



## **APPENDIX M**

### **CULTURAL HERITAGE RESOURCES BASELINE**

- M-1 Stage 1 Archaeology
- M-2 Stage 2 Archaeology
- M-3 Cultural Heritage Assessment





**APPENDIX M-1**

**STAGE 1 ARCHAEOLOGY**



**WOODLAND HERITAGE SERVICES LIMITED**  
**PUBLIC ARCHAEOLOGICAL REPORT**

*Modified Public Access Report to Protect Known Archaeological Site Locations  
Under the Ontario Heritage Act and Confidential Information Under the Freedom  
of Information and Protection of Privacy Act.*

---

**STAGE 1 ARCHAEOLOGICAL AND CULTURAL HERITAGE RESOURCE ASSESSMENT  
OF THE RAINY RIVER RESOURCES ADVANCED EXPLORATION PROJECT  
NORTHWEST OF FORT FRANCES, RAINY RIVER DISTRICT, ONTARIO**

---

Prepared for

**RAINY RIVER RESOURCES LTD.**  
1111 Victoria Avenue East  
Thunder Bay, Ontario  
Canada P7C 1B7

Attention: Kyle L. Stanfield, P.Eng.  
Director, Environment & Sustainability  
Telephone: 807-623-1540  
Cell: 807-621-6152  
Fax: 807-623-0974  
Email: [kstanfield@rainyriverresources.com](mailto:kstanfield@rainyriverresources.com)

Submitted by

**WOODLAND HERITAGE SERVICES LIMITED**  
17 Wellington Street, Box 2529  
New Liskeard, Ontario  
Canada P0J 1P0

---

June 28, 2012

**WOODLAND HERITAGE SERVICES  
17 Wellington Street, Box 2529  
New Liskeard, Ontario  
Canada P0J 1P0**

May 28, 2012

Rainy River Resources Ltd.  
1111 Victoria Avenue East  
Thunder Bay, Ontario  
Canada P7C 1B7  
Attention: Kyle L. Stanfield, P.Eng.  
Director, Environment & Sustainability

Dear Mr. Stanfield,

RE: Stage 1 Archaeological and Cultural Heritage Resource Assessment of the Rainy River Resources Advanced Exploration Project Northwest of Fort Frances, Rainy River District, Ontario.

---

Please find attached three copies of an Archaeological and Heritage Impact Assessment Report for the above captioned project.

For licence and regulatory purposes, we will be sending additional copies on your behalf to the following Ministry:

Ministry of Tourism, Culture and Sport  
Programs and Services Branch  
401 Bay Street, Suite 1700  
Toronto, Ontario  
Canada M7A 0A7

We were pleased to have assisted you with this project and hope to be of continuing service with your future undertakings.

Yours truly,

WOODLAND HERITAGE SERVICES LIMITED.

**Executive Summary**

This is a modified public access/registry report to protect known archaeological site locations under the Ontario Heritage Act and its Regulations. All sensitive/confidential archaeological site or personal information under the Freedom of Information and Protection of Privacy Act that may be confidential and /or may be classified as sensitive information, such as the location of archaeological sites and information concerning First Nation communities and/or private informants is required by MTCS to be removed from the public or Registry report.

A Stage 1 Archaeological and Cultural Heritage Assessment was carried out for Rainy River Resources on a property approximately 26 km northwest of Emo, Ontario (Figure 1), as part of the Environmental Assessment process prior to the proposed mine development and further advanced exploration work (Figures 2-8). This property is located in the Chapple Township Municipality of Rainy River District.

This Stage 1 Assessment reviewed the historical record, maps, geospatial data and other information sources on the settlement of past peoples (First Nation and European). This information was used in conjunction with the on-ground field observations to develop a map of archaeological potential areas.

Several areas of archaeological potential were identified through this Stage 1 Assessment work. Stage 2 Assessment work is recommended for those archaeological potential areas that face future disturbance through Rainy River Resource's advanced exploration activities and/or the development of a mine site proper. Several areas of disturbance were noted through the fieldwork component of the Stage 1 Assessment. Those areas of deep disturbance do not require future archaeological work; similarly, those areas identified as not having archaeological potential do not require future archaeological or cultural heritage work.

## Table Of Contents

<b>1.0 PROJECT BACKGROUND</b>	
1.1 Development Context .....	1
1.2 Historical Context .....	4
1.3 Archaeological Context .....	13
<b>2.0 STAGE 1 ASSESSMENT REPORT</b>	
2.1 Stage 1 Background Overview .....	15
2.1 Stage 1 Property Inspection.....	15
2.3 Stage 1 Analysis and Conclusions .....	17
2.4 Stage 1 Recommendations .....	19
2.5 Advice on Compliance with Legislation .....	20
<b>3.0 FIGURES (MAPS AND IMAGES)</b> .....	21-39
<b>4.0 REFERENCES</b> .....	40
<b>Appendix 1.</b> Table of GPS Waypoints Collected .....	44
<b>Appendix 2.</b> “Quaternary geology, Fort Frances–Rainy River Area” by A.F. Bajc, 2001 .....	46

## List of Figures

Figure 1. Project location map .....	21
Figure 2. Emergent land during the Lockhart phase of Lake Agassiz .....	22
Figure 3. Emergent land during the Emerson phase of Lake Agassiz .....	22
Figure 4. Confirmed Campbell phase shorelines .....	23
Figure 5. Quaternary geology of the study area .....	24
Figure 6. Complete legend for the quaternary geology map .....	25
Figure 7. Study area showing waypoint locations .....	26
Figure 8. Waypoint map of the western portion of the study area.....	27
Figure 9. Waypoint map of the central / northern portion of the study area .....	28
Figure 10. Waypoint map of the central / southern portion of the study area .....	29
Figure 11. Map showing photograph locations .....	30
Figure 12. Photograph “A” of a former river channel of Lake Agassiz with shoreline .....	31
Figure 13. Photograph “B” of the examination of a pit face for artifacts.....	31
Figure 14. Photograph “C” showing a possible hearth .....	32
Figure 15. Photograph “D” showing the four stone piles .....	32
Figure 16. Photograph “E” showing the four stone piles.....	33
Figure 17. Photograph “F” looking at the Pinewood River .....	33
Figure 18. Photograph “G” showing the interior of an old farmhouse .....	34



---

Figure 19. Photograph "H" of an old road that crosses the Pinewood River.....	34
Figure 20. Photograph "I" of timbers in the river channel.....	35
Figure 21. Photograph "J" of Little Pine Lake looking east .....	35
Figure 22. Photograph "K" of an aggregate pit north of the study area.....	36
Figure 23. Photograph "L" showing a headwaters area .....	36
Figure 24. Photograph "M" showing part of the principal exploration area .....	37
Figure 25. Photograph "N" of an outcropping area in the exploration area .....	37
Figure 26. Photograph "O" looking towards the Pinewood River south .....	38
Figure 27. Photograph "P" of domestic farming refuse in field .....	38
Figure 28. Photograph "Q" showing abandoned pioneer buildings north of Dearlock.....	39

---

*It should be noted that this report is in a format prescribed by regulations under the Ministry of Tourism, Culture and Sport (MTCS) Standards and Guidelines.*

*The report has been generated for Rainy River Resources for the explicit purposes defined in the Executive Summary. The modification or publication of this report is not permitted without prior written agreement from Woodland Heritage Services. While this document is believed to contain correct information, neither Woodland Heritage Services nor its affiliates makes any warranty, either expressed or implied, or assumes any legal responsibility for the completeness or usefulness of any results or any information disclosed. The interpretation of this and any other data related to this report is solely the responsibility of the client.*

*Some information in the overall reporting documents to the MTCS may be confidential and may be classified as sensitive information, such as the location of archaeological sites and information concerning First Nation communities and/or private informants. The Freedom of Information and Protection of Privacy Act and the Ontario Heritage Act regulations require that this information be kept secure and not be distributed to unauthorized parties. Therefore the MTCS requires the removal of all sensitive/confidential archaeological site or personal information from the report.*

---

## 1.0 STAGE 1 PROJECT BACKGROUND

---

*This section of the project report provides the context for the archaeological fieldwork. The project background section covers three areas: development context, historical context and archaeological context.*

### **1.1 Development context**

Archaeological and cultural heritage field work was required by the Ministry of Tourism, Culture and Sport (MTCS) as part of the overall Environmental Assessment process, prior to the development of Rainy River Resources advanced mineral exploration project and associated infrastructure. The archaeological field work was performed in advance of any new ground-disturbing activities.

#### 1.1.1. Description of the Development Project

The following company information was drawn from online sources at:

<http://www.rainyriverresources.com>.

Rainy River Resources Ltd. is a Canadian precious metals exploration company whose key asset is the Rainy River Gold Project (RRGP), a large gold system centred in Chapple Township, approximately 65 kilometres northwest of Fort Frances, Ontario (Figure 1). As of September 30, 2011, the Company had \$115 million in cash and securities, and is well funded for its 2012 plans to: 1) commence a feasibility level study on the RRGP; 2) continue growing the existing resource through exploration; 3) conduct a condemnation program in areas identified for potential mine facilities; and 4) continue regional exploration. RRGP is very well located in the southwestern corner of northern Ontario, near the U.S. border. It is accessed by a network of roads and is close to hydro-electric infrastructure. The Rainy River district has a skilled labour force and is one of the lowest-cost areas for mineral exploration and development in Canada.

Exploration at the RRGP started as early as 1967, with Noranda, International Nickel Corporation of Canada, Hudson's Bay Exploration and Development and Mingold Resources

having operations in the area until 1989. On two occasions, in 1971 and 1987-88, the Ontario Geological Survey conducted geological mapping in conjunction with a rotasonic overburden drilling program. Nuinsco engaged in exploration from 1990 until 2004. Rainy River Resources Ltd. acquired a 100% interest in the project from Nuinsco in June 2005.

Woodland Heritage Services Limited received permission to enter the relevant properties in the study area in order to perform all activities related to a Stage 1 Archaeological and Cultural Heritage Resource Assessment.

### 1.1.2. Regulatory Context

This Stage 1 Archaeological and Cultural Heritage Resource Assessment was undertaken within the context of the Environmental Assessment process, under the Environmental Assessment Act, R.S.O. 1990, CHAPTER E.18. The role of cultural heritage and archaeology within this Act is indicated through the definition of "Environment" in Section 1(c) and (d):

- (c) the social, economic and cultural conditions that influence the life of humans or a community,
- (d) any building, structure, machine or other device or thing made by humans,

Given this inclusion of cultural heritage and archaeology within the definition of "Environment," it follows that Archaeological and Cultural Heritage Assessments are part of a suite of studies that must be carried out to fulfil the conditions of the Environment Assessment.

Archaeological and Cultural Heritage Resource Assessment studies are classified as Stage 1 through Stage 4, as follows:

- **Stage 1:** Preliminary assessment to determine if there are any known significant archaeological resources in the immediate vicinity of or on the subject property and the potential of the site to have heritage resources.

- **Stage 2:** Completion of a property inspection by a licensed archaeologist if the Stage 1 assessment identified known resources or the presence of archaeological potential areas, if recommended.
  
- **Stages 3 and 4:** Advanced site-specific archaeological mitigation through excavation, documentation or avoidance, if recommended.

Under the Ontario Heritage Act, R.S.O. 1990, anyone wishing to carry out archaeological fieldwork in Ontario must meet the following criteria:

- Have a licence from the Ministry of Tourism, Culture and Sport.
- File a report with the Ministry of Tourism, Culture and Sport containing details of the fieldwork that has been done for each project.
- File information about all newly discovered or revisited archaeological sites with the Ministry of Tourism, Culture and Sport for each project.

Under Ontario Regulation 8/06 of the Ontario Heritage Act, “consultant archaeologist” means “an archaeologist who enters into an agreement with a client to carry out or supervise archaeological fieldwork on behalf of the client, produce reports for or on behalf of the client and provide technical advice to the client.”

Refer to Sub-section 2.4 of this report titled “Advice on compliance with legislation” for more information.

## **1.2 Historical context**

### 1.2.1 First Nation Historical Overview

Archaeologists generally divide northwestern Ontario's cultural prehistory into the following generalized temporal/cultural sequences;

Late Palaeo (circa 9000 – 6000 BC)  
Shield Archaic (circa 6000 - 500 BC)  
Middle Woodland (circa 500 BC – 1200 AD)  
Late Woodland (circa AD 1200 - 1600 AD)  
Historic (circa AD 1600 - present)

### First Nation Ancestors

Approximately six thousand years ago, following the last glaciation, the climate changed drastically from a colder temperature to one warmer than present temperature. This allowed the Great Lakes-St. Lawrence hardwood forest to cover all of the Rainy River area. During these changing times, the ancestors of the various present day First Nation peoples were living throughout the region. These early Aboriginal peoples are called Archaic Cultures by archaeologists. They were big game hunters who used large spear points, and also mined deposits for flint, chert, quartzite and copper in order to make stone and metal tools. Some of these were traded as part of an extensive trade network already developed 6,000 years ago throughout North America.

Aboriginal cultures (like all cultures worldwide) were continually changing and evolving. In the Rainy River area, the development of new technology such as the spear thrower (atlatl), bow and arrow, fired clay pots and new stone-working techniques resulted in a change in material culture and lifestyles. In this era, Middle and Late Woodland peoples utilized smaller stone tools and may have had a more diversified economy based on a broader range of plant and animal resources. Contact between groups and a sophisticated trade network were well established.

Middle Woodland cultures were the predecessors of the Late Woodland cultures, who are the direct ancestors of the First Nation peoples. These ancestors had a complex and well-organized society. Archaeological evidence indicates they had invented superior ways of making both fired clay pots with their own distinctive designs and smaller more powerful weapons.

Anthropologists and tribal Elders indicate that semi-autonomous bands shared a common

community for the summer, gathering in the spring for ceremonies and fish spawning runs, then dispersing into smaller units for the winter.

Land use patterns were based on an economy of fishing, hunting, gathering, trapping, harvesting of wild rice and some horticulture. During the summer, fishing was supplemented by a simple form of agriculture. Fields were cleared by burning, then corn, beans, squash, and later European-introduced peas, were grown.

In the eighteenth century, French Canadian traders moved west, trading with the Aboriginal hunters and trappers in the vicinity of Lake Superior. Following the War of 1812, Fort Frances—named after Lady Frances Simpson, wife of then Hudson's Bay Company Governor George Simpson—was established as an important HBC trading post (c. 1817).

Ethnographers have documented agricultural production among the Anishinabe for the purpose of selling produce to fur traders; the signing of Treaty No. 3 included promised of federal farming assistance for First Nation; however, Canada prohibited unregulated sales of Aboriginal produce in 1881 and agricultural production had ceased throughout the area by the early twentieth century (Waisberg & Holzkamm 1993).

Researchers have also indicated the significance of sturgeon fisheries to Ojibwa subsistence and commerce during the fur trade era. In particular, a product called isinglass made from the air bladder of sturgeon fish was highly prized in European markets, though overfishing by non-Native commercial fisheries in the twentieth century depleted this resource (Holzkamm, Lytwyn & Waisberg 2008).

The Saulteaux Ojibwa people spoke a dialect of the wider "Algonkian" language shared by other Anishinabe peoples, such as the Cree, Montagnais and Algonquins. Twentieth-century studies show the Saulteaux Ojibwa shared a belief system common to other Anishinabe peoples

including belief in a supreme being, shamanism, the shaking tent ceremony and the dream vision quest. In short, the beliefs reflected “the world view of a hunting-fishing people” (Day 1978:796). According to the nineteenth-century Ojibwa historian, Peter Jones, there was no supreme chief over the Ojibwa and Algonquin; each band had its own chiefs and retained possession of its own territories (Jones 1861:39, 106-114). This observation was confirmed in 1849 by Alexander Vidal and T.G. Anderson, commissioners appointed by the Government of Canada to investigate Indian claims to lands on northern Lakes Huron and Superior:

Long established custom, which among these uncivilized tribes is as binding in its obligations as Law in a civilized nation, has divided this territory among several bands each independent of the others; having its own chief or chiefs, and possessing an exclusive right to, and control over, its own hunting grounds; the limits of these grounds, especially their frontages on the Lakes, area generally well known and acknowledged by neighboring bands. (Vidal and Anderson 1849:5)

#### *Brief History of the First Nations in the Rainy River Study Area*

The Saulteaux Ojibwa people inhabited an area located between the former Minnesota territory, Fort Garry (Winnipeg) and Fort William (Thunder Bay). In 1859-1869, the Anishinabe inhabitants of the area negotiated with surveyors to allow British passage through the region as part of the “Dawson route” (referring to surveyor Simon James Dawson) connecting Lake Superior to Red River. The Ontario portion of this region was subsequently covered by the Northwest Angle Treaty of 1873, or Treaty No. 3.

The First Nation communities associated with the study area belong to a tribal council comprised of seven member nations called the Pwi-Di-Goo-Zing Ne-Yaa-Zhing Advisory Services, established in April 1998. The First Nations are: Naicatchewenin First Nation, Rainy River First Nations, Couchiching First Nation, Lac La Croix First Nation, Nicickousemenecaning First Nation, Seine River First Nation, and Stanjikoming First Nation. One representative from each of the member Nations forms the Board of Directors that governs this Council. The Tribal Council is, in turn, a member of the Grand Council of Treaty 3.

A second regional governing body within the Rainy River District is the Fort Frances Chiefs Secretariat. The Chiefs of the seven nations within the District (the same seven nations which comprise the Pwi-Di-Goo-Zing Ne-Yaa-Zhing Advisory Services) work as a collective authority to represent the Anishinabe peoples of the region (Fort Frances Chiefs Secretariat 2011). Some of its specific areas of focus are policing, education, and health services.

Two additional First Nation communities in the study area are the Anishnaabeg of Naongashiing First Nation and the Big Grassy First Nation. The tribal council in which these communities are members is called the Anishinaabeg of Kabapikotawangag Resource Council Inc.

The following subsections provide a brief account for each of the above nine First Nation communities associated with the study area.

*Information used in the summaries below was taken in part from "Akwasasne to Wunnumin Lake: Profiles of Aboriginal Communities in Ontario" (Ontario Native Affairs Secretariat and Ministry of Citizenship, 1992) and updated to 2012 where applicable with data from the Aboriginal Affairs and Northern Development Canada website (<http://www.aadnc-aandc.gc.ca>) and First Nation official websites.*

### **Rainy River First Nations**

The main reserve land of Rainy River First Nations, the Manitou Rapids Indian Reserve (I.R.) No. 11, was first surveyed in 1876 and was confirmed in 1915 by the Ontario government. Manitou Rapids I.R. No. 11 is located 39 km west of Fort Frances and reported an on-site population in 2006 of 228 individuals. Rainy River First Nations include former members of the Little Forks, Long Sault and Hungry Hall Bands, whose reserves were surrendered in 1915. In 2005, Rainy River First Nations made a historic land claim agreement with the Ontario and Canada governments to resolve the grievance associated with the surrendered land, which included \$71 million in compensation and increased reserve lands. Since 1993, Rainy River First Nations have operated a sturgeon hatchery. The Rainy River First Nations established in 1998 both its Watershed Program, an environmental stewardship initiative, and the world-class Kay-Nah-Chi-



Wah-Nung Cultural Interpretive Centre (see <http://rainyriver.firstnation.ca/watershed> and <http://www.manitoumounds.com/Kay-Nah-Chi-Wah-Nung/kncwn.html>).

### **Naicatchewenin First Nation**

The Naicatchewenin First Nation (aka Anishinaabeg of Nagaajiwanaang) reserve areas were first surveyed in 1878 as part of Treaty No. 3, and later confirmed by the Ontario government in 1915. Nagaajiwanaang (meaning “at the place where the current is obstructed”) is located approximately 60 km northwest of Fort Frances, with the community of Devlin 50 km to the south on Highway 17. It is composed of three land areas (Rainy Lake Indian Reserve No. 17A and 17B & Agency 1) totalling 2500 hectares and reported an on-reserve population of 279 individuals as of January 2012. It shares Agency 1 reserve lands with Couchiching First Nation, Stanjikoming First Nation and Nicickousemenecaning First Nation.

### **Couchiching First Nation**

Chief Mikiseesis (“Little Eagle” of the Rainy Lake Band) was signatory to Treaty No. 3 on October 3, 1873. Upon recommendation from area Chiefs, on September 12<sup>th</sup>, 1875, an adhesion to Treaty No. 3 was signed between the federal government and the Métis people of Rainy Lake and Rainy River who were designated Couchiching I.R. No. 16A for their settlement. In 1967, the 16A reserve was amalgamated with the Rainy Lake band, and the Couchiching Reserve was established on the site of a former Indian agency. Consequently, First Nation members include the descendants of local Métis who were absorbed into the Little Eagle/Rainy Lake Band and are now part of the Couchiching First Nation. All members of Couchiching First Nation are “Status Indians” under the Indian Act (see Couchiching First Nation web site at: <http://www.couchiching.ca/page4/page4.html>). The Couchiching First Nation reported an on-reserve population of 650 in 2012. It shares Agency 1 reserve lands with Stanjikoming First Nation, Naicatchewenin First Nation and Nicickousemenecaning First Nation.

### **Lac La Croix First Nation**

The traditional name of the area inhabited by the Lac La Croix First Nation was Zhingwaako Zaaga'igan or "Lake of the Pines"—a "reference to the pines that surround the lake and are believed to provide protection to the community." According to the First Nation's web site, the pine played "a significant role in the overall cultural practices, especially during times of harvesting fish and game for spring and fall feasts. This traditional process also includes honouring the spirits and the spiritual connection of Zhingwaako Zaaga'igan with expressions of gratitude and respect for the protection they provide" (Lake La Croix First Nation website: <http://llcfn.ca/>). The pine continues to have great significance for the community.

In 1910, the band moved from an Indian settlement at Kawa Bay to a reserve at Neguaguon Lake I.R. No. 25D, approximately 95 km east of Fort Frances. Quetico Provincial Park was created by the Ontario government in 1913, but contained within its boundaries were Sturgeon Lake I.R. No. 24C and Lac La Croix I.R. No. 25D. In 1950, the land identified as Sturgeon Lake I.R. No. 24C became, by Regulation under the *Ontario Provincial Park Act*, part of Quetico Provincial Park, leaving only the Lac La Croix reserve (now Neguaguon Lake I.R. No. 25D). Lac La Croix First Nation reported an on-reserve population of 293 individuals in 2012.

### **Nicickousemenecaning First Nation**

Following Treaty No. 3 negotiations, Rainy Lake I.R. No. 26A was first surveyed in 1878 and confirmed by the Ontario government on April 7, 1915. The on-reserve population in 2012 was 146 individuals. The First Nation was renamed Nigigoonsiminikaaning, meaning "place abundant with little-otter berries." It shares Agency 1 reserve lands with Couchiching First Nation, Naicatchewenin First Nation, and Stanijikoming First Nation.

### **Seine River First Nation**

The Band surrendered some of its reserve land in 1888, and the reserves Seine River I.R. No. 23A and 23B were later confirmed by the Ontario government in 1915. The on-reserve population in 2012 was 325 individuals.

**Stanjikoming First Nation**

In 1989, the Stanjikoming First Nation relocated its community to a site on the western shore of Rainy Lake roughly 16 km north of Fort Frances. The new location was chosen for the purpose of linking the community by road to nearby centres. Some community members live seasonally on Rainy Lake I.R. No. 18C, while others live on more accessible reserves and in non-Native communities. In 2009, the name was officially changed to Mitaanjigaming First Nation. It shares Agency 1 reserve lands with Couchiching First Nation, Naicatchewenin First Nation and Nicickousemenecaning First Nation. The on-reserve population as of 2012 was 99 individuals.

According to the community's web site, the traditional name for the area was "Mitang." The formerly shallow Stanjikoming Bay, into which the Rainy River flows, was known as a manomin (wild rice) feeding area, approximately five miles by three miles in size, and was rich with muskrat, ducks, geese and other fowl. When the Fort Frances dam was built for the paper mill in 1909, the water rose and flooded the area, preventing the growth of rice (see [http://www.7generations.org/About Us/Stanjikoming.html](http://www.7generations.org/About%20Us/Stanjikoming.html)).

**Big Grassy River First Nation**

Big Grassy First Nation achieved legal band status in 1964 when the Assagaska Band split into the Big Grassy First Nation (aka Mishkosiminiziibiing First Nation) and Ojibways of Onigaming First Nation. The community is located on the shores of Lake of the Woods on the Big Grassy I.R. No. 35G. The Big Grassy First Nation has entered into an Alternative Funding Arrangement (AFA) with the federal government in a move towards achieving self-government. The on-reserve population in 2012 was comprised of 228 individuals.

**Anishnaabeg of Naongashiing First Nation**

The Anishinaabeg of Naongashiing people traditionally lived on the south edge of the Aulneau Peninsula located in Lake of the Woods. Formerly called the Big Island First Nation, the community was granted legal band status in the mid-1920s. In the 1950's the band relocated to

a site on the mainland where highway access was possible (see the Anishnaabeg of Naongashiing First Nation website: <http://www.bigisland.ca/>). The Saug-A-Gaw-Sing I.R. No. 1 reserve on the southeast shore of Lake of the Woods was officially established in July 1981. Big Island purchased its present reserve land from private landowners in 1984 and runs a large commercial fishery. The First Nation has also made an AFA agreement with the federal government in a move towards achieving self-government. The on-reserve population in 2012 totalled 158 individuals.

#### 1.2.2. Land Use and Settlement History - Emo and Rainy River, Ontario

According to G.L. Nute's history of Rainy River country and the "boundary waters" that form the Minnesota-Ontario border country, the French fur trader Jacques de Noyons was the first European to traverse the area in 1688. Only a century later, in the 1770s, did the Hudson's Bay Company send traders inland to compete with the North West Company for the rich stores of furs northwest of Lake Superior.

In 1731, Pierre Gaultier, sieur de la Vérendrye, in search of a northwest passage, applied to the governor of New France who was authorized by the king of France to grant permission for La Vérendrye, who managed a trading post on Lake Nipigon, to explore the region between Lake Superior and Lake of the Woods and be given a monopoly on the furs traded in that region. La Vérendrye's expedition in search of the "Sea of the West" relied on information and a map provided by a First Nation trader name Auchagah. In 1731, Charles Dufrost, the nephew of La Vérendrye, proceeded to Lac La Pluie or Rainy Lake and established Fort St. Pierre (later the HBC post Fort Frances), while La Vérendrye established Fort St. Charles on Lake of the Woods in 1732. Nute (1950:10) mentions the existence of minor posts—one on Crane Lake and another on Ball Lake near present day Kenora—located along a "back" route north of the Rainy River. Following the French defeat in the Seven Years' War (1756-1763), British traders and surveyors advanced up Lake Superior to Lake of the Woods. Alexander MacKenzie surveyed the Rainy River in 1801 and commented, "This is one of the finest rivers in the North-West" (*The Rainy River Record*, July 6, 1994: <http://www.fftimes.com/100-years-100-stories/rrhistory.html>).

Throughout the 1800s, the British government granted land for settlers to establish homesteads along the length of the Rainy River. Prior to the building of the rail lines, the river was the main transportation route.

The Township of Emo was incorporated on July 1, 1899, named after a village in Ireland close to where the first reeve, Alexander Luttrell, was born. Emo was settled by pioneers who were granted free homesteads. Emo today is located a 20-minute drive west of Fort Frances and a 30-minute drive east of Rainy River. Its population in 2006 was 1,305.

(<http://www.twspemo.on.ca/history.html>)

The Town of Rainy River was incorporated on December 9, 1903. It was originally developed on the site of a lumber mill established in 1895 (purchased by the Beaver Mills Lumber Company in 1898). The growing community and lumber industry were further supported by the Ontario and Rainy River Railway built through the town in 1901 (later absorbed by the Canadian Northern Railway and then the CNR). In 1910, a forest fire originating in northern Minnesota burned most of the town. The mill relocated, and the local population decreased from 4500 to its current level of approximately 1000 inhabitants. In 1960, a bridge between the Baudette, Minnesota and Rainy River, Ontario was opened. As with Emo, the local economy is today primarily supported by hunting and fishing tourism (<http://www.rainyriver.ca>).

The Township Municipality of Chapple comprises nine townships (including Richardson Township, where the project development will be located) and the villages of Barwick and Black Hawk. Named after Thomas William Chapple, a former Ontario MPP and judge in Rainy River District, the township was incorporated in 1899 and reported a population of 856 individuals in 2006. The Chapple Museum, overseen by a former Reeve, is located in Barwick and contains old municipal records, pictures of original homesteaders and artifacts relevant to local history.

### **1.3 Archaeological context**

#### 1.3.1. Summary of Registered/Known Archaeological Sites

Before initiation of fieldwork, the site files and catalogued reports at Woodland Heritage Services Limited and the offices of the Archaeological Data Coordinator, Ministry of Tourism, Culture and Sport were checked to determine if any pre-contact or historic archaeological sites had been previously recorded either in or near the study area.

Two registered sites are located within 15 kilometres of the study area, DeKm-1 and DeKn-2.

#### 1.3.2. Current Land Use(s), Field Conditions, Soils and Topography

The lands directly associated with the property in question have been and continue to be used for farming, mining, forestry and recreation activities. The principal area of mineral exploration is patent land and was previously farmed. The soils in the area range from medium/fine sand/silt to bedrock knobs and clay (Northern Ontario Engineering Geology Terrain Study). The Pinewood River, a small tributary of the Rainy River, traverses the study area.

#### 1.3.3. Field Work Schedule

Fieldwork was carried out October 17-21, 2011.

#### 1.3.4. Past Fieldwork

Previous field work has been conducted for the principal exploration area of the Rainy River Resources project development by Ross Archaeological Research Associates in the late fall of 2010. They carried out a Stage 1 assessment, which was accepted by way of letter, into the public registry of archaeological reports. There is no known record of other archaeological fieldwork being carried out for the current study area.

#### 1.3.5. Physical Features Affecting Fieldwork Strategy

This area has been investigated quite extensively by surficial geologists as the quaternary geology of the Rainy River area has left several relict features of the Glacial Lake Agassiz. Two prominent lake phase shorelines are preserved within the study area (the Lockhart and the Emerson), and a third is present, but is somewhat more ephemeral. All three stable water phases represented in the geological record have the potential for hosting archaeological sites and/or associated burials.

Appendix 2 contains an excerpt from the original text of the Ontario Geological Society's "Quaternary Geology of the Fort Frances – Rainy River Area" by A.F. Bajc (2001). This resource informed the archaeologists' fieldwork decisions to survey areas of potential associated with former shorelines, as described in detail in Section 2 of this report.

---

## 2.0 STAGE 1 ASSESSMENT REPORT

---

### 2.1 Stage 1 Background Overview

The results of the Stage 1 background study are provided in detail in Section 1.0 of this report. It was determined that a property inspection would be carried out as part of the Stage 1 assessment. One objective of this fieldwork was to investigate the early pioneer settlements in the Black Hawk and Dearlock areas, as well as areas to the north of Marrs Road. The second objective of this work was to investigate the pre-contact archaeological potential along the current waterways and the former shorelines of glacial Lake Agassiz.

### 2.2 Stage 1 Property Inspection

Woodland Heritage Services undertook a ground-based Stage 1 field assessment and survey of areas associated with the proposed development of the Rainy River Resources gold mine in Chapple Township.

During the visit we were unable to carry out on-ground inspections on some of the areas as permissions had not yet been established. However, we were able to field check a representative sample of topography and landforms (see 2.2.1-5) in accordance with Stage 1 assessment guidelines. The remaining areas will need to be inspected during future Stage 2 assessment work.

2.2.1. On October 18, 2011, staff members of Rainy River Resources, the Fort Francis Chiefs Secretariat and Woodland Heritage Services met to investigate a potential former shoreline of Lake Agassiz. This appeared from Highway 600 as an aggregate pit used for farming activities. Upon inspection, it was a silt deposit instead of the washed and sorted sand and gravel deposits that would indicate a former shoreline. Regardless, a thorough inspection of the area was carried out, and it was determined that the calcareous clasts found in the soils of this pit relate to one of the major sediment depositions of the life of Lake Agassiz, likely the infilling of Agassiz



nearing the end of the Moorehead phase. It too was noticed that the area would have been a river of Agassiz's in the past, and that the area where we were could have been a dry shore and inhabited at one time. We then made efforts to locate any sand/gravel deposits we could find and take several positional readings to establish ground control points that could be used to recreate the former shorelines.

Later on, we set out to investigate some of the early farmsteads and former roads in the area. One farmstead dwelling that was still standing was located (Figure 28).

2.2.2. To the east of Marrs Road at GPS Waypoint (WP) 315, a former hearth area was discovered, and at WP 314, four piles of stones in the shape of a square were located (Figures 15-16). Each of these piles had a hollow in the middle that appeared to once support a post. It seems likely that these piles were used as support for a superstructure; however, no evidence of the super structure could be found. Additionally a tree stand for hunting was located at WP 316.

2.2.3. Heading north of Sheppard Road, an early farmstead was located on the east side of the road at WP 322 (Figure 18). This farmstead consisted of a house, former fields and several outbuildings. Future work will address the pioneer settlement of the study area.

2.2.4. In a former field/pasture, a midden of cans and bottles was located among a pile of rocks likely collected from the former field. The remains include a milk jug, bottle glass and several small food cans. This area is located at Waypoint 457 (Figure 27).

2.2.5. North of Dearlock is an area that meets the physical description of a former shoreline of Lake Agassiz. It has characteristic wave-washed rocks and sediment removal from the base of a small rocky hill, as well as sand deposited on both the north and south sides of this small hill. A recent comparison of the latest surficial geology maps to this information resulted in a positive

correlation. From this information a more detailed map of the Agassiz shoreline was constructed to represent the Lockhart phase of Lake Agassiz.

## **2.3 Stage 1 Analysis and Conclusions**

### 2.3.1. Areas of Archaeological Potential

Several different areas of archaeological potential are represented within the Rainy River Resources study area. Generally, three different periods are reflected by the areas of archaeological potential: 1) the late Palaeo-Indian period associated with glacial lake features; 2) the pre-contact and early historic period involving use of the waterways for travel and trade; and 3) the historic period and pioneer settlement of the area. As the waterways in the study area were limited in size, the areas of potential discussed below focus on the presence of ancient glacial lake shorelines and pioneer dwellings.

#### Lake Agassiz Shorelines

A geographic information system was used to reconstruct the original shorelines of the two primary Lake Agassiz phases in the study area, the Lockhart and Emerson Phases. A high resolution LiDar, flown by RRR, was provided to us as a point cloud in order to be able to visualize the shorelines, both accreted and wave cut. This LiDar was also post-processed to show the bare earth—necessary to locate shorelines in wooded areas. Then research into the direction and degree of uplift was carried out and, through Bajc's work (2001), we were able to establish that in the study area the direction of maximum uplift occurred at N30°E with a rise of 39 cm per km. Using this information, a grid was developed perpendicular to the direction of maximum uplift at 1 km intervals. The attributes were edited to reflect the uplift along these lines. The grid was then edited to remove the perpendicular lines, and the remaining lines were converted to points. An interpolation technique was used to convert the series of lines into a raster grid with a 1 metre cell size, with all values calculated for those areas without assigned elevation values. This process assumes a fairly uniform uplift across the study area that equalled nearly a 10 metre difference between the southwest and northeast corners. Finally, in

order to recreate the Lake Agassiz shorelines, the raster grid values were subtracted from the LiDar derived Digital Elevation Model (DEM). This allowed us to re-create the shorelines more accurately. This process represents the best efforts at accurately mapping the ancient shorelines, but it is not fail proof.

The result is a dataset that is flexible and will be honed by future on-ground confirmations of shoreline features. Figure 4 shows the confirmed wave cut shorelines identified through the LiDar analysis. These represent wave cut Campbell shorelines of the Emerson Phase.

### Pioneer Homesteads

An analysis of the orthophotos and LiDar was carried out in order to try to establish the location of what may be pioneer homesteads. The high resolution orthophotography at times was able to show the state of these former/current dwellings. Below is a list of the UTM coordinates of what appears to be remains of former dwellings. Future Stage 2 work should confirm/analyze these remains through on-ground inspection.

### 2.1.2. Areas of Disturbance

Many areas have been subjected to extensive and deep land alternations from the construction of the buildings, roads and their related drainage features, farm infrastructure and former exploration work. The principal areas of exploration, to the south and west of Highway 600 near Roen Road, have incurred substantial disturbance through the historic exploration of the property. As this area is sufficiently far from water, it did not represent an area of archaeological potential in the post-Agassiz pre-contact period. One area would have been exposed during the Emerson phase of Lake Agassiz, appearing as an island, but this area had been subject to a high level of disturbance. The on-ground inspection of this area did not reveal any areas of sand/gravel deposits, nor did it reveal any cultural deposits. Future Stage 2 work should examine the shorelines of the Emerson phase to ensure no cultural resources are going to be impacted.

### **2.4 Stage 1 Recommendations**

It is recommended that Rainy River Resources be allowed to proceed with their ongoing exploration work on area mineral claims the Company holds.

A previous report was filed by Ross Archaeological Research Associates (Ross 2011), that includes part of the area assessed (Figure 1), for which a letter has been issued by the Ministry of Tourism, Culture and Sport accepting the report into the public registry of archaeological reports.

As recommended in the Ross report, it is also recommended in this report that those development areas (such as a new road, bridge or crossing) within 50 metres of any primary water sources i.e., waters passable by canoe such as the Pinewood River be subject to a Stage 2 Archaeological and Cultural Heritage Resource Assessment.

Also, as first recommended in the Ross report, it is further recommended that where future development is planned for areas within 150 metres of identifiable high potential sections of former Lake Agassiz shorelines, then those areas should also be subject to Stage 2 archaeological field assessment work consisting first of a visual inspection to confirm the shoreline and followed where warranted by subsurface testing. These ancient shoreline areas have been mapped from LIDAR and some examples are given in this report (see Figure 4).

Finally, it is recommended that the early pioneer homestead /former farmhouse foundations or ruins and former infrastructure areas (see Table 2 for a preliminary list) be subject where possible to a Stage 2 Archaeological and Cultural Heritage Resource Assessment.

It is also recommended that the archaeological and cultural heritage concerns be removed for all remaining portions of the overall study area that do not have high archaeological potential.

For more detailed information concerning Stage 2 Assessment work, please refer to the 2011 Standards and Guidelines for consultant archaeologists which is available through the Ministry of Tourism, Culture and Sport's website.

### **2.5 Advice on compliance with legislation**

*Advice on compliance with legislation is not part of the archaeological record. However, for the benefit of the proponent and approval authority in the land use planning and development process, the report must include the following standard statements:*

a. This report is submitted to the Ministry of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c. 0.18. The report is reviewed to ensure that the licensed consultant archaeologist has met the terms and conditions of their archaeological licence, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario.

b. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Sec. 48 (1) of the Ontario Heritage Act.

c. The Cemeteries Act requires that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ontario Ministry of Consumer Services.

\*Reports recommending further archaeological fieldwork or protection for one or more archaeological sites must include the following standard statement: 'Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48

(1) of the Ontario Heritage Act and may not be altered, or have artifacts removed, except by a person holding an archaeological licence’.

**3.0 Figures (Maps and Images)** On following pages.

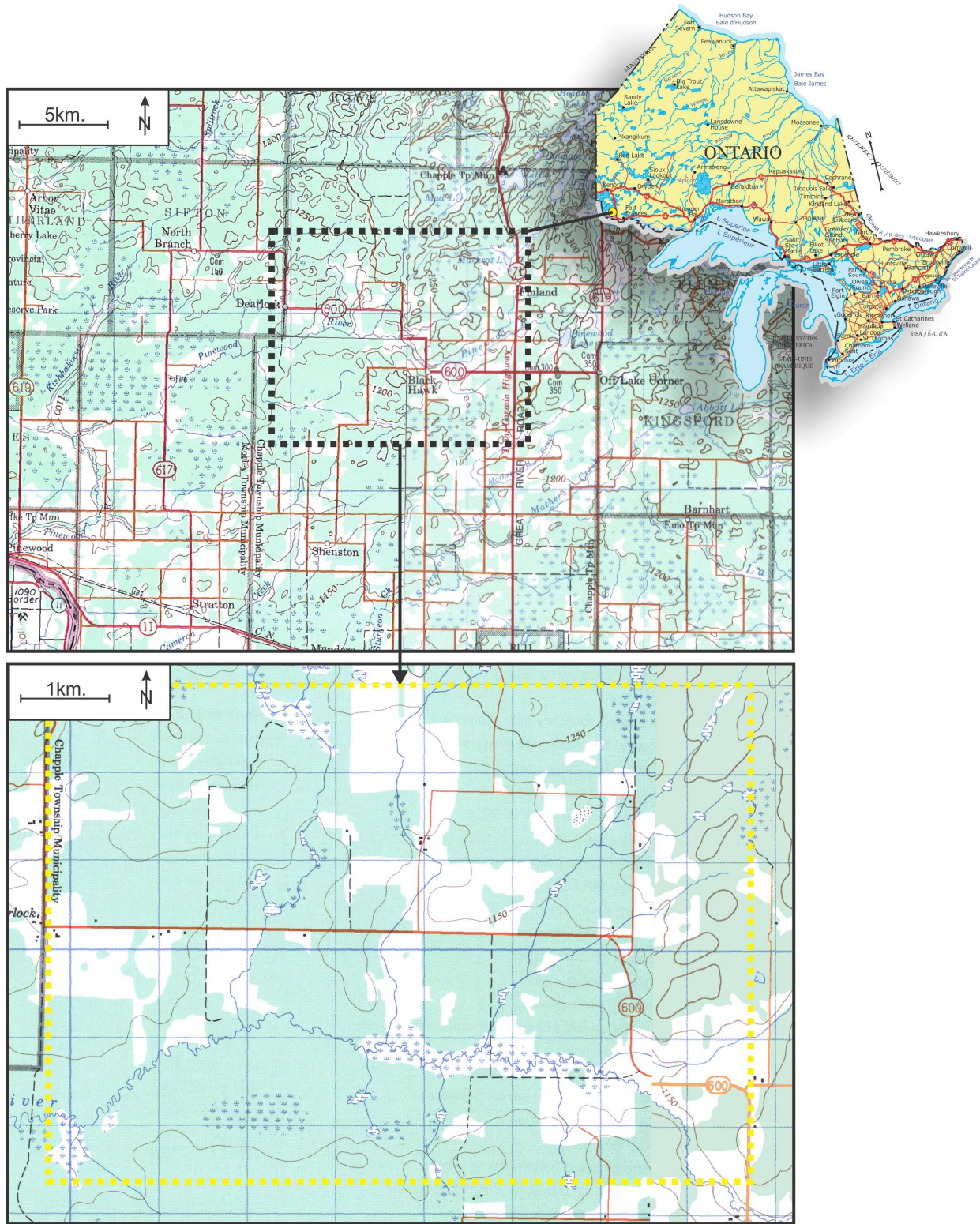


Figure 1. Project Location Map.

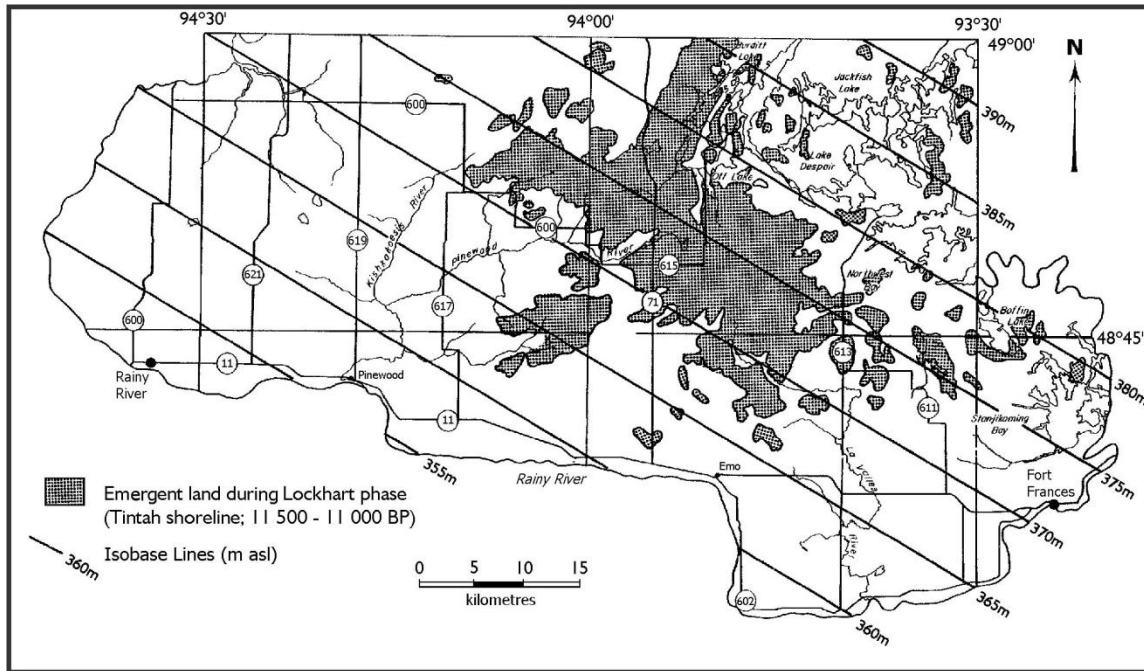


Figure 2. Emergent land during the Lockhart phase of Lake Agassiz (Bajc, 2001)

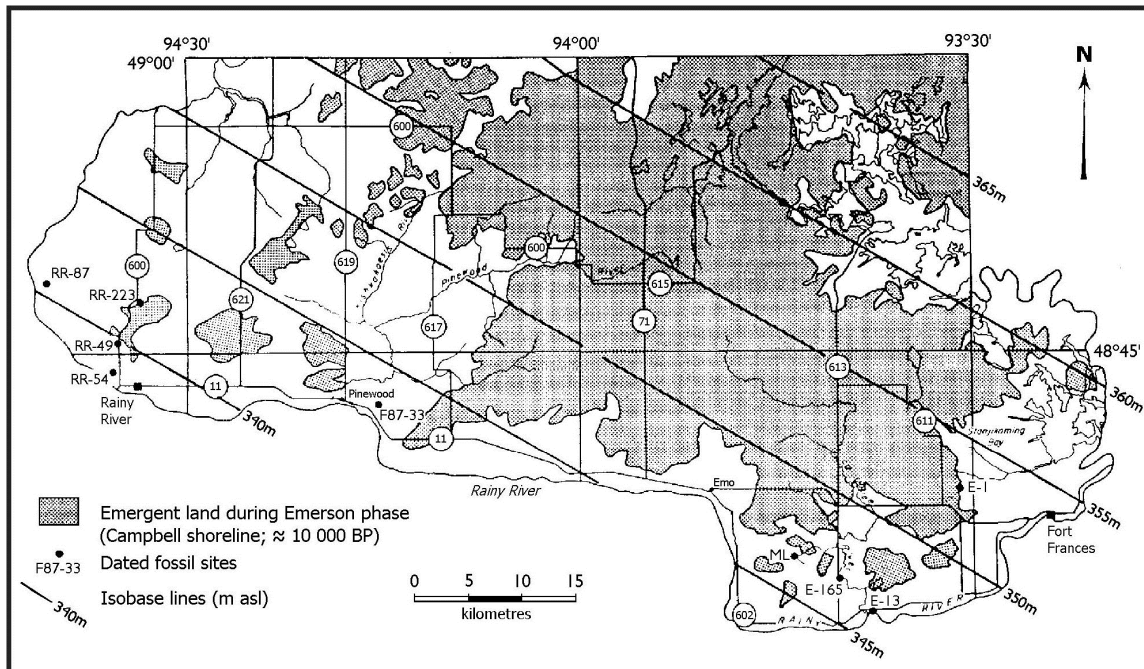


Figure 3. Emergent land during the Emerson phase of Lake Agassiz (Bajc, 2001).



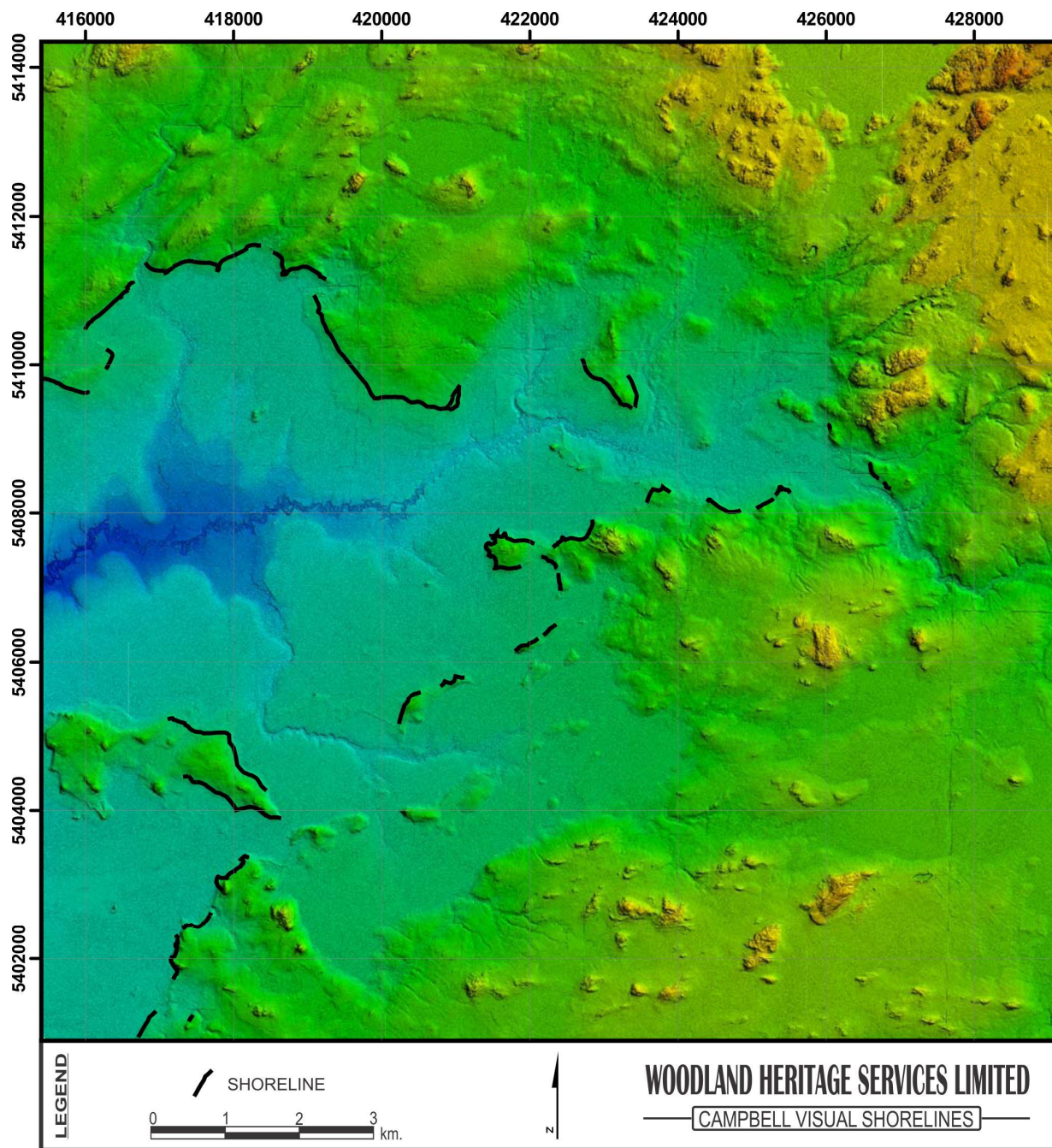


Figure 4. Map of the study area showing the visually confirmed Campbell shorelines.

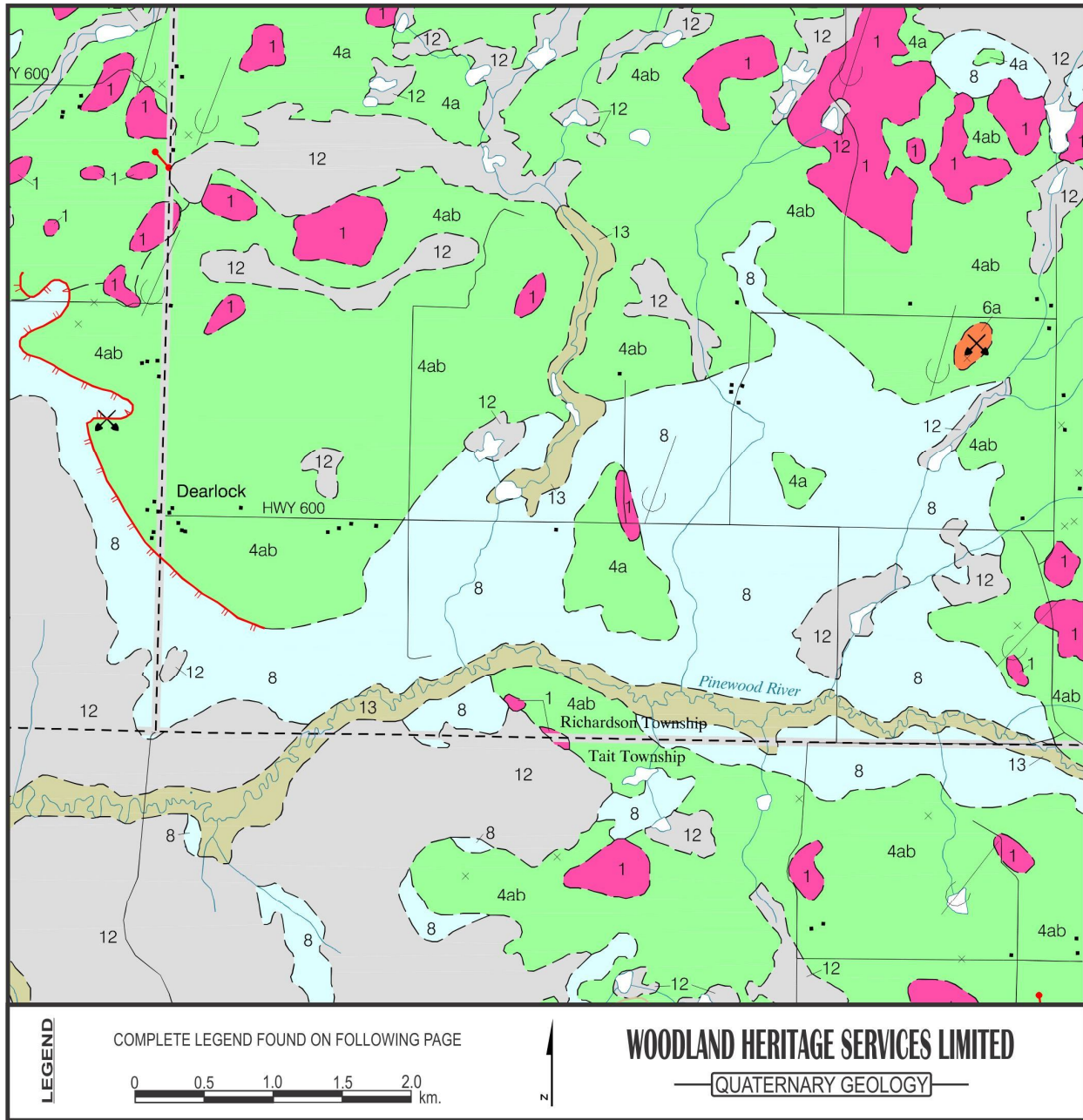


Figure 5. Quaternary geology of the study area.

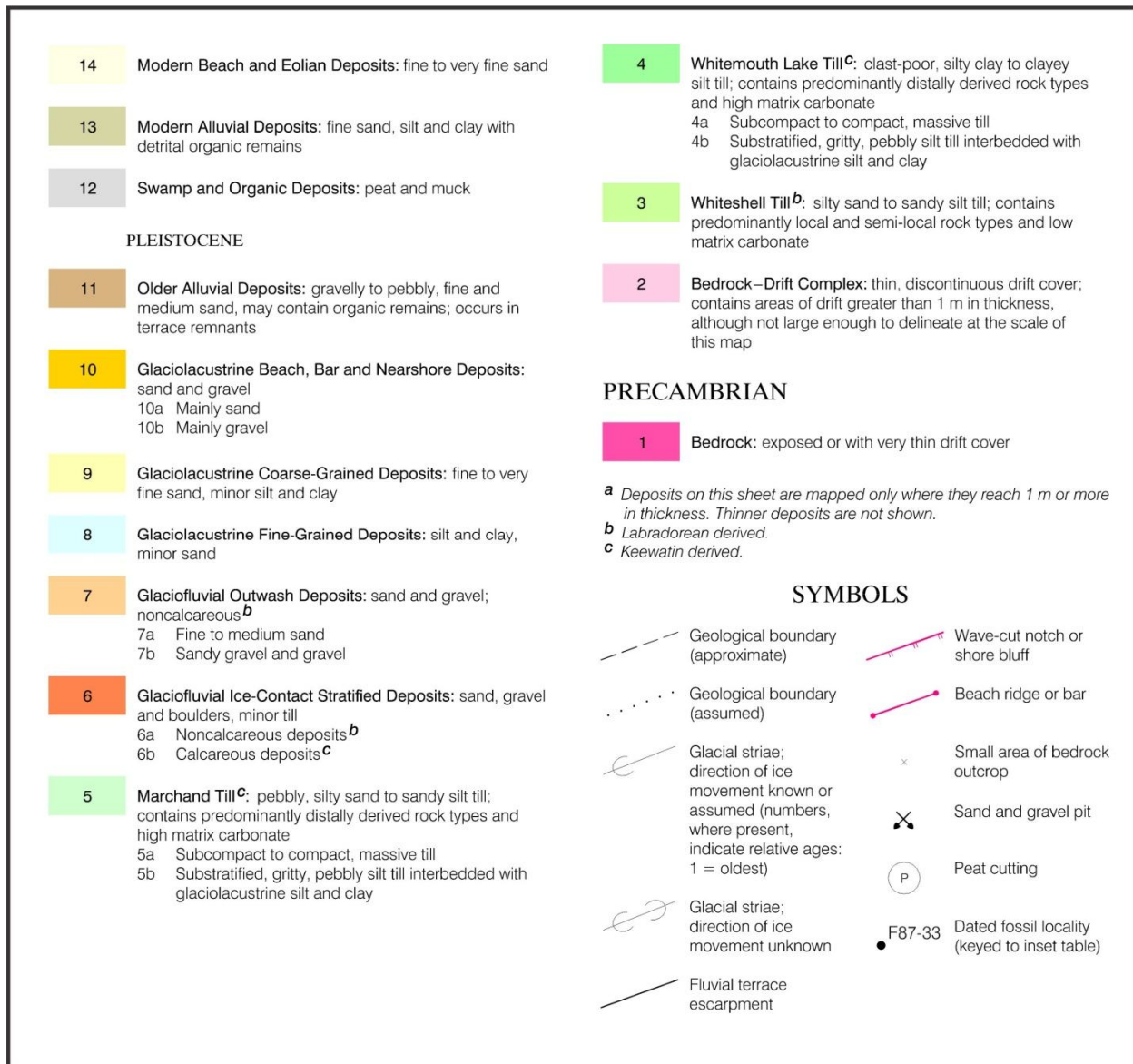


Figure 6. Complete legend for the quaternary geology map.

Figure 7. Study area showing waypoint locations.

Figure 8. Waypoint map of the western portion of the study area.

Figure 9. Waypoint map of the central / northern portion of the study area.

Figure 10. Waypoint map of the central / southern portion of the study area.

Figure 11. Map of the photograph locations.





Figure 12. Photograph "A" of a former river channel of Lake Agassiz with a shoreline that would have been exposed during the Emerson phase.



Figure 13. Photograph "B" of the examination of a pit face for artifacts.



Figure 14. Photograph "C" showing a possible hearth.



Figure 15. Photograph "D" showing the four stone piles.



Figure 16. Photograph "E" showing the four stone piles.



Figure 17. Photograph "F" looking at the Pinewood River.



Figure 18. Photograph "G" showing the interior of an old farmhouse.



Figure 19. Photograph "H" of an old road that crosses the Pinewood River.



Figure 20. Photograph "I" of timbers in the river channel likely used to support the road when it was active.



Figure 21. Photograph "J" of Little Pine Lake looking east.



Figure 22. Photograph "K" of an aggregate pit north of the study area showing fluvial action sorting the gravel.



Figure 23. Photograph "L" showing a headwaters area.



Figure 24. Photograph "M" showing part of the principal advanced exploration area.



Figure 25. Photograph "N" of an outcropping gossan in the advanced exploration area.



Figure 26. Photograph "O" looking towards the Pinewood River south of the exploration area.



Figure 27. Photograph "P" of some domestic farming refuse found in an abandoned field.





Figure 28. Photograph "Q" showing two abandoned pioneer buildings north of Dearlock.

#### 4.0 References

Anon.

1992. Akwesasne to Wunnummin Lake: Profiles of Aboriginal Communities in Ontario. Ontario Native Affairs Secretariat and Ministry of Citizenship.

Arthurs, D.

- 1986 Archaeological Investigations at the Long Sault Site (Manitou Mounds). Ontario Ministry of Citizenship and Culture, Heritage Branch, Northwestern Region, Conservation Archaeology Report No. 7.

Bajc, A.F.

- 1992 Glacial and Glaciolacustrine History of the Fort Frances-Rainy River Area, Ontario, Canada. Ph.D. Thesis, University of Waterloo, Waterloo, Ontario.

Bajc, A.F.

- 2001 Quaternary Geology, Fort Frances–Rainy River Area. Ontario Geological Survey Report No. 0704-2582 286.

Canada

- 1891 Indian Treaties and Surrenders from 1680 to 1890. 2 vols. Ottawa: Queen's Printer.

Coyne, J.H. (ed.)

- 1903 "Exploration of the Great Lakes 1669-1670 by Dollier de Casson and de Brehant de Galinee." Ontario Historical Society: Papers and Records. Vol. IV. Toronto.

Day, Gordon and Bruce Trigger

- 1978 "Algonquin" in Handbook of North American Indians. Volume 15. Bruce Trigger volume editor. Smithsonian Institution, Washington.

Dennis, J.S.

- 1853 Report, Diary and Field Notes of survey of Indian Reserves on Lake Huron. Archives of Ontario MS924 Reel 10.

Harmon, D.W.

- 1905 A Journal of Voyages and Travels in the Interior of North America. New York: Allerton Co.

- Henry, A.  
1901 Travels and Adventures in Canada and the Indian Territories between the years 1760 and 1776. Edited by James Bain. Toronto.
- Holzmann, T.E., Lytwyn, V.P., & Waisberg, L.G.  
2008 Rainy River Sturgeon: An Ojibway Resource in the Fur Trade Economy. *Canadian Geographer*, 32 (3), (September), pp. 194-205.
- Jones, P.  
1861 History of the Ojibwa Indians: With Especial Reference to their Conversion to Christianity. London: A.W.Bennett. Reprinted Freeport, N.Y.: Books for Libraries, 1970.
- Kenyon, W.A.  
1959 Rainy River Project 1959. New Pages in Prehistory. Publication of the Ontario Archaeological Society.
- Kenyon, W.A.  
1971 The Armstrong Mound on Rainy River, Ontario. *Canadian Historic Sites, Occasional Papers in Archaeology and History*, No. 3: 65-84.
- Kenyon, W.A.  
1986 Mounds of Sacred Earth: Burial Mounds of Ontario. Toronto: Royal Ontario Museum.
- Lamb, W.K.  
1970 The Journals and Letters of Alexander Mackenzie. Cambridge: Cambridge University Press.
- NMC H3-902  
1686 National Archives of Canada. National Map collection. Map of the Great Lakes by Claude Bemou.
- Nute, G.L. (ed.)  
1942 Documents Relating to the Northwest Missions 1815-1827. Saint Paul: Minnesota Historical Society.
- Nute, G.L.  
1950 Rainy River Country: A brief History of the Region Bordering Minnesota and Ontario. 2004 reprint of the 1950 edition. St. Paul: Minnesota Historical Society.
- Ontario Atlas  
1969 Economic Atlas of Ontario. Toronto: University of Toronto Press. Plate 98:

Evolution of Administrative Areas, 1788 to 1899~ Plate 99: Original Township Surveys, Southern Ontario.

Ontario

1992 "Akwesasne to Wunnumin Lake: Profiles of Aboriginal Communities in Ontario" Ontario Native Affairs Secretariat and Ministry of Citizenship, 1992.

Rhodes, R.A. and E.M. Todd

1981 "Subarctic Algonquian Languages" in June Helm (ed.), *Subarctic*, Volume 6 of *Handbook of North American Indians*. Washington: Smithsonian Institution: 52-66.

Ritzenthaler, R.E.

1978 "Southwestern Chippewa," in Bruce O. Trigger (ed), *Northeast*, Volume 15 of *Handbook of North American Indians*. Washington: Smithsonian Institution: 743-759.

Rogers, E.S.

1978 "Southeastern Ojibwa." in Bruce O. Trigger (ed.), *Northeast*. Volume 15 of *Handbook of North American Indians*. Washington: Smithsonian Institution: 760-771.

Ross, William

2011 Rainy river Advanced Exploration Project, Stage 1 Archaeological Assessment, Richardson Township, District of Rainy River. PIF #P044-065-2010

Thwaites, R.G. (ed.)

1896-1901 *The Jesuit Relations and Allied Documents*. Cleveland: Burrows Brothers.

Van Kirk, S.

1980 *Many Tender Ties: Women in Fur-Trade Society. 1670-1870*. Winnipeg: Watson and Dyer.

Vidal and Anderson

1849 Report of Commissioners A. Vidal and T.G. Anderson on visit to Indians ... 5 December 1849. Archives of Ontario. Irving Papers. MU 1464.26/31/04.

Waisberg, L.G. and T.E. Holzkamm

1993 "A Tendency to Discourage Them From Cultivating": Ojibwa Agriculture and

Indian Affairs Administration in Northwestern Ontario. *Ethnohistory*, 40(2) (Spring), pp. 175-211.

Wallace, W. S.

1934 Documents Relating to the North West Company. Toronto: The Champlain Society.

Zaslow, M.

1971 The Opening of the Canadian North. 1870-1914. Toronto: McClelland and Stewart.

**APPENDIX 1.**

GPS Field Waypoints for Stage 1 Assessment Property Inspection

The following table of waypoint locations and descriptions relate to the areas inspected/assessed during the Stage 1 assessment. All coordinates are in UTM 15 NAD 83. These data were collected using a Garmin 60CSX and a Garmin 62sc, both with WAAS enabled and an average error rating of  $\pm 4$  metres.

#### **Appendix 1. Table of GPS Waypoints Collected**

**APPENDIX 2.**

“Quaternary Geology, Fort Frances–Rainy River Area” by A.F. Bajc, 2001

Excerpt from “Quaternary Geology, Fort Frances–Rainy River Area” by A.F. Bajc (2001:28-38)

Glaciolacustrine Deposits and Features (from Bajc 2001: 28-38)

Lake Agassiz was the largest of several water bodies that bordered the southern margin of the retreating Laurentide Ice Sheet during the Late Wisconsinan. The lake inundated an area of approximately 1 million km<sup>2</sup>, although at no particular time did it occupy this entire area (Teller and Clayton 1983). Although, by definition, the term “Lake Agassiz” refers to the proglacial water body that formed during the waning stages of the Late Wisconsinan glaciation, numerous earlier phases of the lake, the records of which are incomplete, must have existed throughout the Wisconsinan Stage.

Lake Agassiz was initiated around 11 500 years BP when ice retreat north of the continental divide, at Lake Traverse in northeastern North Dakota, uncovered north-sloping land (Fenton et al. 1983). Progressive expansion of the lake into Minnesota, Saskatchewan, Manitoba and Ontario occurred with further retreat of the ice-sheet margin. By 7500 years BP, the Labradorian ice margin had retreated into the Hudson Bay Lowland, allowing final drainage of the lake and the incursion of the Tyrrell Sea (Elson 1967; Klassen 1983).

The Lake Agassiz chronology has been subdivided into 5 phases, each representing a major water level fluctuation controlled by ice-margin position and outlet availability. These include, from oldest to youngest:

- the Lockhart phase (11 500 to 11 000 years BP);
- the Moor-head phase (11 000 to 10 000 years BP);
- the Emerson phase (10 000 to 9200 years BP);
- the Nipigon phase (9200 to 8500 years BP); and
- the Ojibway phase (8500 to 7500 years BP) (Fenton et al. 1983).

The Lockhart and Emerson phases represent highstands of the lake with southward drainage to the Mississippi River via the Minnesota River valley. The Moorhead, Nipigon and Ojibway phases are periods when Lake Agassiz drained to lower levels as eastern, and possibly western, outlets were uncovered during ice retreat.

A prolonged period of ice-marginal sedimentation within this basin was probably facilitated by a slight pause in the retreat of the Keewatin glacier. The ice margin probably stood along the present route of Highway 619. Bore-hole F87-19 intersected approximately 18 m of calcareous,



Keewatin-derived sand inter-bedded with clayey, subaquatic flowtills (Whitemouth Lake till) at depth. A small gravel pit adjacent to the Rainy River 3 km west of Pinewood exposes several metres of cross-bedded, calcareous sands and gravels overlain by Lockhart and Emerson phase glaciolacustrine sediments. Paleocurrent measurements indicate consistent flow to the east. A former ice-marginal position along the trend of these two deposits is suggested.

Lockhart phase clays are rich in swelling clay minerals (illite-smectite, smectite and vermiculite) and contain lesser amounts of illite, chlorite and kaolinite. A Keewatin source is suggested by the clay mineral assemblages. Clay-rich Lockhart phase sediments often display slickensides on freshly broken surfaces. Similar fracture patterns have been observed in the Brenna Formation of North Dakota (Arndt 1977).

Lockhart phase glaciolacustrine sand is uncommon within the report area. One areally extensive deposit of faintly laminated, slightly calcareous, fine to very fine sand is situated 2 to 3 km northwest of Little Pine Lake. The deposit is located at the southern end of a northward-sloping lowland, along which Log Creek flows.

Northeastward retreat of the Labradorean glacier out of this lowland was accompanied and followed by high levels of glacial Lake Agassiz. Stranded blocks of ice, grounded on the lake bottom, resulted in a landscape that is kettled yet subdued, due to later modification by glaciolacustrine processes following disintegration of the ice blocks.

The Lockhart phase of glacial Lake Agassiz came to an end approximately 11 000 years BP when low-level northern outlets were uncovered during ice retreat. Water levels dropped by as much as 150 m (Teller 1985) exposing much of the lake bed over the southern part of the basin.

Because of their nonglacial character, the deposits and features associated with this low water phase (Moorhead phase) will be discussed in a later section (see "Older Alluvial Deposits"). The Moorhead phase came to an end approximately 10 000 years BP as the low-level outlets were closed by a re-advance of the Laurentide Ice Sheet.

#### EMERSON PHASE (SHERACK FORMATION)

An abrupt, basin-wide transgression marked the beginning of the Emerson phase; the last highstand of Lake Agassiz. During this transgressive event, water levels rose to the prominent Campbell shoreline. Moorhead phase deposits and features were blanketed by glaciolacustrine sands, silts and clays in littoral and deep-water settings. Emerson phase sedimentation ceased between 9500 and 9200 years BP when low, eastern outlets to the upper Great Lakes were opened during ice retreat. In North Dakota, Emerson phase sediments have been formally named the Sherack Formation.

The Campbell shoreline occurs at an elevation of 340 m asl in the southwestern corner of the report area and at 365 m asl in the northeastern corner. Water depths of 15 to 20 m probably existed in the offshore settings. Aside from a few restricted areas of fine to very fine sand along the Rainy River between Fort Frances and Emo, and more extensive patches in the northwestern corner of the study area around Lake of the Woods, most of the Emerson phase glaciolacustrine sediments consist of weakly laminated silt and clay. All of the sediments are extremely calcareous and are probably derived from the winnowing and reworking of local glacial and glaciolacustrine deposits. The Labradorean ice margin was probably at the Lac Seul moraine at this time, more than 75 km northeast of the report area (Minning et al. 1994). An extensive archipelago of islands separating the Wabigoon–Lac Seul and Fort Frances sediment basins restricted the southwestward dispersal of glaciolacustrine sediments into the report area. The Keewatin glacier had retreated to a position north of Lake Winnipeg by this time (Klassen 1983) and probably was not a significant contributor to the sediment supply in the Fort Frances–Rainy River area.

Emerson phase sediments are commonly grey to buff-grey, less than 3 m in total thickness, and are usually massive to weakly laminated. There is very little evidence to suggest a direct glacial influence on sedimentation. Rhythmites and dropstones have not been observed. Fossil plant, mollusc and insect remains are commonly found in the littoral glaciolacustrine deposits.

A distinctive unit of red clay occurs along the eastern edge of the Lake Agassiz basin within Emerson phase glaciolacustrine sediments. The thickest accumulations have been observed in the Wabigoon–Lac Seul basin near Dryden, and in low-lying areas around Mine Centre and Atikokan (Zoltai 1961). In these areas, rhythmically laminated sequences of grey silt and red clay attain a maximum thickness of 60 cm. Grey silt and clay rhythmites, typical of Lake Agassiz deposits, are usually abruptly overlain by 15 to 24 red clay rhythmites (Rittenhouse 1934). The upper transition back to grey rhythmites is diffuse.

Massive to faintly laminated red clay occurs along the northeast shore of Lake of the Woods, around the periphery of Rainy Lake, and in low-lying areas along the Rainy River west of Fort Frances. The red clay unit is 25 cm thick in the Rainy Lake region and decreases to 7 to 8 cm in thickness around the Lake of the Woods basin (Zoltai 1961).

In the Fort Frances–Rainy River area, the red clay unit is usually found within 1 m of surface, near the base of Emerson phase sediments. Pedogenic processes have masked primary sedimentary structures, although crude horizontal laminations are still visible. The stratification is defined by thin, light grey, clayey silt laminations, which at one site numbered 23. Twenty centimetres of massive to faintly laminated red clay has been observed in the Northwest Bay and Stanjikoming Bay areas of Rainy Lake. The red clay has been found as far west as Pinewood, where it attains a thickness of 3 to 4 cm. The clay contains high levels of calcium carbonate (up to 26%) and expanding clay minerals (smectite, illite-smectite and vermiculite) with lesser amounts of illite, chlorite and kaolinite. It would appear that the main sediment supply for the red clay layer is derived from the reworking of local deposits.

Two samples collected from Wabigoon Lake, near Dryden, showed the red clays to be composed primarily of quartz with lesser amounts of albite, calcite, dolomite, illite, hornblende, kaolinite and chlorite (Cowan 1987). A Labradorian sediment source is inferred on the basis of this mineralogy.

The red clay was apparently introduced into the Lake Agassiz basin at the beginning of the Emerson phase when ice of the Marquette advance filled the Superior and Nipigon basins, damming a glacial lake (Lake Kaministikwia) in the vicinity of Thunder Bay. Red beds of the Sibley Group gave the Lake Kaministikwia sediments their red colour (Burwasser 1977). Westerly overflow of the lake into the Lake Agassiz basin over a period of approximately 24 years resulted in the deposition of a time-stratigraphic marker horizon along the eastern margin of the lake. In the Fort Frances–Rainy River basin, it would appear that the glacial Lake Kaministikwia clays serve as a pigment for what are likely mainly locally derived Emerson phase sediments, rather than as a major sediment source. The Marquette advance into the Lake Superior basin is dated at around 10 000 years BP (Clayton and Moran 1982), thus implying a similar age for the red clay within the Lake Agassiz basin.

#### ABANDONED SHORELINES

Geomorphic features associated with nearshore and/or beach environments of glacial Lake Agassiz were identified and traced on aerial photographs as part of the mapping carried out for this study. Field observations confirmed their presence, character and extent. Geomorphic features identified include beach ridge and bar complexes, spits, wave-cut bluffs and notches,

and deltas. Most of the identified features are confined to the drift-covered lowland where erodible source materials are readily available for the construction of littoral landforms. In many cases, ground-checking of tree-covered areas assisted in the identification of nearshore/beach features lacking geomorphic expression (e.g., wash limits). In cleared areas, linear variations in tonal patterns on aerial photographs were checked to confirm the presence or absence of Lake Agassiz strandlines.

The thickest and most extensive accumulations of beach and nearshore sand and gravel occur in the western half of the report area. These sands and gravels are usually less than 3 to 4 m thick and were formed by the reworking and redistribution of Keewatin drift during the Emerson phase. The deposits are rich in well-rounded clasts of Paleozoic carbonate and shale. They are usually underlain by glaciolacustrine clay, till or bedrock. Unionid clams commonly occur in these deposits.

An aneroid altimeter was used to determine the elevations of shoreline features. Measurements were calibrated at bench marks to account for diurnal variations in atmospheric pressure. Corrected elevations obtained from aneroid altimeter measurements match elevations cited on 1:10 000 scale Ontario Basic Mapping Program (OBM) maps. A 2 to 3 m uncertainty in defining a water plane from an abandoned shore feature probably overrides the error inherent in an altimeter measurement.

Shoreline elevations were measured at 72 selected sites across the report area. Five surveyed shoreline elevations, extracted from an earlier publication on the area (Johnston 1946), were used in conjunction with the present data set to construct a strandline diagram. Shoreline elevations range from about 330 to 380 m asl across the report area.

A strandline diagram depicting true water-plane slopes can only be constructed if the direction of maximum uplift is known. Johnston (1946) created the first strandline diagram for the entire Lake Agassiz basin. In the Rainy River area, the direction of maximum uplift, derived from this early work, was taken as 0270 (Johnston 1946). All strandline diagrams drawn subsequent to this (i.e., Elson 1967; Teller and Thorleifson 1983) used a similar direction for the construction of the profiles.

The Emerson phase water plane, referred to as the Campbell shoreline in this report, is a prominent, easily recognized feature that formed during the last highstand of glacial Lake Agassiz. All features formed subsequently were short-lived and, due to their regressive nature, are not as well developed. Within the report area, 38 Campbell shorelines were identified (see Table 3) and projected orthogonally onto 10 profile lines drawn at 50 increments between 000 and 0450. Linear uplift is assumed to occur over the short profile length, which spans about 50 km. A least-squares fit was applied to each data plot to determine the slopes and correlation coefficients for the best-fit lines. Shorelines projected onto the profile line 0300 yielded the highest slope (0.39 m/km) and correlation coefficient (0.83). This direction was therefore chosen as the direction of maximum uplift.

The remaining shoreline data was plotted onto a profile line with a bearing of 0300. The author assumes that the direction of maximum uplift has not changed since deglaciation. Shorelines situated above and below the Campbell level are discontinuous and difficult to correlate. Nevertheless, an attempt has been made to identify discrete water planes. As is the case with the Campbell shoreline, linear uplift is probably suitable for the representation of the strandline data.

Four distinct water planes have been identified, 2 of which occur above the Campbell level. These shorelines are correlated with the Tintah and a transitional Tintah– Campbell water plane defined by Johnston's (1946) strandline diagram. The Tintah and Tintah–Campbell transitional water planes have true slopes that range between 0.68 and 0.60 m/km, respectively, and probably formed during the Lockhart phase of glacial Lake Agassiz. A beach ridge, situated 9 m above the Tintah shoreline, was identified in the central portion of the report area; however, remnants could not be found elsewhere. This feature probably belongs to one of a series of shorelines between the prominent Norcross (Johnston 1946) (also a Lockhart phase level) and Tintah water planes. Glaciolacustrine deposits or features have not been identified at higher elevations within the report area.

Numerous shore features were identified below the Campbell beach. Some of these define a water plane that is correlated with the Lower Campbell shoreline (Johnston 1946). The Lower Campbell shoreline has a slope of 0.35 m/km. Beach ridge and bar forms situated below this level are attributed to short-lived regressive phases associated with the final draining of Lake Agassiz from the report area.

Isobase diagrams were constructed for the Tintah and Campbell shorelines (Figures 3 and 4) using the projected elevations presented in the strandline diagram. All isobase lines trend orthogonal to the direction of maximum uplift (i.e.,  $120^{\circ}$ ). Linear uplift is represented by equally spaced isobase lines.

Topographic maps with contour intervals of 10 m were used to construct the paleogeographic maps of the report area for the Tintah (Lockhart phase) and the Campbell (Emerson phase) shorelines of Lake Agassiz. Much of the Campbell paleogeographic map is based on actual field data since most of the strandlines can be traced for long distances. Due to the discontinuous nature of the Tintah shoreline record, the paleogeographic reconstruction is based almost exclusively on extrapolated shoreline elevations from the strandline diagram.

The paleogeographic reconstructions for these 2 important phases of Lake Agassiz are markedly different. Much of the report area was submerged during the Lockhart phase when the Tintah shoreline was constructed. A large, irregularly shaped island, nearly 40 km long, 25 km wide and fringed by an archipelago of islands on its southern and eastern margins, occupied portions of the Northwest Bay, Arbor Vitae and Emo NTS map sheets. Deep, open-water conditions existed in the western and southeastern portions of the report area.

Tintah shorelines have been extrapolated into the Wabigoon basin of northwestern Ontario. Water levels probably dropped below this level shortly after 11 000 years BP, as the ice margin receded from the Eagle–Finlayson moraine, opening low-level outlets through either the Kasha-bowie–Seine or the Dog River valleys west of Thunder Bay (Prest 1970; Teller and Thorleifson 1983).

During the Emerson phase highstand of Lake Agassiz, there was a marked increase in the amount of emergent land within the report area. The prominent Campbell shoreline delimits an irregularly shaped island, the northern and eastern shores of which extend beyond the limits of the report area. The large, open-water areas that existed during the Lockhart phase became dotted with islands that provided protected, quiet-water environments.

