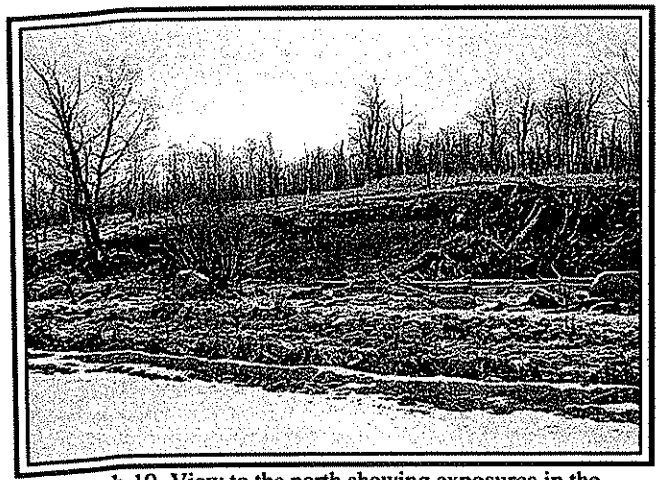
Near the western end of the development a dry creek channel was found which runs roughly northeast-southwest toward the lake (Photograph 20). Backhoe tests were excavated on both the east and west sides of this creek channel (Photographs 21 and 22). The sediments in this part of the development were consistent with those observed in the eastern end of the development. No cultural materials were found in the backhoe tests around the dry creek channel.



Photograph 17. View to the west showing the farmstead in the south central part of the development.

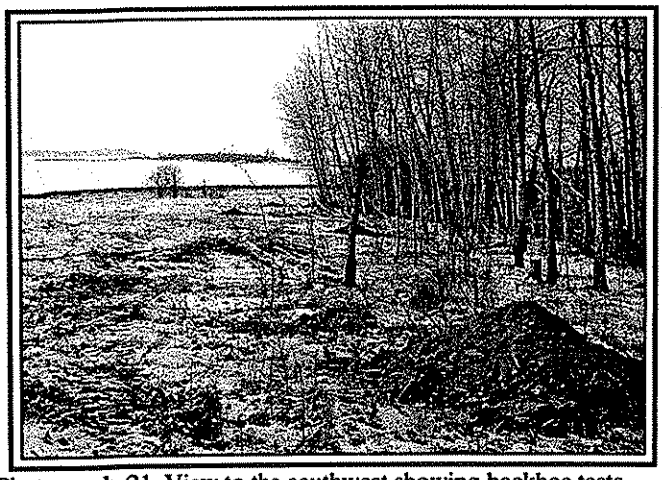


Photograph 18. View to the northwest showing exposures in the side bank east of the farmstead.

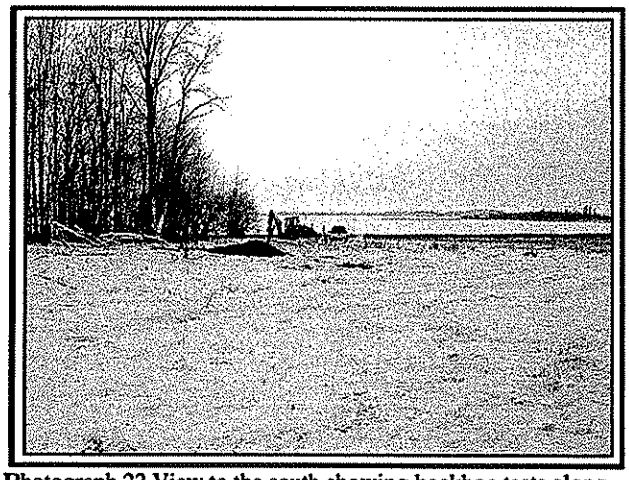


Photograph 19. View to the north showing exposures in the side bank east of the farmstead.

Photograph 20. View to the north showing an old creek channel near the west end of the development.



Photograph 21. View to the southwest showing backhoe tests along the creek channel shown in Photo 20.



Photograph 22 View to the south showing backhoe tests along the creek channel shown in Photo 20.

GfOx-14

Near the southwest corner of the development an attempt was made to relocate previously recorded site GfOx-14. This site was recorded by McCullough in 1975. McCullough reported that the site was located on the beach in front of a small clearing (Figure 10 and Photograph 23; and Site Form Update in Appendix I) and that it extended into the lake approximately 5 feet. He reported finding Fire-Broken-Rock, 11 flakes, 1 piece of shatter, 2 cores, and 1 biface over a distance of 20 meters along the beach. He concluded that the area above the water's edge should be tested in order to determine whether the site was eroding from the side bank.

During the current assessment the lake edge was frozen and snow-covered, and no beach exposures were present, so no survey was conducted of the beach. Three backhoe tests were excavated on the top of the bank immediately by the site (Photograph 24). All the sediment from these three backhoe tests was screened. No cultural materials were found in these backhoe tests, and there was no evidence that the site was eroding from the bank.

Photograph 23. View to the east showing the location of GfOx-14 on the beach to the right of the trees.

Photograph 24. View to the south showing backhoe testing on the terrace above the location of GfOx-14.

5.0 RECOMMENDATIONS

Three new sites (GfOx-47, GfOx-48, and GfOx-49) were found, and one previously recorded site (GfOx-14) was revisited during the survey of the proposed development (Figure 10). Management recommendations are provided in the following.

GfOx-49

GfOx-49 consists of an isolated find (a quartzite core), which was found on the side bank of a drop-off to Lac La Biche.

No additional cultural materials were found to be present in the undisturbed sediments in backhoe tests above the findspot, or in, or on, the side bank. Beyond the presence of the one located artifact, the information potential offered by this site is considered to be minimal.

Further assessment work is not recommended for GfOx-49.

This recommendation is subject to approval by *Alberta Community Development.*

GfOx-47

GfOx-47 consists of a buried lithic scatter (6 quartzite flakes) that was found in two backhoe tests near the edge of a field near the drop-off to Lac La Biche.

No cultural materials were found to be present in four additional backhoe tests by the two positive tests.

Beyond the presence of the located artifacts, the information potential offered by this site is considered to be minimal.

Further assessment work is not recommended for GfOx-47.

This recommendation is subject to approval by *Alberta Community Development.*

GfOx-48

GfOx-48 consists of a buried lithic scatter (one piece of quartzite shatter, 16 quartzite flakes, and one chert flake) that was found in three backhoe tests in a low, flat area by Lac La Biche.

No cultural materials were found to be present in three additional backhoe tests by the three positive tests.

Beyond the presence of the located artifacts, the information potential offered by this site is considered to be minimal. Further assessment work is not recommended for this site area.

This recommendation is subject to approval by *Alberta Community Development.*

GfOx-14

GfOx-14 was described as consisting of a lithic scatter which was found on the shore of Lac La Biche.

Backhoe tests on the top of the bank above the site did not produce any cultural materials, which suggests that the site was restricted to the materials collected during the original 1975 assessment.

Further assessment work is not recommended for this site area.

This recommendation is subject to approval by *Alberta Community Development.*

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APPENDIX I: ARCHAEOLOGICAL SITE INVENTORY DATA FORMS

APPENDIX II: ARTIFACT CATALOUGES FOR SITES GfOx-47, GfOx-48, AND GfOx-48

Alberta
COMMUNITY DEVELOPMENT
Heritage Resource Management Branch
History and Archaeology Section

Old St. Stephen's College
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Canada T6G 2P8

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March 28, 2003

Walt Kowal,
Altamira Consulting Ltd.
Site 207, 10544 – 106 Street
Edmonton, Alberta Government T5H 2X6

Dear Walt:

The Archaeological Survey of Alberta has reviewed your submission entitled **Final Report HRIA Proposed Subdivision S1/2 Section 28-68-13-W4M, Lakeland County, Alberta** for permit No. 2002-314 and has found it acceptable. I agree with the recommendations made in this final report regarding archaeological resources. They will be passed onto the developer. *Any Palaeontological concerns for this project will be assessed by staff, Tyrell Museum of Palaeontology.*

The report will be catalogued and filed in the Archaeological Survey of Alberta's library.

Sincerely yours,

Heinz Pyszczyk
Parkland Archaeologist

SOIL-INFO
LTD.

SOIL SURVEY AND AGRICULTURAL CAPABILITY EVALUATION

SW ¼ - 28-68-13-W4

for

Donatberry Design Ltd.
November, 2002

Prepared by: W.L. Nikiforuk, M. EDes., P.Ag.

SOIL-INFO LTD.

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SOIL-INFO LTD.

1.0 INTRODUCTION

SOIL-INFO LTD. was commissioned by Donatberry Design Ltd. to conduct a soil survey and agricultural capability evaluation of approximately 23 hectares of land located in the SW 1/4 28-68-13-west of the 4th Meridian. The primary objective of the study was to map the soils and evaluate their characteristics relative to determining their agricultural capability.

Field mapping was conducted on October 10, 2002. The results of the mapping and evaluation are presented in the following discussion and on an aerial photograph at a scale of approximately 1:5,000.

2.0 METHODS

Traverses were made across the study area. The soils and landforms were inspected at 3 sites and mapped as indicated on the attached soils map. The soils, parent materials, landform, drainage and texture were classified in accordance with standard procedures used in Canada (Soil Classification Working Group 1998). Soils were assigned series names using the Alberta Soil Names File Generation 3.0 (Agriculture and Agri-Food Canada 1998). The AGRASID (Agricultural Region of Alberta Soil Inventory Database, Version 1.0) (CAESA Soil Inventory Project Working Group 1998) contained background data on soils found on the quarter section.

3.0 SOILS

On the basis of field observations, 4 different soil units were recognized as shown on the soils map (Figure 1).

3.1 ABC (Athabasca)

The Athabasca soil unit consists of moderately well drained Orthic Gray Luvisols developed on moderately fine textured till. In forested areas, these soils are characterized by having a thin (5 to 10 cm) moderately decomposed leaf litter layer overlying a thick (15 to 20 cm), friable, sandy loam textured Ae horizon. The Ae is underlain by a thick (20 to 50 cm), friable to firm, clay loam textured Bt horizon. The clay loam textured, firm, slightly stony, weakly calcareous Ck horizon is encountered at about 80 cm.

In cultivated fields the Ap (topsoil) is a mixture of the surface horizons (LF and Ae). A description of a typical profile, found under cultivation, is as follows:

SOIL-INFO LTD.

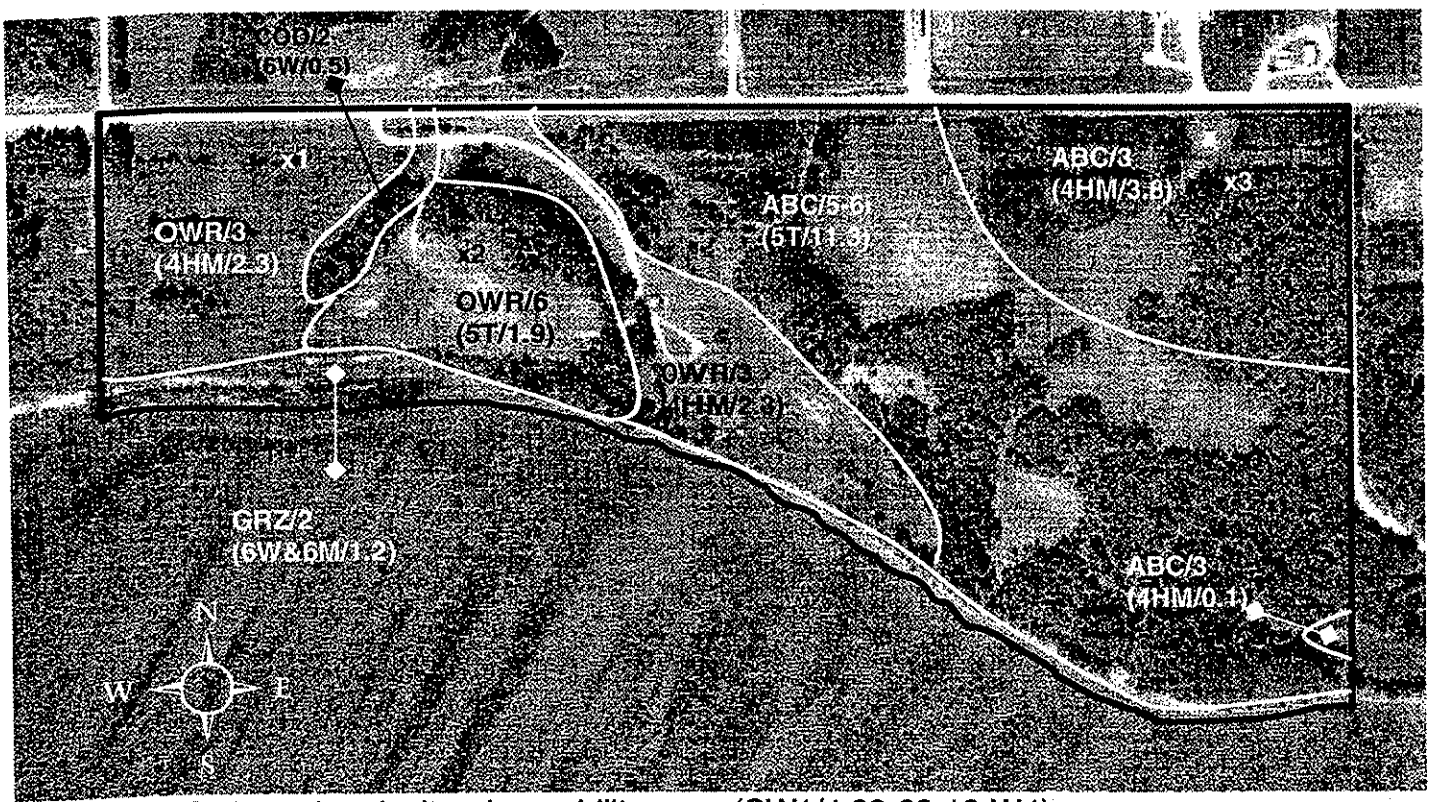

Figure 1. Soils and agricultural capability map (SW1/4 28-68-13-W4)

MAP LEGEND: **Scale 1: 5000**

Soil Unit	ABC/3
Agricultural Rating/hectares	(4H/0.8)
Soil inspection site	x1

Horizon	Depth	Description
Ap	0 - 20	Gray (10YR 5/2 dry); loam to sandy loam; moderate fine granular; friable
Bt	20 - 80	Yellowish brown (10YR 5/4 moist); clay loam; moderate medium subangular blocky; friable to firm
Ck	80+	Brown (10YR 5/3 moist); clay loam; massive; friable to firm

Three ABC soil units were mapped on gently undulating, and hummocky and inclined landscapes with slopes of 2 to 25 percent.

- ABC/3 soil units (slopes 2 to 5%) occupied 3.9 hectares (16.7% of the total area investigated) (Table 2). These soils are rated as Class 4HM (limitations due to climate and water supplying ability).

- ABC/5-6i soil unit (slopes 10 to 30%) occupied 11.3 hectares (48.3% of the total area investigated) (Table 2). These soils are rated as Class 5T (limitations due to topography).

3.2 COD (Codner)

The Codner soil unit consists of poorly drained Rego Humic Gleysols developed on medium to moderately fine textured (loam to clay loam) glaciolacustrine deposits. These soils are characterized by having a thick (20 cm) loam textured Ah horizon overlying a moderately fine textured (clay loam), gleyed, Ckg horizon. A description of a typical profile is as follows:

Horizon	Depth	Description
Ah	0 - 20	Black (10YR 2/1 moist); loam; massive; friable
Ckg	20 – 50+	Very dark grayish brown (10YR 3/2 moist); clay loam; massive; firm

One COD soil unit was mapped, on a nearly level landscape with slopes of 0.5 to 1 percent, and occupied 0.5 hectares (2.1% of the total area investigated) (Table 2). These soils are rated as Class 6W (limitations due to poor soil drainage).

3.3 GRZ (Gratz)

The Gratz soil unit consists of well to poorly drained Cumulic Regosols developed on coarse to medium textured (sandy to silty) glaciofluvial deposits. These soils are found along the shore of Lake Lac LaBiche.

One GRZ soil unit was mapped, on a nearly level landscape with slopes of 0.5 to 1 percent, and occupied 1.2 hectares (5.1% of the total area investigated) (Table 2). These soils are rated as Class 6M and 6W (limitations due to moisture holding capacity and poor drainage).

3.4 OWR (Owl River)

The Owl River soil unit consists of moderately well drained Orthic Gray Luvisols developed on medium to moderately fine textured glaciolacustrine deposits. These soils are characterized by having a thin (15 cm), friable, loam to silt loam textured Ap horizon. The Ap is underlain by a thick (20 to 50 cm), friable, loam ti silt loam textured Bt horizon. The loam to silt loam textured, friable, slightly stony, weakly calcareous Ck horizon is encountered at about 75 cm. A description of a typical profile is as follows:

Horizon	Depth	Description
Ap	0 - 15	Gray (10YR 5/2 dry); loam to silt loam; moderate fine granular; friable
Bt	15 - 75	Dark grayish brown (10YR 4/2 moist); loam to silt loam; moderate medium subangular blocky; friable
Ck	75+	Brown (10YR 5/3 moist); loam to silt loam; massive; friable

Two OWR soil units were mapped on gently undulating and hummocky landscapes with slopes of 2 to 20 percent.

- OWR/3 soil unit (slopes 2 to 5%) occupied 4.6 hectares (19.7% of the total area investigated) (Table 2). These soils are rated as Class 4HM (limitations due to climate and water supplying ability).

- OWR/6 soil unit (slopes 10 to 20%) occupied 1.9 hectares (8.1% of the total area investigated) (Table 2). These soils are rated as Class 5T (limitations due to topography).

4.0 AGRICULTURE CAPABILITY

The agricultural capability for soil map units in this study was determined using the 'Land Suitability Rating System for Agricultural Crops' (Agronomic Interpretations Working Group 1995). This system replaced the Canada Land Inventory (CLI): Soil Capability for Agriculture (Environment Canada 1972; Brocke 1977) and the 'Land Capability Classification for Arable Agriculture in Alberta' (Alberta Soils Advisory Committee 1987). The following assumptions

are the premise of the Land Suitability Rating System for Agricultural Crops system:

1. The system for rating the agricultural potential of a portion of land, considers the characteristics of climate and landscape.
2. Economic factors, such as distance to market or crop values, are not considered in the determination of the ratings.

Agriculture capability is an assessment of the nature and degree of limitations imposed by the environmental characteristics of an area. The Land Suitability Rating System for Agricultural Crops (LSRS) system uses a class / index rating framework to evaluate these environmental characteristics. This approach provides a systematic evaluation of the individual limitations than is feasible with the CLI methodology. The intent of the LSRS method is to remove the subjectivity inherent with the CLI system. Therefore, agriculture capability rating interpretations, using the LSRS system are considered to be more accountable and reproducible.

In the LSRS system, climate, soil and landscape characteristics are individually assessed and assigned an index value. Each of these components is individually assessed by factors specific to that component. For example, soil characteristics (such as texture and drainage) are considered in determining the index value of the soil component. Similarly climatic and landscape features are considered independently. Each component is assigned an initial value of 100 index points. Points are then deducted based on limiting factors. The component with the lowest value determines the class rating of an area for arable agriculture. The final rating of the soil map unit is expressed as a class number with up to three constraint factors identified.

There are seven capability classes, with Class 1 having the highest capability and Class 7 the lowest (Agronomic Interpretations Working Group 1995) (Table 1). In determination of the capability class, the most limiting factors are considered. There are 21 recognized factors associated with the three major components (climate, soils and landscape). The factors and appropriate symbol that are applicable to this study are climate (C) (temperature limiting factor - H); soils (drainage - W) and (water holding capacity – M) and topography (steep slopes – T).

The agricultural capability ratings were assigned based on the field observations. Approximately 36.4 percent of the area is rated as Class 4 agricultural lands; approximately 63.6 percent is rated as Class 5 and 6 (Table 2).

Table 1. The Land Suitability Rating System for Agricultural Crops

Class 1	No significant limitations for crop production (index value 80 -100)
Class 2	Slight modifications that restrict the range of crops or required modified management practices (index value 60 - 79)
Class 3	Moderate limitations that restrict the range of crops or require special management practices (index value 45 - 59)
Class 4	Severe limitations that restrict the range of crops or require special management practices or both (index value 30 - 44)
Class 5	Very severe limitations for sustained arable agriculture and annual cultivation using common cropping practices not recommended (index value 20 - 29)
Class 6	Extremely severe limitations for sustained production of agricultural crops. Cropping is not feasible even on an occasional basis (index value 10 - 19)
Class 7	Unsuitable for arable agriculture (index value 0 - 9)

Table 2. Agriculture Capability Ratings for SW 1/4 -28-68-13-W4

Soil and Landscape Unit	Rating	Hectares	Area (%)
ABC/3	4HM	3.9	16.7
ABC/5-6i	5T	11.3	48.3
COD/2	6W	0.5	2.1
GRZ/2	6M and 6W	1.2	5.1
OWR/3	4HM	4.6	19.7
OWR/6	5T	1.9	8.1

5.0 SUMMARY

The soil survey and agricultural capability evaluation was conducted for the SW ¼ - 28-68-13-W4. The limitations to agriculture are climate (cool temperature), topography (steep slopes) and excessive wetness (poor soil drainage). Approximately 36.4% of the area is rated as Class 4 and 63.6% is rated as Class 5 and 6.

6.0 REFERENCES

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Appendix A Summary of Inspection Sites

SITE No.	Slope Position	Drainage	Slope (%)	Classification	Series	Land Use
1	mid	moderately well	2 - 5	O.GL	OWR	pasture
2	upper	well	15 - 30	O.GL	OWR	pasture
3	upper	moderately well	2 - 5	O.GL	ABC	pasture

Legend:

Classification:

O.GL Orthic Gray Luvisol

Series:

ABC Athabasca
OWR Owl River

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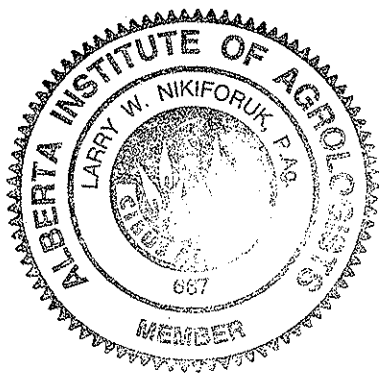
SOIL SURVEY AND AGRICULTURAL CAPABILITY EVALUATION

SE ¼ - 28-68-13-W4

for

Donatberry Design Ltd.
November, 2002



Prepared by: W.L. Nikiforuk, M. EDes., P.Ag.

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SOIL-INFO LTD.

1.0 INTRODUCTION

SOIL-INFO LTD. was commissioned by Donatberry Design Ltd. to conduct a soil survey and agricultural capability evaluation of approximately 28 hectares of land located in the SE 1/4 28-68-13-west of the 4th Meridian. The primary objective of the study was to map the soils and evaluate their characteristics relative to determining their agricultural capability.

Field mapping was conducted on October 10, 2002. The results of the mapping and evaluation are presented in the following discussion and on an aerial photograph at a scale of approximately 1:5,000.

2.0 METHODS

Traverses were made across the study area. The soils and landforms were inspected at 8 sites and mapped as indicated on the attached soils map. The soils, parent materials, landform, drainage and texture were classified in accordance with standard procedures used in Canada (Soil Classification Working Group 1998). Soils were assigned series names using the Alberta Soil Names File Generation 3.0 (Agriculture and Agri-Food Canada 1998). The AGRASID (Agricultural Region of Alberta Soil Inventory Database, Version 1.0) (CAESA Soil Inventory Project Working Group 1998) contained background data on soils found on the quarter section.

3.0 SOILS

On the basis of field observations, 3 different soil units were recognized as shown on the soils map (Figure 1).

3.1 ABC (Athabasca)

The Athabasca soil unit consists of moderately well drained Orthic Gray Luvisols developed on moderately fine textured till. In forested areas, these soils are characterized by having a thin (5 to 10 cm) moderately decomposed leaf litter layer overlying a thick (15 to 20 cm), friable, sandy loam textured Ae horizon. The Ae is underlain by a thick (20 to 50 cm), friable to firm, clay loam textured Bt horizon. The clay loam textured, firm, slightly stony, weakly calcareous Ck horizon is encountered at about 80 cm.

In cultivated fields the Ap (topsoil) is a mixture of the surface horizons (LF and Ae). A description of a typical profile, found under cultivation, is as follows:

SOIL-INFO LTD.

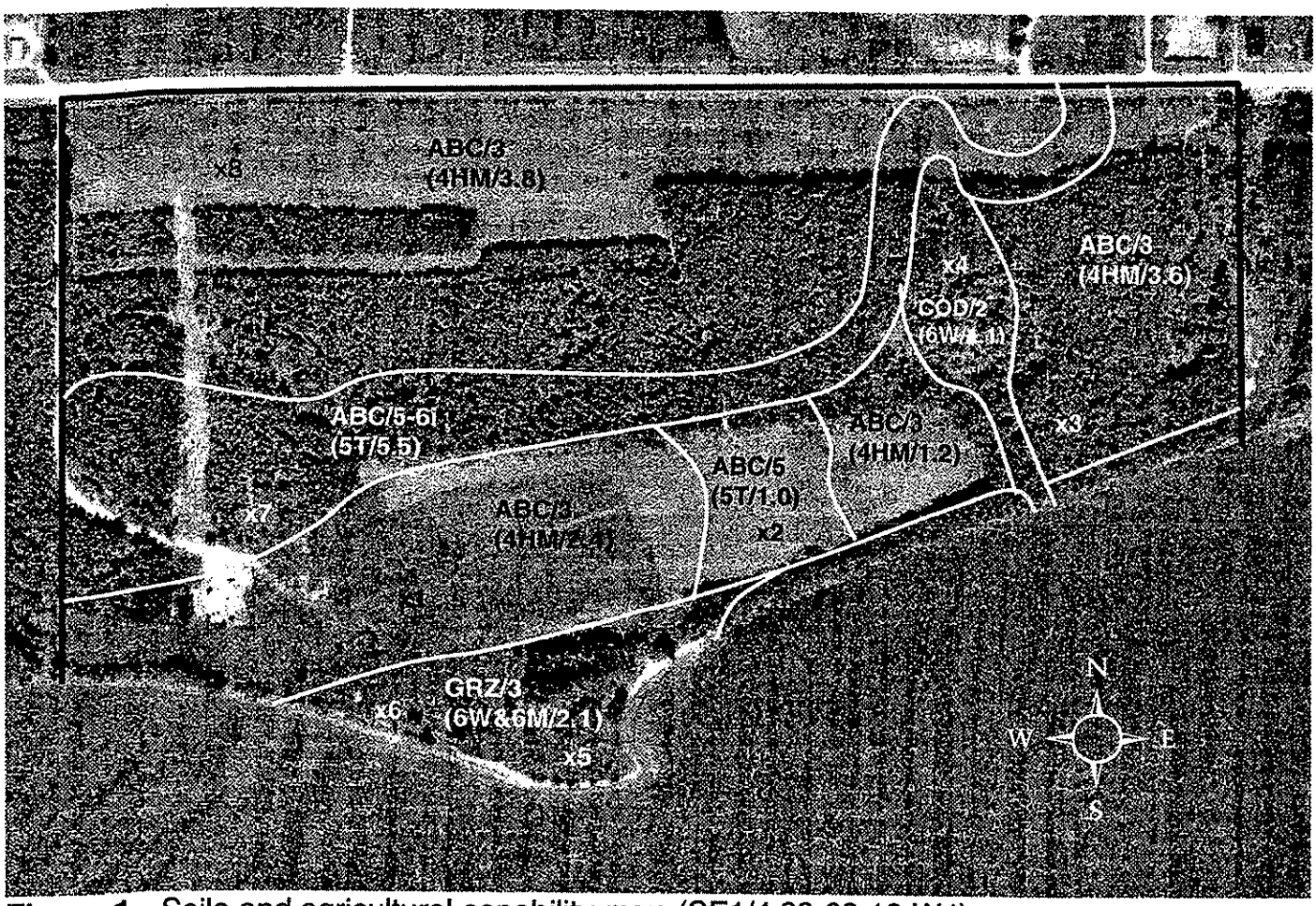

Figure 1. Soils and agricultural capability map (SE1/4 28-68-13-W4)

MAP LEGEND: **Scale 1: 5000**

Soil Unit	ABC/3
Agricultural Rating/hectares	(4H/0.8)
Soil inspection site	x1

Horizon	Depth	Description
Ap	0 – 20	Gray (10YR 5/2 dry); loam to sandy loam; moderate fine granular; friable
Bt	20 – 80	Yellowish brown (10YR 5/4 moist); clay loam; moderate medium subangular blocky; friable to firm
Ck	80+	Brown (10YR 5/3 moist); clay loam; massive; friable to firm

Eight ABC soil units were mapped on gently undulating, and hummocky and inclined landscapes with slopes of 2 to 35 percent.

- ABC/3 soil units (slopes 2 to 5%) occupied 17.6 hectares (62.7% of the total area investigated) (Table 2). These soils are rated as Class 4HM (limitations due to climate and water supplying ability).

- ABC/5 soil unit (slopes 10 to 15%) occupied 1.0 hectares (3.5% of the total area investigated) (Table 2). These soils are rated as Class 5T (limitations due to topography).

- ABC/5-6i soil unit (slopes 10 to 30%) occupied 5.5 hectares (19.6% of the total area investigated) (Table 2). These soils are rated as Class 5T (limitations due to topography).

- ABC/6-7i soil unit (slopes 20 to 35%) occupied 0.8 hectares (2.8% of the total area investigated) (Table 2). These soils are rated as Class 6T (limitations due to topography).

3.2 COD (Codner)

The Codner soil unit consists of poorly drained Rego Humic Gleysols developed on medium to moderately fine textured (loam to clay loam) glaciolacustrine deposits. These soils are characterized by having a thick (20 cm) loam textured Ah horizon overlying a moderately fine textured (clay loam), gleyed, Ckg horizon. A description of a typical profile is as follows:

Horizon	Depth	Description
Ah	0 – 20	Black (10YR 2/1 moist); loam; massive; friable
Ckg	20 – 50+	Very dark grayish brown (10YR 3/2 moist); clay loam; massive; firm

One COD soil unit was mapped, on a nearly level landscape with slopes of 0.5 to 1 percent, and occupied 1.1 hectares (3.9% of the total area investigated) (Table 2). These soils are rated as Class 6W (limitations due to poor soil drainage).

3.3 GRZ (Gratz)

The Gratz soil unit consists of well to poorly drained Cumulic Regosols developed on coarse to medium textured (sandy to silty) glaciofluvial deposits. These soils are found along the shore of Lake Lac LaBiche.

One GRZ soil unit was mapped, on a nearly level landscape with slopes of 1 to 3 percent, and occupied 2.1 hectares (7.5% of the total area investigated) (Table 2). These soils are rated as Class 6M and 6W (limitations due to moisture holding capacity and poor drainage).

4.0 AGRICULTURE CAPABILITY

The agricultural capability for soil map units in this study was determined using the 'Land Suitability Rating System for Agricultural Crops' (Agronomic Interpretations Working Group 1995). This system replaced the Canada Land Inventory (CLI): Soil Capability for Agriculture (Environment Canada 1972; Brocke 1977) and the 'Land Capability Classification for Arable Agriculture in Alberta' (Alberta Soils Advisory Committee 1987). The following assumptions are the premise of the Land Suitability Rating System for Agricultural Crops system:

1. The system for rating the agricultural potential of a portion of land, considers the characteristics of climate and landscape.
2. Economic factors, such as distance to market or crop values, are not considered in the determination of the ratings.

Agriculture capability is an assessment of the nature and degree of limitations imposed by the environmental characteristics of an area. The Land Suitability Rating System for Agricultural Crops (LSRS) system uses a class / index rating framework to evaluate these environmental characteristics. This approach provides a systematic evaluation of the individual limitations than is feasible with the CLI methodology. The intent of the LSRS method is to remove the subjectivity inherent with the CLI system. Therefore, agriculture capability rating interpretations, using the LSRS system are considered to be more accountable and reproducible.

In the LSRS system, climate, soil and landscape characteristics are individually assessed and assigned an index value. Each of these components is individually assessed by factors specific to that component. For example, soil characteristics (such as texture and drainage) are considered in determining the

index value of the soil component. Similarly climatic and landscape features are considered independently. Each component is assigned an initial value of 100 index points. Points are then deducted based on limiting factors. The component with the lowest value determines the class rating of an area for arable agriculture. The final rating of the soil map unit is expressed as a class number with up to three constraint factors identified.

There are seven capability classes, with Class 1 having the highest capability and Class 7 the lowest (Agronomic Interpretations Working Group 1995) (Table 1). In determination of the capability class, the most limiting factors are considered. There are 21 recognized factors associated with the three major components (climate, soils and landscape). The factors and appropriate symbol that are applicable to this study are climate (temperature limiting factor – H); soils (drainage – W) and (water holding capacity – M) and topography (steep slopes – T).

The agricultural capability ratings were assigned based on the field observations. Approximately 62.7 percent of the area is rated as Class 4 agricultural lands; approximately 37.3 percent is rated as Class 5 and 6 (Table 2).

Table 1. The Land Suitability Rating System for Agricultural Crops

Class 1	No significant limitations for crop production (index value 80 –100)
Class 2	Slight modifications that restrict the range of crops or required modified management practices (index value 60 – 79)
Class 3	Moderate limitations that restrict the range of crops or require special management practices (index value 45 – 59)
Class 4	Severe limitations that restrict the range of crops or require special management practices or both (index value 30 – 44)
Class 5	Very severe limitations for sustained arable agriculture and annual cultivation using common cropping practices not recommended (index value 20 – 29)
Class 6	Extremely severe limitations for sustained production of agricultural crops. Cropping is not feasible even on an occasional basis (index value 10 – 19)
Class 7	Unsuitable for arable agriculture (index value 0 – 9)

Table 2. Agriculture Capability Ratings for SE 1/4 –28-68-13-W4

Soil and Landscape Unit	Rating	Hectares	Area (%)
ABC/3	4HM	17.6	62.7
ABC/5	5T	1.0	3.5
ABC/5-6i	5T	5.5	19.6
ABC/6-7i	6T	0.8	2.8
COD/2	6W	1.1	3.9
GRZ/3	6M and 6W	2.1	7.5

5.0 SUMMARY

The soil survey and agricultural capability evaluation was conducted for the SE ¼ - 28-68-13-W4. The limitations to agriculture are climate (cool temperature), topography (steep slopes) and excessive wetness (poor soil drainage). Approximately 62.7% of the area is rated as Class 4 and 37.3% is rated as Class 5 and 6.

6.0 REFERENCES

Agriculture and Agri-Food Canada. 1998. Alberta Soil Names – Generation 3. J.A. Brierley, B.D. Walker, C.J. Tomas and P.E. Smith (eds.). Alberta Agriculture, Food and Rural Development, Edmonton, Alberta.

Agronomic Interpretations Working Group. 1995. Land Suitability Rating System for Agricultural Crops: 1. Spring-seeded small grains. Edited by W.W. Pettapiece. Tech. Bull. 1995-6E. Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa.

Alberta Soils Advisory Committee. 1987. Land Capability Classification for Arable Agriculture in Alberta. W.W. Pettapiece (ed.). Alberta Agriculture, Edmonton, Alberta.

ARDA. 1965. Canada Land Inventory. Soil Capability Classification for Agriculture. The Canada Land Inventory Report No. 2. Department of Forestry and Rural Development, Ottawa (Reprinted by Dept. of Environment 1969 and 1972).

Brocke, L.K. 1977. The Canada Land Inventory Soil Capability for Agriculture in Alberta. Alberta Environment, Edmonton, Alberta.

CAESA Soil Inventory Project Working Group. 1998. AGRASID: Agricultural Region of Alberta Soil Inventory Database (Version 1.0). Edited by: J.A. Brierley, B.D. Walker, P.E. Smith, and W.L. Nikiforuk. Alberta Agriculture Food and Rural Development, Publications. CD-ROM.

Soil Classification Working Group. 1998. The Canadian System of Soil Classification. Agriculture and Agri-Food Canada Publication 1646 (Revised).

SOIL-INFO LTD.

Appendix A Summary of Inspection Sites

Site No.	Slope Position	Drainage	Slope (%)	Classification	Series	Land Use
1	mid	moderately well	2 – 5	O.GL	ABC	pasture
2	crest	moderately well	10 – 15	O.GL	ABC	pasture
3	upper	moderately well	2 – 5	O.GL	ABC	bush
4	depression	poor	0.5 - 2	R.HG	COD	bush
5	level	rapid	2 - 5	CU.R	GRZ	pasture
6	level	rapid	2 - 5	CU.R	GRZ	pasture
7	mid	moderately well	10 – 20	O.GL	ABC	pasture
8	mid	moderately well	2 – 5	O.GL	ABC	pasture

Legend:

Classification:

CU.R Cumulic Regosol
O.GL Orthic Gray Luvisol
R.HG Rego Humic Gleysol

Series:

ABC Athabasca
COD Codner
GRZ Gratz

MPI ***Engineering***
A division of Many Pyes Inc.

Box 36, Site 14, RR#4
Edmonton, Alberta T5E 5S7
Phone / Fax: (780) 973-6060

FAX TRANSMITTAL COVER PAGE

PLEASE TRANSMIT THE FOLLOWING CORRESPONDENCE TO:

TO: Alberta Transportation, Athabasca

ATTENTION: Howard Peterson, Operations Support

RE: TIA for SE and SW 28-68-13-4, Moonlight Cove and Island View Bay

DATE: July 16, 2003
FAX: 1-780-675-5855
NO. OF PAGES: 14
(including Cover Page)

Message:

Howard:

Enclosed you will find a report outlining the results of the "mini" TIA for the above noted developments, as requested by Wayne Duplessis in support of the development application. The sites are adjacent each other and Highway 858, on the north shores of Lac La Biche.

Your review and any comments are requested. I can be reached at 973-6060 or 913-6870 (cell) should you have any concerns. If deemed necessary, a subsequent meeting can be scheduled with the undersigned to discuss ongoing concerns.

Thank you for your attention in this regard and continued recommendation of our services.

Sincerely,

Jim Pyesmany, P. Eng.
Principal

cc Wayne Duplessis, Donatberry Design Ltd.

SENT BY: _____

If you did not receive all the pages, call us at (780) 973-6060.

MPI

TRANSPORTATION IMPACT ANALYSIS FOR SE and SW-28-68-13-4 HIGHWAY 858

donatberryinns.july13.03

Description

MPI is acting on behalf of Wayne Duplessis representing Donatberry Design Ltd., in support of development of two lakeside development subdivisions named Island View Bay and Moonlight Cove, located in Lakeland County. The proposed land use is recreational lake cottages and is located on the north shore of Lac La Biche some 250 km north east of Edmonton.

As shown in Annex A, the proposed development sites are located beside each other on portions of SE and SW-28-68-13-4. They are adjacent the south side of Highway 858, some 3 km west of the junction of Highway 881.

Existing lands are treed with several existing cottages developed. Locally, large development properties have been allowed to subdivide, resulting in multiple access development on both sides of Highway 858. The proposed subdivisions would consolidate 6 existing access locations into 2 accesses, one for each subdivision.

The development plans included in Annex B, call for a 40 lot development at Moonlight Cove and a 37 lot development at Island View Bay, showing single wide gravel road allowances and driveways as access at opposite ends of each development. The accesses will be connected to existing road allowances which will access Highway 858 at a 1.6 km offset and opposite existing local roads to the north. Highway intersections will be improved as required by provincial highway standards.

Each subdivision access, to the existing government road allowances, is located approximately 100 to 150 m south of the Highway 585 centerline. Each development will be developed in three phases, with 8 lots in each first phase.

Highway 858 Cross- Section and Existing Traffic

Highway 858 is a 9.2m wide asphalt surfaced rural roadway paved in 1993. As shown in Annex A, the adjacent portion of Highway 858 has two lanes, is on tangent and exhibits a normal crown section typical with its east/west tangent orientation. Highway 858 is posted at 100 km/h and has a 2002 AADT of between 170 and 200 vpd.

Turning movement counts taken at Jct. Highway 881 indicate an even distribution for both lanes with 91.5% passenger vehicles and 0.5% tractor trailer units.

Review of the past 10 years of highway traffic growth data for this section of Highway 858 indicates a 50% decrease in normal weekday highway traffic. An assessment of no traffic growth appears warranted.

Vehicular Trip Generation

This analysis is based on local experience and interpolated trip generation information provided for similar land uses in Counties and MD's in Alberta, as well as ITE.

Trip generation rates for Country recreational land uses are used and have been modified based on an assumption of 20% full time residency, which has been applied as a worst case traffic impact scenario.

Peak traffic associated with more remote summer recreational cottage use normally occurs on weekends and holidays beyond normal highway peak traffic which normally occurs in the AM Peak periods on weekdays.

The following vehicle trip table represents vehicle trips generated by full development based on the recreational land uses noted above.

VEHICLE GENERATION ON AN AVERAGE WEEKDAY

Land Use	No. of Dwellings	Vehicle Trips per Dwelling*	Veh. Trips on a Weekday
Moonlight Cove (40 lots)			
Summer Cottage Dwellings	32	1	32
20% Full time residential	8	8	64
Total - East intersection	**40**		**96**
Island View Bay (37 lots)			
Cottages	30	1	30
20% Full time residential	7	8	56
Total – West Intersection	**37**		**86**

** Includes inbound and outbound vehicles. Note that weekend trip generation rates for cottage dwellings are typically 3 vpd.*

At the eastern intersection, at full development, the **Moonlight Cove** development would generate a maximum of 48 inbound and 48 outbound automobile trips on a weekday. A total peak weekday traffic volume of **96 vpd** is deemed a reasonable maximum for this development.

Stage 1 traffic volumes will be 19 vpd or 20% of this total.

At full buildout, the **Island View Bay** development would generate a maximum of 43 inbound and 43 outbound automobile trips on a weekday. A total peak weekday traffic volume of **86 vpd** is deemed a reasonable maximum for this development.

Stage 1 traffic volumes will be 17 vpd or 20% of this total.

Weekend peak traffic volumes, at full buildout, can be expected to be 60% higher, at 160 vpd and 150 vpd at the respective intersections, however these volumes would not coincide with normal highway peaks.

Trip Distribution

Turning movement counts taken at Jct. Highway 881 indicate an even distribution for both directions. Little traffic would be captured or diverted from the normal through traffic using Highway 858.

Given full buildout of both proposed site developments, and the development location, 50% of the trips generated were assigned to each highway leg at the separate development access locations.

At the eastern intersection, at full development, the **Moonlight Cove** development is expected to generate a maximum of 48 vehicles from/to the east and 48 vehicle trips from/to the west on a weekday.

At full buildout, the **Island View Bay** development access would generate a maximum of 43 vehicles from/to the east and 43 vehicle trips from/to the west on a weekday.

A future (10 year) projected AADT of 300 vpd for both the east and west legs of Highway 858 appears reasonable based on existing data.

Functional Design

At full build out, the projected volumes can be adequately accommodated with one access, which it should be widened to 9m gravel. The proposed staging will ensure that these projected volumes increase in small increments over several years.

Type 1 highway intersection improvements are warranted as access to either of these developments. Both the highway and development accesses would benefit through the use of 15 m radius curves to accommodate turning movements for larger vehicles such as water haulers, septic vacuum trucks and vehicles towing boats and trailers.

Highway access should be controlled as a "stop" condition. This information indicates that the existing intersection design, with stop sign control, will adequately serve the development requirements.

Considering the linear type of development, use of a single access can be cause for concern due to traffic operations and emergency access concerns. In this case, use of a single site access is dictated by the intended land use, existing topographic features and the location of Highway 858 parallel to its long axis. Both developments may benefit from inclusion of a 6m wide cleared PUL lot aligned to connect with the cul de sacs in each development, to serve as pedestrian, bikeway and emergency access.

In summation, the proposed staged developments, associated traffic volumes and respective access appear to be well positioned and suited to the highway and the area.

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www.trans.gov.ab.ca
Dial 310-0000

Our File No.: 4-13-68-Sec.28 (S)

August 19, 2003

Wayne Duplessis

Re: **TRAFFIC IMPACT ANALYSIS - FUTURE SUBDIVISION CONCEPT**
PT. OF SE AND SW SEC 28-68-13-W4 HIGHWAY 858
LAKELAND COUNTY

Reference is made to the above noted subject as per the report that was submitted to this office by MPI Engineering.

The report provides recommendations and conclusion in view of a future multi-lot rural residential subdivision proposal in Lakeland County adjacent to Highway 858. This is to advise that the department accepts the report's recommendations and would further advise that this report should be included as part of any formal application to the subdivision authority when the applicant is ready to do so.

I trust the above response is satisfactory.

Sincerely,

Howard Peterson
Operations Services Coordinator

HP:lb

Unserviced Residential Subdivision Soils Report
S ½ 28-068-13-W4M

Prepared For DonatBerry Design Ltd.
For Viewing By: Lakeland County Subdivision Authority

May 27-28, 2003

K-File: 01792

Prepared By:

KENTON ENVIRONMENTAL INC.

Box 990 Lac La Biche, Alberta T0A 2C0 Ph:(780) 623-4545 Fax :(780) 623-2626

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1. INTRODUCTION/PROJECT SCOPE

This report has been prepared based on site observation and field data collected May 27 & 28, 2003. It is to fulfill the requirements of a Subdivision Soils Report outlined in Environmental Guidelines for the Review of Subdivisions in Alberta, Draft 1998. (Standards and Guidelines Branch, Environmental Assessment Division, and Environmental Regulatory Service 1998) which is part of the application procedure for proposed subdivisions. According to the environmental guidelines for sewage systems a private sewage disposal system should be matched with the soil conditions within the Sustainable Development Area and the characteristics of the household water supply (Standards and Guidelines Branch et al 1998). Therefore the goal of our project is to determine the type of wastewater disposal system best suited for this specific location based on results from ground water monitoring and percolation rates.

2. PROJECT AREA

2.1 Location and Land Use

This parcel of land is located approximately 35 km from the town of Lac La Biche. The two-quarter sections of land are vacant and situated between Lac La Biche Lake and secondary highway 858. Previously the land was used as residence(s) and grazing fields for cattle, but are now abandoned.

2.2 Topography

Topography in the area is undulating with gentle slopes with no concerns of erosion.

2.3 Water Courses and Water Bodies

As abovementioned, Lac La Biche Lake borders both quarter sections on the south side. In the SW section there is a small creek that runs through and drains into the lake. This creek is most likely from runoff from the higher ground towards the north.

2.4 Vegetation

The proposed site is located in the Dry Mixedwood region of the Boreal Forest ecoregion. Vegetation in the area is characterized by trembling aspen as the dominant tree species and native grass species.

2.5 Soils

Soils in the area are classified as degraded eutric brunisols and display characteristics associated with the Athabasca soils Order (Kjearsgaard 1972). This soils class consists of coarse loamy sand, characterized as a rapidly draining soil.

3. METHODOLOGY

3.1 Ground Water Test Holes

Water table test holes were drilled in order to evaluate the ground water table on the proposed development.

In order to determine the depth to water table, two 15 ft holes were drilled at suspected high and low water table areas on the site (See diagram in Appendix). Soils at the base of the holes were heavy gray-blue clay, which indicates anaerobic activity, and suggests the presence of the water table. Once drilled, the holes were monitored for a period of 4 days.

3.2 Percolation Test

Percolation tests were performed according to the suggestions made by Alberta Environment (Standards and Guidelines Branch et al 1998). Seven percolation test holes were drilled. Each hole was 8 inches in diameter and 36 inches in depth. The holes were located on representative areas on the varying topography of the site (See Base Map in Appendix). Each hole was prepared according to the method outlined in the guidelines pg 33-3, and 33-4. Testing was conducted according to the method recommended in Alberta Private Sewage Systems Standards of Practice-1999 Handbook First Edition July, 2000 page 94 A.6. outlined below.

Percolation Test Procedure:

1) Test holes were soaked for a period of 24 hours where 18 inches of water was continually added to each hole
2) A minimum depth of 18 inches was maintained in the hole for 4 hours before percolation measurements were taken.
3) The water level in the hole was adjusted to 18 inches prior to starting the percolation test.
4) Immediately after adjustment the water level was measured from a fixed point every 30 minutes using a percometer.
5) Water level was adjusted to 18 inches after every meter reading.
6) The test was continued until two successive water level drops did not vary by more than 1/8 inch or remained constant.
7) The last water level drop was used to calculate the percolation rate

3.3 Sodium Adsorption Ratio

It is suggested in the guidelines that Sodium Adsorption Ratio (SAR) of household water be calculated and analyzed as part of the testing procedure. SAR was not determined on site as there is no household water supply and a water supply is yet to be determined. SAR can be determined at a later date if necessary.

4. RESULTS

4.1 Ground Water Monitoring

The ground water test holes were monitored over a period of 4 days (96hours) from May 27 to May 30, 2003. On the SE ¼, the water table measured at 3.75 m (11ft) and on the SW ¼ it was 3.90m (11.44 ft). These measurements indicate that the water table is low.

Table 1.0 Water Table Test Hole #1 Soil Log

0-6 inches	Dark Brown, Silty Loam
6-25 inches	Dark Brown, Silty Loam
25-50 inches	Dark Brown, Silty Clay Loam
50-100 inches	Dark Brown, Clay Loam
100+ inches	Dark Brown, Clay Loam

Table 1.1 Water Table Test Hole # 2 Soil Log

0-50 inches	Light Brown, Sand
50-100 inches	Dark Brown, Sand
100-150 inches	Dark Brown, Clay Loam
150+ inches	Dark Brown, Clay Loam

4.2 Percolation Test

Upon field assessment soil in each test hole consisted of loam topsoil and clay loam subsoil.

Table 2.0- Percolation Test Hole #1 (SE ½) Soil Log

0-6 inches	Dark Brown, Sandy Loam
6-25 inches	Light Brown, Sandy Loam
25-36 inches	Light Grey, Sandy Clay Loam

Table 2.1- Percolation Test Hole #2 Soil Log

0-6 inches	Dark Brown, Sandy Loam
6-25 inches	Dark Brown, Sandy Loam
25-36 inches	Dark Brown, Sandy Clay Loam

Table 2.2- Percolation Test Hole #3 Soil Log

0-9 inches	Dark Brown, Sand
9-25 inches	Dark Brown, Sandy Clay Loam
25-36 inches	Dark Brown, Clay Loam

Table 2.3- Percolation Test Hole #1 (SW ½) Soil Log

0-25 inches	Black, Sandy Loam
25-36 inches	Light Brown, Sandy Clay Loam

Table 2.4- Percolation Test Hole #2 Soil Log

0-25 inches	Dark Brown, Sandy Loam
25-36 inches	Light Gray, Clay Loam

Table 2.5- Percolation Test Hole #3 Soil Log

0-25 inches	Dark Brown, Sandy Loam
25-36 inches	Dark Brown, Sandy Clay Loam

Table 2.6- Percolation Test Hole #4 Soil Log

0-3 inches	Organic
3-25 inches	Black, Loam
25-36 inches	Gray, Clay Loam

Results of the Percolation Tests were as follows:

Table 3.0 Refill Percolation Test Results

Percolation Test Hole #1 (SE ½)

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	1.5 in	20
2	30 min	1.5 in	20
3	30 min	1.5 in	20
4	**30 min**	**1.5 in**	**20**

Percolation Test Hole #2

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30	0.5 in	60
2	30	0.5 in	60
3	30	0.5 in	60
4	**30**	**0.5 in**	**60**

Percolation Test Hole #3

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	1 in	30
2	30 min	$1^{7/8}$ in	16
3	30 min	$1^{7/8}$ in	16
4	**30 min**	**$1^{7/8}$ in**	**16**

Percolation Test Hole #1 **(SW ½)**

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	1.25 in	24
2	30 min	1.00 in	30
3	30 min	1.00 in	30
4	**30 min**	**1.00 in**	**30**

Percolation Test Hole #2

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	0.75 in	40
2	30 min	0.50 in	60
3	30 min	0.50 in	60
4	**30 min**	**0.50 in**	**60**

Percolation Test Hole #3

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	2 1/8	14.18
2	30 min	1 ¾	17.14
3	30 min	1.50	20
4	30 min	1.50	20
5	**30 min**	**1.50**	**20**

Percolation Test Hole #4

Trial #	Time Increment	Water Level Drop	Percolation Rate (min/inch)
1	30 min	1.5 in	20
2	30 min	1.5 in	20
3	30 min	1.5 in	20
4	**30 min**	**1.5 in**	**20**

5. DISCUSSION

5.1 Evaluation of Water Table

Over a monitoring period of 96 hours, water was found within 11 ft. in the water table test holes. According to the Standards and Guidelines Branch a high water table is within 8 feet (2.4m) of the ground surface. This indicates that the ground water table is low. A low water table will not interfere with the functioning of a sewage disposal system. Risk of ground water contamination is very low.

5.2 Evaluation of Soil Percolation Rate

Acceptable percolation rates for sewage treatments, providing a low water table vary between 5 to 60 minutes per inch (Standards and Guidelines Branch et al 1998). The percolation rates for each test hole varied from 14.18 to 60 minutes/inch and indicate permeability conditions that may be suitable for sewage treatment.

5.3 Septic Tank & Disposal Field

Due to the permeability conditions of the soils, a septic tank and disposal field sewage system may be used. The soils on-site consist of loamy sand, which provides permeation of both water and air, which aids in the breakdown of sewage and prevents and/or reduces effluent saturation within the soil.

5.4 Septic Tank & Treatment Mounds

A treatment mound provides an aerobic environment and disperses effluent through the mound, which will prevent surface soil from becoming saturated (Alberta Private Sewage Systems Standard of Practice Handbook, 1999). Treatment mounds can be used in soils with percolation rates that are faster than 120 minutes/inch 2ft below the sand layer and below the sand layer, there is a percolation rate slower than 5 minutes/inch. Another factor to consider would be the depth of the water table. In this case, depth to the water table is $\geq$11 ft and is not a concern. Due to the above reasons, a septic tank and mound system would be an acceptable sewage disposal system for the proposed site.

5.5 Open Discharge System

An open discharge system is not recommended for the proposed subdivision. The permeability of the soils is acceptable, however, the proximity of a water source/course and property lines within the future subdivision would not allow for an open system to be installed.

5.6 Holding Tanks

Another option of sewage disposal is the use of holding tanks. Sewage would be stored in large tanks, which would be emptied periodically by a vacuum truck and hauled to an alternative disposal location. There would be no risk of contamination to surface soil or ground water. However, overtime this may not be the most cost effective method of disposal.

6. CONCLUSION

Overall, site observation, and field-testing methods have provided sufficient information to determine the feasibility of specific sewage disposal treatments for the proposed unserviced subdivision.

Kenton Environmental Inc. is satisfied, that all testing performed by Kenton Environmental Employees Kenton Miller and Melissa Maki has been conducted to the specifics outlined in the following references. All procedures were conducted in a manner that would eliminate variation or inconsistency of results. Data for this report is based solely on the field assessment and the following references.

Date: May 28, 2003
Kenton Miller
President Kenton Environmental Inc.

Date: May 28, 2003
Melissa Maki, B.A.E.M
Project Supervisor

7. REFERENCES

Department of Energy, Mines and Resources. 1977. Lac La Biche, Alberta 73-L/13. Canada Center for Mapping, Ottawa Ontario.

Kjearsgaard, A.A. 1972. Soil Survey of the Tawatinaw Map Sheet (83-I). Alberta Institute of Pedology Report No.S-72-29, Edmonton Alberta.

Safety Codes Council. 1999. Alberta Private Sewage Systems Standards of Practice Handbook. First Edition. Safety Codes Council,Edmonton Alberta.

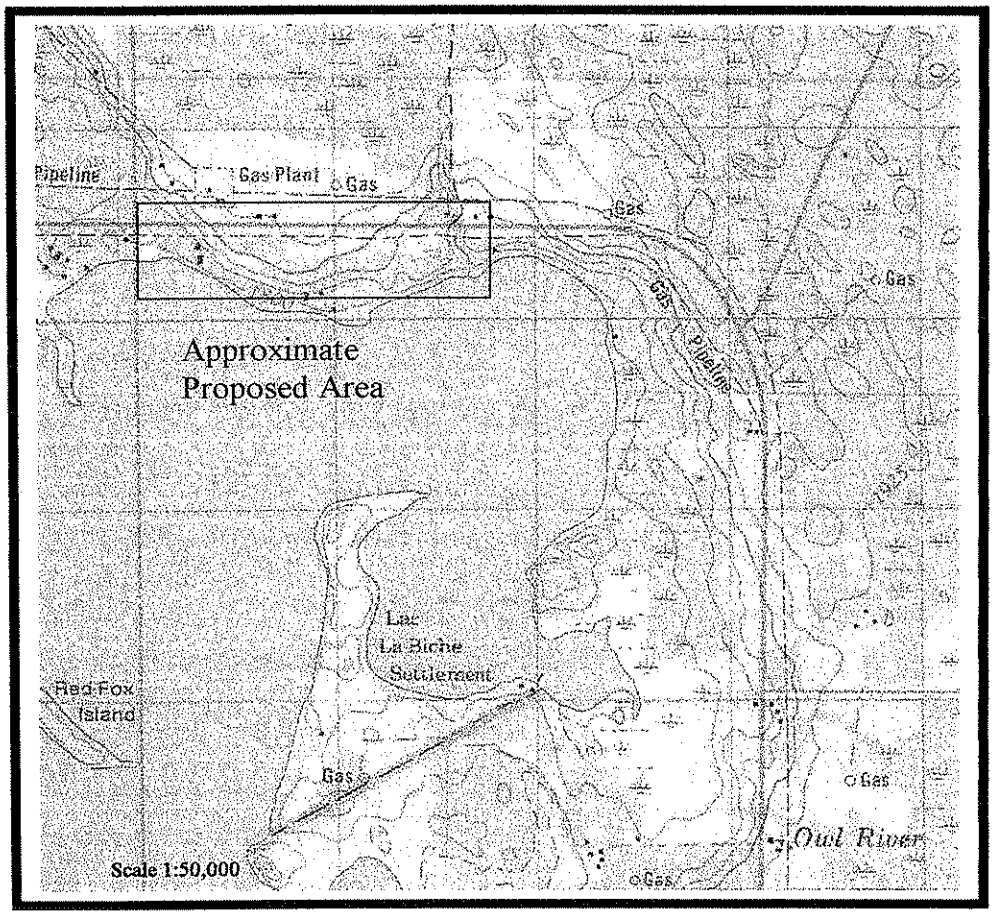
Standards and Guidelines Branch, Environmental Assessment Division, and Environmental Regulatory Service. 1998. Environmental Guidelines for the Review of Subdivisions in Alberta. Draft. Alberta Environment, Edmonton Alberta.

8. APPENDIX

Topographical Map and Base Map

APPENDIX

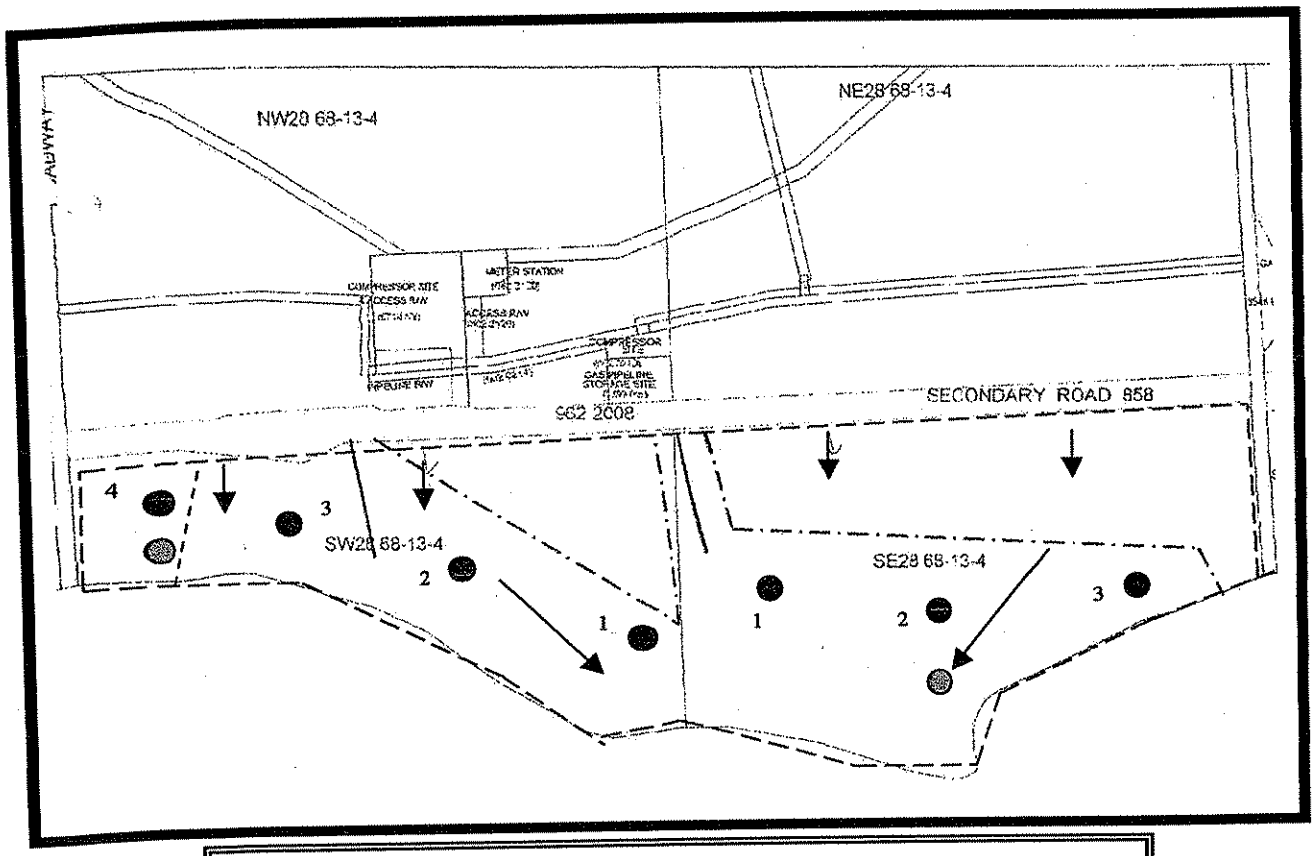
Topographic Map of the Area Surrounding the Proposed Subdivision.



Lac La Biche 73 L/13 (Department of Energy and Mines, 1977)

APPENDIX

Base Map for the Proposed Subdivision S ½ Sec.28 Twp.68 Rng. 13 W4M
Lakeland County



Legend

Percolation Test Hole ●

Water Table Test Hole ◉

Proposed Lot — — —

Direction of Slope → %

Creek - - - - - - - -

Tree-Line —·—·—·—

Proposed Road/Existing Road ————

N

Scale: Unknown

Note: Sketch taken from DonatBerry Design Ltd.

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	188900
Map Verified:	Map
Date Report Received:	

1. Contractor & Well Owner Information

Company Name: UNKNOWN DRILLER	Licence No.:	
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: FLEMMING, DON	Well Owner has a copy of this report:	
P.O. Box Number:	Mailing Address: FORT MCMURRAY	Postal Code:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SE	28	068	13	4

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 1800. FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed(mm/dd/yyyy):
Materials Used:
Method of Drilling: Bored
Flowing Well: N
Gas Present: N
Rate:
Oil Present: N
Proposed well use: Domestic
Anticipated Water Requirements/day 0

4. Formation Log

Depth from ground level (feet)	Lithology Description
3	Brown Clay
4	Brown Sand
10	Brown Clay
13	Brown Sand
26	Blue Clay
29	White Sand
32	Blue Clay
36	Brown Gravel
42	Blue Clay

5. Well Completion

Date Started(mm/dd/yyyy): 10/21/1977	Date Completed (mm/dd/yyyy): 10/21/1977
Well Depth: 42 FT	Borehole Diameter: Inch
Casing Type:	Liner Type: Steel
Size OD: 0 Inch	Size OD: 26 Inch
Wall Thickness: 0 Inch	Wall Thickness: 0 Inch
Bottom at: 0 FT	Top: 0 FT Bottom: 42 FT

Perforations
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
Perforations Size: 0 Inch x 0 Inch
Perforated by: Unknown

Seal:
Sealed Interval:
from: 0 FT to: 0 FT

Screen Type:
Screen ID: 0 Inch

Intervals:
from: 0 FT to: 0 FT Slot Size: 0 Inch
from: 0 FT to: 0 FT Slot Size: Inch

Installation:

Fittings
Top: Bottom:

Pack: Artificial
Grain Size: .75 Amount: 2 Yards

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: Y
Held: 0 Documents Held: 1

Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inch

Comments:
WELL DRILLED BY PETERSON DRILLING, COLINTON. DRILLER REPORTS "MEDIUM HARD WATER"

6. Well Yield

Test Date (mm/dd/yyyy): 10/21/1977
Start Time: 11:00 AM
Test Method: Bailer

Are Drawdown & Recovery measurements in metric or imperial?

Non pumping static level:	32.0 FT
Rate of water removal:	5 Gal/Min
Depth of pump intake:	42 FT
Water level at end of pumping:	42 FT

Distance from top of casing to ground level: Inch

Depth To water level
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 10 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 3 Gal/Min

Recommended pump intake: 0 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name:
Certification No.:

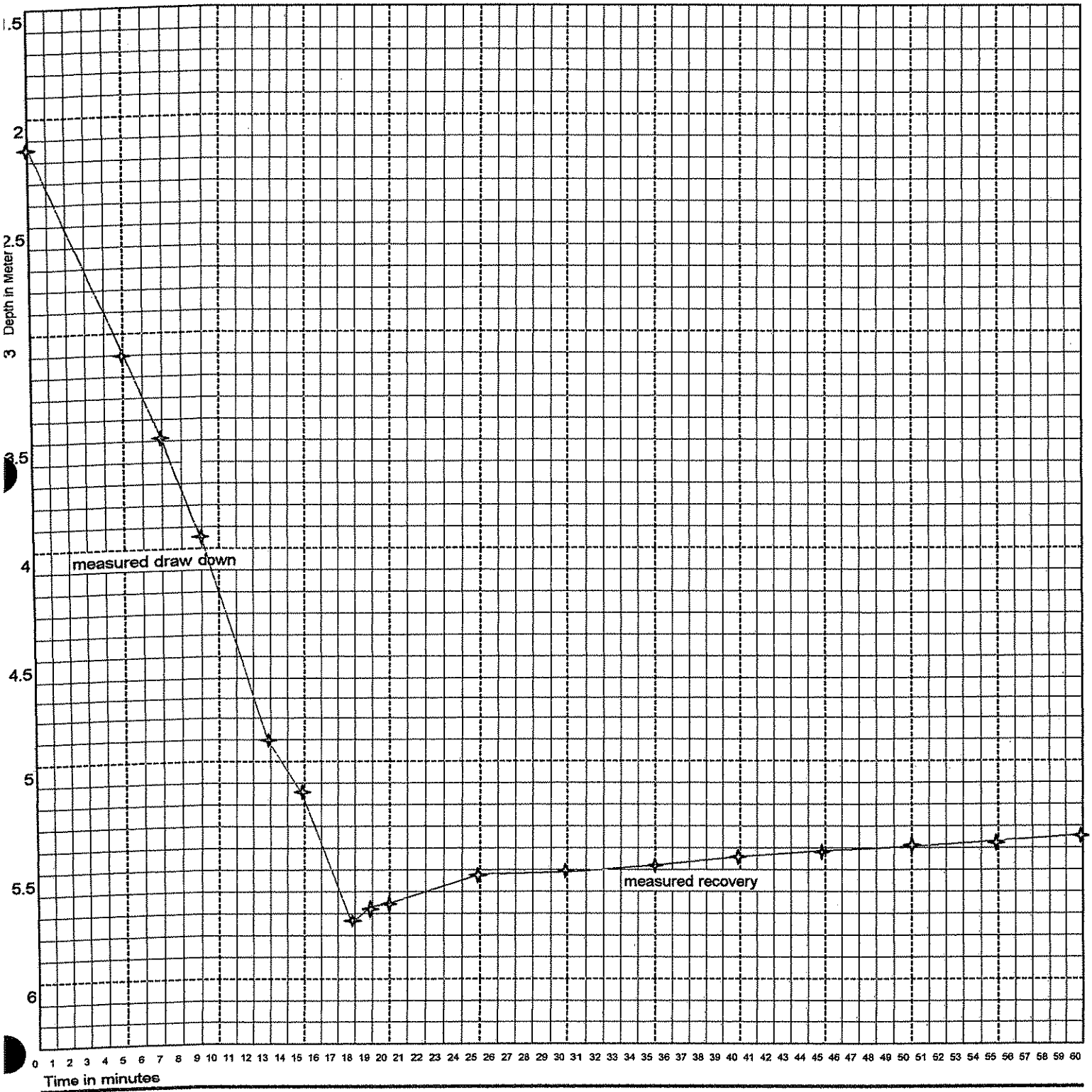
Flow Rate Test

Kenton Environmental Inc.

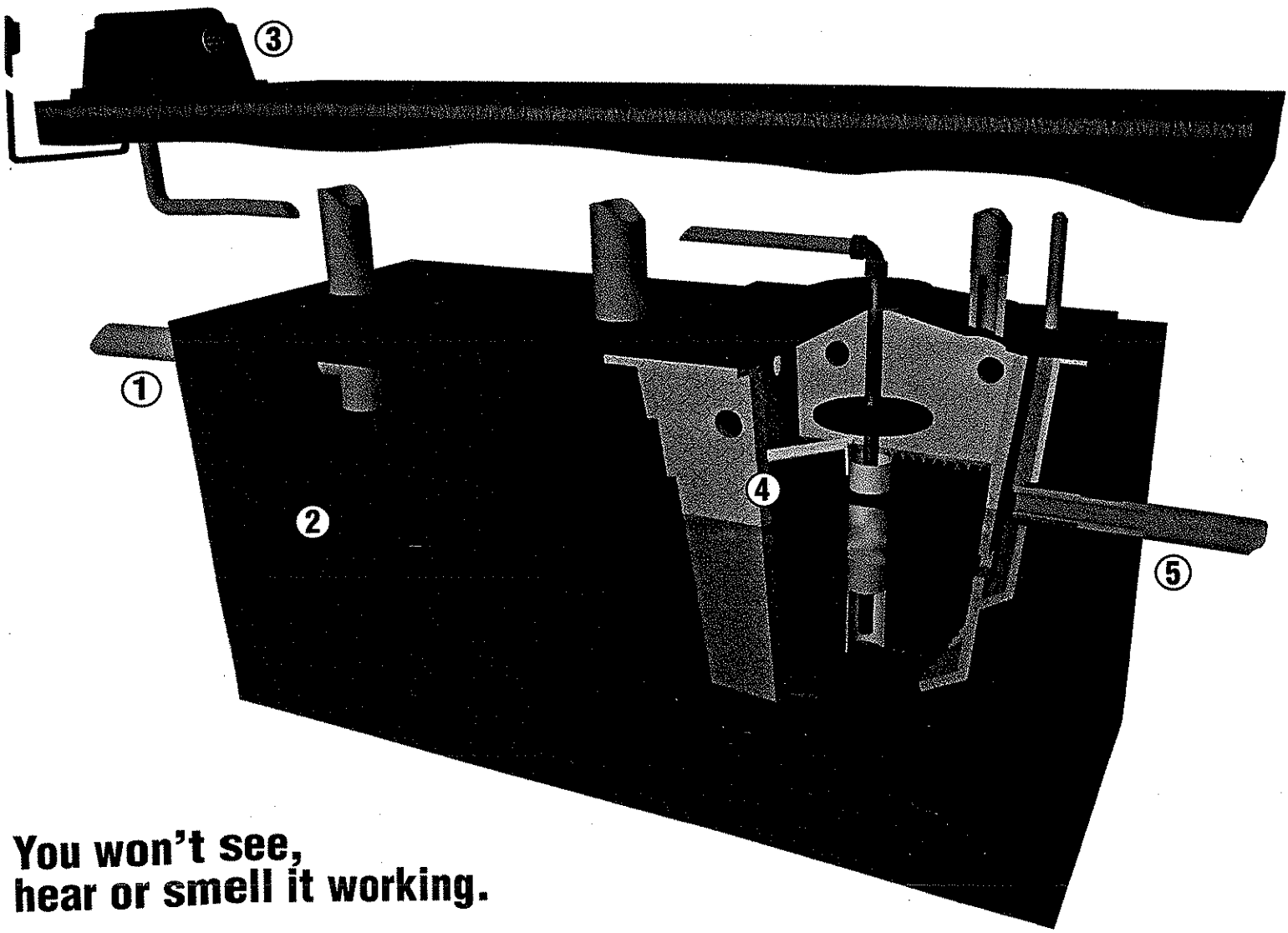
COMPANY: **DonatBerry Design Ltd.**
SITE REF:
LSD: **SE 28-68-13-w4m**
Co. FILE:

DATE: June 11, 2003
DONE BY: K Miller
GOV. FILE:
KENTON FILE: K-1792

gal location of water well: SE 28-68-13-w4m
ndowner, occupant: Wayne Duplessis Phone: 780-689-3639



Introducing FAST® Wastewater Treatment Systems



You won't see, hear or smell it working.

1. FAST® wastewater treatment systems process all the wastewater from single family homes, clusters of homes, small communities or even the high strength wastes from restaurants or commercial facilities.

2. Natural separation and settling processes occur in the first compartment of the underground tank.

3. Remote blower (the system's only moving part) delivers large volumes of air into the heart of the system, creating vigorous water movement. FAST is oxygen-rich and self-cleaning.

4. Proven, reliable FAST treatment module provides the perfect environment for "friendly bacteria" to grow and multiply. FAST consistently processes and removes more than 95% of common impurities. Special patented technology allows exceptional Total Nitrogen reductions (including nitrates) of more than 70%.

5. Clear, odorless treated water is ready for standard or innovative dispersal.