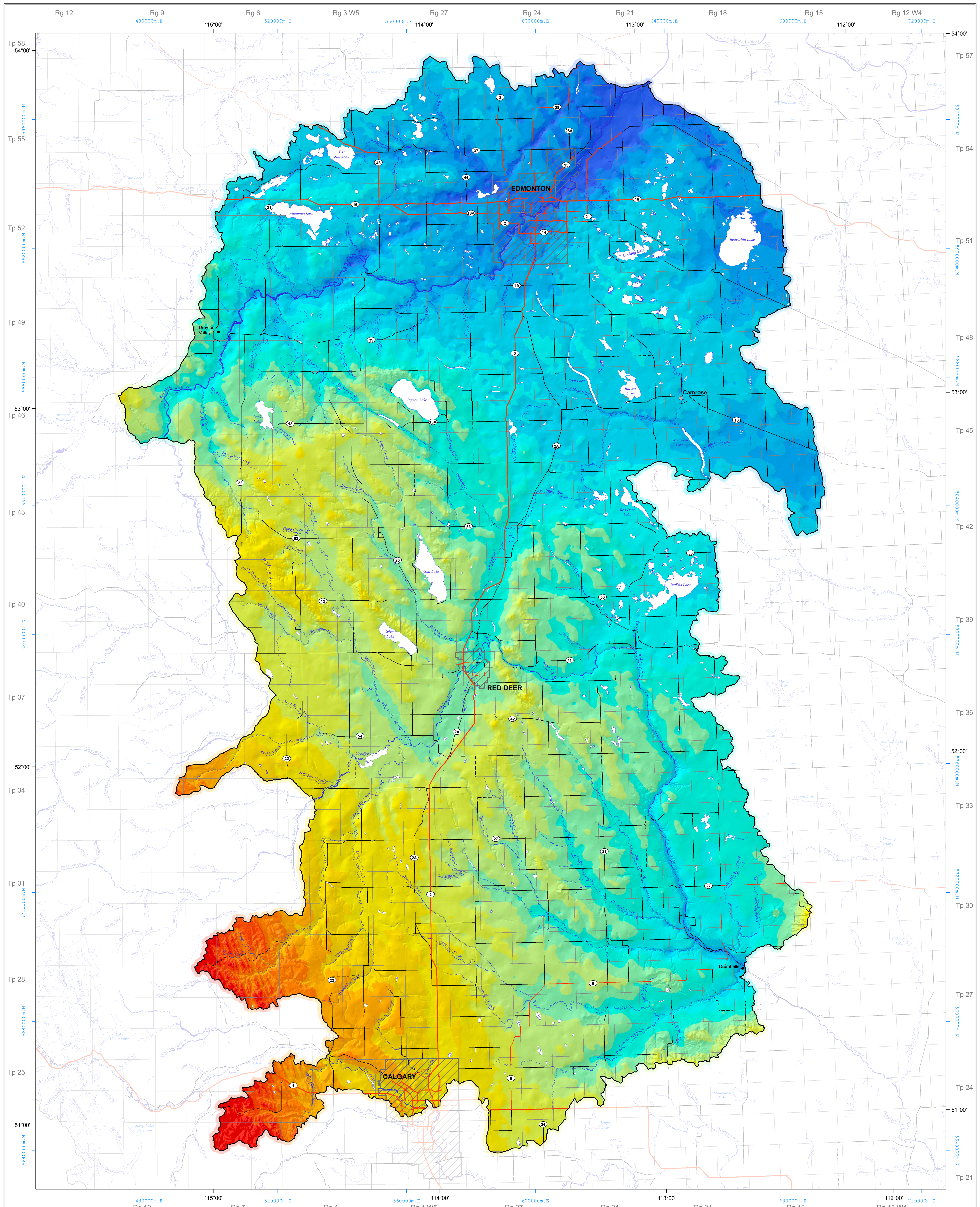
BEDROCK TOPOGRAPHY
NTS 82O, 82P, 83A, 83B, 83G and 83H



Legend

- Major City
- City
- Town
- Divided road
- Undivided road
- Paved road (other)
- Gravel road
- Edmonton-Calgary corridor project boundary

Bedrock Elevation (metres above sea level)

- 568 - 625
- 626 - 650
- 651 - 675
- 676 - 700
- 701 - 750
- 751 - 800
- 801 - 850
- 851 - 900
- 901 - 950
- 951 - 1000
- 1001 - 1100
- 1101 - 1200
- 1201 - 1300
- 1301 - 1400
- 1401 - 1500
- 1501 - 2348

Study Area

The Edmonton-Calgary Corridor (ECC) occupies an area of approximately 49,500 km^2 and lies within portions of National Topographic System map areas 83A, 83B, 83G, 83H, 82J, 82I, 82P and 82O. The boundary of the ECC is defined by ten subwatershed boundaries located within the Red Deer River, Bow River, Battle River and North Saskatchewan River basins (Figure 1). Collectively, the boundaries of these subwatersheds form the irregular shaped boundary of the ECC (Figure 1).

Data Sources

Data used to complete the bedrock topography map for the ECC were compiled from a variety of sources. These included water well records obtained from Alberta Environment's digital water well database, oil and gas well records maintained by the Energy Resources Conservation Board, geological maps produced by the Alberta Geological Survey, a Shuttle Radar Topography Mission 60 m grid-spaced digital elevation model (DEM) and unpublished geological data. Data density on a per township basis for the ECC is illustrated in Figure 1.

Interpretation

Analysis of the bedrock topography map was facilitated by a hill-shaded DEM, which resulted in identifying four bedrock terrains that collectively form the bedrock surface of the ECC. These terrains include highlands, uplands, lowlands and paleochannel complexes. Channel complexes have been subdivided into the Beverly-Onoway, Red Deer River and Drumheller complexes. These names originate from previously published work, their vicinity to urban centres and the morphology of paleodrainage patterns. The location and morphology of each terrain are discussed below.

Bedrock Highlands

The highlands terrain is evident only in the southwest portion of the study area immediately west of Calgary. This terrain is characterized by steep and complex slopes of the Rocky Mountains. It is morphologically similar to the Front Ranges, Central and Southern Foothills, and Western Benchlands physiographic regions (Pettapiece 1986; Figure 2). The topography in this terrain is variable, ranging in elevation from 1200 to 2350 m asl.

Bedrock Uplands

The uplands bedrock terrain is the predominant terrain in the ECC. Morphologically, this terrain is characterized by dissected, steep-sided plateaus, oblate knolls and linear ridges that vary in elevation from 900 to 1200 m asl. The morphology of physiographic regions that overly the uplands terrain, such as the Lodgepole Uplands, Drumheller Uplands, Cooking Lake Uplands, Olds Plain (Pettapiece 1986; Figure 2), are similar to the morphology of the underlying bedrock surface (refer to Figure 2, main map). This relationship indicates that the topography of the underlying bedrock is largely responsible for the morphology of the modern ground surface.

Steep-sided, oblate knolls and linear-shaped ridges in the uplands terrain are typically 150 km long and 15 km wide. This morphology is the result of erosion from adjacent paleochannels. This is particularly evident in the uplands between Red Deer and Drumheller. In this area, uplands have a preferred northwest to southeast orientation, nearly parallel to adjacent paleochannel complexes. Plateau-like terrains are restricted to the western portion of the ECC, where it is bound to the east by Highway 2 and to the north by Pigeon Lake. The steep sides of these plateaus are attributed to erosion by the Beverly-Onoway and Red Deer River paleochannel complexes.

Bedrock Lowlands

The lowlands bedrock terrain occupies the majority of the northern portion of the ECC. This terrain is characterized by a low-lying to gently undulating bedrock surface with a varying relief of 675 to 900 m asl. Topographic fluctuations within the central portion of this terrain, which underlies Edmonton, St. Albert, Spruce Grove and Stony Plain, are attributed to incision and subsequent erosion by the Beverly-Onoway paleochannel complex. Similar topographic fluctuations south of Camrose may be a result of erosion by the Red Deer River paleochannel complex.

Morphological relationships between ground surface and bedrock topography occur throughout this terrain. The low-lying to gently undulating morphology of the Edmonton Plain, Tawatinaw Plain and Sullivan Lake Plain physiographic regions mirror the topography of the underlying bedrock. However, the Cooking Lake Uplands physiographic region does not exhibit a morphological relationship between surface topography and underlying bedrock topography (Figure 2). This trend indicates that the bedrock topography did not play a significant role in influencing surface morphology. Rather, the morphological expression of this physiographic region is solely attributed to erosion and sedimentation by the Laurentide Ice Sheet during the Quaternary.

Paleochannel Complexes

Three main paleochannel complexes are within the ECC. These include the Beverly-Onoway, the Red Deer River and the Drumheller paleochannel complexes. Information pertaining to individual paleochannel complexes is discussed below.

Beverly-Onoway Paleochannel Complex

The Beverly-Onoway paleochannel complex is in the northern portion of the ECC, where it is overlain by the Lac La Biche Plain, Edmonton Plain, Drayton Plain and the Cheerhill Uplands (refer to main map; Figure 2). This southwest-trending complex initiates northeast of Fort Saskatchewan and traverses westward beneath Edmonton, St. Albert and Stony Plain toward Drayton Valley. The complex forms a parallel to rectangular paleodrainge pattern that varies in elevation from 570 to 675 m asl and is below the Lac La Biche Plain, Edmonton Plain, Drayton Plain and Cheerhill Uplands physiographic regions as defined by Pettapiece (1986; Figure 2).

The complex can be subdivided into three separate paleochannels. The first extends southwest beneath Fort Saskatchewan toward Edmonton. This paleochannel continues westward toward the present-day North Saskatchewan River, where it merges with a second paleochannel system. The second paleochannel traverses southwest beneath St. Albert, toward Stony Plain, and continues westward in tangent with the orientation of the present-day North Saskatchewan River. This paleochannel continues southwestward beneath Drayton Valley, extending outside of the ECC boundary. The terminus of this paleochannel is unknown; however, if its orientation remains parallel with that of the present-day North Saskatchewan River, it may extend as far south as Rocky Mountain House (outside of ECC boundary). North of Edmonton, the first and second paleochannel complexes are connected by several southeast-northwest–trending tributaries, resulting in a parallel paleodrainage pattern. The third paleochannel traverses east to west below St. Albert toward Lac Ste. Anne. Similar to the second paleochannel, the lateral extent of this system is unknown as it extends beyond the limits of the ECC boundary.

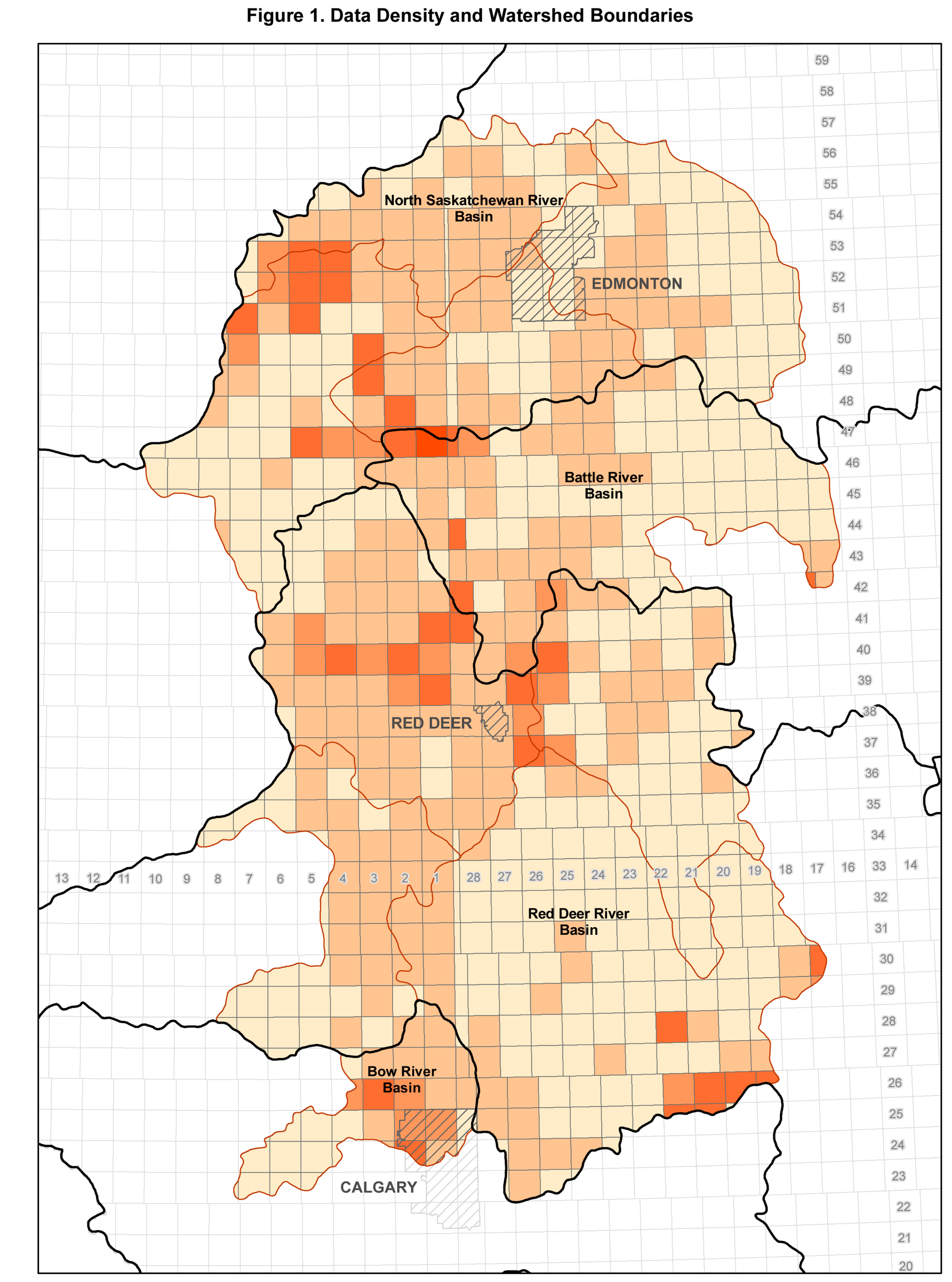
Red Deer River Paleochannel Complex

This complex forms a solitary trunk channel that varies in elevation from 750 to 900 m asl. This nearly straight paleodrainage pattern, which distinguishes it from other paleochannel complexes in the ECC, averages 10 km in width and extends more than 150 km. The complex is overlain by the Sullivan Lake Plain, Edmonton Plain, Big Rivers Plain, Olds Plain and Cooking Lake Uplands physiographic regions (Pettapiece, 1986; Figure 2). It is assumed that the complex intitiates east of Camrose, traversing west toward Wetaskiwin, then south, parallel to Highway 2, for approximately 110 km until it reaches its terminus beneath Innisfail. A second, smaller southeast-trending tributary, approximately 5 km wide and 30 km long, amalgamates with the complex immediately west of Innisfail. Several southeast-trending tributaries converge with the main paleochannel beneath Pigeon Lake, Battle River, Gull Lake, Blindman River and Sylvan Lake. The unique morphology of the Red Deer River paleodrainage pattern remains enigmatic. The solitary, linear-like architecture of the complex may be related to an underlying structural feature. This would account for the confined nature of the paleodrainage pattern.

Drumheller Paleochannel Complex

The Drumheller paleochannel complex is the most extensive in the ECC. It is defined by a dendritic paleodrainage pattern that spans more than 11700 km^2. This southeast-trending complex is bound to the west by Highway 2, to the north by Buffalo Lake and to the south by Serviceberry Creek. It extends eastward beneath Drumheller, parralleling the present-day Red Deer River beyond the boundary of the ECC. The complex is overlain by the Olds Plain, Big River Plains, Bigstick Lake Plain, Sullivan Lake Plain, Edmonton Plain, Drumheller Uplands and the Cooking Lake Uplands physiographic regions (Pettapiece, 1986; Figure 2). On average, tributaries that form the complex are 5 km wide, 75 km long and located beneath present-day creeks and rivers that transect the complex. These include the Serviceberry, Rosebud, Kneehills, Ghostpine, West Michichi and Michichi Creeks, and the Red Deer River.

Figure 1. Data Density and Watershed Boundaries



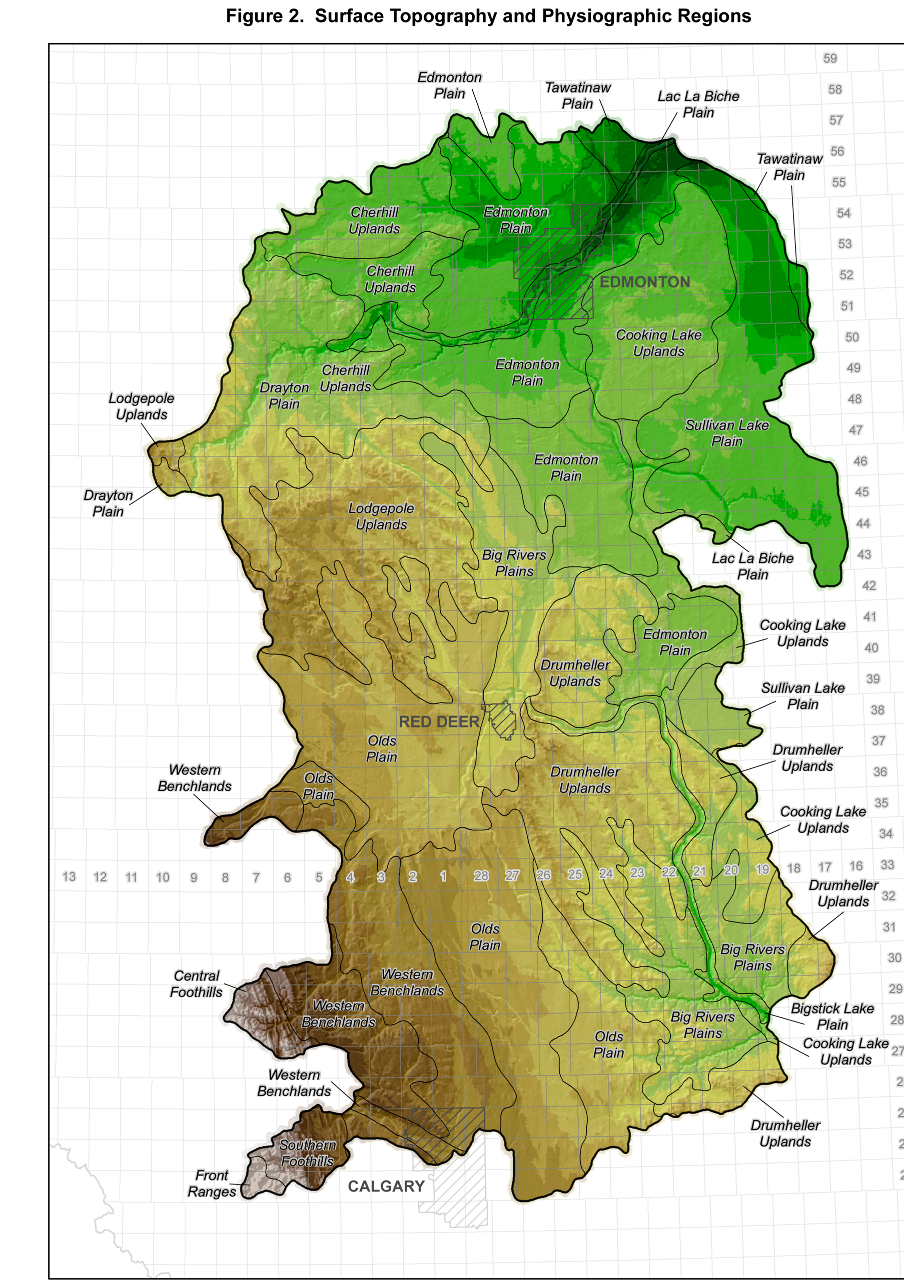
Legend

- City
- Major watershed basin boundary
- Watershed subbasin boundary

Data Density (number of points)

- 0 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- > 5000

Figure 2. Surface Topography and Physiographic Regions



Legend

- City
- Physiographic region boundary

Elevation (metres above sea level)

- 586 - 625
- 626 - 650
- 651 - 675
- 676 - 700
- 701 - 750
- 751 - 800
- 801 - 850
- 851 - 900
- 901 - 950
- 951 - 1000
- 1001 - 1100
- 1101 - 1200
- 1201 - 1300
- 1301 - 1400
- 1401 - 1500
- 1501 - 2471

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Acknowledgments

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* Alberta Environment

Recommended reference format:

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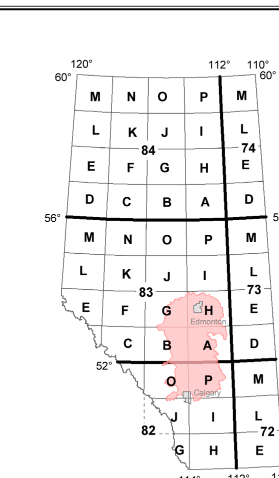
Map 549

Bedrock Topography of the Edmonton-Calgary Corridor

NTS 82O, 82P, 83A, 83B, 83G and 83H

Geology by: S.R. Slattery and A.A. Barker*

Scale 1:500 000



Projection: 10 Degree Transverse Mercator (10TM)
Datum: North American Datum, 1983 (NAD83)

ERCB Energy Resources Conservation Board
AGS Alberta Geological Survey
Government of Alberta