AER/AGS Special Report 102

Alberta Energy Regulator

Limestone and Dolomite Prospects for Industrial Use in the Alberta Foothills and Front Ranges

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AER/AGS Special Report 102

Limestone and Dolomite Prospects for Industrial Use in the Alberta Foothills and Front Ranges

K. Krueger, P. Kluczny and J. Dahrouge

Dahrouge Geological Consulting Ltd.

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Author addresses:
Dahrouge Geological Consulting Ltd.
Suite 18
10509 – 81 Avenue
Edmonton, AB T6E 1X7
Canada
780.434.9808

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Alberta Energy Regulator
Alberta Geological Survey
4th Floor, Twin Atria Building
4999 – 98th Avenue
Edmonton, AB T6B 2X3
Canada

Tel: 780.638.4491
Fax: 780.422.1459
E-mail: AGS-Info@aer.ca
Website: ags.aer.ca

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Abstract

This report, produced by Dahrouge Geological Consulting Ltd. at the request of the Alberta Geological Survey, provides an assessment of the distribution and potential of current limestone and dolomite prospects in the Alberta Foothills and Front Ranges outside of parks, First Nations lands, and current mineral tenure areas. It is part of a project funded by Alberta Energy with the intent to enhance Alberta's mineral geoscience knowledge and to disseminate existing information. The specific purpose of this report was to provide geoscience information on limestone and dolomite prospects to help guide land-use planning.

This report provides maps of the Alberta Foothills and Front Ranges with the locations of documented occurrences and quarries of limestone and dolomite and includes short, plain language overviews of limestone and dolomite prospects for the South Saskatchewan, North Saskatchewan, Upper Athabasca, and Upper Peace regional land-use planning areas. Emphasis is given to occurrences of high-calcium limestone and high-quality dolomite, although prospective areas of carbonate for use as aggregate or building/decorative stone were also included.

Limestone and Dolomite Prospects for Industrial Use Along the Alberta Foothills

Prepared For:
Alberta Energy Regulator (AER)
Alberta Geological Survey (AGS)

Submitted To:
Gloria Lopez
Dean Rokosh
John Pawlowicz
Jill Weiss

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Re-Submitted: January 28, 2016

Prepared By: Kelly Krueger, Geo.I.T., Project Geologist
Patrick Kluczny, P.Geol., Senior Geologist / Manager
Jody Dahrouge, P.Geol., Senior Geologist

Dahrouge Geological Consulting
Suite 18, 10509 81 Avenue, Edmonton, Alberta T6E 1X7, Canada
Tel: +1 780 434 9808 | Fax: +1 780 439-9789| www.dahrouge.com

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*** Bold text denotes high-calcium limestone prospect areas**

1. Executive Summary

Several distinct areas within the Foothills and Front Ranges of Alberta have been identified as having potential for high-calcium limestone and/or high quality dolomite. Prospective areas cover known high-quality carbonates based on previous exploration records/reports, are within close proximity to existing transportation infrastructure and are not overlapped by parks or existing mineral tenures.

Within the Upper Peace Regional Planning (UPRP) area, all occurrences of high-quality limestones are inside park boundaries (Figure 2) and therefore no prospects have been identified. The Upper Athabasca Regional Planning (UARP) area hosts three prospects (P1-P3) covering approximately 220 km^2, which are within the **Folding Mountain** and **Cadomin** areas (Figure 3). Five prospective locations (P4-P8) have been identified within the North Saskatchewan Regional Planning (NSRP) area, which encompass an area of approximately 630 km^2. These sites are located in the **Nordegg, Abraham Lake, Ram Falls** and **Ya-Ha-Tinda** areas (Figure 4). The South Saskatchewan Regional Planning (SSRP) area hosts seven prospects (P9-P15) totaling approximately 520 km^2, which are within the **Exshaw, Bragg Creek, Holy Cross Mountain, Livingstone Mountain, Thunder Mountain, Crowsnest Pass** and **Blairmore** areas (Figure 5).

2. Introduction

Limestone is considered an industrial mineral with common and potential future uses including, but not limited to, quicklime, Portland Cement, aggregate, building stone, decorative stone, paper filler, riprap, sugar refining, water treatment, hydrated agricultural/chemical grade, ag-lime, and whitener (Holter, 1994). Areas prospective for high-calcium limestone (and high quality dolomite) are generally limited to the Foothills and Front Ranges of Alberta. Limestone is actively quarried at Cadomin, Nordegg, Prairie Creek, Corkscrew Mountain, Exshaw Area and Crowsnest Pass (Figure 1). Much of the region is currently reserved from exploration and development due to current land use zone restrictions, including Land Use Zone 1 (LUZ1) designated areas.

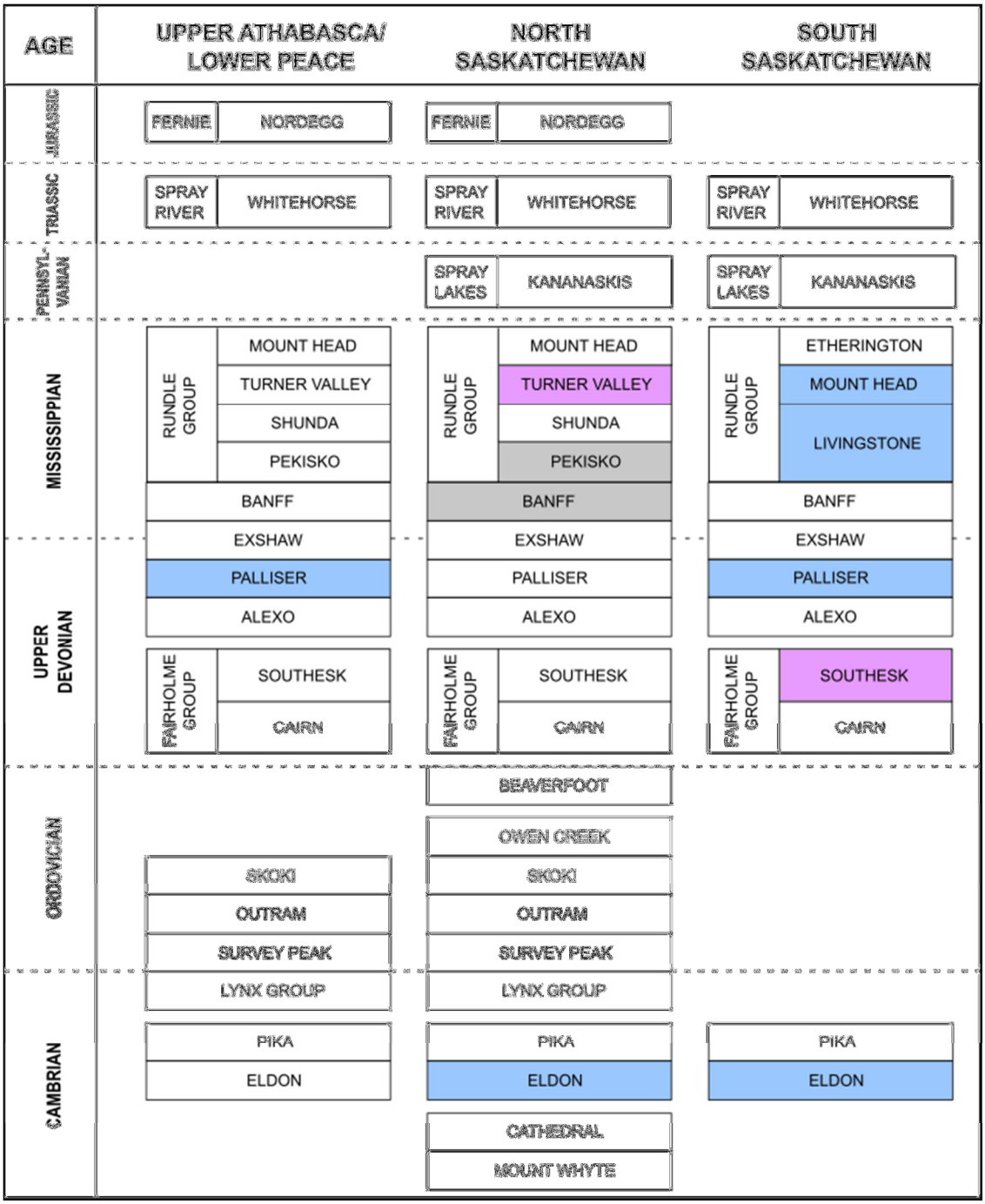
Limestone is a calcium carbonate ($CaCO_3$) and is generally considered high-calcium when it contains 90% $CaCO_3$ or greater and limited impurities (specifically SiO_2). Since there are variations in carbonate compositions in all stratigraphic units, lime operators often blend high and lower-calcium limestones in order to achieve a bulk composition of greater than 90%. Large tonnages and good access to major roads/rail are critical to development of any industrial mineral. Currently, the most common use of high-calcium limestone in Alberta is for the production of cement and quicklime.

Dolomite (also referred to as dolostone) is a calcium magnesium carbonate ($CaMg[CO_3]_2$), and is most commonly used in the construction industry. Typically, it is harder, denser and more durable than limestone, so it is often preferable for concrete and construction aggregate. Crushing and re-sizing for specific road building uses, railroad ballast, rip-rap or fill, and decorative/dimension stone are additional uses for dolomite. The chemical grade is secondary in importance to hardness and durability; however, high-quality dolomite is typically over 40% $MgCO_3$.

Limestones that do not meet chemical requirements for high-calcium purposes may have potential use as aggregate or building/decorative stone. However, this is highly dependent on proximity to transportation infrastructure.

In Alberta, the main sources of high-calcium limestone and dolomite are Paleozoic-aged (Cambrian – Permian) strata within the Front Ranges and Foothills. The most noteworthy limestone and dolomite-bearing units in the Upper Peace, Upper Athabasca, North Saskatchewan and South Saskatchewan Regional Planning areas are summarized in Table 1; geologic formations with either current or historic production are highlighted.

Table 1: Limestone and Dolomite Formations in the Front Ranges and Foothills of Alberta



* Blue denotes high-calcium limestone formations with current or historic production
* Purple denotes high quality dolomite formations with current or historic production
* Grey denotes limestone formations with current or historic aggregate or building stone production
* Sourced from Holter (1976) and Alberta Geological Survey (2015): Alberta Table of Formations, Alberta Energy Regulator, URL https://www.aer.ca/documents/catalog/TOF.pdf [2015-11]

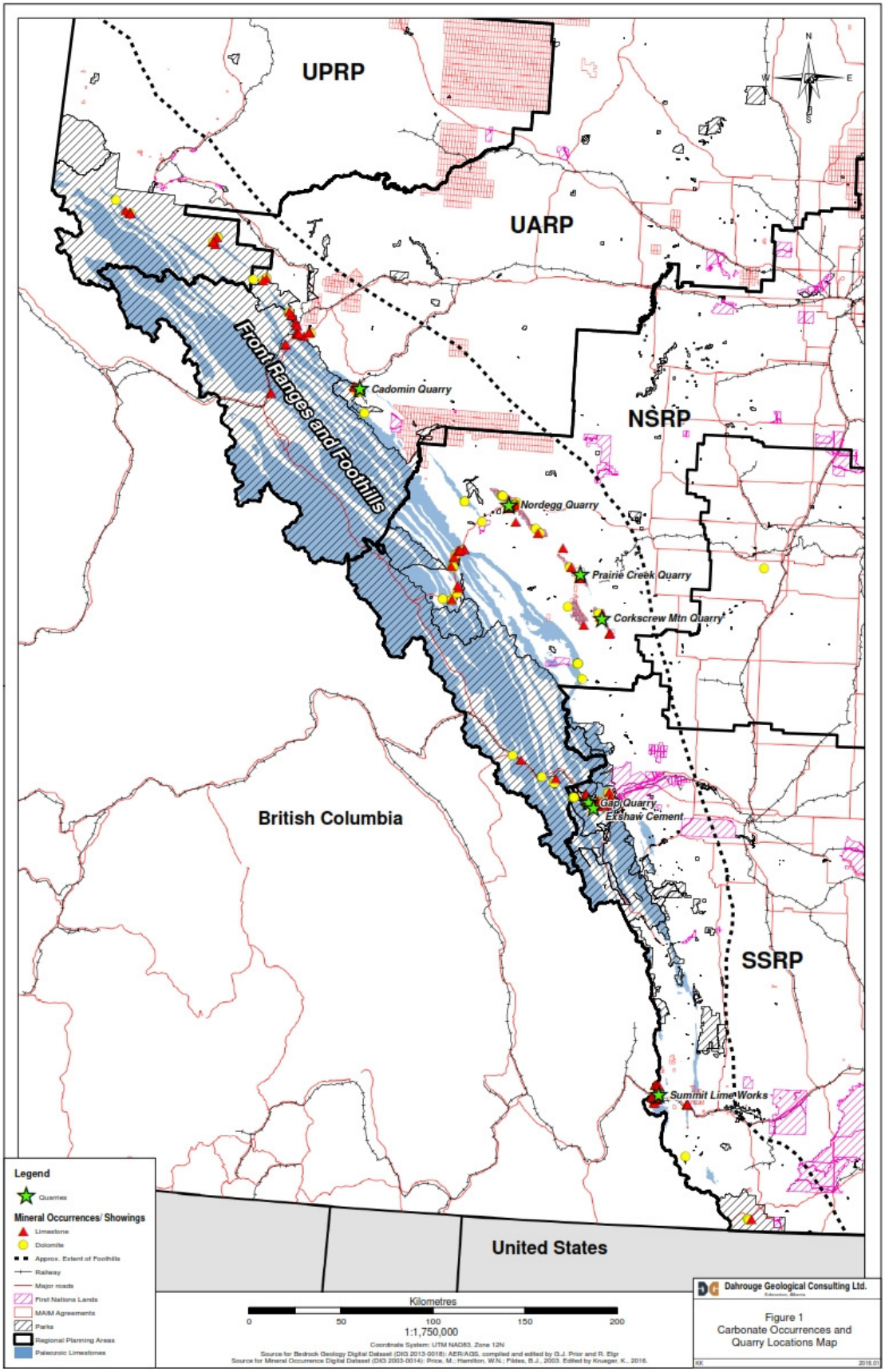


Figure 1: Carbonate Occurrences and Quarry Locations Map

3. Upper Peace Regional Planning (UPRP) Area

3.1 High-Calcium Limestone

All limestone and dolomite-dominant strata in the UPRP are currently covered by existing parks and protected areas (Figure 2). Historic exploration and development for ag-lime occurred southwest of Grand Cache from the Devonian Palliser and Mississippian Pekisko formations (MacDonald and Hamilton, 1981); however, the area is now restricted from these activities.

3.2 Aggregate and Building/Decorative Stone

In the UPRP, the only known potential carbonate for industrial use is within the Nordegg Member of the Jurassic Fernie Formation, a cherty limestone unit, which is up to 40 m thick in the Peace River Area (Poulton et al., 1994). Although there has been limited exploration targeting this unit in the UPRP, it may prove sufficient for building stone or aggregate.

4. Upper Athabasca Regional Planning (UARP) Area

4.1 High-Calcium Limestone

High-calcium limestone is actively quarried at one of two quarries located in Nikanassin Range, south of Cadomin (Figure 3). The quarries target two separate belts of exposed Palliser Formation for high-calcium limestone, which is used for cement production (Halferdahl, 1967). In the past, some material from the Cadomin quarries has also been used for crushed stone. Some exploration and development has also occurred in the Brûlé/Folding Mountain area, targeting high-calcium limestone of the Mississippian Pekisko Formation of the Rundle Group, where an approximately 18 m thick interval of high-calcium limestone was identified. Both the Cadomin quarry and Brûlé/Folding Mountain areas are currently held under mineral tenure. LUZ1 currently limits exploration and development south of Highway 16.

Although there has been limited exploration within the Devonian Arcs Member of the Southesk Formation, it outcrops south of Cadomin and may have some high-calcium limestone potential. Elsewhere in the Rocky Mountains, its thickness ranges from 12-74 m (Glass, 2014).

4.1.1 Folding Mountain Area (P1)

Several high-calcium limestone prospects occur outside parks/protected areas and existing mineral tenures within the UARP (Figure 3). The first prospect (P1 – approx. 12.8 km^2) is a thin, but well-exposed band of Devonian and Mississippian strata just south of Highway 16 and Jasper Park Gate. A historical (abandoned) quarry at the park gate targeted massive, high-calcium, finely crystalline Upper Palliser limestones (approximately 96% $CaCO_3$) (Holter, 1976). P1 includes a band of Palliser Formation, likely comparable to those encountered nearby at the park gate. Additionally, P1 may also cover Mississippian limestones with high-calcium potential. Prospect P1 is easily accessible, located proximal to rail lines and Hwy 16.

4.1.2 North of Cadomin (P2)

The second prospect (P2 – approx. 42.1 km^2) covers Mississippian limestones, most likely of the Rundle Group, located approximately 7 km west of Cadomin. Prospect P2 is situated along Hwy 40 with rail lines nearby.

4.1.3 South of Cadomin (P3)

The third prospect (P3 – approx. 168.4 km^2) is located less than 1 km southwest of First Nations Settlement #234 (Alexis Cardinal) and covers extensive outcrops of both Devonian (Palliser) and Mississippian (Rundle) limestones. P3 can be accessed via existing forestry roads.

4.2 Dolomite

4.2.1 South of Cadomin (P3)

Hamilton (1967) sampled the Devonian Cairn Formation along the southern extent of the Whitehorse Wildland Provincial Park to test for dolomite potential. The Cairn Formation, which ranges from 80-180 m in the Rocky Mountains, is primarily crystalline dolomite. This area, which is located in the northern part of P3 (approx. 168.4 km^2), may have potential for high quality dolomite.

Other units that may have potential for high-quality dolomite are the Mississippian Turner Valley and the lower part of the Devonian Palliser Formation. Both formations have returned $MgCO_3$ values in the 40-46% range further south in the Nordegg area, but without obtaining additional samples, their potential is uncertain in this area. These units occur within P1-P3, but their lithology and quality have not been confirmed in the UARP.

4.3 Aggregate and Building/Decorative Stone

A number of carbonate units in the UARP (Table 1) may have potential for building stone and aggregate, depending on market conditions and end use.

The Triassic Whitehorse Formation (of the Spray River Group) has previously been explored in both the Folding Mountain and Cadomin areas, where it consists primarily of cherty dolomite. Given the proximity to existing infrastructure, these areas may have potential for aggregate and/or building stone.

Outcrops of Devonian Mount Hawk and Palliser formations exist west of Brûlé Lake, approximately 25 km west of Hinton. Given the proximity of these outcrops to CNR's main rail line, there may be building stone or aggregate potential (Holter, 1976). The area west of Brûlé Lake is currently within a LUZ1 area.

5. North Saskatchewan Regional Planning (NSRP) Area

5.1 High-Calcium Limestone

Despite extensive exposures of Cambrian to Mississippian limestones within the NSRP, there are no current operational quarries that produce cement or quicklime; however, three quarries target limestone for aggregate and building/decorative stone (Figure 4). The Brazeau Range near Nordegg and the Limestone Range west of Caroline host significant occurrences of Devonian Palliser Formation, which is quarried elsewhere in the province for cement, and may have potential for quicklime. The Palliser Formation is up to 250 m thick near Nordegg and has an upper high-calcium member (93-96% $CaCO_3$) between 40-45 m thick.

Nordegg Quarry, adjacent to the town of Nordegg, exposes the Mississippian Pekisko Formation, a coarsely crystalline crinoidal limestone. The quarry produces crushed stone, feedstock to the Prairie Creek Quarry and historically, lime for sugar refining.

Exposures of Mississippian Pekisko Formation are also abundant in the Brazeau, Clearwater and Limestone ranges, with measured thicknesses of up to 40 m. This high-calcium packstone to grainstone-rich limestone (generally ranging between 95-98% $CaCO_3$) is considered suitable for quicklime and cement production (Holter, 1976). The majority of high-calcium limestone exposures within the Pekisko and Palliser formations are currently covered by MAIM (Metallic and Industrial Mineral) agreements (Figure 4).

High-calcium limestone is known within the Cambrian Eldon Formation. It was historically quarried at Windy Point along the shoreline of Abraham Lake. This limestone was used for the production of cement

and crushed stone. Hamilton (1987) identified Eldon carbonates (ranging from 97-99% $CaCO_3$) as having the greatest potential for paper-filler and extenders in Alberta, given their relatively light color.

An exposed road-cut on the south end of Abraham Lake contains a high-calcium limestone in an outcrop of the Chephren Member of the Cambrian Mount Whyte Formation (Hamilton, et al., 1998). At its type section near Lake Louise, this member is up to 44 m thick and varies from fine lime mudstone to coarse grainstone.

Another unit with high-calcium limestone potential in the NSRP is the Mississippian Livingstone Formation, which is the equivalent of the Pekisko-Shunda-Turner Valley sequence further east. Holter (1976) suggests that the Livingstone is suitable for cement and quicklime production. In the Crowsnest Pass area, quicklime was historically produced from the Livingstone.

Several high-calcium limestone prospects occur outside parks/protected areas and existing mineral tenures within the NSRP, although several are within LUZ1 areas and are currently not available for exploration or development (Figure 4).

5.1.1 Nordegg Area (P4)

Prospect P4 (approx. 64.4 km^2) occurs along a northwest trending band of Devonian and Mississippian rocks along Highway 11, approximately 15 km west of Nordegg. Although there has been no documented exploration for high-calcium limestone in this area, there is potential within the Palliser and Pekisko formations.

5.1.2 North Abraham Lake (P5)

Prospect P5 (approx. 136.2 km^2) covers the historic Windy Point Quarry site, located along Highway 11, on the western shore of Abraham Lake. In addition to the Eldon Formation, the Palliser and Livingstone formations also have potential for high-calcium limestone. This area has favorable access due to its proximity to Highway 11, but it is adjacent to extensive LUZ1 areas.

5.1.3 South Abraham Lake (P6)

Prospect P6 (approx. 58.0 km^2), located south of Abraham Lake, includes occurrences of Cambrian and Devonian carbonates along Highway 11. High-calcium limestone potential exists within the Mount Whyte Formation (Hamilton et al., 1998) as well as the Livingstone Formation (Holter and Hamilton, 1989). Similar to P5, this area has favorable access due to its proximity to Highway 11, but it is also bordered by extensive LUZ1 areas.

5.1.4 Ram Falls Area (P7)

Prospect P7 (approx. 295.4 km^2) encompasses vast exposures of Devonian and Mississippian carbonates west of Ram Falls. Although there has been no documented exploration for high-calcium limestone in this area, there is potential within the Palliser and Livingstone formations. P7 is almost entirely enclosed by LUZ1 areas.

5.1.5 Ya-Ha-Tinda Area (P8)

Prospect P8 (approx. 76.9 km^2) contains an extensive range of Devonian and Mississippian carbonates east of Ya-Ha-Tinda Ranch. Although there has been no documented exploration for high-calcium limestone in this area, there is potential within the Palliser and Livingstone formations. P8 is almost entirely enclosed by LUZ1 areas.

5.2 Dolomite

Prairie Creek Quarry, located 55 km southwest of Rocky Mountain House on Secondary Highway 752, currently produces three materials: an aesthetically appealing black, grey and brown mottled high-silica limestone marketed as ‘Rocky Mountain Rustic’, dolomite and limestone. It is likely that Prairie Creek Quarry exploits the Turner Valley Formation for dolomite, and the Pekisko Formation for limestone.

Dolomite from this quarry has been used as ballast for the Edmonton LRT expansion projects (Barnes, 2009).

In addition to the Turner Valley Formation, the Cambrian Pika-Eldon formations, Cambrian Lynx Group, Cambrian Cathedral Formation, and the Devonian Palliser Formation and Fairholme Group may have potential for high-quality dolomite (Holter and Hamilton, 1989).

5.2.1 Nordegg Area (P4)

Prospect P4 (approx. 64.4 km^2) covers the Fairholme Group and Turner Valley Formation, which may have potential for high-quality dolomite. West of Nordegg, Hamilton (1967) described a section of potential high-quality dolomite within the Devonian Fairholme Group, with a thickness of over 200 m. Both the Turner Valley and Lower Palliser have returned $MgCO_3$ values in the 40-46% range near Nordegg, over significant thicknesses.

5.2.2 North Abraham Lake (P5)

The northern end of Abraham Lake, Prospect P5 (approx. 136.2 km^2), includes potential high-quality dolomites of the Lynx and Fairholme groups. The Lynx Group dolomites, which Hamilton (1969) described as very hard and up to 35 m thick, returned values of 40% $MgCO_3$ in the same area.

5.2.3 South Abraham Lake (P6)

Prospect P6 (approx. 58.0 km^2) covers the Cambrian Cathedral Formation, which according to Glass (2014) consists of fine- to coarse-grained crystalline dolomite. In the Abraham Lake area, values are up to 42% $MgCO_3$.

5.2.4 Ram Falls Area (P7)

The Fairholme Group in the Ram Falls area (P7 – approx. 295.4 km^2), which is extensively covered by LUZ1 lands, has high-quality dolomite potential (Hamilton, 1967).

5.2.5 Ya-Ha-Tinda Area (P8)

The Pika and Eldon formations were described by Hamilton (1969) as a high-quality dolomite with a combined thickness of 126 m near the Ya-Ha-Tinda area (P8 – approx. 76.9 km^2). Additionally, the Lynx and Fairholme group dolomites may have high-quality potential.

5.3 Aggregate and Building/Decorative Stone

The Corkscrew Mountain Quarry, located along Hwy 591, is approximately 65 km southwest of Rocky Mountain House at the south end of Corkscrew Mountain. The quarry exposes both the Banff Formation and overlying Pekisko Formation to produce aggregate and building/decorative stone.

A number of carbonate units in the NSRP (Table 1) may have potential for building stone and aggregate, depending on market conditions and end use. The most accessible potential aggregate sources occur in the prospect areas previously discussed.

6. South Saskatchewan Regional Planning (NSRP) Area

6.1 High-Calcium Limestone

Summit Lime Works, located in southern Alberta's Crowsnest Pass area, has been active from the 1880's to present (Goudge, 1945) (Figure 5). The quarries target high-calcium limestone of the Mount Head and Livingstone formations for the production of quicklime and crushed stone. Another small quarry east of the limestone quarries exposes high-quality dolomite of the Fairholme Group (Holter, 1976). Overall the quality of the Livingstone Formation is highly variable, but contains thick beds of high-calcium grainstone

throughout. Several members of the Mount Head Formation also contain thick intervals of high-calcium homogeneous packstone and grainstone, which consistently return values over 95% $CaCO_3$.

An active quarry and lime plant near Exshaw (known as the Gap Quarry) targets high-calcium limestone of the Mount Head Formation; however, it has been previously reported as the Livingstone Formation (Holter, 1976). The high-calcium intervals consist of massive grainstone and lesser amounts of mudstone and may be up to 40 m thick.

High-calcium limestone beds within the Cambrian Eldon Formation have been previously quarried (as late as 1962) by Loders Lime Quarry. Some intervals returned values ranging up to 98-99% $CaCO_3$ (Holter, 1976).

The Exshaw cement plant exploits the high-calcium Devonian Palliser Formation. The cement produced is a heterogeneous mixture of limestone, shale and sandstones (Holter, 1976).

A historic quarry and plant at the base of Bluff Mountain near Blairmore, targeted a 10 m band of medium-grained, crinoidal high-calcium limestone. This band of limestone is near the top of the Mississippian Livingstone Formation and averaged 96-98% $CaCO_3$ (Holter, 1976).

6.1.1 Exshaw Area (P9)

Prospect P9 (approx. 77.8 km^2), located in Bow Corridor near Exshaw, covers high-calcium limestones of the Eldon, Palliser, Livingstone and Mount Head formations (Figure 5). This area has excellent access, with proximity to Highway 1 and rail. The majority of occurrences are currently under mineral tenure, covered by LUZ1 areas or within lands where mineral rights are not owned by the Crown.

6.1.2 Bragg Creek Area (P10)

Prospect P10 (approx. 93.0 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Prospect P10, located approximately 15 km west of Bragg Creek, can be accessed via Highway 66.

6.1.3 Holy Cross Mountain Area (P11)

Prospect P11 (approx. 14.6 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Prospect P11, approximately 30 km west of Longview at the southern extent of Holy Cross Mountain, can be accessed via Highway 541. Portions of this prospect are covered by LUZ1 areas and provincial parks.

6.1.4 Livingstone Mountain Area (P12)

Prospect P12 (approx. 131.5 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Prospect P12 covers portions of Windy Peak, Livingstone Mountain, Hailstone Butte and Plateau Mountain, and can be accessed from the Forestry Trunk Road or Highway 532. A significant portion of this prospect is currently covered by LUZ1 area and provincial parks.

6.1.5 Thunder Mountain Area (P13)

Prospect P13 (approx. 76.1 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Prospect P13, which is accessible from the north via the Forestry Trunk Road or from the east from Highway 22, encompasses limestone along Livingstone Range. There is minimal overlap of Prospect 13 by provincial parks and LUZ1 area.

6.1.6 Crowsnest Pass (P14)

Prospect P14 (approx. 101.8 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Prospect

P14 has excellent access, with Highway 3 and rail nearby. The majority of Prospect P14, which includes Summit Lime Works, is either under mineral tenure, covered by LUZ1 area, or within lands where mineral rights are not owned by the Crown.

6.1.7 Blairmore Area (P15)

Prospect P15 (approx. 32.7 km^2) includes extensive north trending exposures of Mississippian carbonates. High-calcium potential exists within the Livingstone and Mount Head formations. Additionally, Prospect P15 covers a band of Devonian Palliser Formation with high-calcium limestone potential (Macdonald and Hamilton, 1981). Prospect P15 has excellent access, with Highway 3 and rail nearby and minimal area is covered by LUZ1 area.

6.2 Dolomite

6.2.1 Exshaw Area (P9)

Limestone prospect P9 (approx. 77.8 km^2) also contains exposures of potential high-quality dolomite of the Fairholme Group. Holter (1976) reports several sample values ranging from 42-44% $MgCO_3$. High-quality dolomite potential may also exist within the lower member of the Palliser Formation.

6.2.2 Crowsnest Pass (P14)

Prospect P14 (approx. 101.8 km^2) exposes parts of the Fairholme Group and Palliser Formation, both of which have potential for high-quality dolomite. Hamilton (1987) describes the Fairholme Group east of Summit Lime Works as buff, crystalline dolomite up to 30 m thick.

6.3 Aggregate and Building/Decorative Stone

A number of carbonate units in the SSRP (Table 1) may have potential for building stone and aggregate, depending on market conditions and end use. The most accessible potential aggregate sources occur in the prospect areas previously discussed.

7. Conclusions

A number of prospective areas in the Foothills and Front Ranges of Alberta have been identified as having potential for high-calcium limestone and/or high quality dolomite. Within the UPRP area, known carbonate formations with potential are currently covered by park lands. Much of the high-potential Paleozoic limestones within the UARP, NSRP and SSRP areas are covered by LUZ1 areas, which currently prohibits exploration and development activities. Restriction of these activities has resulted in an insufficient dataset to accurately estimate the quality and potential of many areas with Paleozoic carbonates. Geologic studies of limestones and dolomites in each of the identified prospective areas is recommended to ascertain their optimal end uses.

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British Columbia

UPRP

UARP

Grande Cache

Muskeg River

N

W

E

S

Legend

Mineral Occurrences/ Showings

- Limestone
- Dolomite
- Approx. Extent of Foothills
- Railway
- Roads
- Rivers
- First Nations Lands
- MAIM Agreements
- Parks
- Regional Planning Areas

Bedrock Geology

- Jurassic to Neogene
- Pennsylvanian to Triassic
- Mississippian & Uppermost Devonian
- Devonian
- Ordovician
- Upper Cambrian
- Middle Cambrian
- Lower Cambrian
- Precambrian

Kilometres

0 25 50

1:500,000

Coordinate System: UTM NAD83, Zone 12N

Source for Bedrock Geology Digital Dataset (DIG 2013-0018): AER/AGS, compiled and edited by G.J. Prior and R. Elgr

Source for Mineral Occurrence Digital Dataset (DIG 2003-0014): Price, M.; Hamilton, W.N.; Fildes, B.J., 2003. Edited by Krueger, K., 2016.

Dahrouge Geological Consulting Ltd.
Edmonton, Alberta

Figure 2
Upper Peace Regional Planning Area

KK 2016.01

UPRP

UARP

NSRP

Folding Mountain (P1)

North of Cadomin (P2)

South of Cadomin (P3)

Nordegg (P4)

Hinton

Brûlé

Robb

Cadomin

Cadomin Quarry

Jasper

Folding Mtn

Wikanaesin Range

Alexis Cardinal

British Columbia

N

W

E

S

Legend

Quarries

Mineral Occurrences/ Showings

- Limestone
- Dolomite
- Approx. Extent of Foothills
- Railway
- Roads
- Rivers
- First Nations Lands
- MAIM Agreements
- Parks
- Prospect Areas
- Regional Planning Areas

Bedrock Geology

- Jurassic to Neogene
- Pennsylvanian to Triassic
- Mississippian & Uppermost Devonian
- Devonian
- Ordovician
- Upper Cambrian
- Middle Cambrian
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1:500,000

Coordinate System: UTM NAD83, Zone 12N

Source for Bedrock Geology Digital Dataset (DIG 2013-0018): AER/AGS, compiled and edited by G.J. Prior and R. Elgr

Source for Mineral Occurrence Digital Dataset (DIG 2003-0014): Price, M.; Hamilton, W.N.; Fildes, B.J., 2003. Edited by Krueger, K., 2016.

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Figure 3
Upper Athabasca Regional Planning Area

KK 2016.01

UARP

NSRP

SSRP

Alexis Cardinal

South of Cadomin (P3)

Nordegg (P4)

North Abraham Lake (P5)

South Abraham Lake (P6)

Ram Falls (P7)

Ya-Ha-Tinda (P8)

Ya-Ha-Tinda Ranch

Nordegg

Nordegg Quarry

Prairie Creek Quarry

Corkscrew Mtn Quarry

Shunda Mtn

Nordegg Mtn

Brazeau Range

Clearwater Range

Limestone Range

Limestone Mtn

Abraham Lake

Windy Point

Red Falls

British Columbia

N

W

E

S

Legend

Quarries

Mineral Occurrences/ Showings

- Limestone
- Dolomite

- Approx. Extent of Foothills
- Major roads
- Railway
- Rivers
- First Nations Lands
- MAIM Agreements
- Parks
- Prospect Areas
- Regional Planning Areas

Bedrock Geology

- Jurassic to Neogene
- Pennsylvanian to Triassic
- Mississippian & Uppermost Devonian
- Devonian
- Ordovician
- Upper Cambrian
- Middle Cambrian
- Lower Cambrian
- Precambrian

Kilometres

0 25 50

1:500,000

Coordinate System: UTM NAD83, Zone 12N

Source for Bedrock Geology Digital Dataset (DIG 2013-0018): AER/AGS, compiled and edited by G.J. Prior and R. Elgr

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Figure 4
North Saskatchewan Regional Planning Area

KK 2016.01

RDRP

NSRP

SSRP

N
W
E
S

Banff

Cochrane

Calgary

Bragg Creek

High River

Longview

Fort Macleod

Pincher Creek

Blairmore

Exshaw (P9)

Gap Quarry

Exshaw Cement

Bragg Creek (P10)

Holy Cross Mtn (P11)

Livingstone Mtn (P12)

Thunder Mtn (P13)

Summit Lime Works

Crowsnest Pass (P14)

Blairmore (P15)

British Columbia

Livingstone Range

Bluff Mtn

Kilometres

0 25 50 75

1:750,000

Coordinate System: UTM NAD83, Zone 12N

Source for Bedrock Geology Digital Dataset (DIG 2013-0018): AER/AGS, compiled and edited by G.J. Prior and R. Elgr

Source for Mineral Occurrence Digital Dataset (DIG 2003-0014): Price, M.; Hamilton, W.N.; Fildes, B.J., 2003. Edited by Krueger, K., 2016.

Legend

Quarries

Mineral Occurrences/ Showings

- Limestone
- Dolomite
- Approx. Extent of Foothills
- Railway
- Roads
- Rivers
- First Nations Lands
- MAIM Agreements
- Parks
- Prospect Areas
- Regional Planning Areas

Bedrock Geology

- Jurassic to Neogene
- Pennsylvanian to Triassic
- Mississippian & Uppermost Devonian
- Devonian
- Ordovician
- Upper Cambrian
- Middle Cambrian
- Lower Cambrian
- Precambrian

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Figure 5
South Saskatchewan Regional Planning Area

KK 2016.01