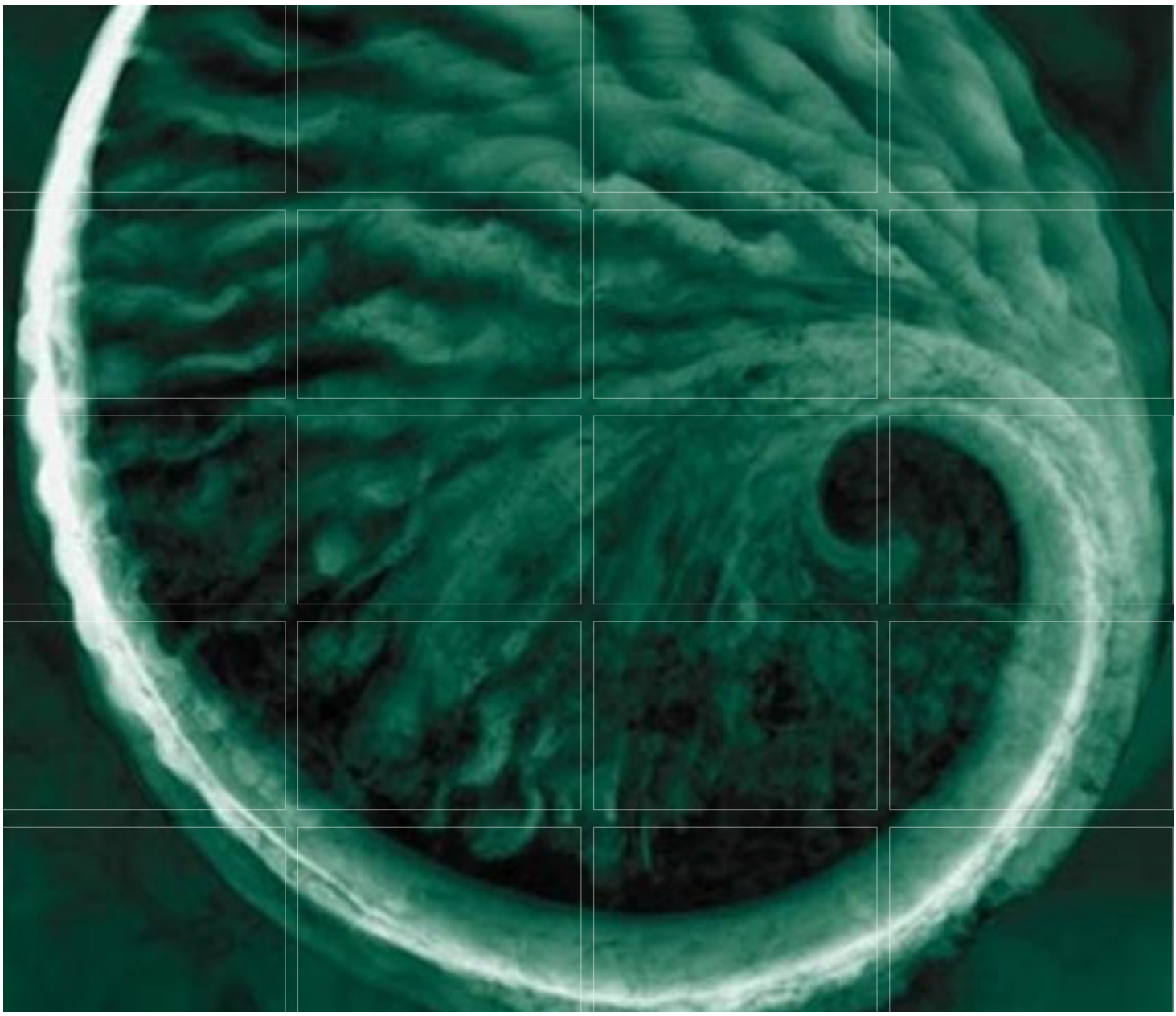
Appendix 9.2-B

Ajax Project: Paleontological Baseline



Prepared for:

KGHM

AJAX PROJECT

Paleontological Baseline

May 2015

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ERM

KGHM Ajax Mining Inc.

AJAX PROJECT
Paleontological Baseline

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ERM
ERM Building, 15th Floor
1111 West Hastings Street
Vancouver, BC
Canada V6E 2J3
T: (604) 689-9460
F: (604) 687-4277

EXECUTIVE SUMMARY

This report provides a preliminary assessment of the potential for paleontological resources for the Ajax Project (the Project) and was carried out by ERM Consultants Canada Ltd. as part of the baseline program for KGHM Ajax Mining Inc. The Project is an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops, British Columbia. The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway No. 1 and the Coquihalla Highway No. 5, within the Thompson Nicola Regional District.

There are several provincial acts that manage paleontological resources in British Columbia; these include the *Heritage Conservation Act* (1996), *Land Act* (1996), *Park Act* (1996), *Ecological Reserve Act* (1996), *Mineral Tenure Act* (1996), *Protected Areas of British Columbia Act* (2000), *Wildlife Act* (1996), and *Environmental and Land Use Act* (1996). The Land Tenures Branch of the British Columbia Ministry of Forests, Lands and Natural Resource Operations has implemented a fossil management framework in the province with fossil management principles that recognize the importance of fossils as heritage resources and that makes their scientific value the most important factor when making management decisions about fossils (Deputy Ministers' Committee on Environment and Resource Development 2004). The province has several mechanisms under these acts through which it can protect fossil sites.

The study considered the heritage Regional Study Area (RSA) for the Project, with a specific focus on the potential fossil resources in the Local Study Area (LSA) where ground disturbance is planned. The purpose of the assessment was to identify any fossil resources that may be affected by development of the Project. To achieve this objective, a review of the geological setting of the Project and existing literature pertaining to fossils within the RSA was undertaken to evaluate fossil potential.

Based on the findings of this study, it is possible but unlikely that a large-scale excavation effort in the RSA will encounter fossils during the course of operations. Fossils are present in some rock units in the area, but the fossil localities identified in the region appear to be related to specific depositional environments that are not commonly preserved in the majority of the deposits that make up the rocks in the RSA. Fossils are absent or uncommon in most of the rocks in the RSA, however, several significant fossil localities have been identified in the RSA vicinity. Based on the rock types and known distribution of fossil resources in the rocks in the RSA, it is unlikely that work at the Project would encounter significant fossils, although some potential to uncover paleontological resources may occur during construction in the Kamloops Group rocks in the eastern LSA.

The deposit targeted for mining at the Project site is hosted within intrusive igneous rocks of the Iron Mask Batholith and near-vent volcanic rocks of the Nicola Group that do not have significant fossil occurrence potential. Known fossil-bearing facies rocks of the Nicola Group and the Kamloops Group, and fossil-bearing Quaternary lakebed deposits are not present within the mine area.

It is recommended that potential for interactions with fossils during construction and operation of the Project be managed using the chance find procedures included in the Archaeology Management Plan. This includes induction and education of relevant staff for reporting possible fossil discoveries, especially focused on construction personnel in areas of mapped or suspected Kamloops Group rocks.

ACKNOWLEDGEMENTS

Author	A. Michael Arnold, R.G., R.H.G.
GIS Mapping	Tobin Pope, B.A., ADP (GIS)
Report Publishing	Laura Henderson

AJAX PROJECT

Paleontological Baseline

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

BC	British Columbia
ERM	ERM Consultants Canada Ltd.
KAM	KGHM Ajax Mining Inc. (the Proponent)
LSA	Local study area
m	metre(s)
MRSF	Mine Rock Storage Facility
Proglacial Lake	A lake formed either by the damming action of a moraine or ice dam during the retreat of a melting glacier.
Project	Ajax Project
RSA	Regional study area
SSN	Stk'emlupsemc te Secwepemc Nation
t	Metric tonne(s)
the Project	KAM's Ajax Project
TSF	Tailings Storage Facility

1. INTRODUCTION

KGHM Ajax Mining Inc. (KAM) proposes to develop the Ajax Project (Project), an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops, British Columbia (BC). The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway No. 1 and the Coquihalla Highway (No. 5), within the Thompson Nicola Regional District.

The Project lies in the traditional territory of the Secwepemc Nation. Within the Secwepemc Nation, the Tk'emlúps te Secwepemc and the Skeetchestn Indian Band are the Aboriginal groups in closest proximity to the Project. In a cooperative effort, the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands have formed the Stk'emlupsemc te Secwepemc Nation (SSN), as a division of the greater Secwepemc Nation. The Ashcroft Indian Band and Lower Nicola Indian Band, whose members are part of the Nlaka'pamux Nation, also assert their Aboriginal rights to the Project area-an area of common interest with the SSN.

The Ajax property includes two historic pits: the Ajax West Pit, and the Ajax East Pit. Both pits were formerly mined in the 1980s and 1990s. As many as 25 rock types have been recognized in the Project area, some of which are "hybrid" units resulting from the intermixing of multiple rock types.

Key Project facilities include the Tailings Storage Facility (TSF), which is planned as a conventional tailings storage facility; water management ponds; Peterson Creek diversion, and the Tailings Embankments, which will be constructed using mine rock; and four mine rock storage facilities (MRSFs). The four MRSFs include:

- the South Mine Rock Storage Facility (SMRSF),
- East Mine Rock Storage Facility (EMRSF),
- West Mine Rock Storage Facility (WMRSF), and
- the In-Pit Mine Rock Storage Facility (IPMRSF).

Several facilities that will be part of the operation phase but not remain after project closure include the:

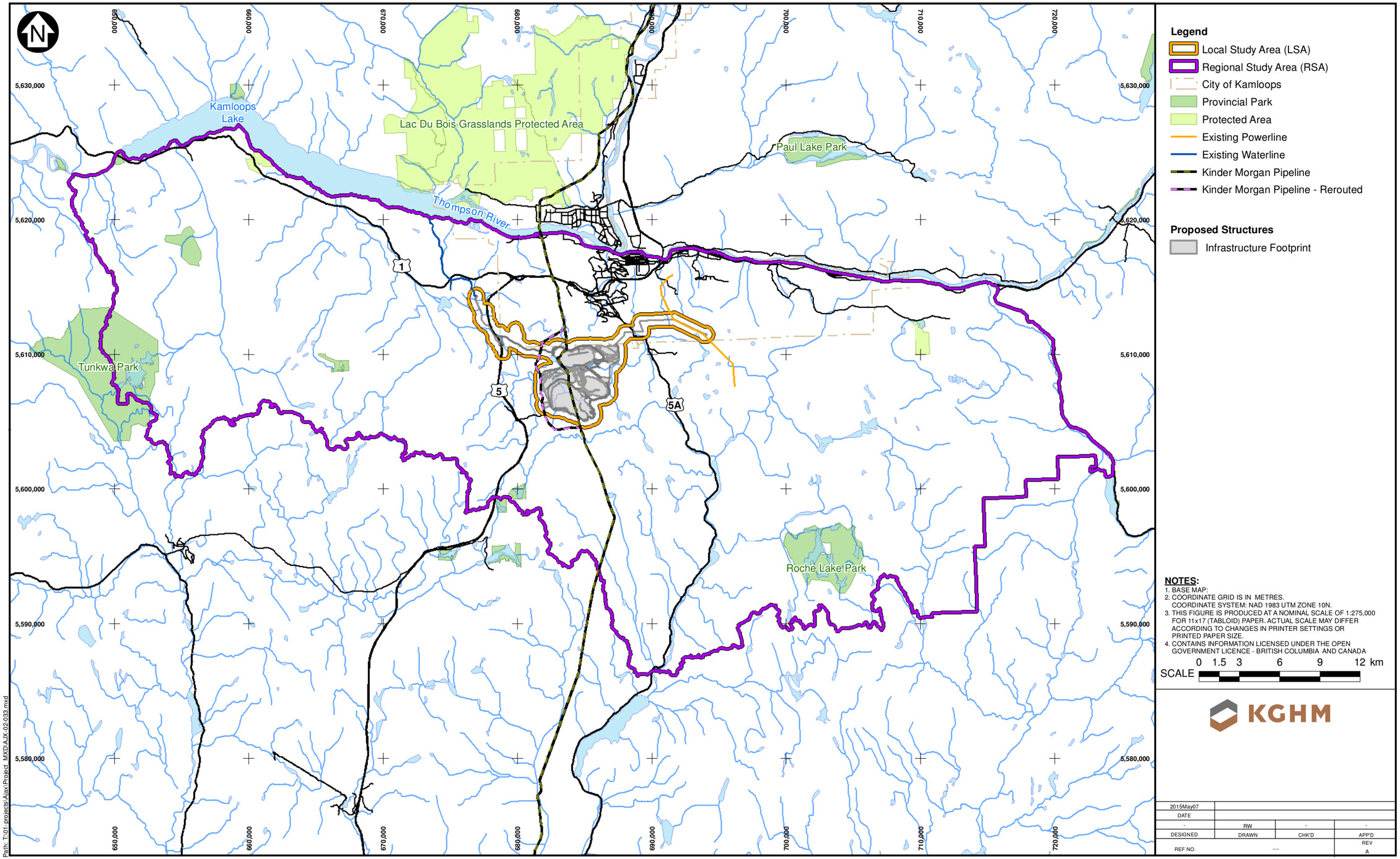
- plant facilities and administration buildings,
- reclamation stockpiles,
- explosives facility,
- truck stop and fuel storage,
- water lines,
- power lines, and
- access roads.

The mine plan for the Project predicts an operation based on a mill throughput of 65,000 tonnes of ore per day from the Ajax Pit with up to a 23 year mine life. The construction phase of the Project will be approximately two and a half years, and following the 23 year operation the decommissioning and closure phase is expected to take up to 5 years. Over the mine life the Project will produce approximately 140 million pounds of copper and 130,000 ounces of gold annually with the concentrate shipped by truck to the Port of Vancouver.

There are several provincial acts that manage paleontological resources in British Columbia; these include the *Heritage Conservation Act* (1996), *Land Act* (1996), *Park Act* (1996), *Ecological Reserve Act* (1996), *Mineral Tenure Act* (1996), *Protected Areas of British Columbia Act* (2000), *Wildlife Act* (1996), and *Environmental and Land Use Act* (1996). The Land Tenures Branch of the British Columbia Ministry of Forests, Lands and Natural Resource Operations has implemented a fossil management framework in the province with fossil management principles that recognize the importance of fossils as heritage resources and that makes their scientific value the most important factor when making management decisions about fossils (Deputy Ministers' Committee on Environment and Resource Development 2004). The province has several mechanisms under these acts through which it can protect fossil sites.

This baseline report provides a preliminary assessment of the potential for fossil resources in the heritage Regional Study Area (RSA) of the KAM Ajax Project (the Project), with specific focus on potential fossil resources in the Local Study Area (LSA), where ground disturbance is planned (see Figure 1). The purpose of the assessment is to identify any fossil resources that may be affected by development of the Project. To achieve this objective, a review of the geological setting of the Project and existing literature pertaining to fossils within the RSA was undertaken to evaluate fossil potential.

Figure 1
Heritage Effects Study Area



2. REGIONAL GEOLOGIC SETTING

The RSA lies within the Intermontane Belt, a morphogeological belt characterized by volcanic and sedimentary rocks with abundant igneous intrusive areas. The age of the Intermontane Belt rocks span from the upper Paleozoic (370 million years ago) to Recent, with the oldest rocks having accreted onto the North American continent in the middle Jurassic approximately 170 million years ago. Volcanic activity and complex faulting in the Eocene produced a series of depositional basins characterized by rapid accumulation of volcanic materials and sediments in lacustrine and subareal environments that reached from central Idaho in the U.S. to north-central British Columbia. Igneous intrusions ranging in age from the late Paleozoic to Cenozoic are scattered throughout the region.

3. STUDY AREA GEOLOGY AND FOSSIL RESOURCE POTENTIAL

The rocks within the RSA are primarily composed of four major geologic units:

- Upper Triassic Nicola Group of the Quesnel Terrane, an upper Triassic volcanic arc terrane, and associated igneous intrusive rocks;
- Late Triassic/Jurassic granitic intrusive igneous rocks;
- Eocene volcanic and lacustrine deposits of the Kamloops Group; and
- Undifferentiated Miocene basaltic volcanic rocks.

A small area of the Jurassic Ashcroft Formation is present at the extreme western edge of the RSA, as is a small area of the Late Triassic/Jurassic Guichon Creek Batholith. Quaternary glacial, lacustrine, and alluvial sediments mantle much of the bedrock in the RSA and LSA.

Rocks within the LSA are primarily Nicola Group intrusive igneous rocks with some Nicola Group volcanic, volcaniclastic, and sedimentary rocks. The intrusive igneous rocks that underlie most of the LSA do not have potential to contain fossils, except for a very small and unconfirmed potential for fossils to be preserved within xenoliths of country rock included in the intrusions. Some small areas of Kamloops Group rocks are present in the LSA.

A geologic map and geologic section summarizing lithologic units present within the RSA are included in Figure 2. A more detailed geologic map of the units present within the LSA is included in Figure 3. A geologic column showing the relative age of the rocks in the RSA is included in Figure 4.

Fossils have been identified in Nicola Group and Ashcroft Formation volcaniclastic and marine sedimentary rocks, within lacustrine sediments in the Kamloops Group, and within Quaternary sediments in the project vicinity. Specific fossil localities identified in the project vicinity within rock units present in the RSA include the following:

- McAbee Fossil Beds Heritage Site northwest of the RSA (Kamloops Group);
- McGlashan Lake Petrified Forest within the RSA (Kamloops Group);
- Falkland Fossil Locality east of the RSA (Kamloops Group); and
- A fossil salmonid locality along the south shore of Kamloops Lake that is likely in the RSA (Quaternary sediments).

Several other minor fossil localities have been reported north of the Kamloops Lake and the Thompson River (Cockfield 1948, Kamloops Trails 2011). Fossils in these areas are apparently few in number and limited in variety, and share similar species with the more prolific fossil localities at McAbee and Falkland.

Additional reported fossil localities in the vicinity of the RSA include a crinoid fossil locality near Paul Lake and an amber locality along Hat Creek, north and west of the RSA, respectively. The crinoid and amber fossil localities are within rock units that are not present within the RSA.

3.1 NICOLA GROUP AND ASSOCIATED INTRUSIVE IGNEOUS ROCKS

The upper Triassic Nicola Group represents a volcanic island arc terrane consisting of lava flows, volcanic breccias, tuffs, volcaniclastic sediments, and minor limestones developed as part of a volcanic island arc complex (Schau 1964). In the RSA, the Nicola Group is intruded by the Iron Mask batholith, which is the central geologic feature of the LSA, and the Cherry Bluff Pluton, which is present in the RSA to the northwest of the LSA. Both intrusive bodies consist of several distinct rock types representing various phases of magmatic intrusion.

In Figure 2, the Nicola Group volcanic and sedimentary rocks in the RSA are differentiated as the Central Volcanic Facies (uTrNC), the Western Volcanic Facies (uTrNW), and the Eastern Volcanic Facies (uTrNE). Intrusive rocks of the Nicola Group in the RSA are subdivided as the Cherry Bluff Pluton (LTrJIC) facies of the Iron Mask Batholith: Cherry Creek (LTrJIC)[1] Unit Hybrid Unit (LTrJIH), Pothook Unit (LTrJIP), Sugarloaf Unit (LTrJIS), and undifferentiated intrusives (LTrJum).

Fossils are present in the Nicola Group sediments and, to a much lesser degree, volcanic units; however, fossils found in Nicola Group rocks are neither well-preserved nor abundant (Schau 1964). The fossils present are primarily marine in origin and are associated with a nearshore reef and shoreline environment. An inventory of fossils found in Nicola Group rocks is included in Table 1. Each species identified is relatively common in rocks of similar age; no paleontological resources of special importance have been identified in Nicola Group rocks.

Although most of the fossil occurrences in the Nicola Group are within sedimentary and volcaniclastic (e.g., tuff) rocks, poorly-preserved individual fossil specimens have been found incorporated within lava flows at two reported localities. Most fossils in the Nicola Group have been identified within tuffaceous layers, in limestone beds, and in conglomeritic rocks. The fossiliferous tuffaceous rocks are likely related to regional reef burial by heavy ashfall from local volcanic eruptions. Similarly, the conglomeritic rocks suggest burial of organisms in high-energy events, such as volcanic lahars or slope collapses.

3.2 NICOLA GROUP VOLCANIC AND SEDIMENTARY ROCKS

The rocks of the Nicola Group in a portion of the LSA have been subdivided into ten different facies by Logan and Mihalynuk (2006). A brief description of each geologic unit within the Nicola Group identified in the LSA, including the potential for paleontological resources (fossils) in each, is included below. These units in parentheses correlate to the rock units identified on the LSA geologic map in Figure 3. The rock units present within the LSA are designated with an asterisk (*) in the subsections below.

[1] Source literature erroneously duplicated the symbol designating the Cherry Bluff Pluton for this clearly separate unit.

Figure 2
Geological Setting for the Ajax Project

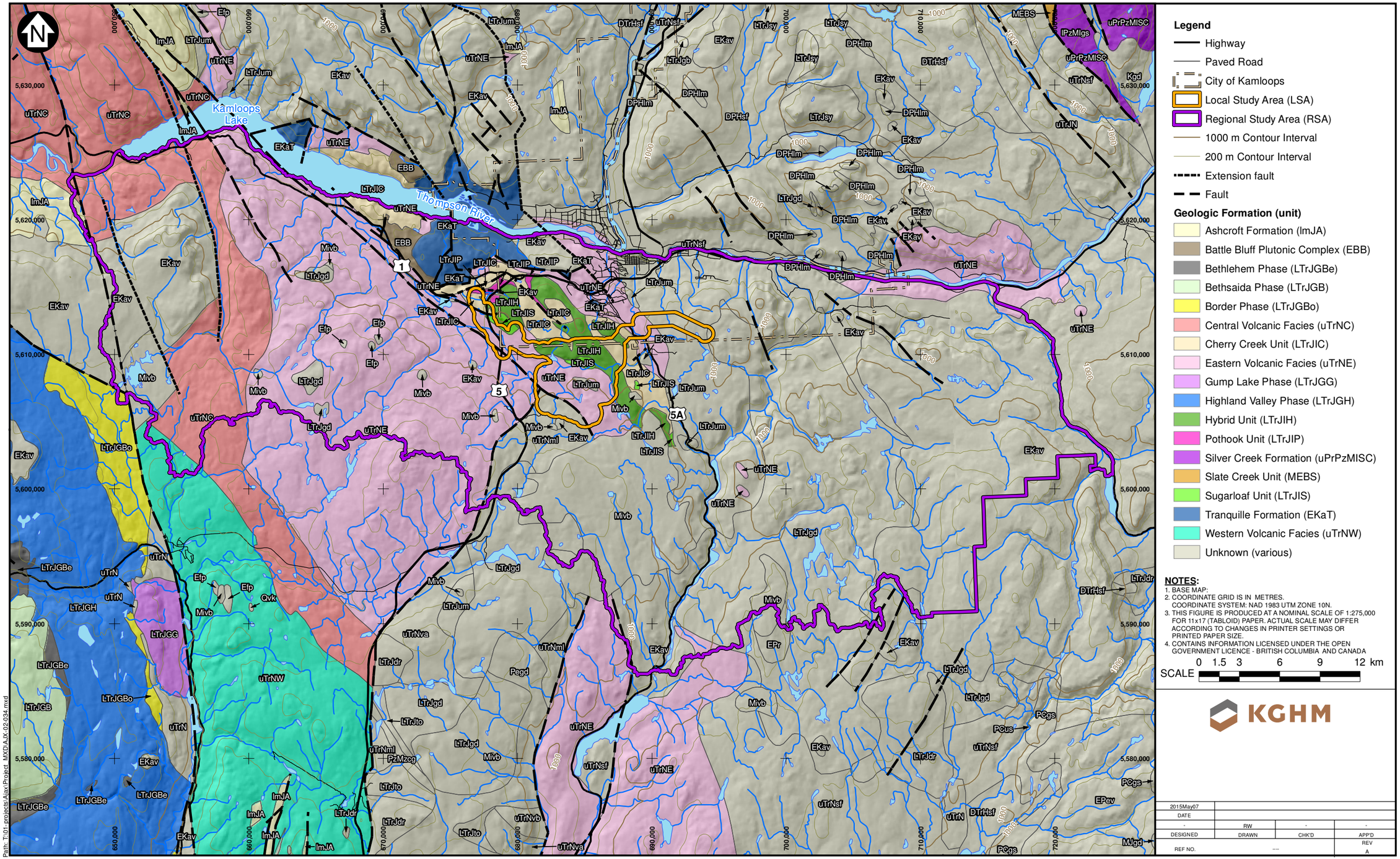


Figure 3
Geologic Detail of Local Study Area

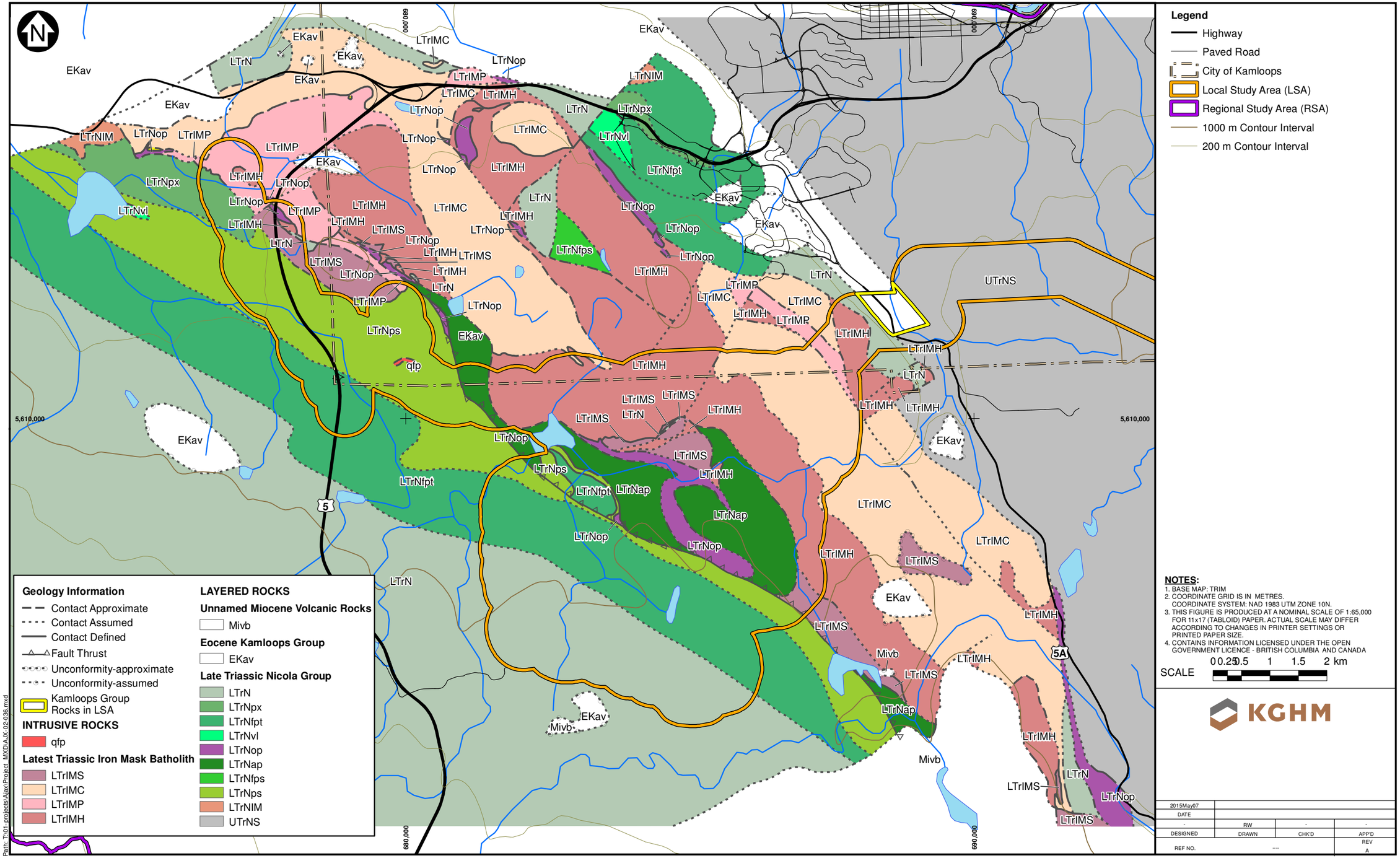


Figure 4

Geologic Section for the Ajax Mine Project

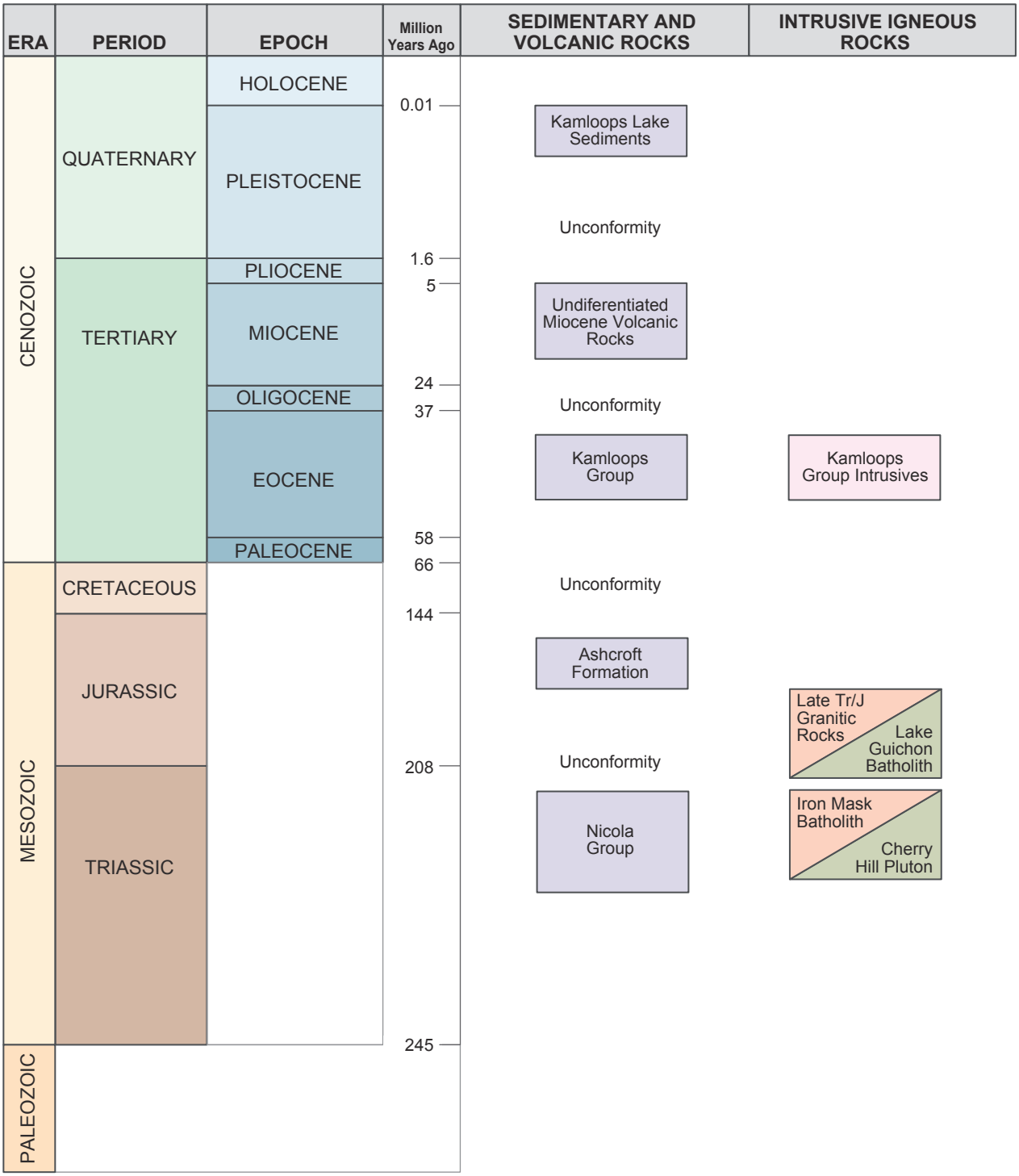


Table 1. Fossils Identified in Nicola Group Sedimentary Rocks

General Fossil Taxonomy	Specific Fossil Description	Relative Abundance In Nicola Group Rocks
Bivalves	Indeterminate carditoid pelecypods	Common to Abundant
	Indeterminate clams	Common to Abundant
	Indeterminate oysters	Common to Abundant
	Indeterminate mussels	Rare to Uncommon
	Indeterminate scallops	Rare to Uncommon
	Indeterminate cockles	Common to Abundant
	Lopha (?)	Rare to Uncommon
	Indeterminate trigionid pelcypods	Uncommon
	Minnetrigonia (?)	Rare to Uncommon
	Indeterminate pelecypod with thick prismatic shell	Rare to Uncommon
	Gervilleia (?)	Rare to Uncommon
	Indeterminate flat, finely-ribbed pelecypod	Common to Abundant
	Meleagrinella (?)	Rare to Uncommon
	Myophoria (?)	Common to Abundant
	Halobia	Common to Abundant
	Oxytoma	Rare to Uncommon
	Pecten	Rare to Uncommon
	Paleocardita (?)	Rare to Uncommon
	Cassianella	Rare to Uncommon
	Megalodont (?)	Rare to Uncommon
Gastropods	Snails	Common to Abundant
	Turriform gastropods	Common to Abundant
	Indeterminate high-spired gastropod	Rare to Uncommon
Scaphopods	Large and small dentaloids	Common to Abundant
Cephalopods	Arcestes (?)	Common to Abundant
	Juvavites (?)	Common to Abundant
	Hannaoceras (?)	Rare to Uncommon
	Flat, ribbed, involute forms	Rare to Uncommon
	Indeterminate ammonite, possibly haloritid	Rare to Uncommon
	Indeterminate orthocone	Rare to Uncommon
	Indeterminate belemnite	Rare to Uncommon
	Indeterminate ammonite	Rare to Uncommon
	Michelinoceras (?)	Rare to Uncommon

(continued)

Table 1. Fossils Identified in Nicola Group Sedimentary Rocks (completed)

General Fossil Taxonomy	Specific Fossil Description	Relative Abundance In Nicola Group Rocks
Brachiopods	Lingula	Rare to Uncommon
	Terebratuloids	Common to Abundant
	Indeterminate hazelnut-shaped brachiopods	Rare to Uncommon
	Indeterminate costate brachiopods	Rare to Uncommon
	Indeterminate cyrtinid brachiopod	Rare to Uncommon
	Plectonconcha (?)	Rare to Uncommon
Echinoderms	Isocrinus	Common to Abundant
	Pentacrinus	Common to Abundant
	Echinoid debris (cidarid spines and ambulacral plates)	Rare to Uncommon
	Crinoid fragments	Common to Abundant
Corals	Astreid corals	Common to Abundant
	Horn corals	Rare to Uncommon
	Thamnasteria	Rare to Uncommon
	Indeterminate colonial corals	Rare to Uncommon
	Halomitra (?)	Rare to Uncommon
	Montlivaultia	Rare to Uncommon
Porifera	Sponge fragments	Rare to Uncommon
	Spongiomorphs	Common to Abundant
Bryozoans	Indeterminate bryozoa (?)	Rare to Uncommon
Chordata	Fish bones	Common to Abundant
Plants	Undifferentiated carbonized wood, twigs, and branches	Common to Abundant
	Undifferentiated plant remains	Common to Abundant
	Algae colonies and pisolites	Common to Abundant
	Posidonia (?)	Rare to Uncommon

Notes:
Developed from Schau (1964)
Common to Abundant = Large numbers of individual fossils at single localities and/or present at multiple localities.
Rare to Uncommon = Small numbers of individual fossils at a single or few localities.

Undivided volcanic and sedimentary rocks* (LTrN) – Fossils are potentially present in the sedimentary and volcaniclastic rocks of this unit, and to a lesser extent in lava flows associated with this unit.

Augite porphyry and polylithic breccia (LTrNpx) – This unit likely represents an accumulation of lava and associated flow breccia near a volcanic vent, therefore there is a very low probability of significant fossil occurrence in this unit.

Feldspar/pyroxene porphyritic lapilli tuff* (LTrNfpt) – Fossils are potentially present in this unit, especially where the tuff might be associated with deposition in a marine environment.

Polylithic lahar, including mineralized clasts (LTrNvl) - Fossils are potentially present in this unit, especially where the tuff might be associated with deposition in a marine environment.

Picrite flow, breccia* (LTrNop) - This unit likely represents an accumulation of lava and associated flow breccia near a volcanic vent, therefore there is a very low probability of significant fossil occurrence in this unit.

Coarse augite porphyry* (LTrNap) - This unit likely represents an accumulation of lava near a volcanic vent, therefore there is a very low probability of significant fossil occurrence in this unit.

Feldspar/pyroxene volcaniclastic rocks (LTrNfps) - Fossils are potentially present in this unit, especially where the volcaniclastic rocks might be associated with deposition in a marine environment.

Sediments with augite porphyry source* (LTrNps) - Fossils are potentially present in this unit, especially where the sediments are associated with deposition in a marine environment.

Nicola/Iron Mask subvolcanic – volcanic breccia (LTrNIM) – Fossils are unlikely to be present in this unit, which includes subsurface rocks shattered by volcanic action, or breccia deposited adjacent to a volcanic vent during energetic eruptive activity.

Nicola sedimentary facies: mainly siltstone, lesser basalt, chert, minor limestone, and ultramafite* (uTrNs) – Fossils may be present within this unit, since the rock types present (siltstone, chert, and limestone) suggest that at least part of this unit was emplaced in a marine environment under conditions that may promote fossil preservation.

3.3 IRON MASK BATHOLITH

The rocks of the Iron Mask Batholith are geochemically similar to the volcanic rock units of the Nicola Group and are considered to have been emplaced coevally with the volcanic deposits. The Iron Mask Batholith has been differentiated into four separate units (Logan and Mihaynuk 2006), each present within the LSA:

- Sugarloaf – A porphyritic horneblende diorite (LTrIMS);
- Cherry Creek – A biotite monzonite to monzodiorite (LTrIMC);
- Pothook – A coarse biotite pyroxene diorite (LTrIMP); and
- Hybrid – Sugarloaf or Pothook phases with abundant recrystallized xenoliths of Nicola Group country rock (LTrIMH).

The abbreviations in parentheses above correlate to the rock units identified on the LSA geologic map in Figure 3. As crystalline intrusive igneous rocks, none of these units have the potential to contain fossils, except for xenoliths of Nicola Group sedimentary rocks that compose part of the Hybrid unit. The degree of recrystallization of the xenoliths, however, would obscure or eliminate fossil traces in these rocks.

3.4 CHERRY BLUFF PLUTON

The rocks of the Cherry Hill Pluton (LTrJIC on Figure 2), consist of multiple rock types, including augite gabbro, augite diorite, and monzonite that crosscut Nicola Group rocks and underlie Kamloops Group rocks (Daly 1915, Betmanis 1972). The Cherry Bluff Pluton was emplaced in the later Triassic and is petrologically similar to the Cherry Creek phase of the Iron Mask Batholith (Ewing 1981). The similarity of rock types and age, as well as the relationship with surrounding rocks, suggest the Cherry Bluff Pluton was coeval with Nicola Group volcanic rocks similarly to those of the Iron Mask Batholith.

The crystalline intrusive igneous rocks of the Cherry Bluff Pluton do not have significant potential to contain fossils.

3.5 LATE TRIASSIC/JURASSIC GRANITIC INTRUSIVE ROCKS

A pluton of granitic rock forms the bedrock across much of the eastern half of the RSA (LTrJgd on Figure 2). The crystalline rock of this unit does not have significant potential to contain fossils.

3.6 GUICHON CREEK BATHOLITH

The Guichon Creek Batholith rocks exposed in the far western portion of the RSA consist of granodiorite (Northcote 1969). These rocks are designated as LtrJGBo on Figure 2. There is no significant potential for fossils in this crystalline igneous intrusive rock.

3.7 ASHCROFT FORMATION

A small area of the Jurassic Ashcroft Formation is exposed in the extreme western portion of the RSA, and rocks of the formation are not present in or near the LSA. The Ashcroft Formation consists of a mixture of volcanic and volcaniclastic rocks, limestones, and marine sediments locally derived from the underlying Nicola Group rocks (McMillan 1974). Ashcroft Formation rocks are indicated as ImJA on Figure 2.

Fossils are uncommon in the formation but have been found primarily associated with limestone and clastic sedimentary beds in the formation. Carbonized wood, ammonites, and pelecypod fossils have been found in this unit (McMillan 1974). No particularly well-preserved or taxonomically significant fossils are reported from the formation.

3.8 KAMLOOPS GROUP AND ASSOCIATED INTRUSIVE IGNEOUS ROCKS

Overlying the Nicola Group and related intrusive rocks in portions of the RSA is the Kamloops Group, an assemblage of volcanic and sedimentary rocks that is widespread in south-central British Columbia. Only small areas of Kamloops Group rocks are present in the LSA. The group is typically subdivided into two formations: the Tranquille formation (EKaT and a portion of EKav on Figure 2) and the overlying Dewdrop Flats formation (a portion of EKav on Figure 2). The Tranquille formation is up to 450 meters thick and consists primarily of lacustrine sediments, pillow lavas with

hyaloclastite flow breccia, and volcanic tuff. The Dewdrop Flats formation is over 1,000 meters thick and is composed mainly of phreatic and flow breccia, flat-lying lava flows, mudflows, and minor volcanic cone complexes (Ewing 1981).

Scattered dikes and sills of Eocene intrusive igneous rocks are present within the Kamloops Group rocks in the RSA (Efp on Figure 2). One larger area of intrusive igneous rocks, the Battle Bluff Pluton (EBB on Figure 2), is present within the RSA adjacent to the Nicola Group-age Cherry Bluff Pluton. These intrusive igneous rocks are interpreted as related to volcanic activity coeval with Kamloops Group volcanic rocks. These crystalline intrusive igneous rocks have no potential for fossil inclusion.

Fossils are not common within the Kamloops Group rocks (Ewing 1981), however, some fossil localities are reported in areas of lacustrine sediments and volcanic tuffs, primarily within the lower Kamloops Group, including the Tranquille formation and unnamed units with similar stratigraphy. These fossil localities include the McAbee fossil beds, a lacustrine fossil locality near Cache Creek, British Columbia, outside of the RSA and the McGlashan Lake Petrified Forest in Kamloops Group in a volcanic tuff deposit within the RSA. Several minor fossil localities have also been reported, but apparently not extensively studied, in Kamloops Group rocks north of Kamloops Lake and the Thompson River near the RSA.

Locations of fossil localities identified in the Kamloops Group Rocks are shown in Figure 5.

3.8.1 McAbee Fossil Beds

The McAbee Fossil Beds are a designated British Columbia Heritage Site approximately 13 kilometers east of Cache Creek, British Columbia. The fossil beds are 59 kilometers west-northwest of Kamloops, and 16.5 kilometers west-northwest of the northwest corner of the RSA. A photograph of the fossil beds is included in Plate 1. The fossil beds are developed in tuffaceous and diatomaceous lacustrine sediments in an unnamed member of the lower to middle Kamloops Group (Mustoe 2005). The McAbee fossil beds contain fossil traces of Eocene plants and animals in rocks formed in a freshwater lakebed environment, and has a history of discovery of abundant fossil specimens of remarkable preservation that include conifer trees, broadleaf trees, insects, arachnids, fish, freshwater crustaceans, pollen, and spores.

The McAbee Fossil Beds have been designated a British Columbia Heritage Site because of the great abundance of fossils and fossilized species and for the exceptional quality of preservation of many of the fossils. Several unique species have been identified in the fossils recovered from the site, including very rare specimens of *Parastacoidea* crayfish (Feldmann et al. 2011).

The presence of the fossil beds shows that abundant life was present in at least some local areas during emplacement of the Kamloops Group rocks, and the depositional environment during the emplacement of some of those rocks was very favorable for fossil preservation. Plates 2 and 3 are typical examples of the detail preserved in the fossils from the site.

Figure 5
Fossil Localities in or near the Regional Study Area

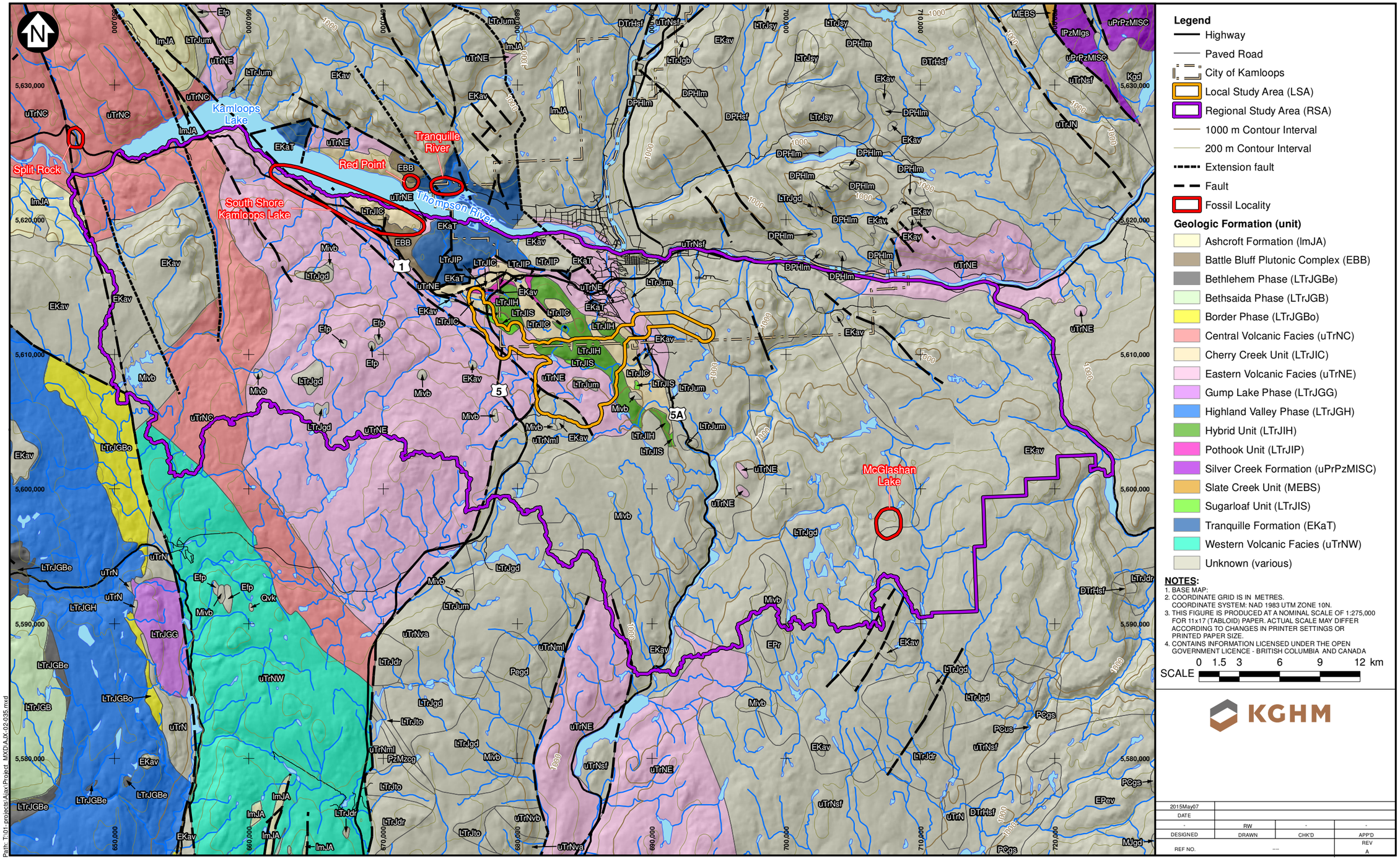


Plate 1. McAbee Fossil Beds (Thompson-Nicola Film Commission 2015).

Plate 2. Eohiodon rosei *from McAbee Fossil Beds, approximately 8.3 cm in length (Bowden 2011).*

3.8.2 McGlashan Lake Petrified Forest

The McGlasahan Lake Petrified Forest is an area of well-preserved fossilized wood in a tuffaceous unit of the Kamloops Formation within the RSA in the area shown on Figure 5 (British Columbia Ministry of Energy and Mines 2001). Fossilized tree trunks up to 1 meter in diameter are reported at the locality, and fossilized bark and amber are also reported (Grauer 2000). The fossilized wood is reported to be pale buff in color with shades of pink and brown, with some carbonaceous material also present.

3.8.3 Falkland Locality

The Falkland locality is an area of fossil plants near Estekwalan Mountain approximately 40 kilometers southeast of Kamloops and approximately 15 kilometers east of the RSA. Fossils include fossils of plant and tree leaves and fragments in a fissile white tuff in the Kamloops Group (Jefferson and Hodgson 1983). The plant fossil assemblage in this locality is described as similar to the plants found at the McAbee Fossil Beds described above (Smith et al. 2009).

Plate 3. Carabidae (species not identified) beetle from McAbee Fossil Beds (Bowden 2013).

3.8.4 Other Fossil Localities

Fish and/or plant fossils are reported from Kamloops Group rocks at loclities near the north shore of Kamloops Lake near the confluence of the Deadman River with the Thompson River (Split Rock locality) and near the mouth of the Tranquille River at the Tranquille River and Red Point localities (Cockfield 1948). Recent publications describing these sites in more detail could not be located.

Amateur fossil collectors mention fossil localities in the Tranquille Canyon and Dewdrop Range north of Kamloops Lake (Kamloops Trails 2011), north of the RSA. No information of the type of fossils at these localities is provided, and the host rock is described only as "shale beds." These localities are likely within Kamloops Group rocks and probably include the Split Rock, Tranquille River, and Red Point localities reported by Cockfield (1948).

3.9 UNDIFFERENTIATED MIOCENE BASALTIC VOLCANIC ROCKS

Basaltic lava flows and tuffs are present across much of the southern RSA, but are not present in the LSA. This unit is designated as Mivb on both Figures 2 and 3. Rustand (*ed.* 2007) describes these rocks as related to the flood basalts of the Chilcotin Group, which consist of basaltic breccia and lava

flows underlying approximately 50,000 square kilometers of central British Columbia. No fossils are reported in this unit, and the presence of fossils is unlikely in the volcanic rocks of this unit.

3.10 KAMLOOPS LAKE QUATERNARY SEDIMENTS

Quaternary sediments consisting of Pleistocene glacial and glaciolacustrine deposits as well as recent alluvium and landslide deposits commonly mantle bedrock in the RSA. These sediments are not mapped on Figures 2 and 3.

One fossil locality is reported in the Quaternary sediments in the RSA by Ratcliffe and Ratcliffe (1999). The locality is in an undisclosed location on the south shore of Kamloops Lake where fossils of complete salmonid fish, as well as fish fragments, have been found. The general location of the fossil locality is shown on Figure 5. Most of the fossils are reportedly fragments, but at least one complete fish fossil has been found there. The complete specimen is apparently only complete fossil of the species *Oncorhynchus nerka* that has been found in North America. Fish fragments from the area yield carbon-14 age dates ranging from 15,480 to 18,110 years before present.

Available information indicates that the fossils are found in "clay," which suggests that the fossils are in lacustrine sediments. Proglacial lake bed sediments are mapped in this area by Ewing (1981). The lake bed sediment deposits are limited to areas below an elevation of 700 meters along the southern shore of Kamloops Lake. Elevations across most of the RSA and all of the LSA are greater than 700 meters.

4. SUMMARY OF FOSSIL POTENTIAL

It is possible but unlikely that a large-scale excavation effort in the RSA will encounter some fossils during the course of operations. Fossils are present in some rock units in the area, but the fossil localities identified in the region appear to be related to specific depositional environments that are not commonly preserved in the majority of the deposits that make up the rocks in the RSA. Although lagerstätte, or sedimentary deposits that feature extraordinary fossils with exceptional preservation, are present in the vicinity of the RSA, these fossil localities are present in a very limited set of rock types that are uncommon within the rock assemblages in the RSA, and the majority of the rocks in the RSA are not conducive to the presence or preservation of fossils.

Based on the available information the potential for significant fossil resources in the RSA is limited to fine-grained, bedded lacustrine sediments and fine-grained bedded tuffs within the Kamloops Group, and fine-grained bedded Quaternary lacustrine deposits. These types of deposits have been confirmed within the RSA at the McGlashan Lake and Kamloops Lake fossil localities. It is likely that similar deposits that have not been discovered or publicly described are present in Kamloops Group rocks and Quaternary sediments in other portions of the RSA.

Not all fossils that are encountered need to be managed. In the case of common and widespread fossils such as many of the invertebrates found in Nicola Group rocks, there is no specific compelling regulatory requirement for active fossil management in British Columbia, except in cases of exceptional preservation of specimens. These conditions are only expected in the RSA within fine-grained rocks of the Kamloops Group and the Quaternary lacustrine sediments described above. Of these, only rocks of the Kamloops Group are expected to potentially be present within the LSA.

Most invertebrate fossils (pelcypods, brachiopods, ammonites, etc.) and plant fossils, where found, are usually abundant and common. Exceptionally well-preserved specimens of invertebrates and plants are desirable for scientific study or as museum exhibits. These specimens are usually very easy to collect and would involve no significant issues for mining operations should they be identified. Because of the common nature of these fossils, it is not practical for mining operations, universities, or museums to address all reports of this category of specimens.

However, deposits of high numbers of exceptionally well-preserved fossils of invertebrates and plants in the vicinity of the RSA have yielded exceptional specimens and academic information. Also, some very rare specimens, such as freshwater crustaceans, have been discovered in the area. With a small amount of training to increase awareness, mine staff can effectively identify the relative degree of importance of invertebrate and plant fossils and can have discretion about whether it is worth reporting such discoveries.

Vertebrate fossils are very rare in British Columbia and therefore it is recommended that they be reported immediately. Fossil fish have been identified in Kamloops Group and Quaternary sediments in the RSA. Any discoveries of fish fossils, or fossils of other vertebrates (reptiles, mammals, etc.), including trace fossils (tracks), should be reported immediately.

Fossil discoveries of importance, such as extremely well-preserved invertebrate or plant specimens or any vertebrate fossils, will be reported to the Royal British Columbia Museum, a local museum, the local paleontological society, or paleontology or geology staff at the Thompson Rivers University.

4.1 PLANNED SURFACE DISTURBANCE AND MINING AREAS

Intrusive operations related to mining and infrastructure development (roads, buildings, power lines, etc.) related to this project are planned only within the LSA. Fossil localities have not been reported in the LSA, and the potential for fossil finds there are limited because most of the LSA is composed of rock types in which fossils are typically not present (intrusive igneous rocks). There is, however, one small area of rocks of the Kamloops Group within the LSA. Kamloops Group rocks are the host for the McGlashan Lake, McAbee, and Falkland fossil localities mentioned above and fossil potential in these rocks within the LSA has not been determined. Some Kamloops Group lacustrine sedimentary rocks are reported in the RSA in the vicinity of the LSA (Ewing, undated).

4.1.1 Mine Area

Most of the rocks that will be disturbed within the mine are intrusive igneous rocks with no potential for fossils, except for the very rare instance of inclusion of a country rock xenolith that contains fossils. Since the country rock (Nicola Group) that makes up the remainder of the rocks within the planned mine area contains few fossils, and none of academic or exhibitory importance, no significant fossil resources are expected to be encountered in the mine area.

4.1.2 Surface Disturbance in Other Areas

It is expected that buildings, roads, power lines, and other structures will be installed within the LSA to support the Ajax Mine Project operation. Paleontological resources may be impacted during the construction of these facilities, although most or all of these facilities will be constructed in areas where the presence of significant fossil resources are very unlikely. An exception may be an area of Kamloops Group rocks in the eastern extension of the LSA (Figure 3). It is not known whether rocks in this area are those that typically host fossils in the other portions of the Kamloops Group (i.e., fine-grained, bedded sediments).

If rocks in this area are disturbed during construction activities, a cursory examination should be made to evaluate whether rock type present may contain fossils. The initial determination could be completed by mine staff with a small amount of training to evaluate rock types and whether fossils are present.

5. CONCLUSIONS

Fossils are absent or uncommon in most of the rocks in the RSA, however, several significant fossil localities have been identified in the RSA vicinity, with the best-documented localities including:

- McAbee Fossil Beds Heritage Site northwest of the RSA (Kamloops Group);
- McGlashan Lake Petrified Forest within the RSA (Kamloops Group);
- Falkland Fossil Locality east of the RSA (Kamloops Group); and
- A fossil salmonid locality along the south shore of Kamloops Lake that is likely in the RSA (Quaternary sediments).

Other, less prolific fossil localities are reported at three sites north of the Thompson River and Kamloops Lake near the RSA. Each of these localities is hosted within fine-grained bedded lacustrine and/or volcanic rocks that are readily identifiable in the field. Rocks of this type are not reported within the LSA and the potential for such rocks to be discovered in the LSA is limited.

Based on the rock types and known distribution of fossil resources in the rocks in the RSA, it is unlikely that work at the proposed Project would encounter significant fossils, although some potential to uncover paleontological resources may occur during construction in the Kamloops Group rocks in the eastern LSA (EKav, Figure 3).

The deposit targeted for mining at the Project site is hosted within intrusive igneous rocks of the Iron Mask Batholith and near-vent volcanic rocks of the Nicola Group (Figure 3) that do not have significant fossil occurrence potential. Known fossil-bearing facies rocks of the Nicola Group and the Kamloops Group, and fossil-bearing Quaternary lakebed deposits are not present within the mine area.

It is recommended that potential for interactions with fossils during construction and operation of the Project be managed using the chance find procedures included in the Archaeology Management Plan. This includes induction and education of relevant staff for reporting possible fossil discoveries, especially focused on construction personnel in areas of mapped or suspected Kamloops Group rocks.

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